16

W. C. Redfield
with the regards of
James Hall

STATE OF NEW-YORK.

Charles Darwin esqr
With the respects of W. C. Redfield

No. 50.

IN ASSEMBLY,

January 24, 1840.

COMMUNICATION

From the Governor, transmitting several reports relative to the Geological Survey of the State.

EXECUTIVE CHAMBER,
ALBANY, *January* 24, 1840.

TO THE ASSEMBLY.

GENTLEMEN,

I transmit herewith the several annual reports of the gentlemen engaged in the Geological Survey of the State.

WILLIAM H. SEWARD.

PUBLISHER'S NOTE

Some of the pages in the following item are uncut. In order to make the Collection as complete as possible we have reproduced those pages which are available.

that many of the mines at present wrought by individuals must fall within the provisions of this act, and in reality belong to the people of the State.

The Geologists, therefore, submit this matter to the consideration of the Governor, and respectfully request that he will make such communications to the Legislature, as will ensure the repeal of the act in question, except in so far as it relates to the lands at present owned by the State. This measure it is believed would meet with the approbation of the people, remove an important obstacle to our mining operations, and well accord with the enlightened views which characterize the present age.

2. Another subject which in the opinion of the Geologists is of considerable importance is, the collecting of copies of the various levels which have been taken by engineers employed by the State or by individuals. The information thus obtained would be of great value in determining the thickness of the various rock strata, their dip, &c. A summary of these observations may be published in the final reports of the Survey and thus a vast amount of information in regard to the topography of the State will be rendered available, which otherwise will probably be entirely lost. We cannot doubt that a request from the Governor will be sufficient for the accomplishment of this important object.

(*Note*. Mr. Ruggles, (the Canal Commissioner,) suggests that an office be established at Albany for the Canal Commissioners, where copies can be preserved of all maps, plans and drawings, of every description, made and to be made for the service of the State. This would meet the above suggestion of the Geologists if it were to include also the surveys and levels made by private companies and individuals, of which there have been a great number in various parts of the State.)

3. The Geologists would again respectfully urge the great importance of providing suitable rooms or a separate building for the collections made during the progress of the Survey. There have been obtained for the State of Mineralogical and Geological specimens alone, upwards of 400 boxes which contain several thousand specimens. These are now deposited in the most rude and unsafe manner possible, in rooms temporarily assigned to the Geologists. But it should be particularly stated at this time, that as our engagements with the State terminate in

July next, it will occasion great delay in the forthcoming works, and cause much embarrassment to us, if we are not permitted at the end of that time to unpack the boxes and arrange the specimens which have been collected. It should be added that the final reports cannot well be completed until this has been done.

It is not easy to ascertain the exact space that will be required for the display of the collections which have been made, but from an estimate which we have made, we are satisfied that it will at least be equal to that of the three rooms in the 2nd story of the old State Hall: and we are unanimously of opinion, that this is the most eligible place for the State Museum. Indeed, it is the only one of the State buildings that contains rooms sufficiently spacious for the purpose.

4. The Board would also suggest to the Governor, as matters which will soon require attention, the mode and manner in which the final reports are to be published, and the number and style of maps, geological sections and diagrams. In regard to these last, it seems to be necessary that some preliminaries should shortly be settled, that there may be no unnecessary delay from that cause in completing the whole work.

All which is respectfully submitted.

J. E. DE KAY,
LARDNER VANUXEM,
EBENEZER EMMONS,
W. W. MATHER,
T. A. CONRAD,
JAMES HALL,
LEWIS C. BECK,

BIRDS.

Family Vulturidæ.
Cathartes aura.

Family Falconidæ.
Aquila chrysaëtos.
Haliaëtos leucocephalus.
Pandion carolinensis.
Butætes Sancti-Johannis.
Buteo borealis.
B. hyemalis.
B. pennsylvanicus.
Nauclerus furcatus.
Falco anatum.
F. columbarius.
Cerchneis sparverius.
Accipiter fuscus.
Astuc Cooperi.
A. atricapillus.
Strigiceps uliginosus.

Family Strigidæ.
Surnia funeria.
Nyctea candida.
Scops asio.
Bubo virginianus.
Brachyotus palustris.
Ulula nebulosa.
Nyctale acadica.

Family Caprimulgidæ.
Antrostomus vociferus,
Cordeiles virginianus.

Family Hirundinidæ.
Chætura pelasgia.
Progne purpurea.
Chelidon bicolor.
Cotyle riparia.
Hirundo fulva.
H. rufa.

Family Ampelidæ.
Bombycilla garrula.
B. carolinensis.

Family Alcedinidæ.
Ceryle alcyon.

Family Trochilidæ.
Trochilus colubris.

Family Certhidæ.
Sitta carolinensis.
S. canadensis.
Certhia americana.
Thryothorus ludovicianus.
T. palustris.
Troglodytes ædon.
T. hyemalis.
T. brevirostris.

Family Orphidæ.
Sialia Wilsoni.
Turdus migratorius.
T. mustelinus.
T. solitarius.
T. minor.
T. Wilsoni.
Mimus polyglottus.
M. rufus.
M. felivox.
Anthus ludovicianus.
Regulus satrapa.
R. calendula.
Parus atricapillus.
P. bicolor.
Trichus marilandica.
T. philadelphia.
Vermivora pennsylvanica.
V. protonotarius.
V. solitaria.
V. chrysoptera.
V. peregrina.
V. rubricapilla.
Seiurus aurocapillus.
S. noveboracensis.
Sylvicola ruficapilla.
S. maculosa.
S. maritima.
S. pardalina.
S. virens.
S. Blackburniæ.
S. icterocephala.
S. castanea.
S. striata.
S. piceus.

Sylvicola parus.
S. tigrina.
S. discolor.
S. æstiva.
S. formosa.
S. canadensis.
S. cerulea.
Wilsonia minuta.
W. pusilla.
Culicivora cærulea.

Family Muscicapidæ.

Setophaga niticilla.
Tyrannula pusilla.
T. acadica.
T. virens.
T. fusca.
Tyrannus Cooperi.
Milvalus tyrannus.
Icteria viridis.
Vireo flavifrons.
V. solitarius.
V. noveboracensis.
V. gilvus.
V. olivaceus.

Family Lanidæ.

Lanius septentrionalis.

Family Corvidæ.

Perisoreus canadensis.
Cyanocorax cristatus.
Pica hudsonica.
Corvus ossifragus.
C. americanus.
C. catolotl.
Quiscalus versicolor.
Scolecophagus ferrugineus.
Sturnella ludoviciana.
Icterus baltimore.
I. spurius.
Agelaius pheniceus.
Molothrus pecoris.
Dolichonyx oryzivorus.

Family Fringillidæ.

Guiraca cerulea.
G. ludoviciana.
Struthus hyemalis.
Passarella iliaca.

Zonotrichia melodia.
Z. graminea.
Z. pennsylvanica.
Z. leucophrys.
Euspiza americana.
Coturniculus passerinus.
Ammodramus maritimus.
A. caudacutus.
Passerculus savana.
P. palustris.
Spizella canadensis.
S. socialis.
S. pusilla.
Chrysomitris tristis.
C. pinus.
Linota linaria.
Erythrospiza purpurea.
Cardinalis virginianus.
Pipilo erythropthalmus.
Spiza cyanea.
Pyranga rubra.
Plectropharus lapponicus.
P. nivalis.
Phileremos cornutus.
Corythus enucleater.
Loxia americana.
L. leucoptera.

Family Picidæ.

Dryotomus pileatus.
Picus villosus.
P. varius.
P. pubescens.
Apternus arcticus.
Melanerpes erythrocephalus.
Centurus carolinus.
Colaptes auratus.

Family Cuculidæ.

Erythrophrys erythropthalmus.
E. americanus.

Family Columbidæ.

Ectopistes migratoria.
E. carolinensis.

Family Tetraonidæ.

Ortyx virginiana, male and female.
Bonasia umbellus.
Tetrao cupido.

Osmerus eperlanus.
Alosa mattowaca.
A. notata.
A. vernalis.
A. sapidissima.
Clupea virescens.
Chatœssus aglina.
Morrhua vulgaris.
M. eglefinus.
M. pruinosus.
Merlangus leptocephalus.
M. carbonarius.
Merluccius vulgaris.
Lota digitata.
Phycis signifer.
Platessa plantis, and reversed.
P. pusilla.
Pleuronectes oblongus.
Rhombus maculatus.
R. ferrugineus.
Lumpus ceruleus.
Anguilla tenuirostris.
Diodon immaculatus.
Accipenser hudsonicus.
Spinax acanthias.
Raia ocellata.
R. diaphanes.
Petromyzon americanus.
P. maurani.

MOLLUSCA.

Loligo punctata, and ovaries.
Helix thyroidus.
H. albolabris.
H. monodon.
H. hirsuta.
H. tridentata.
H. alternata.
Limneus ———.
Melampus bidentatus.
Turbo rudis.
T. palliatus.
T. irroratus.
T. neretoides.
Scalaria lineata.
Paludina disscisa.
Natica heros.
N. duplicata.
Crepidula fornicata.
C. plana.
Nassa trivittata.
N. obsoleta.
Columbella avara.
Ranella caudata.
Fusus cinereus.
Chiton inermis.
Anomia ephippium.
Arca pexata.
Arca transversa.
Modiolus papuanus.
M. demissus.
Alasmodonta undulata.
Unio purpureus.
U. cariosus.
U. ochraceus, and var.
Cardita borealis.
Cardium Mortoni.
C. pinnatulum.
Donax fossor.
Astarte castanea.
Venus gemma.
V. mercenaria.
V. notata.
Cytherea convexa.
Petricola pholadiformis.
Mactra lateralis.
M. solidissima.
Mya arenaria.
Lyonsia hyalina.
Anatina dubia.
Solemya velum.
Pandora trilineata.
Solecurtus caribeus.
S. costatus.
Sanguinolaria fusca.

ANNULOSA.

Padoma trifida.
Piscicola mercenaria.
Hirudo niger.
Epistoma chatauque.

CRUSTACEA.

Portunus pictus.
Platycarcinus irroratus.
Lupea dicantha.
Gelasimus vocans.
Astacus Bartonii.
A. affinis.
Cymothoa triloba
C. olivacea

INSECTS.

Julus marginatus.
Holydesmus angulatus.
Lithobius spinipes.
Cicindela vulgaris.
C. purpurea.
C. rugifrons.
C. punctulata.
Carnonia pennsylvanica.
Brachinus fumans.
B. cordicollis.
Lebia atriventris.
L. viridis.
Scarites subterraneus.
Clivina bipustulata.
C. sphericollis.
Daptus incrassatus.
Staphylinus villosus.
S. immaculatus.
S. cinnamopterus.
Buprestis fasciata.
B. coronata.
B. lineata.
B. ruficollis.
Elater oculatus.
E. bilobatus.
E. vespertinus.
E. dorsalis.
E. militaris.
E. communis.
Lycus reticulatus.
Lampyris versicolor.
L. scintilans.
L. corrusca.
L. laticornis.
L. decipiens.
Telephorus marginatus.
Necrophorus americanus.
N. marginatus.
N. tomentosus.
Silpha americana.
S. marginalis.
S. inequalis.
Ateuchus lævis.
Onthophagus hecate.
Scarabeus jamaicensis.
S. maimon.
S. geminatus.
Rutela punctata.
R. lanigera.
Melolontha quercina.
M. hirsuta.
M. vespertina.
Lucanus capreolus, m. and f.
L. paralellus.
Platycerus piceus.
Passalus cornutus.
Scotinus inequalis.
Upis pennsylvanicus.
U. femoratus.
U. granarius.
Melandria striata.
Hylurgus terebrans.
Parandra brunnea.
Prionus laticollis.
P. levigatus.
P. unicolor.
Cerambyx cinctus.
C. speciosus.
C. nobilis.
C. pictus.
C. erythrocephalus.
C. violaceus.

now, we believe, conceded to be of greater extent than in Europe; and this is attributed mainly to two causes: One is to be found in the large masses of water in the interior, equalizing the temperature to a great extent throughout the Union; the other is the existence of mountain ranges extending in a northeastern and southwesterly direction, compensating by their elevation for the difference of latitude.

The State of New-York, independent of its extent of surface, (comprising an area of 64,000 square miles,) in its latitudinal position is such that it constitutes the northern limits of many southern species, and the southern boundary of many animals usually considered as arctic or northern species. Hence we find the *Didelphis virginiana* or opossum, the *Cathartes aura* or turkey buzzard, the *Scaphiopus solitarius*, the *Hemulon chrysopteron*, and others, appearing in our State from the south; whilst the *Stemmatopus cristatus*, *Surnia nyctea*, *Somateria mollissima*, and, if I am correctly informed, even the *Cervus tarandus*, appear not far from our limits on the north. The distribution of species has been also affected by the hand of man. We refer not particularly to those species which have been domesticated, and rendered subservient to the wants of man; but to those artificial water communications, by means of which the *Cyclea œnea*, the geographic tortoise, and other inhabitants of the great lakes, have transferred their abodes to the waters of the Hudson.

There are, however, limits to the geographical distribution of animals; and the study and determination of these limits forms, at the present day, one of the most interesting objects of inquiry to the zoologist. But in order to establish this point with the requisite degree of exactness, it is scarcely necessary to observe that the species themselves must be first previously well determined; and accordingly, at the outset of our inquiries, we are met with difficulties arising from a want of a due discrimination of species. In the course of our final report, it will be perceived that many species, hitherto considered as identical with those of Europe, are treated as specifically distinct.

In cases where species have been observed north and south of the State, I have not hesitated to include them among the animals of New-York, although I have not had the good fortune to meet with them. Such, however, will undoubtedly be found; and their number, it will be perceived, is comparatively small.

I have conceived that it would add to the value of the Report, to annex short notices of all the animals described as inhabiting the United States, with reference to the source from whence they are derived. Such notices, collected from pamphlets, magazines, reviews and newspapers, all difficult of access, have greatly enhanced my labors; but it is hoped that they will be useful in abridging the researches of future naturalists.

In the general arrangement and distribution of animals, I have taken as the groundwork of my classification the *Regne Animal* of Cuvier, with such modifications as have been introduced by other naturalists. In the description of species, I have endeavored, as far as possible, to observe uniformity; and the measurements are all reduced to inches and tenths corresponding to English measure. Where a species has been described by a naturalist of authority, I have not hesitated to copy his description, with such variations as may be necessary to produce uniformity. The species itself is then carefully compared with the description; and such alterations, corrections or additions as have appeared requisite, have been incorporated in the detailed account. A notice of the habits, geographic range, and their utility or hurtfulness to man, closes the description.

CLASS I. MAMMALIA.

In this Class, I have followed almost exclusively the distribution proposed by Cuvier. The first Order, Quadrumana, is totally wanting in the United States; no monkey, according to Lichtenstein, having been observed beyond the twenty-ninth degree of north latitude.

Order Carnivora.

The first groupe is very natural and exceedingly numerous, not less than one hundred and fifty species having been enumerated in various parts of the globe. But nine species have as yet been detected within the limits of the United States, and five have been described as residents of this State.

Family Vespertilionidæ.

*Vespertilio noveboracensis.	*Vespertilio carolinensis.
*V. pruinosus.	*V. noctivagans.
*V. subulatus.	

* The asterisks indicate those species which have been figured for this Report.

Family Suidæ.

Sus scrofa, introduced.

ORDER RUMINANTIA.

Family Bovidæ.

Bos taurus, introduced.

Ovis aries, introduced.

Family Cervidæ.

Cervus virginianus.

C. alces.

Cervus canadensis, extirpated?

C. tarandus?

ORDER CETACEA.

Family Balænidæ.

Delphinus delphis.

Phocæna melas.

*P. orca.

*Balæna mysticetus.

*Balænoptera rostrata.

*B. fossil.

Physeter macrocephalus.

CLASS II. BIRDS.

This Class has received the most attention from our naturalists, and is consequently better known than others. About four hundred and ninety species have been observed in all North America; and of these, it will be seen that more than three hundred have been observed already within the limits of the State. In this department, I have taken as the basis of my labours the geographical and comparative list of the birds of Europe and North America by C. L. Bonaparte. I have been led to this, partly from the excellence of its arrangement, and more especially as it is to form the groundwork of a General History of Birds, which it is understood will shortly be published by that eminent ornithologist. I have attempted some modifications, suggested by the excellent Synopsis of Audubon.

SUB-CLASS 1. INSESSORES.

ORDER 1. ACCIPITRES.

Family Vulturidæ.

*Cathartes aura.

Family Falconidæ.

*Aquila chrysaëtos.
*Haliaëtos leucocephalus.
*Pandion carolinensis.
*Buteo Sancti-Johannis.
*B. Swainsoni.
*B. borealis.
*B. hyemalis.
*B. pennsylvanicus.
*Nauclerus furcatus.
*Falco anatum.
*F. columbarius.
*F. sparverius.
*Accipiter fuscus.
*Astur Cooperi.
*A. atricapillus.
*Strigiceps uliginosus.

Family Strigidæ.

*Surnia funerea.
*S. nyctea.
*Bubo asio.
*B. virginianus.
*Syrnium cinereum?
*Otus americanus.
*O. brachyotus.
*Ulula nebulosa.
*Nyctale acadica.
*Strix pratincola.

ORDER 2. PASSERES.

SECTION 1. AMBULATORES.

Family Caprimulgidæ.

*Caprimulgus vociferus.
*Caprimulgus virginianus.

Family Hirundinidæ.

*Chætura pelasgia.
*Hirundo purpurea.
*H. bicolor.
*H. riparia.
*Hirundo fulva.
*H. rufa.
*H. serripennis.

Family Ampelidæ.

*Bombycilla garrula.
*Bombycilla carolinensis.

Family Alcedinidæ.

*Alcedo alcyon.

Family Trochilidæ.

*Trochilus colubris.

Family Certhidæ.

*Sitta carolinensis.
*S. canadensis.
*Certhia familiaris.
*Thryothorus ludovicianus.
*T. palustris.
Troglodytes americanus?
*T. ædon.
*T. hyemalis.
*T. brevirostris.

ORDER GRALLÆ.

Family Charadridæ.

*Egialites semipalmatus.
*E. melodus.
*E. Wilsonius.
*E. marmoratus.
*Squatarola helvetica.
*Strepsilas interpres.
*Hæmatopus palliatus.

Family Gruidæ.

*Grus americana.
*Ardea herodios.
*Egretta leuce.
*E. candidissima.
E. ludoviciana.
E. cerulea.
*Herodias virescens.
*Ardeola exilis.
*Botaurus minor.
*Nycticorax americanus.
*N. violaceus.

Family Tantalidæ.

*Ibis alba.
Ibis ordi.

Family Scolopacidæ.

*Numenius longirostris.
*N. hudsonicus.
*N. borealis.
*Hemipalama himantopus.
*H. semipalmata.
*Tringa maritima.
*T. rufescens.
*Pelidna subarquata.
*P. cinclus.
*P. Schinzi.
*P. pectoralis.
*P. pusilla.
*Calidris arenaria.
*Machetes pugnax, accidental.
*Totanus macularius.
*T. Bartramius.
*T. flavipes.
*T. chloropygius.
*T. melanoleucus.
*T. semipalmatus.
*Limosa fedoa.
*L. hudsonica.
*Macroramphus noveboracensis.
*Gallinago Wilsoni.
*Rusticola minor.

Family Rallidæ

*Rallus elegans.
*R. crepitans.
*R. virginianus.
*Ortygometra noveboracensis.
*Ortygometra carolina.
*Gallinula galeata.
*Fulica americana.

Family Phalaropidæ.

*Phalaropus fulicarius.
*Lobipes hyperboreus.
*Lobipes Wilsoni.

Family Recurvirostridæ.

*Recurvirostra americana.

Order Anseres.

Family *Anatidæ.*

*Cygnus americanus.
*Anser hyperboreus.
*A. albifrons.
*A. canadensis.
A. Hutchinsi?
*A. brenta.
*Anas sponsa.
*A. boschas.
*A. discors.
*A. obscura.
*A. stupera.
*Marcea americana.
*Rhynchaspis clypeata.
*Querquedula carolinensis.
*Somateria mollissima.
*Somateria spectabilis.
*Oidemia perspicillata.
*O. fusca.
*O. americana.
*Fuligula valisneria.
F. erythrocephala.
*F. marila.
*F. rufitorques.
*F. labradora.
*Clangula americana.
*C. albeola.
*C. histrionica.
*Harelda glacialis.
*Erismatura rubida.

Family *Mergidæ.*

*Merganser castor.
*M. serrator.
*Merganser cucullatus.

Family *Pelecanidæ.*

*Phalacracorax carbo.
*P. dilophus.
Pelecanus americanus?
*Pelecanus fuscus.
*Sula bassana.
S. fusca.

Family *Laridæ.*

*Rhynchops nigra.
*Sterna Wilsoni.
*S. hirundo.
S. arctica.
*S. dougalli.
*S. argentea.
*Hydrochelidon nigrum.
*Thalasseus cantiacus.
*T. cayanus.
*Gelochelidon aranea.
*Xema Sabini.
*X. Bonapartii.
*X. atricilla.
Rissa tridactyla.
*Larus glaucus.
*L. marinus.
*L. zonorhyncus.
L. leucopterus.
L. argentatus.
*Lestris pomarinus.
*L. Richardsoni.
Procellaria glacialis?
*Puffinus obscurus.
*P. cinereus.
*Thalassidroma Wilsoni.
*T. Leachi.

Family *Colymbidæ.*

*Sylbeocyclus carolinensis.
*Podiceps auritus.
P. cornutus.
*P. rubricollis.
*Podiceps cristatus.
*Colymbus glacialis.
*C. septentrionalis.

Family Scomberidæ.

*Scomber vernalis.
S. scombrus.
S. colias.
Thynnus vulgaris.
*Pelamys sarda.
Cybium maculatum.
*Trichiurus lepturus.
Xiphias gladius.
Naucratus noveboracensis.
*Elacate atlantica.
Trachinotus fuscus.
T. argenteus.
Notacanthus ———.
Caranx punctatus.
*Caranx chrysos.
*C. pisquetus.
Argyreosus vomer.
*A. Mitchilli.
*Vomer Brownii.
V. crinitus.
Seriola Boscii.
S. leiarchus.
*S. zonata.
S. cosmopolita.
*Temnodon saltator.
Peprilus longipinnis.
*P. triacanthus.
Lampris guttatus.

Family Theuthidæ.

Acanthurus phlebotomus.
Acanthurus hepatus.

Family Atherinidæ.

Atherina menidea.
A. Boscii.
Atherina mordax.

Family Mugilidæ.

Mugil petrosus.
M. Plumieri.
Mugil albula.
M. lineatus.

Family Gobidæ.

Blennius gunnellus.
Pholis ———.
Chasmodes Bosquianus.
*Gunnellus mucronatus.
*Zoarces labrosus.
*Z. fimbriatus.
*Anarrhicas lupus.

Family Lophidæ.

Lophius americanus.
Chironectes lævigatus.
Malthea nasuta.
M. notata.
Malthea vespertilio.
*Batrachus tau.
B. variegatus.

Family Labridæ.

*Labrus americanus.
*Crenilabrus ceruleus.
Cychla ænea.
Cychla minima.
C. fasciata.

Family Fistularidæ.

Fistularia serrata.

Order 2. Soft-rayed Fishes.

* Abdominal.

Family Cyprinidæ.

Cyprinus carpio, introduced.
C. auratus, introduced.
*Abraneis versicolor, n. sp.
*Catostomus hudsonius.
*C. oblongus.
*C. elegans, n. sp.
*C. pallidus, n. sp.
C. teres.
Catostomus tuberculatus.
*Leuciscus chrysoleucas.
Hydrargira diaphana.
H. multifasciata.
*Fundulus flavidus, n. sp.
*F. zebra, n. sp.
*Lebias ovinus.

Family Esocidæ.

*Esox reticulatus.
*E. minor, n. sp.
E. niger.
E. estor.
Belone truncata.
Scomberesox equirostris.
Exocetus comatus.
E. furcatus.

Family Siluridæ.

Bagrus marinus.
*Pimelodus vulgaris, n. sp.
P. albidus.
Pimelodus cœnosus.
P. nebulosus.

Family Salmonidæ.

Salmo amethystus.
S. salar, accidental.
*S. fontinalis.
*Osmerus eperlanus.
Corregonus albus.
C. otsego.
C. artedi.

Family Clupidæ.

Clupea fasciata.
C. elongata.
*C. dubia, n. sp.
*Alosa sapidissima.
*A. notata, n. sp.
*Alosa menhaden.
*A. tyrannus.
*A. mattowaca.
*Chatœssus oglina.
Hiodon clodalus.

** Subbrachial.

Family Gadidæ.

*Morrhua vulgaris.
*M. pruinosus.
M. callarias.
M. æglefinus.
*Merlangus carbonarius.
*M. leptocephalus, n. sp.
M. albidus.
*Merluccius vulgaris.
*Lota digitata, n. sp.
Brosmius flavescens.
B. vulgaris.
*Phycis signifer, n. sp.
P. longipes.
P. punctatus.

*Planorbis armigerus.
*P. megastoma, n. sp.
*P. niger, n. sp.
*Lymnea catascopium.
*L. desidiosa.
*L. macrostoma.
*L. reticulata, n. sp.
*L. reflexa.
*L. appressa.
*L. elodes.
*Lymnea humilis.
L. pinguis.
*L. nigrescens, n. sp.
*L. modicellus.
*L. gracilis, n. sp.
*Physa heterostropha.
*P. ancillaria.
*P. fragilis, n. sp.
*P. elliptica.

†† NUDIBRANCHIATA.

Doris ———.
Tritonia Reynoldsi.
Eolis bostoniensis.
Cavolina salmonacea.
Tergipes gymnota.

††† INFEROBRANCHIATA, not observed.

†††† TECTIBRANCHIATA.

Bulla fluviatilis.
*B. insculpata.
Bulla oryza.
B. triticea.

††††† HETEROPODA, not observed.

†††††† PECTINIBRANCHIATA.

Turbo obligatus.
T. irroratus.
*T. vestitus.
T. palliatus.
T. inflatus.
T. incarnatus.
T. minutus.
*T. cinereus.
T. multilineatus, n. sp.
*Lacuna fusca.
Pleurotoma bicarinata.
Turritella interrupta.
*Scalaria subulata.
*Valvata tricarinata.
*V. sincera.
*Paludina disscisa.
P. porata.
P. lustrica.
*P. heros, n. sp.
*Ampullaria paludosa.
Melania multilineata.
Laminia trifida.
L. exigua.
*Natica duplicata.
*N. heros.
*N. triseriata.
*N. pusilla.
N. consolidata.
N. immaculata.
Crepidula glauca.
*C. fornicata.
*C. plana.
*C. convexa.
Galericulum ———.
Calyptrea ———.
Sigaretus glaber.
Velutina rupicola.
Cryptostoma ———.
Marginella carnea.
Trichotropis ———.
Cancellaria leonthocyi.
Buccinum undatum.
*Nassa obsoleta.
*N. trivittata.
*Purpura lapillus.
*P. imbricata.

*Purpura bizonalis.
*Pasithea nigra.
*Ranella caudata.
*Fusus corneus.
Fusus cinereus.
F. decemcostatus.
*Fulgur canaliculatus.

††††††† SCUTIBRANCHIATA.

Fissurella greca.

†††††††† CYCLOBRANCHIATA.

*Patella alveus.
P. candida.
*P. amœna.
Ancyclus rivularis.
Chiton pectinatus.
C. fulminatus.
C. sagrinatus.

ORDER 4. ACEPHALA.

† TESTACEA.

Ostrea borealis.
O. virginica.
Pecten concentricus.
*Anomia ephippium.
*Arca pexata.
A. transversa.
A. incongrua.
Nucula semisulcata.
N. myalis.
Mytilus edulis.
M. cubitus.
M. striatus.
*Modiola papuana.
M. glandula.
*Anodonta cataracta.
A. marginata.
A. pennsylvanica.
A. plana.
A. benedictensis.
A. fragilis.
A. subcylindracea.
A. edentula.
A. Ferussaciana.
Alasmodonta rugosa.
A. undulata.
A. marginata.
A. arcuata.
Unio complanatus.
U. radiatus.
U. occidens.
Unio luteolus.
U. compressus.
U. nasutus.
*U. ochraceus.
U. cariosus.
U. novi-eboraci.
U. heterodon.
U. crassus.
U. gracilis.
Cardita borealis.
*Cardium Mortoni.
C. pinnatulum.
C. pubescens.
C. grœnlandicum.
*Donax fossor.
Cyclas similis.
C. dubia.
C. partumeia.
C. rhomboida.
Cyprina islandica.
Tellina tenera.
T. sordida.
T. lateralis.
T. versicolor.
*Venus mercenaria.
*V. notata.
*V. preopaca.
*V. inequalis.
*V. gemma.
*Astarte castanea.

Stenosoma irrorata.
S. filiformis.
Philoscia vittata.
Oniscus affinis.
Porcellio spinicornis.
P. nigra.
Armadillo pillularis.

ORDER 6. BRANCHIOPODA.

Branchipus ———.
Binoculus caudatus.
Argulus catastomi.
Pandarus sinuatus.
Caligus ———.

ORDER 7. PŒCILOPODA.

Limulus polyphemus.
*Fluvicola Herricki, n. sp.

CLASS VII. RADIARY ANIMALS.

This embraces animals possessing the simplest organization, comprising star fish, sea nettles, intestinal worms, polypi, sponges, and the infusory animals.

ORDER ECHINODERMATA.

Asteria spinosus.
*Ophiura rubida, n. sp.
*O. ———, n. sp.
Echinus granulatus.
Scutella pentaphora.
*S. trifaria.
Holothuria briareus.

ORDER ENTOZOA, not observed.

ORDER ACALEPHA.

Cyanea aurita.
*Beroe aurantiaca, n. sp.

ORDER POLYPI.

Actinia marginata.
Lucernaria ———.
*Tubularia Cooperi, n. sp.
*Sertularia ampullacea, n. sp.
Cellepora ———.
Spongia racemosa.
*S. intertexta, n. sp.

All which is respectfully submitted.

J. E. DE KAY.

December 20, 1839.

COMMUNICATION

From Lewis C. Beck to the Governor, relative to the Geological Survey of the State.

New-Brunswick, N. J. May 25, 1839.

To Governor SEWARD:

MY DEAR SIR,

I returned to this place yesterday, and embrace the first leisure moment to give you a brief account of my operations in connexion with the Geological Survey, since the opening of the season.

Dr. Horton and myself met, at Bergen Hill in New-Jersey, on the 18th of April, and after spending three or four days at that place, and in the vicinity of Paterson, we entered Rockland county, N. Y. through the valley of the Ramapo. My object in this preliminary examination in New-Jersey was, to collect specimens of the interesting minerals found in the green-stone or trap ranges of that State, and to ascertain their true geological associations, that we might have some guide in the subsequent examinations of similar ranges in Rockland.

After visiting all the localities of interest to us in the vicinity of Pearson's, we crossed over to the Hudson and made stops at Tappan slote, Nyack, Haverstraw, Grassy Point and Stony Point. By this means, we had a good opportunity of studying the minerals of the Palisadoes which from Bergen, in New-Jersey, to Grassy Point, form a nearly unbroken barrier along the Hudson. In our excursions, we were much gratified in finding all the minerals previously obtained in New-Jersey; by which means the catalogue of our New-York minerals will be somewhat extended. At Stony Point we found several magnesian minerals

I have thus given you, according to my promise, a sketch of my operations thus far. I hope it will be interesting to you. But whether this be so or not, you will at least be apprized of what we have been doing, and have the means of answering any inquiries that may be made concerning the mineralogical department.

Our next excursion, on which we shall start in a few days, will be through the counties of Greene, Schoharie and Saratoga.—After this we proceed to Lewis and Jefferson, where I have promised to be about the latter part of June. We should be much pleased to have your company in visiting some of our interesting localities—as the lead or iron mines. We can at any time be ready to meet you on two or three days' notice.

Very respectfully,
Your obed't serv't,
LEWIS C. BECK.

New-Brunswick, N. J. June 26, 1839.

To His Excellency Gov. SEWARD:

MY DEAR SIR,

I beg leave to present to you a summary of my operations since the date of my last communication.

Dr. Horton, and myself met at Newburgh early in June, and proceeded to Catskill, where we spent two or three days in studying the mineralogy of the vicinity. The prevailing rock being slate, similar to that found every where on the banks of the Hudson, we had no great reason to expect much that was interestng in our department. At Diamond hill, a short distance from the compact part of the village, we found some rather rare varieties of calcareous spar, and tolerable specimens of rock crystal, or false diamonds, as they are sometimes called, to which indeed this locality owes its name. After finishing our work at Catskill, we continued our journey along the track of the Catskill and Canajoharie rail-road, as far as the village of Cairo. The rock excavations along this road gave us a fine opportunity of examining the geology of the region, and we were fortunate enough to add to our collection, some large and beautiful crystals of carbonate of lime, not surpassed by any hitherto obtained from this State, with the exceptions of those from Jefferson, and St. Lawrence counties

From Cairo to Schoharie Court House, the rock is generally sandstone and slate, and few objects of interest were observed by us. In the vicinity of the latter village, however, we had abundant occupation for a week, and if our time had allowed, could have advantageously added another to it.

The limestone at Schoharie, is remarkable for its singularly cavernous character. Ball's cave is one of the most extensive and interesting in the State, and several descriptions of it have been published. Besides this, there are Young's cave, Nethaway's, and several others of smaller size. The stalactites and stalagmites from some of these, and especially Ball's, are oftentimes of great size and beauty. Indeed so general and so pervading is this cavernous character in the limestone rocks of this region, that they are filled with geodes studded with crystals of great beauty, and sometimes presenting rare and interesting forms. In the immediate vicinity of the village of Schoharie, there is a rock belonging to the water-lime series, which exhibits the peculiarity of containing nodules and masses of some rare minerals, as carbonate of strontian, sulphates of strontian and barytes, together with two compounds of those earths which have been described as new minerals. The carbonate of strontian was long mistaken for white marble, and from its quantity was proposed to be used as such, but its great specific gravity at once serves to distinguish it.

I think this region especially deserving of attention, because the minerals found here are by no means common elsewhere; while here they are so abundant as to lead one to conclude that in some way or other they owe their origin to the rock in which they are found. The determination of rocks from the minerals which are imbedded in them, or the connexion between rocks and the minerals which they contain, is a subject of high scientific and practical importance, and one to which during this season I have devoted much attention. In this respect I have seen no locality so interesting as the one in question.

We put up and forwarded to Albany from Schoharie, three or four boxes of minerals containing upwards of thirty suites. And for our success, we owe much to the polite attentions of John Gebhard, Sen. Esq. and J. Gebhard, Jun. who accompanied us to many of the localities, and furnished us with specimens of several minerals which it would have been difficult for us to have obtained.

REPORT

Of Dr. Lewis C. Beck, on the Mineralogical and Chemical Department of the Survey.

To His Excellency William H. Seward,
Governor of the State of New-York.

Sir—

I beg leave to submit the following report from the department of the Geological Survey which has been committed to my care. Permit me to state, however, that in order to comply with your request that it should be forwarded by the first of January, instead of February as heretofore, I have been obliged to omit some notices which would otherwise have been introduced. Among others I may mention those concerning the soils and mineral-manures of the State, a subject of great practical importance, and in regard to which I have collected many facts and made sundry analyses, but which I have not had time to prepare for publication.

I commenced active operations under my appointment as mineralogist and chemist to the Survey, about the first of July 1836. During that season I visited several of the most important mines of iron, lead and other metallic minerals, and the results of my observations were communicated in my first annual report. In the spring and summer of 1837, I visited several of the more important mineral springs, and before the close of the year completed the chemical analysis of many of these waters; a summary of the whole being given, with a table of our springs, in the second report. My time thus far having been almost exclusively occupied in the subjects above stated, I thought it proper to devote the principal part of the year 1838, to the examination of our other mineral productions and the collection of specimens of them for the use of the State. In addition to this, several of our and seams of mica, forming gneiss. While in the county of Franklin the rocks contain much more hornblende, which is frequently observed in crystalline masses in the walls of the beds and among the ore.*

The ore in these counties is in almost all cases, in what are usually termed beds, or deposits of variable widths and unknown depths running parallel to the direction of the stratification, when the rock is stratified. The general direction of these beds is North-northeast and South-southwest, but when subject to local variations the course is North and South or Northeast and Southwest. Sometimes, however, this ore occurs in large masses in the rock without any regular parallelism of the sides, as is the case in Essex county. And lastly, it is sometimes disseminated in particles in the rock, apparently without any connexion with a bed or vein.

SOUTHERN COUNTIES.—In Orange county, the most abundant ore of iron is the magnetic oxide. It is generally found in that species of primitive rock so common in the highlands of this county, and often called granitic gneiss or gneissoid granite. It lies in beds and layers in this rock, and has the same line of bearing and dip. Where it exists in layers, they are from one inch to twenty feet in thickness, and in some places the layers of the ore alternate several times with those of the rock. Where the ore occurs in masses, the magnitude of the largest has never been ascertained.†

The magnetic iron ore is also found in the gneiss and hornblendic gneiss rocks in Putnam county. "They form" according to Professor Mather, "masses which by casual examination would be called beds; but after a careful investigation of the facts, I think they may be called veins. Their course is parallel to the line of bearing of the strata and they lie parallel to the layers of rock, but by a close examination, it is found that in several instances, after continuing with this parallelism for a certain distance, the ore crosses a stratum of rock and then resumes its parallelism, then crosses obliquely another and so on. In other places, where a great bed of the ore occurs at some depth, only a few small stripes of ore penetrate through the superincumbent mass to the surface, as if the rocks had been cracked asunder, and these small seams of ore had been filled up from the main mass below. The

* See the Reports of Dr. Emmons and Mr. Hall.

† Dr. Horton's Report on the Geology and Mineralogy of Orange county.—Geological Reports, 1839.

beds or veins of magnetic iron ore lie either vertical, or dipping to the E. S. E. at an angle corresponding nearly to the dip of the strata."*

From these facts there can be little doubt that the position and geological relations of this important mineral in the two extremes of the State are entirely similar.

The specular iron ore or red oxide of iron is somewhat peculiar in its associations. In New-York, this ore is chiefly, though not entirely, confined to the counties of St. Lawrence, Jefferson and Franklin, and so far as its deposits have been examined, they are found to be connected with sandstone, which is essentially composed of quartz or silica coloured by oxide of iron. This association is also exhibited in the ore itself, which frequently contains cavities filled with beautiful crystals of quartz, and which sometimes has a flinty or jaspery character. The deposits of this ore, often of vast extent are, moreover, generally, perhaps always, flanked by beds of limestone.

Nearly corresponding with the occurrence of the specular iron ore at the north, is that of the hematitic iron ore, in the southern counties of the State, which occurs in extensive beds, and usually lies near the junction of the limestone with the talcose slate formation.

Bog iron ore is almost equally abundant in different parts of the State, and does not appear to posess any peculiar geological associations. It is evidently formed by the solution and subsequent precipitation of the ores found in the older rock formations, and this precipitation has sometimes taken place at a considerable distance from its original source.

As in other countries, the ores of lead are not peculiar to any of the geological formations, being found here in almost all the series of rocks. We may cite as examples, the occurrence of galena in the hornblendic gneiss of Rossie, St. Lawrence county; in the millstone grit of the Shawangunk mountains; at the junction of the limestone and slate rocks, in Dutchess and Columbia counties; in the Trenton limestone, in Lewis county; and in the calciferous slate, in Monroe county.

In regard to the associated minerals, there are some which seem to be of constant and general occurrence, while others are in part at least influenced by the peculiar nature of the rock in which the deposit exists.

* Geological Reports.

they are not nearly so common as in the counties before mentioned. Every where, however, the close connexion between the serpentine and augite or trap, is too clearly marked to be mistaken.

Mica Slate—This rock, although it has a limited range in the State of New-York, is characterized here as elsewhere, by the occurrence of garnet, staurotide, &c. This is well exhibited in the eastern part of Dutchess county.

Transition Argillite—This rock, which is so extensively distributed throughout the State, is exceedingly poor in minerals. It sometimes contains beds and veins of quartz striated or crystalline. Rarely the crystals are perfect and of considerable size. Perhaps the best specimens that have been found in this rock, are those obtained along the line of the Catskill and Canajoharie rail-road. The same rock frequently contains veins of fibrous and crystallized carbonate of lime, brown spar and earthy oxide of manganese. And these, together with occasional and thin seams of anthracite, and some scattered masses and crystals of iron pyrites, constitute nearly the entire mineralogy of this rock. It may be added that the mineralogical character of the greywacke is nearly the same.

Sparry Limerock—In this rock, which is among the oldest of the blue limestones, and which is characterized by its colour, and by its being traversed in all directions by narrow seams and veins of white calcareous spar: several minerals are often observed. Among these may be noticed nests of quartz crystals and brown spar; crystals of oxide of titanium and magnetic oxide of iron. Dark coloured hornstone, is also common in some of the layers of this rock; and iron pyrites, is often found in considerable abundance in it.

Calciferous Sandrock, of Eaton.—This rock, as characterized by Prof. Eaton, is chiefly composed of quartzose sand, and carbonate of lime, and is widely distributed. It is abundantly supplied with quartz of several varieties. In a decomposed rock of this kind, are found the beautiful crystals of Herkimer county, while fine specimens of drusy quartz occur in the same rock, both here and in the more northern counties of the State. Hornstone, calcedony and agate, are also found in the same stratum; as at Flint-Hill, in Montgomery county, and at Saratoga Springs. Sulphate of barytes, and anthracite in small quantities, are occasionally seen in it.

In the more recent limestones, comparatively few minerals have been found, and these seldom belong to the rarer species. As has already been observed, the Trenton limestone series contains in various localities, and especially in Lewis county, unimportant veins of galena, iron pyrites, fluor and calcareous spar.

Geodiferous Limestone.—This rock extends over some of the western counties, and has been thought to be sufficiently characterized by the numerous geodes which it contains. These geodes, though usually small, are sometimes of considerable size, and contain the sulphates of barytes and strontia, sulphate of lime, in several varieties, fluor spar in limpid and colored crystals, arragonite and pearl spar, besides the most beautiful specimens of dog-tooth spar. Sulphuret of zinc, galena and bitumen, have also been found in this rock—the latter in such quantity as to warrant the conclusion, that the peculiar odour which this rock so frequently possesses is due to the presence of that mineral substance. To these may be added, some of the ores of copper, found in exceedingly minute quantities, and sulphate of magnesia, in an efflorescent form, arising from the decomposition of the carbonate of magnesia which the rock contains.

In the *Water Limestones*, we have some interesting minerals.—Among these may be enumerated various forms of calcareous spar, and yellow sulphuret of zinc, as at Kingston, Ulster county; carbonate of strontia, and other species containing barytes and strontia, as at Schoharie; purple fluor, as at Manlius, Onondaga county, &c.

Finally, in the *Saliferous group*, or *Protean group* of Mr. Vanuxem, we have the beds of argillaceous iron ore, with the accompanying minerals, the great gypseous deposits, and the extensive formations of calcareous tufa, in all their diversified characters. These rocks also constitute the repository of the numerous and important brine springs of Onondaga and Cayuga counties.

Such is a brief outline of the mineral contents of the principal rock formations of this State. Imperfect as it is, it may serve as a guide to those who are desirous of studying our mineralogy in connexion with geology. One fact is here too obvious not to be particularly noticed; and it is that the most abundant mineral deposits are found in the primitive limestone, and generally near the junction of that rock with the granitic ranges. Whether this is owing to the agency of heat, to which also abound, and there are at least two important localities of the lenticular clay iron ore. In regard to the gypsum, it may be stated that a specimen from a bed owned by Mr. Thomson, of Springport, which was analyzed at his request, gave the following results in 100 grains, freed from water, viz.

Sulphate of lime,	71.75
Carbonate of lime,	21.65
Silica and alumina, (clay) colored by oxide of iron,	6.60

Most of the western plaster is probably similar in its composition. It usually effervesces with acids, owing to a portion of carbonate of lime which it contains. The bed from which the above specimen was procured yields about 2000 tons annually, nearly all of which is used at Springport as a manure. It is of a dark grey or nearly black colour, intermixed with thin scales of transparent selenite. On exposure to the air it disintegrates and is peculiarly interesting on account of the layers of pure sulphur, in a semicrystalline form, which pass through it. Although the occurrence of this mineral is not uncommon in the gypseous beds of the West, I have never met with such well characterized specimens as in the present instance.

To the above minerals may be added petroleum found on Cayuga Lake of the same kind as that of Allegany county, though it is less abundant. Rounded masses also occur in the slate near Auburn and elsewhere, which when broken exhibit seams of sulphate of barytes, radiated and of a snow-white colour. These masses are composed chiefly of carbonate of lime and are usually known by the name of *septaria*, in consequence of their being divided into distinct portions by partitions or *septa*.

Among the useful minerals of this county is to be reckoned water limestone, which, as well as the rock above it, contains fluor spar in small crystals, calcareous tufa is found in Sempronius, and sulphate of iron and sulphate of magnesia, are also to be included among the minerals of this county; as they are formed on some of the shales by the spontaneous decomposition of the substances which they contain.

Messrs. Vanuxem and Hall found associated with petroleum, near Ogden's Ferry, a liquid substance of the colour of phosphate of iron or Prussian blue, and another like spermaceti before the oil is fully pressed out of it. It was composed of fine scales, had a yellowish white colour, was in small irregular masses, with the appearance of having been melted. They were found in the septaria above the Tully limestone at the above locality and are supposed by Mr. Vanuxem to be new substances.*

CHAUTAUQUE COUNTY.

The most interesting object in this county connected with the mineralogical department of the survey, is the carburetted hydrogen gas, which is here evolved in such large quantities. The most remarkable localities are those at Fredonia, Westfield and Van Buren Harbor. These are commonly called gas springs, and as such, I have particularly noticed them in my report of 1838. This gas possesses an illuminating power quite equal to that of the purest coal or oil gas, and the quantity evolved is moreover so large, that it may in many places be advantageously employed. There are also often observed in the rock from which this gas issues, thin seams of a highly bituminous coal or hardened bitumen. The sandstone sometimes contains cavities filled with petroleum. Indeed this rock, especially at the Laona quarry has throughout a highly bituminous odour and all the specimens that I have tried burn with flame when thrown into the fire;—from which it may be inferred that the whole of this bed is charged with bituminous matter.†

Equally common are springs charged with sulphuretted hydrogen, being found in various parts of the county, but especially on the shores of Lake Erie. These springs in addition to the sulphuretted hydrogen which they evolve, contain minute quantities of the sulphates of lime and of magnesia.

There are here several localities of bog iron ore, but those hitherto known are not of much importance in an economical point of view. Shell marl is abundant on the banks of Cassadaga lake, where it is put up into the form of bricks and burned into lime. Alum and cop-

* New-York Geological Reports, 1839, p. 283.

† The following are the results of an analysis of a specimen of the Laona sandstone:—

Silica,	79.80
Oxide of iron and alumina,	4.25
Carbonate of lime,	10.50
Bituminous matter,	2.10
Moisture and loss,	3.35

only by experiments conducted on a large scale, and by a careful comparison of the results with those afforded by the varieties of this mineral now in use.

Peat and marl are to be included among the useful products of this county. Of these, there are several important localities which cannot fail to be of great value. According to Mr. Mather, there exist beds of marble in the towns of Hillsdale and Copake, equal to those of Stockbridge and Egremont, in Massachusetts.*

Columbia county contains several sulphur and chalybeate springs, and one which possesses great interest in consequence of its evolving nitrogen gas, viz: the Lebanon springs, which are too well known to need any further notice.

The following minerals have also been found in this county, viz.

Graphite—Several unimportant localities.

Sulphate of barytes—Associated with the lead ore at Ancram.

Calcareous tufa—Several localities.

Brown spar—Several localities, in the slate rock.

Sulphate of lime—has been found in small quantities at Hudson.

Crystallized quartz, fetid and milky quartz, and basanite—Of each of these there are several localities.

Alum—In the form of efflorescence.

Epidote—Is credited to this county, but I have not met with it.

Iron pyrites—Several localities.

Sulphuret of copper, pyritous copper, and green carbonate of copper—All found in company with lead ore.

CORTLAND COUNTY.

The only notices to be introduced here are those of iron ore, which occurs in small quantities; one or two sulphur springs; a weak brine spring, and some beds of marl. Mr. Vanuxem states that the marl near the Four Corners is put into the form of bricks, dried and burned into lime.†

* N. Y. Geological Reports, 1838, p. 171. † N. Y. Geological Reports, 1837, p. 192.

DELAWARE COUNTY.

This county has heretofore proved to be still less rich in minerals than the preceding. A brine-spring was discovered near Delhi in 1833, and a boring of considerable depth was made through the rock. I have not ascertained the strength of the water they obtained. According to Mr. Mather there are some deposites of bog-iron ore in this county which may hereafter prove to be valuable. He also states that copper ore is very extensively diffused although in small quantities.* There are moreover several mineral springs.

DUTCHESS COUNTY.

The mineral productions of this county are quite similar to those of Columbia, to which it is contiguous. There is no part of the State in which iron ore is more abundant or more advantageously wrought. This ore is almost always of the variety called hematite, which is sufficiently rich, and yields iron of an excellent quality. Beds of it have been opened in the towns of Fishkill, Unionvale, Dover and Amenia, from which several furnaces are contantly supplied. But from appearances which are presented in various places, there can be no doubt that new beds will hereafter be discovered, and that the supply of ore will be equal to any demand that may be created.

There exist here, as in Columbia county, several localities of wad or earthy oxide of manganese; some of these may hereafter turn out to be valuable.

The marble quarries of Dutchess are numerous, and the quantity of this useful material is entirely inexhaustable. The beds are similar in their character to those of Stockbridge and Egremont, and are found in the towns of North-East, Dover, Pawlings, Beekman and Fishkill. But the only ones which are extensively wrought at present are those of Dover, a circumstance chiefly to be ascribed to the land transport which is required to bring the marble to market.

The Dutchess county marble varies somewhat in its characters. It is almost always dolomitic, or composed of the carbonates of lime and magnesia in variable proportions; sometimes it is large grained and quite compact; at others it is fine grained and so loose in its texture as to be unfit for a building material. A specimen of this marble from

* Letter to his Excellency Governor Seward, published in the newspapers in September, 1839.

Insoluble matters, (silica and alumina,)	12.25
Bituminous matter,	0.25
Carbonate of lime,	51.00
Carbonate of magnesia,	36.50

It is therefore similar in its composition to the water limestones found in other parts of the State.*

There is a sulphur spring of some character four miles from Buffalo, and a spring on Grand Island is interesting in consequence of its containing free sulphuric acid although in a very dilute State. Petroleum is also found floating on the surface of many springs, but it is by no means abundant.

It remains only for me to notice under this county those septaria or rolled masses of impure limestone to which I have previously referred. These as they are found here are entirely similar to those which occur in Chautauque county. They commonly exhibit on the outside, sutures which pass in various directions, and are generally composed of minerals different from those in other parts of the mass. They are either folia or blades of sulphate of barytes, or crystals of calcareous spar or brown spar, with occasionally some anhydrite.†

ESSEX COUNTY.

Unlike the preceding, this county possesses immense mineral resources. Enough is already known to warrant this assertion, but many years must elapse before a correct estimate can be formed in regard to their real extent and value. To say that there are here numerous beds of magnetic iron ore, would scarcely convey a true idea of the enormous deposits of that mineral which are found in various parts of the county. Some notices of these have already been published in the reports of Dr. Emmons and Mr. Hall. The ore is every where of sufficient purity for the manufacturer, and if only a small proportion of it

* Another specimen of water limestone from Williamsville in this county, contains

Silica and alumina,	18.45
Bituminous matter,	1.30
Carbonate of lime,	46.25
Carbonate of magnesia,	34.00

† The occurrence of this mineral in the septaria is given on the authority of Mr. Vanuxem. New-York Geological Reports 1837, p. 191.

can be wrought, Essex must become one of the most thriving counties in the State.*

In addition to these deposits of magnetic iron ore, there are also beds of the specular ore which are used at Crown Point, &c.

Several localities of graphite occur in this county. One of these is situated near Ticonderoga and has long been celebrated for the excellent quality of the mineral which it yields. As early as 1822, two or three tons were annually obtained here and sent to market. From a statement of property cleared at Whitehall, from 1823 to 1834, it appears that there were shipped of black lead in 1829, 10,000 lbs; in 1834, 22,000 lbs. This amount was probably obtained from the mine now noticed. Besides this, there are several other localities of this mineral, but I have not been able to learn any thing of their value.

Among the useful minerals of Essex may be mentioned marble of the verd antique variety, a valuable bed of which is found near Cedar Point. It appears to be free from cracks and flaws, and is equal in beauty to any of the marbles of this kind.

To the mineralogist, this county presents one of the most interesting fields of research. Although it has been but partially explored, many rare and beautiful minerals have already been discovered. The following is a list of these:

Calcareous spar—Several forms and several localities.

Crystallized phosphate of lime.

Fibrous phosphate of lime—*Eupyrchroite* of Dr. Emmons, (see appendix) Crown Point.

Sulphate of lime—In solution in springs.

Sulphate of magnesia—In similar situations with the preceding.

Rose quartz, together with some other varieties of this mineral.

Tabular spar—Town of Lewis.

---

* I have recently analyzed a specimen of magnetic iron ore which I received from A. McIntyre, Esq. It is from the great bed at the head of the mill pond, in the town of Newcomb. It is black, attracted by the magnet and has feeble polarity. The following is its composition in 100 parts—

Protoxide and peroxide of iron,	92.15
Earthy matters, principally silica,	7.85

Proportion of metallic iron about 66, in 100 of the ore.

Of marl, calcareous tufa and agaric mineral, there are several valuable localities. All these may at some future time be made useful to the agriculturalist. A specimen of marl from the the farm of Mr. Van Bergen near Coxsackie, gave when perfectly dry, the following results in 100 grs.

Carbonate of lime,	97.32
Insoluble matters, principally of silica and alumina,	2.15
Oxide of iron, with vegetable matter,	0.53

Another specimen from the vicinity of Catskill contained

Carbonate of lime,	91.75
Insoluble matters, with some oxide of iron, &c.,	8.25

Of course both of these are sufficiently pure to be advantageously employed as fertilizers.

Some interesting crystalline forms of calcareous spar occur in the fissures of the limestone along the track of the Catskill and Canajoharie rail-road; and there have also been found fine crystals of quartz in cavities in the slate rock, near Catskill. Among these are some modifications which will be particularly described in the final report of this department of the survey.*

The following minerals have also been found in Greene county, viz:

Sulphur—In minute quantities.

Coal—Several unimportant localities.

Sulphate of barytes.

Labradorite—Occasionally found in bowlders.

Alum and sulphate of iron—Both formed by the decomposition of iron pyrites, which is abundant.

Specular iron ore—In small quantities.

---

* A dark grey shell limestone found near the paper-mill, two miles N. W. of Catskill, on the Catskill and Canajoharie rail-road, has the following composition:

Silica and alumina,	3.25
Organic matter,	0.25
Carbonate of lime,	95.00

HAMILTON COUNTY.

Until recently this county has been but little known, and I am not prepared at present to give any information concerning its resources. Dr. Emmons reports that it contains several important localities of peat.* It will undoubtedly be found to possess many useful and interesting minerals.

HERKIMER COUNTY.

This county promises at least to be well supplied with iron ore, for in addition to the argillaceous oxide, long known and justly esteemed, a bed of magnetic iron ore has recently been discovered in the town of Salisbury, and which will probably prove to be an important one. I am informed by the Hon. A. Loomis that the vein is from two to eight feet wide, and has been traced about three quarters of a mile. Between one and two hundred tons of ore have been raised, which is highly magnetic, and yields iron of a good quality. I regret that the specimens sent by Mr. Loomis did not reach me in time for a more detailed notice at present.

Within a few years a considerable quantity of gypsum has been obtained in the town of Starke, and it is, I believe, the most eastern point at which this useful mineral has been found in any abundance It is represented by Mr. Vanuxem to be equal to the Nova Scotia, both before and after calcination. Crystals of sulphate of strontian are sometimes associated with the gypsum.

From the specimens of lead ore which have been found in this county, it was supposed by some that workable beds of it would be discovered. Thus far, however, these anticipations have not been realized. Excavations have been made about two miles from Salisbury corners, but they have furnished only cabinet specimens of the sulphurets of lead, zinc, iron and copper, with occasional stains of the green carbonate of copper and bog iron ore; the former proceeding from the action of the atmosphere upon the pyritous copper, and the latter from the decomposition of the iron pyrites.

The remark just made in regard to lead ore will also apply to the anthracite which has been found here in a state of great purity. After repeated examinations it has been ascertained that the quantity is quite too small to answer any useful purpose.

* N. Y. Geological Reports, 1839.

in the manufacture of the finer kinds of pottery, and if in abundance will no doubt be valuable.

The following minerals also belong to this county :

Graphite—Several localities, but unimportant.

Agaric mineral—In a cave near Watertown.

Sulphate of strontian—Chamont Bay.

Carbonate of Strontian—Associated with fluor spar, according to Dr. Emmons.

Fluor Spar—Banks of Muscolunge lake, crystals of a foot in diameter have been found here.

Phosphate of lime—Banks of Vrooman lake and elsewhere.

Serpentine, massive and crystallized—Near Oxbow, &c.

Amianthus—Associated with the preceding.

Hornblende, tremolite, pargasite—Many localities.

Feldspar—Crystallized.

Mica, crystallized and plumose—Several localities.

Pyroxene—Several localities.

Idocrase, the primary, with the lateral edges truncated—Near Oxbow.

Brucite or chondrodite—Near Oxbow.

Spinelle, of a fine blue colour, and sometimes $\frac{3}{8}$ of an inch in diameter—two localities near Oxbow.

Iron pyrites—The common variety is abundant, the plumose is said to occur in Champion.

KINGS COUNTY.

The only substance heretofore found in this county, which is at all connected with my department of the survey, is peat, reported to be common and sufficiently abundant. Several minerals, however, occur in bowlders, which have been brought hither by some mechanical agencies, the nature of which is not yet understood.

LEWIS COUNTY.

There are few counties in the State more deserving the attention of the mineralogist than this. The cursory examinations which have been made, have resulted in the discovery of many interesting minerals, but when it is recollected that in the western part of the county there is a tract almost unexplored, and which probably contains ranges of primary rocks, there can be little doubt that the number of these will hereafter be greatly increased.

There are in this county some beds of iron ore especially in the town of Watson. The argillaceous variety is believed to be the most abundant. Veins of magnetic iron ore are also found in the primitive rocks on Moose and Black rivers, but neither their extent nor value has yet been determined. I have found magnetic iron sand on the banks of Moose river, near Lyondale. An impure specular ore occurs near the Natural Bridge.*

Black oxide of manganese, or wad, has been found in rounded masses near the summit of Tug hill, but the locality has not been sufficiently explored to determine its extent.

In the vicinity of Martinsburgh and Lowville, veins of galena of various widths traverse the limestone, and mining operations have been carried to some extent. From one of these veins several tons of the ore were obtained, but the quantity was by no means sufficient to meet the outlay which had been incurred. Indeed it is quite doubtful, from what is known concerning the occurrence of this ore, whether it would be prudent to continue these operations.

These veins, however, have furnished some interesting specimens of galena, both crystallized and massive. They are often accompanied by iron pyrites, and at one locality near Martinsburgh, it occurs in flattened wedge form octahedrons. In almost every vein of lead ore, moreover, we find six-sided and lenticular crystals of carbonate of lime, the former of which are also found at Leyden and elsewhere, independently of that association. To these may be added the beautiful cubic crystals of green fluor spar, which occur in one of the veins formerly worked for lead ore, near Lowville.

* I refer here to a deposite which was strangely enough thought to be silver ore. The specimens which I obtained are of a steel grey colour, sometimes of a greenish tint, resembling chlorite, which mineral they also resemble in structure. The purest of these was found to contain about 50 per cent peroxide of iron, the remaining portion consisting of earthy matters, principally silica mixed with some graphite. It is scarcely necessary for me to add that I could not detect the slightest trace of silver in any of them.

ally increasing in number by the percolation of water through the calciferous slate of which the hill is composed.

There are a few other minerals in this county, viz:

Sulphur—Sometimes found associated with gypsum.

Sulphate of barytes—In the bituminous limestone near Chittenango.

Hydrate of iron, staining calcareous tufa; called by Mr. Vanuxem, tufaceous iron ore.

MONROE COUNTY.

The mineralogical characters of this county are not unlike to those of the preceding. Of the argillaceous iron ore, so widely diffused through the western part of the State, we have here several localities. In addition to this magnetic iron, sand has been found in considerable abundance on the shores of Lake Ontario.

In the vicinity of Rochester small quantities of the sulphurets of lead and zinc have been found in the limestone. A company was once formed for working one of the veins, but it is needless to say that they soon became satisfied that the pursuit was visionary.

Of gypsum and marl there are here several important deposits, especially in the southern part of the county; while calcareous tufa. is also abundant. All these may be advantageously employed as fertilizers and for other purposes.

No county in the State is more largely supplied with sulphur springs than this. Indeed, it would seem that the evolution of sulphuretted hydrogen is in some way or other connected with the rock strata which characterize it. In some instances, these springs are highly charged with the gas, and have become places of much resort. Bathing houses, and houses for the accommodation of visitors, have been erected at many of them. The Caledonia spring, in the town of Wheatland, is remarkable for the large quantity of sulphuretted water which it contains.

In Riga there are springs which give out carburetted hydrogen gas in such quantities as to supply a constant flame. And it may also be added, that several brine springs have been discovered in this county, but none of them are of any importance.

To the above are to be added the following minerals, which have been found in Monroe county, viz:

Fluor spar—In the limestone near Rochester; in cubes, which are sometimes of a bluish tint.

Pearl spar, having the crystals bent and twisted—Rochester.

Calcareous spar, usually in dodecahedrons—With the preceding.

Sulphate of magnesia, sulphate of iron, muriate of soda and alum—Found in the form of efflorescences on rocks.

Snowy gypsum in nodules—Rochester.

Sulphate of barytes, of a flesh red color. In nodules in limestone—Rochester.

Sulphate of strontian—Sometimes found with the preceding.

Garnet sand—Associated with iron sand on the shores of Lake Ontario.

Iron pyrites—Abundant.

MONTGOMERY COUNTY.

Few minerals have hitherto been found in this county. The most important, perhaps, is marl, which is said to occur in several places, and in considerable abundance.

Mining operations, however, have been prosecuted to some extent, with a view to the opening of veins of lead ore which have been discovered on Flat creek, near Spraker's Basin. Good specimens of this ore have been obtained at this locality, but the question whether it exists in any quantity, is still undecided.

The following minerals have also been found to occur in this county, viz:

Calcareous tufa, calcareous spar, stalactite, &c.—Mitchell's cave.

Sulphate of barytes, the lamellar variety.

Brown spar.

Anthracite—In small seams, and also inclosed in quartz crystals.

Quartz, crystallized, sometimes having one end globular and smooth, as if fused; also calcedony and agate.

Garnet, of pink colour—In the gneiss at the Noses.

Sulphuret of zinc—Associated with galena.

Oxide of titanium—In minute crystals in calcareous spar, near Sprakers. *Mather.*

Sulphur springs occur near the Falls of Niagara, at Lockport, and elsewhere in this county. Some of them are well charged with gas, and hold in solution small quantities of sulphate of magnesia. To these may also be added, a chalybeate spring, some unimportant brine springs, and a gas spring, so called; from the latter of which, carburetted hydrogen gas is evolved in considerable abundance.

I should not omit to state, that beautiful geodes of crystallized quartz, sometimes passing into calcedony and agate, are found near Niagara Falls; and Mr. Vanuxem has observed minute quantities of copper pyrites and green carbonate of copper at Lockport.

ONEIDA COUNTY.

The mineralogy of this county is in many respects similar to that of the counties which lie west of it. Several important and useful products occur in it in great abundance. Among these may be enumerated the argillaceous clay iron ore in beds from twelve to twenty inches in thickness. The character of this ore is so well established that several furnaces are supplied with it from this county. Gypsum also is found here in beds of vast extent, especially on Oneida creek. To these may be added water limestone of which according to Mr. Vanuxem there are immense series; and peat and marl are said, also, to occur in this county.

Oneida county is plentifully supplied with mineral springs of various kinds. Sulphur springs are quite numerous; weak brine springs are occasionally found, and near Vernon village, carburetted hydrogen gas issues through a spring at the rate of about a gallon a minute.* It burns with a flame of a reddish white colour.

The following are also to be included among the minerals of this county:

Anthracite—In small quantities.

Sulphate of barytes, sometimes called Barystrontianite—Near Hamilton College.

Calcareous spar, sometimes presenting interesting forms—Several localities.

Sulphate of magnesia—In solution, in springs.

Quartz, crystallized, and massive.

---

* Eaton, in Silliman's Journal, XV. 236.

Tabular spar—In bowlders near Boonville, associated with green coccolite, green pyroxene and brown granular garnet—The specimens are often of great beauty.*

Sulphuret of lead, associated with sulphuret of zinc, the latter also alone—One or two unimportant localities.

Sulphuret of copper—With the preceding but still more rare.

Sulphate of iron and alum—Formed by the decomposition of iron pyrites, which, as usual, is abundant.

ONONDAGA COUNTY.

We have in this county a fine illustration of the influence which important mineral productions exert upon the prosperity of a people. When brine springs were first discovered in this part of the State, it could hardly have been anticipated that they would in so short a time, have yielded such a large return. As I have in a former report given a detailed account of the brine springs of this county, and have offered such suggestions as occurred to me in regard to the manufacture of salt, it will not be necessary to occupy much time with them at present. I may be permitted, however, again to advert to the importance of an attention to this manufacture as one in which the State is deeply interested, and for the improvement of which no trifling expenditure should be regarded. The erection of a State reservoir for the purification of the brine cannot be too strongly insisted on. By such an apparatus much waste would be prevented, the salt rendered more pure and the expense of manufacturing it greatly reduced.

Besides the invaluable brine springs which this county contains, it is well supplied with many other useful mineral productions. Among these we may reckon several important beds and quarries of the argillaceous oxide of iron, of gypsum, marl and water limestone, which are found in abundance for all the uses to which they are ordinarily applied. Of gypsum there is probably on the Auburn and Syracuse rail-road, one of the most extensive beds to be found in the State, and as for marl, the bed of the Onondaga lake is entirely composed of it; while all around it, in the vicinity of Syracuse and in other parts of the county, there are deposits of similar kind.

Among the objects which in this county engage the attention of the mineralogist are the extensive calcareous depositions which are found

* Prof. O. P. Hubbard, in Silliman's Journal, XXXII, 230.

A notice of several interesting minerals obtained in this county, must now be reserved for the final report, as I have not yet had time to complete their chemical examination.*

ORLEANS COUNTY.

The mineralogy of this county, so far at least as it is at present known, is exceedingly simple. Several brine springs have been found in various parts of it, and some of them were formerly used to a limited extent in the manufacture of salt. But they are now entirely neglected. There are also one or two sulphur springs, and some deposits of bog iron ore; but there is only one locality of the latter, where the mineral is in sufficient quantity, to be of any use in the manufacture of iron.

OSWEGO COUNTY.

Still more barren of minerals, than the last; for we have only to notice some unimportant brine springs, and a locality of bog iron ore, which is of trifling importance.

OTSEGO COUNTY.

This county contains abundance of good marble, and several sulphur springs, one or two of which are in considerable repute. Calcareous tufa is found near them, and also selenite and gypsum in small quantities. These together with a weak brine spring are, I believe, the only mineral productions, thus far credited to this county. I should add, however, that a mass of native iron, probably of meteoric origin, was some years since found near Burlington.

PUTNAM COUNTY.

As might be inferred from the geological characters of this county, its mineral productions are of much interest. Pursuing the order which has been heretofore adopted, it may be observed, that in iron ore, this county is peculiarly rich. It contains several beds, or veins of the magnetic kind, which yields ore of the best quality, and in the greatest abundance. These deposites have been minutely described, by Mr. Mather, in his report of last year.

---

* Of several specimens of marl which I have received from this county, I have only had time to analyze one, and that is from the lands of Gen. Wickham. Its composition in 100 grains is as follows:

Insoluble matters, (silica and alumina)............	6.25
Carbonate of lime,..............................	93.75

Of carbonate of lime, in the form of calcareous spar, and marble, there are several localities. The latter term, however, is usually applied here to a dolomite similar to that of Dutchess county, and which is found abundantly in the vicinity of Patterson. The only objection to this material for construction, is its friable character.* Being a compound of the carbonates of lime, and magnesia, it has been thought that the product of its calcination, is not so valuable, as a fertilizing agent, as that which contains lime alone. On this subject, however, as I have already remarked, mistaken views have been entertained, as some soils which appear to have been formed in part of the magnesian limestone are by no means wanting in fertility. It may be added that a white crystalline limestone occurs in this county which is entirely free from magnesia.

A very valuable mineral product of Putnam county is serpentine, which exists in vast quantity, can be obtained in blocks of uniform density, and is susceptible of a fine polish. But for the fact that the quarries of this beautiful material are situated at too great a distance from water transport, they would long ago have been extensively wrought. Of the precious or noble serpentine, also, there are several localities where the mineralogist may obtain specimens equal in beauty to any that are found in the United States.

Among the objects worthy of notice in this connexion are two localities of arsenical iron pyrites, one of which has at some former period been extensively wrought. This ore which might be used for the extraction of arsenic, seems to be abundant, but the present condition of the mine renders it difficult to arrive at a certain conclusion on this subject. Its reported mixture with silver is probably one of those stories circulated for selfish purposes, and the only ground for it in the present instance is, the fact that in other countries, the arsenical ores are often associated with those of a more valuable metal.

I should not omit to add that a bed of limonite or hydrate of iron, occurs in Peekskill Hollow, near the line between Philipstown and Carmel. Mr. Mather, however, remarks that it seems to be too siliceous to work well alone in the furnace. There are also several localities of peat, and probably marl will hereafter be found accompanying this substance as it does in several other counties.

Putnam county has for many years been visited by mineralogists

* The Putnam county dolomite often contains a large admixture of tremolite.

Albite, in large crystals—Near Patterson.

Laumonite, stilbite and chabasie—Formerly obtained at Coldspring. The locality is believed to be exhausted.

Epidote, in beautiful crystals—Near Carmel.

Mica—Several localities.

Zircon—Formerly obtained at Cold Spring.

Iron pyrites—Associated with magnetic iron ore. By long exposure to the weather the iron pyrites is decomposed, and the resulting salt washed out.

Pyritous copper and green carbonate of copper—Philip's ore bed.

Sphene—At the Philips ore bed, and formerly at Cold Spring.

Orpiment or yellow sulphuret of arsenic—Formed on the timbers of the old arsenic mine by the decomposition of the arsenical iron pyrites.

Copperas or sulphate of iron—Formed by the decomposition of iron pyrites, on the farm of J. Wood, six miles S. S. E. of Carmel.

QUEENS COUNTY.

The only substance at all connected with this department of the survey, in this county, is peat, of which Mr. Mather informs us that there are several localities.* Many of the minerals, however, found in other parts of the State occur here in bowlders.

RENSSELAER COUNTY.

This county does not contain many useful minerals, strictly so called, and there are but few that possess much interest to the mineralogist. As a geological survey of it was made by Professor Eaton, in 1821, its productions are probably as well known as those of any other county.

In an economical point of view, one of the most important substances here found is marl, of which there is a bed in the town of Schaghticoke. The same substance, but more pure, occurs in various parts of the town of Sand Lake.

Sulphur springs abound in this county, and some of them have acquired celebrity for their supposed medicinal properties. But these as they are found in almost every county in the State, do not excite so much interest as the springs of Hoosick, which, like the Lebanon

* New-York Geological Reports, 1338, p. 122.

springs, are remarkable for the evolution of nitrogen gas, which is constantly going on.

There are in Rensselaer county several localities of crystallized quartz, occurring in fissures in the rock. One of these is at Lansingburgh, and was formerly known by the name of Diamond Rock. But it has long since been shorn of its beauty. This mineral, (quartz,) in the form of basanite and jasper, are also occasionally met with. Inferior specimens of calcareous spar, and thin seams of anthracite are to be noticed as among the minerals of this county. Iron pyrites is abundantly diffused and as usual gives rise by its decomposition, to the formation of the sulphates of iron and magnesia. To the preceding list are only to be added slaty chorite and oxide of manganese, which are occasionally found, together with loose masses of hematitic iron.

RICHMOND COUNTY.

This county is exceedingly interesting to the mineralogist, not so much on account of the variety of minerals that are found in it, but of the manner in which they are associated and pass into one another. Indeed, the remarks which were made under Putnam county are generally applicable here. A fine illustration of this grouping of minerals may be observed very near the quarantine. At this locality, which is on the road side, a short distance from the old pavilion, will be found a serpentine rock, embracing veins of asbestus, assuming every variety from the compact and ligniform to the amianthoid, depending in a great measure upon the exposure to which it has been subjected. We obtained specimens of the fibrous kind a foot or more in length. A little further on we find masses of precious serpentine, with veins of the marmolite of Mr. Nuttall, but which, although differing somewhat from serpentine in its external characters, is closely allied to, if not identical with, it. Then we have the magnesian marble of Nuttall, or the white compact carbonate of lime and magnesia, with a conchoidal fracture, and a hardness that sometimes causes it to strike fire with steel. This upon analysis proves to be identical with the gurhofite, noticed among the minerals of Putnam county. And with these again are associated some varieties of talc, and more rarely the hydrate and carbonate of magnesia, and the chromate of iron. There are many intermediate or transition states, of these minerals, which in hand specimens might pass for distinct ones, but an attentive examination of the locality, will show their true characters and save the chemist much labor and anxiety.

Near Ramapo, there often are found in the granitic rocks, masses of magnetic oxide of iron, but this ore has not hitherto been found here in such quantities as to render it of any importance in an economical point of view. Thin strata of the hematitic ore also occasionally occur, and there are some small deposits of the earthy black oxide of manganese. To these I may add peat, of which there are said to be several localities.

The mineralogy of Rockland also includes the following, viz.

Iron pyrites.

Carbonate of copper and red oxide of copper—Staining the trap rocks near Ladenton.

Zircon—In granitic bowlders, near Ladenton.

Hornblende—Several varieties in the trap at Haverstraw, and elsewhere.

Agate—In small nodules in trap.

Quartz and feldspar—Several localities.

ST. LAWRENCE COUNTY.

Next to Orange, this county has the most extensive catalogue of minerals of any in the State; but in regard to the value of these products it may perhaps be placed at the head of the list. Embracing, as it does, such a large extent of territory, a part of which is still almost a wilderness, it is not surprising that it has been but partially explored. Indeed it will probably be a long time before its great mineral resources will be fully understood, or duly appreciated.

The most important mineral at present known in this county is lead ore, which occurs in various places, but which is obtained in large quantities only in the vicinity of the village of Rossie. All the more important veins of this ore have been so fully described in the previous reports of the survey, that little need be said concerning them on the present occasion. I believe no new discoveries of any importance have been made during the last year, and the mining operations have not materially changed their character. There have been, it is true, as is generally the case in the business of mining, fluctuations in the prospects of those who are interested in these mines; the veins sometimes becoming narrower and less rich, and at others again, wider and more productive. But upon the whole, the condition of the mines is about the same as heretofore, with the exception that as the excavations proceed the expense of raising the ore is increased.

These mines are of great interest to the mineralogist in consequence of the perfection and beauty of the crystals of galena and of the accompanying minerals. The galena occurs in the form of the cube variously modified, while of calcareous spar the varieties of form are almost innumerable. It will require a long and patient examination to describe the new and interesting varieties which have here been found. The same remark also applies to the iron pyrites, crystals of which are found associated with the galena in the form of the cube, dodecahedron and others. Fluor spar also occurs in the form of the octahedron and cubo-octahedron. Add to these the splendid specimens of crystallized sulphate of strontian which have recently been found in the Rossie vein, and we have a locality which will compare with almost any in the world.

It is much to be regretted that the proprietors of these mines should have neglected to reserve a complete suite of the minerals found in them, as it would not only be of use in the mining operations, but would give those who might be desirous of studying these minerals an opportunity of so doing. Perhaps it is not yet too late to supply the deficiency. I trust I shall be excused for suggesting the propriety of making a similar collection for the State Cabinet. The value and importance of these mines would thus be more fully brought before the public, science would reap benefit, while the interests of the proprietors would be no less promoted. The adoption of some such plan as that now proposed is particularly important to those who are engaged in the study of our minerals, for the most interesting specimens are usually valued at such a high price as to place them entirely beyond the reach of ordinary mineralogists. I do not object to the sale of specimens from important localities, but to the manner in which it is here conducted. It would be far better for all parties if the superintendents of the mines should take the matter into their own hands. By paying the miners a reasonable price for good specimens, they would feel an interest in obtaining them, and the whole might then be exposed for sale at the office of the establishment.

Of the ores of zinc and copper, which have been found in various parts of this county, I have little to say. From the frequency of their occurrence, it seems not improbable that they exist in abundance, but on this point we are at present left entirely to conjecture.

The deposits of iron ore are truly enormous. The magnetic kind, though less common, is found in several places and is of a good quality.

present, except that one or two new springs have been recently discovered at Saratoga which are thought to rival those that have heretofore maintained the ascendancy. In matters of this kind, however, the public are better qualified to come to a correct decision than those individuals whose interests are immediately concerned.

Among the useful mineral productions of this county may be mentioned marl and bog iron ore, of which there are several localities. The magnetic oxide and hematite are also found, but heretofore only in very small quantities.

In the immediate vicinity of Saratoga Springs, there are several interesting minerals. Thus agate and calcedony are found associated with a siliceous limestone. The rare chrysoberyl, presenting some interesting forms, occurs in the town of Greenfield, about a mile from the springs, and in the same vein with this we have also garnet, tourmaline, feldspar, mica, phosphate of lime, and perhaps spodumene. Some other minerals have been noticed as having been found in this county by Dr. Steele, to whom we are indebted for much information concerning its productions. These are,

Graphite, crystallized quartz, asbestus, calcareous spar, calcareous tufa, at the high rock spring, oolite,* coccolite, tremolite, steatite, alum in efflorescences, epidote, hornblende, iron and copper pyrites, and lignite.

SCHENECTADY COUNTY.

Very few minerals have hitherto been found in this county. The only useful one I believe is bog iron ore, of which there are some beds near the line between this and Albany. There are several localities of calcareous spar, one of which is particularly interesting, as this mineral constitutes the cement of a stratum of pebbles, and assumes the form of dodecahedral crystals. It has usually been called arragonite, but I doubt much whether it deserves to be ranked under that species.

These and a few inferior specimens of quartz and common jasper, are all the minerals at present credited to this county.

* There is a bed of oolite about four miles north of Saratoga Springs. It is of a dark colour, and is made up of grains about as large as a pin's head. On analysis I found its composition to be as follows in 100 grains:

Carbonate of lime	95.00
Silica and alumica, with some carbonaceous matter	5.00

SCHOHARIE COUNTY.

In this fertile and well cultivated county, there are several minerals of great interest. The labors of the mineralogist and geologist are moreover greatly facilitated by the assistance of the Messrs Gebhard, who have so long and so well explored the rich field which is here presented to the student of nature. I can only repeat in this place my acknowledgments to those gentlemen, for their liberality and kindness in advancing the cause to which we are devoted.

If I were to characterize the mineralogy of Schoharie county by a single remark, it would be in reference to the number of caverns which it contains and the various forms of calcareous spar which these caverns exhibit. Stalactites and stalagmites are often found here of enormous size, and with a structure of great beauty. Ball's cave is the most celebrated on this account as well as of its extent, but there are many others within a circuit of a few miles, and probably more will hereafter be discovered.

In the immediate vicinity of Schoharie Court-House is a stratum of water limestone, which according to my analysis has the following composition, viz:

Carbonate of lime,	56.25
Carbonate of magnesia,	30.75
Silica and alumina,	11.50
Oxide of iron,	1.50

So that it does not differ essentially from the specimens obtained in Ulster county and elsewhere. A remarkable fact, connected with the water limestone at Schoharie, is the abundance of sulphate of barytes and carbonate of strontian which it contains. The latter mineral sometimes occurs massive when it resembles white marble, although much heavier. It is believed to be the only locality in the United States.

The sulphate of barytes, which is here also found in considerable abundance, is often mixed in various proportions, with the carbonates of lime and of strontian. Several new minerals have been described as from Schoharie, and I might perhaps have added others to the list; but careful observation constrains me to say that all these supposed new species are nothing more than mixtures of the various substances so abundantly diffused through the rocks in this vicinity. This remark, will, I think, especially apply to the Calstronbaryte of Shepard and sulphur springs and some beds of iron ore. I have not yet visited this county, and such is the short time still left for survey, that it is not probable that I shall add any thing further from personal examination.

SUFFOLK COUNTY.

The mineralogy of this county is of course similar to that of Kings and Queens. Thus it contains hematitic iron ore, but not in large and important beds. Iron pyrites and lignite are also associated with a white astringent clay, as on other parts of Long-Island, while magnetic iron sand and garnet sand are found along the whole sea shore. It is indeed so abundant in some places, especially after storms, that it may perhaps be collected for the purpose of reduction.

Salt is manufactured on some parts of the shore of Long-Island, by the exposure of sea water in shallow vats to the sun and wind.

SULLIVAN COUNTY.

Although the number of minerals in this county is not large, their localities are of considerable interest. I refer particularly to the mines of lead ore which have recently been opened in the vicinity of Wurtzboro'. Besides galena, or sulphuret of lead, there are crystallized iron and copper pyrites and the sulphuret of zinc, or blende, and these metallic minerals are contained in a gangue of quartz, which is often in handsome crystals. These mines and their products were particularly noticed in my last report, and I then expressed some doubts whether they could be advantageously wrought, on account of the difficulty of separating the copper, zinc and iron from the lead. I have been informed that during the last summer large quantities of the ore were raised, and that the difficulties which attended the reduction of it have been overcome. If this be correct, and if the vein of ore continues of its present width, the location of the principal mine on the immediate bank of the Hudson and Delaware canal is such as to give it great importance.

TIOGA COUNTY.

In this county I have to notice only the occurrence of some sulphur springs, and a bed of marl in the town of Spencer, from which lime is made by calcination.

TOMPKINS COUNTY.

Scarcely more abundantly supplied with minerals than the preceding, at least so far as my information extends. Calcareous tufa is found in considerable quantities near the village of Ithaca, investing moss, &c. as in many other parts of the State. There are also beds of gypsum in the calciferous slate, but I have no means of knowing their value. To these may be added two or three sulphur springs.

ULSTER COUNTY.

Although the mineral productions of this county are not numerous, a few of them are of great importance. This is particularly the case with the water limestone, of which immense deposits are found along the Rondout and the Hudson and Delaware canal. Some account of the operations in this article was given in my last annual report, and I now add with regret, that the discontinuance of many of our public works has seriously affected this important branch of industry.

In the vicinity of the High falls there is a soft argillaceous limestone, which, as it may be easily reduced to powder, has been proposed as a fertilizing agent. Its composition is similar to that of the water limestone, with which it is no doubt associated. An analysis gave the following results:

Carbonate of lime,	29.45
Carbonate of magnesia,	24.30
Silica and alumina,	42.50
Oxide of iron,	3.75

This limestone often contains cubical and dodecahedral crystals of iron pyrites, similar to those found in the county of Schoharie.

Of marl, there are several localities in Ulster,* while the other more common forms of carbonate of lime are also abundant; as for example calcareous spar and stalactites, the latter of which has been found in a cavern fourteen miles south-west from Esopus. It deserves also to be stated, that fossil bones have been obtained from the marl beds of this county.

Lead ore has long been known to occur in the Shawangunk mountains, within the limits of Ulster, and mining operations have recently been commenced near the red bridge, which forms the boundary be-

* A specimen of marl from Judge Hasbrouk's farm, near Kingston, having a greyish colour and containing shells, is composed in 100 parts, of

Silica and alumina,	3.25
Vegetable matter,	4.00
Carbonate of lime,	92.75

bushels of salt were manufactured. But these works have long since ceased, in consequence of their vicinity to the more important springs of Onondaga.

WESTCHESTER COUNTY.

This county furnishes an extensive list of minerals. Among the most important, in an economical point of view, may be ranked the dolomitic marble, which occurs abundantly in various places, and is extensively employed as a building material.

Of iron ore, some localities occur near Tarrytown and Sing-Sing, but it has not yet been found in such abundance as to warrant extensive operations.

In the vicinity of Sing-Sing, mining operations were formerly carried on to a considerable extent, under the flattering idea that silver ore existed there. Singular stories are related of the occurrence of this ore, and native silver has been credited to this place, in some mineralogical works. We have at present no means of arriving at the truth. Galena has been obtained here in small specimens, and it is more than probable that this may have been mistaken for silver ore. Several ores of copper have been found in the same vicinity, as copper pyrites, black sulphuret of copper, and green carbonate of copper. And to these may be added iron pyrites, sulphuret of zinc and oxide of manganese, which occasionally occur in the limestone.

Of sulphur springs, there is one near Sing-Sing which has acquired some celebrity.

Like the counties of Putnam and Richmond, Westchester contains beds of serpentine, with which are associated other magnesian minerals. The serpentine, although often of a beautiful colour, and susceptible of a fine polish, can seldom be procured in blocks of sufficient size for any useful purpose.

The following is a list of the remaining minerals of this county:

Calcareous spar, the *cuboide* of Hauy—Near Sing-Sing. Other forms, elsewhere.

Sulphate of barytes—Anthony's Nose, near the line of Putnam county.

Phosphate of lime—With the preceding.

Hydrate of magnesia and carbonate of magnesia, compact and crystalline. Found, according to Mr. Mather, at New-Rochelle.

Quartz, drusy, calcedony, agate and jasper—New-Rochelle.

Serpentine, almost every variety—New-Rochelle.

Pyroxene—every where in the dolomite.

Hornblende—Near Verplanck and elsewhere. Actynolite, tremolite and asbestus are also common.

Hydrous anthophyllite—White-Plains? *Mather.*

Feldspar—Several localities, especially near Tarrytown.

Stilbite—West-Farms.

Garnet—On the Croton river.

Epidote—Peekskill.

Chlorite—Rye.

Tourmaline, in long slender crystals—Rye.

Vauquelinite—Near Sing-Sing. *Dr. Torrey.*

Magnetic pyrites—Sparta and Sing-Sing.

Chromate of iron—New-Rochelle.

Magnetic oxide of iron—In serpentine beds, with the preceding.

Red ochre and red chalk—Cortlandtown.

Sphene—Said to have been found near Peekskill, in an aggregate of quartz.

YATES COUNTY.

I have no information concerning the mineral productions of this county. A gas spring is credited to it; and it deserves to be mentioned that a mass of native iron was some years since found on the surface of the earth, in the town of Penn-Yan. It was probably of meteoric origin, although, according to the analysis of Mr. Clemson, it contained no nickel.

Such is a condensed account of the mineralogy of the several counties in the State, and a summary of the materials which have been collected for illustrating this department of the survey. Although there can be no doubt that many discoveries will hereafter be made, we have already evidence enough to satisfy us that, much as New-York may mineral. From the filtered liquor, after the addition of water, the oxide of iron was thrown down by ammonia. The following are the results, viz :

Phosphate of lime,	92.85
Oxide of iron, with a little alumina,	5.20
Silica, (foreign,)	0.50
Moisture,	1.25
Fluoric acid,	trace.

The oxide of iron, silica and alumina, are undoubtedly accidental ingredients, and the mineral is therefore a phosphate of lime, although in a rare form. It was found near Crown Point, in Essex county.

The presence of fluoric acid in the phosphate of lime, may be shown by reducing it to powder, and then mixing sulphuric acid with it, in a platinum crucible. Upon covering the crucible with a plate of glass, and applying a gentle heat, the glass is soon corroded. In this way I have detected the presence of fluoric acid in the crystallized phosphate of lime in Orange county, and also in that from Rossie, St. Lawrence county. A very slight effect only was produced, when the fibrous variety was thus operated upon.

Pyroxenic Steatite.

This substance was described by Dr. Emmons, in the first report of the survey, under the name of *Rensselaerite*. His description is as follows :

Hardness, = 3.5 or 4.0. Specific gravity, 2.874. Form, oblique rhombic prism. M on M = 94° and 86° ; P on M = 106° 30′.—Cleavage parallel to P. Colour, white, yellowish-white, or dark slate. Fracture uneven. Corresponding varieties somewhat granular. Individuals strongly coherent. Before the blowpipe, it fuses with difficulty into a white enamel ; moistened with nitrate of cobalt, it assumes a pale flesh red colour.

Dr. Emmons furnished me with specimens of the above mineral from Canton, in St. Lawrence county, more than a year ago. During the last summer, Dr. Horton and myself found it in great abundance near Oxbow, Jefferson county, at Governeur, St. Lawrence county, and elsewhere.

My examination of this substance was conducted according to the usual process for the analysis of minerals not decomposable by acids. The following are the results :

Silica,	59.75
Magnesia,	32.90
Lime,	1.10
Peroxide of iron,	3.40
Water,	2.85

The composition, therefore, agrees very well with that of steatite. In regard to its crystalline character, it is similar to the steatitic pyroxenes of Sahla, noticed by Beudant, which contain from 30 to 60 per cent of foreign matters, but which still have the form and cleavage of pyroxene. Rose has analyzed three varieties, the composition of one of which is as follows :

Silica,	58.30
Lime,	9.98
Magnesia,	24.22
Protoxide of iron,	4.24
Oxide of manganese,	0.68
Alumina,	0.11
Water,	3.11*

The other varieties have a somewhat different composition. But they all serve to show how a mixture of pyroxene may impress its crystalline character upon the steatite. We obtained numerous varieties of this substance, both in colour and structure, and it is probable that all these would exhibit some slight differences in chemical composition.

Schiller spar, or metalloidal diallage.

As there is some confusion in regard to the above names, it is proper to state that the mineral about to be noticed is identical with the schiller spar of Dr. Thomson.†

Colour dark green, almost blackish green. Fracture uneven, splintery. Sectile. Specific gravity 2.746. It is in broad foliated masses which cleave in two directions, and apparently have the primary form of a rhombohedron. The lamina slightly curved. One of the cleavages is easily obtained and has a metallic pearly lustre, and a pinchback brown colour. Hardness about the same as that of serpentine. Powder yellowish grey. Where the mineral has been exposed to the air, it is of a tombac brown colour.

Thin fragments treated by the blow pipe are merely rounded on the edges, but become of the same brown colour as when they have been long exposed to the air, and are attracted by the magnet. With borax it is fusible, though with difficulty, and the glass when cold has a greenish colour.

This mineral is found associated with dark coloured common serpentine at Brown's quarry, near Carmel, Putnam county. Its composition is no doubt influenced by its contact with the latter substance.

Allanite.

This interesting mineral now for the first time, I believe, credited to the United States, has been found in Warwick, Orange county. The specimen which I received from Dr. Horton has the following characters.

Massive, although it has the appearance of being part of a crystal. Colour, brownish-black. Dull on the outside, but the fresh fracture has a resinous or imperfectly metallic lustre. Powder brown. Opaque or feebly translucent, on thin edges. Very brittle. Fracture uneven or small conchoidal. Hardness about 6.0. Specific gravity 3.635.

Before the blowpipe it melts with effervescence into a black shining glass. With borax it melts easily into a dark green glass. It gelatinizes with heated muriatic acid. The solution causes an abundant precipitate with ammonia.

* Beudant, Traité Elémentaire de Minéralogie, II. 224.
† Outlines of Mineralogy and Chemical Analysis, I. 173.

REPORT

Of Dr. Torrey, on the Botanical Department of the Survey.

To His Excellency, William H. Seward,
Governor of the State of New-York.

Sir:

As Botanist under the act for a Geological Survey of the State, I present you with the following catalogue, preparatory to my final report on the department committed to my charge. When I received my commission, no specific duties were assigned to me, except to make a thorough examination of the vegetable productions of the State, to collect and preserve seven sets of each species, and to arrange and name the whole. One of the sets was to be put up in volumes, for reference, and deposited in the Capitol at Albany; the others to be placed at the disposal of the Executive.

In compliance with these instructions, I have made numerous journeys in various parts of the State, and have prepared extensive collections of botanical specimens. I have also been greatly aided by several botanical friends, particularly by Dr. Asa Gray, who has devoted much time to the study of the plants of New-York, Dr. Peter D. Knieskern of Oriskany, and Dr. H. P. Sartwell of Penn-Yan. I am likewise indebted to many other botanists and naturalists for the communication of specimens, or localities of rare or interesting plants, among whom I take pleasure in naming Prof. Bailey of West-Point; I. Carey, Esq. of New-York; Dr. Hadley of Fairfield; Dr. Bradley of Greece; Dr. Emmons and Prof. Hall, of the geological corps, and Prof. Dewey of Rochester. I have also availed myself of information formerly received from many other botanists who have explored various parts of the State. To Dr. Crawe, I am indebted for some rare species from St. Lawrence and Jefferson counties; to Dr. Barratt, for

In some cases, it will be well, in order to exhibit the natural appearance and colour of the flower and other parts, to send drawings of the plants, made from nature. Specimens and descriptions of medicinal plants, are particularly desired, with an account of their virtues and popular use. Also information respecting the various kinds of timber trees, the quantity, quality and uses of each species; notices of weeds and other injurious plants, with the best modes of eradicating them; and, in a word, any interesting facts relating to the economical or scientific botany of the State, will be thankfully received.

JOHN TORREY.

CATALOGUE OF PLANTS.

CLASS I. EXOGENS, OR MONOCOTYLEDONOUS PLANTS.

ORDER RANUNCULACEÆ. THE CROWFOOT TRIBE.

CLEMATIS, *Linn.* *Virgin's Bower.*
ochroleuca, *Ait.* Long Island, near New-York. June.
virginiana, *L.* *Common Virgin's Bower.* Hills and copses. Aug.
verticillaris, *D. C.* Rocky places. April–May.

ANEMONE, *L.* *Wind Flower.*
nemorosa, *L.* Woods. April–May.
cylindrica, *Gray.* Western part of the State. May–June.
virginiana, *L.* Rocky woods, &c. July.
multifida, *D. C.* Var. hudsoniana, *D. C.* Watertown, Jefferson county, *Dr. Crawe.* June. The only known locality of this plant in the State.
pennsylvanica, *L.* Rocky places, near streams. June–July.

HEPATICA, *Dill.* *Liver-leaf, Liver-wort.*
triloba, *Chaix.* Woods. March–April.

RANUNCULUS, *L.* *Crowfoot.*
aquatilis, *L.* Var. capillaceus, *D. C.* Ponds and small streams. June–August.
flammula, *L.* Inundated places. July–August.
reptans, *L.* Borders of lakes and rivers, north and west of Albany. June–August.
pusillus, *Poir.* Boggy places, near New-York, and on Long Island. July.
cymbalaria, *Pursh.* Salt marshes along the seacoast of New-Jersey, and at Salina. August.

RANUNCULUS, (continued.)

abortivus, *L.* Rocky woods. April–June.
sceleratus, *L.* Ditches and overflowed places. June–August.
Purshii, *Richardson.* R. multifidus, *Pursh.* R. lacustris, *Beck & Tracy.* Ponds and wet places. May–July.
acris, *L.* *Buttercups.* Meadows and pastures. June.
repens, *L.* R. Clintonii, *Beck.* R. intermedius, *Eaton.* Wet shady places. May–July.
pennsylvanicus, *L.* Wet places, rare. June–August.
recurvatus, *Poir.* Shady places, in rich soils. May–June.
fascicularis, *Muhl.* Rocky woods. April–May.
bulbosus, *L.* *Common Buttercups.* May. Introduced.

CALTHA, *L.* *Marsh Marigold.*

palustris, *L.* Swamps. April–May.
Var. integerrima, *Torr. & Gr.* C. integerrima, *Pursh.* Near Peekskill. *Dr. Crandell.*

TROLLIUS, *L.* *Globe Flower.*

laxus, *Salisb.* Sphagnous swamps, western part of the State. May.

COPTIS, *Salisb.* *Gold Thread.*

trifolia, *Salisb.* Swamps. May–June.

AQUILEGIA, *L.* *Columbine.*

canadensis, *L.* Rocks. May–July.

DELPHINIUM, *L.* *Larkspur.*

§ consolida, *L.* *Common Larkspur.* Fields and road sides. July.

ACONITUM, *L.* *Monkshood.*

uncinatum, *L.* Mountains, in wet places, Chenango county. *Major I. Le Conte.* This plant has not been found within the limits of this State, since it was discovered by Maj. Le Conte.

ACTÆA, *L.*

alba, *Bigel.* *Baneberry, White Cohosh.* Rocky woods. May.
rubra, *Bigel.* *Red Cohosh.* Rocky Woods. May.

CIMICIFUGA, *L.* *Bugbane.*

racemosa, *Ell.* Actæa racemosa, *L.* *Blacksnake-root.* Dry woods. July.

THALICTRUM, *L.* *Meadow Rue.*
dioicum, *L.* Rocky woods. April–May.
cornuti, *L.* Wet meadows. June–July.
anemonoides, *Michx.* Woods, in rich soils. April–May

ORDER MAGNOLIACEÆ. THE MAGNOLIA TRIBE.

MAGNOLIA, *L.*
glauca, *L.* *Sweet Bay.* Swamps, Long Island. Not found elsewhere in the State. May–June.
acuminata, *L.* *Cucumber Tree.* Lewiston and Portage, *Dr. Sartwell.* Also in Cattaraugus, where it is a tall tree with a trunk often more than four feet in diameter. *Prof. I. Hall.*
umbrella, *Lam.* *Umbrella Tree.* "Northern part of the State of New-York." *Michaux.* No other botanist has found this tree within the limits of this State.

LIRIODENDRON, *L.* *Tulip Tree.*
tulipifera, *L.* *White-wood.* Woods. May–June.

ORDER MENISPERMACEÆ. THE MOONSEED TRIBE.

MENISPERMUM, *L.* *Moonseed.*
canadense, *L.* Banks of rivers and thickets. June–July.

ORDER BERBERIDACEÆ. THE BARBERRY TRIBE.

BERBERIS, *L.*
§ vulgaris, *L.* *Barberry Bush.* Hedges, fields. Not found far in the interior.

LEONTICE, *L.*
thalictroides, *L.* *Blue Cohosh.* Woods. April.

JEFFERSONIA, *Bart.* *Twin-leaf.*
diphylla, *Pers.* Rich calcareous, northern and western parts of the State. April.

PODOPHYLLUM, *L.* *May Apple.*
peltatum, *L.* Woods and meadows. May.

Order CABOMBACEÆ. The Water-Shield Tribe.

Brasenia, *Schreb.* *Water Shield.*
peltata, *Pursh.* Floating in still water. July.

Order CERATOPHYLLACEÆ.

Ceratophyllum, *L.* *Hornwort.*
echinatum, *Gray.* In ponds, or slow-flowing water. August.

Order NELUMBIACEÆ.

Nelumbium, *Juss.*
luteum, *Willd.* *Great Yellow Water Lily.* Sodus Bay, Lake Ontario. *Dr. Sartwell.* June.

Order NYMPHÆACEÆ. The Water-Lily Tribe.

Nymphæa, *Tourn.* *White Water Lily.*
odorata, *Ait.* In water. June–September.

Nuphar, *Smith.* *Yellow Pond Lily.*
lutea. Var. Kalmiana, *Torr. & Gr.* N. Kalmiana, *Pursh.* In water. June.
advena, *Ait.* *Spatterdock.* In water. June–August.

Order SARRACENIACEÆ.

Sarracenia, *L.* *Sidesaddle Flower.*
purpurea, *L.* Swamps. May–June.
Var. heterophylla. S. heterophylla, *Eaton.* Junius, Seneca county. *Dr. Sartwell.* The flowers of this variety are of a dull yellow colour, and the leaves are somewhat different from those of the ordinary form; but the plant does not appear to be a distinct species.

Order PAPAVERACEÆ. The Poppy Tribe.

Sanguinaria, *L.* *Blood-root.*
canadensis, *L.* Open woods. March–April.

CHELIDONIUM, *L.* *Celandine.*
§ majus, *L.* Waste grounds, and along fences. May–October.

ORDER FUMARIACEÆ. THE FUMITORY TRIBE.

DIELYTRA, *Borkh.*
cucullaria, *D. C.* *Breeches Flower.* Shady woods, in rich soil. April.
canadensis, *D. C.* *Squirrel Corn.* Rocky woods. April.
eximia, *D. C.* Fumaria eximia, *Ker.* D. formosa, *T. & G.* not of *D. C.* nor Fumaria formosa, *Andr.* Corydalis formosa, *Pursh.* Yates county. *Dr. Sartwell.*

ADLUMIA, *Raf.*
cirrhosa, *Raf.* *Climbing Fumaria.* Shady rocks. July–Sept.

CORYDALIS, *D. C.*
aurea, *Willd.* Rocky woods. April–August.
glauca, *Pursh.* Rocky places. May–July.

FUMARIA, *L.* *Fumitory.*
§ officinalis, *L.* Fields and cultivated grounds. May–August.

ORDER CRUCIFERÆ. THE CRUCIFEROUS TRIBE.

NASTURTIUM, *R. Br.*
palustre, *D. C.* Wet places. June–August.
hispidum, *D. C.* Wet places. Highlands of New-York. *Dr. Barratt.*
natans. Var. americanum, *Gray.* Oneida lake, *Dr. Gray.* Ogdensburgh, *Dr. Crawe.* July.

BARBAREA, *R. Br.*
vulgaris, *R. Br.* *Winter Cress.* Along streams, and road sides. May–June.

TURRITIS, *Dill.* *Tower Mustard.*
glabra, var. *Torr. & Gr.* Rocks, Watertown. *Dr. Crawe.*

ARABIS, *L.* *Wall Cress.*
hirsuta, *Scop.* Rocky places. Rare.
lyrata, *L.* Rocks. April–May.
lævigata, *D. C.* Rocky woods, and along rivers. May.
canadensis, *L.* With the preceding. June–July.

CARDAMINE, *L.*
rotundifolia, *Michx.* C. rhomboidea, *D. C.* Wet meadows, and about shady springs. April–May.
pratensis, *L.* *Cuckoo Flower.* Swamps, western part of the State. April–May.
hirsuta, *L.* C. pennsylvanica, *Muhl.* C. virginica, *L.* Wet places, and on rocks. May–June.

DENTARIA, *L.* *Toothwort.*
laciniata, *Muhl.* Rich shady soils. April–May.
maxima, *Nutt.* Western part of the State. *Nuttall.* I have never found this plant, nor has it been observed by any other botanist save its discoverer.
diphylla, *Michx.* *Pepper Root.* Rich shady soils. April–May.

SISYMBRIUM, *Allioni.*
§ officinale, *Scop.* *Hedge Mustard.* Road sides, &c. May–August.
thaliana, *Gay.* Rocks and sandy fields. May.

ERYSIMUM, *L.* *Hedge Mustard.*
cheiranthoides, *L.* Along streams, in the interior of the State. July–August.

SINAPIS, *L.* *Mustard.*
§ nigra, *L.* *Black Mustard,* Fields and waste places. June–August.
§ arvensis, *L.* Wet meadows and fields. Common in the interior of the State. Called *Wild Mustard,* and *Charlock.*

DRABA, *L.*
arabisans, *Michx.* On rocks along the borders of lakes in the northern part of the State. May.
caroliniana, *Walt.* Sandy fields near New-York. April–June.
verna, *L.* *Whitlow Grass.* Fields and hill sides. March–April.

CAMELINA, *Crantz.* *Gold of Pleasure.*
§ sativa, *Crantz.* Fields and cultivated grounds. May–June.

THLASPI, *Dill.*
§ arvense, *L.* New-York. June–July. *Pursh.* I have not found this plant within the limits of the State.

Lepidium, *L.* *Pepper-wort.*

§ campestre, *L.* Waste places. June–July.
virginicum, *L.* Fields and road sides. June–August.

Capsella, *Vent.* *Shepherd's Purse.*

§ bursa-pastoris, *Mœnch.* Fields and waste places. May–Sept.

Cakile, *Tourn.*

maritima, *Scop.* *Sea Rocket.* Seashore of Long Island. July–August.

Order CAPPARIDACEÆ. The Caper Tribe.

Polanisia, *Raf.*

graveolens, *Raf.* Gravelly banks of rivers and lakes. June–August.

Order POLYGALACEÆ. The Milkwort Tribe.

Polygala, *Tourn.* *Milkwort.*

sanguinea, *L.* P. purpurea, *Nutt.* Fields and meadows. July–September.
cruciata, *L.* Sphagnous swamps. August–September.
verticillata, *L.* Dry sandy soils. June–October.
senega, *L.* *Seneca Snake-root.* Dry rocky woods. May–June.
polygama, *Walt.* Sandy fields and woods. June–July.
paucifolia, *Willd.* Sphagnous swamps. May.
Var. alba. Sand plains near Albany. *Dr. J. Eights.*

Order VIOLACEÆ. The Violet Tribe.

Viola, *L.* *Violet.*

pedata, *L.* Dry sandy woods. May–June.
palmata, *L.* Low grounds. May.
cucullata, *Ait.* Fields and woods, in damp soils. April–May.
Selkirkii, *Goldie.* Woody hill sides, western part of the State.
sagittata, *Ait.* V. primulifolia, *Pursh,* not of *L.* Hills and fields. April–May.
rotundifolia, *Michx.* Shady rocky woods. May.
blanda, *Willd.* Wet meadows. April–May.
primulæfolia, *L.* Wet meadows. April–June.
lanceolata, *L.* Wet meadows and swamps. April–May.

Viola, (continued.)
striata, *Ait.* Wet meadows. April–May.
Muhlenbergii, *Torr.* Swamps and shady woods. April–May.
rostrata, *Pursh.* Moist rocky places. May.
pubescens, *Ait.* Dry woods. April–May.
canadensis, *L.* Shady woods. May–July.
tricolor. Var. arvensis, *D. C.* Dry hills. May.

Solea, *Ging.*
concolor, *Ging.* Wet shady woods; western part of the State. April–May.

Order DROSERACEÆ. The Sundew Tribe.

Drosera, *L.* *Sundew.*
rotundifolia, *L.* Sphagnous swamps. June–August.
longifolia, *L.* Sphagnous and sandy swamps. June–August.
filiformis, *Raf.* Wet sandy places, Suffolk county, Long Island. August–September.

Parnassia, *Tourn.* *Grass of Parnassus.*
caroliniana, *Michx.* Wet meadows. July–August.

Order CISTACEÆ. The Rock-rose Tribe.

Helianthemum, *Tourn.*
canadense, *Michx.* Dry sandy places. June.

Lechea, *L.*
major, *Michx.* Dry woods and hills. July–September.
thymifolia, *Pursh.* Sandy shore of Long Island. July–September.
minor, *Lam.* Dry fields and open woods. June–September.

Hudsonia, *L.*
ericoides, *L.* Sandy woods, Suffolk county. May.
tomentosa, *Nutt.* Sandy fields near the sea, Suffolk county; and on Lake Champlain. May.

Order HYPERICACEÆ. The St. John's-wort Tribe.

Hypericum, *L.* *St. John's Wort.*
pyramidatum, *Ait.* Banks of rivers. July.
Kalmianum, *L.* Rocks, Falls of Niagara, &c. August.

HYPERICUM, (continued.)

§ perforatum, *L.* *Common St. John's Wort.* Fields, pastures, &c. July–August.

corymbosum, *Muhl.* Open woods and meadows. July–August.

ellipticum, *Hook.* Moist grounds along rivers, northern and western parts of the State.

mutilum, *L.* H. parviflorum, *Muhl.* Low grounds. July–Sept.

canadense, *L.* Wet sandy soils. June–August.

sarothra, *Michx.* Sandy places. June–August.

ELODEA, *Adans.*

virginica, *Nutt.* Swamps. July–August.

ORDER ILLECEBRACEÆ. THE KNOT-GRASS TRIBE.

ANYCHIA, *Michx.*

dichotoma, *Michx.* Dry hills and woods. June–August.

SPERGULA, *Bartl.*

§ arvensis, *L.* Fields and waste places. May–October.

rubra, *Torr. & Gr.* Arenaria rubra, *L.* Sandy fields and salt marshes April–November.

ORDER CARYOPHYLLACEÆ. THE PINK TRIBE.

MOLLUGO, *L.* *Indian Chickweed.*

verticillata, *L.* Sandy soils. June–September.

HONCKENYA, *Ehrh.*

peploides, *Ehrh.* Arenaria peploides, *L.* Seashore of Long Island.

SAGINA, *Bartl.* *Pearl-wort.*

procumbens, *L.* Wet ground. May–August.

erecta, *L.* Dry hills near New-York. May.

ARENARIA, *L.* *Sand-wort.*

squarrosa, *Michx.* Sandy fields, Suffolk county. April–Sept.

stricta, *Michx.* Rocks and barren places, northern and western part of the State. May–July.

grœnlandica, *Spreng.* Crevices of rocks on the highest summits of the Shawangunk and Adirondack mountains. July–August.

ARENARIA, (continued.)
§ serpyllifolia, *L.* Sandy field, and on rocks. April–July.
lateriflora, *L.* Damp, rather shady places. June.

STELLARIA, *L.* *Stitch-wort.*
§ media, *Smith.* Fields & cultivated grounds. March–December.
longifolia, *Muhl.* Damp shady places. June.
borealis, *Bigel.* Wet shady swamps. Western and northern parts of the State.

CERASTIUM, *L.* *Mouse-ear Chickweed.*
§ vulgatum, *L.* Cultivated grounds, road sides, &c. April–September.
§ viscosum, *L.* Fields, &c. May–September.
arvense, *L.* Rocky places. May–July.
oblongifolium, *Torr.* Rocky hills. April–June.
nutans, *Raf.* Low moist grounds. May.

SILENE, *L.* *Catch-fly.*
stellata, *L.* Dry woods. June–August.
antirrhina, *L.* Dry stony places. April–June.
§ nocturna, *L.* Old fields. July–August.
pennsylvanica, *Michx.* Dry rocks. April–June.
virginica, *L.* Yates county. *Dr. Sartwell.*

LYCHNIS, *D. C.*
§ githago, *Lam.* Agrostema githago, *L.* *Corn Cockle.* Cultivated fields. June.

SAPONARIA, *L.* *Soap-wort.*
§ officinalis, *L.* Waste grounds. July–August.
§ vaccaria, *L.* Cultivated places. July–August.

ORDER PORTULACACEÆ. THE PURSELANE TRIBE.

PORTULACA, *L.*
§ oleracea, *L.* *Purselane.* Cultivated and waste places. July–August.

CLAYTONIA, *L.* *Spring Beauty.*
virginica, *L.* Low grounds and moist woods. March–May.
caroliniana, *Michx.* Woods, usually in highlands; northern and western parts of the State. April.

Order ELATINACEÆ. The Water-Pepper Tribe.

Elatine, *L.* *Water-wort.*

americana, *Arn.* Crypta minima, *Nutt.* Overflowed borders of ponds, Long Island. July–September.

Order LINACEÆ. The Flax Tribe.

Linum, *L.* *Flax.*

virginianum, *L.* Dry hills and woods. May–August.
§ usitatissimum. *L.* *Common Flax.* Fields, &c. June–July.

Order GERANIACEÆ. The Geranium Tribe.

Geranium, *L.*

maculatum, *L.* Open woods, &c. April–July.
carolinianum, *L.* Dry barren soils. May–June.
pusillum, *L.* Fields and road sides. Long Island, and western part of the State. May–July. West Point. *Prof. Bailey.*
robertianum, *L.* *Herb Robert.* Wet rocks. June–October.
dissectum, *L.?* Yates county. *Dr. Sartwell.*

Erodium, *L'Her.* *Cranesbill.*

§ cicutarium, *L'Her.* Island in Oneida lake. *Dr. Kneiskern.*

Order BALSAMINACEÆ. The Balsam Tribe.

Impatiens, *L.* *Lady's Slipper.* *Balsam.*

pallida, *Nutt.* Moist shady places. July–September. Rare near the seacoast.
fulva, *Nutt.* Wet shady places. June–September.

Order LIMNANTHACEÆ.

Flœrkea, *Willd.*

proserpinacoides, *Willd.* Wet places, in the interior of the State. April–May.

Order OXALIDACEÆ. The Wood-Sorrel Tribe.

Oxalis, *L.* *Wood Sorrel.*

acetosella, *L.* Woods, west and north of Catskill mountains. June.

Oxalis, (continued.)
violacea, *L.* Rocky woods. April–May.
stricta, *L.* Cultivated grounds, fields, &c. June–September.

Order ZANTHOXYLACEÆ.

Zanthoxylum, *L.*
americanum, *Mill.*, *Torr. & Gr.* Z. fraxineum, *Willd.* *Prickly Ash.* Rocky woods. April–May.

Ptelea, *L.*
trifoliata, *L.* *Shrubby Trefoil.* Shore of Lake Erie. June.

Order ANACARDIACEÆ. The Cashew Tribe.

Rhus, *L.* *Sumac.*
typhina, *L.* *Stag's-horn Sumac.* Rocky hills. June.
glabra, *L.* *Smooth Sumac.* Rocky places. July–August.
copallina, *L.* *Mountain Sumac.* Rocky hills. July–August.
venenata, *D. C.* *Poison Sumac*, *Poison Elder.* Swamps. June.
toxicodendron, *L.* *Poison Oak*, *Poison Ivy.* Borders of woods, &c. June.
Var. radicans, *Torr.* R. radicans, *L.* *Poison Ivy*, *Mercury*, *&c.* Woods, and along fences. June.
aromatica, *Ait.* Dry rocky places. Catskill, &c. April–May.

Order MALVACEÆ. The Mallow Tribe.

Malva, *L.* *Mallows.*
§ rotundifolia, *L.* Road sides and waste grounds. May–Sept.

Althæa, *L.* *Marsh Mallow.*
§ officinalis, *L.* Borders of salt marshes, Flushing, Oysterbay, &c. Long Island. August–September.

Abutilon, *Dill.*
§ avicennæ, *Gært.* Sida abutilon, *L.* Waste places, Road sides, &c. August–September.

Hibiscus, *L.*
virginicus, *L.* Borders of salt marshes, Long Island.
moscheutos, L. *Mallow Rose.* Borders of marshes, particularly near the salt water. August–September.

Order TILIACEÆ. The Linden Tribe.

Tilia, *L.* *Linden* or *Lime Tree.* *Bass-wood.*
americana, *L.* Woods. June.

Order VITACEÆ. The Vine Tribe.

Vitis, *L.* *Vine.*
labrusca, *L.* *Fox Grape.* Woods and thickets. June.
æstivalis, *Michx.* *Summer Grape.* Woods and river banks. June.
riparia, *Michx.* *Winter Grape.* Thickets along rivers.

Ampelopsis, *Michx.*
quinquefolia, *Michx.* *Virginian Creeper, American Joy.* Borders of woods, and along fences. July.

Order ACERACEÆ. The Maple Tribe.

Acer, *L.* *Maple.*
pennsylvanica, *L.* *Striped Maple, Moose-wood, Dog-wood.* Mountain woods. May.
spicatum, *Lam.* *Mountain Maple.* Rocky hills. May–June.
saccharinum, *Wang.* *Sugar Maple.* Woods. April–May.
dasycarpum, *Ehrh.* *White Maple, Soft Maple, Silver-leaved Maple.* Banks of rivers, Fishkill, &c. March–April.
rubrum, *L.* *Red* or *Swamp Maple.* Swamps and borders of streams. March–April.

Order CELASTRACEÆ.

Staphylea, *L.* *Bladder-nut.*
trifolia, *L.* Rocky woods, particularly along rivers. May.

Celastrus, *L.*
scandens, *L.* *Bittersweet, Wax-work.* Borders of woods, fences, &c. June.

Euonymus, *L.* *Spindle Tree.*
atropurpureus, *Jacq.* *Burning Bush.* Shady woods. June–July.
americanus, *L.* *Strawberry Tree.* Wet woods and swamps. June.

ORDER RHAMNACEÆ. THE BUCKTHORN TRIBE.

RHAMNUS, *L.* *Buckthorn.*
- catharticus, *L.* Rocky woods, Highlands of New-York. *Dr. Barratt.*
- alnifolius, *L'Her.* Sphagnous swamps. May–June.

CEANOTHUS, *L.*
- americanus, *L.* *New-Jersey Tea.* Woods and copses. June–July.
- ovalis, *Bigel.* Barren rocky places, northern counties. May.

ORDER LEGUMINOSÆ. THE BEAN TRIBE.

VICIA, *L.* *Vetch.*
- americana, *Muhl.* Shady moist places. June.
- cracca, *L.* Borders of woods, &c. April–June.
- caroliniana, *Walt.* Banks of rivers. April–May.
- § sativa, *L.* *Common Vetch, Tare.* Fields, &c. July.

ERVUM, *L.* *Tare.*
- § ? hirsutum, *L.* Borders of rivers. May–June.

LATHYRUS, *L.*
- maritimus, *Bigel.* Pisum maritimum, *L.* Sandy shores and hill sides, particularly near salt water. June–July.
- ochroleucus, *Hook.* Sandy hill sides. June–July.
- myrtifolius, *Muhl.* Banks of rivers, &c. July–August.
- palustris, *L.* Wet borders of streams. July–August.

PHASEOLUS, *L.* *Kidney Bean.*
- perennis, *Walt.* Woods and borders of swamps. July–August.
- diversifolius, *Pers.* Sandy shores. August–October.
- helvolus, *L.* Sandy fields. August–September.

APIOS, *Boerh.*
- tuberosa, *Mœnch.* Moist shady places. July.

AMPHICARPÆA, *Elliott.*
- monoica, *Torr. & Gr.* Woods and thickets. August–September.

ROBINIA, *L.* *Locust Tree.*
- pseudacacia, *L.* *Common Locust.* Not indigenous in this State, but almost naturalized in some places. May–June.

TEPHROSIA, *Pers.*
virginiana, *Pers.* Dry sandy soils. June–July.

TRIFOLIUM, *L.* *Clover, Trefoil.*
§ arvense, *L.* *Stone Clover, Rabbit-foot.* Dry soils. June–August.
§ pratense, *L.* *Red Clover.* Meadows, fields, &c. May–Sept.
repens, *L.* *White Clover.* Pastures, &c. April–November.
§ agrarium, *L.* *Hop Clover.* Sandy soils. June–August.

MELILOTUS, *Tourn.* *Melilot.*
§ officinalis, *Willd.* *Yellow Melilot.* River banks. June–August.
leucantha, *Koch.* *White Melilot.* River banks. June–August.

MEDICAGO, *L.* *Medick.*
§ sativa, *L.* *Lucerne.* Fields. June–July.
§ lupulina, *L.* Fields and cultivated grounds. June–August.

ASTRAGALUS, *L.* *Milk Vetch.*
canadensis, *L.* Rocky banks of rivers. June–August.

PHACA, *L.* *Bastard Vetch.*
neglecta, *Torr. & Gr.* Gravelly banks of rivers and lakes, western counties. June–July.

STYLOSANTHES, *Swartz.*
elatior, *Swartz.* Sandy woods, Suffolk county. July–August.

DESMODIUM, *D. C.*
nudiflorum, *D. C.* Dry rocky woods. July–August.
acuminatum, *D. C.* Dry woods. July.
canadense, *D. C.* Dry woods. August.
canescens, *D. C.* Moist rich soils. July–August.
Dillenii, *Darlingt.* Rich woodlands. August.
cuspidatum, *Torr. & Gr.* D. bracteatum, *D. C.* Banks of rivers, and rocky thickets. August.
marilandicum, *Boott.*, (*D. C.?*) Hedysarum marilandicum, *L.* H. obtusum, *Willd. &c.* Fields and woods. July–August.
rigidum, *D. C.* Hill sides. August–September.
ciliare, *D. C.* Borders of woods, &c. August.
paniculatum, *D. C.* Dry woods and copses. August.
rotundifolium, *D. C.* Rocky woods. August.

LESPEDEZA, *Michx.*
procumbens, *Michx.* Sandy fields and hill sides. August.
repens, *Torr. & Gr.* L. prostrata, *Pursh.* Sandy fields. Aug.
violacea, *Pers., Torr. & Gr.* (L. divergens.)
Var. 1. sessiliflora, *Torr. & Gr.* L. sessiliflora, *Michx.*
Var. 2. angustifolia, *Torr. & Gr.* L. reticulata, *Pers.* Dry woods and thickets. August–September.
capitata, *Michx.* L. frutescens, *Ell.* Sandy fields, &c. August–September.
hirta, *Ell.* L. polystachya, *Michx.* Sandy fields. August–September.

LUPINUS, *L.* *Lupine.*
perennis, *L.* *Wild Lupine.* Sandy woods. June.

CROTALARIA, *L.* *Rattlebox.*
sagittalis, *L.* Dry woods and sandy fields. July–August.

BAPTISIA, *Vent.*
tinctoria, *R. Br.* *Wild Indigo.* Sandy woods and fields. July–August.

GLEDITSCHIA, *L.*
triacanthos, *L.* *Honey Locust.* Not indigenous in this State, but often planted about houses, and nearly naturalized in some places.

CASSIA, *L.*
marilandica, *L.* *Wild Senna.* Banks of streams. July–August.
nictitans, *L.* *Wild Sensitive Plant.* Sandy places. August.
chamæcrista, *L.* *Magothy-bay Bean.* Sandy places. July–August.

CERCIS, *L.* *Judas Tree.*
canadensis, *L.* Niagara county?

ORDER ROSACEÆ. THE ROSE TRIBE.

PRUNUS, *Tourn.* *Plum.*
americana, *Marshall.* P. nigra, *Ait.* *Yellow Plum.* Banks of streams, borders of fields, &c. April.
maritima, *Wang.* P. sphærocarpa, *Michx.* P. pygmæa, *Willd.* P. littoralis, *Bigel.* *Beach Plum.* Sandy fields

and hill sides near the seacoast, Long Island. May.

CERASUS, *Juss.* *Cherry.*
pumila, *Michx.* *Sand Cherry.* Rocky or sandy shores. May.
pennsylvanica, *Loisel.* C. borealis, *Michx.* Rocky woods. May.
virginiana. Prunus virginiana, *L.* P. serotina, *Torr. fl.*, *Beck*, *&c.;* not of *Ehrh.* *Choke-Cherry.* Rocky hills. May.
serotina, *Loisel.* Prunus serotina, *Ehrh.* Cerasus virginiana, *Michx.* *Wild Cherry, Black Cherry.* Woods. June.

SPIRÆA, *L.* *Meadow-sweet.*
opulifolia, *L.* *Nine-bark.* Rocky river banks. June.
salicifolia, *L.* *Queen of the Meadow.* Along brooks, and on rocky hills. June–July.
tomentosa, *L.* *Steeple-bush, Hardhack.* Low grounds. July.

GILLENIA, *Mœnch.*
trifoliata, *Mœnch.* *Indian Physic, Bowman's-root.* Woods. June.
stipulacea, *Nutt.* Western part of the State. *David Thomas, Esq.*

SANGUISORBA, *L.* *Burnet Saxifrage.*
canadensis, *L.* Wet meadows, &c. August–September.

AGRIMONIA, *L.* *Agrimony.*
eupatoria, *L.* Dry woods and fields. July.

POTENTILLA, *L.* *Cinquefoil.*
fruticosa, *L.* Bog meadows. June–September.
arguta, *Pursh.* Rocky hills. June.
argentea, *L.* Rocks and barren fields. June–September.
canadensis, *L.* P. simplex, *Michx.* *Five-finger, Barren Strawberry.* Fields and woods. April–August.
§? norvegica, *L.* Old fields, &c. June–August.
tridentata, *Ait.* Clefts of rocks, on mountains. June–July.
palustris, *Scop.* Comarum palustre, *L.* Swamps. June.

GEUM, *L.* *Avens.*
canadense, *Murr.* G. strictum, *Ait.* Swamps and fields. July.
virginianum, *L.* G. album, *Gmel.* Woods, &c. June–July.
rivale, *L.* *Water Avens.* Bogs and wet meadows. May–June.

COMAROPSIS, *Richard*.
fragarioides, *D. C.* Woods. May–June.

DALIBARDA, *L.*
repens, *L.* Moist shady places. June–August.

FRAGARIA, *L.* *Strawberry*.
virginiana, *Mill.* *Wild Strawberry*. Old fields, &c. May–June.
canadensis, *Michx.* Rocky hills. May–June.

RUBUS, *L.* *Bramble*.
odoratus, *L.* *Flowering Raspberry*. Rocky places. June–Aug.
strigosus, *Michx.* *Red Raspberry*. Rocks and hill sides. May.
occidentalis, *L.* *Black Raspberry, Thimble-berry*. Borders of woods, and in thickets. May.
cuneifolius, *Pursh.* Sandy fields, Long Island. May–June.
villosus, *Ait.* *Blackberry, High Blackberry*. Old fields, &c. May–June.
procumbens, *Muhl.* R. trivialis, *Pursh.* R. hispidus, *D. C.*
hispidus, *L.* R. obovalis, *Michx.* R. obovatus, *Pers.*, *Darlingt.* Shady swamps. June.
triflorus, *Richards.* R. saxatilis, var. canadensis, *Michx.* R. canadensis, *Torr. fl.* Swamps. June.

ROSA, *L.* *Rose*.
§ rubiginosa, *L.* *Sweet Brier*. Fields, &c. June.
carolina, *L.* *Swamp Rose*. Wet thickets. June–July.
parviflora, *Ehrh.* R. caroliniana, *Michx.* Old fields, &c. June.

CRATÆGUS, *Lindl.* *Hawthorn*.
crus-galli, *L.* *Cockspur Thorn, Newcastle Thorn*. Borders of woods, &c. June.
punctata, *Ait.* Woods and along streams. May–June.
pyrifolia, *Ait.* Rocky woods, &c. May–June.
coccinea, *L.* *White Thorn*. Borders of woods. May.

AMELANCHIER, *Medic.*, *D. C.*
canadensis, *Torr. & Gr.* Mespilus canadensis, *L.* *Shad-flower, June-berry, Snowy Medlar*.
Var. 1. botryapium, *Torr. & Gr.* A. botryapium, *D. C.*
Var. 2. oligocarpa, *Torr. & Gr.* Pyrus sanguinea, *Pursh*.
Var. 3. rotundifolia, *Torr. & Gr.* Aronia ovalis, *Pers.*
Var. 4. oblongifolia, *Torr. & Gr.*
Rocky woods and low grounds. April–May.

PYRUS, *Lindl.* *Apple, Pear, &c.*
§ malus, *L.* *Apple Tree.* Naturalized in some places. May.
coronaria, *L.* *Sweet-scented Crab-apple.* Woods. April–May.
aucuparia, *Gært.* Sorbus aucuparia, *L.*, *Michx.* S. americana and microcarpa, *Pursh.* *Mountain Ash.* Mountain swamps and shady hill sides. May. Not found south of the Highlands.
arbutifolia, *L. f.*
Var. 1. erythrocarpa. P. arbutifolia, *D. C.*
Var. 2. melanocarpa. P. melanocarpa, *D. C.*
Choke-berry. Woods and hill sides. May–June.

ORDER MELASTOMACEÆ.

RHEXIA, *L.*
virginica, *L.* *Deer Grass.* Swamps. August.

ORDER LYTHRACEÆ. THE LOOSE-STRIFE TRIBE.

LYTHRUM, *L.* *Loose-strife.*
hyssopifolia, *L.* In the State of New-York. *Nuttall.*

CUPHEA, *L.*
viscosissima, *Jacq.* Fields, &c. northern and western counties. September.

DECODON, *Gmel.*
verticillatum, *Ell.* Swamps. August.

ORDER ONAGRACEÆ. THE EVENING PRIMROSE TRIBE.

EPILOBIUM, *L.* *Willow Herb.*
angustifolium, *L.* E. spicatum, *Lam.* Banks of rivers and low grounds. July.
alpinum, *L.* Adirondack mountains. August.
coloratum, *Muhl.* Wet places. July–August.
molle, *Torr.* E. strictum, *Muhl.* Sphagnous swamps. August.
palustre, *L.* Swamps. August.
Var. albiflorum, *Lehm.* E. oliganthum, *Michx.* E. squamatum, *Nutt.* Sphagnous swamps. August–September.

GAURA, *L.*
biennis, *L.* Dry soil, river banks, &c. August.

ŒNOTHERA, *L.* *Evening Primrose.*
pumila, *L.* Œ. chrysantha and pusilla, *Michx.* Fields and meadows. June–July.
fruticosa, *L.* Œ. canadensis, *Goldie.* Dry places. June–Aug.
Var. ambigua, *Nutt.* Stony fields. August.
biennis, *L.* Œ. grandiflora, *Ait.* Œ. parviflora, *L.* Fields and meadows. June–August.

LUDWIGIA, *L.*
palustris, *Ell.* Stagnant water. July–October.
alternifolia, *L.* Swamps. July–August.

CIRCÆA, *Tourn.* *Enchanter's Nightshade.*
lutetiana. Var. 1. canadensis, *L.*
Var. 2. alpina. C. alpina, *L.*
Damp shady woods. July–August.

SUB-ORDER HALORAGEÆ.

PROSERPINACA, *L.* *Mermaid Weed.*
palustris, *L.* In water. July–August.

MYRIOPHYLLUM, *Vaill.* *Water Milfoil.*
spicatum, *L.* Deep water. July–August.
verticillatum, *L.* Ponds and streams. July–September.
heterophyllum, *Michx.* Ponds and streams. July–September.
ambiguum, *Nutt.* Ponds and muddy places, Long Island. July–August.
tenellum, *Bigel.* Borders of ponds, northern counties. August.

HIPPURIS, *L.* *Mare's-tail.*
vulgaris, *L.* Ponds and lakes, Schenectady, *Dr. Beck.* Cayuga lake, *Dr. I. Smith.* Ditches near Coldspring, Putnam county, *Prof. Bailey.*

ORDER CALLITRICHACEÆ. THE WATER-CHICKWEED TRIBE.

CALLITRICHE, *L.* *Water Chickweed.*
verna, *L.* C. heterophylla, *Pursh.* In water. May–September.
Var.? linearis. C. linearis, *Pursh.* In water. August.
Var.? terrestris. C. terrestris, *Raf.* Muddy places. July.

Order CUCURBITACEÆ. The Gourd Tribe.

Sicyos, *L.* *Single-seeded Cucumber.*
angulatus, *L.* Cultivated grounds and river banks. August.

Hexameria, *Torr. & Gr.*
echinata, *Torr. & Gr.* Momordica echinata, *Willd.* Sicyos lobatus, *Michx.* Moist alluvial soils. August.

Order GROSSULARIACEÆ. The Currant Tribe.

Ribes, *L.* *Currant* and *Gooseberry.*
prostratum, *L'Herit.* R. rigens and trifidum, *Michx.* Rocky places; northern and western counties. May.
floridum, *L'Herit.* R. recurvatum, *Michx.* *Wild Black Currant.* Woods and hedges. May.
hirtellum, *Michx.* R. saxosum, *Hook.* Rocky places. May.
rotundifolium, *Michx.* R. triflorum, *Willd.* *Wild Gooseberry.* Rocky woods, and on mountains. May–June.
lacustre, *Poir.* Catskill mountains. May–June.
cynosbati. *L.* Mountain woods. May–June.

Order CACTACEÆ. The Cactus Tribe.

Opuntia, *Tourn.* *Indian Fig.*
vulgaris, *D. C.* Cactus opuntia, *L.* *Prickly Pear.* Rocks, and in sand. June–July.

Order CRASSULACEÆ. The House-leek Tribe.

Sedum, *L.* *Stone-crop.*
telephioides, *Michx.* Rocks on Seneca lake. *Prof. J. Hall.*

Penthorum, *L.*
sedoides, *L.* Low wet places. July–August.

Order SAXIFRAGACEÆ. The Saxifrage Tribe.

Saxifraga, *L.* *Saxifrage.*
virginiensis, *Michx.* Rocks. April–May.
pennsylvanica, *L.* Swamps and bogs. May–June.

CHRYSOSPLENIUM, *L.* *Golden Saxifrage.*
americanum, *Schwein.* C. oppositifolium, *Michx.* and most American botanists; not of *Linn.* In water. April–May.

MITELLA, *L.* *False Sanicle, Bishop's Cap.*
diphylla, *L.* Rocky wet banks. May.
nuda, *L.* M. cordifolia, *Lam.* M. prostrata, *Michx.* Moist rocky places. May–June.

TIARELLA, *L.* *Mitre-wort.*
cordifolia, *L.* Rocky woods. May–June.

HEUCHERA, *L.* *Alum-root.*
americana, *L.* Shady rocks. June–July.

ORDER HAMAMELACEÆ. THE WITCH HAZEL TRIBE

HAMAMELIS, *L.* *Witch Hazel.*
virginiana, *L.* Woods. October–November.

ORDER UMBELLIFERÆ. THE UMBELLIFEROUS TRIBE.

HYDROCOTYLE, *L.* *Marsh Penny-wort.*
umbellata, *L.* Var. umbellulata, *D. C.* Sandy swamps, Long Island. July–August.
americana, *L.* Moist shady places and swamps. July.

CRANTZIA, *Nutt.*
linearis, *Nutt.* Muddy banks of rivers, West Point. *Prof. Bailey.*

SANICULA, *L.* *Sanicle.*
marilandica, *L.* Woods. June–August.

CICUTA, *L.*
maculata, *L.* *Water Hemlock.* Wet grounds. July–August.
bulbifera, *L.* Swamps. August.

ZIZIA, *Koch.*
aurea, *Koch.* Rocky hills. June.
cordata, *Koch.* Meadows, and banks of rivers. May–June.
integerrima, *D. C.* Dry hills. May.

DISCOPLEURA, *D. C.*
capillacea, *D. C.* Brackish swamps. July–September.

CRYPTOTÆNIA, *D. C.*
canadensis, *D. C.* Chærophyllum canadense, *Pers.* *Hone-wort.* Woods. June.

SIUM, *L.* *Water Parsnip.*
latifolium, *L.* S. lineare, *Michx.* Swamps. July.

SELINUM, *L.*
canadense, *Michx.* Cnidium canadense, *Spreng.* Swamps, Oriskany, Oneida county. August.

BUPLEURUM, *L.* *Modesty, Thoroughwax.*
§ rotundifolium, *L.* Cultivated grounds and waste places. Aug.

ANGELICA, *L.*
atropurpurea, *L.* *Common Angelica.* Low grounds. June.
hirsuta, *Muhl.* A. triquinata of American authors; not of *Michx.* Dry thickets, and borders of woods. August.

ARCHEMORA, *D. C.*
rigida, *D. C.* Sium rigidius, *L.* *Cowbane.* Swamps. August.

PASTINACA, *L.* *Parsnep.*
§ sativa, *L.* *Common Parsnep.* Old fields. June–August.

HERACLEUM, *L.* *Cow Parsnep.*
lanatum, *L.* Low grounds. June.

DAUCUS, *L.* *Carrot.*
§ carota, *L.* Fields and road sides. July–September.

OSMORHIZA, *Raf.*
longistylis, *D. C.* *Sweet Cicely.* Woods, in rich soil. May.
brevistylis, *D. C.* Shady rocky woods. May.

CONIUM, *L.* *Hemlock.*
§ maculatum, *L.* *Poison Hemlock.* Waste places. June–July

ORDER ARALIACEÆ. THE ARALIA TRIBE.

ARALIA, *L.*
nudicaulis, *L.* *Wild Sarsaparilla.* Rocky woods. May–June

ARALIA, (continued.)
racemosa, *L.* *Spikenard.* Woods. July.
hispida, *L.* *Wild Elder.* Rocks. July.

PANAX, *L.* *Ginseng.*
quinquefolium, *L.* *Common Ginseng.* Woods. July.
trifolium, *L.* *Dwarf Ginseng, Ground-nut.* Moist shady woods. April.

ORDER CORNACEÆ. THE DOG-WOOD TRIBE.

CORNUS, *L.* *Dog-wood.*
canadensis, *L.* *Dwarf Dog-wood.* Woods and swamps. May–June.
florida, *L.* *Common Dog-wood.* Woods. May.
circinata, *L'Herit.* Margins of streams. June.
sericea, *L'Herit.* *Swamp Dog-wood.* Low grounds. June.
stolonifera, *Michx.* C. alba, of American botanists; not of *Linn.* Wet banks of streams, and swamps. June.
paniculata, *L'Herit.* Banks of streams. June.
alternifolia, *L.* Shady woods. May–June.

ORDER CAPRIFOLIACEÆ. THE HONEYSUCKLE TRIBE.

SAMBUCUS, *L.* *Elder.*
canadensis, *L.* *Common Elder.* Low grounds, &c. June–July.
pubens, *Michx.* *Red-berried Elder.* Rocky woods. May.

VIBURNUM, *L.*
prunifolium, *L.* *Black Haw, Sloe.* Woods. May–June.
lentago, *L.* Woods, along streams. May.
cassinioides, *L.*; not of authors. Swamps, northern counties.
nudum, *L.* Swamps. June.
dentatum, *L.* Moist rocky places. June.
pubescens, *Pursh.* Rocks. June.
lantanoides, *Michx.* *Hobble-bush.* Mountain woods. May–June.
acerifolium, *L.* *Arrow-wood, Dogmackie.* Woods. June.
oxycoccus, *Pursh.* *Bush Cranberry.* Rocky woods. June.

TRIOSTEUM, *L.*
perfoliatum, *L.* *Fever-root, Horse Gentian, Wild Coffee.* Rocky woods. May–June.

Diervilla, *Tourn.*
Tournefortii, *Michx.* Rocky woods. June–July.

Lonicera, *L.* *Honeysuckle.*
flava, *Sims.* Catskill mountains. June–July. *Pursh.*
hirsuta, *Eaton.* Caprifolium pubescens, *Goldie.* Rocky woods. June.
parviflora, *Lam.* Rocky woods. June.
grata, *Ait.* Mountains, New-York. *Pursh.* I have not found this species.
ciliata, *Muhl.* Rocky hills. May–June.
cærulea, *L.* L. villosa, *Muhl.* Xylosteum villosum, *Michx.* X. solonis, *Eat.* Rocky hills, Poughkeepsie. May.
oblongifolia, *Hook.* Xylosteum oblongifolium, *Goldie.* Rocks. June.
sempervirens, *Ait.* Rocks near water, Island of New-York. May.

Symphoricarpos, *Dill.*
vulgaris, *Michx.* Symphoria glomerata, *Pers.* Yates county. *Dr. Sartwell.*
racemosus, *Michx.* Rocky river banks. July.

Linnæa, *Gronov.*
borealis, *L.* *Twin-flower.* Shady moist woods and swamps.

Order RUBIACEÆ. The Madder Tribe.

Hedyotis, *L.*, *Hook.*
glomerata, *Ell.* Damp shady soils, near New-York. August.
cærulea, *Hook.* Houstonia cærulea, *L.* Wet banks and woods. April–September.
longifolia, *Hook.* Houstonia longifolia, *Michx.* Woods, &c. June.
ciliolata, *Hook.* Houstonia ciliolata, *Torr.* Wet rocks and banks, near the Great Lakes. June–July.

Mitchella, *L.* *Partridge-berry.*
repens, *L.* Woods. June.

Cephalanthus, *L.* *Button-bush.*
occidentalis, *L.* Swamps and along streams. July–August.

Galium, *L.* *Bedstraw, Goose-grass.*
trifidum, *L.* Low wet places. July.

Galium, (continued.)
tinctorium, *L.* Moist shady woods. June–July.
asprellum, *Michx.* Wet thickets. July.
aparine, *L.* Shady rocky places, and along fences. May.
triflorum, *Michx.* Moist woods. July.
pilosum, *Ait.* Dry woods and thickets. June.
circæzans, *Michx.* Woods, in rich soil. June–July.
lanceolatum, *Torr.* Moist woods. July.
boreale, *L.* Dry woods. July–August.

Order VALERIANACEÆ. The Valerian Tribe.

Fedia, *Mœnch.* *Lamb Lettuce.*
radiata, *Michx.* Meadows and banks of rivers. May.

Valeriana, *L.* *Valerian.*
sylvatica, *Richardson.* Sphagnous swamps in Wayne county *Dr. Sartwell.*

Order DIPSACEÆ. The Scabious Tribe.

Dipsacus, *L.* *Teasel.*
§ sylvestris, *L.* *Wild Teasel.* Waste places. July.

Order COMPOSITÆ.

Vernonia, *Schreb.* *Iron-weed.*
noveboracensis, *Willd.* Low grounds. August.

Liatris, *Schreb.* *Blazing Star.*
scariosa, *Willd.* Sandy fields. September.
flexuosa, *Thomas, in Sill. Jour. Oct.* 1839.

Eupatorium, *L.*
sessilifolium, *L.* Rocky woods. August.
perfoliatum, *L.* *Boneset, Thoroughwort.* Wet grounds. August.
purpureum, *L.* E. verticillatum, *Willd.* Low grounds. August.
maculatum, *L.* E. trifoliatum, *L.* E. ternifolium, *Ell., D. C.* Swamps, and borders of wet woods. August. Perhaps not distinct from the preceding.
ageratoides, *L. f.* Woods and rocky banks. August–September.
teucrifolium, *Willd.* Low grounds. August.

MIKANIA, *Willd.*
scandens, *Willd.* Wet thickets. August.

NARDOSMIA, *Cass.*
palmata, *Hook.* Tussilago palmata, *Ait.* Swamps near Saratoga. *Dr. Steele.*

TUSSILAGO, *Tourn.* *Coltsfoot.*
farfara, *L.* Moist banks. April. Introduced?

ASTER, *L.* *Starwort.*
novæ-angliæ, *Ait.* Low grounds. September.
patens, *Ait.* A. amplexicaulis, *Michx.* Dry woods. August–September.
phlogifolius, *Muhl.* Dry woods. August.
cordifolius, *L.* Woods. September.
paniculatus, *Ait.* Dry woods. August–September.
heterophyllus, *Willd.* Rocky banks and thickets. September.
diversifolius, *Michx.* Dry woods. September.
prenanthoides, *Muhl.* Low grounds. September.
puniceus, *L.* Swamps. September.
novæ-belgii, *L.* Near Albany. *Dr. Beck.*
parviflorus, *Nees.* Old fields. September.
divergens, *Ait.* Fields and thickets. September.
fragilis, *Willd.* Swamps. September.
tradescanti, *L.* Thickets. August–October.
ericoides, *L.* Wet bushy places. September.
diffusus, *Ait.* Old fields. September.
miser, *L.* Old fields. September–October.
multiflorus, *Ait.* Fields and dry banks. September.
concinnus, *Willd.* Swamps. September.
mutabilis, *Ait.* Rocky river banks. September.
lævis, *L.* Moist shady banks. September.
rubricaulis, *Lam.* A. cyaneus, *Hoffm.* Borders of woods. Sept.
bellidiflorus, *Willd.* Meadows. September.

A few other species of this genus have been collected, but not determined.

TRIPOLIUM, *Nees.*
flexuosum, *Nees.* Aster flexuosus, *Nutt.* Salt marshes. Sept.
subulatum, *Nees.* A. subulatus, *Michx.?* Salt marshes.

SERICOCARPUS, *Nees.*
solidaginoides, *Nees.* Aster solidaginoides, *Willd.* Dry woods. July–August.
conyzoides, *Nees.* Aster conyzoides, *Willd.* Dry woods and thickets. July–August.

HELEASTRUM, *D. C.*
album, *D. C.* Chrysopsis alba, *Nutt.* Rocky banks of Black river, Jefferson county. August. *Dr. Crawe.*

BIOTIA, *D. C.*
macrophylla, *D. C.* Aster macrophyllus, *L.* Rocky woods. August–September. B. Schreberi, latifolia and glomerata, *D. C.* do not appear to be more than varieties of this species.
corymbosa, *D. C.* Dry woods. July–August.

DIPLOSTEPHIUM, *Cass.*
amygdalinum, *Cass.* Aster amygdalinus, *L.* Also? A. umbellatus, *Ait.* Low grounds. August–September.
cornifolium, *D. C.* A. cornifolius, *Muhl.* Woods. August.
acuminatum, *D. C.* A. acuminatus, *Michx.* Mountain woods. September.

DIPLOPAPPUS, *Cass.*, *D. C.*
linariæfolius, *Lindl.* Aster linariifolius, *L.* Rocks and sandy woods.

ERIGERON, *L.* *Fleabane.*
philadelphicum, *L.* Woods. June–August.
pulchellum, *Michx.* E. bellidifolium, *Muhl.* *Poor Robert's Plantain.* Woods. May–June.
purpureum, *Ait.* Sides of hills, &c. June.
canadense, *L.* E. pusillum, *Nutt.* *Horse-weed, Butter-weed.* Fields, &c. August–September.

STENACTIS, *Nees.*
annua, *Nees.* Aster annuus, *L.* Erigeron heterophyllum, *Nutt.* Fields and meadows. June–July.
strigosa, *D. C.* Erigeron strigosum, *Muhl.* Fields and woods. June–August.

Chrysopsis, *Nutt.*
mariana, *Nutt.* Dry sandy woods. September.
falcata, *Ell.* Sandy fields, Suffolk county. September.

Solidago, *L.* *Golden-rod.*
canadensis, *L.* Woods. August–September.
gigantea, *Ait.* Low grounds. August.
ciliaris, *Muhl.* Dry fields and woods. August.
rugosa, *Mill.* Woods and low grounds. August–September.
altissima, *L.* Low grounds. August–September.
nemoralis, *Ait.* S. puberula, *Nutt.?* Dry woods and fields. Aug.
patula, *Muhl.* Low grounds. September.
ulmifolia, *Muhl.* Low grounds. August–September.
arguta, *Ait.* Rocky banks. August.
odora, *Ait.* Mountain woods and thickets. August–September.
bicolor, *L.* Woods and thickets. August–September.
flexicaulis, *L.* Rocky woods. September.
Var. latifolia. S. latifolia, *L.* Rocky banks. September.
serotina, *L.* Rocky banks. September.
juncea, *Ait.* Swamps. September.
cæsia, *L.* Thickets. September.
squarrosa, *Muhl.*, *Nutt.* Rocky hills. August–September.
sempervirens, *L.* Borders of salt and brackish meadows. September–October.
virgaurea, *L.* var. alpina. Summit of Mount Marcy, Essex county. August.
rigida, *L.* Highlands of New-York. *Dr. Barratt.*
graminifolia, *Ell.* S. lanceolata, *Willd.* Low grounds. August.
tenuifolia, *Pursh.* Sandy soils. August–September.

Baccharis, *L.* ***Ploughman's Spikenard.***
halimifolia, *L.* Seacoast of Long Island. September–October.

Pluchea, *Cass.*
fœtida, *Torr. & Gr.*; not of *D. C.* P. marilandica and camphorata, *D. C.* Baccharis fœtida, *L.* Conyza marilandica, *Michx.*, *Ell.* Borders of salt marshes. August.

Inula, *L.*
§ helenium, *L.* ***Elecampane.*** Fields and road sides. July.

SILPHIUM, *L.*
ternatum, *Retz.* Near Niagara. *Dr. Eddy.*

POLYMNIA, *L.*
uvedalia, *L.* Rocky woods. July–August.
canadensis, *L.* Shady hill sides. June–July.

XANTHIUM, *L.* *Clot-weed, Cockle-bur.*
§ strumarium, *L.* Borders of fields, &c. August–September.
echinatum, *Murr.* X. macrocarpum, var. glabratum, *D. C.* X. orientale, *Linn. f.*, *Muhl.* X. maculatum, *Raf.* Sandy shores, near salt water. August.
§ spinosum, *L.* Road sides and waste places. September.

AMBROSIA, *L.* *Hog-weed.*
elatior, *L.* *Rag-weed, Bitter-weed.* Old fields. August–Sept.
trifida, *L.* Along fences, and in low grounds. August.

IVA, *L.* *False Jesuit's Bark.*
frutescens, *L.* *High-water Shrub.* Salt marshes. August.

HELIOPSIS, *Pers.*
lævis, *Pers.* Banks of streams. August.

RUDBECKIA, *L.*
laciniata, *L.* Moist thickets. July–August.

OBELISCARIA, *Cass.*
pinnata, *Cass.* Rudbeckia pinnata, *Vent.* Shore of Lake Erie. *Dr. Sartwell.*

COREOPSIS, *L.* *Tickseed Sunflower.*
trichosperma, *Michx.* Cedar swamps, Long Island. August.

ACTINOMERIS, *Nutt.*
alternifolia, *D. C.* A. squarrosa, *Nutt.* Coreopsis alternifolia, *L.* Borders of Crooked lake, Yates county. *Dr. Sartwell.*

HELIANTHUS, *L.* *Sunflower.*
divaricatus, *L.* Woods and hill sides. July–August.
frondosus, *L.* Woods. July and August.
decapetalus, *L.* Woods and thickets. August.
trachelifolius, *Willd.* Low grounds. August–September.
altissimus, *L.* Swamps. August.

Bidens, *L.* *Bur Marigold.*

connata, *L.* Swamps and low grounds. September.
frondosa, *L.* Along fences, &c. August–September.
cernua, *Willd.* B. petiolata, *Nutt.?* Swamps. August–Sept.
chrysanthemoides, *Michx.* Low grounds. August–September.
Beckii, *Torr.* Lakes and ponds near Schenectady, *Dr. Beck.* Western part of New-York, *Dr. Aikin* and *Dr. Gray.*
bipinnata, *L.* *Spanish Needles.* Fields and rocky hills. August–September.

Helenium, *L.*

autumnale, *L.* Swamps. August–September.

Maruta, *Cass.*

§ cotula, *Cass.* Anthemis cotula, *L.* *May-weed, Stinking Chamomile.* Road sides, &c. June–September.

Achillea, *L.* *Yarrow, Milfoil.*

§ millefolium, *L.* Fields, pastures, &c. June–August.

Leucanthemum, *Tourn.*

§ vulgare, *Lam.* Chrysanthemum leucanthemum, *L.* *Ox-eye Daisy.* Pastures, &c. June–August.

Artemisia, *L.* *Wormwood.*

§ vulgaris, *L.* *Mugwort.* Fields and road sides. September.
canadensis, *L.* *Wild Wormwood.* Sandy shores of Lake Erie. July–August. *Dr. Beck.*
caudata, *Michx.* Sandy seacoast of Long Island. September.

Tanacetum, *L.* *Tansey.*

§ vulgare, *L.* *Common Tansey.* Road sides, &c. July–Aug.

Gnaphalium, *L.*, *D. Don.* *Cudweed.*

decurrens, *Ives.* Fields and borders of woods. August.
polycephalum, *Michx.* *Life Everlasting, Balsam.* Old fields, &c. August–September.
uliginosum, *L.* Low grounds. July–August.
purpureum, *L.* Dry open woods. July. G. sylvaticum, *Pursh.* (not of *Linn.*), G. americanum, *Pursh.* (not of *Mill.*), and G. pennsylvanicum, *Willd.* seem not to be distinct from this species.

FILAGO, *Tourn.*
§? germanica, *L.* Gnaphalium germanicum, *Willd.* Old fields, Staten Island, &c. August–September.

ANTENNARIA, *R. Br.*
plantaginea, *R. Br.* Gnaphalium plantagineum, *L.* Dry woods and hills. April–May.
margaritacea, *R. Br.* Gnaphalium margaritaceum, *L.* Dry woods and hills. August.

ERECHTITES, *Raf.*
hieracifolia, *Raf.* Senecio hieracifolius, *Raf.* *Fire-weed.* Low grounds. August.

ARNICA, *L.*
montana, *L.* Sources of the Hudson, Essex county. August.

CACALIA, *L.*
suaveolens, *L.* In the State of New-York. *B. D. Greene, Esq.*
atriplicifolia, *L.* Near Geneseo.

SENECIO, *L.* *Groundsel.*
vulgaris, *L.* Road sides, &c. Long Island. August.
balsamitæ, *Willd.* Rocky banks of streams. June.
aureus, *L.* S. obovatus, *Muhl.* S. gracilis, *Ph.* Meadows, and along streams; sometimes on rocks. May–June.

CENTAUREA, *L.* *Knapweed.*
§ cyanus, *L.* *Bluebottle.* Cultivated grounds. July.

CNICUS, *Vaill.*
§ benedictus, *L.* *Blessed Thistle.* Road sides, &c. June.

CIRSIUM, *Tourn.* *Thistle.*
lanceolatum, *Scop.* Carduus lanceolatus, *L.* *Common Thistle.* Fields, road sides, &c. June–September.
altissimum, *Spreng.* Carduus altissimus, *L.* Old fields. August.
discolor, *Spreng.* Cnicus discolor, *Muhl.* Fields and thickets. August.
pumilum, *Spreng.* Carduus pumilus, *Nutt.* Cnicus odoratus, *Muhl.* Old fields. July.
muticum, *Michx.* Swamps. September.
§ arvense, *Scop.* Cnicus arvensis, *Hoff.* *Canada Thistle.* Fields and road sides. July–September.

LAPPA, *Tourn.*
§ major, *Gært.* Arctium lappa, var. *L.* A. lappa, *Willd.* *Common Burdock.* Old fields, &c. July–Sept.

CICHORIUM, *L.*
§ intybus, *L.* *Chicory, Wild Succory.* Fields, &c. August.

CYNTHIA, *D. Don.*
virginica, *Don.* Troximon virginicum, *Pursh.* Dry sandy soils. May–July.

KRIGIA, *Schreb.*
virginica, *Willd.* Woods and fields. May–June.

LACTUCA, *Tourn.* *Lettuce.*
elongata, *Muhl.* L. canadensis, *L.?* Thickets and borders of woods. July.
integrifolia, *Bigel.* Hill sides, &c. July.

TARAXACUM, *Hall.*
§ dens-leonis, *Desf.* Leontodon taraxacum, *L.* *Dandelion.* Pastures, road sides, &c. March–November.

SONCHUS, *L., Cass.* *Sow Thistle.*
§ oleraceus, *L.* Old fields and cultivated grounds. August–Sept.
§ palustris, *L.* New-York. *Muhlenberg.*

HIERACIUM, *L.* *Hawk-weed.*
venosum, *L.* H. Gronovii, *L.* in part. Dry open woods, &c. May–June.
Gronovii, *L.* in part.; *Michx.* *β.* Woods and meadows. August–September.
Var. marianum. H. marianum, *Willd.* Woods. August.
canadensis, *Michx.* H. virgatum and? fasciculatum, *Pursh.* H. Kalmii, *Torr. comp., Beck, &c.;* not of *Linn.* Highlands of New-York, and in the western parts of the State.
paniculatum, *L.* Dry woods. August.

NABALUS, *Cass.*
altissimus, *Hook.* N. alatus, *Hook.* Prenanthes altissima, L.
albus, *Hook.* Prenanthes alba, *L.* Dry woods, &c. August–September.

Nabalus, (continued.)

Var. 1. serpentaria. Prenanthes serpentaria, *Pursh*. Nabalus serpentarius, *Hook*. Fields and copses. August.

Var. 2. nanus. Prenanthes alba, var. nana, *Bigel*. Nabalus nanus and? N. Bootii, *D. C.* High mountains of Essex county. August.

Mulgedium, *Cass*.

floridanum, *D. C.* Sonchus floridanus, *L.* Rocky hills. August.

acuminatum, *D. C.* S. acuminatus, *Willd.* Woods. August.

Order LOBELIACEÆ.

Lobelia, *L.*

Dortmanna, *L.* *Water Gladiole*. Shallow water. Long Island, *Dr. Barratt*. West Point, *Prof. Bailey*. Northern part of the State, *Dr. Emmons*. August–September.

Kalmii, *L.* Wet rocks, &c. July–August.

Claytoniana, *Michx.* Woods and meadows. June.

siphilitica, *L.* Wet meadows and swamps. September.

Var. alba. Near Peekskill.

cardinalis, *L.* *Cardinal Flower*. Wet places. August–Sept.

inflata, *L.* *Indian Tobacco*. Fields, road sides, &c. August.

Order CAMPANULACEÆ. The Bell-Flower Tribe.

Campanula, *L.* *Bell Flower*.

rotundifolia, *L.* Rocky banks, and on mountains. June–August.

amplexicaulis, *Michx.* C. perfoliata, *L.* Fields, &c. June–July.

americana, *L.* C. acuminata, *Michx.* Moist shady places, western counties. July.

aparinoides, *Pursh*. C. erinoides, *Muhl.*; not of *Linn.* Swamps and wet thickets. June–July.

Order ERICACEÆ. The Heath Tribe.

Andromeda, *L.*

mariana, *L.* Sandy woods and fields. June–July.

polifolia, *L.* Sphagnous swamps. June.

racemosa, *L.* Wet thickets. June.

ANDROMEDA, (continued.)

paniculata, *L.* (in part.), *Willd. &c.* A. ligustrina, *Muhl.* Vaccinium ligustrinum, *L.* *Pepper-bush.* Moist woods and thickets. June.

calyculata, *L.* Swamps. April.

ARBUTUS, *L.* *Bear-berry.*

uva-ursi, *L.* Dry sandy soils. April–May.

GAUTIERA, (incorrectly written *Gaultheria* by most botanists.)

procumbens, *L.* *Partridge-berry.* Sandy woods. May–June.

CLETHRA, *L.* *Sweet-scented Pepper-bush.*

alnifolia, *L.* Swamps and wet thickets. August.

RHODODENDRON, *L.* *Rose-bay.*

maximum, *L.* *Great Laurel.* Swamps. June–July.

canadense. Rhodora canadensis, *L.* Mountain bogs. May.

nudiflorum, *Torr.* Azalea nudiflora, *L.* *Wild Honeysuckle.* Woods and thickets. April–May.

viscosum, *Torr.* Azalea viscosa, *L.* Woods and swamps. June.

hispidum, *Torr.* Azalea hispida, *Pursh.* Borders of mountain lakes, New-York. *Pursh.* I have not found this species.

KALMIA, *L.* *Laurel.*

latifolia, *L.* *Calico-bush, High Laurel.* Rocky hills. May–June.

angustifolia, *L.* *Dwarf Laurel, Sheep Laurel.* Low wet places. June.

glauca, *L.* Sphagnous swamps. April–May.

Var. rosmarinifolia, *Pursh.* Swamps near Albany, &c.

EPIGÆA, *L.* *Mountain Tea.*

repens, *L.* *Ground Laurel, Trailing Arbutus.* Sandy woods and hills. April.

LEDUM, *L.*

latifolium, *L.* *Labrador Tea.* Swamps. May–June.

SUB-ORDER VACCINEÆ.

VACCINIUM, *L.* *Whortleberry* or *Huckleberry.*

stamineum, *L.* *Deer-berry.* Dry woods. May–June.

dumosum, *Andr.* Sandy woods. June.
frondosum, *L.* *Blue Tangles.* Woods. June.
resinosum, *Ait.* Dry woods and rocky hills. May.
corymbosum, *L.* *Swamp* or *High Huckleberry.* Shady swamps. May.
pennsylvanicum, *Lam.* *Blue Huckleberry.* Rocky woods. May.
tenellum, *Ait.* *Dwarf Blue Huckleberry.* Dry woods. May.
uliginosum, *L.* Sources of the Hudson in the Adirondack mountains. July–August.

OXYCOCCUS, *Pers.* *Cranberry.*
macrocarpus, *Pursh.* *Common Cranberry.* Swamps. June.
vulgaris, *Pers.* Sphagnous swamps, northern and western counties. June.

LASIERPA, *Torr.*
hispidula, *Torr.* Vaccinium hispidulum, *L.* Gaultheria serpyllifolia, *Pursh.* Swamps. April–May. The fruit of this genus is incorrectly described in my Flora of the Northern States.

SUB-ORDER PYROLEÆ.

PYROLA, *L.* *Winter-green.*
rotundifolia, *L.* Woods.
chlorantha, *Swartz.* P. asarifolia, *Torr.*, *Beck;* not of *Michx.* Woods, northern and western counties. June–July.
elliptica, *Nutt.* *Shin-leaf.* Dry woods. July.
minor, *L.* Western part of New-York. *Pursh.* I have not found this species, and doubt whether it is a native of the State.
secunda, *L.* Dry woods. June–July.
uniflora, *L.* Woods, northern and western counties. June.
uliginosa, *Torr. & Gr.* Sphagnous swamps, Oneida county, and northern part of the State. *Dr. Gray* and *Dr. Kneiskern.*

CHIMAPHILA, *Pursh.*
umbellata, *Nutt.* *Pipsissawa.* Dry woods. June.
maculata, *Pursh.* Dry woods. June.

Sub-Order Monotropeæ.

Monotropa, *L.* *Bird's-nest.*
uniflora, *L.* *Indian Pipe.* Woods. June–July.

Hypopithys, *Dill.* *Pine-sap.*
lanuginosa, *Nutt.* Moist woods. July–August.

Pterospora, *Nutt.*
andromedea, *Nutt.* Clayey soils. Near Albany, *Dr. James, Eaton.* Seneca lake, *Dr. Gray.* Near Niagara Falls, *Whitlow.* Little Falls of the Mohawk, *Cooper.* Port Henry, Lake Champlain, *Prof. A. Hopkins.* Near Sacket's-Harbor, *Dr. Wood.* July.

Order EBENACEÆ. The Ebony Tribe.

Diospyros, *L.* *Persimmon.*
virginiana, *L.* Woods. May.

Order AQUIFOLIACEÆ. The Holly Tribe.

Ilex, *L.* *Holly.*
opaca, *Ait.* Sandy woods, Long Island. June.

Nemopanthes, *Raf.*
canadensis, *Raf.* Ilex canadensis, *Michx.* Mountains. May.

Prinos, *L.* *Winter-berry.*
verticillatus, *L.* Swamps. June–July.
lævigatus, *Pursh.* Cedar swamps. June.
glaber, *L.* *Ink-berry.* Swamps. July.

Order OLEACEÆ. The Olive Tribe.

Ligustrum, *L.* *Privet* or *Prim.*
§ **vulgare, *L.*** Woods and along fences. May–June.

Fraxinus, *L.* *Ash.*
sambucifolia, *Willd.* *Black Ash.* Wet woods and swamps. April.
acuminata, *Lam.* F. americana, *Michx. f.* Woods. May.

Order APOCYNACEÆ. The Dog-bane Tribe.

Apocynum, *L.* *Dog's-bane.*
androsæmifolium, *L.* Borders of woods, and along fences. June.
cannabinum, *L.* A. hypericifolium, *Ait.* A. pubescens, *R. Br.* Banks of streams, and on hill sides. July.

Order ASCLEPIADACEÆ. The Milkweed Tribe.

Asclepias, *L.* *Milkweed, Swallow-wort.*
syriaca, *L.* *Common Milkweed.* Fields, &c. June–July.
phytolaccoides, *L.* Rocky woods. June–July.
variegata, *L.* A. hybrida, *Michx.* Dry woods. June–July.
purpurascens, *L.* Borders of woods and thickets. July.
incarnata, *L.* Low grounds. July–August.
obtusifolia, *Michx.* Sandy woods and hill sides. June–July.
quadrifolia, *Jacq.* Rocky woods. June.
verticillata, *L.* Dry hills. July.
tuberosa, *L.* *Pleurisy-root, Butterfly-weed.* Sandy fields. July–August.

Acerates, *Ell.*
viridiflora, *Ell.* Asclepias viridiflora, *Raf.* Sandy fields. July.

Periploca, *L.*
græca, *L.* Western part of the State, indigenous or naturalized, *Nuttall.* Near Rochester, *Dr. Bradley.* I have never found this plant, nor have I received it from any part of the United States.

Order GENTIANACEÆ. The Gentian Tribe.

Gentiana, *L.* *Gentian.*
saponaria, *L.* *Soap Gentian.* Borders of swamps. September.
Var.? linearis, *Griseb.* G. pneumonanthe, *Michx.*, *Bigel.*; not of *Linn.* Wet grassy places. Sources of the Hudson, Essex county, August 7th. This is probably a distinct species.
quinqueflora, *Lam.* Woods. August.
crinita, *Frœl.* Rocky open woods. September.

HALENIA, *Borkh.*
deflexa, *Griesb.* Swertia deflexa, *Smith.* Northern part of the State. *Prof. Hadley.*

FRASERA, *Walt.*
carolinensis, *Walt.* *American Columbo.* Swamps. Western part of the State. *Prof. Hadley.*

SABBATIA, *Adans.*
stellaris, *Pursh.* Salt marshes. August.
angularis, *Pursh.* *Centaury.* Meadows and old fields. July–August.
chloroides, *Pursh.* Salt marshes. August.

ERYTHRÆA, *Rich.*
Muhlenbergii, *Griseb.* E. centaurium, *Beck*, not of *Pers.* Open woods and fields, Rockland county. July. Near Oswego, *Dr. Aikin.*
ramosissima, *Pers.?* Borders of salt marshes, Long Island. July.

CENTAURELLA, *Michx.*
autumnalis, *Pursh.* Dry meadows, &c. August.

LIMNANTHEMUM, *Gmel.*
lacunosum, *Griseb.* Villarsia cordata, *Ell.* In water. August.

MENYANTHES, *L.*
trifoliata, *L.* *Buckbean.* Marshes. May.

ORDER BIGNONIACEÆ. THE TRUMPET-FLOWER TRIBE.

CATALPA, *Juss.* *Bean Tree.*
cordifolia, *Duham.* Planted about habitations: not indigenous in any part of the State. July.

ORDER PEDALIACEÆ. THE OIL-SEED TRIBE.

MARTYNIA, *L.*
§ proboscidea, *L.* *Unicorn Plant.* Cultivated grounds, &c. August.

Order POLEMONIACEÆ. The Greek-Valerian Tribe.

Phlox, *L.*
divaricata, *L.* Dry woods and rocky banks. May.
subulata, *L.* *Mountain Pink.* Rocky hills. May.

Polemonium, *L.* *Greek Valerian, Jacob's Ladder.*
reptans, *L.* Cattaraugus county. *Dr. Bradley.*

Order CONVOLVULACEÆ. The Bindweed Tribe.

Convolvulus, *L.* *Bind-weed.*
§ arvensis, *L.* Near Fort Ticonderoga, Lake Champlain, *Mr.* ———. Near Albany, *Dr. Beck.*
sepium, *L.* Moist thickets. June–July.
spithamæus, *L.* Dry woods and fields. June.
panduratus, *L.* *Wild Potato-vine, Mechoacanna, Man-of-the-earth.* Borders of woods and hill sides. July–August.

Cuscuta, *L.* *Dodder.*
americana, *L.* Low grounds. August.
§ epilinum, *Weihe.* C. europæa, *Beck, Darlington, &c.;* not of *Linn.* *Flax Dodder.* Parasitic on flax. June.

Order BORAGINACEÆ. The Borage Tribe.

Lithospermum, *L.* *Gromwell.*
§ arvense, *L.* *Corn Gromwell.* Cultivated grounds, pastures, &c. May.
latifolium, *Michx.* Sandy fields and river banks. May. L. denticulatum, *Lehm.* is said to grow in the State of New-York, but I have never received specimens of the plant from any part of the United States.

Batschia, *Gmel.*
canescens, *Michx.* *Puccoon.* Northern part of the State, *Prof. Hadley.* June.

Onosmodium, *Michx.*
hispidum, *Michx.* Dry hills. July.

SYMPHYTUM, *L.* *Comfrey.*
§ officinale, *L.* Cultivated grounds. June.

LYCOPSIS, *L.* *Small Bugloss.*
§ arvensis, *L.* Sandy fields. June–July.

MYOSOTIS, *L.* *Scorpion Grass.*
palustris, *Roth.* Ditches and wet grounds. May–July.
arvensis, *Sibth.* Sandy woods. May–June.

ECHINOSPERMUM, *Lehm.*
§ lappula, *Lehm.* Road sides and fields. July.
virginicum, *Lehm.* Borders of woods and thickets. July.

CYNOGLOSSUM, *L.* *Hound's-tongue.*
officinale, *L.* Road sides, &c. May–June.
virginicum. *L.* Woods, in rich soil. May–June.

PULMONARIA, *L.* *Lungwort.*
virginica, *L.* Sandy alluvial soil, western counties. May.

ECHIUM, *L.* *Viper's Bugloss.*
§ vulgare, *L.* *Blue Thistle.* Fields and hill sides. June.

ORDER HYDROPHYLLACEÆ.

HYDROPHYLLUM, *L.*
virginicum, *L.* Moist shady places. June.
canadense, *L.* Woods. June.

ORDER LABIATÆ. THE MINT TRIBE.

LYCOPUS, *L.* *Water Horehound.*
sinuatus, *Ell.*, *Benth.* L. europæus, *Pursh* and others, not of *Linn.* L. americanus, *Muhl.* Overflowed places. August.
virginicus, *L.* *Bugle-weed.* Low wet places and woods. July–August.

MENTHA, *L.* *Mint.*
§ viridis, *L.* *Spearmint.* Moist grounds. July–August.
§ piperita, *L.* *Peppermint.* Moist grounds. August.
canadensis, *L.* M. borealis, *Michx.* Wet thickets and meadows. August.

ISANTHUS, *Michx.*
cæruleus, *Michx.* Sandy banks of rivers. July–August.

MONARDA, *L.* *Horse-mint.*
fistulosa, *L.*, *Benth.* M. allophylla, *Michx.* M. clinopodia, *L.* M. oblongata and rugosa, *Ait.* Rocky banks and thickets. July.
didyma, *L.* M. Kalmiana, *Pursh.* *Oswego Tea.* Wet thickets. August.
punctata, *L.* Dry sandy fields. September.

BLEPHILIA, *Raf.*
hirsuta, *Raf.*, *Benth.* Monarda hirsuta, *Pursh.* Wet woods. August.

PYCNANTHEMUM, *Michx.*
incanum, *Michx.* Rocky woods. July–August.
Torrei, *Benth.* Rocky hill sides, Rockland county. August.
lanceolatum, *Pursh*, *Benth.* Blephilia verticillatum, *Michx.* B. lanceolatum, *Willd.* Thickets and rocky hills. July–August.
linifolium, *Pursh.* Moist thickets and exsiccated swamps. July.

ORIGANUM, *L.* *Marjoram.*
§ vulgare, *L.* *Wild Marjoram.* Rocky banks. July–August.

COLLINSONIA, *L.* *Horse Balm.*
canadensis, *L.* *Knot-root.* Rocky shady soils. July–August.

CUNILA, *L.*
mariana, *L.* *Dittany.* Rocky hills. August–September.

HEDEOMA, *Pers.*
pulegioides, *Pers.* *Pennyroyal.* Dry sterile soils. August.

MICROMERIA, *Benth.*
Nuttallii, *Torr. & Gr.* M. glabella, *Benth.*, *Lab. p.* 371, *excl. syn. Michx.* Hedeoma glabella, *Nutt. excl. syn.* Wet rocks, Niagara Falls. August.

MELISSA, *L.* *Balm.*
§ clinopodium, *Benth.* Clinopodium vulgare, *L.* *Wild Basil.* Rocky banks. July–August.
§ officinalis, *L.* *Common Balm.* Road sides, &c. August.

PRUNELLA, *L.* *Heal-all.*
§? vulgaris, *L.* Open woods, &c. July–September.

SCUTELLARIA, *L.* *Scullcap.*
pilosa, *Michx.* Dry open woods and thickets. June–August.
integrifolia, *L.* Moist thickets. June–July.
galericulata, *L.* Borders of swamps. August.
lateriflora, *L.* *Mad-dog Scullcap.* Low wet grounds. August.
parvula, *Michx.* Shores of Lakes Erie and Ontario. *Dr. Gray.*

LOPHANTHUS, *Benth.*
nepetoides, *Benth.* Hyssopus nepetoides, *L.* Thickets and along fences. July–August.
Var. scrophularifolius. L. scrophularifolius, *Benth.* Hyssopus scrophularifolius, *Willd.* With the preceding.

NEPETA, *L.* *Catnep.*
§ cataria, *L.* *Common Catnep.* Road sides, &c. July–August.
§ glechoma, *Benth.* Glechoma hederacea. *Ground Ivy, Gill.* Road sides, and shady grassy places. May–June.

DRACOCEPHALUM, *L.*
parviflorum, *Nutt.* Barren fields and woods, Jefferson county, *Dr. Crawe, Dr. Gray.* Rocky banks of small lakes, St. Lawrence county. June–August.

PHYSOSTEGIA, *Benth.*
virginiana, *Benth.* Dracocephalum virginianum, *L.* Banks of rivers; western counties. July.

LAMIUM, *L.* *Dead Nettle.*
§ amplexicaule, *L.* Cultivated grounds and fields. April–May.

LEONURUS, *L.* *Motherwort.*
§ cardiaca, *L.* Rubbish and waste places. June.

STACHYS, *L.* *Hedge Nettle.*
palustris, *L.* Low damp grounds. July–August.
aspera, *Michx.* Wet thickets, along rivers. July–August.
hyssopifolia, *Michx.* Wet meadows, Long Island. July.

GALEOPSIS, *L.* *Hemp Nettle.*
§ tetrahit, *L.* Waste places, road sides, &c. July–August.
§ ladanum, *L.* Old fields, northern counties. July.

MARRUBIUM, *L.* *Horehound.*
§ vulgare, *L.* Rocky banks, fields, &c. July–August.

TRICHOSTEMA, *L.*
dichotomum, *L.* Sandy fields. August.

TEUCRIUM, *L.* *Germander.*
canadense, *L.* T. virginicum, *L.* Low grounds. July.

ORDER SOLANACEÆ. THE NIGHTSHADE TRIBE.

SOLANUM, *L.* *Nightshade.*
§ dulcamara, *L.* *Bittersweet.* Road sides and fields. July–Aug.
§ nigrum, *L.* Old fields and waste places. July–August.
carolinianum, *L.* Borders of woods, Long Island. July.

PHYSALIS, *L.* *Winter Cherry.*
viscosa, *L.*, *Aikin.* Road sides, fields, &c. July. I fully agree with Dr. Aikin in his view of this species as given in Eaton's Manual, Ed. 7, p. 436.

NICANDRA, *Adans.*
§ physaloides, *Pers.* Cultivated grounds. July–September.

NICOTIANA, *L.*
§ rustica, *L.* Naturalized in the western part of the State. *Nuttall.*

DATURA, *L.* *Thorn Apple, Jamestown Weed.*
§ stramonium, *L.* Waste grounds. July–September.
Var. tatula. D. tatula, *L.* With the preceding.

HYOSCYAMUS, *L.* *Henbane.*
§ niger, *L.* Road sides, &c. June.

ORDER SCROPHULARIACEÆ. THE FIGWORT TRIBE.

VERBASCUM, *L.* *Mullein.*
§ thapsus, *L.* *Common Mullein.* Old fields, road sides, &c. June.
blattaria, *L.* Road sides, &c. June–July.
§ lychnitis, *L.* Old fields, near Oneida lake. June–July.
Var. hybrida. Intermediate between this species and V. thapsus. With the preceding.

VERONICA, *L.* *Speedwell.*
§ serpyllifolia, *L.* Meadows and pastures. May–August.
scutellata, *L.* Wet meadows and swamps. May–June.
anagallis, *L.* *Water Speedwell.* Ditches. June–August.
beccabunga, *L.* *Brooklime.* Wet places. June.
§ officinalis, *L.* *Common Speedwell.* Dry woods. June.
peregrina, *L.* *Neck-weed.* Cultivated grounds. May.
§ arvensis, *L.* Dry banks and fields. May.
§ hederifolia, *L.* Near Brooklyn, Long Island. April.
virginica, *L.* Leptandra virginica, *Nutt.* Borders of woods, &c. July.

BUCHNERA, *L.*
americana, *L.* Sandy soils, western counties. July.

SCROPHULARIA, *L.* *Figwort.*
marilandica, *L.* S. lanceolata, *Pursh.* Dry woods, and along fences. July–August.

LINARIA, *Tourn.* *Toad Flax.*
§ vulgaris, *Ait.* Antirrhinum linaria, *L.* *Continental Weed, Ransted Weed.* Road sides and fields. June–Oct.
canadensis, *Spreng.* Antirrhinum canadense, *L.* Sandy soils, wet or dry. June–July.
§ elatine, *Desf.* Antirrhinum elatine, *L.* Shore of Cayuga lake. *Dr. Gray.*

MIMULUS, *L.* *Monkey Flower.*
ringens, *L.* Wet grounds. August.
alatus, *L.* Low grounds, along rivers, &c. August.

GRATIOLA, *L.* *Hedge Hyssop.*
virginica, *L.* Overflowed places. July–August.
aurea, *Muhl.* Sandy swamps, Long Island.

LINDERNIA, *L.*
dilatata, *Muhl.* Low wet places. July–August.
attenuata, *Muhl.* With the preceding.

CHELONE, *L.* *Snake-head.*
glabra, *L.* Margin of swamps. August–September.

PENTSTEMON, *L'Her.*
pubescens, *Ait.* Hill sides. June.

Collinsia, *Nutt.*
verna, *Nutt.* Rich alluvial soil. Near Utica, May, *Dr. Gray.* Ithaca, *Dr. Aikin.*

Limosella, *L.* *Mudwort.*
subulata, *Ives.* Muddy banks of rivers. West Point, *Prof. Bailey.*

Gerardia, *L.*
purpurea, *L.* Borders of swamps. August–September.
maritima, *Raf.* Salt marshes. August–September.
tenuifolia, *Vahl.* Dry woods. August.
flava, *L.* Woods. July–August.
quercifolia, *Pursh.* Woods. August.
pedicularia, *L.* Dry hills and sandy woods. August.

Pedicularis, *L.* *Lousewort.*
lanceolata, *Michx.* P. pallida, *Pursh.* Swamps near New-York. September.
canadensis, *L.* P. gladiata, *Michx.* Borders of woods. June.

Castilleja, *Mutis.*
coccinea, *Spreng.* Euchroma coccinea, *Nutt.* Wet meadows. May.

Melampyrum. *L.* *Cow Wheat.*
americanum, *Michx.* Woods. June–July.

Order OROBANCHACEÆ. The Broom-Rape Tribe.

Orobanche. *L.* *Broom Rape.*
americana, *L.* *Caveer-root.* Woods. July.
uniflora, *L.* Woods. May–June.

Epiphegus, *Nutt.* *Beech-drops.*
americanus, *Nutt.* Under the shade of beech trees. September.

Order VERBENACEÆ. The Vervain Tribe.

Verbena, *L.* *Vervain.*
hastata, *L.* Low grounds. July–August.
spuria, *L.* Sandy fields and waste places. August.
urticifolia, *L.* Road sides. July.
angustifolia, *Michx.* Sandy woods and river banks. August.

Phryma, *L.* *Lopseed.*
leptostachya, *L.* Borders of woods. July.

Order ACANTHACEÆ. The Justicia Tribe.

Justicia, *L.*
americana, *Vahl.* In water; western counties. July–August.

Order LENTIBULACEÆ.

Utricularia, *L.* *Bladder-wort.*
inflata, *Walt.* U. ceratophylla, *Michx.* Ponds, Long Island. July.
vulgaris, *L.* Ponds and slow streams. August.
intermedia, *Hayne.* Swamps, Jefferson county. June–July. *Dr. Gray.*
minor, *Willd.* With the preceding, *Dr. Gray.* Near Albany, *Dr. Beck.*
cornuta, *Michx.* Swamps. August.

Pinguicula, *Butter-wort.*
vulgaris, *L.* Wet rocks, Genesee Falls. May. *Prof. Hadley.*

Order PRIMULACEÆ. The Primrose Tribe.

Primula, *L.* *Primrose.*
mistassinica, *Michx.* Yates county. *Dr. Sartwell.*

Trientalis, *L.* *Chickweed, Wintergreen.*
americana, *Pursh.* Wet woods and swamps. May.

Hottonia, *L.* *Water Feather.*
inflata, *Ell.* Stagnant water, Westchester county. *Beck.*

Lysimachia, *L.* *Loosestrife.*
stricta, *Ait.* Low grounds. July.
quadrifolia, *L.* Borders of woods, &c. June–July.
ciliata, *L.* Borders of woods and streams. June–July.
thyrsiflora, *L.* Marshes. June.
revoluta, *Nutt.* Wet rocks, Niagara Falls. August.

Anagallis, *L.* *Pimpernel.*
§ arvensis, *L.* *Red Chickweed.* Road sides and fields. June–September.

SAMOLUS, *L.* *Water Pimpernel.*
valerandi, *L.* Wet grounds. July–September.

ORDER PLUMBAGINACEÆ. THE LEADWORT TRIBE.

STATICE, *L.* *Marsh Rosemary.*
limonium, *L.* Borders of salt marshes. August–October.

ORDER PLANTAGINEÆ. THE PLANTAIN TRIBE.

PLANTAGO, *L.* *Plantain.*
cordata, *Lam.* Banks of streams, near New-York and Fishkill. June.
§ major, *L.* *Common Plantain.* Fields, road sides, &c. June–September.
virginica, *L.* Sterile fields and dry hills. May–June.
§ lanceolata, *L.* *Narrow-leaved Plantain, Ripple Grass.* Fields and meadows. May–August.
maritima, *L.* Salt marshes. August–September.
pusilla, *Nutt.* Arid hills, Island of New-York. May. Is this a dwarf form of P. sparsiflora, *Michx.?*

ORDER AMARANTHACEÆ. THE AMARANTH TRIBE.

AMARANTHUS, *L.*
§ albus, *L.* Cultivated grounds. August.
§ hybridus, *L.* Gardens and waste grounds. August.
§ retroflexus, *L.* Waste grounds and cultivated fields. August.
pumilus, *Nutt.* Sandy coast of Long Island. August.

ORDER CHENOPODIACEÆ. THE GOOSEFOOT TRIBE.

CHENOPODIUM, *L.* *Goosefoot.*
§ ambrosioides, *L.* Road sides. August–September.
§ album, *L.* Cultivated grounds, and about houses. July–Sept.
§ anthelminticum, *L.* *Wormseed.* Road sides. August–Sept.
§ botrys, *L.* *Jerusalem Oak.* Road sides. August.
§ hybridum, *L.* Fields and waste grounds. August.
§ rubrum, *L.?* Western part of the State. August.

SHOBERIA, *C. A. Meyer.*
maritima, *C. A. Meyer.* Chenopodium maritimum, *L.* Salt marshes. August–September.

Atriplex, *L.* *Orach.*
laciniata, *L.* Borders of salt marshes. August.
arenaria, *Nutt.* Sea beach of Long Island. August–September.

Acnida, *L.* *Water Hemp.*
cannabina, *L.* Borders of salt marshes. July–August. A. ruscocarpa, *Michx.* seems to be scarcely distinct from this.

Salicornia, *L.* *Glasswort.*
herbacea, *L.* Salt marshes. August–September.

Salsola, *L.* *Saltwort.*
soda, *L.* S. caroliniana, *Michx.* Sandy shores about New-York, and on the seacoast of Long Island. Near West Point, *Prof. Bailey.* August–September.

Blitum, *L.*
§? capitatum, *L.* *Strawberry Blite.* Banks of rivulets. June.
maritimum, *Nutt.* Salt marshes near New-York. Atriplex?

Order PHYTOLACCACEÆ. The Pokeweed Tribe.

Phytolacca, *L.* *Poke*, or *Pokeweed.*
decandra, *L.* Hill sides, borders of fields, &c. June–October.

Order POLYGONACEÆ. The Buckwheat Tribe.

Polygonum, *L.* *Knot-weed.*
§ aviculare, *L.* About houses, road sides, &c. June–October.
Var. glaucum. P. glaucum, *Nutt.* Seacoast. August–Sept.
§ erectum, *L.* Road sides, waste places, &c. August–Sept.
tenue, *Michx.* Rocky hills and dry banks. July–August.
virginianum, *L.* Rocky woods in rich soil. July–August.
hydropiper, *L.* P. hydropiperoides, *Pursh.* *Water Pepper.* Low wet grounds. August.
mite, *Pers.* P. hydropiperoides, *Michx.* Swamps. August–September.
§ persicaria, *L.* *Lady's Thumb.* Waste places, and gardens. July–September.
amphibium, *L.*
Var. 1. natans, *Michx.* Floating in ponds. August.

Polygonum, (continued.)

Var. 2. emersum, *Michx.* P. coccineum, *Willd.* Margin of ponds and rivers. August–September.

Var. 3. strigosum. Head of Seneca lake. *Dr. Gray.*

Var. 4. acuminatum. Cayuga lake. *Dr. Aikin.*

pennsylvanicum, *L.* Borders of fields, wet thickets, &c. July–August.

§ orientale, *L.* *Prince's Feather.* Cultivated grounds. July–September.

sagittatum, *L.* Wet thickets. August.

arifolium, *L.* Wet thickets and river banks. August.

scandens, *L.* *Climbing Buckwheat.* Shady thickets, &c. Aug.

§ convolvulus, *L.* *Black Bindweed.* Cultivated grounds. July.

§ fagopyrum, *L.* *Buckwheat.* Fields. Scarcely naturalized. September.

cilinode, *Michx.* Rocky thickets, northern counties. July.

Rumex, *L.* *Dock.*

§ crispus, *L.* *Curled Dock.* Fields. June–July.

§ obtusifolius, *L.* Fields and borders of woods. June–July.

verticillatus, *L.* Swamps. June–July.

britannica, *L.* *Yellow-rooted Water Dock.* Swamps. June–July.

§ acetosella, *L.* *Sheep Sorrel.* Fields and road sides. May–July.

Order LAURACEÆ. The Cinnamon Tribe.

Laurus, *L.*

benzoin, *L.* *Wild Allspice, Fever Bush, Benjamin Tree.* Swamps. April.

sassafras, *L.* *Common Sassafras.* Woods. April.

Order ELEAGNACEÆ. The Oleaster Tribe.

Shepherdia, *Nutt.*

canadensis, *Nutt.* Rocky banks of streams and lakes, northern and western counties. May.

Order THYMELACEÆ. The Mezereum Tribe.

Dirca, *L.* *Leather-wood.*
palustris, *L.* Woods, near streams. April.

Order SANTALACEÆ. The Sanders-Wood Tribe.

Nyssa, *L.*
multiflora, *Walt.* N. sylvatica, *Michx. sylv.* N. villosa, *Willd.* *Black Gum.* Woods. May–June.

Comandra, *Nutt.*
umbellata, *Nutt.* *Bastard Toad-flax.* Rocky hills. June.

Order ARISTOLOCHIACEÆ. The Birthwort Tribe.

Aristolochia, *L.*
serpentaria, *L.* *Virginia Snake-root.* Shady woods. June.

Asarum, *L.*
canadense, *L.* *Wild Ginger, Coltsfoot.* Rocky woods. May.

Order EMPETRACEÆ. The Crowberry Tribe.

Empetrum, *L.* *Crowberry.*
nigrum, *L.* Summit of Mount Marcy and Mount McIntyre. July. Found also on Whiteface Mountain, by *Dr. Emmons* and *Prof. Hall.*

Order EUPHORBIACEÆ. The Euphorbium Tribe.

Acalypha, *L.* *Three-seeded Mercury.*
virginica, *L.* Fields and road sides. June–August.

Euphorbia, *L.* *Spurge.*
hypericifolia, *L.* E. maculata, *Michx.* Road sides and sandy fields. July–September.
maculata, *L.* E. depressa, *Torr. in Ell. sk.* Cultivated grounds and sandy fields. July–September.
polygonifolia, *L.* E. maritima, *Nutt.* Seacoast. August.
obtusata, *Pursh.* Sandy fields and river banks. July–August.

Order URTICACEÆ. The Nettle Tribe.

Urtica, *L.* *Nettle.*
pumila, *L.* Wet grounds. July–August.
§ dioica, *L.* *Stinging Nettle.* Waste grounds, road sides, &c. July.
canadensis, *L.* U. divaricata, *L.* Shady rocky places, along streams. July–August.

Bœhmeria, *Willd.*
cylindrica, *Willd.* Moist shady woods and thickets. July–Aug.

Parietaria, *L.* *Pellitory.*
pennsylvanica, *Muhl.* Shady rocky hill sides. July.

Cannabis, *L.* *Hemp.*
§ sativa, *L.* Fields, and along fences. June–July.

Humulus, *L.* *Hop.*
§ lupulus, *L.* Borders of woods and rivers. August.

Morus, *L.* *Mulberry.*
rubra, *L.* *Red Mulberry.* Woods. May.
§ alba, *L.* *White Mulberry.* About houses: naturalized in some places. May.

Order SAURURACEÆ.

Saururus, *L.* *Lizard's-tail.*
cernuus, *L.* Swamps and borders of streams. July.

Order PODOSTEMACEÆ.

Podostemum, *Michx.*
ceratophyllum, *Michx.* Lacis ceratophylla, *Bong.* On stones in Black river. *Dr. Crawe.*

Order AMENTACEÆ.

Sub-Order Cupuliferæ. The Nut Tribe.

Carpinus, *L.* *Hornbeam.*
americana, *Michx.* Rocky woods. April.

Ostrya, *Scop. Hop Hornbeam.*
virginica, *Willd. Iron-wood.* Rocky woods. April–May.

Corylus, *L. Hazel-nut.*
americana, *Walt. Wild Filbert.* Thickets, &c. April.
rostrata, *Ait.* Mountain woods. April.

Fagus, *L. Beech.*
sylvatica, *L.* F. sylvestris, *Michx. f. sylv. Common Beech, White Beech.* Woods, in fertile soil. May.

Castanea, *Gært. Chestnut.*
vesca, var. americana, *Michx. Chestnut.* Woods. June.
pumila, *Michx. Chinquapin.* Woods, Long Island. *Mr. W. R. Prince.*

Quercus, *L. Oak.*
tinctoria, *Bartr. Black Oak, Quercitron.* Woods. May.
rubra, *L. Red Oak.* Dry hilly woods. May.
palustris, *Michx. Water* or *Pin Oak.* Borders of swamps.
ilicifolia, *Willd.* Q. banisteri, *Michx. Barren Scrub Oak.* Sandy woods, and on mountains. May.
stellata, *Willd.* Q. obtusiloba, *Michx. Post Oak.* Sandy woods, Long Island.
olivæformis, *Michx. f. sylv.* Banks of the Hudson, near Albany. This has not been found by any other botanist than the younger Michaux.
alba, *L. White Oak.* Woods.
bicolor, *Willd. Swamp White Oak.* Borders of swamps.
montana, *Willd. Rock Chestnut Oak.* Rocky woods, along rivers.
prinoides, *Willd.* Q. chinquapin, *Michx. f. Dwarf Chestnut Oak.* Sandy woods.
coccinea, *Wang. Scarlet Oak.* Woods.

Sub-Order Betuleæ. The Birch Tribe.

Betula, *L. Birch.*
populifolia, *Ait. White Birch.* Rocky and sandy woods.
papyracea, *Ait. Canoe Birch.* Forests in the north part of the State.

Betula, (continued.)

lenta, *L.* B. carpinifolia, *Michx.* *Cherry Birch, Sweet Birch.* Woods.

excelsa, *Ait.* B. lutea, *Michx. f. sylv.* *Yellow Birch.* Woods, and borders of swamps.

nana, *L.* *Dwarf Birch.* High mountains of Essex county.

Alnus, *Willd.* *Alder.*

serrulata, *Willd.* *Common Alder.* Swamps and wet thickets. March.

incana, *Willd.?* Sources of the Hudson, Essex county.

Sub-Order Salicineæ. The Willow Tribe.

Salix, *L.* *Willow.*

§ viminalis, *L.* *Osier, Basket Willow.* Banks of streams. April.
Muhlenbergiana, *Willd.* Dry woods and sandy thickets. April.
tristis, *Muhl.* Dry woods. April–May.
pedicellaris, *Pursh.* Swamps, usually on mountains. May.
conifera, *Wang.* S. eriocephala, *Michx.?* Wet thickets. April.
myricoides, *Muhl.* Swamps. April.
prinoides, *Pursh.* Swamps. April. Distinct from the preceding?
discolor, *Willd.* Low grounds. April.
longifolia, *Muhl.* River banks. May.
§ babylonica, *L.* *Weeping Willow.* About houses. April.
nigra, *Marsh.* Banks of streams. May.
longirostris, *Michx.* Wet thickets and woods. April.
rigida, *Muhl.* Borders of swamps. April.
lucida, *Muhl.* With the preceding. April.
cordata, *Muhl.* Low wet grounds. April.
grisea, *Willd.* Low grounds. April.
§ vitellina, *L.* About houses, and along brooks. April.
uva-ursi. *Pursh?* Mount Marcy. July. Whiteface Mountain, *Dr. Emmons.*

I have several other undetermined species of Willow, collected in this State.

Populus, *L.* *Poplar.*

balsamifera, *Michx.* *Balsam Poplar, Tacamahac.* Shores of Lake Champlain. *Michx. f.*

§ candicans, *Ait.* About houses. April.

Populus, (continued.)

tremuloides, *Michx.* *American Aspen.* Dry woods. April.
tremula, *L.* P. grandidenta, *Michx.* *Large Aspen.* Woods.
lævigata, *Ait.* P. canadensis, *Michx. f.* *Cotton-wood.* Western part of New-York. *Michaux.*
nigra, *Michx.* P. hudsonica, *Michx. sylv.* P. betulifolia, *Pursh.* *Black Poplar.* Banks of the Hudson above Albany, *Michx. fil.* Borders of Oneida lake.

Sub-Order Myriceæ. The Gale Tribe.

Myrica, *L.*

gale, *L.* *Sweet Gale.* Borders of lakes, generally in mountainous tracts. May.
cerifera, *L.* *Bayberry, Wax Myrtle.* Woods and thickets. May.

Comptonia, *Banks.*

asplenifolia, *Ait.* *Sweet Fern.* Dry woods. April–May.

Sub-Order Plataneæ. The Plane Tribe.

Platanus, *L.* *Plane Tree.*

occidentalis, *L.* *Button-wood, Sycamore.* Banks of rivers. May.

Sub-Order Styracifluеæ.

Liquidambar, *L.* *Sweet Gum Tree.*

styraciflua, *L.* *Bilested.* Woods. April.

Order ULMACEÆ. The Elm Tribe.

Ulmus, *L.* *Elm.*

americana, *L.* *White Elm.* Low woods. April–May.
fulva, *Michx.* U. rubra, *Michx. f. sylv.* *Slippery Elm, Red Elm.* Rocky banks of rivers. April.
racemosa, *Thomas.* Western counties, *Mr. Thomas, Dr. Kneiskern.*

Celtis, *L.* *Hackberry.*

occidentalis, *L.* *Hoop Ash, Beaver-wood.* Woods. May.

ORDER JUGLANDACEÆ. THE WALNUT TRIBE.

JUGLANS, *L.* *Walnut.*
nigra, *L.* *Black Walnut.* Woods. May.
cinerea, *L.* *Butternut.* Woods. May.

CARYA, *Nutt.* *Hickory.*
sulcata, *Nutt.* Juglans laciniosa, *Michx. sylv.* *Thick Shell-bark Hickory.* Fertile woods.
alba, *Nutt.* Juglans squamosa, *Michx. sylv.* *Shell-bark Hickory, Kiskytom.* Fertile woods.
tomentosa, *Nutt.* *Common Hickory, Mochee-nut.* Woods.
amara, *Nutt.* *Bitter-nut.* Dry woods. May.
porcina, *Nutt.* *Pig-nut, Broom Hickory.* Dry fertile woods.

CLASS II. GYMNOSPERMS.

ORDER CONIFERÆ. THE FIR TRIBE.

PINUS, *L.* *Pine.*
resinosa, *Ait.* P. rubra, *Michx. f. sylv.* *Red Pine.* Heldeberg mountain. *Beck.*
rigida, *L.* *Pitch Pine.* Woods, in poor soil.
strobus, *L.* *White Pine, Weymouth Pine.* Fertile soils, and swamps.
variabilis, *Lamb.* P. mitis, *Michx.* *Yellow Pine.* Banks of the Hudson, a little below Albany. *Michx. fil.*

ABIES, *Juss.* (ABIES and LARIX, *Tourn.*)
nigra, *Michx. f. sylv.* A. denticulata, *Michx. fl.* Pinus nigra, *Ait.* *Black* or *Double Spruce.* Wet rocky soils and swamps. The Red Spruce, Pinus rubra, *Lamb.* appears to be only a variety of this species.
alba, *Michx.* Pinus alba, *Ait.* *White* or *Single Spruce.* Rocky damp soils and swamps.
balsamea, *Mill.* A. balsamifera, *Michx.* Pinus balsamea, *Ait.* Mountains. Not found south of Catskill.
canadensis, *Michx.* Pinus canadensis, *L.* *Hemlock Spruce.* Rocky woods, and along mountain ravines.
pendula. Pinus pendula, *Ait.* Larix americana, *Michx.* *American Larch, Tamarack, Hackmatack.* Swamps.

THUYA, *L.* *Arbor Vitæ.*
occidentalis, *L.* Rocky hills, along rivers. May.

CUPRESSUS, *L.* *Cypress.*
thuyoides, *L.* *White Cedar.* Swamps, Long Island. May.

JUNIPERUS, *L.* *Juniper.*
virginiana, *L.* *Red Cedar.* Rocky banks and dry hills. Sir W. Hooker considers this species as identical with J. sabina. May.
communis, *L.* *Common Juniper.* Dry rocky woods. May.

SUB-ORDER TAXINEÆ.

TAXUS, *L.* *Yew.*
canadensis, *L.* *American Yew, Running* or *Ground Hemlock.* Moist rocky places. April.

CLASS III. ENDOGENS, OR MONOCOTYLEDONS.

ORDER AMARYLLIDACEÆ. THE NARCISSUS TRIBE.

HYPOXIS, *L.* *Star Grass.*
erecta, *L.* Woods. May–July.

ORDER IRIDACEÆ. THE IRIS TRIBE.

SISYRINCHIUM, *L.* *Blue-eyed Grass.*
anceps, *L.* Meadows. July.
Var. mucronatum. S. mucronatum, *Michx.* Sandy woods, Long Island, &c.

IRIS, *L.*
versicolor, *L.* I. virginica, *Pursh.* *Blue Flag.* Wet grounds. June–July.
virginica, *L.* I. prismatica, *Pursh.* I. gracilis, *Bigel.* Margins of swamps. June.

ORDER HYDROCHARACEÆ. THE FROG-BIT TRIBE.

HYDROCHARIS, *L.* *Frog's-bit.*
cordifolia, *Nutt.* Braddock's Bay, Lake Ontario. *Dr. Bradley.*

UDORA, *Nutt*.
canadensis, *Nutt*. Elodea canadensis, *Michx*. Lakes and still water. August.

VALISNERIA, *L*.
spiralis, *L*. V. americana, *Michx*. Slow flowing water. Common in the Hudson north of the Highlands. Aug.

ORDER ORCHIDACEÆ. THE ORCHIS TRIBE.

HABENARIA, *Willd*., *R. Br*.

§ 1. *Platanthera*, Rich., Lindl.

orbiculata, *Torr*. Orchis macrophylla, *Goldie*. Woods. June–July.
Hookeriana, *Torr*. Orchis orbiculata, *Hook*. Woods. June.
ciliaris, *R. Br*. Swamps. July–August.
blephariglottis, *Hook*. Swamps. July–August.
dilatata, *Spreng*. Swamps, northern counties. June–July.
hyperborea, *R. Br*. Swamps. June–July.
flava, *Gray in Sill. Jour*. 1840. Orchis flava, *L*. Habenaria herbiola, *R. Br*. Moist woods. June–July.
psycodes, *Gray, l. c*. Orchis psycodes, *L*. O. fimbriata, *Ait*. O. fissa and incisa, *Muhl*. and *Willd*.
Var. grandiflora, *Gray, l. c*. Orchis grandiflora, *Bigel*. Meadows and swamps. June–July.
lacera, *Gray, l. c*. Orchis lacera, *Michx*. O. psycodes, *Willd*.; not of *Linn*.
obtusata, *R. Br*. Sphagnous swamps and wet woods, northern counties. June–July.

§ 2. *Peristylus*, Lindl.

bracteata, *R. Br*. Shady woods. June.
tridentata, *Hook*. Swamps. July–August.

ORCHIS, *L*.
spectabilis, *L*. Rocky woods. May.

MICROSTYLIS, *Nutt*.
ophioglossoides, *Nutt*. Swamps, and about the roots of trees. June.
brachypoda, *Gray*. Deep shady swamps. Fairfield, Herkimer county, *Prof. Hadley*. Oneida county, *Dr. Gray* and *Dr. Bradley*. July.

Liparis, *Rich.*
liliifolia, *Rich.* Malaxis liliifolia, *Sw.* Swamps and shady woods. June–July.
loeseli, *Rich.* Malaxis correana, *Bart.* Swamps. Clinton, Oneida county, *Dr. Bradley.*

Tipularia, *Nutt.*
discolor, *Nutt.* Parma, Monroe county. July. *Dr. Bradley.*

Aplectrum, *Nutt.*
hyemale, *Nutt.* *Putty-root, Adam & Eve.* Shady fertile woods, northern and western counties. July. *Dr. Gray* and *Dr. Bradley.* Washington county, *Dr. Stevenson.*

Corallorhiza, *Swartz.* *Coral-root.*
verna, *Nutt.* Sphagnous swamps. May.
odontorhiza, *Nutt.* Damp fertile woods. August–September.
multiflora, *Nutt.* Woods. August–September.
The last two species may not be distinct.

Arethusa, *L.*
bulbosa, *L.* Sphagnous swamps. June.

Pogonia, *Juss.*
ophioglossoides, *R. Br.* Swamps. June–July.
verticillata, *Nutt.* Swamps. Oneida county, *Dr. Kneiskern.* Eaton, Madison county, *Dr. Bradley.*

Triphora, *Nutt.*
pendula, *Nutt.* Rocky woods. June–July.

Calopogon, *R. Br.*
pulchellus, *R. Br.* Swamps. June–July.

Spiranthes, *Rich.*
tortilis, *Rich.* Neottia tortilis, *Sw.* Moist grounds, open woods, &c. July–August.
Var. gracilis, *Torr.* Neottia gracilis, *Bigel.* With the preceding.
cernua, *Rich.* Neottia cernua, *Sw.* Swamps and wet thickets. August–September.
Var.? latifolia, *Torr.* S. æstivalis, *Rich.?* Swamps; particularly on mountains. July.

Listera, *R. Br.*
cordata, *R. Br.* Sphagnous swamps. June–July.

Goodyera, *R. Br.*
pubescens, *R. Br.* Shady fertile woods. July–August.
repens, *R. Br.* Shady moist woods, northern counties. July.

Cypripedium, *L.* *Ladies' Slipper.*
pubescens, *Willd.* C. parviflorum, *Ait.* *Mocasin Flower, Noah's Ark.* Rocky moist woods. May.
acaule, *Ait.* Dry woods and sandy thickets. May.
spectabile, *Sw.* Swamps. June–July.
arietinum, *Ait.* Near Oneida lake. *Dr. Gray.*

Order PONTEDERIACEÆ.

Pontederia, *L.*
cordata, *L.* *Pickerel-weed.* In water. July–August.
Var. angustifolia, *Torr.* P. angustifolia, *Pursh.* Mountain lakes. *Pursh.*

Schollera, *Schreb.*
graminifolia, *Muhl.* Leptanthus gramineus, *Michx.* In flowing waters. July–August.

Heteranthera, *Ruiz* and *Pavon.*
reniformis, *R. & P.* Leptanthus reniformis, *Michx.* Muddy banks of rivers, Fishkill, Hudson, &c. July–August.

Order MELANTHACEÆ. The Colchicum Tribe.

Zigadenus, *Michx.*
glaucus, *Nutt.* Shore of Lake Erie. *Dr. Beck.*

Lermanthium, *Willd.*
virginicum, *Willd.* Melanthium virginicum, *L.* Wet meadows. Orange county. *Dr. Horton,* fide *Beck.* Is not this L. hybridum?

Veratrum, L. *White Hellebore.*
virida, *Ait.* Swamps. May.

Helonias, *L., Gray*.
dioica, *Pursh*. Veratrum luteum, *L*. *Blazing Star, Devil's-bit*. Wet meadows and borders of woods. May–June.

Order TRILLIACEÆ.

Trillium, *L*. *Three-leaved Nightshade*.
erythrocarpum, *Michx*. T. pictum, *Pursh*. Shady woods. May.
erectum, *L*. T. atropurpureum, *Curt*. Shady rocks. May.
Var. 1. album, *Pursh*. T. pendulum, *Willd*. Western counties.
Var. 2. flavum. Hamilton, Madison county. *Dr. Douglass*.
cernuum, *L*. Woods. May.
grandiflorum, *Salisb*. Shady woods, in rich soil. May.

Medeola, *L*. *Indian Cucumber*.
virginica, *L*. Rocky woods and thickets. June.

Order LILIACEÆ. The Lily Tribe.

Lilium, *L*. *Lily*.
philadelphicum, *L*. Thickets and borders of woods. June.
canadense, *L*. Wet meadows. June–July.
superbum, *L*. Wet meadows. July.

Erythronium, *L*. *Dog's-tooth Violet*.
americanum, *Smith*. Wet meadows and woods. April.
albidum, *Nutt*. Near Albany. *Dr. Beck* and *Dr. Eights*.

Allium, *L*.
canadense, *L*. Jefferson county. *Dr. Crawe*.
§ vineale, *L*. *Wild Garlic*. Pastures and meadows. June–July.
tricoccum, *Ait*. *Wild Leek*. Woods, in rich soil; western and northern counties. July.

Aletris, *L*. *Star Grass*.
farinosa, *L*. *Colic-root*. Sandy thickets. June.

Convallaria, *L*.
§ *Polygonatum*, Desf.
multiflora, *L*. C. polygonatum, *Muhl*. C. pubescens, *Willd*. Polygonatum canaliculatum & latifolium, *Pursh*. Rocky woods, &c. May–June.

CONVALLARIA, (continued.)

§ *Maianthemum*, Desf.

bifolia, *L.* Shady woods, about the roots of trees. May.

§ *Smilacina*, Desf.

stellata, *L.* Rocky banks. May–June.

trifolia, *L.* Sphagnous swamps, northern and western counties. June.

racemosa, *L.* Rocky woods, in rich soil. June–July.

§ *Clintonia*, Raf.

borealis. Dracæna borealis, *Ait.* Clintonia borealis, *Raf.* Moist rocky woods, &c. June.

STREPTOPUS, *Michx.*

roseus, *Michx.* Rocky woods, particularly on mountains. May–June.

amplexifolius, var. americanus, *Gray.* S. distortus, *Michx.* Deep swamps, near Utica. Near Fairfield, *Prof. Hadley.*

lanuginosus, *Michx.* Cattaraugus and Monroe counties, *Dr. Bradley.* Near Rochester, *Dr. Harris.* Near Auburn, *Mr. Carey.*

UVULARIA, *L.* *Bellwort.*

perfoliata, *L.* Woods and rocky banks. May.

Var. major, *Michx.* U. grandiflora, *Smith.* Western counties. Also near Albany.

sessilifolia, *L.* Woods. May.

ASPARAGUS, *L.*

§ officinalis, *L.* *Common Asparagus.* Borders of salt marshes, Long Island, and near New-York. June.

ORNITHOGALUM, *L.* *Star of Bethlehem.*

§ umbellatum, *L.* Pastures and wet meadows. May.

ORDER COMMELINACEÆ. THE SPIDER-WORT TRIBE.

TRADESCANTIA, *L.* *Spider-wort.*

virginica, *L.* Near Buffalo, *Dr. Kinnicutt.* May.

ORDER ALISMACEÆ. THE WATER-PLANTAIN TRIBE.

SAGITTARIA, *L.* *Arrow-head.*

sagittifolia, *L.* Ditches and wet grounds. July–August.

Var. 1. vulgaris, *Hook.* S. sagittifolia, *Ph.*

— 2. latifolia, *Torr.* Var. macrophylla, *Hook.* S. latifolia and obtusa, *Ph.*

— 3. pubescens, *Torr.*

— 4. hastata, *Torr.* S. hastata, *Pursh.*

— 5. gracilis, *Torr.* S. gracilis and heterophylla, *Ph.*

— 6. simplex, *Hook.* S. simplex, graminea & acutifolia, *Ph.*

— 7. rigida, *Torr.* S. rigida, *Pursh.*

pusilla, *Nutt.* Muddy banks of streams. August.

ALISMA, *L.* *Water Plantain.*

plantago, *L.* A. parviflora, *Pursh.* In water. July–August.

ORDER JUNCEÆ. THE RUSH TRIBE.

LUZULA, *D. C.*

campestris, *D. C.* Meadows and dry woods. April–May.

pilosa, *Willd.* Open woods, banks of rivers, &c. Northern and western counties. May.

melanocarpa, *Desv.* High mountains of Essex county. July.

JUNCUS, *L.* *Rush.*

effusus, *L.* Low wet grounds. June.

filiformis, *L.* Borders of lakes, northern and western counties. July.

balticus, *Willd.* Sandy shore of Lake Erie and the St. Lawrence. July.

nodosus, *L.* J. polycephalus, *Michx.* J. echinatus, *Ell.?* Wet meadows and swamps. June.

tenuis, *Willd.* Low grounds, and in dry places. June–July.

acuminatus, *Michx.* Borders of ponds, &c. July.

marginatus, *Rostk.* Sandy wet places. June–July.

bufonius, *L.* Wet low grounds. July.

trifidus, *L.* Summit of Mount Marcy, Essex county.

bulbosus, *L.* Salt marshes. July–August.

stygius, *L.* Sphagnous swamps, near Perch lake, Jefferson county. August. *Dr. Gray.*

Order RESTIACEÆ.

Sub-Order Ericauloneæ.

Eriocaulon, *L.* *Pipewort.*
septangulare, *With.* E. pellucidum, *Michx.* Ponds and muddy banks. August.

Order XYRIDACEÆ.

Xyris, *L.* *Yellow-eyed Grass.*
caroliniana, *Walt.* Sandy swamps, Long Island. July.

Order SMILACEÆ. The Smilax Tribe.

Smilax, *L.* *Rough Bindweed.*
rotundifolia, *L.* *Cat Brier, Green Brier.* Thickets and woods. June.
caduca, *L.* Sandy fields and hill sides. June. Perhaps not distinct from the preceding.
herbacea, *L.* Meadows and borders of woods. May–June.

Order DIOSCOREACEÆ. The Yam Tribe.

Dioscorea, *L.* *Yam.*
villosa, *L.* Thickets. June–July.

Order ARACEÆ. The Arum Tribe.

Arum, *L.*
dracontium, *L.* *Green Dragon, Dragon-root.* Low grounds. Valley of the Mohawk, &c. May–June.
triphyllum, *L.* *Indian Turnip.* Moist shady places. May.

Peltandra, *Raf.*
virginica, *Raf.* Arum virginicum, *L.* Lecontea virginica, *Cooper.* Rensselaeria virginica, *Beck.* Swamps and wet shady thickets. June–July.

Calla, *L.* *Water Arum.*
palustris, *L.* Swamps; northern counties. July.

Symplocarpus, *Salisb.* *Skunk Cabbage.*
fœtida, *Nutt.* Low grounds. February–March.

ORONTIUM, *L.* *Golden Club, Floating Arum.*
aquaticum, *L.* In shallow water. May.

ACORUS, *L.* *Calamus, Sweet Flag.*
calamus, *L.* Wet meadows and swamps. May–June.

ORDER TYPHACEÆ. THE CAT-TAIL TRIBE.

TYPHA, *L.* *Cat-tail, Reed Mace.*
latifolia, *L.* Borders of swamps and rivers. June–July.
angustifolia, *L.* With the preceding.

SPARGANIUM, *L.* *Burr Reed.*
ramosum, *L.* In shallow ponds and streams. June.
simplex, *Smith.* S. americanum, *Nutt.* Borders of streams. July.

ORDER FLUVIALES.

NAJAS, *L.*
canadensis, *Michx.* Ponds and slow-flowing water. July.

ZOSTERA, *L.* *Grasswrack.*
marina, *L.* Seashore and salt-water bays.

ZANNICHELLIA, *L.* *Triple-headed Pondweed.*
palustris, *L.* Z. intermedia, *Torr.* Ditches and shallow ponds; most common in brackish water. July.

RUPPIA, *L.*
maritima, *L.* Salt-water ditches. July.

POTAMOGETON, *L.* *Pondweed.*
natans, *L.* Ponds and slow-flowing water. July.
heterophyllus, *Schreb.?* P. fluitans of American botanists. Ponds, &c.
diversifolius, *Bart.* Flowing water. July–August.
perfoliatus, *L.* Flowing water. July.
prælongus, *Wulff.* P. luceus of American botanists. Slow-flowing deep water. July–August.
compressus, *L.* P. zosteræfolius, *Schum.?* Flowing water. July.
gramineus, *Michx.* P. pauciflorus, *Pursh.* Small streams. July–August.
pectinatus, *L.* P. marinus, *Michx.* Fresh and brackish water. July.

ORDER JUNCAGINACEÆ. THE ARROW-GRASS TRIBE.

TRIGLOCHIN, *L.* *Arrow Grass.*
palustre, *L.* Marshes. Near Buffalo, *Dr. Kinnicut.* Salina.
maritimum, *L.* Salt marshes, near New-York and Salina. July.
elatum, *Nutt.* Marshes. Gorham, *Dr. Aikin.* Near Bridgewater, &c. *Dr. Gray.* June–July.

SCHEUCHZERIA, *L.*
palustris, *L.* Sphagnous swamps; western and northern counties. July. Near Albany, *Dr. Beck.*

ORDER PISTIACEÆ. THE DUCKWEED TRIBE.

LEMNA, *L.* *Duckweed, Duck's-meat.*
polyrrhiza, *L.* Ditches and stagnant waters.
gibba, *L.* Near Liverpool, Onondaga county. *Pursh.*
minor, *L.* Stagnant waters.
trisulca, *L.* Ditches and ponds. July.

ORDER CYPERACEÆ. THE SEDGE TRIBE.

DULICHIUM, *Rich.*
spathaceum, *Pers.* Borders of ponds, &c. August–September.

CYPERUS, *L.* *Galingale.*
flavescens, *L.* Boggy places, especially near salt water. August–September.
diandrus, *Torr.* Wet places, near salt water. September.
Var. castaneus, *Torr.* Muddy and sandy shores. August–September.
Nuttallii, *Torr.* Borders of salt marshes. August.
Michauxianus, *Schultz.* Borders of salt marshes. August.
strigosus, *L.* Low moist grounds. August.
repens, *Ell.* C. phymatodes, *Muhl.* Wet sandy places. August.
filiculmis, *Vahl.* C. mariscoides, *Ell.* Dry sterile soils. Sept.
Grayii, *Torr.* Sandy fields, Long Island. August–September.
dentatus, *Torr.* Sandy wet places. September.
inflexus, *Muhl.* C. uncinatus, *Pursh.* Sandy banks of rivers and lakes, north and west of Albany. Albany. Aug.
Schweinitzii, *Torr.* Sandy shore of Lake Ontario, near Braddock's Bay. *Dr. Bradley.*

Cyperus, (continued.)

ovularis, *Torr.* Mariscus ovularis, *Vahl.* Sandy soils, in dry and moist situations. August–October.

Mariscus, *Vahl.*

retrofractus, *Vahl.* Sandy soils, near New-York. July.

Fuirena, *Rottb.*

squarrosa, var. γ. *Torr. Cyp.* Bogs and swamps, Long Island.
Var. 2. pumila, *Torr. Cyp.* Wet sandy places, Long Island. August–September.

Eleocharis, *R. Br.*

palustris, *R. Br.* Low wet places. May–June.
olivacea, *Torr.* Sandy swamps, Long Island. July.
intermedia, *Schultes.* Wet places, and in shallow running water. Oneida county. *Dr. Gray.*
obtusa, *Schultes.* Scirpus càpitatus, *Walt.;* not of *Linn.* Bogs and ditches. July.
tuberculosa, *R. Br.* Sandy swamps, Long Island. August.
acicularis, *R. Br.* Borders of ponds. June.
tenuis, *Schultes.* Bogs and margin of swamps. May.
pygmæa, *Torr.* Salt marshes, near New-York. August.

Scirpus, *L.* *Club-rush.*

planifolius, *Muhl.* Dry woods and bogs.
subterminalis, *Torr.* Slow-flowing water. August.
rostellatus, *Torr.* Yates county. *Dr. Sartwell.*
cæspitosus, *L.* High mountains of Essex county. July.
debilis, *Pursh.* Sandy shores, in wet places. July.
lacustris, *L.* *Bulrush.* In fresh water. June.
maritimus, *L.* Salt marshes. Near New-York, and on Long Island.
Var. fluviatilis, *Torr.* Swamps and borders of lakes; western and northern counties.
triqueter, *L.* Swamps and wet meadows, both salt and fresh.
mucronatus, *Vahl.?* Swamp near West Point. *Prof. Bailey.*
atrovirens, *Muhl.* Wet meadows and swamps. June.
brunneus, *Muhl.* Swamps. August.
eriophorum, *Michx.* Borders of swamps, and wet meadows.
lineatus, *Michx.* Near Poughkeepsie. *Mr. Dudgeon.* This species has not been found in the State by any other botanist.

ERIOPHORUM, *L*. *Cotton Grass*.
alpinum, *L*. Sphagnous swamps; northern and western counties. May–June.
vaginatum, *L*. Deep sphagnous swamps; northern and western counties. Also on the high mountains of Essex.
virginicum, *L*. Swamps. July.
polystachyum, *L*. Boggy meadows. June.
angustifolium, *Reichard*. Sphagnous swamps; northern and western counties. *Dr. Gray*. June.
Var. brevifolium, *Torr*. Near Utica. *Dr. Gray*.

FIMBRISTYLIS, *Vahl*.
spadicea, *Vahl*. Wet meadows, particularly near salt water. Island of New-York.

ISOLEPIS, *R. Brown*.
subsquarrosa, *Schrad*. Scirpus subsquarrosus, *Muhl*. Sandy shores of lakes and rivers; northern and western counties. August.
capillaris, *Rœm. & Schult*. Scirpus capillaris, *L*. Sandy fields. July.

TRICHELOSTYLIS, *Lestib*.
mucronulata, *Torr*. Scirpus mucronulatus, *Michx*. S. autumnalis, *Pursh*. Moist sandy soils; rarely in dry places. July–September.

RHYNCHOSPORA, *Vahl*.
alba, *Vahl*. Swamps. July.
capillacea, *Torr*. Swamps, Yates county, *Dr. Sartwell*. On limestone rocks, Jefferson county, *Dr. Gray*.
fusca, *Rœm. & Schult*. Genesee county, *Dr. Bradley*.
gracilenta, *Gray*. Putnam county, *Dr. Barratt*.
glomerata, *Vahl*. Low moist grounds. July–August.
cephalantha, *Gray*. Sandy swamps. Long Island.

CLADIUM, *Browne*.
mariscoides, *Torr*. Schœnus mariscoides, *Muhl*. Wet meadows. July.

SCLERIA, *Bergius*.
reticularis, *Michx*. Sandy swamps, Long Island. August.

SCLERIA, (continued.)

laxa, *Torr.* S. reticularis, *Muhl.;* not of *Michx.* With the preceding.

triglomerata, *Michx.* Wet thickets and borders of swamps. July.

verticillata, *Muhl.* Swamps, Yates county. *Dr. Sartwell.*

pauciflora, *Muhl.* Greece, Monroe county. *Dr. Bradley.*

CAREX, *L.* *Sedge.*

dioica, *L.?* Swamps, Yates county. *Dr. Sartwell.*

exilis, *Dewey.* Sphagnous swamps, Oneida county. *Dr. Kneiskern.*

chordorrhiza, *Ehrh.* Northern and western counties. June.

disperma, *Dew.* Swamps; often on mountains.

rosea, *Schk.* Woods and low grounds. May.

Var. retroflexa, *Torr. & Gr.* C. retroflexa, *Muhl.* Wet places. May.

cephalophora, *Muhl.* Dry woods and hill sides. April.

sparganioides, *Muhl.* Low grounds and thickets. May.

stipata, *Muhl.* Wet meadows. April.

bromoides, *Schk.* Moist woods and wet meadows. May.

vulpinoidea, *Michx.* C. multiflora, *Muhl.* Swamps and low grounds. May.

decomposita, *Dew.* Yates county. *Dr. Sartwell.*

paniculata, var. teretiuscula, *Wahl.* Swamps. May.

Muhlenbergii, *Schk.* Rocky woods. May.

bromoides, *Schk.* Swamps. May.

trisperma, *Dew.* Shady swamps, and mountain woods. June.

Deweyana, *Schw.* Moist woods. June.

tenuiflora, *Wahl.* Swamps. Near Ogdensburgh, *Dr. Crawe.* Oriskany swamp, Oneida county, *Dr. Kneiskern.*

stellulata, *Good.* C. scirpoides, *Schk.* C. sterilis, *Willd.* Swamps and wet meadows. May.

curta, *Good.* C. Richardi, *Michx.* Swamps.

scoparia, *Schk.* Wet meadows. May.

Var. lagopodioides. C. lagopodioides, *Willd.* Wet meadows.

festucacea, *Schk.* Moist woods and meadows. May.

cristata, *Schw.* Swamps and wet meadows. May.

straminea, *Willd.* Swamps. May.

Var. minor. C. tenera, *Dew.* Swamps. May.

aurea, *Nutt.* Wet borders of streams, and in swamps. June.

saxatilis, *L.* Summit of Mount Marcy, Essex county. August.

Carex, (continued.)

cespitosa, *L.? Schk.* Swamps; northern and western counties.

acuta, *L.? Schk.* Bog meadows. May.

aquatilis, *Wahl.* Wet borders of lakes, western counties. *Dr. Gray.*

crinita, *Lam.* Swamps, and along streams. May–June.

leucoglochin, *Ehrh.* C. pauciflora, *Willd.* Sphagnous swamps; northern and western counties.

polytrichoides, *Muhl.* Moist woods and low grounds. May.

Willdenovii, *Schk.* Jefferson county, *Dr. Gray.* Yates county, *Dr. Sartwell.* Moist shady places. June.

pedunculata, *Muhl.* Woods and hill sides. April–May.

squarrosa, *L.* Low wet grounds. May.

Buxbaumii, *Wahl.* Swamps; northern and western counties. June.

triceps, *Michx.* C. hirsuta, *Willd.* Meadows and open moist woods. May–June.

virescens, *Muhl.* Woods and shady hill sides. May–June.

gracillima, *Schw.* Woods and wet meadows. May.

formosa, *Dew.* Wet meadows. May.

Davisii, *Torr. & Schw.* C. Torreyana, *Dew.* Moist banks of rivers; western counties. May.

lanuginosa, *Michx.* C. pellita, *Muhl.* Wet meadows and swamps. May.

vestita, *Willd.* Wet grounds. May–June.

pennsylvanica, *Lam.* C. marginata, *Muhl.* Dry woods. April.

Var. Muhlenbergii, *Gray.* C. varia, *Muhl.* With the preceding.

novæ-angliæ, *Schw.* Mount Marcy, Essex county. June.

pubescens, *Muhl.* Woods and rocky hill sides. May.

striata, *Michx.* C. polymorpha, *Muhl.* C. Halseyana, *Dew.* Swamps; western counties. June.

oligocarpa, *Schk.* C. Sartwelliana, *Gay.* Western counties. *Dr. Sartwell.*

Var. major. C. Hitchcockiana, *Dew.* With the preceding.

laxiflora, *Muhl.* Wet meadows. May.

conoidea, *Schk.* Moist woods, in fertile soil. April–May.

tetanica, *Schk.* Wet meadows. May.

eburnea, *Boott.* C. alba, *Dewey* and American botanists; not of *Hænke.* Limestone hills, northern and western counties. June.

CAREX, (continued.)

anceps, *Muhl.* C. striatula, *Michx.* C. plantaginea & conoidea, *Muhl.* Woods and low grounds. April–May.

plantaginea, *Lam.* Shady ravines. April.

Careyana, *Dew.* Woods near Auburn. *Mr. Carey.*

digitalis, *Willd.* C. oligocarpa, *Schw.*, *Torr. & Dew.*; not of *Schk.* Rocky woods. May.

sylvatica, *Huds.* Borders of swamps. June.

debilis, *Michx.* C. flexuosa, *Muhl.* Wet woods. June.

livida, *Willd.* C. Grayana, *Dew.* Sphagnous swamps, Oneida county. June. *Dr. Gray* and *Dr. Kneiskern.*

œderi, *Ehrh.* C. viridula, *Michx.* Wet rocks and sandy shores. Lake Ontario, &c. June.

flava, *L.* Meadows and low grounds. May.

folliculata, *L.* C. xanthophysa, *Wahl.* Swamps. June–July.

subulata, *Mich.* Cedar swamps, Long Island. June–July.

intumescens, *Rudge.* C. folliculata, *Schk.*; not of *Linn.* Wet woods. June.

lupulina, *Muhl.* Swamps. June.

Var. polystachya, *Torr. & Schw.* Putnam county. *Dr. Barratt*

Var. pedunculata, *Gray.* Shore of Lake Erie. *Dr. Gray.*

tentaculata, *Muhl.* Low wet meadows. June.

retrorsa, *Schw.* Swamps. June.

oligosperma, *Michx.* C. Oakesiana, *Dew.* Wet borders of small lakes, Essex county. July.

bullata, *Schk.* Swamps. June.

Var.? cylindracea, *Torr. & Gr.* C. vesicaria, α and β, *Dew.* Swamps.

physocarpa, *Boott.* C. vesicaria, *Schw. & Torr.*; not of *Linn.* C. ampullacea, *Dewey.*

Schweinitzii, *Dew.*

aristata, *R. Br.* Watertown, New-York. *Dr. Crawe.*

trichocarpa, *Muhl.* Swamps. May.

lacustris, *Willd.* Borders of lakes. June.

scabrata, *Schw.* Shady swamps. May.

hystericina, *Muhl.* Wet meadows. May.

pseudo-cyperus, *L.* Swamps. May.

longirostris, *Torr.* Shady rocky places; northern counties. June.

limosa, *L.* Sphagnous swamps; northern and western counties. June.

CAREX, (continued.)

Var. irrigua, *Wahl*. C. paupercula, *Michx*. With the preceding.

flexilis, *Rudge*. C. blepharophora, *Gray*. Moist shady places. Oneida county, *Dr. Gray*. Essex county, *Dr. Kneiskern*. June.

miliacea, *Muhl*. Wet grassy banks. May.

pallescens, *L*. Wet grounds. May.

umbellata, *Schk*. Rocky hills. June.

ORDER GRAMINEÆ. THE GRASS TRIBE.

The Grasses are here arranged nearly as they are described in my Flora of the Middle and Northern States, and in Dr. Beck's Botany. A more natural arrangement of them will be adopted in my final report.

AGROSTIS, *L*. *Bent Grass*.

§ stricta, *Willd*. Sandy fields, near Oneida lake. June.

§ polymorpha, *Huds*. A. vulgaris and alba, *L*. *Red-top*, *Fiorin Grass*, *Herd's Grass*. Meadows, road sides, &c. June–August.

Michauxii, *Trin*. Trichodium laxiflorum, *Michx*. *Thin Grass*. Fields and meadows.

cryptandra, *Torr*. Near Buffalo, *Dr. Aikin*. Probably a Vilfa.

BRACHYELYTRUM, *P. de Beauv*.

aristatum, *P. de B*. Muhlenbergia aristata, *Roth*. Dilepyrum aristosum, *Michx*. Rocky hills and woods. June.

MUHLENBERGIA, *Schreb*.

mexicana, *Trin*. Agrostis mexicana, *L*. A. lateriflora, *Michx*. A. mexicana and filiformis, *Muhl*. Wet grounds. August.

sobolifera, *Trin*. Agrostis sobolifera, *Muhl*. Rocky hill sides. August.

Willdenovii, *Trin*. Agrostis tenuiflora, *Willd*. Rocky woods. July–August.

sylvatica, *Torr*. Agrostis sylvatica, *Torr. fl*, Rocky hill sides, near rivers. August.

glomerata, *Trin*. Agrostis setosa, *Muhl*. Polypogon racemosus, *Nutt*. Swamps. August–September.

Muhlenbergia, (continued.)

cinna, *Trin.* Cinna arundinacea, *L.* Swamps and wet shady woods. August.

diffusa, *Schreb.* Rocky hill sides and fields. August.

Vilfa, *Adans.*

serotina, *Torr. in Gray's Gram. & Cyp.* Agrostis serotina, *Torr. fl.* Sandy swamps, Long Island. September.

vaginæflora, *Torr. l. c.* Agrostis virginica, *Muhl.*, not of *Linn.* Sandy soils and sterile hill sides. September–October.

longifolia, *Torr. l. c.* Agrostis longifolia, *Torr. fl.* Sandy fields, Long Island. September.

heterolepis, *Gray.* Rocks, Jefferson county. *Dr. Gray.* August–September.

Alopecurus, *L.* *Fox-tail Grass.*

§ pratensis, *L.* Fields and pastures. June.

geniculatus, *L.* Wet meadows. June.

Var. aristulatus, *Torr.* A. aristulatus, *Michx.* With the preceding.

Phleum, *L.* *Cat-tail Grass.*

§ pratense, *L.* *Timothy, Herd's Grass.* Fields. June–August.

Phalaris, *L.* *Canary Grass.*

arundinacea, *L.* Swamps. July.

§ canariensis, *L.* Fields and pastures.

Milium, *L.* *Millet Grass.*

effusum, *L.* Wet woods. July. Northern and western counties.

pungens, *Torr.* Rocky hills. May.

Piptatherum, *P. de Beauv.*

nigrum, *Torr.* Oryzopsis melanocarpa, *Muhl.* Rocky woods. August.

Stipa, *L.* *Feather Grass.*

avenacea, *L.* Dry woods and hill sides. June.

Oryzopsis, *Michx.*

asperifolia, *Michx.* *Mountain Rice.* Woody hill sides; western counties. April–May.

PANICUM, *L.* *Panic Grass.*

§ crus-galli, *L.* Fields and cultivated grounds. August–Sept.
hispidum, *Muhl.* Borders of salt marshes. August–September.
clandestinum, *L*, Woods and thickets. July–August.
Var. pendunculatum. P. pedunculatum, *Torr. fl.* Woods.
latifolium, *L.* Woods and moist thickets. June.
dichotomum, *L.* Woods and moist low grounds. A very polymorphous species, including P. nitidum, *Lam.* and of my Flora of the Northern & Middle States, as well as numerous species described in more recent works.
agrostoides, *Muhl.* Wet meadows. July–August.
depauperatum, *Muhl.* P. rectum, *Rœm. & Schult.* P. involutum, *Torr. fl.* P. strictum, *Pursh*, not of *R. Br.* Dry woods and sterile hills. May–June.
virgatum, *L.* Sandy shores. August.
verrucosum, *Muhl.* P. debile, *Ell.* Sandy swamps, Long Island.
prolificum, *Lam.* P. geniculatum, *Muhl.* Wet meadows, and also in sandy fields. September.
xanthophysum, *Gray.* Dry pine barrens; western counties. June–July. *Dr. Gray, Dr. Sartwell.*
capillare, *L.* Sandy fields and cultivated grounds; also in dry woods. August–September.

SETARIA, *P. de Beauv.*

§ viridis, *P. de B.* *Bottle Grass.* Cultivated grounds. July.
§ glauca, *P. de B.* *Fox-tail Grass.* Fields and road sides. July.

DIGITARIA, *Haller.* *Crab Grass.*

§ sanguinalis, *Scop.* *Common Crab Grass.* Cultivated grounds, &c. August–September.
glabra, *R. & S.* Sandy fields. August–September.
filiformis, *Muhl.* Sandy fields. August.

PASPALUM, *L.*

ciliatifolium, *Michx.* Sandy fields, August–September.
læve, *Michx.* Grassy banks and moist meadows. August.

CENCHRUS, *L.* *Hedgehog Grass.*

tribuloides, *L.*, *Muhl.* C. echinatus, *Muhl.* Sandy shores of Long Island and the Island of New-York. July–August.

ARISTIDA, *L.*
dichotoma, *Michx.* Barren fields. July.
gracilis, *Ell.* Sandy fields. Long Island.

CALAMAGROSTIS, *Roth.*
canadensis, *P. de Beauv.* Wet meadows. August.
coarctata, *Torr. in Gray's Gram. & Cyp.* C. canadensis, *Nutt.* Arundo coarctata, *Torr. fl.* Wet thickets. Aug.
inexpansa, *Gray.* Swamps; northern and western counties. July.
arenaria, *Roth.* Arundo arenaria, *L.* Sandy seacoast of Long Island. August–September.

ANTHOXANTHUM, *L.* *Sweet-scented Vernal Grass.*
§ odoratum, *L.* Moist meadows and open woods. June–August.

AIRA, *L.* *Hair Grass.*
flexuosa, *L.* Dry woods and rocky hills. June.
cespitosa, *L.* A. aristulata, *Torr. fl.* Moist situations, along rivers. June.
atropurpurea, *Wahl.* Sources of the Hudson, Essex county. Aug.

TRISETUM, *Pers.*
palustre, *Torr.* Avena pennsylvanica, *L.* A. palustris, *Michx.* Wet meadows. May–July.
purpurascens, *Torr.* Avena striata, *Michx.* Northern and western counties. Wet woods and banks of rivers. June.
molle, *Trin.* Avena mollis, *Michx.* Rocky banks of rivers; northern and western counties. July.

HOLCHUS, *L.* *Soft Grass.*
§ lanatus, *L.* Wet meadows. July.

HIEROCHLOA, *Gmel.*
borealis, *R. & S.* Holchus odoratus, *L.* H. fragrans, *Ph.* *Seneca Grass.* Wet meadows. May.
alpina, *R. & S.* High mountains of Essex county. June.

URALEPIS, *Nutt.*
aristulata, *Nutt.* Sandy shores about New-York, and on the seacoast of Long Island. August.

ARUNDO, *L.* *Reed Grass.*
phragmites, *L.* Borders of ponds and swamps. August.

DANTHONIA, *D. C.*
spicata, *P. de Beauv.* Woods and fields. June–August.

FESTUCA, *L.* *Fescue Grass.*
§ duriuscula, *L.* Sandy fields. June.
tenella, *Willd.* Sandy fields and dry banks. June.
§ elatior, *L.* Wet meadows. June.
§ pratensis, *Huds.* Fields and meadows. June.
nutans, *Willd.* Woods and rocky shady places. June.
fascicularis, *Lam.* Borders of salt marshes, Long Island. August.

GLYCERIA, *R. Br.* *Manna Grass.*
fluitans, *R. Br.* Stagnant waters and ponds. June.
acutiflora, *Torr.* Wet meadows. June.

POA, *L.* *Meadow Grass.*
§ annua, *L.* Fields and cultivated grounds. April–August.
dentata, *Torr.* Swamps. June–July.
aquatica, *L.* Wet meadows. July–August.
§ pratensis, *L.* Meadows, road sides, &c. May–July.
§ trivialis, *L.* Wet meadows. June–July.
compressa, *L.* *Blue Grass.* Fields, woods, and sandy shores. June.
serotina, *Ehrh.* *Red-top.* Wet meadows. June–July.
nemoralis, *L.* Woods and meadows. June–July.
nervata, *Willd.* Wet meadows. June.
Torreyana, *Spreng.* P. elongata, *Torr.*, not of *Willd.* Wet meadows. July.
canadensis, *Torr.* Briza canadensis, *Michx.* Swamps. July.
capillaris, *L.* Sandy fields and dry hills. August.
hirsuta, *Michx.* Sandy fields, Long Island. August.
alpina, *L.* Summit of Mount Marcy, Essex county.
pilosa, *L.* P. pectinacea, *Michx.* Sandy fields. July–August.
reptans, *Michx.* Wet sandy shores, north and west of Albany.
§ eragrostis, *L.* Sandy fields. July. September.

OBS. An undetermined species, probably new, occurs in woods, in the northern and western counties. It will be fully described in my final report.

UNIOLA, *L.* *Spike Grass.*
gracilis, *Michx.* Sandy swamps, Long Island. August.
spicata, *L.* Salt marshes. August–September.

TRICUSPIS, *P. de Beauv.*
seslerioides, *Torr.* Poa seslerioides, *Michx.* Sandy fields. Aug.

DACTYLIS, *L.* *Orchard Grass.*
§ glomerata, *L.* Fields and meadows. June.

KŒLERIA, *Pers.*
pennsylvanica, *D. C.* Rocky woods. May–June.
truncata, *Torr.* Dry woods. June.

BROMUS, *L.* *Brome Grass.*
§ secalinus, *L.* *Chess*, or *Cheat.* Cultivated grounds. June.
ciliatus, *L.* Dry woods. June.
purgans, *L.* B. canadensis, *Michx.* Woods and river banks. June–July.
§? sterilis, *L.* Penn-Yan, Yates county. *Dr. Sartwell.*

ATHEROPOGON, *Muhl.*
apludoides, *Muhl.* Rocky hills, Dutchess and Orange counties. August.

ELEUSINE, *Gært.* *Dog's-tail Grass.*
§ indica, *Lam.* Cultivated grounds, pavements of streets, &c. July–November.

SECALE, *L.* *Rye.*
§ cereale, *L.* Old fields. June.

ELYMUS, *L.* *Lyme Grass, Wild Rye.*
virginicus, *L.* River banks. July–August.
canadensis, *L.* River banks and rocky hill sides. July.
striatus, *Willd.* Dry rocky hills. July.
hystrix, *L.* Rocky woods. July.

TRITICUM, *L.* *Wheat.*
§ repens, *L.* *Couch Grass.* Fields and cultivated grounds. July.

LOLIUM, *L.* *Darnel.*
§ perenne, *L.* Meadows and pastures. June.

ANDROPOGON, *L.* *Beard Grass.*
scoparius, *Michx.* Dry hills and barren fields. August.
virginicus, *L.* Exsiccated swamps. September.
macrourus, *Michx.* Brackish swamps. September–October.

ANDROPOGON, (continued.)
furcatus, *Muhl.* Rocky banks. September–October.
nutans, *L.* Sandy fields and rocky hills. September.

LEERSIA, *Swartz.* *White Grass.*
virginica, *Willd.* Wet woods and thickets. August.
oryzoides, *Swartz.* Ditches and swamps. August–September.

ZIZANIA, *L.* *Wild Rice, Water Oats.*
aquatica, *Lamb.* *Tuscarora Rice.* Fresh or brackish water. Aug.

OBS. Z. fluitans, *Michx.* according to the herbarium of that botanist, was not found in Lake Champlain, as stated by mistake in the *Flora Boreali-Americana*, but near Charleston, South-Carolina.

CLASS IV. ACROGENS.

ORDER EQUISETACEÆ. THE HORSE-TAIL TRIBE.

EQUISETUM, *L.* *Horse-tail.*
limosum, *L.* Swamps and borders of ponds. June.
sylvaticum, *L.* Moist woods.
hyemale, *L.* *Scouring Rush.* Swamps and wet banks. May–June.
variegatum, *Scleich.* Wet sandy places, among rocks. Niagara, *Dr. Kinnicutt.*
arvense, *L.* Low grounds. April.
scirpoides, *Michx.* Shady rocky places; northern counties.

ORDER FILICES. THE FERN TRIBE.

SUB-ORDER POLYPODIEÆ.

POLYPODIUM, *L.* *Polypody.*
vulgare, *L.* Rocky woods and hill sides. July.
hexagonopterum, *Michx.* Moist woods. July.
phegopteris, *L.* P. connectile, *Michx.* Shady woods. July.
calcareum, *Smith.* Moist shady woods; northern and western counties. July.

ASPIDIUM, *Swartz.* *Shield Fern.*
acrostichoides, *Willd.* Shady rocky hill sides. June–August.
Var. incisum, *Gray.* A. Schweinitzii, *Beck.* Shady ravines, near Hamilton College. *Dr. Gray.*

ASPIDIUM, (continued.)

thelypteris, *Sw.* A. noveboracense, *Willd.*

Goldianum, *Hook.* Shady woods. July.

marginale, *Sw.* Rocky hill sides. July.

dilatatum, *Sw.* A. intermedium, *Willd.* Shady woods. July.

asplenoides, *Sw.* Nephrodium filix-fœminea and asplenoides, *Michx.* Shady woods. July.

lancastriense, *Sw.* A. cristatum of American botanists, not of *Swartz.* Swamps. July.

CYSTOPTERIS, *Bernh.*

fragilis, *Bernh.* Cyathea fragilis, *Sm.* Aspidium tenue, *Sw.* A. atomarium, *Willd.* Nephrodium tenue, *Michx.* Moist rocks. June–July.

bulbifera, *Bernh.* Aspidium bulbiferum, *Willd.* Nephrodium bulbiferum, *Michx.* Shady rocky places. July.

DICKSONIA, *L'Herit.*

pilosiuscula, *Willd.* Nephrodium punctilobulum, *Michx.* Shady rocky places. July.

WOODSIA, *R. Br.*

obtusa. W. Perriniana, *Hook. & Grev.* Aspidium obtusum, *Sw.* Rocky woods. July.

ilvensis, *R. Br.?* Nephrodium rufidulum, *Michx.* Sides of rocky hills. June.

ASPLENIUM, *L.* *Spleenwort.*

rhizophyllum, *L.* Camptosorus rhizophyllus, *Presl.* Moist rocks; generally on limestone. July.

angustifolium, *Michx.* Shady woods. July.

ebeneum, *Willd.* Rocky woods. July.

trichomanes, *L.* A. melanocaulon, *Willd.* Shady rocks. July.

thelypterioides, *Michx.* Diplazium thelypterioides, *Presl.* Shady rocky woods. July.

ruta-muraria, *L.* *Wall-rue Spleenwort.* Shady limestone rocks. July.

WOODWARDIA, *Smith.*

angustifolia, *Smith.* W. onocleoides, *Willd.* Swamps: rare. August.

virginica, *Sw.* Doodia virginica, *Presl.* Swamps. July.

Scolopendrium, *Smith*. *Hart's-tongue*.
officinarum, *Sw*. Sides of limestone rocks, near Chittenango Falls. July.

Pteris, *L*. *Brake*.
aquilina, *L*. *Common Brake*, or *Bracken*. Woods and thickets. July–August.
atropurpurea, *L*. Limestone rocks. June–July.

Cryptogramma, *R. Br*.
gracile. Pteris gracilis, *Michx*. Allosorus gracilis, *Presl*. Rocks. Near Whitehall, *Dr. Beck*. Yates county, *Dr. Sartwell*. Northern counties. July–August.

Adiantum, *L*. *Maidenhair*.
pedatum, *L*. Shady woods. July.

Struthiopteris, *Willd*.
germanica, *Willd*. S. pennsylvanica, *Willd*. Borders of swamps. July–August.

Onoclea, *L*.
sensibilis, *L*. Ragiopteris onocleoides, *Presl*. Moist woods and thickets. July.
obtusilobata, *Schk.?* Ragiopteris obtusiloba, *Presl.?* Near Salem, Washington county. *Dr. I. Smith*.

Sub-Order Osmundeæ.

Osmunda, *L*. *Flowering Fern*.
Claytoniana, *L*. O. interrupta, *Michx*. Low moist grounds. June–July.
cinnamomea, *L*. Low grounds. July.
Var. frondosa, *Torr. & Gray*. Frond leafy below; fructiferous at the summit. O. Claytoniana, *Beck*.
regalis, *L*. O. spectabilis, *Willd*. Wet meadows and thickets. July.

Lygodium, *Swartz*. *Climbing Fern*.
palmatum, *Sw*. Western part of the State; locality not recorded.

Sub-order Ophioglosseæ.

Ophioglossum, *L.* *Adder's-tongue.*
vulgatum, *L.* Low grounds and thickets. June.

Botrychium, *Swartz.* *Moonwort.*
fumarioides, *Sw.* Moist woods. July–August.
dissectum, *Muhl.* Moist woods. August–September.
virginicum, *Sw.* B. gracile, *Michx.* Woods and rocky hills. May–June.
simplex, *Hitchcock.* Highlands of New-York. *Dr. Barratt.*

Order LYCOPODIACEÆ. The Club-Moss Tribe.

Lycopodium, *L.* *Club Moss.*
clavatum, *L.* Dry woods. July.
complanatum, *L.* Dry woods. July.
obscurum, *L.* L. dendroideum, *Michx.* Shady woods. July.
annotinum, *L.* Sandy woods and hill sides. July.
inundatum, *L.* Wet places; western counties. July.
rupestre, *L.* Dry rocks. July.
selago, *L.* Summit of Mount Marcy. July. Whiteface Mountain. *Prof. Hall* and *Dr. Emmons.*
lucidulum, *Michx.* Shady woods and swamps. July–August.
apodum, *L.* L. albidulum, *Michx.* Moist woods. July–August.

Isœtes, *L.* *Quillwort.*
lacustris, *L.* Bottom of Oswego River, near the Falls. *Pursh.*

Order SALVINIEÆ.

Salvinia, *Guett.*
natans, *Hoff.* Lakes of still water; western part of the State. *Pursh.*

Azolla, *Lam.*
caroliniana, *Lam.* Ponds and lakes; near New-York. Braddock's Bay, Lake Ontario, *Dr. Bradley.*

THIRD ANNUAL REPORT

Of T. A. Conrad, on the Palæontological Department of the Survey.

The superstructure of modern geology is based chiefly on organic remains, and it must be a narrow and partial view of the subject, which would not assign to their investigation a prominent place in a geological exploration, thus guarding against visionary hopes of treasure and erroneous conclusions which would otherwise meet the geologist at every step. Fossils, indeed, in their relations to geology, may be compared to the balance wheel of an engine, which gives regularity and certainty to its motion, and they harmonize with, and shed light on the other departments of the science. The most enlightened geologists of Europe will bear me witness that I do not give undue importance to this fascinating study. They have almost unanimously made mineral character in identifying formations, subordinate to the more intelligible record of organic remains in whole series of rocks above the primordial system, and every day's observation tends to confirm the singular agreement in the fossil contents of equivalent strata in every region of the globe, however diversified may be the mineral composition of the rocks. Thus, we are taught that the living beings of a certain era, were generally spread throughout the extended ocean, which pervaded the greater portion of the globe; the uniformity of the groups being greatest in proportion to the antiquity of the rocks which now hold their remains. Thus the identity of several ancient formations in Europe and America is clearly determined, and the mineral treasures are found to correspond in a remarkable manner, showing that the same general causes influenced the deposition of the rocks over a vastly extended area, thus giving to geological science a more tangible character, and a firmer base than its most ardent admirers would a few years since have dared to hope it would so speedily acquire.

The science of Palæontology is, therefore, not only ardently pursued in Europe by the highest order of minds, but their labors are deemed worthy to be encouraged by the proceeds of certain funds for the advancement of scientific knowledge, but the legislature of New-York alone has had the liberality to cause the organic remains of the various formations to be figured and described in the final report of the geologists. The plan contemplated in describing them, is that of a stratagraphical arrangement, or grouping of all the organic remains a particular series of strata referrible to one geological epoch; and that a student may with the book before him in the field identify at once the rocks he desires to investigate. And so admirably distinct are the grand divisions of the rocks, not in mineral character, but in the fossil groups they contain, that with the clew we shall furnish, no one can easily mistake either of the formations within the limits of the State. To obtain such desirable results, much time and labor is necessarily required in a new and unexplored field. The obscurities of the ancient records of creation are often "perplexing in the extreme," and the naturalist must patiently and minutely trace those slight characters and delicate distinctions which mark a species; make close comparisons with the analogous fossils of distant lands of which the geology is better known, and having thus a clew to the comparative ages of his various formations, he speaks with confidence on the probable occurrence, or the certain absence of coal and some valuable metals, and by a good description and accurate figures of fossil remains, enables every one who takes an interest in the subject speedily to acquire the important knowledge which has been slowly and laboriously gained.

The occurrence of several formations of great thickness between the primary and coal series was unknown in this country before the publication of the first annual reports of this survey. The splendid work of Murchison on the Silurian system, has given intense interest to their investigation, as they nearly all belong to this system, to which I referred them in my first annual report as geologist of the third district, deriving my information from a tabular list of organic remains, published by Murchison in a scientific journal. The appearance of his great work marks a distinct era in geological inquiry, inasmuch as it affords a standard of comparison for a series of the least known and yet most important and universally extended formations of the globe, the same species of shells and corals being found in these rocks in Asia, Europe, Africa and America, and in all latitudes. The series in New-York is far more complete than that of Wales described by Murchison; the formations pre-eminently characterized by their organic contents being three times the number of those illustrated in the "Silurian system."

Caradoc sandstone.

The organic contents of the Caradoc sandstone and Trenton limestone correspond as groups, and the Llandeilo flags are absent. The fossils common to the two groups are embraced in the following list:

Trilobites.

Cryptolithus tessellatus, *Green*, (Trinucleus carractaci, *Murch.*) Calymene punctata, *Wahl.*

Shells.

Strophomena sericea, (Leptæna, *Sow.*) Strophomena alternata, (Orthis, *Sow.*) S. compressa, (Orthis, *Sow.*) Orthis callactis, O. flabellulum, O. testudinaria, Delthyris tripartita? (Terebratula, *Sow.*) Lingula attenuata, Trochus lenticularis, Euomphalus corndensis, (Louisville, Kentucky,) Bellerophon bilobatus, (abundant at Trenton Falls.)

Thus we have thirteen species in the Trenton limestone, which are characteristic of the Caradoc sandstone; thus identifying the formations notwithstanding the great difference in mineral composition.

Salmon river sandstones and shales. By this name I have indicated a formation which over-lies and immediately succeeds the Trenton limestone series, and was the first to shew that it possessed a distinct group of fossil very different from those above or below it. I find not one of these species noticed in Murchison's work, and therefore the formation is probably wanting in Wales.

Niagara sandstone. This name I applied to the red sandstone of Niagara and Oswego, and ascertained that its fossil remains are peculiar to it; the splendid Fucoides Harlani characterising it in New-York, Pennsylvania and Virginia. Though this fossil has not been found in Wales, yet a shell which is peculiar to the Niagara sandstone, Bellerophon trilobatus, (Sowerby,) occurs in the Caradoc sandstone, and in the strata above it we find Tentaculites annulatus, Agnostus latus, (A. pisiformis, *Murch.* pl. 3, fig. 17,) and particularly the Pentamerus oblongus, and P. lævis which characterize the upper part of the Caradoc sandstone in Wales. Therefore, I presume that from the limestone containing the Pentamerus to the base of the Trenton series, all the rocks would be included in the Caradoc formation, according to Murchison's arrangement, but they should evidently be classed in four distinct formations.

Wenlock shale.

This is identical with the shales at Rochester, which abound in the Asaphus limulurus of Green, (A. longicadautus, *Murch.*) The fossil common to both sides the Atlantic are as follows :

Trilobites.

Bumastus barriensis, found by Mr. Hall, Asaphus limulurus.

Shells.

Strophomena transversalis, (Leptæna, *Sow.*) Orthis elegantula, (O. canalis, *Sow.*) O. hybrida, O. sinuatus, (*Sow.*) Orthoceras annulatum.

Wenlock limestone.

Mr. Murchison supposes the Wenlock limestone immediately succeeds to the shale as it doubtless does in Wales, but the two formations are here separated by the following rocks; each of considerable thickness, and with distinct fossil groups : 1. Lockport limestone ; 2 Gypseous shales ; 3. Water lime series. Over the latter we find a blue sub-crystalline limestone, and then a gray shaly limestone, which together appear to represent the Wenlock formation, both in fossils and mineral character. The comparative list is as follows :

Trilobite.

* Calymene bufo, *Green*, (C. macropthalma, *Murch.*)

Shells.

Strophomena euglypha, (Leptæna, *Sow.*) S. rugosa, (Leptæna depressa, *Sow.*) Atrypa prisca, (A. affini, *Sow.*) A. lacunosa, (Terebratula, *Sow.*) Pentamerus galeatus, (Atrypa, *Dal.*) Atrypa bidentata, (Terebratula, *Sow.*) Conularia quadrisulcata, † Tentaculites ornatus.

CORALS.

Aulopora serpens, Millepora repens, Favosites gothlandica, F. fibrosa. The Cyathophyllum dianthus, C. turbinatum, Syringipora bifurcata ? are found only in the limestones above the shaly limestone, and se-

---

* This occurs more abundantly in the Ludlow equivalents.

† This shell is found only in the water lime series under the Pentamerus galeatus.

parated from it by five formations. 1. A blue limestone well marked by the remains of a large species of Crinoida resembling a Scutella in form. 2. Oriskany sandstone, with a most singular group of large brachiopodous bivalves, of which not one is figured by Murchison. 3. Fucoidal brown sandstone. 4. Grit, which is the Lower Ludlow rock of Murchison. 5. Black limestone.

Lower Ludlow Rock

The position of this I have indicated above, but there are other formations higher in the scale which have different fossils, yet evidently analogous to those of the Lower Ludlow rocks. The comparative list in the grit is as follows:

Shells.

Phragmoceras arcuatum, Lituites biddulphii, Orthoceras pyriforme, Spirorbis tenuis.

The Lituites biddulphii has the spirorbis impressions upon it just like the specimen figured by Murchison.

One of the finest geological sections in the whole range of the Silurian system occurs at Schoharie, where fortunately the organic remains have been collected in great numbers by my friend John Gebhard, Jun. whose zeal is worthy of all praise. Through him I have obtained rare and valuable specimens for the use of the survey, and still more valuable information regarding the stratagraphical position of some of them. It may be interesting to some persons to have a knowledge of this section, and I therefore subjoin it, and embrace some of the fossils of the Helderberg in the same table.

Black slate, ...	Posidonia, Orthoceras linteum.
Gray limestone, ...	Odontocephalus selenurus, (Asaphus, *Eaton*,) Platyceras dumosum, Delthyris acuminata.
Blue limestone, ...	Favosites gothlandica, Cyathophyllum vermiculare, Syringipora bifurcata?
Black limestone, ...	Calymene Rowi, Asaphus laticostatus, Atrypa naviculoides.
Grit, ...	Calymene platys, Lituites biddulphii, Phragmoceras arcuatum, Orthoceras pyriforme, spirorbis tenuis, Pleurorhyncus cuneus.
Brown sandstone, ...	Fucoides cauda-galli.
Oriskany sandstone, .	Atrypa elongata, Delthyris arenosa, Strophomena unguiformis.

Blue limestone, ...	Delthyris, (new species,) new forms of Crinoidea.	
Gray shaly limestone	Asaphus pleuroptyx, Delthyris macropleura, Strophomena costellata, S. rugosa, Atrypa prisca, Conularia quadrisulcata, Calceola, (new.)	
Blue limestone, ...	Pentamerus galeatus, Atrypa lacunosa.	
Shale, ...	Astrocrinites,	Water lime series.
Black limestone, ...	Asaphus micrurus,	Water lime series.
Shale, ...	Cytherina alta, Tentaculites ornatus,	Water lime series.
*Shale, ...	No organic remains,	Water lime series.
Shale.	Favosites gothlandica,	Water lime series.
Graywacke, ...	No organic remains.	

Each of these formations is marked by a wide terrace suggesting the idea of a stair case on a large scale. This adds much to the picturesque beauty of the scenery at Schoharie, when viewed from a distant point.

Descriptions of new species of organic remains.

TRILOBITES.

Odontocephalus selenurus.

In Mr. Gebhard's collection I was fortunate enough to discover the thoracic plate of this trilobite, and a whole specimen from Auburn has proved that the tail of Asaphus selenurus, and the head of Calymene odontocephalus belong to the same trilobite. The thoracic plate has teeth-like angular projections which interlock with another set on the front margin of the buckler, which I have deemed a generic character in conjunction with the peculiar form of the ribs and the still more singular shape of the tail which has two long spines. Mr. Gebhard had drawn the inference that the two nominal species were identical in consequence of their frequent occurrence together in the rock. This trilobite characterizes a limestone above the grit which contains the Lower Ludlow fossils.

Asaphus Hallii.

I have given Mr. Hall's name to a species of Asaphus found by that geologist, at York, Livingston county. The lower part of the abdomen and tail are well preserved, but there is no line of division between the

* Mr. Gebhard found his fine specimen of strontian and barytes in this shale.

two. No portion of the original crust remains. It may thus be characterized; ribs numerous, narrow, prominent, with a longitudinal groove tuberculated on the margins; ribs of the middle lobe somewhat angulated in the middle, the angle pointing downwards; margin of the tail regularly rounded, with a broad flat depression between it and the ribs, finely striated. A buckler was found in the same locality, which is probably of this species. It has a general resemblance to the buckler of A. longicaudatus of Murchison, but the oculiferous tubercles are far larger.

Acidapsis tuberculatus.

A very small species much like a Limulus, especially in the tail which is a long spine; the angles of the buckler are elongated; the whole surface of the buckler covered with unequal pustules; on each side of the middle lobe are two short elliptical tubercles. It is very dissimilar to the species described by Murchison, and much smaller. I found one specimen in the shaly limestone or Wenlock equivalent, near Clarksville, Albany county, in the bank of a stream.

Acanthaloma.

This is a fragment apparently of the buckler of a most singular species; it is elongated into a curved spine and has a row of spines along the front, and three spines on the opposite side of the prolongation. not uncommon in the shaly limestone near Clarksville.

UNIVALVE SHELLS.

Platyceras.

I propose to group in this genus the Pileopsis tubifer, *Sowerby*, P. vetusta, *Sowerby*, the Nerita haleotes, *Sowerby*, and perhaps Bellerophon cornu-arietis. The shells are suboval or subglobose, with a small spire, the whorls of which are sometimes free and sometimes contiguous; the mouth is generally campanulate or expanded. I have seen a species above the Silurian rocks, though they probably occur above them in Europe, and they are never found in the Lower Silurian strata, They characterize the middle portion of the system.

Platyceras dumosum.

Shell covered with thick tubular spines arranged in longitudinal rows; margin of aperture waved; volutions free.

Localities. Near Clarksville, Albany county, and at Schoharie, in the limestone which contains the Asaphus selenurus of Eaton. It also occurs in the Moscow shales in Livingston county. In some varieties the spines are comparatively few.

Platyceras ventricosum.

Shell ventricose; aperture very large and campanulate; volutions three, contiguous, depressed below the upper margin of the large whorl.

Locality. Near Clarksville. Occurs abundantly in the shaly limestone or Wenlock equivalent.

Platyceras Gebhardii.

Differs from the last, in having a much larger and more prominent spire which is longitudinally carinated near the apex and with distinct transverse undulated striæ. Found at Schoharie by John Gebhard, Jr. in the same limestone which contains the preceding species.

CYRTOCERAS.

Cyrtoceras trivolvis.

Shell large, rounded; with transverse waved lines of growth; septa numerous.

Locality. Schoharie; Mr. Gebhard.

Cyrtoceras Matheri.

Resembles the last, but the transverse ridges are more prominent and distant, they meet at an angle on the middle of the back.

Locality. Found with the preceding, by Mr. Gebhard.

Phragmoceras spinosum.

Shell with two rows of foliated spines.

Locality. Schoharie; Mr. Gebhard. Occurs in the grit which contains the Lower Ludlow species.

BIVALVES.

Pleurorhyncus cuneus.

Shell triangular, with radiating ribs; umbonial slope oblique, anterior side cuneiform, rostrated; anterior dorsal margin straight, oblique, thick; sub-margin broad and separated from the disk by a deep groove.

Localities. Near Salem, Albany county, and at Schoharie. They most abound in the grit above mentioned, but also occur in a black limestone above, and more rarely in the gray limestone over the latter. This is the fossil well known as the bilobite, which is a crushed specimen.

Calceola plicata.

Shell longitudinally striated; plicated towards the aperture, the margin of which is waved.

Locality. Schoharie; Mr. Gebhard. Occurs in the shaly limestone.

Delthyris macropleura.

Shell large, with about six broad rounded ribs finely striated longitudinally; middle of the superior valve with a very broad and prominent rib, and there is a corresponding depression on the opposite valve.

Localities. Near Clarksville and Schoharie In shaly limestone, abundant.

CRINOIDEA.

* *Lepocrinites Gebhardii.*

By this name I introduce a singular fossil found by Mr. Gebhard. The body is composed of plates of unequal sizes, a few of which have ambulacra, connecting this fossil with the echinodcrmata; lower half of the column apparently solid and traversed by a pentangular canal.

T. A. CONRAD, *Palæontologist.*

* For geological position, see table of Schoharie fossils.

LETTER

From W. W. Mather, transmitting his Fourth Annual Report.

Brooklyn, Con. Dec. 27, 1839.

To his Excellency WILLIAM H. SEWARD.

MY DEAR SIR :

I enclose herewith the Fourth Annual Report on the Geological Survey of the First District of the State.

It contains the results of my observations on the economical geology of Sullivan, Ulster, Delaware, Greene and Schoharie counties. Many important facts have been observed, that were before unknown. The discovery of fine building stones and marbles, favorably situated for exploration and transportation : the tracing the stratum of flagging stone rock to a great distance, a material that was supposed to be confined to a small area ; a similar fact in regard to the water limestone of Ulster county, and which is ascertained to be inexhaustible ; the discovery of extensive bodies of peat, a combustible second only in value and usefulness to coal beds : the notice and discovery of mineral springs ; and the examination of supposed mines, the proprietors of which have been discouraged from the further expenditure of capital, where there were not indications to warrant exploration ; are among the useful results of the survey during the past season.

I have the honor to remain,

Very truly, your ob't serv't,

W. W. MATHER,

Geologist First District, New-York.

FOURTH ANNUAL REPORT

Of W. W. Mather, Geologist of the First Geological District of the State of New-York.

To his Excellency WILLIAM H. SEWARD.

SIR :—

Since the last report, I have been engaged in exploring the geological phenomena of the counties of Sullivan, Delaware, Ulster, Greene and Schoharie.

Of the twenty-one counties of the First District, sixteen have now been examined, viz: Suffolk, Kings, Queens, Richmond, New-York, Westchester, Putnam, Dutchess, Columbia, Rockland, Orange, Sullivan, Ulster, Delaware, Greene and Schoharie.

I had supposed that so much of the next season would be devoted to the geological survey, as would complete four years from the dates of the several commissions, and perhaps more than this, to enable the various individuals, not only to complete their field labors, but also their final report of the survey. It is now understood that the survey will close on the first of July next. As there are five counties in the First District which are yet unexamined, they cannot be explored in the short time remaining, with the same degree of attention that has been bestowed upon the others, and which I should give to these, had I the time I had expected.

PRELIMINARY OBSERVATIONS.

The general physical features and aspect of the country, as well as the agricultural and mineral value, are dependent on its geological structure and mineral composition. There are four distinct groups of rock formations in the region examined the past season, each of which demands consideration in an economical point of view, and which also presents many points of the highest interest to science.

The subjoined nomenclature of these rock groups is presented as local, and one of convenience merely, as the divisions are thus easily traced. Although there is scarcely a doubt as to what formations in Europe these are equivalent, yet, I have thought it preferable to describe groups of rocks as they are, instead of striving to identify them with those of other countries, which must necessarily differ from them in some respects. Geological equivalents can be settled in a permanent manner, when all the facts of superposition, and the more or less local extent of subordinate strata, shall have been definitively ascertained.

B. Fossiliferous series of Rocks.

(1.) The lowest in the series is the *Hudson River Slate group*, consisting of slates, shales, and grits, with interstratified limestones, all of which occur under various modifications. This group is overlaid unconformably in many places by the various rock formations of more recent origin.

(2.) The next in order of superposition, in the district under examination the past season, is the *Shawangunk grits*, including the associated red and green slates, shales and grits.

(3.) The next in order is the *Helderberg group*, which is composed of various strata of common and hydraulic limestones of various colours and textures, (enclosing a great variety of fossil remains,) interstratified with grits and shales. It includes the limestones of the Helderberg, of Schoharie, Saugerties, Kingston, and the valley of the Delaware and Hudson canal to Carpenter's Point, on the Delaware.

(4.) The *Catskill Mountain group* terminates the series of *indurated rocks* in the First District. This group consists of white, gray and red conglomerates, with gray, red, olive, and black grits, slates and shales. Some of the strata in the lower half of this group, abound with the impressions and casts of fossil shells, while those of the upper half contain the impressions and casts of numerous plants, some of which are similar to those of the coal beds of Carbondale.

The tertiary and alluvial formations complete the series of rocks under examination this season, in the First District. The groups and formations will be discussed in order, beginning with the most recent.

Economical Geology of Sullivan, Delaware, Ulster, Greene and Schoharie Counties.

The economical results of the survey, with as little of scientific detail as possible, are brought before the public in the annual reports. It has been thought proper to retain most of the strictly scientific matter, until the *final report*, to insure greater certainty in the results, from long continued, more extended, and better matured observation.

Topographical character.

The general aspect of the country where the *Hudson River group* forms the surface, is hilly, with a good soil, though often very broken and stony. The hills rarely exceed three or four hundred feet above the Hudson. The Shawangunk mountains, Marlborough mountain, Huzzy hill, and the range of high hills between the two latter, and between the Wallkill and the Hudson are from 600 to 1,100 feet high.

The *Shawangunk grits*, and the strata between these and the Helderberg and Schoharie rocks, are high rolling hills, with a cold, and frequently a stony soil.

The limestone and slate lands of the *Helderberg group* are rolling, with a good soil, and very productive for wheat and other crops. The strata are generally nearly horizontal, but through the valley of the Delaware and Hudson canal, and from Kingston to Coxsackie, the rocks are upheaved, and sometimes overturned. Many parts of this region are very rough and broken.

The *Catskill mountain group* forms the high mountain region of Greene, Ulster, Sullivan, Delaware and Schoharie counties. The streams flow in deep valleys which seem to have been formed by erosive action, since the strata in most instances correspond on the opposite sides of the valleys. There are some exceptions, where there are indications of great fractures and rents of the strata, which traverse the country for many miles, and give direction to the streams. The soils on this formation are generally good, but as the country is very heavily timbered, much time, labor and expense are required to bring them into use.

The tertiary and alluvial lands are level, or with small hills. The former are generally terraces of nearly level land, at an elevation of 10 to 150 feet above the streams in the valleys.

Alluvions.

These deposits are in constant process of formation, by a great variety of causes in action at the present time. The two most important alluvions in the counties under examination, may be classed under the names of *fluviatile* and *marsh alluvions*.

A large portion of the *low* lands along the rivers, creeks and smaller streams, which are so generally celebrated for their fertility, and which vary in texture from clay through loam and sand, to gravel and pebble beds, belong to fluviatile alluvions. The most extensive deposits of this class, in the counties under examination, are those on the Wallkill, extending from below Springtown, by that village and New-Paltz, to near Libertyville: those of the Rondout river, near Rochester, Wawarsing and Ellenville; those of the Esopus creek, from Marbletown, by Hurly and Kingston, to near the Esopus Falls; those of the Catskill and Katerskill creeks; and the Schoharie flats, which extend with slight interruptions, from the mouth of Kripplebush kill, by the villages of Central Bridge, Schoharie and Middleburgh Bridge, to 4 or 5 miles above the latter place.

The Schoharie flats have long and justly been celebrated for their exuberant fertility. The soil contains a mixture of such materials as makes sandy, gravelly and argillaceous loams, with a suitable mixture of animal, vegetable and calcareous materials. These flats are frequently overflowed by freshets, and the soil is thus renovated by fresh additions of animal, vegetable and mineral matter. The soil, in consequence of these additions, is less rapidly deteriorated by constant tillage than it would be under the common skinning and exhausting modes of cultivation, in which the produce of the land is taken off and nothing returned to it, to serve as aliment to the succeeding crops.

There is another class of fluviatile alluvions in the counties under examination, as yet unsusceptible of cultivation; but these deposits are gradually approaching a state, in which they may be expected to become productive and valuable lands. These are the mud flats, at, and near the mouths of the various streams that flow into the Hudson river; the shoals of sand, gravel and mud, in the re-enterings of the shore, and where eddy currents are formed during the flux and reflux of the tide; and where the tidal flow is checked by the current of the river. These deposits are continually increasing in extent and thickness, not only by the deposition of earthy materials, but also by the constant accumulation of vegetable and animal matter, from the successive growth and decay of various organic products.

The most extensive and important of these alluvial flats, may be classed as *deltas* on a small scale, and they extend some distance above and below the mouths of the Rondout, Esopus and Catskill creeks. The smaller flats are too numerous to mention, but the mud that has accumulated on them, and which is generally uncovered at low ebb-tides, is well adapted for use by the farmer on his soils as a manure. It is believed that this material, which is loaded with organic products, will soon be extensively used for improving the farms adjoining the Hudson river.

Marsh Alluvions.

Peat and bog iron ore are the principal marsh alluvions in the counties under examination. No beds of swamp and "lake marl," like those of Orange, Columbia and Dutchess counties have been observed the past season. The peat bogs are not very numerous. The principal ones are as follows:

	Cords.
1. The summit of the Delaware and Hudson canal, between Wurtzboro' and Red bridge, in Sullivan county, contains about	50,000
2. A marsh extending down the valley of the Basher's kill, from near Wurtzboro' towards Cuddebackville, and containing probably 1000 acres, with 1000 cords per acre,	1,000,000
3. A bog a few miles west of Ellenville, (did not see it,) say,	100,000
4. The bog in the valley of Three brooks, south of Monticello,	500,000
5. The marsh 1 mile southwest of Monticello, belonging to Hon. Mr. Jones, and others,	50,000
6. The marsh half a mile southwest of Monticello, belonging to Hon. Mr. Jones,	8,000
7. The marsh half a mile west of Monticello, belonging to Hon. Mr. Jones,	10,000
8. Several marshes between Monticello and Bridgeville, on the Neversink,	60,000
9. Bog between Dashville and Esopus, on the north end of the Passant Binnewater, say 40 acres,	40,000

	Cords.
10. Bog 1 mile north of the above, on the north branch of the south fork of Black creek, in Paltz, Ulster county,	10,000
11. Bogs on Black creek, near the Poughkeepsie and Paltz turnpike, ...	60,000
12. Bog in the valley of the east branch of the Delaware in Roxbury, Delaware county, on Mr. Stratton's farm,..	10,000
13. Bog in Marlborough, on the south road from Marlborough to Pleasant Valley, on land of G. Birdsal, Mrs. Bingham and D. Cassman, in Ulster county,.......	20,000

I would again urge upon our farmers and other citizens, the importance of making use of peat for fuel and manure. It is a cheap and valuable article for fuel, and when properly prepared, it also makes one of the best renovators of the soil.

It has been recommended to burn this combustible in heaps in the field, and scatter the ashes over the ground. A great loss is thus sustained, for the earthy and saline portions only of the peat are obtained, while by far the largest portion of the mass, that part, in fact, that would afford food to plants, is consumed and dissipated in the atmosphere.

The best mode of preparing peat for manure is, to make it into compost heaps, with some lime and stable manure, or, to have cattle and hogs yarded on it, where it is exposed to the weather and frost. In order to set this matter in a proper light, and enable our farmers to profit by the experience of others, I subjoin two letters to Dr. Jackson, the State Geologist of Maine, from gentlemen who are strictly practical farmers, and who are considered among the best farmers in Massachusetts.

" *Lexington, January* 30*th*, 1839.

"DEAR SIR :

"I herewith send you a sample of my peat. I am very desirous of availing myself of the benefit to be derived from a chemical analysis of the same, which you kindly offered to make. A more intimate knowledge of the nature and properties of peat, which can be obtained only by a scientific examination of its constituent parts, would enable farmers more justly to appreciate this valuable species of land. It is from a want of this knowledge, that our extensive tracts of low meadow and swamp lands have hitherto been esteemed of little or no value. Allow me to say, sir, that I know of no way in which you could render a more essential service to the public, more especially to farmers, than by enabling them to convert their unproductive and unsightly bogs and morasses into luxuriant fields and sources of wealth. I consider my peat grounds by far the most valuable part of my farm; more valuable than my wood lots for fuel, and more than double the value of an equal number of acres of my uplands, for the purposes of cultivation.

"In addition to these, they furnish an inexhaustible supply of the most essential ingredient for the manure heap. A statement of the uses to which I have appropriated peat lands, and my management of them, though very imperfect, may serve to give you a partial conception of their value and uses, and at the same time enable you to see how important it is that the farming community should have more information on this subject.

"In the first place, they are valuable for fuel. I have for twenty years past resorted to my peat meadows for fuel. These, with the prunings from my fruit trees, and the brush from my uncleared lands, have given me my whole supply. The prunings and brush are bound in bundles and housed; and with the help of a small bundle of these faggots, and peat, a quick and durable fire is made. It gives a summer-like atmosphere, and lights a room better than a wood fire. The smoke from peat has no irritating effect upon the eyes, and does not in the slightest degree obstruct respiration, like the smoke of wood; and it has none of that drying, unpleasant effect of a coal fire. The ashes of peat are, to be sure, more abundant, but not more troublesome, and are less injurious to the furniture of a room, than the ashes of coal.

"The best peat is found in meadows, which have for many years been destitute of trees, and brush, and well drained, and where the surface has become so dry, and the accumulation of decayed vegetable matter so great, that but little grass or herbage of any description is seen upon the surface. If the meadows are suffered to remain in a wet and miry condition, the wild grasses and coarse herbage will continue to grow, and the peat be of a light and chaffy texture, filled with undecayed fibrous roots. By draining they become hard, and the peat becomes compact and solid, and the cutting out and carrying off greatly facilitated. A rod square, cut two splittings deep, each splitting of the depth of 18 inches will give three cords when dried. It may be cut from May to September. If the weather in autumn be very dry, the best time for cutting will be from the middle of August to the middle of September. If cut the latter part of summer, or early in autumn, it dries more gradually, and is not so liable to crack and crumble, as when cut early in summer. The pieces are taken out with an instrument made for the purpose, from two to three inches square; and if of good quality, will shrink about one half in drying. It is considered a day's work for a man, a boy, and a horse to cut out and spread a rod square. The man cuts it out, and lays it upon a light kind of drag made for the purpose, and it is drawn off by the horse, and spread by the boy as thick as the pieces can lay singly. After becoming dry enough to handle without breaking, it is made into piles, cob-house fashion, of from 12 to 20 pieces in a pile. It will then require about four weeks of dry weather to render it fit to be housed for use. The top, or turf, is thrown back into the pits, from which the peat is taken; and if well levelled, and the ground drained, it will, after the first year, give a large crop of foul meadow, or other lowland grass. Peat taken from land which has been many years drained, when dried, is nearly as heavy as oak wood, and bears about the same price in the market.

"The value of peat and swamp lands for tillage, is now pretty well known, and acknowledged. Some years since, I occasionally sold to my neighbors a few rods of my peat land, yearly, to be cut out for fuel, at three dollars per rod, being at the rate of four hundred and eighty dollars per acre; but finding this sum to be less than its value for cultivation, especially when laid to grass, I have declined making further sales at that price. I have raised upon my reclaimed meadows seventy-five bushels of corn, five hundred bushels of potatoes, or from four to five tons of the best hay, at a first and second cutting to the acre, at a less expense of labor and manure, than would be required to produce half this crop upon uplands. To render these lands productive, they should be thoroughly drained, by digging a ditch around the margin of the meadow, so as to cut off the springs, and receive the water, that is continually flowing in from the surrounding uplands. If the meadow be wide, a ditch through the centre may be necessary, but this will be of no use without the border ditches. This being thoroughly done, and the surplus water all drawn off, the next step is to exterminate the wild grasses, and herbage of every kind, that grow upon the surface. To effect this, the method heretofore generally, and now by some pursued, is to cover with gravel or sand, top dress with manure, sow the grass seed, and then rake, or bush it over. This, for the first year or two, will give a good crop of hay ; but after this, I have invariably found that the more coarse and hardy kinds of wild grass would work their way through the sand, or gravel, and entirely supplant the cultivated grasses—when the whole must have another covering, or be adandoned as worthless. If to be planted with corn, or any of the root crops, my course has been to turn over the turf or sward with a plough having a wrought iron share or coulter, ground to a sharp edge, in the dryest season, say in the month of September, roll down as hard as possible, carry on in the winter a sufficient top dressing of compost, twenty cart loads to the acre, and in the spring plant with corn or roots without disturbing the sod. When the corn or roots are taken off, the surface is made smooth with the cultivator, or hoe and harrow, and late in November, or just before the heavy frosts set in, sow with herds grass and red top seed, half a bushel of the former and one bushel of the latter to the acre. The field is then rolled, which completes the process. If the plough does not turn the sods smooth, it will be necessary to follow it with the bog-hoe, to level the uneven places. By keeping the sod undisturbed in the cultivation, a more firm and compact surface is formed, upon which horses or oxen may work, generally, without danger of miring. If the land is intended for grass, without the intervention of a hoed crop, the turf is turned over with the plough, as before stated, in August or September, or as early as the surface becomes dry enough to admit the oxen or horses upon it ; then follow with the bog-hoe, and turn over such parts as the plough has left unturned, make the whole smooth with the hoe, and late in November spread on a dressing of compost, not less than twenty cart loads, made half of loam and half of stable manure, to the acre ; then sow the grass seed, and bush and roll down. If the ground be miry, so as to render the use of the plough impracticable, the bog-hoe must be resorted to, and the whole turned over by hand, and top dressed and seeded to grass, as above stated. The cost of turning over with the hoe will be twenty dollars per acre, at the usual price of labor. This mode of culture completely subdues the natural wild grasses, and gives a compact and rich surface of vegetable mould, which will give an abundant crop of the best English hay, for four or five years, without the aid of more manure. If the sod is disturbed, and attempted to be pulverized, in the course of the cultivation, the surface, when laid to grass, will be loose and spongy ; an extra top dressing of loam and manure will be required, and, after all, the surface will not become so compact, nor the produce by any means so great.

"Should meadows be found too soft and miry to admit of their being ploughed in the summer or autumn, and the expense of turning with the hoe should be thought to be too great, I would advise ploughing in the spring, when the frost is out to the depth of three or four inches, carting on manure, and then sowing or planting at a convenient and proper season. The art of reclaiming these low meadows, consists in taking off all the surplus water by judicious draining, and in thoroughly exterminating the natural herbage and grasses. This being effected, we have our rich bottoms equally as productive as the deep alluvials of the west, and obtained at a cost and sacrifice infinitely less.

"The third particular in which peat lands may be considered valuable to the farmer, consists in furnishing him with a very important ingredient for his compost. Peat is made up principally of decomposed vegetable substances, with a portion of the lighter particles of vegetable mould, washed in from the surrounding highlands. But when taken fresh from the pit, it contains certain antiseptic properties, injurious to vegetation, which must be absorbed or neutralized, by a combination with other substances, in order to render it food for plants. This may in some measure be effected by exposure to the action of the air and frost. Where the surrounding uplands are composed of gravel and sand, the peat or swamp mud may be called silicious, and is less valuable for manure, especially if the adjacent uplands rise abruptly: when composed principally of clay, the peat is aluminous. This is frequently found resting on beds of marl, and is considered much richer and more valuable for the compost heap.

"I have annually, for some years past, used on my farm some hundreds of loads of peat mud, which is either thrown into my hog-sty, or mixed with fresh stable dung, or with lime. When mixed with green stable manure, the proportions are two parts of peat mud to one of dung; and I am confident, from repeated experiments, that a load of this compost, well mixed and fermented, will give as great a produce, and a more permanent improvement to the soil, than the same quantity of stable manure. In this opinion I am not alone. Other accurate and intelligent cultivators have made similar experiments with similar results.

"The vegetable substances of which peat is composed, having been decomposed in stagnant waters, they have not passed through a putrefactive fermentation, and are therefore supposed to retain much of their natural oils, gums and acids. Peats, in this region are also supposed to contain portions of sulphate of iron, or copperas, oxide of iron, &c. This opinion is formed from noticing the difference between the effect produced by using the peat mud on grounds when first taken out of the meadow; and that which is produced after fermentation, with stable manure, or mixing it with lime. The ashes of peat have little or no perceptible effects when used alone, but by mixing them with lime, they become a valuable manure.

"That our peat may possess other and different properties, which are in a greater or less degree injurious to plants, is highly probable. These can be detected and remedied only by the aid of science. It is to the agricultural chemist, that the practical farmer must look for a development of his resources, to remove the obstacles which impede his progress, and to impart that information which will give confidence to action, and a successful issue to labor.

"With an earnest desire that you may persevere in your useful labors,

"I am, dear sir, with the highest respect,
"Your obedient servant,
(Signed) "E. PHINNEY."

The other letter is also subjoined.

"Dear Sir:

"Being much indebted to you for information in regard to the use of peat, as a manure, and the mode in which its acid properties may be not only neutralized but made a valuable food for plants, I beg leave to state, that in the fall of 1836, I took from my bog about three cords of peat, and placed it in a pile on the nearest solid land, in the woods. It remained there undisturbed until sometime in November, 1837. By the action of the *frost* of the preceding winter, and the heat of the summer, it had lost much of its adhesive property and was greatly reduced in weight.

"I now brought it home, and while one was unloading, another sifted in lime with the hand, (it having been previously slaked to a fine powder,) at the rate of one bushel to a cord of peat. Lime having been thus scattered evenly through the whole mass, nothing further was done to it until about the middle of the next May. Observing, after the manure had been removed from the barn yard, that a considerable quantity of water from the rains had collected itself in the lowest part of the yard (say six or eight barrels,) I had the peat removed into it. The garnet coloured wash of the yard was rapidly and entirely absorbed. I allowed it to remain in this situation until the first of June, during which time its colour had changed from mahogany to jet black. Fermentation did not take place.

"By the successive action of the frost, lime, and the wash of the yard, the sensible qualities of the peat had very much changed. When first taken from the bog, it was pulpy and very adhesive—could be spread like butter; now it was a fine powder, having entirely lost its peculiar adhesive properties.

"I used the manure thus prepared, for squashes—planting fifteen rods of ground, very sandy and much exposed to drought. After the manure had been dropped, (one shovel full in a hill,) I sprinkled a little lime in each hill, directly upon the peat. Upon this, I planted the autumnal marrow squash. The seeds came up well, and the plants were of a healthy colour. Some of the plants were destroyed, and all of them badly eaten by insects; the yellow bug was most destructive. The plants, after they had recovered from this shock, grew more rapidly than any that I had before witnessed. The colour of the vines, and the rapidity with which they covered the ground, were most convincing proofs to my mind that they were perfectly healthy, and well supplied with nutriment. In the severe drought which came on in the summer, these vines, for many weeks, did not appear to suffer, while others of a similar kind in the neighborhood, were dead and dying. The result was, that notwithstanding the long continuance of the drought, in which nearly all our potatoes, peas, &c. were killed, these squashes were preserved, and yielded a middling crop.

"I also used the compost, as above, on interval land, near the Connecticut river, soil alluvial, no stones or gravel, can be easily compressed, does not bake in the sun, has been cultivated more than one hundred and fifty years, and yields a very scanty crop without manure. The compost was spread over the ground, and ploughed in, at the rate of nine cords to the acre of ground; thus prepared, I planted thirty rods with sugar beets—distance between the rows eighteen inches—

hills eight inches—one seed in a hill. The seeds proved bad, not more than one-third coming up; yet I had 116 bushels of beets; while above an acre of the same land, manured with the best stable manure, at the rate of twelve cords to the acre, did not produce one hundred bushels. Two rows of potatoes were planted next the beets; the land had been designed for beets, and was prepared precisely the same. Between these two rows, and more than an acre immediately adjoining, (where a large quantity of the best barnyard or animal manure was used,) there was a very perceptible difference in favor of the former. I also planted a few hills of potatoes on very sandy land, in the latter part of June. Into the hills I put peat, which had been saturated with lye from the bottom of a soap-tub—no lime. The tops of these potatoes, during the whole drought, were of the most living green, and the most luxuriant growth that I ever beheld. They were killed by the frost in the fall, before maturity—the potatoes were small.

"In conclusion, I would mention, that I am so well pleased with the result of these experiments, on a small scale, that I am now preparing one hundred and fifty cords of peat, and fifty casks of Camden lime, and all the animal manure I can make, to enrich as fast as possible, my whole farm.

"*Expenses*—I get out my peat by ox-team and cart. Three men can, in this way, get out eight cords per day, $4,00; price of lime, $1.50 per cask. My peat being three and a half miles from my barn, that portion of it which I bring home, I estimate to cost me, for carting, one dollar per cord. The peat and the lime for the compost—using one-third of a cask of lime to a cord of peat—there cost me, on the ground near the peat bog—three cords of peat, $1.50—one cask of lime, $1.50; that which I cart home, one dollar per cord more.

"I intend to put about one-sixth part of animal manure, but as it cannot be purchased in any adequate quantity, it is more difficult to fix a price. The nearest place where livery stable manure is sold, is four miles; price there, per cord, $3,00—cost of carting, $1.50.

Five cords of peat, delivered,....................	$7 50
Two and one-third casks of lime, delivered,.......	3 50
One cord livery stable manure, do	4 50
	$15 50

divided by six—the number of cords, not estimating the increase of quantity from the bulk of the lime—gives the cost, two dollars and fifty-eight cents, delivered, or one dollar and fifty-eight cents per cord, at the peat bog.

(Signed.) SAMUEL KEEP."

The importance of peat lands, and their value for fuel and manure, has been urged in the preceding reports on the Geological Survey. The results obtained by practical men, by an application of those principles, will, it is hoped, lead many of our farmers to avail themselves of the bountiful provision of nature for the benefit of their lands. The value of peat bogs may be stated in a few words.

1. Peat is equal in value to oak wood, bulk for bulk.
2. Peat lands are more productive by far, than uplands.
3. Peat manure is more valuable than stable manure.

Bog Iron Ore.

This ore has been found in numerous places, but few localities promise to be of any economical importance.

In Sullivan county, shot ore was observed, but not abundantly, between Monticello and Forestburgh; also, shot and solid bog ore, on Mr. Hamilton's farm, 2½ miles southwest of Monticello. At both these localities, the ore contained black oxide of manganese, sufficient to give it a black colour.

Bog ore occurs on the flats at Deposit, on the Delaware, but as it was in Broome county, and out of the boundaries of my district, I did not visit the locality.

A bed of iron ore was examined near the Delaware, in the township of Tompkins, 4 miles above Cannonsville, Delaware county, on land owned by Mr. Maples, and by a widow lady, whose name is not remembered. Judging from the surface indications, there may be some hundred, perhaps some thousand tons.

Near the village of Delhi, Delaware county, bog ore was observed in some quantity, on the lands of Mr. Titus and Mr. Sherwood. It was discovered by Mr. James Foote, a young man, who has explored the country around with much care. He reported it to be two feet or more thick, and it was seen in so many places in the meadows, as to induce the belief that a stratum of bog iron ore underlies the soil of the flats and mill-pond over many acres.

Bog ore was also observed on the flats of the Delaware, on land of Mr. Bela Frost, 2½ miles from Delhi, on the road to Bloomville.

Dr. Henry Marshall, of Kortright, to whom I am indebted for much local information and many kindnesses, informed me of a locality of bog iron ore on the land of Mr. Rich, near Roseville, opposite the mouth of Betty's brook, Delaware county. The ore is said to be abundant.

Bog ore is said to have been ploughed up on the flats of the Wallkill, near Paltz, Ulster county. The locality has not been explored, and the quantity is not known.

Alluvions from Springs.

Calcareous tufa has been observed in several localities during the past season. The most important one is at Sharon Springs, in Sharon, Schoharie county. Several springs, (most of which are strong hepatic or sulphuretted waters,) rise from the ground, and are more or less loaded with carbonates and sulphates of lime, magnesia and iron. The carbonate of lime is the principal deposite, and a mass of tufa, averag ing two hundred yards in length, fifty in breadth, and about ten in depth, (or probably 100,000 cubic yards of rock,) has, in the course of time, been precipitated from solution in these waters.

The springs rise from the pyritous slates lying under the Schoharie or Helderberg limestone series, and which we shall have occasion to discuss in another place.*

Helices, leaves of trees, and various plants, are constantly being imbedded in this rock, and the most beautiful specimens of incrusted moss, and the tufa, under various imitative forms, containing shells and vegetable impressions, can be procured.

Another locality of calcareous tufa is about 1¼ miles west of Schoharie, on the road to Cobleskill. It is loose, and can be shovelled up. It may be called a tufaceous marl, and is adapted for agricultural uses.

* These slates, in the northern part of Schoharie county, almost deserve the name of *barytic* slates, for sulphate of baryta is found in some abundance in them, and has been observed in them in several places, by Mr. John Gebhard, jr. This gentleman was engaged as an assistant on the survey of Schoharie county, and it is in a great degree owing to his indefatigable researches, and minute local knowledge, that I am enabled to speak of many things in that county that would have remained unobserved.

Another is near a limestone spring, by the locality of fibrous sulphate of baryta, in Carlisle, Schoharie county.

Another is at the foot of a ledge of limestone, on the banks of Stoney creek, on land of David Schoonmaker, in the township of Rochester, Ulster county.

These localities are all situated at or near the junction of the pyritous slates with the Helderberg limestone series.

Calcareous tufa is frequently employed for making lime for stucco work and "hard finish;" because in whiteness and purity, it is superior to most other limes.

TERRAINS DE TRANSPORT.

The tertiary and diluvial formations are found in the valleys of all the streams in the district under examination; but as it is difficult to draw any line of demarkation between them, in consequence of the absence of fossil remains, they are in this report classed under the comprehensive and significant term of terrains de transport.

These deposits consist of stratified beds of pebbles, gravel, sand, loam and clay; and by means of the transported fragments and the composition of the clays, we can trace the direction from which these materials have been transported.

The gravel and pebble beds afford fine paving stones, and the sand beds, materials for mortar and the brick manufacture; but the clay beds are far more valuable. The clay beds in the valley of the Schoharie creek, have the same characters as those of the Hudson river, while those of the Delaware and Susquehanna are entirely different.

Bricks are extensively manufactured in Greene and Ulster counties. The principal places of this manufacture are Coxsackie, Athens, Glasco, Catskill, &c. and the average aggregate number made in these two counties may be estimated at 20,000,000 of bricks per annum.

The range of the main body of the tertiary clay and sand beds in Greene and Ulster counties, is from a few miles north of Coxsackie, by that village and the landing, up the Coxsackie and down Murderer's creeks, to Athens, thence to Catskill, and thence down the Hudson four or five miles, with a variable breadth, from 100 yards to two or three miles. It occurs again at Saugerties, ranges by Glasco, near which it leaves the Hudson and passing among the limestone and slate hills which are as islands, it ranges by Kingston, Bolton and Eddyville. From Rosendale it ranges across the northeast point of the Shawangunk mountains, (the grit rock of which disappears beneath it,) south to the Wallkill, and a few miles up that stream.

The clay and loam lands of this formation have long been held in high repute, but it is only within a few years that these light and sandy soils have begun to be appreciated. They are easy lands to till, and by means of plastering and clovering, they make soils of the best quality.

IV. CATSKILL MOUNTAIN SERIES.

The next group of rocks in the district under examination, and the most recent of the consolidated formations, is that which lies between the Helderberg limestone series, and the coal bearing rocks of Carbondale in Pennsylvania. It contains the "olive sandstones," "dark coloured shales," and "black slate" of groups 8 and 9 of Mr. Conrad's Report of 1839; and formations viii. ix. x. and xi. of Professor Rodger's Report on the geology of Pennsylvania for 1838, viz: the part of the "olive slates" above the limestone formation, the "red sandstones and shales," the "sandstones and conglomerates," and the "red shale of the anthracite coal regions."

The Catskill mountain series consists of coarse and fine grits, grayish, greenish and various shades of red and brown, which lie thick bedded, with water lines of deposition strongly marked where a cross fracture exhibits the structure; conglomerates of various degrees of coarseness, grayish, greenish and red; slaty sandstones, with slates and shales of various colours, as red, green, spotted, gray and black.

Testacea are the principal fossils of the lower, and plants of the upper portions of the series.

The general arrangement of parts of this series is

1. Conglomerates and coarse grits.
2. Red shales, slates and grits.
3. Gray slaty grits.
4. Chocolate grits with red shales and slates.
5. Gray grits and bluish shales, among which are the flag stones.
6. The olive slates and shales over the Helderberg series.

This formation occupies the county of Delaware, and by far the largest portions of the counties of Sullivan, Ulster, Greene and Schoharie. Seams and layers of pure anthracite have been observed in some places, and fossil plants similar to those of the coal beds of Carbondale have been found, not only in the shales associated with the anthracite, but also abundantly in the grits and slaty sandstones of the middle and upper parts of the series. These strata are all, perhaps, below the coal bearing rocks of Pennsylvania, and it is not considered probable that coal will be found in useful quantity in them; still, some parts of the upper portions bear so much resemblance to the anthracite coal rocks of Pennsylvania, both in mineralogical character and fossil remains, that it is thought *possible*, that coal beds of workable thickness may be discovered.

The Catskill mountain group is exceedingly barren of useful minerals.

Small quantities of copper, lead, zinc and iron ores were seen extensively diffused in a particular stratum of rock, in various parts of Greene, Ulster, Sullivan and Delaware counties, but the stratum was nowhere more than eighteen inches thick. It was generally a calcareous conglomerate or breccia, formed of small masses of limestone, imbedded in a reddish or brownish paste of the underlaying shale bed.* Sometimes the rounded nodules are of carbonate of iron, and more rarely of galena, blende, sulphuret of copper, and the green and blue carbonates of copper. Black oxide of manganese in a earthy form was also seen. This stratum, although thin, seems to be co-extensive with the formation in which it was observed. The underlaying shales, and the overlaying slaty grits, frequently abound with vegetable impressions, the original vegetable matter of which is sometimes converted into anthracite, and sometimes replaced by blende, oxide of iron, black oxide of manganese, black sulphuret of copper, or by the blue or green carbonate of copper. Although these materials were observed in several places, as in Franklin, Delhi, Roxbury, Windham, Durham, Monticello, &c. yet, no lo-

* This stratum when exposed to the weather becomes more or less porous and cellular, from the solvent action of the water upon the calcareous ingredient. Considerable quantities of it are seen scattered over the fields, and it has acquired the name of *fire-stone* in some of these counties, in consequence of its resisting the effects of common fires, not cracking to pieces. Almost all the common grits of the country, when heated, burst to pieces with loud explosions, or else exfoliate and crumble by heat.

calities were seen where they existed in such apparent quantities as to be of any economical importance.

One of these localities on Gooseberry hill, ¾ of a mile east of Delhi, in Delaware county, has been called the coal mine. It is a seam of the gray slaty grit, about eight inches thick, containing many imperfect vegetable impressions. In some of these, the original plant is changed to anthracite, in others, it is replaced by earthy black oxide of manganese, by crystalline sulphuret of zinc, by sulphuret of copper, (black,) or by the carbonate of copper. None of these minerals are in any valuable quantity, and it is difficult even, to procure a fair suite of specimens. The upper part of Gooseberry hill is said to be about 450 feet above the Delaware, which flows at its base, and is composed of gray slaty grit, some of which splits out in plates ¼ to ¾ inch thick. Some of these plates have been used for covering the roof of a log building instead of shingles. They are not heavier than the large slates, or the common tiles, are indestructible and impermeable to water. They may, perhaps, be used for roofing at some future time, if they can be got out of regular sizes and shapes, and pierced for nails without too much waste and expense.

Another of these localities of copper ore was examined on the land of Judge Beach of Franklin, Delaware county. Here are the same beds of slaty grit and of shale filled with vegetable impressions, as were observed on Gooseberry hill, also a similar bed of breccia or conglomerate, containing the carbonate of iron, and the blue and green carbonates of copper. A few rods below is what has been called a mineral spring, though I could not by *tasting*, detect any mineral qualities. It had acquired the name of a mineral spring, in consequence of some person from New-York, (who stated that he was engaged on the Geological survey of the State, but who had no connection with it,) having assured the proprietor that it was a valuable mineral spring. It is a tolerably copious spring of very pure water, and which had been in use by the Indians, long before the settlement of the country by the whites.

The copper mine, as it is called, in Roxbury, Delaware county, is on the land of Mr. Leonard, on the Beaver-dam creek, about 3½ miles from Roxbury village, on the road to Mooresville. A little copper ore was observed in the beds of shale and conglomerate. Whether the supposed body of ore was expected to be discovered in the bed of shale, or in a vein which appears as a broad fissure in the rocks, is not now known. This "mine" was opened before the French war of 1755, and re-opened in 1827 or 1828. Indications of copper are said to have been very distinct, when last opened, by gentlemen in whom I can place confidence. Scarce any traces of copper are visible among the rubbish of the mine at the present time. The son of the owner informed me that the Germans who came there last to open the mine, some years since, tried the water of a spring from the hill side, and found it to contain copper. He gave their mode of trial as follows. "Water from the spring was boiled down to a small quantity in an *iron kettle;* a silver sixpenny piece was then introduced, and taken out coated with copper." Any one acquainted with the relative chemical affinities, knows this to be impossible, as the copper, if any, would be precipitated by the iron of the kettle. Copper would precipitate silver from solution, but silver would not precipitate copper under such circumstances. Some deception must have been practised, if the above statement of the process be correct.

Another mine, a "silver mine" as it was called, was showed me on the bank of Dry brook, about three miles above Arkville, which is at the junction of the Bushkill and Dry brook, with the east branch of the Delaware. A handsome adit has been excavated at the juncture of the gray grit with the red shale, leaving the former rock as a solid substantial rock roof. At the end of the adit, which penetrates horizontally some 30 or 40 feet, a shaft has been sunk, and it is said that rooms of some size have been excavated in the rock below, but the shaft was full of water, so that nothing more could be examined than the adit. The mineral which is supposed to have caused this excavation, was common pyrites, which abounds at the junction of the grit and shale. It decomposes readily, causing the shale to crumble away by its decomposing action and the crystallizing power of the resulting salts. Copperas (sulphate of iron,) was observed in some abundance efflorescing from the surface of the rock, and could be scraped off in handsful. The excavation was made many years ago by some Germans, and silver is reputed to have been obtained, but I saw no traces of any other ore than the common iron pyrites, (bisulphuret of iron.) Col. Noah Dimmick of Arkville, had the kindness to pilot me to the locality.

Mr. James Foote and Mr. Wood of Delhi, brought me specimens of the black sulphuret, and of the blue and green carbonates of copper, in the gritty shale containing vegetable impressions. If the stratum from which they obtained their specimens is of the thickness of two feet, and as rich as the specimens they exhibited to me, it would be important for exploration. As they did not communicate to me the locality, I can form no judgment of its importance.

A "coal mine" has been opened in Sullivan county, about 1½ miles west of Red Bridge, which latter place is where the line between Ulster and Sullivan is crossed by the Delaware and Hudson canal. It is a bed of black carbonaceous shale, 4½ to 5 feet thick, with thin seams of anthracite interlaminated, from the thickness of paper to that of thick pasteboard. The shale contains vegetable impressions similar to some of those at Carbondale. It has been opened on the right bank of the Sandberg creek, about 30 feet deep in the dip of the strata, and a seam of pure anthracite *is said* to occur in the shale, six to nine inches thick. I did not see this, the mine being filled with water. A shaft has been sunk — feet, with the expectation of striking the coal at the depth of aboout 150 feet, and of finding it there to be thicker. The strata dip about 30° to 40° to the west-northwest, and there is so little back to the seam, at such depths as would be of easy drainage, that if a coal bed of 5 feet thick could be found there, it is perhaps doubtful whether it could compete successfully with the Carbondale and other coal beds of Pennsylvania. It could not perhaps be drained without expensive and powerful steam engines and pumps, to a greater depth than 200 feet, giving a back of about 100 yards in the direction of the outcrop, or 100 tons of coal per yard in length of the seam for each yard in thickness.

It is presumed there are no seams of workable coal in this vicinity, still, if there is a coal formation in the portion of the State under my examination, it will probably be found in this region. From the Shawangunk mountains westward by the mine, the whole series of rocks in this part of my district, are upturned on their edges. The rocks at the mine are 1,000 to 1,500 feet above the fossiliferous slaty grits. These grits abound with the most beautiful fossils, about ½ mile east of the mine. At no great distance westward of the mine, the strata become nearly horizontal, conforming to the general position of this series of rocks in Sullivan, Ulster, Greene, Delaware and Schoharie counties.

Flagging stones, grindstones, &c.

The only rock of the Catskill mountain series that is applied *extensively* to useful purposes, is a bluish gray slaty sandstone, which is quarried as a flagging stone. It has various local names, as the Saugerties, Kingston, Coxsackie, and North River flag stones. This stone forms a stratum which is generally about two feet in thickness, and can be split out in slabs of from 10 to 100 square feet, and from one to four inches thick. The rock is traversed by joints that divide the slabs about perpendicular to their layers, and smooth as if cut by a saw. There are two, sometimes three sets of these joints which divide the rock into regular blocks, and facilitate the labors of the quarrymen. Similar joints traverse the whole rock series under examination, (viz: the Catskill mountain group.) These joints are remarkable for their smoothness, and are nearly uniform in their directions.

The stratum of flag stone is from 700 to 1,000 feet above the Helderberg limestone series. It is quarried in Sullivan county for the supply of that and Orange counties; but the principal quarries are in Ulster, Greene and Albany counties. It has been estimated that fifty loads per day pass through Kingston to the landing for five months in the year, for shipment to New-York and other places, which would give about 900,000 feet as the amount shipped from Kingston. Saugerties, Coxsackie, Bristol and New-Baltimore, send in the aggregate about 2,500,000 feet more. The aggregate amount of flagging stone quarried in Sullivan, Ulster, Greene and Albany counties, may be supposed to be about 3,500,000 feet per annum.

The principal quarries near Kingston, are owned by Judge Hasbrouck, who leases them to the quarrymen for $5 per M feet, and as each square yard will give on an average from 50 to 70 feet, each acre may be conceived to yield 300,000 feet, and thus give the proprietor a clear income of $1,500 per acre, from land which was purchased a few years since for one dollar per acre.

This rock ranges from the Delaware river, through Sullivan and Ulster counties, nearly parallel to the Delaware and Hudson canal, to within 4 or 5 miles of Kingston; thence nearly parallel to the Hudson to opposite Saugerties; thence around the Catskills to the mountains east of Rensselaerville; and thence westward through Schoharie county, a distance of about 140 miles, without reckoning the winding line of outcrop, in consequence of various irregularities of the ground.

The flag stone rock, like many others of this series that do not disintegrate by exposure to the weather, frequently forms terraces, and in many places it is but slightly covered by soil, or by a thin stratum of rock which is similar to this, except that it does not split as regularly. The quarrymen select such places as present the least obstruction to working, and are nearest to good roads leading to the Hudson river. The strata lie nearly horizontal, pitching very slightly to the northwest from the Delaware to Woodstock,* then westward to east of Rensselaerville, then southwestward and southward to Summit in Schoharie county.

Other varieties of the grits of the Catskill mountain series are quarried to some extent for *grindstones*, for which some of the strata are well adapted. *Rubstones* or *whetstones* of various degrees of fineness, hardness and sharpness of grit, might be procured, and have been obtained in Monticello, on both branches of the Delaware, and on the Beaverkill and Willewemack river. Grindstones are quarried in Cobleskill and Fulton in Schoharie county.

Some of the shales that crumble by exposure to the weather, would, it is believed, be useful as mineral manures or marls on the lighter soils of this region. They contain more or less lime and some pyrites, and by decomposition would form a portion of sulphate of lime or gypsum. There are numerous strata of red, gray and black shales in this formation, that crumble easily, and when quarried, require nothing more than exposure to the frosts and weather to prepare them for strewing over the soil.

Beautiful building stones have been quarried from the Catskill mountain series in many places, which come out of the quarry in regular layers, from 6 to 15 inches thick, with faces along the joints of the rock perpendicular to the layers, and smooth as if sawed. They have been particularly noticed in Meredith and Kortright, in Delaware county, and near the mouth of the Willewemack river, in Sullivan county.

Brine springs, licks, &c.

Salt water occurs in the Catskill mountain series in Delaware, and probably in some of the other counties. Deer licks are numerous in Delaware county, but these are not always an indication of salt water, for wild animals will lick the clay and rocks where there is almost any soluble saline substance. Salt is said to have been formerly made by the hunters on the farm of George Dane, 3½ miles from the village of Col-

---

*From the Delaware to Wawarsing, the strata next the valley of the Delaware and Hudson canal are all upturned at a high angle, and the flag stone stratum throughout this distance is upheaved in the same way as the adjacent rocks.

chester, on the east fork of the west branch of Downes' brook, near the road from Walton to Colchester. The water was scarcely perceptibly saline at the time of my visit; but deer and cattle constantly resort to it to drink the water.

A salt well was bored to the depth of 394 feet in the valley of Elk creek, about 3½ miles from the village of Delhi, at one of the Deer licks, and salt water was obtained, which increased in strength, in proportion as the well was sunk to a greater depth. The water is a pretty strong brine, and carburetted hydrogen is constantly rising in bubbles through the water in the well. The amount of the supply of the water, and its exact strength were not measured. Several hundred barrels of salt have been made at this well, and it is said to have been very white and a superior article for table use.

Ten bushels of salt were made per day with two cords of wood in eight kettles, as I was informed. Wood is cheap in the vicinity, and if the supply of water is abundant, the well could probably be worked with profit for the local supply of the country around, if not for a more distant market. All the salt used in that region is now brought from the Erie canal, or from the Hudson river, a distance of 60 to 80 miles.

The water of this salt well when kept a few days, smells like free iodine, and probably the water may contain this substance in some form of combination, and perhaps in some quantity.

It is thought that salt water in useful quantities may be obtained, by boring to some depth in the valleys of either branch of the Delaware. The rocks between the Susquehanna and the Catskill mountains dip slightly towards the valley of the Delaware, and in Schoharie county they dip southward, giving a basin shaped form to the stratification. It is a fact that has been forced upon my attention by extended observation, that many of our salt well districts in the United States, are in depressions of the strata; in other words, they are within the undulations, as troughs or basins in the strata.

Whatever be the origin of the salt water of our salt wells and licks, whether from salt in mass, or disseminated in the superincumbent rocks, as some of my colleagues and others believe, or from the water of the ocean, (for there is indubitable evidence that it formerly covered all these rocks,) the *fact* that *salt water* is *generally* found in such depressions of the strata, is believed capable of demonstration.

Mineral Springs.

A chalybeate spring was observed between Sidney Plains and Unadilla, on the left hand side of the road that leads up the left bank of the Susquehannah.

A similar one was seen between Unadilla and Franklin, in Delaware county.

Another, discharging a considerable quantity of water, occurs in the meadow of the brook, about 2 miles from Bloomville, on the road to Kortright-Centre, on land of Nehemiah Every, Delaware county.

Chalybeate waters flow from the marsh on the Beaverdam flats, $\frac{1}{4}$ mile above the mouth of Stratton's falls brook. Most of the springs are now covered over, in consequence of a bed of gravel and stones having been swept into the Delaware,* during the heavy freshet of last winter, by the Stratton's falls brook, and which has dammed up the former stream about two feet.

Mr. Reed, of Hancock, informed me of a mineral spring in that township, on the east branch of the Delaware, on Mr. Thomas' farm, three miles above Shahocton, in Delaware county. From the description, it is probably a sulphur spring. I did not see it. Ferruginous deposits, indicating chalybeate springs, were observed in many places along the route of the Erie rail-road, between Shahocton and Deposit, but most abundantly within four or five miles of Shahocton.

Another chalybeate spring was seen on the farm of James Weed, in the township of Walton, three miles above the village, in the valley of the west branch of the Delaware, in Delaware county. Bog ore is deposited from this water.

A sulphur spring rises from the alluvial gravel over the slate rocks of the Catskill mountain series, on the bank of   creek, about

*The upper part of the east branch of the Delaware, above the mouth of the Bushkill and Dry brook, is called the Beaverdam creek. Its name is appropriate, as it was formerly dammed up in many places by the beavers, which were once numerous on this stream. Long narrow ponds, of nearly still water, were formed in this way, and sometimes, also, by causes similar to that above mentioned, viz. by alluvial action.

¾ of a mile west of Greenville, Greene county, on land of Francis Hikok, Esq. It is well located, within a few miles of the Hudson river, in a highly cultivated country, and in the bracing air of the Catskill mountains.

A chalybeate spring was observed three miles from Oak-Hill, on the road to Freehold, north of the turnpike, on the farm of Walter Barlow. The owner did not know of it until informed.

A mineral spring is said to occur near North-Blenheim post office. I did not see it.

A sulphur spring was visited in Rensselaerville, Albany county, in the valley of Fox creek, three miles from Preston Hollow. This is a moderately strong hepatic water, and flows at the rate of a gallon in four or five minutes. It is much used by the people in the vicinity. It is said to be somewhat diuretic in its effects. The spring is on the farm of Mr. Weeden.

III. HELDERBERG LIMESTONE GROUP.

This group embraces a series of limestones, varied in mineralogical character, in chemical composition, and which abounds in fossil remains. It contains subordinate beds of shales, slates and silicious grits. It skirts the group of rocks last described, in a parallel zone, and underlies them, it is supposed, through their whole extent.

This formation extends in the district under examination, from Sharon Springs, in Schoharie county, by Schoharie, to the northeast part of the Helderberg mountains; thence southeast, to near New-Baltimore; thence southwardly, by Catskill and Saugerties, to Rondout; thence up the valley of the Rondout, by Rochester, Wawarsing and Ellenville; thence on through the Mamakatting valley, by Cuddebackville, to Carpenter's Point, on the Delaware. At the latter place, it passes out of the State of New-York into New-Jersey, and crosses the Delaware into Pennsylvania, at the Walpack bend of the Delaware, according to Professor Rogers.*

This formation varies much in its subordinate beds in different localities, particular beds being either entirely wanting, or replaced by others; but its fossil contents are nearly uniform. Mr. John Gebhard,

* Vide Professor Rogers' 2d Annual Report on the Geological Survey of Pennsylvania, p. 56.

jr. of Schoharie, who was the assistant for Schoharie county, has examined this group with much attention for several years, and he has a more perfect collection of the fossil remains of its various strata than any other individual.

The Helderberg series is a part of Prof. Rogers' "olive slate group," or formation No. 8, in his 2d report on the geological survey of Pennsylvania; No. 7 of Mr. Conrad's synopsis of the rocks of New-York, in his 2d palæontological report, or as he conceives, the upper part of the medial silurian strata of Mr. Murchison. It is also the upper limestones and water limestone series of Prof. Vanuxem's 2d annual report on the geology of New-York.

The lower strata of this series of rocks consists of various beds of common and hydraulic limestones, varying much in thickness and quality, even in contiguous quarries. These strata sometimes rest unconformably upon the Hudson slate group, as at Lawrence's quarry, on the Rondout, opposite Wilbur; sometimes conformably on the Shawangunk grit, (mill-stone grit of Eaton,) as at Rosendale and Lawrenceville, on the Rondout; sometimes on the red and variegated shales and grits that overlie the Shawangunk grits, as at the High Falls of the Rondout, in Marbletown; and upon the shales and grits of Schenectady, and the north part of Schoharie county.

The following section, most of the details of which were procured by Mr, John Gebhard, jr. indicates the principal masses of this group at Schoharie.

1. Grey calcareous sandstone, abounding with fossils.

2. Corniferous limestone, containing many layers and courses of nodules of chert and hornstone.

3. Cocktail grit of Dr. Eights, characterized by fucoides caudagalli.

4. Sparry limestone,* highly crystalline in texture, and containing many fine fossils.

5. Shale.

6. Pentamerus limestone, capped by a thin silicious stratum, containing many fine fossils.

* This limestone, called by Mr. Gebhard, sparry limestone, is very different in aspect and geological position from that called by this name by Prof. Eaton. Mr. G's. sparry limestone will have a suitable name when its fossils shall have been described by Mr. Conrad.

7. Tentaculite limestone.

8. Water limestones.

9. Pyritous slates.

Near New-Baltimore, Coxsackie, and thence on by Catskill, Kingston and Rochester, the principal masses of this formation are similar to those of Becraft's mountain, near Hudson, and contain the pentamerus limestone, tentaculite limestone, and water limestone. In some places the sparry limestone* and shale are found in addition to the preceding, which are the principal extensive strata of this formation, in the district under examination this year.

Economical applications of the materials of this group.

The materials in the Helderberg limestone group, that are applicable to useful purposes, are,

1. Limestones, for building stone.
2. " " marbles.
3. " " common lime.
4. Cement rock for hydraulic lime.
5. Pyritiferous slate, for alum, copperas and sulphate of lime.

Building stones and marbles.

The pentamerus, tentaculite and water limestones, all afford fine building stones, which can be procured in blocks of large size, perfectly solid, and free from cracks or flaws, in many parts of the range of these rocks, which extends in a curved line 140 miles. Through this long distance, the outcrop of these rocks is not concealed more than 20 or 25 miles, and this only at intervals of a few miles, where they are covered by the tertiary and alluvial deposits of the Mamakatting valley, between Rochester and the Delaware river at Carpenter's point.

Numerous quarries may be opened near to water transportation, for the supply of the New-York and other markets, from the "High Rocks" above Kingston point, by Rondout, Eddyville, Rosendale, Lawrenceville, High-Falls, Rochester and Wawarsing, and which shall be within a few rods to one half mile of canal or river navigation.

Strata of these rocks are from a few inches to 3 feet thick, from which the stone can be taken out in regular and sound blocks of almost any desired size.

* See note on page 237.

These stones vary from ash gray to black, and present almost every shade between these colours. Blocks may be selected of uniform texture. As handsome stones can be procured here as at the celebrated Amsterdam quarries, where so many are quarried for the Erie canal, and for the Albany, Troy and New-York markets.

The blocks from some of these beds are susceptible of a high polish, and will undoubtedly make as handsome and valuable black and dark coloured marbles, as those at Glenn's-Falls and Swanton.

Lime and hydraulic cement.

Quick lime is made from particular beds of every part of the Helderberg series. It is not made in such quantities as to deserve particular notice. In Schoharie county, it is supposed that about 20,000 bushels are made annually for manure, building, and for the supply of Delaware county, which it is believed has no beds of limestone suitable for burning.

Between Wilbur and Eddyville, are four limekilns for making quicklime, belonging to Mr. Hamilton and Mr. Dubois. These kilns are supplied with limestone from strata that lie between strata of cement rock. They are on the bank of the Rondout, and offer every facility for easy transport. These and other kilns in Ulster county probably make 40,000 bushels per annum.

The beds of limestone that yield hydraulic cement are extensively worked in the vicinity of Kingston, Rosendale, Lawrenceville and High-Falls.

Lawrence & Austin,	2	kilns	between Kingston landing and Eddyville.
Benjamin & Co....	2	"	and steam mill for grinding.
Taylor & Little,...	2	"	between Kingston landing and Eddyville.
Thaddeus Phelps, .	3	"	" " "
McNulty & Chapman,	2	"	" " "
Whiting & Weeks,	2	"	" " "
Dusenbury,.......	1	"	at Eddyville.
White & Co.	15	"	between Kingston and Rosendale.
———, ...	2	"	at Bridgeport, near Rosendale.
Flint, ...	3	"	1½ miles north of Bridgeport.
Lawrence & Co...	13	"	at Lawrenceville, near Rosendale.
O'Neil,..........	2	"	on Coxen-clove creek S. W. of "
———, ...	2	"	on Rondout above Lawrenceville.

Isaac Hasbrouck, . .	4	kilns	High-Falls of Rondout.
Tho's D. Robinson,	2	"	¼ mile above High-Falls.
————, ...	3	"	4 or 5 miles above High-Falls.
Total number, ...	60		

There are 60 kilns for the manufacture of cement, each of which, on an average, may be estimated to yield 40 barrels per diem, when in operation. Most of the kilns are in operation as perpetual kilns, during the warmer season of the year, when the Hudson river is navigable. In June last, it was estimated that 600,000 barrels of cement would be sent to market from those kilns during the past season. It was said that 500,000 barrels were manufactured there during the previous season. The Croton water works and the various government works consume large quantities of this cement, and its uses for various hydraulic works and for cisterns, wet cellars, &c. cause a continually increasing consumption. It is shipped to all our Atlantic ports and to the West Indies.

White's quarries and kilns are the most numerous, and turn off about 600 barrels of cement per diem. Mr. White contracts with the quarrymen to quarry and burn the stone for 25 cents per barrel, while he furnishes the fuel, (dust anthracite from screened coal,) delivered at the kilns, removes the cement to the mills, grinds and barrels it.

The kilns are built something in the form of a high furnace, except the hearth, which has a sloping sole of 40° to 45° from the back of the kiln to the floor of the drawing arch at the base. These kilns are kept in perpetual operation several months, and are charged like a high furnace. The dust anthracite and broken cement rock are charged, as usual in perpetual kilns, twice in 24 hours, each charge being introduced in successive layers at the top of the kiln, after a quantity of cement has been hauled out from the sole of the kiln, into the shed next the drawing arch. About a ton of dust anthracite is used daily in a kiln that burns 40 barrels per diem. The kilns are usually built double or triple, that is, two or three, or even more, are built in one stack, one set of men being sufficient to attend several kilns. Some have roofs over them, others have not, but *all* have sheds over the drawing arches, in consequence of the necessity of protecting the cement from the weather.

At Lawrence's works, there are two blocks of kilns, one containing 6 kilns and the other 7. The quarries, kilns, mills for grinding, and barrel factory, are almost contiguous, and on the banks of the Delaware and Hudson canal. These works economize labor and transportation more than any others I have seen connected with the cement manufacture, and they turn off from 1,500 to 3,000 barrels of cement per week.

The cement business of Ulster county gives direct employment to at least 700 men, as quarrymen, burners, teamsters, millers, packers, coopers, and those engaged in transporting the article to New-York; and indirectly it affords employment and profit to many others.

When making the reconnoisance, soon after the commencement of the survey, this business had but commenced, and there was no cement manufactured on the Rondout, except at Lawrenceville, and there, but few kilns were in operation. It was not then known to the inhabitants that the cement rock was abundant, except at and near those quarries, until some of them were then informed of its inexhaustible quantities. Even now, few are aware of the great extent of this rock, and still fewer understand how to trace out the situation of favorably located new quarries.

The cement beds and overlying limestones, up the valley of the Rondout, (and in fact north to New-Baltimore,) are very much broken up, upheaved, overturned even, and contorted very much. As the facts connected with this derangement of the strata have a practical bearing, in exposing the cement beds so as to render them capable of being worked with the minimum expense, in a multitude of localities where they would not otherwise be accessible, it is thought proper to introduce some details that would, under other circumstances, have been reserved for the final report.

Between Kingston and Wilbur, the strata are very much broken and contorted, having been traversed by numerous extensive faults and disruptions ;and where these have not occurred, the strata are bent and contorted in a remarkable manner. At some of the quarries on the hill near Wilbur; the strata approach to a horizontal position, but they bend down more and more, until they pitch under the Rondout river, at angles of 40° to 50° and 60°. On the opposite shore, the same strata show their broken ends on the mural precipice that rises from the water, and their dip is slight, and in the same direction as the more moderate dip at the quarries on the top of the hill. The river here flows along a line of fault.

At White's quarries, which are numerous, the rocks generally dip to the east-southeast, at angles from 35° to 45°; but there are some, where the strata are nearly vertical; in one they are reversed and dip 75° to 85° degrees to the west-northwest, and in one they are nearly horizontal. There are generally two or three strata of the cement rock with seams of calcareous slate or shale between, varying from four to twenty feet thick; and again, other strata of the cement are separated by strata of limestone twenty or thirty feet thick. Each hill seems to have been formed by the strata cracking in parallel lines, and then being upheaved or down-heaved on one side or on a diagonal line, while the opposite side or angle remained fixed. The same strata are seen in each hill and in the same order of succession, except in some few cases of overturn, where the strata are reversed.

On Pine mountain, between Rondout and Kingston point, is a high cliff of limestone overlaying the gray grits of the Hudson slate series. The strata of these grits are from 8 to 20 inches thick, homogenous in texture, and divided into blocks by joints, which traverse the rocks in parallel directions with regard to the planes of stratification. The strata of this rock here dip to the east-southeast at angles of 40° to 60°. The overlaying limestone along the brow of the hill and at the cement beds of Hasbrouck's quarries* dip about 80° west-northwest, and this dip continues nearly uniform along this line of upheave to the "High-Rocks" above Kingston point.

At Lawrence's quarry, opposite Wilbur, at the southwest end of the limestone hill on the right bank of the Rondout, is a fine exposure of the different strata, and the Hudson slates are seen *unconformable*, below the limestones.

The following is an approximative section of the rocks at the south-southwest end of that hill.

*** Mr, Hasbrouck has three quarries leased out on Pine mountain, between Rondout and Kingston point. One of them 650 feet in length is leased for $250 per annum, and yields about 40 tons of cement rock per diem, which is sent to Newark, New-Jersey to be burned.**

1.	Fossiliferous limestome like the "middle limestone of Becraft's mountain,"	60 feet.
2.	Fossiliferous limestone, different from the above, and containing hornstone,	50
3.	Compact dark gray limestone, (pentamerus,)	34
4.	Clouded striped limestone,	20
5.	*Cement rock*, (gray,)	2
6.	Compact black limestone,	1
7.	*Cement rock*, (gray,) four strata,	12
8.	Black coralline limestone, (various radiaria,)	8
9.	*Cement rock*, (gray to black,)	8
10.	Limestone, dark coloured, impure and fossiliferous,	8
	Thickness of the limestones and cements,	203 feet.
11.	Hudson slates and grits, thickness unknown.	

At the extreme southwest end of the hill, the strata are much deranged and bent, but a little farther east, at the quarries, and along the face of the cliff, they are finely exposed, dipping at a moderate angle to the east-southeast.

There is an anticlinal axis along the broken ridge between the Esopus creek and the Rondout. The rocks on the northwest of this axis dip to the west-northwest, at a small angle conformable to the general dip of the rocks which overlie them on the northwest side of the valley, and which do not appear to have been much disturbed by the upheaving action that has dislocated and upturned all the rocks east and south of this valley. On the southeast of this axis, the strata are broken and upheaved, dip to the south-southeast, at angles from 20° to 80°, and present successive mural escarpments. There are several anticlinal lines, and lines of fault parallel and subordinate to the main one. One passes through two small lakes in Marbletown. A high mural precipice originating in a fault passes along the east shore, while two long promontories with arched strata stretch far into the lake from its extremities. The same continues to the other pond, and the continuation of this fault and anticlinal axis is easily traced thence by the eye over the whole line of hills, to the summit of the Shawangunk mountain, ranging south 15° to 20° west. This line of fault continues south-southwest by Flint's quarries, between which and Bridgeport, it forms the high mural scarp of mountain on its west side, thence across the country from Bridgeport, with mural escarpments, to a high cliff on the Shawangunk.

Other lines of fault are seen at Lawrenceville, and which may be traced to cliffs on the Shawangunk. Near Lawrenceville, the limestone beds may be seen downheaved, and abutting against the Shawangunk grit (which underlies) by successive faults.

A disruption, or double line of fault, with an included anticlinal axis, may be seen between the upper end of Lawrenceville and the bridge across the Rondout, on the road to High-Falls. It extends south 20° west, to the gap on the Shawangunk mountain, where the same appearance presents itself, and which can be seen on the opposite side of the mountain from many parts of Orange county.

Various sections and diagrams will illustrate these and numerous similar facts in the final report.

Pyritous Stratum.

This rock has but a small thickness in the counties under examination, but in other parts of the State it becomes an important rock, the equivalent, it is believed, of the "gypseous deposit" of Prof. Vanuxem, in the central and western parts of the State. Its geological position in Schoharie, Greene, Ulster and Sullivan counties, is next below the "water limestone series," (lower part of the Helderberg limstone series,) and above the red and green shales that overlie the Shawangunk grits. No beds of gypsum have been discovered in connexion with this stratum in any part of its range in the 1st geological district, but where the lower beds of the water lime series are pyritiferous, as they frequently are, this material might be used with the same useful effects as would be obtained by the use of gypsum.

At High-Falls on the Rondout, in Marbletown, Ulster couunty, this stratum, which is there a slaty bluish limestone, occurs above the red shales that overlie the Shawangunk grit. The following is a section of the rocks at that place, above the bridge, and near the bend of the creek, on its left bank below the falls.

1.	Cement rock,	12 to	15 feet.
2.	Limestone,	10	30
3.	Cement rock,	6	8
4.	*Pyritous slaty limestone,*	4	10
5.	Red shale with green spots, containing nodules and crystals of pyrites, and thin bands of gray compact limestone,	15	20
6.	Conglomerate or Shawangunk grit, unknown thickness.		

The red shale and slate, No. 5 of the above section, may perhaps, for economical purposes, be called a *red marl*. It contains some lime, and there are several thin bands of limestone. The whole of this stratum has the aspect and composition of the red marl rock of Rockland county, described in the third annual report.

The pyritous slaty limestone lying next above, is more or less argillaceous, and loaded with crystallized pyrites, which are continually decomposing and forming gypsum. The mineral thus formed coats the rocks in brilliant druses or flocky and acicular efflorescences. Epsom salts are also formed, if the taste is to be trusted; and Mr. Robinson the owner of the locality, says, that the saline matter sparkles or deflagrates slightly when thrown on red hot coals. This sparkling would indicate the presence of nitrate of lime.

I advised Mr. Robinson to grind some of the pyritous limestone and red marl, as they are easily crushed, and when spread on the ground and exposed to the weather, both would give rise to the formation of gypsum, by the decompositon of the pyrites and the combination of the sulphuric acid thus formed with the lime. The slaty limestone is rich in pyrites, minute crystals of which are disseminated through its mass; and judging from the relative proportions of pyrites and limestone, it is supposed that this material, when ground or crushed might be worth as much for use as one half of its weight of pure gypsum.

Should it ever be deemed expedient to work the stratum, numerous localities might be found in the vicinity.

At Schoharie, near the bridge over the creek, the stratum containing the pyrites is exposed, underlying the Helderberg or Schoharie limestone series. This locality has been long known in consequence of the fine crystals and groups of crystals imbedded in the decomposed clayey green shale.

Many places were observed, where the same crumbling green shale, interlaminated with limestone, and containing an abundance of pyrites, was underlying the Helderberg limestone series. The slate, or dark colored shale, which contains the fibrous sulphate of baryta, lies directly below the pyritous rock in Carlisle and Sharon, in Schoharie county.

It is thought probable that localities may be discovered in the pyritous stratum, where copperas, and perhaps alum, may be manufactured with advantage.

II. SHAWANGUNK GRIT.

This rock varies in texture, from a conglomerate to a fine grained grit rock, and it is almost entirely silicious. It is generally white or light gray in colour, but there is one bed at the upper part of its mass, that is red.

The mountain on which the grit rock abounds has taken its name from the predominant colour of the rock,—the word Shawangunk meaning, it is said, in the language of the aborigines of the country, *white rocks.*

The Shawangunk grit has not a *very* extensive range in the 1st geological district of New-York, but in New-Jersey and Pennsylvania, it is reported by Prof. Rodgers to be more largely developed. It extends in an almost unbroken range, from the New-Jersey line, on the top of the Shawangunk mountains, to Rosendale, near Kingston, a distance of 43 miles, where it disappears beneath the water limestone and the tertiary deposits of the Hudson valley. On the higher parts of the Shawangunk mountains, it generally lies in nearly horizontal strata, often thick bedded, and presenting mural escarpments of broken ends of the strata, 30 to 200 feet high. Some places on the eastern face of the mountain, present the strata with a high dip to the east-southeast; but on the western face, the dip is almost uniformly to the west-northwest and northwest, at variable angles. That part of the range about Wurtsboro', Ellenville and Wawarsing, shows a dip from 30° to 60° to the west and northwest; but with some local exceptions, the dip of the grit rock towards either extremity of the range is less, and does not generally exceed 8° to 15°.

The thickness of the Shawangunk grits is variable, but its maximum is believed to be less than 500 feet, and its usual thickness is from 60 to 150 feet.

The strata are traversed by two great systems of fracture, one longitudinal, and approaching more or less to the direction of the strike, the other transverse. Their usual directions are south 20° west, and north 20° east, for the first, and south 60° east, and north 60° west, for the second.

When the elevatory movement has been along the *transverse* fractures, the dip is sometimes to the north-northeast, but most frequently to the south-southwest; and when the upheave has been along the *longitudinal* fractures, the dip is to the west-northwest or to the east-southeast. The upheaves have generally occurred along both these lines of fracture, giving echelon movements to the masses of strata, so their dip is commonly oblique to the direction of ranges of hills and mountains, and even to the usual line of the emergence of the strata on the surface. The southeast angles of the masses, between the intersecting fractures, are usually elevated, giving mural precipices on the eastern and southern faces of the hills, while the strata dip more or less gradually to the northwest.

The same general principles hold true in the rocks lying lower in the series, as the Hudson slate group, (a part of which are metamorphic,) and the rocks of the Highlands, except that the *southwest angles* of most of the masses of those strata have been highly elevated, giving a high *easterly* dip, and that they have been exposed to a *greater number* of elevatory movements, producing a greater derangement of the stratification.

Most of the streams follow the lines of these two systems of fracture, changing from one to the other to produce many of their changes of direction. I have been enabled to trace some of these lines of fault across mountains and valleys, for many miles.

Metallic veins occur in several places along both these systems of fracture, and it is mostly in consequence of the echelon movements that have occurred in the strata since their first breaking up,* that it is a matter of much practical difficulty to trace out the continuation of metalliferous veins and beds, so as to open them in the most favorable locations.

General and local sections will illustrate these and numerous other interesting and important facts in the final report of the geological survey.

---

* There are distinct evidences of at least three elevatory movements, viz: one (at least) before the deposition of the Shawangunk grit strata; another after the deposition of the Shawangunk, Helderberg and Catskill mountain series, and before the tertiary epoch, and another since that period.

The Shawangunk grit rock has been called "mill-stone grit," by Professor Eaton; and it well deserves the name, both from its uses, and its similarity in texture and mineral composition, to the mill-stone grit of England; but as it has a different position, in the geological series, from that rock, which has now become a term indicating a conglomerate grit in a particular geological position, I have thought it better to use a local term for this formation, viz: *Shawangunk grit.*

Economical applications and mines.

The useful applications of the Shawangunk grits are not numerous. They are, for mill-stones, building stones and glass.

The firm, coarse grits, have been long quarried for mill-stones, and have been extensively used. They are known in market by the name of *Esopus mill-stones.** They are still quarried to a small extent, but since the French buhr stone has been brought into common use for mill-stones, the Esopus stones are in less demand. Many *small mill-stones,* for family use, in grinding corn among the planters of the southern States, are still manufactured and sent to market.

The finer white and gray grits, which frequently resemble granular quartz, are well adapted for the manufacture of glass, and it is believed that the glass factory at Ellenville, Ulster county, makes use of this material. I know it was in contemplation to do so at the time of its erection.

These fine grits would make a beautiful and durable building material, which is as easily dressed as the common granites. Localities were seen, within less than two miles of the canal, where blocks could be procured three to five feet thick, and five to twenty feet in their other dimensions, without a seam, and on which the weather has produced no perceptible effect, during the ages through which they have been exposed. Such rock as this, the engineer may use without fear of hazarding his reputation; and his employer may feel certain that the structures built of it will not crumble down by the ordinary action of the weather in a few years, like some of our public works and private dwellings.

*Esopus was the name of the township and village of Kingston, during the war of the revolution, and as these stones were quarried at no great distance, and were shipped from that vicinity, they have acquired the name of Esopus mill-stones. Esopus is now the name of a township and village a few miles south of Kingston.

It is surprising to see how little attention is paid to the selection of materials for construction. Judging from what has come under my observation, the general impression must be, that *any solid stone may, with equal propriety be put into the walls of buildings.* It is not so, and in our public works and expensive buildings, it is of great importance to select materials that will stand time unchanged. Some granites, limestones, sandstones, marbles and other rocks will stand the vicissitudes of the seasons for ages without any perceptible change; others nearly similar in appearance and belonging to the same kinds of rocks will crumble to sand or powder in a few years. An experienced eye is necessary to judge whether particular kinds of rock ought to be employed for structures that are intended to be permanent.

Metalliferous veins have been found in several localities in the Shawangunk grits. There are traditions that lead ore has been *cut out* of the Shawangunk mountain in many places by the Indians and hunters of former days, and melted to make their bullets. Traditions of this kind are said to have led to the discovery of the lead ores at Ellenville, Red-Bridge, and Wurtsboro'. Lead ore has been discovered at many other points on the western side of the Shawangunk mountains, and in so many places, that it is thought probable a metalliferous vein may be almost co-extensive in length with this range of mountains in Ulster, Sullivan and Orange counties.

The *Ellenville mine* is within one half mile of that village, at the base of the Shawangunk mountain. The vein is one of the transverse breaks of the strata, and ranges south 60° east nearly vertical. The materials filling the vein are nearly the same as the grit rock that it traverses, more or less loaded with pyrites and crystallized quartz, and in some places with blende and galena. The vein is from two to three feet wide, and a copious spring flows from near its junction with the marsh below. The mine was first opened about twenty years ago, and some lead and zinc ores were obtained, that were reputed to be rich in silver. The lead ore was said to have been more abundant in the marsh than where the "mine" was opened, and it is supposed the Indians and hunters obtained their supplies from the marsh. The "mine" has been worked again within a few years by the North American Coal and Mining Company. It has been said that the adit level penetrated 600 feet into the mountain, but no lead ore of importance seems to have been obtained. I should suppose from the mass of rubbish, that the level cannot have been carried so far; and again, they would undoubtedly have perforated the grit rock, and entered the subjacent slate rocks, in less than that distance.

It is a fact well ascertained in mining, that metalliferous veins change in productiveness, and sometimes in the kind of ore, as they pass from one kind of rock to another. The grit rock of the Shawangunk mountains is overlaid by limestone,* and underlaid by the slate rocks of the Hudson river group. Both these rocks are, in general, more metalliferous than the grit rocks; hence, the metalliferous veins of the grit, when traced into those rocks, or when the mines shall have been worked through the grit into them, may probably, be more productive. The limestone was not seen in place at Ellenville, but was observed at no great distance, both up and down the valley, parallel to the mountain, dipping in the same direction, and some sink holes, as they appeared to be, left no doubt on my mind, that the limestone ranged along the valley, between the canal and the base of the mountain, covered by alluvial deposits.

The *Ulster mine* near Red-Bridge, and worked by the North American Coal and Mining Company, is situated on the Shawangunk mountain about one mile east of Red-Bridge, and six or seven from Wurtsboro', at an elevation of 600 or 700 feet above the valley. Two or three openings have been made. The first, which I believe is the uppermost one, I saw in 1837. It had been excavated during the preceding season and winter. It was on a line of fault, where the fractured grit rock abutted against the broken, irregular and bent edges of the slate of the Hudson slate group. It seemed as though the slate rock had been elevated, and its edges by rubbing against the face of the grit, had been broken and bent very irregularly. The space between the slate and grit was filled with a silicious gangue containing quartz crystals in great numbers and of large size, more or less interspersed with masses of blende, galena, copper pyrites and common pyrites. In 1838 the company had driven an adit level to intersect the vein at a depth of — feet. This level which intersects the strata of grit rock in a direction nearly perpendicular to their line of bearing, has been executed in the best manner, and is abundantly spacious, not only for drainage, but for taking out the ore on the most extensive scale, should it be found in quantity. Some lead ore has been obtained from this mine, but the quantity

* The limestone does not often cover the grit rock on the sides of this part of the ountains, but ranges along the valley, superposed in geological position.

is believed not to amount to many tons. Whether this mine will ultimately be a profitable investment of capital, is doubtful; but it is thought that when the vein shall have been followed into the subjacent slate rock, the mine will probably prove more productive than it has thus far. It was intended to re-examine this mine the past autumn, when I could see the results of the explorations of the company for the past season, as it was intimated to me in the spring, that they had determined to expend $10,000 on it this year. As I have not been able to examine it this fall, I hope to do so next season.

The *Shawangunk mine*, is located on the Shawangunk mountain, about two miles northeast of the flourishing village of Wurtsboro', in Sullivan county, at an elevation of 600 or 700 feet above the Mamakating valley. The vein, in many places, has the aspect of a bed parallel to the contiguous strata of the grit rock of the mountain, but from a careful examination, it is believed to be a true vein, which, like some of the veins of magnetic iron ore that were examined in Putnam and Orange counties, runs between the strata, and then cuts obliquely across them, without altering its dip in any great degree. The strike of the vein corresponds nearly to that of the grit rock, but its *aggregate dip* is greater. The strata were observed to be more or less broken and bent, where the vein, after passing between them, crossed them obliquely. The grit rock on the mountain near the mine is traversed by small veins of quartz, which is more or less porous from the decomposition of its contained minerals. The vein on which the mine is worked, varies from two to five feet in width, and the larger portion of its mass, as far as it has been explored, is a silicious rock similar to that forming the roof and floor, except that it contains fragments and particles of greenish and blackish slate. The vein-stone is more or less loaded with blende, galena, copper pyrites, iron pyrites and crystallized quartz. The blende and galena constitute probaby $\frac{4}{5}$ of the metalliferous contents of the vein, and these minerals are in general more or less intimately mixed.

The metalliferous part of the vein is from one to three feet thick in some parts, in others it narrows to a thin almost linear seam; in some places the lead ore, in others the zinc ore predominates. The ore, as an aggregate, may be said to lie in bunches, and the productiveness of different parts of the vein is very variable. When examining the mine last spring, three masses of galena, free from other ores and from gangue, were taken out of the mine, weighing about 800, 1,000 and 1,400 pounds. One of these masses is believed to have been sent to the office of the company in New-York.

This mine is said to have been originally discovered by a hunter, and the first opening was made some 40 or 50 feet from the present shaft of the mine. It was worked from the outcrop of the vein to a depth of about thirty feet, and some tons of lead ore, (it is supposed thirty tons,) were taken out of the mine. This opening was abandoned in consequence of the thinning of the metalliferous part of the vein, and the difficulty of raising the ore through an irregular and sloping shaft. A vertical shaft was in process of excavation at the time of my visit in 1837, and it had reached the vein at that time. Lateral galleries have since been driven on the course of the vein. An adit level was driven perpendicular to the strike of the vein through the intervening strata of grit rock, 52 feet* below the mouth of the shaft, so as to intersect the vein at the distance of about 200 feet from the main shaft. Galleries have been excavated laterally on the course of the vein from the extremity of the adit; and the southern one of these has been connected with the shaft. This adit and the contiguous galleries serve as a drainage level for the upper portions of the mine. Another adit level has been driven into the mountain so as to intersect the vein at a perpendicular depth of 75 feet below the other, and the main shaft is continuous from this intersection, sloping up the course of the vein to where this inclined shaft unites with the vertical one, at the upper tier of galleries. Lateral galleries have been excavated on the course of the vein from the sides of the inclined part of the main shaft, and it was in these that the miners were employed at the time of my visit.

The ore is slidden down the inclined shaft to the lower adit level, whence it is removed to the ore heaps opposite this level. It is there picked and washed, and then sent to the smelting-house on the bank of the canal, which, by the winding course of the road is about one, or one and one-fourth miles.

The adit levels of this mine are spacious, and have been well executed, and as the rocks are indestructible, the preparations for working the mine may be considered as permanent improvements to last for ages, if it should be sufficiently productive to continue working it.

* Vide Prof. Beck's 3d Annual Rep. on Mineralogical Department of the Geol. Survey, p. 49.

There is now a back* with an average depth of perhaps 150 feet on the slope of the vein, ready for removal by the miner, and ready drained, so that if large bodies of ore exist there, they can now be removed without additional expense, except that merely of mining, since all the necessary preliminary expenses have already been incurred.

The advantages of these mines are,

1st. Contiguity to water transportation and nearness of market.

2d. Great depth to which they may be drained without machinery.

3d. Abundance and cheapness of fuel for smelting.

The disadvantages are,

1st. Uncertainty of the quantity of ore.

2d. The more or less intimate mixture of the galena and blende.

3d. The silicious nature of the gangue.

The explorations in progress will demonstrate the probability or improbability of the mines being prospectively productive.

The mixture of the galena and blende offers a practical difficulty in the smelting operation, and various mothods have been tried to effect a separation, so as to be enabled to smelt the ore and obtain the lead; but they have not proved successful up to the present season. At the time of my visit, they were erecting shaking washing tables, which, (if the ore be first crushed or stamped, and then separated into uniform sizes by screens of different degrees of fineness,) it is presumed will be successful.

The process for separating the blende or zinc ore, will also separate the greatest portion of the silicious matter, so that if the shaking washing tables effect the separation, the future value of the mines will depend only on the quantity of ore.

There is a strong probability that there are valuable deposits of lead ore in the Shawangunk mountain, since so much lead ore has been taken from this and other mines, and from its having been found in so many places.

The zinc ore in the Shawangunk mine, as far as it has been worked, is believed to have exceeded the lead ore in quantity. At the time of my visit, they were taking out large quantities of both these ores.

* The "*back*," in mining phraseology, means the mass of a vein that has not been removed, and lying above the galleries that have been opened.

It is thought probable that the ores may prove more abundant, and richer in lead, when the workings shall have reached the slate rocks that underlie the grit, but as the vein does not dip at a much greater angle than the strata, it is not probable that these rocks would be reached in this mine, without penetrating to at least the level of the valley, or 500 to 700 feet below the present workings.

The lead ore of this mine contains some silver, but I have not ascertained the proportion. I cupelled a few grains of the lead obtained from some of the ore. A small but distinct globule of silver remained. Prof. Beck, of the mineralogical and chemical department of the Geological Survey, has since cupelled some of the ore and obtained silver.* Whether it exists in such quantity as to make its separation a matter of importance is not ascertained.

Pyritous grit.

In some places, the upper strata of the Shawangunk grit, are more or less loaded with pyrites. Occasionally this mineral forms a large portion of the rock, constituting the gangue, in which the pebbles and finer grains of silicious matter are embedded. Boulders of this variety of the grit rock were observed scattered over the country in the counties of Orange and Ulster, southeast of the Shawangunk mountains, and boulders of precisely similar appearance and composition were seen on Long-Island near Sand's-Point, and in other places.

A locality of this pyritous grit was examined south of Rochester, Ulster county, where the rock contained pyrites, and had been reputed to be a *silver mine.* A small excavation had been made. The only use to which it could be applied would be the manufacture of copperas; but it is not sufficiently abundant there to warrant any expenditure. This locality is near the base of the Shawangunk mountain, and one fourth of a mile south of the Mule kill, in the township of Rochester.

Red rock of the Shawangunk group.

A stratum of red rock has been mentioned as lying on the top of the Shawangunk grit. It is observed covering it in several places, but it is usually thin, and varies in texture from a compact hard red grit, to a red crumbling shale. The former may be seen in crossing the mountain between Bloomingburgh and Wurtsboro, about one fourth of the

* Vide Assembly Document No. 275, for 1839, p. 51.

distance up the mountain on its western side. It may also be seen in several places between this locality and the New-Jersey line.

On the road between the Shawangunk lead mine, and the smelting house, the red rock is seen as a crumbling slaty sandstone of a chocolate colour.

At the High falls of the Roundout, in Marbletown, Ulster county, the red rock is a shale and fine slaty grit, spotted with green, and interlaminated with thin bands of limestone. It is there covered by the water-lime series of the Helderberg limestone group.

South of Rochester, Ulster county, near the locality of pyritous grit mentioned above, is a red shale passing into a red clay* by exposure to the weather. It covers the white rock in patches in this vicinity. The grit rock is here waved in gentle swells, along axes of elevation which are subordinate to the two main axes of the Shawangunk mountains.† It is thought probable that beds of iron ore may be found in connection with this rock, which is highly ferruginous and frequently pyritiferous. Iron ore abounds in some parts of Pennsylvania and New-York in a similar geological position.

---

* The clay beds and loams of maay parts of the valley of the Rondout, and of this part in particular, are reddish, as is supposed from the intermixture of the materials derived from the "red rock."

† The fact of two great systems of fracture in our rocks, which approach to regularity of direction within comparatively narrow limits, and that the southerly ends of masses of strata are almost constantly elevated along the traverse lines of fault, while the proper axes of elevation follow the other or longitudinal lines of fracture, has already been adverted to. The results of these combined elevations, are echelon movements of the strata to a greater or less extent. The successive ridges sink gradually to the northeast, until they disappear, while they are frequently succeeded by other ridges, which are not in the exact lines of prolongation of the former, but obliquely lateral to them. These in turn sink, and so on. If the faults are numerous, a serrated or broken outline is given to the ridges. The Shawangunk mountains are less broken than any others with which I am acquainted, and which have been upheaved along an axis of elevation; bnt several breaks may be observed in them. These mountains continue with but slight breaks, from the New-Jersey line near Carpenter's-Point, to opposite Ellenville and Wawarsing, in Ulster county, where this ridge is crossed, by great breaks and faults. The ridge then sinks and rapidly disappears beneath the valley, while several subordinate parallel axes of elevation spring up on the east at about the same height, run northeastward between the Stony kill, Mule kill, Sanders kill, &c, sink down gradually towards the mouths of those streams, and finally disappear below the valley in Rochester and Marbletown, or show their continuation only by low broken ridges of upheaved limestone. These axes of elevation are terminated, apparently, on the south, by the high cliffs along the transverse lines of fault.

I. HUDSON SLATE GROUP.

This group consists of a series of slates, shales, grits, and limestones, with silicious and calcareous breccias, and hypogene and plutonic rocks.

Some of the grits, or graywackes as they have been called, of this group, are used as building stone, and some of them are well adapted for such uses. They are easily quarried and come out with smooth faces along the joints of the rocks.

Coal has been sought in many places in the Hudson slate group, in consequence of the blackness of many of the beds of slate and shale, and because thin laminæ, and small masses of anthracite have been found. There are such localities in Marlborough, New-Paltz, Plattekill and Marbletown, in Ulster county; and Coxsackie, in Greene county, where excavations have been made, and high expectations of the value and productiveness of the mines entertained. It is perhaps superfluous to add, that no valuable quantity of coal has been found, or *will*, probably be found in this group of rocks.

A *sulphur spring* occurs on the land of Mr. J. Hasbrouck, about one mile west of Springtown, in the township of New-Paltz, Ulster county. It rises from the alluvial gravel over the slate rock in the bed of a small brook, and it is believed that if the brook should be excluded, the water would be strongly hepatic, and might be applied medicinally to the cure of such diseases as are benefited by hepatic waters. Gas rises in bub bles at intervals of a few seconds from the bottom of the spring. The spring is near the base of the Shawangunk mountain, and nearly opposite Buntico Point.*

On the east of these minor axes, the second main axis of elevation takes its rise from High Point, which is a high cliff of grit rock on the main fault, and ranges thence northeastward, more or less broken and dislocated by minor transverse and oblique faults, and diminishing in height, until the Shawangunk mountain, and its grits, which envelope most of the higher parts, entirely disappear below the limestones and tertiary deposits at and near Rosendale. Several high points with mural fronts and ends, are seen between High-Point and Springtown, as Sam's-Point, Great Mogunk, Buntico-Point, &c. all of which are caused by faults along the main fractures of the mountain.

* Buntico-Point is a high point or precipice on the Shawangunk mountain, and is one of the old landmarks of the county, as well as most of the other high points of those mountains to which lines were run in laying out the "Patents." Buntico, in the language of the aborigines, is said to mean a spotted cow, and Buntico-Point took its name from its having been one of the landmarks of a tract of land purchased of the Indians in exchange for a spotted cow. Messrs. Van Wagenen, of New-Paltz, and J. Hasbrouck, of Springtown, gave me much local information relative to the objects of the survey.

A sulphur spring is said to occur near the Katerskill, two miles west of Catskill village, on Henry Palmer's farm, and with gas bubbling up through the water. Another sulphur spring, a mile from the above, on the other side of the creek, on Peter Acler's farm. Another mineral spring in the township of Esopus, and not far from the village. I did not see the three last mentioned springs.

The range of limestone described in the second annual report under the name of Barnegat limestone, and in the third report under the name of Newburgh limestone, occupies a small area in the district under examination this year. A hundred acres or more of this rock may be seen in the southeast corner of the township of Marlborough, in Ulster county. On the north-northeast it crosses the Hudson and ranges through Dutchess and Columbia counties, while on the south-southwest it ranges across Orange county. In Marlborough it has been used some for lime, but to no great extent. These lands will ultimately become valuable. The general dip of the limestone, is the same as the adjacent slate rocks, viz: east-southeast from 20° to 70°.

But few fossils have been found in the Hudson slate group this year. A few fossil shells, or rather the impressions, were found in the thick beds of graywacke, which contained drusy quartz and small broken fragments of anthracite, on the right bank of the Wallkill, by the road side, a few rods above the falls at Dashville, in New-Paltz, Ulster county. The other fossil remains were fucoides, among which are F. serra, F. dentatus, and two other species which are probably F. lineatus, and F. ramulosus. These fucoides or graptolites were in the black shale underlaying the Shawangunk grit, on the mountain about 1½ miles east of Ellenville, at the height of 500 to 700 feet above the valley.

The Hudson slate group corresponds in many respects with the "Cambrian system" of Professor Sedgwick, to which it may be a geological equivalent. It occupies most of the country between the Highlands on the southeast, and the Shawangunk mountains on the northwest, and forms the mass of the latter mountains which are capped, and in some places enveloped by the Shawangunk grit. From Kingston, the Hudson slate group ranges along the right or western bank of the Hudson to Albany, underlaying the superincumbent rocks unconformably, with few exceptions. Its range on the left bank of the Hudson, as far as examined, is detailed in the second annual report on the geological survey of the first district of New-York.

The particular description of this series will be delayed until the final Report, when the whole of these rocks within the limits of the State shall have been examined.

The specimens collected this year and which are not very numerous in consequence of the slight variations in aspect over extensive areas, have been placed in the cases in the Capitol.

W. W. MATHER, *State Geologist.*

FOURTH ANNUAL REPORT

Of E. Emmons, of the Survey of the Second Geological District.

To his Excellency William H. Seward,
Governor of the State of New-York:

Sir:—The prosecution of the Geological survey has proceeded during the past year without interruption. My regular assistant and myself were in the field during the period of six months, which is about the medium term in which field duties can be prosecuted to advantage. Our labors have been principally directed to the valuable ores of iron and lead, in which the Second Geological District is known to abound. There are important reasons for giving an undivided attention to those mineral deposits. Their geological position requires an exact determination. The indications of their presence demand a full investigation, in order that a system of rules may be formed by which the miner may judge of the presence, or absence of any given mineral production in a given formation. Besides these economical considerations, there are others which relate to the science in general, and which are promoted by exact and particular observations on the accumulation of mineral matter in general. The idea that cursory observations are sufficient to establish rational hypotheses or to develop a system of formations, is not admitted at the present day; but on the contrary, it is required that every fact should be collected which bears even remotely on the subject. In this method only, may we hope to advance geology, and remove those uncertainties which belong to it and place it on a foundation less empyrical than it rests at present. The consideration that exact observations are of the highest importance in geology, is fully supported by the measures which both the governments of England and France have instituted to secure minutely accurate geological surveys in their respective kingdoms.

England has yet in progress the ordnance geological survey, which is under the able direction of H. T. De La Beche, F. R. S. from whom we have an important report, in a volume of 648 pages, which has been made during the last year. It embraces a very detailed account of the geology of Cornwall, Devonshire and West Somerset, and is accompanied with numerous coloured maps and sections. It is worthy of notice that the district on which the labors of De La Beche have been expended, is one which has already received the attention of almost all the distinguished geologists of that country. Still the government in consideration of the importance of the subject, is urging forward the accomplishment of a new and thorough survey, as rapidly as is consistent with perfect accuracy.

France too, prior to 1833, had ordered a geological map of the whole kingdom, and which has been executed by M. M. Elie de Beaumont and Dufrénoy. These facts are stated, that it may be more generally known that government surveys of this kind are not confined to this country; and also, that it may be known in what light works of this kind are viewed in Europe.

Individuals in their private capacity, and at their own expense, may and do accomplish much, and the country ought to have them in esteem as promoters of the public welfare. Yet it cannot ro ought not to be expected that individuals can accomplish for a long period to come, surveys of this country. In the mean time much would be lost in various ways, if left to individual exertion, for want of exact knowledge in this department of science; and in particular, much would be expended in speculations in a business, the principles of which are but little known, and but imperfectly established. The expression of these views, I am sensible is unimportant to the enlightened body before whom they are to be laid; yet they may assist in sustaining a policy which may not be so well understood by those whose means of information is, for any cause, deficient.

In this report I shall speak of the subjects in nearly the order in which they were investigated in the field. I shall, therefore, in the first place invite your attention to the *iron ores* of Essex and Clinton counties. I shall describe each collection of ore under the name by which it is known in its immediate vicinity. It is not my intention to be very minute in my details at this time: those considerations which are of a general nature, it is deemed are more suitable to an annual report.

SECTION I.

1. *General considerations.*

The iron ores of Clinton county being the first in the order to be noticed, belong mostly to granite which varies somewhat in its character, if the whole district in which these ores occur, is considered.

The ore is the magnetic oxide, generally black in the mass and streak. The exceptions to these characters will be noticed when I come to speak of individual deposits. The ore occurs in veins which traverse the rock in directions varying but little from north and south. The general direction of the strike of the rock, is northeast and southwest. The veins as would be expected, cut the strata at a small angle both in th prolongation north or south, and also in their direction downwards. If the relations of the ore to the rock are, as they are now stated, there is no difficulty in conceiving it to occur in veins. More conclusive evidence, however, will be furnished on this point, when we speak of the individual veins, where alone all the parts may be so stated, as to save repetition. It is perhaps needless to say, that they have been considered as beds, a decision which was probably made by considering that there was a parallelism between the prolongation of the ore and the layers composing the rock. There is, it is true, but little difference in the bearing of the rocks and of the veins; but yet, careful inspection, and especially measurement, show that parallelism does not exist, unless in very limited distances.

Arnold Veins.

No vein of iron ore has acquired so much celebrity as this. It furnishes an ore easy to reduce; forms a soft, tough iron, and which is rapidly produced in the common forge. Bloomers are always satisfied if they can be furnished with this ore, for the above reasons; to which may be added, that in consequence of its purity, it does not require washing or separation. For these reasons too, it has been explored deeper and more extensively than any other mine in the northern counties.

It acquired a high reputation soon after it was discovered, and was leased to the Peru Iron Company for ten years, at a rent of $6,000 per annum.

There are 3 parallel veins, which are known as the Arnold ore. The 1st is the old blue vein; 2d, the gray; and 3d, the black. The first is the most valuable in the estimation of bloomers, and for which a preference is always expressed. The colour is a light blue, and it is destitute mostly of a metallic lustre. It is more or less granular and soft, and unlike the ore of this mineralogical species, it gives a red streak, thereby indicating that it has undergone an important change in regard to the degree of oxidation of the ore, and is at the maximum state. The facility with which the ore works is to be attributed mostly to the presence of silex, or quartz, finely disseminated through the ore in the proper proportion for forming a flux. There is no excess of stony or earthy matter on which the heat and other agents in reduction requires to be expended. This vein has been worked to the depth of two hundred feet, and about fifty rods in length. Its width varies from 2 to 8 feet. This variation of width is not an uncommon circumstance. Its medium width is not far from 4 feet.

In its descent it dips at an angle of about 75° or 80° to the west. This vein was necessarily abandoned a few years since in consequence of the caving in of the western side. The removal of ore to the depth of 200 feet brought the pressure of the rock and earth on the western side, which it was unable to support on account of the dip. About six rods in width of rock and earth fell towards the east about three feet, thus nearly closing up the space which had existed between the walls. The timbers which were placed lengthwise against the walls, were crushed, though they were so numerous that it was impossible for a man to get about between them. This vein is now recovered by the enterprise of the present proprietor, Col. Barton. It was recovered by ascertaining correctly, the direction of its strike towards the north, and excavating through the gravel and boulders, down to the rock. The first attempt was successful, and it shows the value of geological principles in recovering a lost vein.

2. *Quality of the Iron.*

The iron produced from this ore is remarkable for the following properties; toughness and softness combined with great malleability and tenacity. The possession of these properties have been determined by a series of experiments, under the direction of government, for t e purpose of ascertaining the strength and value of the iron for cables. Cables were formerly made by the Peru Company. These, though they possessed the requisite tenacity, yet the company could not compete successfully in market with English cable, and the manufacture of them was consequently abandoned. This iron too, was acted on more by sea water than the harder kinds of iron, and hence there arose another objection to the cables made from the Arnold ore.

It is evident too, that for horse shoes and other purposes where it is exposed to wear, it is not so valuable; this objection is obviated, however, by mixing harder ores with it, by which there is formed an iron possessing both hardness and tenacity.

3. *Other veins of the Arnold Hill.*

Lying side by side with the blue vein is a gray and black vein. They are separated by only a few feet of rock, and though they are distinguished by distinct names, yet there is in fact but little difference in the appearance of the ore. Each vein furnishes much that is blue and similar in appearance to the blue vein. Taking, however, either vein as a whole, there is sufficient difference in the eyes of a miner, for the distinctions already referred to. The quality of the ore too, is similar to the blue vein, being soft, granular and easily wrought. They furnish iron also of the same general qualities. If any difference exists, it is in hardness, which however, is only slightly increased. The same facts too, exist in relation to dip, direction and depth to which they have been worked. The width of the *black vein* is from 3 to 11 feet wide, and the *gray* is from 2 to 8 feet. In pursuing these veins downwards there is no decrease in width. At the surface they pursue parallel courses, but it is possible that they may constitute but one vein in the interior of the earth.

The three veins are crossed and cut through by a green stone dyke, which is about 10 feet wide. In its passage across them it produces no change in the direction of the blue and gray veins, but the north side of the black vein is moved four feet towards the east.

Another vein which was early discovered on the Arnold hill, is one which is called the Indian vein. It appears some fifty rods to the west of the veins just described, and passes in a direction oblique to the others, so that it intersects them some distance north of the present workings of the blue and black veins.

It is a harder ore and has not been wrought to sufficient extent to determine its real value. The iron however which was made from it is said to have been excellent, though it worked harder than the neighboring ores, on which account it has not been explored. This vein furnishes an additional reason for the opinion which has been expressed in favor of considering the collections of ores, as veins instead of beds. The Indian vein is a perfect example of a vein, which no one would think of calling a bed; besides there are distinct walls in each case bounding the mass of iron on the east and west sides.

The rock containing these ores is a red granite, the colour of which may be owing to the dissemination of the oxide of iron. The changes in the ores also is generally stained with the peroxide of iron, the presence of which is always taken as an indication of the goodness of an ore.

4. *Associated Minerals.*

Fluor spar in small green, also occasionally in purple masses, occurs sparingly in the gangue of the ore. Calcareous spar in opake masses forms a large proportion of the gangue. The arrangement of the mineral matter constituting the vein is in alternating layers, an arrangement which is not easily described without the aid of a diagram.

PALMER VIEN.

The history of the working of this vein is interesting on account of the difficulties which have been experienced in finding the main vein. It has been explored for many years and has furnished a large amount of ore, but the principal vein was not opened till this last year.

The difficulty of finding the true vein, has been owing to four distinct dykes which cross the vein in as many directions. One of these is fourteen feet wide, and may be traced on the surface for the distance of half a mile. Its strike is in a direction nearly parallel to the vein, but still sufficiently oblique to it to cut it at a small angle at the place where it is opened to the greatest depth and width. Upon the east side of this dyke there were several places where ore occurred, and in some points large masses had been exposed and removed. These masses however were generally rather lean, and finally became unprofitable, and of course were abandoned. By the perseverance and well directed efforts of Mr. Burt, the manager of the Peru Iron Company's works, the main vein was discovered. This fortunate result was effected by piercing the fourteen foot dyke, on the west side of which, a vein thirty-five feet in width was discovered. The ore is black and mixed with white flint. It contains too much earthy matter to be smelted without washing. It is therefore less pure than the Arnold veins. It loses about one-third of its weight by this operation.

The relative position of the dykes spoken of, cannot be understood without the aid of a diagram. I shall not therefore attempt to convey an idea of their position.

The rock embracing this vein is gneiss of the ordinary gray colour, and without any remarkable characters.

5. *Quality of the Palmer ore.*

Experience has proved the value of Palmer ore, and it is regarded as one easy to reduce, and as furnishing a valuable iron. It is a harder ore and produces a harder iron than the Arnold vein. It is therefore used with the latter for the purpose of increasing the hardness of this product. It is not so rich in the vein, and is mixed, as has been remarked, with white flint in too large a proportion to be reduced without washing. It will be inferred that it is preferable to the Arnold ore for some purposes, such as bands for cart wheels, horse shoes, and horse nails, and for all purposes where an elastic iron is required.

6. *Probable quantity.*

If the opinion is correct, that in piercing the fourteen foot dyke the main vein was reached, then, there can be no doubt, that the quantity of ore is inexhaustible. This portion measured from southeast to northwest was found to be thirty-five feet wide. The eastern wall of this vein is formed by this dyke, from which the ore cleaves, leaving a smooth naked surface. The opposite wall is formed by the main rock, and is more or less irregular and uneven. The vein dips to the west, but the amount of dip could not be ascertained in consequence of the feeble light and the small surface exposed on its western side. The interesting relations of this vein to the main rock, and to the dykes which traverse it, cannot be well understood or explained without the aid of diagrams.

The vein and its accompanying dykes furnish one of the most interesting and instructive examples of the effects of intruded rocks, and of subterranean force in producing derangements, known in the northern section, a particular account of which, will be given in the final report.

COOK VEIN.

The Cook vein traverses a hill 3 miles northwest from Clintonville. The Peru Iron Company have, in former times, worked a vein cutting through this same hill, which is only two feet in its greatest width. By the side of this vein, and only 4 or 5 feet to the west, another parallel vein existed, which is thirteen feet wide, but remained undiscovered till about a year since, when it was brought to light by making a cross cut, a mode of opening, which ought always to be pursued; inasmuch, as simply following a vein in the direction of its length, cannot lead to farther discoveries, as is proved by the experience of the Peru Company in working the narrow vein, to which, allusion has already been made. By opening a vein in a direction perpendicular to its strike, or in other words, across its course, there is a better opportunity to ascertain the nature of its contents, the width of the vein, and advantages are secured for raising ore, together with a chance of discovering additional veins; the instances are very common for two or more parallel veins to exist in immediate proximity. It is too, the only method by which a lost vein can be recovered. It may be therefore considered as an established rule, the importance of which is supported by experience in all mining countries, that veins are to be opened by cutting across them and not by sinking perpendicular shafts, or shafts passing in the direction of the dip.

The ore of the Cook vein is black, some parts of the vein is granular or soft, as this slate is usually called by miners, other portions are compact or in firm masses. It is a rich vein even near the surface, and it improved as the excavation proceeded downwards. It is not however so pure in the vein as to admit of smelting previous to washing. Its gangue is quartz or flint, black mica and hornblende. Its supporting rock is granite. The course of the vein is north and south. Parallel with the thirteen foot vein which is to be considered as the main vein, are three others, one of six, one of three and another of two feet. The hill on which these veins are found is two hundred feet above the plain. Its location is therefore quite favorable for mining operations, as it will be for a long time easy to drain, and convenient for removing the ore.

7. *Quality of the iron.*

The iron made from this ore is of the first quality. Along with hardness, there is sufficient elasticity and toughness to make it valuable for spikes, horse shoes, bands and nails. The grain is fine and bright with a clear metallic lustre; it hammers very smoothly, and presents a very fine even compact surface. In fine it resembles very nearly the old Russia sable, so celebrated in this country. The ore makes iron fast, and considering all its properties, it must be considered one of the most valuable veins in the county of Clinton.

8. *Quantity.*

In estimating the quantity of ore which the Cook vein may yield, it is proper to take into the account the four parallel veins. It will be seen that their aggregate width is twenty-four feet. Those several veins are so near each other that by transverse cuttings, all of them may be worked as one vein. The examination of the vein proved also the increase of ore downwards, an increase produced in part by an increase of the width of the vein, and also by the disappearance of the stony matter in the vein. The arrangement of the ore and earthy matter is mostly in vertical parallel bands or stripes. It is evident in many instances that there is a larger amount of rock in the vein near the surface. This was evidently the case with the Cook vein, though it would not be an uncommon circumstance if the predominance of earthy matter should be found restored deeper in the vein. Still the indications were favorable to an increase of ore, rather than a diminution of it.

The Cook vein may be traced in a northerly direction by the masses of ore at the surface of the rock, for one and a half miles. At its extreme northerly boundary it appears again in heavy masses, and has there been opened by Mr. Stone, and is now successfully and profitably worked. The ore of this vein is highly magnetic and possesses distinctly, polarity. This is a property, however, which is more frequently possessed by that portion of the vein above the surface of the rock, or that portion which has been exposed to light. It often happens that ore which is raised from a depth of 25 or 30 feet, exhibits at first neither polarity nor magnetism, but after exposure to light and atmospheric agents, this property is strongly developed, indicating it would seem, some connexion with imponderables, as light, caloric and electricity at the surface, which does not exist far beneath it.

From what has been said, it will be seen that the quantity of ore which the Cook vein is capable of furnishing, is all that can be wished. Its breadth and prolongation northwards show conclusively that for a long time it will be accessible without deep excavation.

This consideration I have thought proper to introduce, inasmuch as it bears on the permanence and stability of the manufacture of iron, and the expediency of permanent improvements. If the veins of ore in a given section of country are soon to be exhausted, then there is no occasion or no propriety in making extra expenditures to facilitate the transportation of heavy articles. On the contrary, if these collections of ore are inexhaustible, then they constitute a permanent source of wealth and income to the country, and which may be increased by facilities for transportation, without danger of finally losing value from want of articles to transport.

Baltic Ore.

The Baltic vein is to be considered as a part of the Cook vein. It is distant from the latter one and a half miles, and from which it may be traced by surface ore. The vein has been exposed in two places; the most southerly was mixed largely with iron pyrites, especially the portion adjacent to the eastern wall. It is not so highly charged as to prevent its use in the furnace; but for bar iron it proves brittle. On account of the injurious mixture of pyrites in the southerly opening, the vein was sought for twenty or twenty-five rods further north, when it was found to be well developed near the surface. This last opening was just made at the time of my examination, and the true character of the vein could not be determined. Still, there was a width of thirteen or fourteen feet of vein, mixed with rock composed of flint, hornblende and black mica. Thick solid masses of ore, free from pyrites, were found traversing the vein longitudinally, somewhat wedge-form in shape, with the thicker portion downward, indicating an increase of ore in that direction, and the disappearance of rock from the vein. It is proved by reduction, to make an iron similar to that made from the Cook ore; ore, as has already been stated, as of the best quality.

About fifteen rods farther west, is another vein of iron, with a gangue of pure white flint, which I examined, and which may be traced thirty or forty rods. The ore is black, and constitutes about one-third of the vein at the surface. By the encouragements which were given, this vein has also been opened, and presents favorable indications of being a valuable deposit of ore. The presence of white flint is always regarded as an important substance in the magnetic oxide, particularly as it becomes a valuable flux in the process of reduction.

This vein varied from four to six feet in width at the surface; and I am informed since my visit, that not only the quantity of ore increased in the vein, but also increased in width.

Rutgers Vein.

This vein is eight miles west from Clintonville, and like most of the veins in this vicinity, occupies a ridge of one of the primary ranges. It has not been explored to a great extent. Its appearance is loam at the surface, but no more so than many veins which by farther pursuit, have proved to furnish an abundance of ore. The gangue or mineral matter associated with the ore, is very peculiar; and so far as appearance and some of its physical characters may be relied upon, is a new mineral substance. Its characteristics have not been sufficiently tested to determine this point.

The whole width of the Rutgers vein is about ten feet. It pursues a parallel course with the Cook and Arnold veins, and has been traced about one mile. It is probably an extensive vein. It has not furnished an iron so valuable as most of the other ores; it has therefore been abandoned.

Winter Ore.

This ore has generally been considered to be deposited in the form of a bed, in consequence of its appearing as thick plate overspreading several square rods of the rock with which it is associated; or it appears as though it was deposited horizontally on the rock, like an overflowing melted mass of lava. The opinion that it is a bed is questionable, inasmuch as it presents no phenomena really distinct from the ordinary veins of this section of country. The rich layer of ore was 2 or 3 feet thick. The ore does not disappear beneath, but it is underlaid by a very lean mass in which the particles of ore are disseminated. The whole amount of valuable ore extended forty feet in one direction, and one hundred in another. The whole of this mass has been removed, and the surface now exposed presents an unequal distribution of ore, but in no place an amount worth the expense of raising. It presents, however, the same general arrangement of ore as all the veins, that of parallel bands or stripes. In some portions the ore is in the proportion of one half, the other half being white flint. Considered as a vein, its strike or course is west of north, and its dip, west. Ten or fifteen feet beneath the solid plate of ore, a passage has been made in the solid rock for at least one hundred feet. It commences on the northern slope and runs nearly south. No ore was discovered by this procedure, and it could not have been reached, even if there is an abundance of ore, in consequence of the dip of the vein; the entrance into the rock being made on the eastern side of the vein to which its course is parallel.

The great difficulty of obtaining ore at this place, is in consequence of the great derangement produced by transverse dykes. In the distance of one hundred feet on the line of the ore, there are nine dykes. Without occupying time and space in describing the vein or its derangements, it is sufficient to say, that so long as there are other deposits of ore more accessible than this, it is not likely to receive any farther exploration. There may be an abundance of ore, still stronger inducements must exist before it can be explored by men of ordinary judgment and prudence.

MACE VEIN.

This is a vein which is newly discovered, and has not yet been opened to an extent which admits of a thorough examination. At the surface it is well characterized, and is four feet wide. The width has increased since it has been worked. It pursues the same northerly direction as the other beds, and its dip is to the west. It may be traced by the masses of ore in the rock, twenty-five or thirty rods. The ore being rich in the vein and associated with flint, furnishes good evidence of a valuable vein. It is about two miles east from Clintonville, and is easy of access. It furnishes a valuable addition to the stock of ores in this vicinity.

BURT VEIN.

This is a hard ore and requires only a passing notice. In our trial with the ore, it was reduced easily, but when put under the forge hammer, the loop broke in many pieces. These were again put into the fire and came out good iron. The ore is fine grained, with a strong metallic lustre. It is tough and contains much sulphuret of iron. Still, those unaccustomed to the busines of smelting ores, would consider it as one of the most valuable of this species. Generally, those ores which have a bright lustre and are tough or difficult to break, are to be ranked among the poorest of ores; while those with dull lustre, accompanied with friability, are as generally good.

The Burt vein is eight feet wide, or rather the associated mineral, which is feldspar, is eight feet, in which the ore is disseminated in it in masses of several pounds weight. Its direction is east and west.

JACKSON VEIN.

This vein I consider a continuation of the Arnold ore, as it is in the direction of its course, and on a hill of the same elevation, and only a mile or a mile and a half distant. The vein is quite distinct, but was not opened its entire width. The quality of the ore is unquestionably good, and there is no doubt of their being an abundance.

Finch Vein.

This is the southern prolongation of the Arnold vein. It has furnished a large amount of ore for the forges in the vicinity of Clintonville. The character of the ore is much the same as the gray and black veins of Arnold hill. It is not worked at the present time.

McIntyre Vein.

This vein, though situated on the same hill as the Palmer ore, cannot be considered as a part of this vein. It is on the south face of the hill, and has a course about northwest. It is a new vein, and has been explored to a small extent only; but from its appearance, the indications for a valuable ore, and abundance of it, could hardly be doubted. It has a width of from six to ten feet. Many parts of it, as now exposed, are the soft granular variety. So far as I observed, sulphuret of iron is not present in the ore. It is associated with black mica, hornblende and quartz. For reduction, it requires either separation of the earthy matter by working, or the magnetic machine.

9. *Entire width of the veins, in the Clintonville District.*

The preceding account of the iron ores, in the vicinity of Clintonville, is drawn from facts and observations which were made during the last season. I have not spoken of those which I did not visit. It appears from the facts now presented, that there is a width of vein of at least 136 feet, after excluding the Burt and Winter veins. Several of these veins have not been explored to a depth which furnishes the best ore, either as it regards purity in the vein, or freedom from earthy matter. As the veins are worked, they become more valuable. It will be understood, that the veins described, occur in the vicinity of Clintonville, and within eight miles of the village. It is a mineral district.

It must be confessed, however, that in consequence of the consumption of wood, that the prospect for the future is not so cheering to the enterprising manufacturer of iron, as could be wished. Unless means of communication are furnished to the wooded districts of the Saranac and Upper Au Sable, the present highly flourishing establishments for the manufacture of iron, must in time be abandoned, and, as it would appear, at a period when the demand for it will be greater, and when every attending circumstance will be favorable to the production of a better material, at a diminished cost.

The amount of ore is inexhaustible, and it is quite accessible. Its value at the mine, after it is raised and dressed, varies from 4 to 6 dollars. The establishments for this manufacture are increasing. Though they are generally small, still they are profitable; and could the forest at the western boundary of the county, become more accessible, it would be all that is required to give perpetuity to the present establishments, and also encourage many more, all of which could not fail of making this district one of the most flourishing in the State.

The following account of the iron ores of Newcomb, was prepared by the request of the proprietors, and furnished in advance of the annual report. At the first view, it may appear that it contains matter too local to be admitted into the annual report. So it appeared to the writer at first, yet, after some reflection and examination, I saw and found that it all related to the resources in which there is a general interest. That which relates, for instance, to water-power, wood, &c. is important to be known, because the value of the mineral deposits depend greatly on their character and quantity. I have therefore retained the report in form and substance, as prepared for the proprietors of this section of the country. I have also retained the letter of your Excellency, addressed to me, at the time specified.

To A. McIntyre, D. Henderson and A. Robertson, Esqs:

Gentlemen:

It gives me pleasure to inform you that his Excellency, Wm. H. Seward, has no objection to the publication of that portion of the geological report which relates to the iron ores of Newcomb, in advance of the full annual report to the Legislature, for February, 1840.

You will learn the liberality of Governor Seward's views on this subject by the subjoined letter.

Very respectfully yours,
E. EMMONS.

Auburn, June 14, 1839.

Dear Sir :

I have just received your letter of the 5th inst. I see no objection to your furnishing Mr. McIntyre and his associates the information mentioned, if you can do it without material diversion from the duties of the geological survey. Nor does it seem to me important that they shall be restricted to the publicity they may desire to make of the facts to be obtained by them from you. The greatest public good will result from the widest dissemination of the knowledge acquired by the survey.

I am very respectfully,
Your obedient servant,
WM. H. SEWARD.

To E. Emmons, Esq. at Clintonville.

ORES OF NEWCOMB.

The following account of the iron ores in the town of Newcomb, Essex county, New-York, the author has made as full as time and circumstances would permit. In the preparation of it, it has been thought proper to introduce a few general considerations relative to the geology of this section of country, embracing in them those theoretical views which are intimately connected with practical points in reference to these deposits. Without some doctrinal statements of this kind, the report would be incomplete in itself, and less useful to those persons for whom it is intended.

It may be thought by some, that too much minuteness of detail has been observed in the description of individual veins, and that the whole, or all that is essential, might have been embraced in one general account with equal advantage, and thereby have avoided disagreeable repetition. This course, it is true, might have been adopted, and the report would have presented a more compact form ; still, a full account of each vein seemed necessary and important to a correct understanding of the whole subject. Besides, the reader will be enabled to appreciate the value and amount of those rich repositories of ore, and the peculiar advantages which this section of country offers, for the manufacture of iron, above all others at present known. In this last assertion it may be thought

In the State of New-York, it is sufficient to refer the reader to the geological reports, particularly those of Professors Beck, Mather and Hall. The species occurs abundantly in the primary parts of New-England, but never in wide or extensive veins or beds. Upon the whole, it may be considered as one of the most widely distributed minerals known, and the most common form under which the iron ore occurs.

SECTION V.

Question relative to the nature of the repositories of Magnetic Oxide.

The determination of this question has required a series of observations on all the important known localities of this ore. I have been desirous of putting the question to rest, both on account of the practical importance of the question itself, and on account of the bearing it has on the origin of the ore, or those theoretical considerations connected with its original formation. There are many geologists who consider the repositories as *beds*, or an accumulation of mineral matter in irregular shaped couches. That some of the repositories are veins, no one can doubt, and there can be but little doubt in relation to all those minor collections of ore, as the whole width, direction, walls, &c. are frequently exposed by the operations of mining. It is in those cases where the development of ore is on so large a scale that its relative connexions remain concealed by earth or rock. Without resorting to the argument drawn from analogy, I may state directly the facts which bear upon the question under consideration.

1st. The direction of the masses of ore is rarely, for any great distance, parallel with the strata, or with the mountain ranges, when enclosed in rocks which are unstratified. They are, for a short distance, often parallel, but by an offset are thrown into other layers, either to the right or left, between which they preserve their course for a time, when they are again rocked, as it were, from between the last layers into a new position. According to Mr. Mather, this change occurs often in the repositories of the magnetic oxide in the highlands of the Hudson.

2nd. In the immediate vicinity of veins of ore which run nearly parallel with the strata or mountain ranges, others occasionally occur, running directly across the strata, which of course possess all the characteristics of true veins.

3d. The side-walls of the larger masses of ore, though not straight or even, or perfect for great distances, yet are so to a limited extent, and the interruptions are frequently projections of ore into the adjacent wall in the form of veins; a circumstance by which the continuity of the wall is broken, but does not seem to militate against the idea of a vein.

4th. All the repositories of ore, when they can be traversed in their whole width, present all the characteristics of a vein, enlarging and diminishing at different points, but upon the whole preserving a given width, or increasing downward at a slow rate, and cutting across the strata, sometimes at a small angle, and then nearly at right angles, and presenting, on one side at least, a wall of rock, more or less perfectly defined.

I may with propriety, refer to some examples of veins, the characters of which, cannot be doubted. The Arnold Hill, in the vicinity of Clintonville, is one, among many, to which reference may be made. On this hill, there are 4 veins, running parallel or side by side; their width varies, from 3 to 11 feet. One of these, viz. the *old blue vein*, as it is called, has been worked to the depth of 200 feet, and in length 100 rods. Throughout this extent, it preserves an uniformity of width, which is on an average, of about 4 or 5 feet. In some portions of the vein, it is only 2, in others 8 feet. It dips to the west, at an angle of about 75°. It has regular side walls, though less perfect on the west side, than on the east. The primary rocks of this country, pursue a course nearly northeast and southwest. In some instances, it is difficult to detect a deviation in the vein from the general course of the rocks. This is the case with the Old Crown Point ore, in the town of West-Port. This vein, is about twelve feet wide, and has been quarried out for half a mile, in the direction of the strata. This ore, so far as can be discovered, lies between the layers of gneiss, without crossing or shifting, from one layer to another. This would be considered a bed, according the usual definition of the term; but as there are so many instances, of a shifting of the ore, from between two given layers to those adjacent, may we not rather infer, that this is only a particular instance, in which the ore continues in parallel position, a greater distance than ordinary.

5th. There is, however, one particular in which some of the apparent beds, differ from true beds; it is in this, though they pursue a dithe qualities of the iron produced, the granular ores, make iron faster than the hard ones. Facts of this kind, are not entirely explicable; though undoubtedly, the state of division, has much to do with the facility of working, as a state of minute division, favors the action of heat.

It would appear, however, that the nature of the rock in which the ore occurs, is of more consequence than any other consideration, both as it regards facility of working, and the quality of the iron produced

When the rock is silicious, the reduction is uniformly easy; when of labradorite and hypersthene, though the reduction is not so readily effected, the iron possesses some remarkable qualities unknown to the ores connected with a silicious gangue.

The ores of Essex and Clinton counties are capable of furnishing every variety of iron which can be found, either as it regards hardness, or softness, or tenacity, and we have reason to believe that many of them, if properly manufactured, would furnish iron equal in character to the celebrated old sable. There always has been, and still is, a sufficient reason why American manufacture, is inferior to the best foreign, viz: the want of capital and skill; and so long as manufacturers must depend on the immediate sale of their products for support, just so long will the quality of the article remain below the best foreign manufacture. Another constant difference which is found to prevail in different veins of ore, is, that some are better for the forge, while others are more profitably reduced in the high furnace. Many ores which cannot be worked in the forge, make an excellent iron when first worked in the furnace; some make better castings than others, and those which make an excellent iron in the forge, do not work so well, or furnish as good castings as those which make a very inferior iron in the forge. The presence of a little sulphuret of iron is useful, for making smooth and handsome castings. Again, it is found that the lean ores are better for furnaces, than the rich. As it regards fluxes, silex appears to be the natural flux, when reduced in the forge; while carbonate of lime is preferred in the high furnace.

SECTION VIII.

Processes, preparatory to the reduction of the magnetic oxide.

Previous to the assay, the magnetic oxide requires generally, roasting, pulverizing and washing, or to undergo some operation, by which the earthy matter may be separated from the metallic. The object of roasting, is mostly to render the ore more friable, or in some cases to expel sulphur. Washing or separation, is a necessary operation in a great majority of veins, especially if they are to be worked in a forge. If they were to be smelted in the furnace, this process might be omitted, the stony matter would be in sufficient quantity only to form a flux. At one time, the magnet was considered the best instrument for separating the ores; it is, however, now going out of use. The improved mode of separating by washing, has superseded the use of the employment of the magnetic machine. Washing the ore is important in more considerations than one, as by it, iron of an uniform quality is produced; but the removal of the stony matter, alters also, the property of the iron: for example, previous to the use of the washing or separating apparatus, steel of an excellent quality was often produced, and undoubtedly, with extended experience, might have been produced at pleasure. Again, the iron produced by the unseparated ores, was remarkable for resisting oxidation. Such are some of the modifying effects of the earthy matter in mixture with the ore. The Arnold ore, is the only one which is employed without separation. Without addition, it makes iron rapidly and of the softest kind. Hence, it is much sought after by bloomers, and is frequently transported twenty miles on wagons.

SECTION IX.

Outline of the Geology of Essex County.

If an observer should commence his examination of the geology of Essex county at Cedar-Point, and proceed west, he would pass over, first, a narrow belt of the calciferous sand rock of Eaton, after which, he would meet with gneiss, and in the last place, the hypersthene rock, which embraces the great masses of magnetic oxide of Newcomb.

The first rock mentioned, exists, as has been stated, only in a narrow belt, which at Cedar-Point is not more than 80 rods in width. It skirts the country on its eastern border, but is not continuous. The primary strata appear a little north of the iron works of Port-Henry, and occupy the whole space between the latter place and Split-Rock. Upon the calciferous rock at Cedar-Point, there reposes a thin stratum of tertiary clay of the most recent of the marine deposits in this country. In the vicinity of Cedar-Point, there also occurs, heavy masses of primary limestone, and a mixture of limestone and serpentine. The latter formations either occupy beds or veins in gneiss, which extend west about nine miles. It possesses the ordinary characters of gneiss. It is traversed at different places by limestone, the hydrous peroxide of iron, and the magnetic oxide. In fact there are but few sections of coun try so full of ore, as East-Moriah, some account of which, has been given in the annual reports. The hypersthene rock is the most important and extensive formation in the county. It commences at the distance from the lake just mentioned, and continues nearly to the extreme western border. It is an unstratified rock, but breaks into angular blocks or tables, whose general form is rhombic. This cleavage, as it may be termed, might be mistaken in some cases, for stratification; but the whole system of fissures, resembles those planes which result from crystallization, and not those of deposition.

As it regards the western limit of the hypersthene rock, I would remark again that it extends only 4 or 5 miles west of the village of Mc-Intyre. We have at its western termination, a recurrence of gneiss accompanied with its usual associates, the coarse, white, primary, lime rock, narrow veins of the magnetic oxide, and probably of the serpentine and soapstone. It is an important consideration, that limestone makes its appearance so near the establishment. It may in fact, be considered as sufficiently near the works; for it is better that all those operations which consume the fuel, should be distributed widely over the country, than concentrated at one point. The hauling of the lime a few miles, is a matter of less consequence, than the entire consumption of fuel, in the immediate vicinity of a great establishment, when operations are entirely dependent on wood. The limestone in many places, is impure. It contains imbedded minerals, as pyroxene, quartz, phosphate of lime, mica, hornblende, &c. The softer strata in the vicinity of the iron works, are peat, felsphatic clays and gravels. The marshy grounds, are sometimes shaky and wet, yet as they are invariably furnished with hard bottoms at no great depth, there is no obstacle to the construction of the best of roads over them. In concluding this outline of the geology of Essex, it is sufficient to observe, that I have mentioned the most important rocks which are found in the county. The particular localities at which they occur, is not an important subject for our present consideration; their general arrangement may be learned by the sectional line, which has been described, when passing from Cedar-Point to the western border of the county, through Moriah and Newcomb, along the travelled road. The erratic blocks which are scattered over the surface, are the hypersthene masses, and small boulders of sandstone. The former, are by far the most abundant. The latter, have a northern origin, and have evidently been transported by agents, which are at present hypothetical. The surfaces of rocks when recently uncovered, present the usual water-worn appearances, as grooves and scratches. Having given a general account of the magnetic oxide, as it occurs in the northern section of the State, and also a brief outline of the geology of the county of Essex, we are prepared to furnish a detailed description of the ores of McIntyre.

SECTION X.

Sandford Ore.

This mine is situated upon a hill whieh rises 600 or 700 feet above Lake Sandford. It rises so gradually from the eastern border of the lake, that loaded teams may be driven to or from the mine, with ease. The greatest angular slope, is occupied by the ore, but does not probably exceed 25°. The portion below the mine towards the lake has a slope not exceeding 5°. The distance of the middle portion of the vein, from the lake, is about 80 rods. The ore occupies the western face of the hill, down which the slope is so equal, that an inclined plane might be constructed from the mine to the lake, for the delivery of ore, into boats, in case this measure was deemed expedient. It is two miles south from the village.

SECTION XI.

Mineralogical Character of the Sandford Ore.

The colour of the ore is black; it is moderately coarse grained, being in this respect intermediate, between the fine grained ore east of the village, and the coarse black ore on which the works are located. Structure of the mass, always crystalline, but rarely if ever, compact; lustre, dull; streak, black; sufficiently hard, to give sparks with steel; texture, generally rather firm, but never tough, and very frequently friable; constituting what miners call, shot ore. It never occurs in crystals. The surface masses of the ore, are magnetic, but rarely possess polarity. In the mass, the structure is slaty, resembling in this respect, a regular rock formation. It is probably owing to crystallization, as it is very difficult to conceive this structure to have been produced by deposition. It is not, therefore, properly speaking *stratification*, though the lines of separation are parallel, like those of veins of slate or gneiss. The existence of this kind of structure, favors very materially, the quarrying of the ore. It is even possible to remove large masses, with the assistance of an iron bar. The dip of the layers, is about 75° to the east. Much of the ore after it is raised, and has been exposed for a time to the air, becomes quite loose in its texture; and its friability is greatly increased.

SECTION XII.

Purity of the Ore.

The portions of the vein adjacent to the walls, especially on the western side, are more or less mixed with hypersthene and granular feldspar. The central and eastern portion of the vein, for the space of 300 feet, is unmixed with stony matter. The layers of rock, which appear at the western border, probably belong to the surface, and unless there is an exception to a general rule, will disappear, as the mine is worked downwards.

SECTION XIII.

Extent of the Sandford Mine.

In regard to the dimensions of the vein, it is proper to observe, that it is covered mostly with soil, varying in depth, from one to three feet, on which there is a heavy growth of timber. It is not uncommon, however, to see the ore entirely exposed at the surface. To ascertain the whole extent of the vein, as far as was practicable under existing circumstances, excavations were made down to the ore, on four transverse lines, and one in the direction of the length of the vein. Those excavations were made sufficiently large to admit of a thorough examination, whether of rock or ore, and specimens taken from each, which were labelled and numbered on the spot, to prevent any mistake. By pursuing this course, I obtained the result, which will be given in the proper place. As to the actual width, I give only that, which was obtained by measuring along the line of excavation, which was made at right angles to the vein; but it is far from being certain, that the western limit of the vein was ascertained, as in proceeding west, the accumulation of soil increased rapidly; the examinations were therefore discontinued in that direction. It is not therefore at all certain, that I am able to state the actual width of the Sandford Vein.

By the course stated above, the width of the ore on the main line of excavation, is *five hundred and fourteen feet*, and the length, along a line nearly in the centre of the vein, *sixteen hundred and sixty-seven feet.* It then passes beneath tabular masses of rock. Having given the width and length of that portion which has been actually examined, it is proper to state, that the vein disappears by passing under or beneath the rock at both extremities; that it is not discontinued, is proved by excavation at numerous places at the northern and southern extremities, where it may be seen passing beneath tabular masses of the hypersthene rock. The shape of the vein, which has been exposed, is nearly triangular.

SECTION XIV.

Explanation of the Middle Section, and description of the Ore at different points.

1st. Middle transverse section. Commencing at the western limit, or at the base of the hill, and proceeding nearly eastward, or at right angles to the vein.

First excavation. No. 1. Fine granular feldspar, intermixed with iron, garnet and hornblende.

2nd. 36 feet from No. 1. A rich ore, breaking into tabular masses.

3rd. 10 feet from No. 2. Rich ore, as above.

4th. 15 " 3. A rich ore.

5th. 20 " 4. A rich ore, mixed in a small proportion with granular feldspar.

6th. 12 feet from No. 5. Granular feldspar in a decomposing state, containing only a small proportion of ore.

7th. 20 feet from No. 6. Rich ore, mixed with a few scales of black mica and feldspar.

8th. 22 feet from No. 7. Rich ore, mixed with garnet and feldspar.

9th. 24 feet from No. 8. Nearly the same as No. 8, but brighter.

10th. 24 " 9. Rich ore, with very small proportion of feldspar.

11th. 22 feet from No. 10. Loose decomposed rock.

12th. 17 " 11. Rich ore.

13th. 15 " 12. Rich ore, with feldspar.

14th. 39 " 13. A rich granular ore, with a resinous lustre.

15th. 15 " 14. A lean ore.

16th. 22 " 15. Principally rock.

17th. 28 " 16. A pure ore.

18th. 35 " 17. A pure and rich ore.

19th. 36 " 18. A rich ore.

20th. 22 " 19. A pure oxide.

21st. 27 " 20. A pure ore.

22d.	30 feet from No. 21.		A pure ore.
23d.	29 "	22.	A pure ore.
24th.	30 "	23.	Ore mixed with garnet.
25th.	14 "	24.	Rock mixed with particles of ore.

2d. Description of the section 268 feet south of the middle section. Whole width on this transverse line, 610 feet.

No. 1. Good ore, mixed with small particles of decomposed feldspar and hypersthene.
No. 2. Same as No. 1.
3. Same as No. 1.
4. Same as No. 1, but brighter and coarser grained.
5. Good ore and fine grained.
6. Good ore, granular and friable.
7. Good ore; granular; colour, black.
8. Good ore, with metallic lustre.
9. Good ore.
10. Good ore.

3d. Description of the section which is south from the preceding section, 210 feet.

No. 1. Rich, black, coarse grained ore, intermixed with a few particles of decomposed hypersthene.
No. 2. Rich ore, similar to No. 1.
3. Rich ore, similar to No. 1.
4. Rich, black, compact ore.
5. Pure granular ore, coated with a greenish substance.
6. Rich ore, with slight incrustation of peroxide of iron.

4th. Description of the section 231 feet north of the middle or main section.

No. 1. Rock.
2. Rock, intermixed with iron.
3. Fine grained ore.
4. Good ore.
5.
6. Pure ore.
7. Good ore, but intermixed with crystals of hypersthene.
8. Good ore.
9. Rock.

In order to obtain a correct conception of the amount of ore on the Sandford hill, we may estimate its solid contents, or if we merely estimate the amount of ore at the depth of 2 feet from the surface, we shall find that it amounts to at least 6,832,734 tons, a large proportion of which may be removed or raised without the use of powder. This amount of ore will produce at least 3,000,000 tons of iron of the best quality, and cannot be worth less than from $100 to $120 per ton in the market.

SECTION XV.

Natural advantages for raising the Sandford Ore.

After what has been said of this remarkable vein of the magnetic oxide, little need be added in relation to the advantages it presents for exploration. It will be understood that it is easy of access, and that there are no natural obstructions to be overcome in approaching the vein, and that it, in one sense, lies open and exposed, as it were, to the light of day, as there is nothing to be removed but a light soil, excepting occasionally boulders, which have been transported here in former times.

The western edge of the vein is 200 feet at least above the lake, and it rises rapidly towards the east, so that its eastern limit is probably 600 feet above the lake. A large proportion of the vein is, therefore, situated above the waters of the lake, and under circumstances as favorable for drainage as can be desired. Water will, therefore, form no obstacle to mining or quarrying the ore. Again, in conducting the ore to the lake, or even to the works, the surface of the ground is such that a gradual descent may be obtained. In fact there can be no occasion for raising the ore over any elevation of ground. So favorable is the location, that after it is raised, it may be rolled downwards on cars or carriages, for transportation to the lake, or to the works directly. Again, the ore being unmixed with rock, no labor need be lost in removing worthless stone; and, as much surface may be at once exposed, all the operations will be conducted in open daylight for a great length of time. In addition to the advantages which this vein presents for working, I may state that of its fissile character, or its natural separation into layers; hence masses are frequently readily detached by the aid of the bar alone, especially near the surface.

It is obvious, that the true method of working this vein, is to commence on a line with the pure ore, or as far down the western slope as possible, and work towards the east, and to the right and left; by this mode of procedure, all the water which would accumulate above, from rains, &c. will be carried to a lower level than the line of the workings. The whole business of mining, then, at this place, will consist in blasting and breaking the ore, all of which may be conducted without engines of any description. Hence, as it regards expense, there probably never was a vein so favorably situated, and where so little capital will be required to obtain the ore, and transport it to the place where it is to be reduced.

SECTION XVI.

Freedom from injurious substances.

One of the most remarkable facts which I have observed, in relation to the Sandford mine, is the entire freedom of this immense vein from pyrites, and also from any substance which is known to exert an injurious effect on iron. This circumstance, is probably in part to be attributed to another fact, viz: that the hypersthene rock is one which is far from being metalliferous; scarcely any of the sulphurets or oxides appear in it, except the well known substance, the oxide of iron, whereas, gneiss, the adjacent rock, abounds in sulphurets of iron and many of the earthy minerals, and as a consequence, many of the veins of iron are more or less charged with sulphuret of iron. The ore of the Sandford vein, is one of the purest which is at present known, if we except the Arnold ore in Peru, but which is not a hundredth part so extensive.

SECTION XVII.

Quality of the Iron manufactured from the Sandford Ore.

As might be expected, the iron made from this ore has proved to be of the first quality; and it is not only of the first quality, but is said to make fast. Whether it is of the same quality as that which has been made from the coarse black ore, to be described hereafter, has not been determined. It is sufficient at the present time to say, that so far as trials have been made with it, it is equal to the best of the iron made at the forges in the northern section of the State. Experiment only can determine how good it is possible to make the product from this ore, and whether it has the properties which render it suitable for steel.

The only foreign minerals present in the Sandford vein, are hypersthene, labradorite, hornblende, and common feldspar. These, though they exert no injurious effect on the iron, yet interfere in its reduction; when these are present therefore, to some extent, it becomes nncessary to wash the ore, and this becomes the more necessary on account of the low point at which those two minerals fuse.

SECTION XVIII.

Northern and Southern prolongation of the Sandford Vein.

At the distance of about one mile and a half from the Sandford vein there is an out crop of ore, possessing the same characters as the ore just described. If this was the only vein in the country, it would be considered as very remarkable on account of its extent. It is 32 rods in length, and about 15 in width. The mineralogical characters are precisely those of the Sandford ore, and probably the qualities of the iron will be much the same as those already enumerated.

Another out crop apparently of the same ore, occurs on the opposite side of the lake, in the direction of Hill's island. It disappears under the water of the lake, and hence, its actual extent cannot be ascertained; that there is a large amount of ore at this locality there can be no doubt, and sufficient in itself, to justify the erection of extensive works. It is not easily determined, whether this is really a prolongation of the Sandford vein; it appears a few rods too far to the west to be in a line of its strike, unless the Sandford vein passes beneath the lake, which is not improbable, as the western limit has not been ascertained. The distance of the Sandford vein, from the site of the present works, is 2 miles and 53 rods, and the whole surface of the ground is such, that a railway may be constructed which shall have any amount of descent which may be desired.

From these data then, we may estimate the whole length of the Sandford vein, as about 2½ miles. Intermediate between the several large out crops, ore appears at the surface in sufficient abundance to indicate the presence of the vein beneath. We have evidence, therefore, in addition to that furnished by external characters, that of ore scattered on the surface, on the line of the strike of the main vein, an indication which rarely if ever has failed, when tested by the only sure method, that of excavation. On this subject, I may with propriety remark, farther, by referring to the experience of miners in the vicinity of the Peru Iron Works, who have frequently traced a vein of ore, simply by the presence of a few grains in the loose stones on the surface, a distance of a mile at least, and have verified their opinion as regards the presence of ore beneath, by excavation. The same fact has repeatedly fallen under my own observation.

If the application of theory is admissible, it will bear us out in these views; I refer to the theory of the origin of these veins, and to which I would invite the attention of the reader.

SECTION XIX.

Of the Vein, called the Coarse Grained Black Ore.

This vein is situated in close proximity to the site of the present works, in fact, the foundations of several of the buildings rest on this vein. It takes its name from the colour and coarse granular texture of the ore. Its texture throughout, is coarser than the Sandford ore. It is a hard ore or more tenacious; still it is not the hard ore of miners, or one that works hard, and produces hard and brittle iron.

SECTION XX.

Purity of the Black Coarse Grained Ore.

On this point, the same remarks might be repeated, which were made on the purity of the Sandford vein. The impurities, are intermixtures of the earthy minerals, as Hypersthene, Labradorite, and small masses of dark coloured Serpentine. In one or two instances, masses of sulphuret of iron, of the size of a butternut, have been seen. That no injurious substance exists in the ore, is fully shown by the quality of the iron produced from it. This is evidence of the best kind, and supersedes the necessity of making any farther remarks under this head.

SECTION XXI.

Extent of the Coarse Grained Black Ore.

With our present knowledge, it is impossible to assign definite boundaries to this vein. On a line measured east and west, and commencing at the supposed eastern limit of the vein, and terminating at excavations near the western limit of the cleared fields on the west, it gives a width of more than 700 feet. By measurement, on a line running nearly north and south or in the direction of its strike, it is found to extend 3,168 feet. The evidence of its vast extent, rests on the same data as those which were obtained of the Sandford vein, viz: excavations at numerous points. We did not proceed in a manner so systematic, as in the case just referred to; and in the several examinations made, we found the ore passing more frequently beneath the common rock of the country. To a superficial observer, this great vein might be considered as many large disconnected beds, or beds separated by intervening rock; but in this instance as in the Sandford hill, we found the ore passing beneath rocks and not terminating against them, giving thereby strong indications at least, that the apparently insulated masses of ore, are merely parts of a great vein, connected together beneath the layers of rock. Whether this view of the subject is true or false, each of the masses of ore which have been exposed, will furnish any amount which can possibly be desired. The width of that portion of the vein which furnishes ore at the present time for the forge, and has been exposed by the removal of soil, is 36 feet, presenting a solid wall of pure ore, unmixed with rock. This is only a single instance among five or six others directly in the village of McIntyre, equally favorable and in confirmation of the opinion so often expressed, that all the large masses of ore are merely portions of one vast vein. It is, however, a matter of small consequence whether this view is correct or not, so long as such an abundance of ore can be obtained at either of the exposed places, and especially when it is known that either will furnish materials for the manufacture of iron for centuries to come.

SECTION XXII.

Quality of the Iron produced from the Coarse Black Ore.

Experience has established the fact in relation to the magnetic oxide, that different veins produce iron of different qualities, even when the processes pursued are similar. Another fact also, is equally proved, that ore from which the stony matter has been separated, produces iron possessed of different properties,* from that which has been made from the unwashed or unseparated ore. An instance of the latter kind, is furnished in the iron formerly made from this ore. When first used, it was wrought without separation. The iron then made, was remarkable for its hardness and toughness or tenacity, it in fact produced steel of the best quality, and the bars which were at that period made and left in rather a damp place, preserved their smooth appearance, without presenting any disposition to rust or oxidate. This may perhaps be accounted for by supposing the formation of an alloy of iron and silicum. Whether the explanation is correct or not, the fact is important and interesting, and worthy of being preserved.

---

* This result may be accounted for on the supposition, that a higher temperature is required for reduction under those circumstances.

Leaving considerations of this kind, I have only to remark, that probably no ore in this country or any other, has produced iron of a better quality than the vein now under consideration, or perhaps it would be better to say, capable of producing better iron. Without entering at all on the statement of facts in proof of the assertion, I shall refer the reader at once, to Prof. Johnson's report, where he will find a statement of the experiments which were instituted, for the trial of this iron. When it is considered, that this iron was not manufactured by the most approved process but in rather a rough unscientific mode, it seems to be clearly established, that there is something very extraordinary in this ore, to produce the kind of iron which is proved by experiment it actually does.

And who can doubt, but that in scientific hands, it will prove fully equal to the best Russian and Swedish irons, which have been so long celebrated, and used in the manufacture of steel. Such at any rate I conceive to be the qualities of the iron, that it is a matter of national importance, that the operations in its manufacture should be conducted in the best possible mode. There are some particular uses to which this can be applied, and for which there is nothing equal to it made in this country, viz: where there is much wear or friction, and at the same time great tenacity required; as the axles of locomotive engines, rail-road cars, or chain cables for ships of war, large spikes, nails, &c. Iron is so much used in the present state of society, and so many lives depending on its quality, that it is a subject of great importance, to secure for public use, that quality of iron, which shall not jeopardize life and limb in the public conveyances on the great thoroughfares of the nation. It is in this light, that an article becomes important to a nation, and though its patronage benefits in a pecuniary point of view, the individual proprietors, yet, the nation is after all the most benefited by promoting safety and expedition, on the ocean and on the land.

SECTION XXIII.

Of the Vein called the Fine Grained Ore.

This ore constitutes a distinct varicty, and is peculiar in its characters. At the surface, it is always more or less granular, the grains rarely exceeding a common buck shot, and generally much finer. In many parts of the vein, it is quite friable, and belongs to that variety which is termed by miners, *shot ore.*

The greater portion of the vein is quite firm and requires a smart blow of the hammer to break it. At the place where it has been quarried, it presents a black dull appearance; it has all the characters of rich ore.

SECTION XXIV.

Extent of the Vein.

The width of the vein is about 70 feet. It has been traced in the direction of its length, 5,742 feet. It preserves a great uniformity of breadth throughout this distance, and it is far more continuous, and passes less frequently beneath the rock.

SECTION XXV.

Purity of the Ore.

Generally, at the surface, this vein appears more intermixed with rock than either of the others. I have, however, often found, that this is owing, in part, to weathering, as a large proportion of the particles in mass, though earthy in their appearance, still were obedient to the magnet. Disseminated very sparingly in the ore at some points, are minute particles of sulphuret of iron. My attention was first directed to this mineral by observing a brown stain, and instances of a thick brown rust over the face of the vein, where it was exposed to the weather. It was beneath the rust, that I detected this mineral. It is not however uniformly present, and when it is, it is quite doubtful, whether it is in sufficient quantity to affect the quality of the iron. Judging from experience, I am disposed to consider this ore as better adapted to the furnace than the other veins. The presence of sulphuret of iron, in part improves the appearance of the castings, renders them smoother, and in fact increases the fusibility of the ore.

SECTION XXVI.

Situation of the Vein.

This vein is about 80 rods east of the site of the works, on a steep ridge which overlooks the entire clearing in which the village is situated. It extends in a northwest direction, more than half a mile from the works. It possesses all the advantages of the Sandford vein for quarrying. In fact, an inclined plane from the main vein might be so constructed, as to carry the ore directly into a furnace. It is, therefore, as favorably located as can be desired, so far as mining operations are concerned, or the transportation of ore to the works.

This ore, though situated in the immediate vicinity of the forge, has not yet been wrought, it is therefore impossible to speak of the quality of the iron which the ore is capable of producing. We have no reason for supposing that it will make bad iron, or that it will work hard. These are points which can be settled only by experiment.

SECTION XXVII.

Other known veins of less extent in the vicinity of McIntyre.

Of the veins recently discovered, I may mention one on the west side of Lake Henderson, about three-quarters of a mile from the works. It is a beautiful fine grained ore, and is worthy of exploration.

Another exists on the west side of Lake Sandford, and nearly opposite to the ore bed; it is quite extensive but has not received much attention. Another exists on the east side of the Sandford hill; it is supposed to be a continuation of that vein and an out crop on that side of the hill; its extent is unknown. There is but little doubt that it is abundant, as it appears in a solid ledge.

Again, strong indication of ore exists on the East river, and a branch which falls into it, from the east. Large masses of a beautiful pure ore are scattered along each of those streams which have been brought down on masses of ice. Of the existence of one or more beds in that region, there can be no doubt, and as it will be in the vicinity of water power, they may be made to furnish the ore for an establishment on those branches. Besides, the whole will be in the vicinity of the railroad, which leads to Lake Champlain.

SECTION XXVIII.

Clays.

It is only a short time since clay of any kind was known in the vicinity of the village. It was of course a great desideratum, inasmuch as brick especially, are so indispensable to a manufacturing establishment. The clay found on the Adirondack river, is not only suitable for brick of the ordinary kinds, but from some trials made, it seems to be of the first quality for fire-brick, and not only so, but such is its fineness, that it is at least suitable for the manufacture of all the ordinary stone wares. This clay evidently results from the decomposition of the labradorite, hence it is strictly speaking, a *porcelain clay*. It has not however, the whiteness of the clays of the common feldspar, yet it seems to possess its infusibility,* which is the principal property that is wanted.

The colour of this clay is a yellowish white, with a tinge of brown, or in some instances a tinge of green. It consists of aluminous matter intimately blended with fine siliceous particles, and which imparts to it a slightly gritty feel. It is entirely destitute of the argillaceous odour. When moistened with water it is readily formed into any shape, which it invariably retains. When placed on hot coals it hardens and dries without cracking,† even when it is suddenly exposed to a high temperature. When a small mass has been exposed for five minutes, to a white heat in a blacksmith's forge, it becomes hard like stone, and acquires a very thin glazing, but does not otherwise melt or crack.

From these experiments, it is evident that this substance is quite remarkable, and must become extensively useful for many purposes, but particularly for brick of every description. This clay is found occupying the low swampy ground, through which streams pass from the adjacent mountains. It is always overlaid with gravel and sand, varying in depth according to the exposure.

The most important bed, is less than half a mile from McIntyre. It occupies a low meadow of about 10 acres, some parts of which are marshy. By sounding, its depth could not be ascertained. Another locality was found near Lake Henderson. There seems, therefore, to be a sufficient quantity in the immediate neighborhood of the establishment, to meet all the demands for it.

SECTION XXIX.

Peculiar advantages of the village of McIntyre and its vicinity, for the extensive Manufucture of Iron.

On a partial view of this subject, it might appear that a distance of 40 or 50 miles from water-carriage to the great markets, would be an important objection to an establishment which involves in its very nature the transportation of heavy articles. When we further consider, however, that such are the improvements in the construction of railroads and canals, and that scarcely any part of the country is inacces-

* I have since found it fusible in the porcelain furnace.

† From this remarkable property, it is eminently fitted for moulds, masks, statuary, &c.

sible by the one or the other of these modes, the objection vanishes: and the only inquiry remaining is, whether the vicinity of the proposed establishment abounds in the necessary articles required for its successful operation. The *first* question is, whether there is a sufficiency of ore in an accessible situation; the *second*, whether there is wood or other combustible materials for reducing it; and the *third*, whether there is water power for moving machinery; though the latter is not so important as the former, for it is possible, that steam, in a wooded country, may be as cheap a moving power as can be employed.

As regards the *first* of these inquiries, it is a very plain case; for there can be no doubt as it regards the quantity as well as the quality of the ore in accessible positions. From what has been said in the preceding pages, respecting the great amount of ore in either masses, it will be perceived, that such is the thickness and extent of these masses, whether considered as veins or beds, that the ore has only to be quarried as the common rocks of the country for a long period to come: therefore, the heavy expenses incident to mining are saved.— These incident expenses not only include the machinery for raising ore and draining the water, but a vast amount of labor. All the varieties of ore which can be deemed necessary, are found in the village and its immediate vicinity. The coarse grained ores are suitable for the production of malleable iron and steel. Their purity qualifies them for those purposes. The fine grained ore is suitable for castings, it being a leaner ore, blended somewhat with pyrites. The presence of the latter substance aids, it is thought, in the perfection of the castings from the moulds, and secures smoothness of surface. Probably, no portion of the world can vie with McIntyre in its ores of irons; even the far famed Iron Mountains of Missouri are eclipsed by the rich ores of Essex county, New-York; and if not in quantity, at least in quality; for the ore of those Iron Mountains contains quite a large amount of sulphuret of iron, which must injure the quality of the iron produced from it. It is not, however, our business to detract from the merits or resources of our western sister, but to present in their true aspect the distinguished advantages possessed by New-York for the manufacture of this important article, and especially that portion of the State under immediate consideration. If we were disposed to enter into calculation, it would be easy to demonstrate, that *either* of the great veins which have been described, cannot be exhausted for centuries.

The *second* inquiry is, whether there is wood in sufficient abundance to justify the establishment of iron works on the most liberal scale. On this point I may observe that the village of Mc Intyre is situated in the midst of an unbroken forest. Towards the east, there is at least 25 miles of forest. To the south it is 16 miles to the Pendleton settlement. In other directions, the extent of unbroken forest is much greater. It will be perceived, then, that there can be no lack of fuel for a long period, if these resources are properly husbanded. The abundance of wood is that which gives so much value to this locality. It is a positive good, and nothing yet discovered can supply its place if it were wanting; for it is agreeable to the experience of all who have been in the manufacture of iron, that charcoal and wood are the best combustibles which can be employed. Coke and mineral coal are resorted to as substitutes, when the former cannot be obtained. When we look at the whole subject, it seems to be worthy of remark in the affairs of this State, that so wide an extent of territory has been preserved in its primitive state, untouched by the axe, until its mineral value should be fully known, its peculiar riches pointed out, and the mode by which they can be made available, well understood. For had the progress of settlements gone on as in other sections of the State, the forests of timber would have been, ere this, so far prostrated as to diminish greatly the use, for which nature seems to have intended them. The neglect, therefore, which this portion of the State has suffered, will prove an ultimate advantage. The time has arrived when the inquiry is made, not only into the value of production *on* the surface, but beneath it; and it is hoped, that the policy will no longer prevail of converting, indiscriminately, the products of the vegetable kingdom, so slow of growth, into ready cash, by the unsparing axe of the husbandman, but that some regard to the future may be paid both to questions of taste and utility.

With regard to the *third* inquiry, whether there is water power for moving machinery, I need only remark, that the amount of water fall, and the number of mill sites within short distances of each other, in and near the village, will afford any amount of water power that can be desired.

In giving an account of the iron ores of McIntyre, it can scarcely be considered unjust to other sections, where similar ore occurs, to state the peculiar advantage of this place above others at present known for the manufacture of iron. It is in fact proper that the truth should be extensively known and circulated, that the community may prize the resources at home, and that a commendable pride should be felt in encouraging the manufacture of an article, the demands for which are constantly increasing. For a long time to come this must be the case; for though a large amount of iron is made, and will probably increase in the mineral coal districts in the Union, still, the ores found there, do not, or have not furnished a quality of iron suitable for steel, and the stronger and tougher varieties of iron so much in demand, and so necessary to the perfection of machinery.

If we compare the prospects of an establishment at this place, with others in this country which might be named, and are in successful operation, the former would appear to great advantage. If, for instance, there are inducements to embark in the manufacture of iron, where the ore costs at the mine $5 per ton, and which has to be transported over a rough country on wagons 4 and 5 miles, and in some instances 20; and at the same time charcoal cannot be obtained at a distance much short of 6 or 8 miles; I say, if under these circumstances it is a profitable business, (and large dividends are realized,) what may not be expected where the ore cannot cost more than $1 per ton at the works, and an abundance of coal may be obtained in their immediate vicinity at $3.50 to $4.00 per 100 bushels. To these considerations must be added the superior iron which the ore produces. This, in my estimation, is one of the greatest advantages which the manufacture at McIntyre will have over all others established in this country. On this point I do not speak problematically, but proof is furnished from the experiments which have been instituted, and which have resulted in the establishment of this position. I refer to a report of experiments on this iron by Prof. W. R. Johnson, published in Silliman's Journal, and in the Journal of the Franklin Institute, and also appended to this report.

In the progress of this report, I have had occasion to refer to other collections of the magnetic oxide of iron, in this and the neighboring counties. I have made those references for the purpose of imparting correct opinions of the nature of the depositories of this species of mineral. It will have been perceived, that the localities at which this species occurs, are somewhat numerous. These, though they are important, and have been successfully worked, still, in the comparison of quantity with those of McIntyre, they are only as the spatterings from the great cauldron, in which those ores have been formed.

The site of the village of McIntyre, is not far from what will be one of the great lines of communication through the State. Situated as it is on the table land of the north, it can have a communication east to Lake Champlain; or south, through Long and Racket lakes; or north-west, down the Racket river to the St. Lawrence, and thence to Canada.

SECTION XXX.

Theory of the origin of the Veins of the Magnetic Oxide.

The complete establishment of any doctrine in geology, as in all other branches of science, requires an extensive series of observations. Ample time for observation and reflection must be given to the subject before a theory can be established, or even advanced with propriety. Hutton, after an extended series of observations led the way to the establishment of the doctrine of the igneous origin of granite and basalt, and consequently to the overthrow of the theory of Werner. Since the day of Hutton, his doctrine by farther elucidation, is confirmed, and it is now the received doctrine of the day. Since then, the theories in relation to the formation of other rocks have likewise undergone similar changes, so that igneous rocks are spoken of with as much confidence as those formed by deposition from water.

Applying the same rules of reasoning as have been employed in establishing the igneous origin of granite, and we shall probably arrive at the same result, as it regards the origin of the magnetic oxide. A moment's consideration only, is required to reject the theory, that those veins are of aqueous origin. The idea that they may have been formed by electro-magnetic agency, is quite difficult to support, when such immense quantities of matter are concerned. We are left, then, to adopt the igneous theory, almost by necessity. We may now ask, what phenomena do those veins present, which go to show that the materials were ever in a state of fusion, and were projected upwards into fissures while in this state.

In the first place, there is presumptive evidence of this, arising from the fact that the magnetic oxide* is always associated with igneous rocks, and in fact embraced in them.

---

* There is no improbability of their being contemporaneous with the rock, and to have been acted upon by the same agents.

In the second place, there are often seen branches extending off from the main vein, which are similar to those which granite sends off laterally, or obliquely, from a great mass.

Again, there are many instances both on a large and small scale, in which the mass widens as it proceeds downwards. Such is the case with the great mass of ore at Lake Sandford.

In searching for changes of structure, in parts of the rock adjacent to a mass of ore which would bear the appearance of heat, we do not discover that evidence which presents itself, when an igneous rock comes in contact with one of aqueous origin. We, however, discover a change of a different kind, which we are disposed to attribute to the agency of a mass of melted matter on the rock; it is the conversion of rock into garnet, a change, which requires only the chemical union of iron with the earthy matters composing the labradorite; and a change of this kind appears possible, while the materials are in a melted state. This view of the subject, is sustained by the fact, that garnet does not occur in the rock, except in proximity with the ferruginous masses.

Without pretending to establish the doctrine of the igneous origin of the veins of the magnetic oxide, I have only to remark that all the facts which have been observed, favor the doctrine expressed above; but a greater number of observations and facts are required, to establish it, and place it on the same ground, as that of the igneous origin of granite and basalt.

SECTION XXXI.

Face of the Country, Lakes, Timber, &c.

The face of the country, is both hilly and mountainous. To the northeast of the Adirondack Iron Works, at the distance of about 15 miles, is Mount Marcy, the highest mountain* in the State. Surrounding it in all directions, are other peaks of lesser elevation. In the immediate vicinity of the works, the mountains are comparatively low, and the valleys between them of considerable extent. The arrangement of the mountains, and the connexion of the valleys, are such, that

* The height of this mountain is 5,467 feet. Mr. Johnson, however, gives the height as much less, a d he has made an elaborate statement in Silliman's Journal to prove that his measurement was right and mine was wrong. This was quite natural. Proof has been furnished since his report, that he is in error only a little over 400 feet.

no formidable obstacles are presented in approaching the establishment; that is, there are no mountain barriers to prevent access, either by good common roads, or by rail roads, on which locomotives may be propelled by steam. The height of the village of McIntyre above the level of the sea, as ascertained by barometrical measurement, is about 1800 feet. This height is about the uniform level of the table land, of the north section of the State. When overcome, we may travel over a great extent of country, either by ordinary modes, or by canoes, batteaux, &c. by means of the lakes, which are here and there spread out, and which are connected more or less together by their outlets, and which are also nearly on uniform levels. By lakes and their outlets through low passes between the hills, we may pass to the larger lakes, to the southwest, viz: Long and Racket lakes. This may be considered an important fact, for it leads to an immense extent of wooded lands of the best kinds, and which would be of great importance to the Adirondack works, if they were not already surrounded by forests. This consideration, however, serves to dispel all fear in relation to the ultimate failure of fuel.

The timber of the higher mountain tract, is spruce, pine and balsam; of the lower, a mixture of spruce, pine, larch, cedar, maple, beech, birch, with a little ash and hemlock; intermixed, are lesser patches of entirely hard wood. The whole country, except the higher mountains, may be considered as heavily timbered, for though the growth is not so large as on the rich alluvial bottoms of the western part of the State, yet, the trees are more numerous, and would furnish nearly an equal amount of wood to the acre.

SECTION XXXII.

Adirondack River.

The Adirondack river rises in two principal branches, in a north and northeasterly direction from the village of Mc Intyre. The northeasterly one is, between 4 and 5 miles in length; and the northerly is full 5 miles long, and takes its origin in the great Adirondack pass. The branches form a junction at the above named village, and from thence pursue a southerly course for 7 miles, when they mingle their waters with the Opalescent river. The Adirondack in its course, flows through two important lakes, the upper one is, Lake Henderson, which is two miles long, and from 40 to 160 rods in width, the lower, is Lake Sandford, and is about 5 miles long, and from 20 to 100 rods in width.

It drains so wide an extent of mountainous country, (and which is entirely covered with a heavy growth of timber,) that it forms a river at the works, whose width is 40 feet, with an average depth of one foot. It flows rapidly over a rocky bed almost its whole length, excluding of course its passage through the above named lakes. The most important portion of the Adirondack is between those lakes, whose relative position, together with Opalescent river, may be seen on the county maps.

The portion referred to, is about two miles in length, in which distance there is a fall of 90 feet and a fraction, and which furnishes space for 5 mill sites, without interference with each other. The amount of fall at each site, varies from 13 to 15 feet. The most important of these is, at the outlet of Lake Henderson; it is important, as connected with this lake, inasmuch, as it may be used in a dry season as a reservoir.

The dam, as it is now constructed at this outlet, forms a basin which holds in reserve about 99 millions of gallons of water; this quantity may be increased to 180 millions, by raising the dam 10 feet, which quantity of water, would furnish a supply for daily expenditure, during 60 days, of 3 millions of gallons. For the measurements, I am indebted to Mr. E. N. Horsford's Report to the proprietors of works situated on this river.

To prevent however, any apprehension of a failure of water during an excessive drought, it has been proposed to turn the upper waters of the Opalescent river, into the east branch of the Adirondack, the source of which is some 160 rods below Lake Colden, at which place there is a low pass of only 18 feet perpendicular height, which divides the source of the one, from the bed or channel of the other. To unite those waters, requires only a dam below this pass, whose bottom shall be 33 feet; the top requires a length of about 50 feet, while the height need be only from 19 to 20 feet, in order to flow through the pass without excavation. The change in the direction of those waters, would increase the amount at the works, about 50 per cent, and furnish many additional mill sites of great power along the east branch of the Adirondack. But to satisfy all demands for water, which the most extended works may require, there is in reserve all the waters of the Opalescent river, which fully equal that of the Adirondack. The river, is about two miles from the works by a wooden rail-road. Above the intersection of this road, the river descends for 3 miles from the great falls, in a series of rapids; furnishing at many points, safe and convenient mill sites.

SECTION XXXIII.

Sand.

Accompanying the clay, or in near connexion with it, there occurs *Sand,* both in a fine and coarse state. Its appearance leads me to conclude, that it is formed from the decomposition of the hypersthene rock. It is composed of grains of dark coloured labradorite and quartz. The latter predominates greatly, and may, therefore, be considered as a siliceous sand. It is scarcely necessary to enter upon a detailed description of the beds occurring in this vicinity, though the fact of their existence is of great importance. From experiments which have already been made in bricks, it is found necessary to add freely of the sand to the clay, in order to form a mortar, which shall be of a suitable composition. The close proximity of the two substances is a circumstance worth noticing in this region, inasmuch as it was formerly quite doubtful whether they existed in sufficient abundance to become articles of importance to the settlement. Those doubts are now happily removed, by the discovery of both in sufficient quantity to meet all demands which can probably be made for them.

Fire Clay.

In a note to page 295, it will be seen that the clay, which is there described as a *fire clay*, has not been confirmed by experiments which have been made with it in a porcelain furnace. It is proper to remark, however, that no doubt exists in relation to the origin of the clay, viz: that it is a product which arises from the decomposition of a felspathic rock, but which has not undergone a perfect change. It is still a valuable clay, but as it contains portions of lime and soda, it is fusible at a high temperature. Though the particular locality from which the specimens which have been subjected to trial, and that a severe one, has failed in proving the correctness of our former conclusions, still we are not to suppose that a fire clay does not exist in this region, and it is highly probable that when the surface clays have been removed, at some localities, clays highly refractory will be found. However this may be, we have to state that a *ferruginous clay* does exist in abundance, on the banks of the Opalescent river, which may be considered a true *fire clay:* I shall speak of it, however, as a yellow ochre.

Yellow Ochre.

From trials which have been made with this form of ferruginous clay in the *porcelain furnace*, it is found absolutely infusible. It appears, therefore, for no analysis has yet been made of the ochre, that the quantity of iron is not sufficient to operate as a flux, neither is there a mixture of silex, as it would in that case be fusible. The most remarkable character which appears in this ferruginous clay is, the brightness of its colour. On exposure to heat, it assumes a lively brown, which is superior to the common Spanish brown. We have, therefore, not only a fine clay, or one which may be employed for fire-bricks, crucibles, &c. but one which furnishes a superior pigment. The composition is evidently that of the porcelain clays, with the addition of iron, in a sufficient quantity to impart to it a fine yellow hue, and also, by burning, a bright reddish brown. It is now used in the Jersey City Works, and is found superior to any hitherto employed.

Confirmation of former views, in relation to the purity of the Ore of the Sandford Vein.

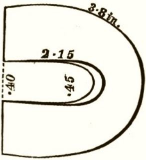
Since the preceding account of the Sandford vein was written, an excavation has been made in it about its centre. This excavation is 10 feet in perpendicular depth, and about 20 feet wide, and about 30 in length. After the removal of the surface, the whole excavation presents entire layers of ore, without a particle of rock, a large portion of which is of the soft or granular kind, a variety much esteemed and sought for by bloomers, inasmuch as it requires no washing, and makes iron rapidly in the common forge. Without occupying farther time and space in the description of this or the other veins, I shall merely remark, that this improvement in the purity and goodness of the ore, is in accordance with the every day experience of miners.

SECTION XXXIV.

Extract from a report, by Prof. W. R. Johnson, of Experiments on the iron, manufactured at the village of McIntyre, Essex county, New-York.

To ascertain the toughness and ductility of this iron when cold, I caused the bar to be bent at a temperature of 50° at a part where the breadth was 1.295 inches, and the thickness .59 inch. This bend was made flatwise, and continued until the corresponding faces on the inside, about one inch from the middle of the inner curve, were four-tenths of an inch apart, and the widest part of the opening only .45 of an inch. The alteration in the form of the bar appeared to be limited to this portion. On measuring along the interior and exterior edges of this curve, the former was found to be 2.15, and the latter 3.8 inches, manifesting a difference in the length of the inner and outer fibres of 1.65 inches in a length of about $2\frac{1}{4}$, the original extent of the bent portion. See Fig. 1.

Fig. 1.



By this trial the whole form of the cross section of a bar is changed, and instead of straight lines exhibits only curves. In the present case the parallelogram Fig. 2, was converted into the form of Fig. 3, the largest curve being on the inside of the bend.

Fig. 2.

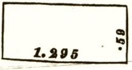
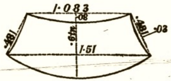


Fig. 3.



This change of figure and displacement of parts were borne without exhibiting any signs of rupture until the curvature above stated, had been attained, when a few cracks began to appear on the exterior part of the curve.

The next test to which this iron was subjected, was to heat a portion of the bar to redness, quench it in cold water and then bend the same portion cold, in the manner already described. No difference of result was obtained except a greater facility in producing it. A few slight surface cracks were seen near the close of the operation.

A third trial of a similar kind on a bar annealed and cooled in dry ashes resulted like the preceding, but exhibited rather more cracks on the exterior surface of the bend than either of the foregoing.

Another trial of the toughness of this iron when cold, was made by drawing out a bar .7 of an inch wide, .18 inch thick, and 5.4 inch long, and twisting it cold in the manner of a common twisted auger, twice round in the length just specified. The edges of the spiral were now exactly 7 inches long. Hence, the elongation of the exterior fibres on the edges was $\frac{.7-5.4}{5.4}$—29.6 per cent. It is proper to state that this experiment was made after annealing the bar, and cooling it off in dry ashes. In attempting to carry the torsion beyond this extent, the bar was twisted off at the jaws of the vice, in which the operation was performed.

Having thus proved that this iron is not under any circumstances *cold-short,* I caused the bar 1⅝ inches wide, and .6 inch thick, to be heated to a fair working red heat, and in that state bent flatwise over the corner of an anvil, and a right angle exterior and interior to be formed ¾ of an inch from the end. The exterior angle remained perfectly sound. On the interior, a thin scale only of metal appeared to be corrugated and partly detached from the rest of the mass, owing, probably, to a defect in welding—but not the least sign of a tendency to fracture was discovered. Another portion of the same bar was heated as before and 3 inches of it bent over and hammered flat upon the face of the adjacent part.

Complaints are made by workmen that much of the iron which they employ will not sustain either of the two preceding operations. They were, however, borne by the iron under trial, without evincing any weakness or undue distortion of parts.

A third test of the quality of this iron, when hot, was afforded by heating about 3 inches near the end of the bar and driving a steel punch .8 of an inch in diameter, quite through it. This was done without splitting or cracking at the edges, as is too often the case in making screw nuts. Machinists are well aware of the importance of a good material for the formation of screws and nuts.

The foregoing trials having, as it was conceived, fully established the freedom of this iron from the defects known either as *hot shortness* or *cold shortness*, and its softness and malleability being amply tested by the cutting and hammering incident to these experiments, the next step was to determine the absolute force of cohesion, together with the extensibility, when subjected to longitudinal strain, and the interior structure of the metal under various circumstances, including that of welding in the ordinary way.

For this purpose five bars were drawn out and prepared from the specimens already described, numbered I, II, III, IV, and V, each about 9 or 10 inches long, 1 inch wide and .2 inch thick.

No. I. after being reduced to a nearly uniform size throughout its length, was annealed at a red heat and allowed to cool slowly in the air.

No. II. was *hammer hardened*, or beaten with moderate force, throughout its length until it had been for several minutes black, the hammer being occasionally moistened during the process.

No. III. was forged out and hammered till it was only visibly red in daylight, being left at about the temperature at which workmen cease their operations on many of the articles which they produce.

No. IV. after being brought to an uniform size, was upset for about 3 inches, in the middle, and was then annealed and cooled slowly.

No. V. was drawn out, cut into in the middle, and welded together. This sample was only 6½ inches long.

All these bars were then carefully gauged, both in breadth and thickness, at every inch of their lengths, before commencing the trials of tenacity. The machine employed in testing them was the same which had been used in experiments made at the request of the Treasury Department, on the strength of materials for steam boilers, for a description of which the reader may be referred to the report on that subject.* The following table will be understood without any other remark than that the breaking weights in the 5th column, are corrected for friction of the machine. The specific gravities of several of the fragments of each bar after it had been broken up, are given under the head of ob-

* See also Journal of the Franklin Institute, vol. xix. p. 84.

servations, and may serve as well to illustrate the general character of the iron in this respect, as to indicate the effect of the several methods of preparation on the density of iron.

The following experiments confirm the evidence already adduced of the great toughness and ductility of this variety of iron. Besides the facts mentioned under the head of *observations* in the 7th column we may add that after the first fracture on each bar, a measurement was taken between two of the inch marks still remaining on one of its parts and the following results obtained, viz:

No. I.	In an original	length of	6 in.	had been	elongated	.87 in.	= 14.5	pr. ct.
II.	"	"	4 "	"	"	.2 "	= 5	"
III.	"	"	5 "	"	"	.6 "	= 12	"
IV.	"	"	4 "	"	"	.2 "	= 5	"

TABLE.

Experiments on the Tenacity of the Iron.

o. of the bar.	State of the bar.	No. of the experiment.	Area of section before trial in sq. inches	Breaking weight in lbs. avoirdupois.	Strength in lbs. per sq. inch,	Observations.
I.	Completely annealed.	1	.1890	10.175	53.820	Length before trial, 10 inches, after, 13.5—total elongation 35 pr. ct. Sp. Gr. after trial 7.685, 7.676, 7.668. Mean = 7.676. After the 4th fracture the area of section was .1064 in. instead of .1986 as at first, diminution 46 per ct. Mean strength of this bar 53.311. Greatest difference 1706 lbs. = 3.2 per ct. of the mean.
		2	.1929	10.288	53.336	
		3	.1954	10.345.5	52.945	
		4	.1986	10.374	52.235	
		5	.2036	10.972.5	53.941	
		6	.2057	11.029.5	53.614	
II.	Hammer hardened.	1	.1980	12.967.5	65.492	Length before trial 9⅛. in, after, 11 in.—total elongation 20.5 per ct. Sp. Gr. after trial, 7.769, 7.756, 7.779, mean = 7.768. Mean strength 65.713. Greatest difference 2348 lbs. = 3.5 per ct. of the mean.
		2	.2019	13.053	64.650	
		3	.2000	13.399.75	66.998	
III.	Hammered till nearly black.	1	.1983	11.970	60.363	Length before trial 9.5 in., after, 12¼—total elongation 28.94 per ct. Sp. Gr. 7.760, 7.778, 7.662, mean = 7.750. After the 2d fracture the area of section at the point of fracture was .1176—diminution 45.2 per ct. Mean strength 58.912. Greatest difference 2.444 lbs. = 4.15 per ct. of the mean.
		2	.2151	12.454.5	57.919	
		3	.2163	12.768	59.029	
		4	.2213	12.910.5	58.339	

TABLE—(CONTINUED.)

No. of the bar.	State of the bar.	No. of the experiment.	Area of section before trial in sq. inches.	Breaking weight in lbs. avoirdupois.	Strength in lbs. per sq. inch.	Observations.
IV.	Upset in the centre and annealed.	1 2 3 4 5	.2086 .2233 .2316 .2282 .2354	13.110 13.623 13.737 15.162 15.561	62.847 61.007 59.313 66.441 66.104	Length before trial 9, after 11.2—total elongation 24.46 per ct. of original length. Sp. Gr. after trial 7.813, 7.731, 7.754, 7.634, mean = 7.733. Mean strength 63.142. Greatest difference 7.128 lbs. = 11.2 per ct. of the mean. The last two results belong to the upset portion of the bar. The thickest part of the upsetting remained, however, unbroken.
V.	Welded together near the middle, hammered till nearly black.	1	.1845	10.773	39.585	Broke outside of welding. The strength is about the same as in No. III.

To compare this iron with others, it is proper to assume bar No. III. as the standard, that having been hammered till of a dull red heat. The report already cited furnishes us with abundant data derived from experiments, made with the same machine, on other kinds of bar iron, in a similar state. Thus we have—

				Strength in lbs. per sq. inch.
Iron from	Salisbury, Conn., by a mean of	40	trials,	58.009
"	Sweden, "	4	"	58.184
"	Centre Co. Pa. "	15	"	58.400
"	Lancaster Co. Pa. "	2	"	58.661
"	McIntyre, Essex Co. N. Y. [as above]	4	"	58.912
"	England, cable bolt [E. V.]	5	"	59.105
"	Russia,	5	"	76.069

Hence it appears that the last only is essentially superior to the iron of McIntyre. These are among the best varieties of bar iron in point of tenacity.

The fracture is of a light iron grey colour, silky lustre, and generally displays a compact structure. It is worthy of remark that most of the fractures took place in directions oblique to the line of tension and making with it, either in the breadth or thickness, one or more angles of about 60 degrees each.

The fibrous structure of the metal was very marked in cutting with the cold chisel and was further developed by acids on a part of No. III, on the surface of which delicate lines were shown traversing a distance of several inches. The specific gravity in the annealed state was, it appears, increased 1.2 per cent by hammer hardening.

In conclusion it may be observed that as a large and increasing demand for good iron prevails in the United States, in proportion to the increase of finished and accurate machinery requiring superior materials as well as workmanship, there can be no doubt that any quantity which could probably be produced, if possessing the properties of that above described, would command a ready market and the best of prices.

Iron Ores of St. Lawrence and Jefferson Counties.

It is a fact worthy of particular consideration that the ores of St. Lawrence and Jefferson belong to different mineralogical species from those of Essex, Clinton, Franklin and Warren counties; a difference for which it is not easy to account. The specular ore, which is a per-oxide of iron and always gives a red powder, though black in itself, is peculiar to the former counties, while the magnetic, which is a combination of the protoxide and peroxide, belongs to the latter. There are no instances of the occurrence of the specular ore on the eastern side of the Adirondack mountains. There are, however, veins of the altered magnetic oxide; for instance, there is a collection of ore in Crown-Point, known as the Saxe ore bed, in which the ore has probably been changed from the magnetic to the hydrous per-oxide of iron; and again, the Arnold vein, without doubt, has been so far changed as to give a decided red powder; though the structure and crystalline form remains as in the magnetic oxide. In the Saxe ore bed the structure has become fibrous, and resembles the Limonite of Authors. The specular ore belongs to a formation in which the primary limestone forms a large part. This is the only geological condition in which the rocks in the two districts differ. Both species of ore belong, strictly speaking, to a primary formation; but the limestone of the St. Lawrence exceeds that on the Champlain side; and, moreover, the specular appears to have a more or less intimate connexion with limestone. It is, perhaps, sufficient to state the fact, without entering upon the speculation *how* the limestone can have produced the change. In regard to the geological position of the two species of ore, it is evident that the hypersthene rock, that which constitutes the central portion of mountains of the northern part of the State, is the true location for the magnetic oxide. In this it is developed to the greatest amount; though it is not confined to it, it will be seen, however, on comparing the amount of ore in the hypersethene rock, and the ordinary granite and gneiss, that a single vein in the former equals all the veins of the latter rocks put together.

The specular oxide may be found in two geological positions; in the first it is associated with primary limestone; in the second with gneiss or some other primary rock beneath, and the Potsdam sandstone above. Examples of the first geological position are furnished by several collections of ore in Edwards; and of the second by the Kearny and Parish ore beds in Governeur. In addition to the limestone, serpentine is a common associate. It is sometimes in pure, separate masses, and then in others, it is in intimate mixture and combination; giving in the first instance a spotted, and in the last a mottled appearance to the rock. The character of the beds or veins of specular ore is now well understood, especially those which are connected purely with the cal careo-serpentine rock. At the surface, they are quite promising in many instances, but exploration soon reveals the fact that they, (frequently at least,) are but superficial collections of ore. They are found to be wedge-form masses, or masses which thin out entirely in the downward direction. The quantity varies exceedingly. In one instance 120 tons were raised, in another, between 500 and 600 lbs. In the last instance, the whole mass was moveable with a bar; it was in place, but decomposition had entirely separated its connexions with the parent rock. There are instances, however, in which a true vein apparently exists, or in which those masses extend into the rock without decreasing in width. The nature of these collections of ore, I consider to be attributed to the origin of the rock which embraces them. As it regards my views of the origin of limestone and serpentine, I refer the reader to the report for 1838.

Perhaps I ought not to consider that every collection of the specular oxide, is as limited as in the instances cited, or that even there is an exhaustion in those instances; there is, however, so much derangement, if more exists, it is quite difficult to discover it. In raising this variety of ore it is no uncommon thing to meet with an insulated mass of it in the rock, as if an excavation in the rock had been made of the size of a pail, and subsequently filled with ore.

The most abundant variety of the specular ore, is that which occurs of a deep red colour, and frequently in red powder or bright shining scales, which by a slight pressure becomes a red powder. Instances of these are furnished by the Kearney and Parish beds, the new bed discovered in Theresa and the Tate bed in Hermon. The two former beds belong really to one, as has been proved this last season, and which is agreeable to an opinion I have often expressed. It is quite difficult to form an opinion in regard to the nature of the collections of the variety of ore. No side walls have as yet been discovered, though they appear to pursue a determinate direction. There is too, a great difference in the quantity of ore which they contain; some, as in the instances cited are apparently inexhaustible, while others are merely a mass of red earth in which there are a few lumps of hard ore. There are many of those smaller collections between the sandstone and the primary rocks beneath. These are so frequent and common that I have no hesitation in considering the position as geological, and as having depended on a cause which operated generally at this particular period.

The position spoken of above, is confined to the upper portion of the primary strata and lower layers of the Potsdam sandstone. It is rather remarkable that this rock, which is so generally connected with this deep red ore, is not higher coloured throughout, for its general colour is white, at most but pale red or reddish, with a tinge of brown or yellow. In some places, however, it is deep coloured, but I have generally found those to be connected with some local disturbance.

Of the localities of specular ore it would be possible to enumerate a great number in the counties of St. Lawrence and Jefferson. I shall confine my remarks, however, to the most important, inasmuch as it is from them we are to derive the most information. Among those, I may class the Kearney, Parish, Sterling and Theresa beds.

The two first belong truly to one bed, as has been proved by intermediate openings. Besides, it probably extends south or southeast some considerable distance, as seems to be indicated by an out crop of ore in that direction. Indications appear also of the extension of the bed still north or northeast of the Kearney bed. This bed may then, without exaggeration, be traced at least a mile. Though we may trace it thus satisfactorily upon the surface, still it is not possible yet to determine its lateral extent. As it is now exposed, it has the character of a bed, laying as it were between the primitive rocks and the oldest of the sandstones. Still, it is possible that not only this, but all the masses of ore termed specular, may prove to be in veins, being the upward extension into the sandstone from the primary mass. The following facts have a bearing on this point. 1st. There are numerous places where this ore has no other connexion than with the primary. 2d. There are strong reasons in support of the position, that at these localities the sandstone has been removed, and that they were formerly in the same geological relations as the range in which the Parish and Kearney beds are now found. There are every where abraded surfaces and fractured strata, and it appears that the sandstone was once continuous over wider areas than it now appears, as we find its remains as far east as the specular is known to occur. According to this view, the sandstone, together with the red ore, has been removed; and according to well known facts, the whole must have been carried south. And what do we find in that direction? Not only beds of red oxide of iron, mixed it is true with argillaceous matter, but also siliceous rocks, the red sandstone and the gray band of Professor Eaton, &c. in connexion with this argillaceous oxide.

Could we establish the connexion which we have now supposed may have existed between the rocks of St. Lawrence and Jefferson and those of the counties south, it would be an important link in the chain of facts connecting the origin of those rocks, the relative period of deposit, the slope of the country, the direction of the valleys, in fine it would be the gathering up of a mass of history of ancient times of the most interesting character, and bearing generally on the geology of the State.

The establishment of a fact in antient geology is often difficult, while the inferences from it are comparatively obvious. It may be that we shall never be able to do this in relation to the ores we have just spoken of; and it may be, that all we ever shall be able to say will be, the argillaceous ores exist; they are found above and in connexion with sandstones; they are mechanical deposits; they came from some foreign source, and transported matter was carried from north to south; therefore the beds of argillaceous iron may have been transported from the northern counties to the more southern. There is in this view, if admitted, a beautiful exhibition of prospective care for the wants and necessities of man. We may suppose, that in the north are vast beds of this invaluable substance, far more than can be necessary for all the uses of those who may dwell there; but in the progress of reducing to order the earth's surface, and bringing it to the best possible state to meet their wants, those northern rocks were broken up, and their valuable contents pulverized and transported to a more distant land; one which, acccrding to the established order, would not contain this mineral, unless carried to it by the means we have supposed. It is a case similar to that of the accumulation of carbonaceous matter from the great stores which existed at a certain period in the earth's history, and like that, is an instance of prospective wisdom, and provision for the future.

The red ore already spoken of as the Theresa bed, is about 4 miles east from the falls. Its general appearance is much like the Parish ore. It occurs in the sandstone, like that, but is in general a leaner ore. It is, however, a new bed, and had only been opened a short time; all that was exposed was surface ore, and probably inferior to that beneath. This bed had been traced a mile in a northerly direction; hence the indications for an abundance are not inferior to the range in which the Parish and Kearney beds are situated. It is carried to Carthage for reduction, and was said to be excellent. Being situated, however, only 4 miles from the Highfalls, it will probably find a market there, inasmuch as the falls form one of the finest water privileges in the northern counties, and besides, there is not a lack of wood for coal.

In this connexion, I may mention another *new bed,* on or near Muscolunge lake, which, in case of the improvement of the navigation of Indian river, could be transported to the falls for reduction by water.

Qualities of the Specular Ore.

It is particularly valuable for castings, as it runs smooth and exhibits a beautiful finish. It is not used in the forge, or made directly into malleable iron. It makes, however, good bar iron from the pig.

It was supposed formerly that the bright crystallized variety could not be worked. It was undoubtedly a whim or prejudice of the workmen employed in the first trials. It was said to contain arsenic, and to have created sickness and vomiting. Proper trials, as was predicted, have proved the falsity of those assertions. It is an excellent ore, does not contain arsenic, and never exhales an unpleasant or poisonous vapor. As a general rule, the opinions of many of the bloomers and furnace-men are to be received with some allowance.

Associated Minerals.

There seems to be a great uniformity in the kind of mineral substances found in these beds. They indicate, therefore; a common origin. We may enumerate the following as constant attendants of the specular ore: sulphuret of iron, quartz, either amorphous or in crystals, an interesting and rare form of the latter is the dodecahedron, carbonate of iron in amorphous masses or in crystals, sulphate of barytes, carbonate of lime in thin fibrous individuals, and also in crystals. The most common form is the nailhead spar. Serpentine, green and brown, with a remarkable distinct conchoidal fracture, and a very perfect resinous lustre, sulphate of iron, formed by decomposition of the sulphuret.

ORIGIN OF THE SPECULAR OXIDE.

Various opinions have been expressed on the mode of filling mineral veins. Some adopting the theory of injection from beneath ; others that of sublimation, and others still an electro-magnetic action, or the separation and transference of particles from the parent rock, into cracks or fissures, by an electrical agency. It is an agency well illustrated by the currents which flow from the positive to negative side of a galvanic battery. If a liquid, as water, for instance, is acted upon by the current, it is decomposed, and the oxygen is found at, or transferred to, the positive pole. To deny such an agency in the filling of veins in all cases, would certainly be wrong; but to attribute the filling of *all* veins to that agency, is equally wrong. Now, experiment clearly proves that the most common mineral substances resist entirely the action of this form of electricity, except under certain conditions. All bodies, in a solid state belong to this class; *fluidity* is an essential condition. This, it is true, may be an aqueous or igneous fluidity. If there is an open fissure filled with water, or any fluid, holding, in solution, mineral matter, it may be deposited or separated from it by galvanic agency. It would appear as an essential condition that a fissure should previously exist. Now, if we suppose igneous fluidity, either of the rock or the mineral in question, or both, it may be galena, or iron, as either have a condition which is incompatible with the formation of a fissure, so long as fluidity exists; or we have a condition in which it becomes unnecessary to call on the aid of an electro-motive power. If the rock is in a state of fusion, no fissure can be formed, into which a metallic substance can be transferred, so long as that condition exists; and when it becomes solid, it loses the essential condition requisite for electromotive action; but while it is in this state of igneous fusion, the particles are in a state which are favorable for movements in obedience to the power of attraction; and hence, masses of mineral matter may, under this condition, form, but the masses are not veins. Again, if the mineral itself is in a state of igneous fusion, and there is a fissure to receive it, then the very power which caused this fusion, is adequate to the filling of it, either by injection, while in a melted state, or by sublimation.

It will be observed that the great objection to the filling of veins by electro-magnetic agency, is, the want of a state in which that agent can exert its powers, that condition or state being one of liquidity; so long, therefore, as a substance is solid, or in an aeriform state, it is just so long unacted upon by this agent.* Besides, in favor of igneous agency in the filling of veins, we have many positive examples in the case of dykes of green-stone, lava, &c.

If the above is true, we may conceive that the error comes from the general and exclusive character of the theory. The filling of a vein, in a

*Thus, water, though decomposed by galvanism, is not at all acted upon when frozen, or in a solid state.

certain sense, may be, in part, the result of galvanic agency; but it must, from the nature of the case, be confined to the *separation* or decomposition of materials already in the vein; for instance, the salts of silver being in solution, may be decomposed, and pure silver may be deposited on the wood and other materials in the mine. This has occurred in some of the abandoned pits of mines which were filled with water, in which ladders and other implements were left. But this is a result quite different from the original action, when the vein was filled; and in all the experiments yet published to illustrate this process by galvanic agency, the analogy of the two cases is quite obscure, if it does not totally fail, and the result amounts to but little more than the decomposition of some of the materials held in solution by the water filling the vein, and does not go so far as to explain how the materials got there in the first place.

MAGNETIC OXIDE OF ST. LAWRENCE AND JEFFERSON COUNTIES.

In the southeastern part of St. Lawrence, the great beds of limestone disappear, and along with them, the specular oxide. In their places we find a granite, approaching in its character to the hypersthene rock, with its usual associate, the magnetic oxide. The geological structure of this region is much like that of the eastern part of Essex, and the southern part of Clinton, and the probability is, that when the country is cleared, there will be found a similar mineral district. We already know of several veins of the magnetic oxide. One of these has been noticed in one of the preceding reports. It is known as the Chamont bed, and was explored to some extent, twenty years ago. It is about 4 miles west from the point where the Albany road crosses the Oswegatchie. It is situated near the road, and traverses a ridge or hill, about 100 feet high. A portion of this hill is occupied by the ore mixed with flint, varying in proportions, from 50 to 80 per cent of iron. It is black, and resembles the Palmer ore. It is described by Dr. Ambler, of Rossie, who visited the locality last fall, as a complete "pepper and salt mixture," which we may understand as consisting of fine grains of gray quartz and black particles of iron.

The direction of the ore is nearly east and west, and the richest portion is on the southern declivity. It is in a gneiss rock, whose strata are nearly vertical, but whose dip is to the west. It is highly magnetic.

The quality of this ore has not been sufficiently tested. Nothing in it appears injurious, and the probability is, that it will prove valuable.

Near the locality is good water power and abundance of fuel. Besides the eastern ores, as noticed above, in the primary region of Jefferson county, Alexandria furnishes a few localities of the magnetic oxide. These localities are limited in extent, furnish a bright, shining ore when recently fractured, and have been called, erroneously, specular oxide. Those varieties of ore which I have seen, are similar to those which are known in other places as making a hard iron.

Magnetic Ore of Essex and Warren Counties.

Before concluding my account of the ores of the Second Geological District, I would not omit noticing a mineral district in the neighborhood of Brant lake, and a vein of valuable ore in Schroon.

The first locality is on the Ellis tract, in Hague. It is a vein of ore about 2 feet wide at the surface, runs north and south, and dips to the east. The accompanying rock is hornblende, much stained with the oxide of iron. It is highly magnetic, fine granular, free from rock, and upon the whole looks like good ore.

Another collection of ore occurs 3 miles north of Brant lake, in a region called *Desolate.* It is from 8 to 10 rods in length, and about 10 feet thick. The ore is fine granular, and compact, stained slightly on the surface by decomposed pyrites. It appears like a valuable furnace ore.

In Schroon, on the land of Mr. Harris, is a *vein of magnetic oxide,* 6 or 7 feet wide, and which may be traced a number of rods. It is on the west side of Paradox lake. It is a beautiful, coarse grained ore, mixed with a very small quantity of flint. It is the purest ore which I have yet seen in that particular neighborhood, and is well worthy of attention.

Another vein arises on the east side of Paradox; it is only about 18 inches wide, and dips too much into the mountain to be explored to advantage.

The Roberts vein, in Warrensburgh on lot No. 80, has been noticed in the former reports. It is about 4 feet wide, and increases in width as it extends downwards.

Notwithstanding all that has been said of the ores of iron in the Second Geological District, I still consider the accounts to be yet incomplete. I have lost no opportunity for observation on this important substance, and have gathered from others those facts which are essential to the completion of our information concerning them.

We may sum up, briefly, our present knowledge of the ores of iron, from which we shall perceive more clearly the value and amount of this mineral in the northern section.

1*st. The Clintonville Mineral District.*—In this, I have described 12 veins, 10 of which supply ore to forges for the manufacture of bar iron; and it is well known that the iron is of the best quality.

2*d. The Moriah Mineral District,*—in which we may enumerate, also, 10 or 12 veins; as a whole, they are wider and are capable of furnishing more ore than those of Clintonville; some of them are equal in quality to the best, others are inferior and produced a brittle iron.

3*d. The Newcomb Mineral District.*—The magnificent veins of this district have been fully described. It will be seen on inspection that the whole width of 3 veins amount to, at least, 1,484 feet.

4*th. The Schroon Mineral District.*—This has been explored to a less extent than the preceding. There is no doubt but it will prove productive in iron ores, and the facilities for reducing remarkably good. Thus, the falls on the Schroon river at or near Mr. I. Griffins, in Chester, present very superior advantages for the location of a forge or a furnace. Schroon lake and river are boatable above and below the falls. The state of the river below the falls gives access to the Brant Lake district, a distance of 6 or 7 miles.

5*th.*—Another mineral district exists in Duane, in Franklin county, but not yet examined.

6*th.—The mineral districts* of St. Lawrence, in the southeastern part of the county, to which the Chamont ore and the vein in township No. 10 belongs; and another in the adjacent wilderness, whose locality is known only to a few.

7*th.—The region of the* specular ore constitutes another mineral district of great importance. The amount of ore belonging to this species cannot be estimated so accurately at present as the others, but may be set down as inexhaustible in the present generation.

It is possible there is another mineral district a few miles west of Plattsburgh. The only fact, however, known to me, is the occurrence of a vein of magnetic oxide in that region. This part of my district I hope to explore the next season. We have, as will be seen, seven distinct mineral districts in the northern counties, each of which are capable of supplying a vast amount of ore. Of these ores, it is to be considered that they possess, in themselves, qualities which will enable a scientific manufacturer to convert them into the best of iron and steel. Of this, there is no doubt. Whether it is as profitable to embark in the manufacture of refined iron and the best varieties of steel as to continue to make the ordinary bar iron, is another question; but that the ores can be converted into them as economically as those of any country, (the value of labor being the same) we consider established.

Jefferson County.

The geology of Jefferson county is quite simple and free from any obscure points, so far, at least, as it regards the order of superposition of its rocks. In speaking of its geology, brevity will be consulted, for the reason that in my next report I shall, necessarily, give a detailed account of it. It will be quite unnecessary to speak of the character of the surface or of the soil. Few counties are better known than this. It is celebrated for its agricultural productions, the excellencies of which are owing, partly to its limestones and argillaceous slates, which undergo a slow decomposition and furnish the elements of a valuable soil.

A general division of the rocks of this county may be made as follows: 1st. The primary class. They are confined mostly to the eastern towns, Wilna and Antwerp; though a portion of Alexandria, all of Wells island and a part of Grindstone island are also of this class. The primary rocks are a gray granite and gneiss, a white granular limestone and hornblende. They are associated together more or less, though there are tracts over which one or the other may extend to the exclusion of all the others; thus, in Antwerp, there is an extended field of primary limestone, and in Alexandria, granite; though Wells island and a large portion of the shore opposite the island is hornblende and gneiss, with scarcely any limestone. Besides the primitive rocks just noticed is one composed of a mixture of serpentine and granular limestone, forming what is frequently called *Verd Antique*. To this I may subjoin *Rensselaerite*, which frequently occurs in thick, heavy beds in connexion with the above.

I am the more disposed to notice the Rensselaerite, in consequence of the use which has been made of it in agriculture as a substitute for plaster, or rather, it was declared to be true plaster, and sold as such. It was a gross imposition and fraud upon those who purchased it: for it was distinctly pronounced entirely unfit for the purposes of agriculture, and as being a stone, different in composition from gypsum. The Rensselaerite, in colour, varies from nearly a pure white to jet black; passing through the several shades of grey, yellowish and smoky grey to black. It is soft, and on the surface may be scratched by the nail; the interior is harder. The structure is generally compact, though sometimes, coarsely fibrous or columnar; fibres or columns diverging from a centre. It is the rock frequently employed for inkstands. The white and finely compact variety is a beautiful substance when polished; when cut thin it is translucent and closely resembles porcelain. The black variety, also, when polished, is handsome and worthy of a place in a cabinet. This rock is generally associated with the primary limestone and serpentine. It hardens by heat like the common soapstone for which it had been mistaken, but may be employed for the same purposes. It may be easily distinguished from it by its hardness; *soapstone* or *steatite* is uniformly soft throughout its mass; whereas, *Rensselaerite*, though it may be soft on the outside, yet, is much harder than steatite on a recent fracture.

Lying unconformably upon the primary is the Potsdam sandstone. It is therefore next in the series. It is a firmer rock, more crystalline and less porous than the same rock in St. Lawrence, and especially that belonging to Potsdam. It is particularly well characterized on the road leading from Carthage to Antwerp. In many places it is broken up and fractured; it everywhere exhibits an abraded surface. The abrasions furnish many instances in which the rock is worn through; or ground away down to the primary rocks beneath. We have evidence of this in the masses of the conglomerate, which is the lower layer, still adhering in small masses to the primary, or which are only a few feet in diameter; their hardness enabling them to resist the abrading action. An instance may be seen near the Oxbow, on the road leading to the Pulpit rock; a remarkable pot hole which has already been mentioned.

This rock furnishes in no place the vestige of any metalliferous product, except what occurs at its junction with the primary; or it is not itself in any portion of the Second Geological District a bearer of the metals. It furnishes, however, a valuable building material; and when porous and uncrystalline it is an excellent stone for resisting heat.

The extent of surface which is occupied by the Potsdam sandstone may be defined by drawing a line from, or near Carthage to Perch lake, and thence to the Oxbow, by Theresa falls. There are, however, on the east side of this line many broken masses of sandstone, but none which are continuous for any considerable extent. Another portion of this rock appears at French creek; it constitutes a part of Grindstone island. This rock is necessarily characterized by its position and mineral structure; as the only fossil which abounds in it is the *lingula ovata*, and large portions of it are entirely destitute even of this. But it may be considered as a characteristic fossil wherever it appears. It is found in the granular and friable masses one mile east of French creek on the road to Depeauville. This fossil, too, is well known to occur at Keesville; it is therefore widely distributed. It is an extremely thin, small shell, and hence easily escapes notice unless it is particularly sought for. This circumstance indicates a great scarcity of lime in the waters from which the rock was deposited, or a great scarcity of food; for we find that in our fresh water lakes those unios or other genera of animals, if the waters are free from lime, have always their delicate shells; whereas, in those which are highly charged with lime they are thick and heavy.

In proceeding upwards we next meet with a thin mass, composed of about equal proportions of carbonate of lime and sandstone; and which is filled with marine plants. It has received the name of *fucoidal mass*. It merits this distinction, for it uniformly occupies this position; it is evident too, that an important ehange had commenced in the nature of the earthy materials. Previously, no fossil of this kind had appeared; the waters of the ocean had been too much troubled to permit the growth of sea weeds on its bottom; but at this period an abundance suddenly appears in the waters, showing thereby a quiet, settled condition; and moreover, an accession of matter from a new source, viz: carbonate of lime.

This mass varies from 2 to 10 feet in thickness. It appears at the summit of the hill one mile east of French creek. It was uncovered on repairing the road at this place. The lingula ovata may be found just below in the friable sandstone, lying by the roadside. Though the fucoidal mass is very thin, comparatively, still it is a very constant rock, and is rarely absent; thus it is found on Lake Champlain at numerous places, bearing precisely the same fossil.

The next rock in succession is the *calciferous sandrock* of Prof. Eaton, as its name indicates; it is a sandstone, having carbonate of lime in sufficient quantity to effervesce with acids. It is well developed at Chamont, and furnishes excellent blocks which are transported to Oswego for the public works. The upper portion may be the Mohawk limestone. It is a very durable rock, stands the weather remarkably, and is truly one of the most valuable building materials in the State. Where the series of rocks are complete, the next one in succession is the Birdseye. In relation to this, I am not fully satisfied whether it appears in Jefferson county or not. There is a limestone however which I have called the Birdseye between French creek and Depeauville. It is quite compact, breaks with a fracture somewhat conchoidal, but is destitute of animal remains. My doubts on this subject arise from not being able to refer to the specimens of this rock which I collected for illustration. In the rock which occurs between the two places just named, we have the first of the water limes. Before exposure to atmospheric agents, this rock differs very little in appearance from the Birdseye; only it is not so compact and in some parts, is sandy and friable. On weathering, however, it turns yellowish and appears in contrast to the adjacent rock. It is entirely destitute of fossils of any kind. But the effect of the weather upon it, together with the presence of *sulphate of strontian* and *calcareous spar*, are characters sufficiently definite to distinguish it from other rocks in the vicinity. I have called this the water lime rock of Depeauville; or *Depeauville water lime*, as it was at this place it was first prepared for use.

There is a difference of opinion as it regards its value for water lime; I conceive this to arise from a want of a proper selection from the rock for burning. Those portions which are sandy, contain evidently too much silex for mortar. Whenever, therefore, such portions have been used, there has been a disappointment.

This rock has not been analyzed, but it probably contains silex, a little alumine and oxide of iron, in addition to the carbonate of lime. If I am right in the opinion just expressed, the Depeauville water lime occurs in beds, or overlies the Birdseye. Its beds are rarely more than 10 feet thick at those places where it is quarried. The Birdseye extends north to La Fargeville, preserving much the same character as in other places. It also at this last place contains a few important fossils which have not been examined. At this place too, the rock exhibits those straight columnar masses which appear in the western limestone, which are produced by the crystallization of sulphate of magnesia or some other salt. Probably it is the lowest rock in which this appearance is known.

Trenton Limestone.

This is the most extensive rock in Jefferson county. It is the gray variety, interlaminated with seams of slate of a darker colour than the limestone. At the surface in many places, it is separated into innumerable roundish pieces by weathering. These are the hardest portions of the rock, and seem to have been produced by molecular atttraction, while the rock was in the progress of consolidation. It is generally loaded with organic remains, as several species of Orthoceras, Strophomena, Delthyris, Orthis, Lingulæ, Bellerophon, Isotelus, Asaphus, Calymenæ, Columnariæ, Cyathophylum, &c. These genera constitute but a small part of the fossils which are found in the rock.

This rock extends across the country from east to west, or from Champion to Sacket's-Harbor. It is especially well developed in Watertown, Brownville and Sacket's-Harbor, Pillar Point, Adams and Rutland.

It is not the repository of any metals, so far as is known in this county. It is, however, a valuable rock as a building stone in its rough state, and the compact and sound portions form valuable marble. It is an excellent substratum for soil. It not only furnishes the elements of a good soil, but one which produces a somewhat peculiar vegetation. Thus the neighborhood of Watertown produces many rare botanical species which are confined to those places underlaid by this limestone.

This rock is remarkable for its cavernous structure. Several extensive caves occur in it, in the vicinity of Watertown and Brownville. These abound in beautiful stalagmites in which we frequently find the bones of bats. These subterranean passages were evidently formed by the action of running water. When these passages had been formed, much as we now find them, the pereolation of water through the roof, containing in solution carbonate of lime, commenced, a portion of which fell on the limestone beneath and then accumulating, it slowly deposited the remaining carbonate of lime on the floor. The external forms of these concreted masses are various. Some are in crystalline nodules, others are spread out in sheets which are waved on their upper surface, an appearance communicated by the slight ripple of the water from which the deposit took place. In these masses we find many cavities, and with fine yellow crystals. In fine, the caves of Watertown are well worth the attention of the traveller.

The following report has been furnished by professor F. N. Benedict, of the University of Vermont. It will, I have no doubt, be considered an important addition to the information which has already been communicated through the Legislature to the people.

It bears upon the face of it great accuracy, and a patient investigation of the subjects upon which it treats. It will be perceived that it gives an impartial view of the measurements of the mountains of the northern section of the State, and places in their true light the relative value of the barometrical and trigonometrical measurements in general. In relation to the discrepancies which appear between us I would remark, 1st, that Professor Benedict's instruments are more perfect than those I used. In the 2d place, we have invariably found that the greatest differences appear with Burlington as a station than with those at Albany, N. Y. which seems to result from the difference of time in the changes of atmospheric pressure. It is proper also to add that the observations made upon White-Face, in 1837, by myself and Mr. Hall, were at a time the most unfavorable for accuracy, being made at or near the time of the autumnal equinox, and just at the commencement of a storm; a a time when the fluctuations of the barometer are greater than at other periods. I have not at any time claimed a greater accuracy in measurement than my observations would warrant. It has been my wish that they should be received as approximations to the truth, hoping also that the attention of the public might be called thereby to the subject, that individuals might be induced to take it up and furnish a portion of the materials for a final result; for it is certain that the work of determining the height of the mountains, even of Essex county, is too great to be accomplished by one individual during the period of the survey.

"*Burlington*, 13 *Feb*. 1840.

To Prof. E. EMMONS.

DEAR SIR—Agreeably with your request I visited at two different times, in the months of July and August last, the sources of the Hudson, Saranac and Racket rivers, with the view of determining the position of that plateau which forms the base of, and extends west of the Adirondack mountains. From the want of time and the requisite angular instruments I was obliged to have recourse exclusively to barometrical measurements.

The instruments used at the two stations were Bunten's mountain barometers, purchased by the University of Vermont, with special reference to their adaptedness to exact observations. These instruments are syphons, with the bores of the two legs made scrupulously equal; thus avoiding erroneous corrections for capillarity. The zero point is near the middle of the scale, and the readings are from that point to the tangents of the two mercurial surfaces. The sum of these gives the observed length of the column. Such is the construction of the vernier that it must be careless reading which would give an error of five hundredths of a millimetre, or about two thousandths of an inch. The thermometer attached is encased in the brass scale which surrounds the tube at its middle. The graduation of both the thermometer and barometer scale is very accurate. A great variety of comparative observations which I have made in connexion with Prof. G. W. Benedict leaves no reasonable doubt of the accuracy of the graduation or uniformity of the tubes.

Of the observations made at Burlington to synchronize with those at the superior stations, those before the 6th of July were made by Prof. G. W. Benedict, whose high standard of accuracy is well known. The elevation of this station is 235 feet above Lake Champlain, as determined and verified by the spirit level, or 325 feet above tide, estimating the elevation of Lake Champlain at 90 feet. The observations at Burlington, after the first of August, were made by my brother, whose carefulness and skill in observing had been tested The elevation of this station above tide was 374 feet, determined by the spirit level as above.

The table below exhibits the notes as they were taken from the instruments, with their respective calculated elevations. To convey a just idea of the agreement or discrepancy of the results, I have presented all that were made, with the exception, I think, of five or six, some of which bore evident marks of faultiness in their observations. The two numbers in the sixth column, corresponding to each date, are the upper and lower readings of the barometer, which are recorded instead of their sum, as furnishing a means of verifying the accuracy of the observations, particularly in reference to the temperature of the mercury, which is liable, without extreme care, to a false indication by the attached thermometer, of a number of degrees. I have ascertained that the condition to be satisfied in order to be assured of accuracy in this respect, for any syphon barometer, is contained in the equation

$$a - b = \mathrm{A} + \mathrm{BT} + \mathrm{C}(v + \mathrm{D});$$

in which a, b, are respectively the upper and lower readings, T the temperature of the mercury as indicated by the attached thermometer, v the distance of the superior mercurial surface, and A, B, C, D, coefficients which differ in different barometers, but are constant in the same. The appropriate conditions for the barometers No. 275 and No. 366, the former of which was used at Burlington, I have found to be, respectively, $a - b = -2{,}17 + 0{,}107\,\mathrm{T}$, ... (1)
and $a' - b' = 35{,}14 + 0{,}107\,\mathrm{T}' - 0{,}004\,(402 - a)$. .... (2)
These formulæ have been employed in rejecting some of the faulty observations referred to above, and, assuming the correctness of T, in correcting the elevations of Lake Colden and Mt. Marcy, where the conditions expressed in (2) were not satisfactorily answered.

As is not uncommon, even with good instruments, the column of No. 275 exceeded that of No. 366 by 2.50 millemetres, which I consequently added to the sum of the upper and lower readings of the superior barometer. This difference between the columns is a mean derived from a comparison of more than 100 sets of observations, in which care was taken to secure as great a degree of uniformity in the temperatures of the atmosphere and mercury as possible, and to exclude all causes of change in the columns which were not equally operative in each, except those depending upon peculiarities in the constructions of the instruments themselves.

Various experiments, which it is needless at present to detail, suggested the possibility that a part at least of this difference of columns might arise from a small portion of air in the summit of the tube of No. 366; and that consequently the correction above, instead of being constant, would depend upon the temperature and volume of the included air. On this hypothesis, which however I was prevented from verifying to the extent desired, by the loss of one of the barometers, I made the correction $(451 - a) \times 0{,}021 \times (16 - \mathrm{T})$, in metres, which is additive or substractive according as T is less or greater than 16. But to whatever extent this correction might differ from the truth, the correction produced much more uniformity in the results of observations made at any one point than appeared without it. This correction likewise provides, to some extent at least, for any error which possibly may exist in the ordinary valuation of the effect of the temperature of the air upon the calculated elevation, or of its hydrometrical state so far as it may be indicated by this temperature, which at the superior station differs but little from T. The formula therefore used is $h = p + (451 - a) \times 0{,}021 \times (16 - T)$, in which h represents the true difference of level between the stations in metres, p this difference, according to the tables of Oltmanns, a the upper reading of the superior barometer, and T the temperature indicated by its attached thermometer.

The additional correction which I applied to the elevations of Lake Colden and Mt. Marcy is $12(-m + m' + n - n')$, in which m, m', are the first members of the conditions (1), (2); and n, n', the second.

A slight correction for capillarity, of about three-tenths of a millimetre, I deducted from the correction 2.50 in the 7 observations made during my first visit.

Oltmanns' tables have been employed in these calculations, which have furnished, in the cases in which I have compared them, the same results as those derived from La Place's theorem. An example of this agreement appears in the calculation of the height of Mt. Marcy. I have not seen the construction of these tables, but conjecture from this agreement, that La Place's theorem was made their base. Humboldt, who made his calculations according to the theorem, mentions the harmony of his results with those of the same heights by Prof. Oltmanns, and pronounces the tables of the latter to be "of the utmost precision."

TABLE OF BAROMETRICAL OBSERVATIONS AND ALTITUDES.

Elevation of Lower Saranac Lake.

		Att.	Det.	Obs.	Alt. in Eng. feet.	Deviation from mean.
July 6th, 1839.						
1 Burlington,	8h 50′ p m	20.4	15.5	751.75		
Lake, ...	" "	14.6	14.5	720.07	1528.37	+1.06
Aug. 28.						
2 Burlington,	6h 30′ p m	16.4	13	378.30		
				378.70		
Lake, ...	6h 30′ p m	11.	10.6	379.75		
				343.54	1527.80	+0.49
3 Burlington,	7h 10′ p m	15.3	11.6	378.35		
				378.75		
Lake, ...	7h 0′ p m	10.	8.9	379.70		
				343.60	1526.41	—0.90
Aug. 29.						
4 Burlington,	5h 56′ a m	10.2	5.3	379.05		
				380.15		
Lake, ...	6h 0′ a m	4.1	3.3	380.40		
				344.90	1526.67	—0.64
Mean elevation above tide,					1527.31	

Upper Saranac Lake.

July 6.					
5 Burlington,	12h 50′ p m	20.2	18.3	755.70	
Lake, ...	1h 0′ p m	15.	15.	378.30	
				341.60	1567.58

Stony Ponds.

July 6.					
Burlington,	10h 20′ a m	20.1	19.8	756.00	
do	11h 50′ a m	20.1	20.6	755.70	
6 Means, ...	11h 5′ a m	20.1	20.2	755.85	
Ponds, ...	11h 0′ a m	18.	18.	721.15	1536.36

Foot of Racket-Falls, about 8 miles below Long Lake.

July 6.					
Burlington,	6h 20′ a m	20.1	16.	756.70	
Falls, ...	6h 15′ a m	11.	11.	721.25	
7 Falls, ...	6h 30′ a m	11.	11.	721.20	
Means, ...	6h 22′ a m	11.	11.	721.22	1538.84

Long Lake, Hamilton County.

		Att.	Det.	Obs.	Elevation above tide.	Deviation fr'm mean.
July 3.						
8 Burlington,	11h 30′ a m	23.8	23.2	750.15	1575.03	—0.93
	11h 38′ a m	22.	22.	376.10		
Lake, ...				338.60		
9 Burlington,	12h 10′ p m	23.9	24.2	749.65	1566.83	—9.13
Lake, ...	" "	22.5	22.5	376.00		
				338.50		
10 Burlington,	12h 33′ p m	24.	25.5	749.55	1566.83	—9.13
Lake, ...	12h 40′ p m	23.	23.	376.00		
				338.50		
Aug. 22.						
11 Burlington,	1h 28′ p m	27.9	26.5	377.10		
				376.20	1573.80	—2.16
Lake, ...	1h 30′ p m	25.7	24.7	378.10		
				340.30		
Aug. 24.						
12 Burlington,	2h 2′ p m	27.6	29.6	377.20		
				376.40	1587.53	+11.57
Lake, ...	2h 0′ p m	25.6	25.	378.25		
				340.50		
13 Burlington,	3h 2′ p m	28.	28.9	377.00		
				376.15	1590.17	+14.21
Lake, ...	3h 0′ p m	26.4	24.7	378.07		
				340.10		
14 Burlington,	4h 2′ p m	27.2	27.	376.70		
				376.00	1585.53	+9.57
Lake, ...	4h 0′ p m	25.2	24.4	377.80		
				340.00		
15 Burlington,	5h 7′ p m	26.7	24.	376.70		
				375.90	1579.28	+3.32
Lake, ...	5h 0′ p m	23.6	23.	377.75		
				340.00		
Aug. 20.						
16 Burlington,	1h 24′ p m	27.7	27.9	378.90		
				378.00	1573.61	—2.35
Lake, ...	1h 30′ p m	28.1	27.2	380.20		
				342.10		
17 Burlington,	1h 54′ p m	28.	27.7	378.90		
				378.00	1572.18	—3.78
Lake, ...	2h 0′ p m	27.8	26.1	380.10		
				342.10		
18 Burlington,	6h 24′ p m	28.1	23.3	378.50		
				377.40	1579.49	+3.53

		Att.	Det.	Obs.	Elevation above tide.	Deviation fr'm mean.
Lake, ...	6h 30′ p m	23.9	23.9	379.23 341.60		
19 Burlington,	6h 54′ p m	28.7	23.3	378.45 377.40	1561.21	—14.75
Lake, ...	7h 0′ p m	20.5	21.1	379.00 341.80		
Mean elevation above tide,					1575.96	

Forked Lake.

Aug. 21.						
20 Burlington,	10h 26′ p m	25.	26.1	378.40 377.90	1717.66	+13.14
Lake, ...	10h 30′ p m	23.5	22.4	378.10 340.50		
21 Burlington,	1h 26′ p m	28.6	28.6	378.20 377.30	1694.33	—10.19
Lake, ...	1h 30′ p m	28.	26.2	377.93 339.95		
Aug. 26.						
22 Burlington,	6h 36′ p m	22.	18.1	275.50 375.30	1694.36	—10.16
Lake, ...	6h 30′ p m	21.7	21.3	375.30 337.85		
23 Burlington,	7h 6′ p m	22.	18.1	375.40 375.30	1711.75	+7.23
Lake, ...	7h 0′ p m	21.5	21.1	375.00 337.60		
Mean elevation above tide,					1704.52	

Elevation of Racket above Forked Lake.

The observations taken with the same barometer.

Aug. 27.						
24 Forked L..	6h 25′ a m	20.	18.9	374.10 337.00		
Racket L..	6h 0′ a m	20.	19.5	373.65 336.75	26.98	
Add elevation of Racket above Forked Lake,..					1704.52	
Elevation of Racket Lake above tide,					1731.50	

Owl's Head, about 4 miles northwest of the head of Long Lake.

Aug. 22.						
25 Burlington,	10h 27′ a m	24.3	24.	377.50 377.10	2706.13	+4.52
Owl's Head	10h 30′ a m	21.	20.5	364.10 326.92		

Owl's Head above Long Lake.

With the same barometer.

No.	Station	Time	Att.	Det.	Obs.	Elevation above tide.	Deviatiom fr'm mean.
	Aug. 22.						
26	Long Lake,	1h 30′ p m	25.7	24.7	378.10		
					340.30		
	Owl's Head	11h 30′ a m	22.	22.2	363.90		
					326.80	1121.13	
	Add elevation of Long Lake above tide,					1575.96	
	Elevation above tide,					2697.09	
	Mean of the above results,					2701.61	—4.52

Rich Lake.

No.	Station	Time	Att.	Det.	Obs.	Elevation above tide.	Deviatiom fr'm mean.
	Aug. 19.						
27	Burlington,	6h 22′ p m	28.1	23.7	379.30		
					379.35	1547.20	+0.05
	Lake, ...	6h 30′ p m	20.9	20.	380.60		
					343.30		
28	Burlington,	6h 52′ p m	28.1	23.9	379.30		
					379.40	1547.10	—0.05
	Lake, ...	7h 0′ p m	19.8	19.1	380.50		
					343.40		
	Mean elevation above tide,					1547.15	

Newcomb Lake.

No.	Station	Time	Att.	Det.	Obs.	Elevation above tide.	Deviatiom fr'm mean.
	Aug. 19.						
	Burlington,	1h 22′ p m	26.6	26.5	379.70		
					379.00		
29	Lake, ...	1h 15′ p m	23.8	22.8	379.10		
					341.55	1698.98	

Lake Sanford.

No.	Station	Time	Att.	Det.	Obs.	Elevation above tide.	Deviatiom fr'm mean.
	Aug. 15.						
	Burlington,	6h 14′ p m	23.6	19.4	380.80		
					380.40		
	Burlington,	6h 44′ p m	23.1	19.3	380.70		
					380.24		
	Means, ...	6h 29′ p m	23.4	19.3	380.75		
					380.32		
30	Lake, ...	6h 30′ p m	16.4	16.4	379.30		
					342.57	1719.26	+7.29
	Burlington,	6h 44′ p m	23.1	19.	380.70		
					380.24		
31	Lake, ...	6h 45′ p m	16.2	16.	379.30		
					342.65	1710.58	—1.39
	Burlington,	6h 44′ p m	23.1	19.	380.70		
					380.24		

		Att.	Det.	Obs.	Elevation above tide.	Deviation fr'm mean.
49 Mt.	7h 0′ a m	7.5	7.	335.00		
				299.50	5347.31	+9.80
Mt.	7h 30′ a m	8.	7.5	335.05		
				299.50		
Mean, ...	7h 15′ a m	7.7	7.2	335.02		
				299.50		
Mean elevation above tide, ...					5337.51	
Mean of these observations, calculated by La Place's formula.						
50	....	18.	14.7	381.57		
				381.77	5344.69	
		7.2	6.9	334.95		
				299.44		

The singular elevation of Mount Marcy, distinguishes it from the other objects of calculation in the above table, and entitles it to particular consideration, more especially so, as some discrepancy exists between the measurements that have hitherto been made.

Passing over every other personal circumstance connected with my ascent, I cannot but remark, that through the characteristic liberality of the Hon. A. McIntyre, and the attentions of his agent, Mr. Porteus, I was supplied with every thing needful to my comfort as a guest, and the object of my visit materially promoted.

The following table embraces all the observations that were made during my stay on the summit. The reductions of the mercurial columns were made from a table executed by Prof. G. W. Benedict, with great care and precision, which has regard to the effect of temperature upon the brass scale, as well as upon the column of mercury.

	Times of observation.		*Alt. Ther.*	*Det. Ther.*	*Cor. Columns.*
1	Aug. 14.	6h 7′ a m....	6.6	6.6	633.67
2	do	6h 30′ a m....	7.0	6.6	633.57
3	do	7h 0′ a m....	7.5	7.0	633.72
4	do	7h 30′ a m....	8.0	7.5	633.71
5	do	8h 0′ a m....	8.0	7.8	633.76
6	do	8h 30′ a m....	8.5	8.3	633.90
7	do	9h 0′ a m....		9.2	634.15
8	do	9h 30′ a m....	9.8	9.5	634.05
9	do	10h 0′ a m....	9.9	9.5	634.04
10	do	10h 30′ a m....	9.8	9.5	633.80

The wind, during the whole period, was strong and uniform from the north. Until about 8 o'clock, the summit was swept by a cloud of of rain and vapor. This gradually disappeared, producing rapid alternations of storm and sunshine. About 10 o'clock the sky became almost entirely clear.

It appears from the above notes, that the whole range of the column, embracing the slight but unavoidable errors of observation, is less than 6 tenths of a millimétre, or less than three thousandths of an inch.—The uniformity of the force and direction of the wind, is a circumstance favorable to correct results not always found on mountain peaks, which are liable to be swept by variable and conflicting currents.

From some misunderstanding in regard to time, and from not attaining the summit as early as I anticipated, only three sets of observations synchronized sufficiently to be employed. The remainder, however, answered the important purpose of verifying those that were taken.

The following are the observations made at Burlington:

	Dates.	Att. Ther.	Det. Ther.	Cor. columns.		
1	Aug. 14, 5h 10′ a m	18.0	13.7	760.43	Wind northeasterly;	cloudy.
2	do 7h 40′ a m	18.0	13.6	760.53	do	do
3	do 6h 10′ a m	18.0	13.9	760.73	do	do
4	do 6h 40′ a m	17.9	14.9	761.13	do	do
5	do 7h 10′ a m	18.0	15.2	761.33	do	do

From the little time allowed, in my first observation on the summit, for the mercury to acquire the temperature of the air, and for taking the requisite precautions, the result, 47, errs in deficiency. The elevation derived from the three sets is 5337.5 above tide, which differs from the three results only by 12.2 and 10 feet.

According to the barometrical measurement by Mr. Redfield and Prof. Emmons, as given in the New-York Geological Report of 1838, the elevation of this peak is 5,467 feet. The difference between these results is not so considerable as of *itself* to impair confidence essentially in either, and they should therefore be regarded rather in the light of mutual verifications—at least so far as concerns *barometrical* measurement. The justness of this opinion may be inferred from some remarks that may follow. If the circumstances of the two measurements were similar, in regard to the delicacy and exactness of the instruments, the positions of the stations, and the number of observations, the mean of the two should undoubtedly be taken. Not having seen a description of Mr. Redfield's barometers, I can only *conjecture* that they were of the ordinary cistern kind; and if so, the less perfect instruments.

As to the stations, Prof. Emmons had the advantage of being in nearly the same longitude, while mine differed in this respect probably 50 minutes; but they had the disadvantage in their remoteness, mine being about 40 and his 100 miles asunder. The most important circumstance in favor of my result is the number of observations.

The only other measurement of this mountain, which has come to my knowledge, is a trigonometrical one, executed by E. F. Johnson, Esq. a distinguished civil engineer, and published Jan. 30, 1839, in his report to the New-York Legislature, of his survey of a rail-road from Ogdensburgh to Lake Champlain. The altitude of Mount Marcy, according to this result, is 4,907 feet, which is less than the barometrical measurements make it, by 430 to 560 feet. This discrepancy is too considerable to be altogether overlooked.

The fair presumption, as it appears to me, is, that Mr. Johnson *sought* no greater degree of accuracy than was requisite to convey a general idea of its elevation. This may be inferred from the fact that its *exact* determination was a matter of no consequence to the rail-road that he was exploring, the relation between them being remote and incidental. This presumption is strengthened, moreover, from his manner of executing the measurement. His estimating the distance to the mountain from a map, instead of deriving it from an accurately established base, connected with his acknowledged skill in his profession, furnishes abundant evidence that strict topographical accuracy was not his object.

Between what limits, then, may the trigonometrical result be depended upon? Mr. Johnson has deprived his measurement of a requisite essential to confidence as an exact operation, in leaving us totally ignorant of the position in space of his point of observation, of the distance that he actually used, and of the number and values of the angles that he observed. His estimate of *distance*, on the authority of the old survey records of that alpine region, is liable to an error of at least five miles. These surveys are notoriously imperfect—a fact that we might anticipate, in a country where the lands were almost absolutely valueless, and where numerous obstacles, such as local attractions, ponds and mountains, opposed the execution of a survey with even an approximation to accuracy.

Suppose now, that the angles were observed from a point near the University, at an elevation of 360 feet above tide—that the distance of the peak from this station falls between 35 and 45 miles—and that its elevation above tide, according to the trigonometrical measurement, is 4,907 feet. These hypotheses are sufficiently exact to answer our purpose, and from all that appears in Mr. Johnson's description of his method, the ones most favorable to his result. Imagine the elevation to consist of three parts; the first part that which is intercepted between the levels of tide and the station at Burlington; the second part, that which is intercepted between the level at Burlington, and a plane that touches the earth's surface at the point of observation; and the remainder of the elevation, the third part. These three portions, in the order above named, assuming the distance to be 35 miles, are 360, 817 and 3,730 feet. All things else being equal, correct now a supposable error in distance of 5 miles, calling it 40 instead of 35. The first part of the elevation remains constant; the second part, varying as the square of the distance, is 1,067 feet, and the third part, varying in the simple ratio of the distance, is 4,263 feet. The total elevation based on this last hypothesis of distance, is 5,690 feet, which exceeds my measurement by 341 feet, and the one by Mr. Redfield and Prof. Emmons by 223. An error in distance, therefore, of 5 miles, induces an error of elevation of 783 feet.

To show what error in Mr. Johnson's estimates would produce identity in our results, we will suppose that the distance which formed the base of his calculations was 35 miles, and that the distance necessary to make our results agree, is d. The familiar principles above alluded to furnish the equation,

$$\frac{2d^2}{3} + \frac{3730+d}{35} + 360 - 4907 = 442.$$

This gives the requisite distance d, equal to 37.8 miles. Supposing, therefore, an error in distance of only 2 miles and 8 tenths, a supposition not only possible but probable, our results would become identical.

As I have not learned the distance that Mr. Johnson actually used, it is proper to remark, that if we should assume the distances 40 and 45, instead of 35 and 40, our conclusions would not differ so much from those above, as to vitiate the argument. Using these latter numbers, which are probably somewhat nearer the truth than the former, an error of 5 miles in distance would still induce an error in elevation of 718 feet.

Refraction is another cause of deviation from exactness, of which, however, I shall merely remark in this connection, that it may occasion an error of about 100 feet, and that, too, even after a correction has been applied according to the best authorities.

A discussion of the comparative merits of barometrical and angular measurements of great elevations, would prolong this communication to an unreasonable length. I shall pass over it, therefore, at present, with one or two brief remarks. The barometer and theodolite have their peculiar capabilities and defects; and the exact measurement, by either, of a mountain covered with clouds during the greatest portion of the year, and surrounded by an atmosphere subject to incessant change, demands more perfect instruments and skill in their use, than is generally apprehended.

The chief difficulty that the barometer has to contend with, and one over which it has no direct control, is a want of uniformity in the changes of atmospheric pressure, in different places at corresponding times. As correct observations have been multiplied, more harmony in this respect has been detected than had formerly been supposed. Indeed, this is not the only department in which nature has been held accountable for blunders due to clumsy instruments and unskilful observers. This difficulty, without doubt, exists to such an extent as to impair confidence in single sets of observations at least, with whatever care they may have been made. The atmosphere, whether charged uniformly with vapor or not, must evidently have a strong tendency to equilibrium, and a derangement of it, within moderate distances, must consequently be transient. For this reason, a course of consecutive observations at the same station should always be taken, which will enable the observer to guard against error, either by rejecting all, or selecting those that, in this way, are shown to be worthy of confidence.

The corrections for the hygrometrical state of the atmosphere, are undoubtedly more or less imperfect, although that portion of the error which yet remains unprovided for, I apprehend is comparatively inconsiderable. La Place measures these effects by the temperature of the air, and observes that this hypothesis very nearly satisfies the observations that have hitherto been made. The agreement of my results, where *courses* of observations were taken, intimates with what degree of approximation I have corrected for the changes of the weather. This agreement is particularly worthy of remark in relation to Long lake, where the observations were protracted in time, and the weather singularly variable. But notwithstanding all this, I am free to admit, that these corrections are still less perfect than could be desired.

The theodolite is above the need of eulogium from any one; but, like every other human invention, it has its proper capabilities and defects. An indispensable condition to the accuracy of angular measurements, is the exact determination of a base line, a work which requires that skill, variety of delicate instruments, time, and means, which, in this country, are not generally at the command of a single individual. Triangulations embracing great extent, have been executed with astonishing precision, and the results of similar measurements, properly conducted, are entitled to the utmost confidence. On the contrary, the angular determinations of high mountains have been comparatively vague. One cause for this difference, consists in the great distances at which mountains are generally observed, and the consequent smallness of the angles of elevation. In this respect, a condition is almost necessarily violated, which was scrupulously satisfied in the surveys just referred to.

The chief source of error in mountain measurements, and one which distinguishes it from horizontal ones, is refraction. This difficulty, growing out of the condition of the air, and independent, therefore, of the instrument, is analagous to the one which the barometrical method is exposed to, with this difference in favor of the latter, that the atmospheric changes going on at both stations may be detected and compared.

Refraction differs, in different countries and at different times, from one fourteenth to one-eighth of the distance, reckoned in minutes. Such being the uncertainty as to the true path of light in low and familiar regions, it must be particularly difficult to follow it with precision through mediums of changing relations, and elevated tracts comparatively unknown. Refraction, too, depends not only upon the affections of the air, but upon the relations of the line of sight with other objects. Every one who has used the spirit level, is aware of the errors that he is exposed to, when, in clear weather, his line of collimation approaches logs and fences or the surface of the ground.

The Peak of Teneriffe, from its great elevation, and the number of times that it has been measured according to both methods, by distinguished observers, is a fair practical example, illustrative of the foregoing remarks, and shows that barometrical measurements are not altogether unworthy of confidence, even when compared with angular ones by the same observers. The following table, as published by Humboldt, exhibits the results :

Geometrical measurements made on land.				
By P. Feuillée,	made in	1724,	2,213	toises.
The same result, modified by Bouguer,	do		2,062	do
By Heberden and Cross, five operations,	do	1752,	2,408	do
By Hernandez,	do	1742,	2,658	do
By Borda and Pingré,	do	1771,	1,742	do
By Borda,	do	1776,	1,905	do
Geometrical measurements made under sail.				
By Mannevilette,	do	1749,	2,000	do
By Borda and Pingré,	do	1771,	1,701	do
By Churacca,	do	1788,	2,193	do
By Johnston,			2,023	do
Barometrical measurements, calculated after the formula of La Place.				
By Feuellée and Verguin,	do	1724,	2,025	do
By Borda,	do	1776,	1,976	do
By Lamanon,	do	1785,	1,902	do
By Cordier,	do	1803,	1,920	do

In view of these measurements, Humboldt makes the following remarks:

"These measures, taken at different periods, vary from 1,700 to 2,600 toises, and, what is remarkable enough, the results obtained by geometrical operations, differ more from each other, than those which were found by the barometer. It has, nevertheless, been extremely wrong to cite this want of harmony as a proof of the uncertainty of all measurements of mountains. Angles, the value of which is determined by imperfect graphometers; bases that have not been levelled, or the length of which has been determined by the log; triangles that give an excessively acute angle at the summit of the mountain; heights of the barometer, without any notice taken of the temperature of the air and of the mercury; unquestionably are not means calculated to lead to accurate results. Of fourteen trigonometrical and barometrical operations above indicated, the four following only can be considered as true measurements:

Borda by trigonometry,	1905	toises.
" means of the barometer,	1976	"
Lamanon, the same,	1902	"
Cordier, do	1920	"

Humboldt's Personal Narrative, vol. 1 and 2, in one. It is worthy of remark that the mean of the five geometrical measurements made on land differs from the extremes by 422 and 493 toises, while the mean of the barometrical measurements differs from the extremes by less than 53 and 59 toises.

It is remarkable, also, that Humboldt, after elaborate discussion with the details of the operations before him, should select but one geometrical result out of 9, and three barometrical ones out of 4, as the most suitable to derive his mean from.

It appears, also, that the range of the differences of the 4 measurements adopted as true ones, is 74 toises, or 3.9 per cent of the whole elevation. This justifies a remark made in an early part of this article, that the two barometrical results should be regarded as accordant; since the difference is only 2.4 per cent of the elevation of the summit above the lower station, which is more than one-third less than Humboldt, considered consistent with reasonable agreement.

The measurements which I have made, although by no means so numerous as could be desired, are sufficient to fix with considerable accuracy the position of that extensive tract of table land interposed between Lakes Ontario and Champlain. Racket lake, a beautiful sheet of water in Hamilton county, embracing a surface of probably 20 or 25 square miles, is situated near the geographical centre of it, and may be regarded as its summit, particularly of that portion which lies west of the Adirondack mountains. The area of this tract is little, if any, less than 10,000 square miles; embracing nearly the whole of Essex, Hamilton and Warren counties, the southern and western parts of Clinton, the southern half of Franklin, the southeastern angle of St. Lawrence and northern half of Herkimer counties. These estimates are founded partly upon my own observations, and partly upon information derived from other sources, and should therefore be regarded as vague approximations only to topographical accuracy.

The natural features of this tract are prominent, and in some respects singularly interesting. The eastern division, commencing within a few miles of Lake Champlain, form the base of the Adirondack mountains. This mountain chain rises from the valley of the St. Lawrence, and takes a southern direction through Clinton, Franklin, Essex and Warren counties. It is then interrupted by the valley of the Mohawk, where it loses its name, although it shortly resumes a portion of its grandeur in the Catskill mountains.

In the county of Essex the chain attains its greatest elevation in the form of an aggregation of summits rising from an elevated base of nearly 3,000 feet in height. These peaks usually affect a conical form, and exhibit some other indications of their having been subject to volcanic action at some remote geological epoch. After the able and interesting relation by Mr. Redfield of his visits to the sources of the Hudson, it would seem unnecessary for me to add that there are probably few places in North America where Nature is invested with more magnificence and solitude than on these mountain peaks. Among the many summits which attain the perpendicular elevation of nearly a mile, Mt. Marcy is probably the highest, being 5,337 feet above tide. The western limit of this Alpine district is formed by Mt. Clinch,* about 8 or 10 miles south of Long lake, which apparently reaches the height of 4,000 feet; St. Anthony, (corrupted into Santanoni) a ridge of probably 5,000 feet high, between Long lake and McIntyre; and Mt. Seward, perhaps 4,000 feet in height, a few miles north and in the line of Long lake, partially interposed between the Racket and Saranac rivers. The western division of this elevated tract presents a surface diversified with plains and hills, with little of it, which came under my notice, deserving the appellation of mountainous.

A striking feature observable throughout the whole extent of this high country, and one particularly interesting in an economical point of

* In honor of the Hon. Mr. Clinch of New-York, who was one of the original projectors of the survey now in progress.

view, is the number and magnitude of its ponds and rivers, and the almost unparalleled extent of natural batteaux navigation that they form. It is also a remarkable fact that these waters, although belonging in some cases to different and remote systems, are situated for more than 100 miles in extent in nearly the same horizontal plain. This will appear sufficiently evident from the following table, in which the distances and directions are rudely estimated from Racket lake.

				Elevation.
Racket lake,				1731 feet.
Forked do	8	miles	north,	1704 "
Long do	20	"	northwesterly,	1576 "
Upper Saranac lake,	58	"	"	1567 "
Round do	54	"	"	1567 "
Lower Saranac do	64	"	"	1527 "
Tupper's do	60	"	north,	1500 "
Rich do	30	"	northwesterly,	1547 "
Newcomb do	40	"	"	1699 "
Lake Sanford,	50	"	"	1712 "
" Henderson,	52	"	"	1826 "
Clear pond,	80	"	westerly,	1870 "

These distances are vaguely estimated by the courses of the rivers, or the most direct land routes, without seeking any greater degree of accuracy than is requisite for forming a *general* idea of extent. The elevations of all were taken by the barometer, except that of Tupper's lake, which is connected with my station below Racket-Falls by an unobstructed navigation, as I am informed, and consequently not very different from 30 or 40 feet below it.

These lakes are chiefly situated on the northeast quarter of this table, and that, too, which presents the most varied and mountainous surface. Judging from some examinations of my own, and from other sources worthy of confidence, the southern and western divisions are each equal in extent to this, and conform still more nearly to a horizontal plane which rests upon the surface of Racket lake.

Some general idea of the extent of natural batteaux navigation, may be derived from a glance at the Saranac and Racket rivers. The former of these rises near the southern line of Franklin county, in a beaumatter would be borne along farther, but would be deposited early; it would constitute regular sandstone. Another portion would be carried still farther, and would probably be associated with calcareous particles. These would subside also, and would constitute a siliceo-calcareous rock. All this is in accordance with what is found in the lower rocks of St. Lawrence and the other northern counties.

Near the provincial line there is a large mass of conglomerate, similar to the millstone grit. It is 300 feet thick, and is composed entirely of coarse gravel and small stones. A little farther south, it becomes a moderately coarse sandstone; still farther the rock is a mixture of fine siliceous and calcareous particles, constituting the calciferous sand rock of Prof. Eaton.

From this we may learn that two rocks may be contemporaneous, for the deposition of the calciferous sand rock may go on simultaneously with the Potsdam sandstone. But they will differ in two respects: the sandstone will be found near the shore, and of course in shallow water, which will be indicated by ripple marks, and it will bear, or contain those organic relics which are peculiar to such locations. On the other hand, the calciferous will be formed in deep water, and will contain the remains, generally, of those animals which inhabit deep water.

It is evident that the lines separating two rocks found under such circumstances, would be faintly drawn. Nature has associated them together, and has only made a gradual transition from one to the other. We can find no abrupt discontinuance or commencement of either.—We may find gradual transitions, as in the example cited, extend to three or four rocks, and in the geographical range of the 2d district we accordingly find that it actually extends up to the Trenton limestone and the black slates above. In the several members constituting this natural association or group, there are characters in common, but a gradual departure appears, as we trace these masses upwards.

From these remarks we may see what ought to constitute a group of rocks, for it is evident that a group should consist of those members, and those only, which were formed under the same conditions, as it regards atmospheric agency. When this agency is uniform, there will be a uniformity in the organic productions. The great differences will be produced by shoal and deep water, but the productions of one will pass gradually to the other. Differences will exist in the extremes, but accident will more or less assimilate them to each other. When, however, atmospheric agency changes, when temperature is diminished a certain amount, then organic laws suffer an infraction and beings fall victims to the change. A few, however, are capable of surviving or resisting this change, and may continue while the mass is extirpated. Very few, if any species of animals of the Trenton limestone, have survived the atmospheric changes which occurred between that period and the carboniferous limestone.

Natural associations or groups of rocks cannot be determined by mineralogical composition or character, for observation proves that nature associates sandstone, limestone and slates, and it results mostly from the fineness, coarseness and miscibility of particles, or their capability of transportation. In the primitive construction of the globe, and in the elements constituting the primary masses, we find the siliceous, calcareous and aluminous earths. There is, therefore, nothing remarkable in this association. If these views are correct, we may avail ourselves of the principles contained in them in determining or constituting groups, and the order in which the members are to be placed. Slates, accordingly, usually form the superior bed, and the sandstones the inferior, though it may be questioned whether unexceptionable rules can be established. In the sandstones, the inferior portion is composed of much larger particles than the upper. In fact it is often a coarse breccia.— From this fact it follows, that the cause or causes producing the fracture of rocks, and also that which transports them, is more violent at the commencement than at subsequent periods, while, at the termination of a group, the particles are extremely fine, as in the calcareous and siliceous slates.

The Period when, and Causes by which the Northern Rocks were abraded.

In former reports I have had occasion to speak of abrasions which the northern rocks have suffered in ancient times. Those who have examined this subject, know full well that it is difficult, if not impossible to fix the precise period when the causes producing those effects were in action. That they were comparatively modern, may in some instances be shown to be probable by existing records of facts. Though I am of the opinion that abrasions will be found to have been produced in different periods; for when I examined the Trenton limestone on Lake Champlain, I found a layer of that rock, situated about midway in the ledge, whose upper surface was grooved and scratched in the usual manner, but which passed beneath the upper layers, and from above which, layers had been removed by quarrying, showing conclusively that this surface had been abraded previous to the desposition of the upper portion of this rock, and that this upper portion was deposited upon an abraded surface. If I was not deceived in the examination of this locality, then there is one instance which can in no sense be called modern. Still the instances which generally fall under our observation, appear much nearer our own times than the one specified, for the common abrasions which appear on the rock along the valley of Champlain, whatever that rock may be, is beneath the tertiary, which is a thin deposit of clay and sand. If then, those grooves and scratches were made just anterior to the deposit of the tertiary, then they were made in comparatively recent times, for the organic relics of this formation belong to those genera and species which now inhabit our seas.

Without consuming farther time and space in the consideration of the period when those abrasions were made, I will proceed to the consideration of the causes by which they were produced, or the theories which have been advanced to explain them.

One of the most prominent theories which has been advanced to account for abrasions, grooves, scratches, &c. is that which assigns the waters of the Noachain Deluge as the cause. This deluge, it is maintained, swept over the land with immense force, broke up the foundations of the rock, bore their fragments along with impetuosity, deeply scratched and ground those surfaces of the solid strata over which they passed. In this theory there is much plausibility, and something that commends itself to our assent. Still it is found, when tested, to be quite objectionable. One objection only need be adduced, viz: that the Noachain Deluge is much too recent an event to apply to the case in question; for as has already been remarked, the abraded surfaces are beneath the tertiary of Champlain, which though a thin deposit in the valley specified, still must have required too long a period for deposition, to have been formed since that catastrophe.

Another which has been offered, and is still supported and maintained by Geologists, is the *iceberg* theory. Icebergs or icefloes are known to be driven out to sea, and to bear along rocks and stones, which, as the ice melts, are dropped into the sea, and thus they become the instruments of spreading widely the fragments of the solid strata. Icebergs, it is supposed then, as they are borne by currents or driven by the winds, perform the office of wearing away the rocks, by means of their attached boulders, while they are firmly frozen in, or imbedded in their inferior portions. This is a favorite theory with geologists, and it is certainly one which explains admirably the transportation of boulders, and their dissemination over wide areas at the present day; but is it adequate to the explanation of what are termed diluvial grooves and scratches, and moreover the polishing of rocks, which in the case of limestones, is often quite perfect? It is thought not, for the following reasons: 1st. The immense width of country over which those polished surfaces are found almost continuously. 2d. There is a nicer uniformity of action exhibited on those surfaces than apparently could be produced by icefloes. But in the 3d place, those polished surfaces were made before icefloes were known in the earth's history. That the movement of mountains of ice in the sea is a modern event, is clear, when it is known that no large boulders occur in any of the rocks. It is evident they ought to be found, in case they existed during the deposition of the earlier strata, for then as now, they must have been loaded with rocks and stones, and then as now, they would have been dropped and scattered over the bottom of seas where rocks were forming, and which would have inclosed them, and which, ere this time, would have been disclosed by human agency. The large boulders which we suppose may have been transported by ice, overlie all other formations, and I have not been able to find even in the tertiary class of this State a single rock. Occasionally I have met with very small stones, such as are transported by moderate currents of water. If ice, carrying stones and rocks, wore and polished the rocks in the great valley of the St. Lawrence, we ought to find stones and rocks in the deposit immediately upon those surfaces, but as we do not find them, we are compelled to assign some other reason for this abrasion than ice in the transportation of boulders.

The whole appearance of the polished surfaces is such, as to indicate at least great uniformity of action, an appearance more in conformity to what we should expect to result, from running water bearing along sand and gravel, alternating with currents of great power, during which increase, larger stones were forced along. In connexion with this subject, I may very properly mention the existence of an immense *pot hole* in a ledge of granite in the town of Antwerp, and in the open country. It is at least 100 feet above the Oswegatchie, three-fourths of a mile distant, with an intervening hill, higher by some 50 feet than this remarkable hole. This ledge of rocks skirts a valley on the west which is about 100 rods wide, and its direction is about north and south. This hole is from 24 to 30 feet deep, and from 12 to 14 feet in diameter, bearing the usual marks on the interior of water-worn surfaces. Upon the summit of the intervening high ground and the river, we find the polished rocks; in one place a mass of the Potsdam sandstone, still adhering to the primary, 7 or 8 feet in diameter, of an oval form, and about 2 feet thick, is all that remains of the stratum at this place, and grooved in the usual manner, with the scratches in a north and south direction. Now, is there any connexion between the pot hole and the abrasions of the sandstone? We know the former could not have been produced by an iceberg, and probably not by the deluge, but we know they are the effects of running water. There may be a connexion, but it is not possible to demonstrate it. Both phenomena have the appearance of having been produced by one agent, but we are wanting in facts, and are necessarily obliged to wait the progress of discovery either to prove or disprove the inquiry.

It is evident, objections to theories are easily raised, and it is difficult even to propose one to account for ancient phenomena, which shall be free from objections. This is strongly felt by all who have attempted the task. In relation to the phenomena which have been discussed in this chapter, it is clear that we are not yet in the possession of facts which can sustain any theory. It is not sufficient that we admit that the *deluge* may have carried along stones, rocks, &c. or that *ice-floes* do the same, since both may be shown to belong to periods more recent than the phenomena they are intended to explain.

FIVE HINTS TO AGRICULTURISTS.

1*st*. *Drainage*. The cure of a very common evil, that of a cold, wet soil, may be effected by knowing the nature of the rock which constitutes the substratum. Springs which supply this excess of moisture, issue from reservoirs formed in the cavities of rocks, and it is a very common circumstance, that the issue of water is at the edge of the jointed rock, or perhaps the efflux of water is determined by a fault.— In either case, the remedy is to drain the water into the joints of the rock. It may be, however, that drainage cannot be effected. The nature of the substratum or rock determines the question. Geological knowledge is required in the first place, to know how, and in the second, to determine when it is possible to effect it.

2d. Wells, and boring for water. The place for boring for water may be determined by the direction of a *fault*. Springs may generally be found at a fault, whether that is in a solid rock or in a clay bed, for the layers of many stratified rocks, and of clay, being impervious, the water will flow along the layers till it finds some obstruction; that obstruction will be in the line of a fault, when it may be brought to the surface by piercing to the layers on this line.

3d. Valuable materials below the surface. Substantial products for enriching the soil often exist a few feet only from the surface. It may be *peat*, or *marl* or *marly clay*. A little geological knowledge is useful for the determination of the question.

4th. Building materials. Durability is the main question to be determined. The layers of any given rock are not equally durable. Rocks, or those portions which are pulverulent, or are acted upon by atmospheric agents, though they are worked easily, are to be rejected, while those layers which project and have withstood the elements, may be selected.

5th. Knowledge of soil, substrata and water. This knowledge may be valuable, not only as it regards crops, but cattle; for, as in the vegetable kingdom some species prefer a certain soil, so in the animal there are some species which express a similar choice, and manifest the reresult by health, thrift and a good condition. Goodness of soil does not wholly depend on chemical composition and a certain mechanical mixture, but is influenced by substrata, mostly in consequence of their conductibility of heat, and their power of absorbing water. Hence the questions of a change of crop, or change in the range for cattle, often rests on geological data.

E. EMMONS, M. D. *State Geologist.*

Albany, Jan. 1. 1840.

ACKNOWLEDGEMENTS.

I am indebted to the following gentlemen for assistance in various ways, and for donations of specimens to the State collection: Messrs. McIntyre & Henderson, proprietors of the iron works at Newcomb; Mr. Burt, of the Clintonville iron works; Messrs. Wheelock & Wilson, of the Rossie lead works; Drs. Sherman and Ambler, of Rossie; Drs. Benton and Briggs, of Antwerp; Dr. Brewster, of Fowler, and Mr. Dodge, of Gouverneur.

FOURTH ANNUAL REPORT

Of the Geological Survey of the Third District, by Lardner Vanuxem.

This report, in accordance with the plan of the survey, must form the last of the annual ones, the four years allotted to the survey ending on the first day of July next; and on the completion of the final report of the district, which will be the next in order, our engagement with the State will be at an end. It is evident, from the number of rocks and groups of rocks in this district, that there was much to do, and the time given to perform the work comparatively limited; much detail, therefore, will for the present remain unknown, though much will be known; yet it is better to bring the survey to a close at the time specified, even though not perfected, than to prolong it to another period. What remains unfinished, can be finished by the person or curator who may have charge of the State collection.

That a vast mass of facts will have been collected and presented to the public, there can be no doubt; the whole of the rocks, their characters, both mineral and fossil, likewise their mineral associates, will be known; their order of succession, also, and their geographical distribution. Much light will be thrown upon an early period, and one of long duration in the world's eventful history, and important light, too, which must be known, if we wish to acquire knowledge of the ways of its Creator, exemplified as they are in his marvellous works.

Our former reports embraced the counties of Montgomery, Fulton, Herkimer, Oneida, Oswego, Madison, Onondaga, Cayuga, and some parts of the more southern counties of the district. To complete the report of the northern counties, there yet remains Lewis and Otsego; the former county we shall report in brief, and leave the latter one for the final report, not having sufficiently examined its northern edge and its eastern limits. The latter forming, as they do, a part of the boundary between the first and third geological districts, we have proposed with

Mr. Mather to examine in the spring the whole of our common line, being desirous of obtaining an accordance of results, which could not be so well effected as by a conjoined examination.

The subject matter of our report will consist of Lewis county, and an abstract or summary of all the rocks and groups of the district, preparatory to our next communication, which will be the *final report of the district.*

It must not be supposed that we have given in this and in our former reports, all the useful matter collected, for this reason, that the term useful is too relative, and our reports, at least my own, have been made and given merely as reports of progress.

LEWIS COUNTY.

This is the only one of the northern counties of the third district not noticed in the former reports, its examination having been left to a late period of the survey, wishing to avail myself of whatever progress might have been made in the excavation of the Black River canal, and the quarrying of stone and other materials for the same.

The Black river divides Lewis county into nearly two equal geographical parts; draining the whole of its surface, with the exception of a small portion of the northeast and a similar portion of the southwest. No less important is this river in its hydrographical than in a statistical point of view, for it forms the boundary between the primary or the sparsely settled region to the east, and the transition of those rich limestone, slate and shale lands to the west, which in the early settlement of the county were well and far known under the name of *the Black River lands.*

The geology of Lewis county, though it has many distinct rocks, yet from their regular geographical distribution and undisturbed position is quite simple. Its rocks are the primary, the Potsdam sandstone, the fucoidal layers, the Mohawk limestone, the Trenton limestone, the black slate, the Frankfort slate, and the shales of Pulaski. All these rocks, with the exception of the Potsdam sandstone and the fucoidal layers, pursue a uniform north and south direction through the county. The whole of the primary lies to the east of Black river and along the margin of the river, excepting at its entrance from Oneida. The Potsdam sandstone is only met with in the northeast part of the county, near to Jefferson and St. Lawrence, resting upon the primary, the two being unconformable to each other; the primary showing in all places visible, the same disturbance in its parts, and the same water worn appearance, which elsewhere in western New-York is so characteristic of it; whilst the sandstone is more or less horizontal.

Quitting the primary and proceeding west, we find the land rises with considerable altitude towards the source of the tributaries of the Black river. These take their rise in the sandstone and shales of Pulaski, and descend to the river over the Frankfort and the Black slate, the Trenton and the Mohawk limestones; each of the latter rocks forming a narrow terrace for its great length, and, as might be supposed, the waters descending from one elevation to another, give rise to numerous cascades, some of great height and beauty.

The two sides of the Black river strongly contrast with each other, as to rocks, soil, vegetation and population. The surface of the east side, or primary division, consists, with few exceptions, of an almost unbroken range of forest, spread upon an uneven surface, the result of materials or masses first disturbed, and subsequently water worn; no part of its surface in Lewis county presenting elevations of consequence, excepting near the southern part, where it joins to Oneida: there it forms low mountain ridges. The western side of the river, on the contrary, is well settled, and exhibits those steps or terraces common to horizontal rocks or undisturbed mechanical deposits, presenting an almost unbroken outline, the lowest mass of which, the Mohawk limestone, rises and forms the west side of the river valley, either by the side or upon the primary, and presents a cliff or mural precipice, extending through the county.

In no part of the whole of the division east of Black river, could I find or hear of any rock but which formed a part of its mass, with the exception of the fucoidal layers and the Potsdam sandstone; and these were partial, confined to narrow limits, and north of a line passing from the natural bridge to Harrisville. Thus it is obvious, that the county is naturally divided into two geological divisions, the eastern formed of primary masses, and the western those of the transition class.

With this brief outline of the geology of Lewis county, we proceed to such observations as relate more particularly to an economical report.

From all that I had time or opportunity to observe, the primary mass presents but few rocks, consisting chiefly of granite and that peculiar kind of gneiss common to the west primary region of New-York. This kind of gneiss contains but little mica, and shows little tendency to decomposition, disintegration or alteration, and is therefore well fitted to be a good building stone, as regards durability. The same remarks also apply to granite, its associate. In the third district, these two rocks are of contemporaneous origin.

The only common metallic mineral which is common in Lewis county to the two rocks, is magnetic or rock iron ore; this in some places is so much intermixed with the rock as to appear like a constituent; but I did not meet with any locality where it was in sufficient abundance to be worked; yet it is a fair inference, that where it is found disseminated in a rock, it is probable that it may exist in larger particles, or workable masses. This ore was noticed near Lewisburgh furnace, at the High falls also of Black river, at Lyonsdale, and on the road from Harrisville to the natural bridge.

The rock ore may readily be known by its being highly attractive of the magnet, by being black in the mass, and black in its powder. It forms the iron sand so often met with in the streams and sands of the primary region, having been set free by the destruction of its parent rock, and subsequently accumulated by the action of water.

Magnetic iron ore forms the colouring matter, and contaminates, likewise, some of the minerals of the primary rock. The alteration which it has undergone in some places, is highly instructive, and corroborative of facts, brought forth in the second report, of an action of thermal waters at the junction of the primary mass, and its unconformable overlying masses.

At Little-Falls, the primary rock presents numerous cracks or fissures. In some of them the rock, which is usually some shade of gray, is observed to be of a bright red for many inches from their surface, and sometimes the sides of the fissures are coated by the same red mineral, apparently an exudation. This colour is caused by the iron of the rock, altered by the action of hot or thermal water, for when the alteration of the black oxide of iron is unaccompanied by heat, the tendency is to the forming of an hydrate, which produces either a yellow or brown colour, according to cohesion. That this action has operated to a great extent in some other parts of New-York, is evident from information communicated by Prof. Emmons; for masses which evidently, from the structure of their particles, were once magnetic ore, have lost the property of attracting the needle, and have been changed to those of a higher degree of oxidation.

Whilst on the subject of magnetic iron, it may here be well to mention the new locality of this ore, discovered last year, about two miles to the north and east of Salisbury-Centre, in Herkimer county, on the land of Congdon and Gifford. The ore appears near the surface, on a low hill side, composed of various kinds of gneiss with hornblende rock. The course of the layers of the gneiss is nearly east and west, highly inclined, with a south dip. The ore appears as a bed, being parallel with the gneiss and hornblende rock, the whole intermixing with each other, so as to show a contemporaneous origin. Where the bed has been opened, it is quite irregular as to width, varying from a few inches to nearly two feet in thickness. There seems to be something like a curving or rolling of the ore and its associates, resembling the contortions frequently seen in gneiss and other crystalline laminar rock. From this cause it was difficult, at the time of my visit, from the smallness of the excavation, to form any correct opinion of the quantity of ore, or in other words, value of the deposit. Since being there, I have been informed that from one to two hundred tons of ore have been al ready obtained from the deposit.

By means of the compass, the ore has been traced for a mile or more to the east, and in the direction of its line of bearing where opened. There, when about twenty feet from the excavation, and on its north side, at a right angle to the line of bearing, the needle begins to show signs of being acted upon; and in advancing towards the opening, or mass of ore, the action increases and finally the position is reversed, the needle finding its north at the mass.

The same action, in all respects, upon the magnetic needle, is observed from place to place, for the distance mentioned, showing that, as a mass, it is not continuous, though it has a given direction or place, analagous, in this respect, to all subordinate masses, uniform as to position, but without continuity. That this is no generalization from one fact, is evident from observations on the adjoining tract, owned by Prof. McVickar. There, at the bottom of a brook whose waters cross the layers, and have uncovered the rocks, we find the same ore, with the same associates, and there the action of the needle was the same as in the first instance mentioned.

Besides the magnetic ore, there occurs, in Lewis county, two other ores of oxide of iron, both of which are intermediate in age to the primary rocks which contain the magnetic ore and the Potsdam sandstone. These ores are the specular or oligiste iron and the red oxide, a variety of the hematite.

So far as the third district has been examined, these ores have only been met with in the northeast part of Lewis county, and as yet but in small quantity. It would appear that their geographical range, in the third district, corresponds with their range in the second district, both being confined to the north and eastern slope of the primary region.

The specular or oligiste is the next kind as to age. It differs from the magnetic by its powder being red, though it is black in the mass. It does not occur in the granite and gneiss, but with highly crystalline limestone. In all places where I met with this ore in the county, it is in masses, either without any determinate form, or more or less wedged shaped, and invariably limited as to quantity. When first discovered, there seems to be the promise of great abundance, so large are the masses, which are free from all other mineral or extraneous matter; but soon a locality is exhausted, disappointing the high expectations entertained of its richness. This is the same kind of ore which has given so much celebrity to the island of Elba, and to Framont in France, from the great beauty of their specimens. This ore contains more oxygen than the magnetic, and less oxygen than the next or third kind, the *compact red ore, or the hematite.*

The third kind is a variety of the hematite, being compact and not fibrous in its structure. It is red in the mass and red in its powder.— It is more or less mixed with the specular ore, and from having numerous cracks or separations, it is usually coated with fine scales of the red iron froth of the Germans. In every place where I saw the red ore, it was connected with siliceous and with steatitic matter, rarely with carbonate of lime, unless associated at its lowest part with specular ore.

It is but recently that the red ore has been discovered in Lewis county, and though it cannot have an extensive range as to location, yet near to Lewisburg furnace there is the appearance of abundance. At the place in question, the thin mass of quartz conglomerate, which forms the bottom part of the low ridge of Potsdam sandstone, shows that the scaly ore or froth has exuded by its seams and cracks; and where excavations have been made, at the foot of the ridge, in the loose materials which there exist, and near to the seams and cracks, the froth is observed in unusual quantity, accompanied by the solid red and specular ores. At one place at the foot of the ridge, where there was a promise of ore, on excavating a few feet, the crystalline limestone, with specular ore, was found in connection with steatitic matter, showing, to appearance, a common age for the ores.

This locality, which is about two miles from the furnace, is one of the best I have seen for observing the position which the specular and red iron ores hold in the geological series. The hard red ore with the red froth is there connected at their upper part with sandstone which makes a part of the conglomerate, above which is the Potsdam sandstone. These rocks at their junction with the ore are inclined; but at a short distance the conglomerate disappears below the soil and the sandstone presents its usual horizontal position. Below the red ores are the specular ore and its calcareous associates; and these at another excavation made for specular ore, are seen reposing upon primary rock.

The Potsdam sandstone becomes, therefore, a good guide for the discovery of the specular and red ores. Knowing that their place or position is above the primary and below this sandstone, we are certain that where the sandstone exists, that whatever ore was deposited below it, there it exists; but when this rock is absent, so great has been the action of destructive agents through the primary region, that we have no guide for its discovery, excepting its actual presence.

The red iron froth or scaly iron ore so soft and greasy to the touch, is readily imitated by calcining equal portions of common salt and copperas. After that operation the soluble part is to be removed by washing with water. It is then used for razor straps.

Carburet of iron. Not far from the natural bridge on the land of Mr. Cleaveland, there is an extensive deposit of this mineral or plumbago in extremely fine particles mixed with what appears to be chlorite, and also some epidote and probably idocrase. The plumbago in consequence of its mixture with other minerals is of little or no use to which this substance is usually applied, but from its apparent great abundance ti might be used as an iron ore and with care may be converted by one operation to steel and of the best quality; for a like combination must produce a first rate metal as to quality, which experiment in the ordinary way on a small scale, has shown, that the iron obtained from it was of the best kind.

This is the mineral which has made some noise as a silver ore, which it was calculated to do from its unusual appearance and its great quantity. Many satisfactory experiments are cited in proof of its containing silver, all which experiments are negatived not only by the non-existence in nature of any ore of silver of the kind, but by the fact, that silver will not unite to carbon, nor will it unite with iron in greater amount than one five hundredths. In combining silver with steel for the purpose of increasing its hardness for razors and other instruments requiring a keen edge, it has been found that when more than the quantity just named is fused with that metal, the silver exhibits itself throughout the mass in the form of filaments or threads ; now no such appearance was visible in the experiment made to ascertain the quality of the iron which the ore would produce.

The chemical department of the survey belonging to Dr. Beck, an analysis of the ore no doubt will be given by him and which will be decisive of its nature.

The plumbago ore is connected with steatitic masses, some green, white, black, &c. Likewise with dark greenish masses, containing pyrites, the kind connected with the base of the specular ore. I also noticed a peculiar porous rock, with fine scales of plumbago, which I met with in another locality near Sommerville, between Parish's and Kearney's ore beds.

The plumbago ore shows itself on Mr. Cleaveland's land in several places on the side of a hill, back of which at no great distance are the usual gneiss and granite masses, and I should judge that the whole of the product noticed, were an overlying deposit to these rocks, and analogous as to cause, origin and position, to the second and third deposits of iron already mentioned.

As natural bridges are not of frequent occurrence, a word in passing seems to be necessary. The bridge exists at the bend of a branch of Indian river near to the village of its name. It is formed merely by a cavity or fissure in the primary limestone which there abounds as an associate of the usual granite gneiss rocks. A portion of the water passes by the cavity, whilst other portions pass round the bend and under the wooden bridge beyond, Near to the bridge Mr. Williard has excavated for copper as I understand, but I saw no other metallic mineral there, but some beautifully tarnished pyrites.

Since the discovery of the Rossie lead vein, innumerable excavations have been made for ore; and profitless in many instances have been the expenditure of time and money in its pursuit. In one place we visited a large excavation in limestone made for lead ore, the rock showing none; but it contained plumbago in scales. The cause of the excavation was owing to the common name of this mineral, *black lead*, misleading its pursuers, they supposing that from similarity of name, there was a connection of composition and origin. They were not aware that the composition of black lead was carbon and iron, and that not one particle of lead entered into its composition, or was it in any wise connected with lead, else their time and money would have been saved.

Potsdam sandstone.

This rock appears in the northeast part of Lewis county, in low ridges, and with all the characters given by Prof. Emmons, in whose district it is an extensive rock. It is well suited for building, and for the the lining and the hearth stones of furnaces.

Fucoidal layers. These are the layers which are interposed between the "calciferous sandrock" and the Mohawk limestone, and which are so abundant in the valley of the Mohawk. They appear to be almost horizontal to the eye, and may be seen on the road from Lewisburg furnace to the natural bridge, extending thence north and east into the second district.

With these notices and remarks, we terminate for this report all that we have to say of the primary rocks and their overlaying masses of the region to the east of the Black river, and proceed to those masses which follow them in age, and which extend west from the river. The first of these is the Mohawk limestone, no other rock being visible between it and the primary, along the whole line of its course in the county.

Mohawk limestone. This rock in our former reports was connected with the "bird's eye," but in extending our researches from county to county, we found that a separation seemed necessary, and we adopted the division set forth in Mr. Conrad's last report, correcting the error which had crept into it, of placing this limestone upon the "bird's eye," in lieu of making the latter the upper or superior mass.

The Mohawk limestone is an extensive and thick deposit, in Lewis county, making its appearance near Boonville, on the river, and extending without interruption through the county, with a thickness which cannot be less than forty feet.

Near to Boonville its upper layers are even with the level of the river, but the rock rises from thence, attaining its greatest elevation a few miles below the village, exhibiting a cliff or mural edge, whilst traversing the county, its layers falling with the river from the point of greatest elevation, and from thence dipping probably to the northwest.

In no place could I see this limestone reposing upon the primary, or observe what rock was under it, from the lower layers being concealed by soil or other extraneous materials. No rock can be seen between it and the primary, which we before have said forms the margin and bed of the river.

The Mohawk limestone is extensively quarried near Boonville, for the locks of the canal. Its layers are thick, solid, with joints in two directions perpendicular to the layers, is easily worked, undergoes no change but solution, and for building purposes only inferior to the Onondaga limestone, not having the toughness of the latter.

About half way in the series, there is an earthy drab or yellowish coloured limestone, which is burnt and used at Lowville for water lime. That it contains silex and perhaps alumine, seems certain, for when too much heated, its surface, I was told, fuses into a glass. Dr. Emmons has since informed me that sulphate of strontian has been found in it, which I did not see.

The Mohawk limestone does not afford any metallic mineral, its value consists in furnishing good lime by burning, and a first rate material for building purposes.

The "birds-eye" limestone does not occur in Lewis county, and by its absence causes the Trenton limestone to rest immediately upon the Mohawk limestone, and to form the second terrace west of the river.

Trenton limestone. This rock underlies the villages of Lowville, Martinsburg, Denmark and Copenhagen. It seems to increase in thickness from Boonville to Copenhagen. At the latter place it must be 300 feet thick, showing a great increase in its progress from the

Mohawk river, where in no place is it 30 feet in thickness. Its layers, like most of the New-York rocks, are generally divided by cracks or fissures, having a two-fold direction, presenting a double system of parallel lines of separation. Though the cracks are not always continuous, owing to unequal resistance in the rock, yet their direction nevertheless is uniform, and to speak approximately, for the sake of a convenient expression, their direction is north and south for one system, and east and west for the other system.

High expectations were at one time entertained, that this rock would prove to be a metalliferous one from the abundance of small particles of lead ore, visible near Martinsburg, about half a mile northwest of the village. The working for ore was commenced at the upper part of the limestone, which there has but a thin covering of earth or soil. The rock shows the two-fold system of cracks or joints, more or less regular as to direction and irregular as to width. These cracks or joints, are filled with white sparry limestone, containing ores of lead, zinc and pyrites, forming as many veins in the space uncovered, as there are east and west joints or cracks. The veins are not always continuous, either downwards or in a horizontal direction, from the cause before mentioned, so that they are often interrupted, and a rock without seam or any indication of one must be passed to recover the part lost. In width, the veins vary from walls almost in contact with each other, to walls eight or more inches distant from each other. Sometimes the vein divides in consequence of two cracks or joints coming together, or conversely, two joints meeting in one.

There are several parallel workings, all "open to the day," one of which extends for 200 feet along the surface, and in one place is 50 feet deep. The ore is galena, accompanied by blende, and copper, and iron pyrites, having a matrix of white laminar and granular carbonate of lime. There is an appearance of calamine in some of the ore, in which the galena presents a beautiful feathery form of crystallization.

The workings are now suspended. About $3,000 have been expended upon them, and the quantity of metallic lead obtained was but small for the ore obtained, and for the money expended, owing, as I am informed, to the quantity of rock excavated for the ore gotten out, and for want of a proper system of drainage, &c. That there is lead ore in that locality is certain, from the numerous cracks or veins which show its existence, but unless larger veins should be discovered, the profit must, from past experience, be hopeless. No further attempt should I think be made to resume this working, before parallel north and south trenches are opened in order to ascertain the widest and most promising of them.

In the same limestone rock, near the head of the small falls, in the creek at Lowville, there are small excavations on the left side of the stream, from which ore supposed to contain silver, existing in narrow veins, was extracted. The ore proved to be galena, blende and copper and iron pyrites, having for matrix carbonate and fluate of lime. Both these localities were noticed mineralogically by Dr. Beck.

The ore occurs in the same system of cracks or joints as at Martinsburg, and clearly shows an infiltration or exudation from the rock, both galena and blende having been found at the latter place enveloped by the solid rock, so as to leave no doubt, that the rock was the source from whence the veins derived their material. The occurrence in these two places of metallic minerals, in an east and west direction, a fact so general in all countries, is of importance to the true theory of veins, and show a connection with the galvanic one, either as cause or effect, and wholly adverse to the theory which makes them the result of injection from below, for in that case there would be no difference as to quantity of ore, in the different systems of veins or fissures.

Besides these facts, there are others in the third district which show that injection could not have heen the operating cause. Of the five localities where ore exists in veins, two of them are in the upper part of the Trenton limestone, and two in the lower part of the black slate which rests upon that limestone. These facts show a connection between the veins and the rock, and moreover, they are cut off from the source of injection, if the primary rocks be that source, by the Mohawk limestone, the fucoidal layers and the calciferous sandrock, none of these rocks in the third district showing ore in veins or in like abundance.

The fifth fact is the instance cited in the second report, of a small vein of lead ore, existing at the junction of the black slate and Trenton limestone with the "calciferous sandrock" and "bird's eye" limestone, at the up-lift on East Canada creek, and there the ore is on the side of the two former, and not the latter rocks.

Upper rocks of Lewis county. In proceeding west after leaving the terrace or level of the Trenton limestone, we ascend the black slate, then its successor the Frankfort slate, and finally the Pulaski shales. On these latter the waters divide, going east and west. Those of the west descend over rock, which though holding a higher geological level, yet are geographically lower, exhibiting the same phenomenon observed on the south side of the Mohawk valley, after attaining the height of the elevation, or the point from whence the waters divide, showing that the uplifting cause has operated upon the south and west side of the primary nucleus, in an uniform manner.

Having communicated all the information that we wish to give in this report of Lewis county, our next subject is a summary of all the rocks and groups of rocks which compose the third district, with such other matter or information which may seem necessary, since some of the counties of the third district have not been noticed in the reports that have been made. In this summary we shall commence with the lowest rock or mass, then the next in succession, terminating with the last one in the district.

Primary rocks. Granite and gneiss constitute the base or substratum of the third district, having occasionally for associates combinations of one or more of their mineral elements, with amphibole or hornblende forming sienite, granito-sienite and hornblende rock; likewise some aggregates of which granular carbonate of lime is the base, and other more rare in which we find pyroxene and table or tabular spar. It is with hornblende rock, granite and gneiss, that magnetic ore is usually associated.

All these rocks and aggregates are designated as primary ones, meaning thereby, that their origin was anterior to *all known organic bodies*, and that their mineral particles or their parts, are the result of crystallization.

The primary rocks form the northern part of Herkimer and Fulton counties, the northeastern part of Oneida, and the whole of Lewis county east of Black river, being the south and west part of that immense nucleus, which from a height, according to Prof. Emmons, of nearly 6,000 feet, descends with great irregularity, and disappears under the less ancient rocks which border the St. Lawrence, the Champlain, the Mohawk and the Black river, appearing again west in the Ozark mountains of Arkansas and the iron mountain of Missouri.

Besides the above localities of the primary, we find it as before stated, forming the base of the uplifts of the Noses, Little falls, and also Middleville.

Great contrast exists between the layers of the primary masses and those of the transition class contiguous to them. The former presenting disturbed appearance, exhibiting high grades of inclination, whilst those of the transition are like the deposits of tranquil waters, and to the eye often present an almost horizontal outline. From this difference many important inferences follow, one of which only at this time will be mentioned, namely, that the disturbance of the primary, was anterior to the deposition of the transition class of the third district, and shows the propriety of their separation.

We have said that the layers of the transition rarely present other than an horizontal appearance, but when examined they show a two fold dip or inclination, one general in accordance with the contour of the primary nucleus, the other conforming to its more local changes or features.

Specular and red ores of iron. These ores are to be referred to the period which intervened between the two classes of rock as they exist in the third district. That there are some members wanting to complete the series of that period is certain, from observations made out of the district, and in other counties which we shall advert to in our next report. To this period however we would state at present, that we should refer the Cambrian system of Prof. Sedgwick.

Potsdam sandstone. This rock is well characterized in the northeast part of Lewis county, agreeing in all respects with the same rock in the 2d district. South of that county it is not so, and therefore there are several varieties of it. Under this name, we include the layers below the "calciferous sandrock" at the Paper mill on Spruce creek, and likewise the layers below the same rock on East and West Canada creeks and at Amsterdam. In all these latter localities the structure of sandstone is lost, and therefore in all respects unfitted for the purposes to which the northern sandstone is applied, namely, the lining of furnaces and for their hearth stones. For a full account of this rock, see Prof. Emmons' report for 1838.

At Keeseville the Lingula ——— abounds in this rock. As yet I have seen no fossil in it.

"*Calciferous sandrock.*" This rock is abundant at all the uplifts on the Mohawk, and in many parts of the new county of Fulton, formerly the northern part of Montgomery. It is found to the east and south of Amsterdam, the Noses, St. Johnsville, Little Falls or Rockton, and on the East and West Canada creeks, and on Spruce creek, a tributary of the former. I did not meet with this rock north of Oneida county. At the Noses and Little Falls it rests immediately upon the primary, without any intermediate mass, but in other places, those layers which correspond with the Potsdam sandstone intervene.

The "calciferous sandrock," in many localities abounds with cavities large and small, often containing rock crystals and small quantities of anthracite coal. Frequently the large cavities, which in part are filled with crystals, have a covering of coal, which is flattened or depressed towards the centre, showing that the coal was in a soft or yielding state. In other cavities, the coal is sometimes found in the form of drops or buttons. These facts show that the coal was once bitumi nous, and had by heat been changed to anthracite. In some of the cavities the whole of the crystals, amounting to a peck or more, will have their angles and edges rounded from friction, either from water having entered with a circular motion, or that a motion of the kind had originated from either vapour or gas. That this rounding of the angles and edges of the crystals was anterior to the solidification of the coaly matter, is evident from the fact of the anthracite covering, in the manner above mentioned, the crystals which had been rounded by rubbing one against another.

At the Noses, Little Falls and Middleville, this rock attains its greatest thickness, being about 250 feet thick at Little Falls.

In the second district the Lingula acuminata characterises the calciferous, but I have not seen this fossil in the third district, nor any other than the casts mentioned in the second report.

Fucoidal layers. These layers were separated from the above rock from their distinctive characters, position, and finding them in Lewis and Jefferson counties, without the "calciferous sandrock" upon which they rest. It is in these layers that we first meet with that peculiar class of marine organization, in all probability vegetable, which for convenience have received the name of fucoides. In these layers, they are evident and abundant, though the forms more or less regular, arising from the mixed mineral nature of the layers, may be confounded with those of the fucoides. The fucoides are yet undetermined.

The best localities along the Mohawk for the examination of these layers are the falls on the creek near Spraker's basin, and by the side of the rail-road, opposite to Fort-Plain—greatest thickness about thirty feet.

Mohawk limestone. This is the rock so extensively quarried for the enlarged Erie canal at Amsterdam, Canajoharie, Fort-Plain and other places along the Mohawk river, also along the Black river, for the use of its canal. Its layers are thick, solid, easy to work from being somewhat brittle, but for hardness and solidity must form very durable mason work.

Its associates are the water lime of Lowville on the Black river. At Canajoharie some of its layers contain a greenish matter analgous to "green earth;" others are brownish and sandy, probably from union with the fucoidal layers below them.

It contains no metallic mineral, if we except a little iron pyrites, of which very few of the New-York rocks in any locality, are entirely destitute. Greatest thickness about 40 feet.

Its characteristic fossil is the orthostoma communis; there are several others, none of which have yet been described or named. In this rock we first meet the genus Cytherina. The individuals, however, are but few in number.

"*Bird's eye*" *limestone.* This rock is confined almost entirely to the Mohawk valley, and invariably where it exists, it rests upon the last mentioned limestone, forming the upper layers (from memory) of all the quarries to the west of Canajoharie, embracing those on East and West Canada creeks, with the exception of the quarry on the south side of the river west of Little Falls.

This rock is eminently characterized by the fucoides demissus which is often replaced by crystalline limestone, and sometimes by black and by green mineral matter, which exhibits the outlines of the fucoides in strongly marked characters. When the taste of our citizens shall incline them to simple colours, like the drab and dove, then the "bird's eye" and the Mohawk limestones will be resorted to for marbles, from the beautiful shades of these colours which they present.

Trenton limestone. This limestone is usually in thin layers, of a black, dark and a light grey colour. The layers are generally separated by black shale or slate, and to which the colour of the rock is owing. This limestone is abundant, and is found in the counties of Montgomery, Fulton, Herkimer, Oneida and Lewis. On the Mohawk its thickness rarely exceeds 30 feet, but increases through Oneida and Lewis, being 300 feet in the north part of the latter county.

Being the only rock at Trenton falls, it from thence derives its name. There are two divisions of this rock, the dark which is the lowest mass, and the grey which is the upper mass. This latter is less abundant and is principally found in the towns of Trenton, Floyd and Steuben of Oneida, and Newport of Herkimer. The Trenton limestone is loaded with the remains of animal life. In the preceding rocks there was but the dawn, but in this the full existence for the kind.

Of the Crustacea we have Isotelus gigas, I. Cyclops, Cryptolithus Tessellatus, Asaphus tuberculatus, Calymene blumenbachii, Ceraurus pleurexanthemus and Illanus perovalis ?

The Testacea are Strophomena deltoidea, S. alternata, S. semiovalis, Delthyris microptera, D. pecten, Orthis' glabella, O. testudinaria, Lingula ovata, Orbicula ———, Bellerophon apertus, Pleurotomaria cirriformis, Trocholites ammonius, Phragmolites compressus, Conularia quadrisulcata, Orthoceras duplex, O. striatum.

The Polyparia are Trianisites cliffordii, Columnaria sulcata, Cyathophyllum ceratites, Gorgonia.

Of Plants. Fucoides dentatus.

These are but a part of the many fossils which have been obtained from the Trenton limestone, but these are all that have as yet been identified and named. In this rock is the Lead mine of Martinsburg and the supposed silver mine of Lowville.

Black slate or shale. There is no mineralogical difference between the shale which separates the dark coloured layers of the Trenton limestone and this rock, but though in many localities it contains thin beds or flags of limestone in the lowest part of its mass, yet we often find above these thin beds, a thickness of two or more hundred feet, without any limestone whatever. A separation therefore was necessary.

Were it not that quarrying for limestone is carried on to the greatest extent upon the Mohawk, incidentally furnishing thin layers of limestone for flagging, and at a cheap rate, those of the black slate would be sought for, being thin, level and smooth. They may be obtained in almost all the water courses which flow over the lower part of the black slate in Herkimer county, on both sides of the Mohawk. We noticed some very excellent ones back of Little Falls, near Stephen Hammond's, not far from the old road to Fairfield. Near to these flags, in a small water course, at a higher level in the slate, there are two thin seams of sulphate of strontian, of a bluish colour and fibrous texture. In the thickest seam, which is about the third of an inch, that mineral shows in some parts a mixture with carbonate of lime in all proportions. There is also near to the strontian, a thin layer of greyish shale which when wet with water, separates into parts like lime in slaking.

In the upper part of this rock, fossils are extremely rare; but not so in the lower part. There we meet with many common to the Trenton limestone, such as Lingula ovata, Isotelus gigas, Fucoides dentatus. This latter fossil is rare comparatively in the Trenton limestone, but is extremely abundant in the Black slate and associated with the Fucoides scalaris. There are a few fossils which are peculiar to this rock besides the last mentioned one, among them is the Triarthus Beckii, its characteristic trilobite.

The small veins of Lead ore and pyrites, on the creek near Spraker's basin, are in the Black slate.

Frankfort slate. This rock or mass is the successor to the Black slate; the one changing to the other by imperceptible gradations, the dark or black colour of the lower rock disappearing in the lighter colour of the upper rock. This rock may be seen to the greatest advantage on Frankfort creek, back of the village from whence it takes its name, and also on the waters of the creek which flow by Utica to the southeast of the city, being interposed between the Black slate which there forms the bed and sides of the Mohawk and the "millstone grit," in consequence of the absence of the next three rocks.

The upper part of the Frankfort slate in many places alternates with thin layers of a fine grained sandstone, more or less intermixed with the matter of the slate; both by long exposure to the air assume a dark green or olive colour, by which they are readily distinguished from the Black slate, which changes to a brown.

Fossils are rare in the lower part of the Frankfort slate, but are numerous at the upper part where it joins the next series, the Pulaski shales. To which of these two masses they belong, or if they form a separate mass, has not been determined; but that they form an important geological line of division is certain, for there is no essential difference between the fossils, whether seen at the mill race at Lee centre, or Whitall's quarry, near Rome, Halleck's springs, in Hampton, or the gully near Utica and the Cohoes, near Waterford. In all these localities, the characteristic shells of the Pulaski shales are wanting, and others appear, that had no previous existence in the district. Among the Fossils are cryptolithus, probably the tessellatus Pentacrinites ——— and Trimerus ———.

Halleck's spring was commenced in the upper part of this rock, and it is not improbable that the springs of Ballston, Saratoga and Albany may be in the same rock, (the Frankfort slate,) and for these reasons. The fossils of Waterford show the existence of the upper part of the mass on the Hudson. Secondly, that there are extensive and thick masses of argillaceous rock upon that river, whose age is matter of controversy. Thirdly, that organic life abounded in the period of the Trenton limestone, and disappeared in the lower part of the Black slate, reappearing only at the upper part of the Frankfort slate, leaving a thickness of mud rock, of at least 400 feet, comparatively destitute of organic bodies. Now what cause so well explains this absence of life, as the existence of saline matter, as to kind or quantity, unfavorable to its existence or development.

Pulaski shales. Called in the last report the shales of Salmon river, which we have changed to the first name, from finding them at the village of Pulaski, unaccompanied by any other mass. There the argillaceous part predominates at the lower part of the village, accompanied by some carbonate of lime, whilst above the village we find the sandstone begins to predominate.

The fossil which best characterise these shales are Pterinia carinata and Cyrtolites ornatus. Besides there are others whose individuals are very numerous, as Pterinia planulata, P. Modiolaris, P. pholadis and Delthyris equistriata and others not yet named. Again those which are common to the Trenton series, such as Strophomena alternata, Orthis testudinaria, Bellerophon apertus, Calymene blumenbachii.

These shales form the elevated parts of Lewis county, a considerable portion of the northwest part of Oneida, and the comparative depression which extends from Pulaski to near Jefferson county, bordering on the Lake. Their most southern point is at Talcott's quarry, about two miles southeast of Rome.

Salmon River sandstone. This rock is grey and greenish as to colour, the latter prevailing at the lower part, the former at the upper. Frequently there is a thin coating of green shale upon the lower layers, with and without markings or configurations like fucoides.

This rock forms the falls of Salmon river, in the town of Orwell, and the falls on the same river above Redfield village, and though their elevation be very different, yet they were originally parallel masses. It forms the knobs near Florence village, and the rock of Woodruff's quarry, to the southeast of Rome. It may be seen to the north of the road which leads from Pulaski to Oswego, where we have the upper part. From the falls at Orwell it disappears, descending the river so as to bring the shales of Pulaski in view. This rock furnishes grind stones, near the High falls of Salmon river, and at Woodruff's quarry, as mentioned in former reports.

Medina sandstone. Called in former reports the red sandstone of Oswego. Predominant colour red, more rarely whitish and greenish. This rock is confined to Oswego county, to the high grounds of Oneida at Florence village, and other parts of the town of Florence, and to the extreme north parts of the counties of Onondaga and Cayuga.

In this rock are many brine springs, and it is the lowest deposit of western New-York for common salt.

Its characteristic fossil is Fucoides Harlanii, being abundant at the upper part of it, and exclusively confined to this rock.

Oneida conglomerate. The "millstone grit" of Prof. Eaton, which has been changed, to do away with all ambiguity, there being no other rock of the kind in Oneida county, if we except the thin irregular layers, composed of small sized pebbles, which makes a part of the succeeding group, and which may be seen at Blackstone's quarry, to the south of Utica.

Protean group. This group by the next report will be divided into two, the upper one consisting of the Lockport limestone and its calca.

reous shales, whilst the lower will embrace the green shales, their associated sandstones and iron ore beds.

This group extends through the third district, forming a part of the high range south of the Erie canal in Montgomery, Herkimer and Oneida counties. By the dip of the rock to the southwest, the rise of the ground, and from the extent of denudation when upon the summit level of the canal, this group ceases to form a part of the elevation, but underlies the southern part of the level, extending through Lake Oneida, and onwards in the direction of the Lake to the fourth district. This group is an highly important one for its iron ore, limestone, sandstone, and from its forming an era in marine botany, for the number and kinds of plants which are found in it.

Its fossils, in the upper or calcareous part of the group, are Orthis bicostata, Delthyris lineatus, Strophomena rugosa, and a few others. From the thinning out of this part of the third district, it contains but few fossils comparatively with the same mass in Mr. Hall's district, where it is of great thickness. In the lower part they are more numerous, but a few only have been determined. The small and peculiar crustacean, the Agnostus pisiformis belongs to this part, being found with the iron ores. So also the Pentamerus elongatus, Strophomena rugosa likewise, being the lowest position of the shell. With these we have the Trimerus delphinocephalus and two other Trilobites not determined.

The greatest thickness of this group must be over 200 feet. In this group we have the third deposit of iron ore, viz. the oolitic or concretionary red oxide.

Onondaga salt group. This is not only an immense deposit, but an highly important group, extending through the third and fourth districts, with a thickness in Onondaga of about 700 feet. It embraces all the salines of Onondaga and Cayuga, as well as all the Gypsum beds of the State. No gypsum or plaster of any consequence has been found east of Oneida creek, excepting in the town of Stark, south of Little-Falls, and this accords with the greatest development of the group which is west of that creek.

It is divided into four parts or masses. "The first or lowest is the Red shale. Second, the lower Gypseous shales, the lower part alternating with the red shale, the red ceasing entirely with this mass. 3d the gypseous deposit, which embraces the great masses quarried for plaster, the hopper shaped cavities," the "vermicular limerock" of Eaton, and other porous rocks; and 4th, those rocks which abound in groups of needle form cavities, originally occupied by sulphate of magnesia.

Not a fossil has been observed in the two lowest deposits; they are found, but rarely, in the two upper ones. In the 3d mass at Bull's quarry we find a few small fucoides, resembling spear grass, the Lingula limosa and two or three thin shelled bivalves not yet determined. A small Cytherina in the road from Jordan to Peru, on the south side of the canal. Two species of bivalves are also found at Dunlop's mill, below Jamesville, accompanied by fucoides and a large sized Cytherina, all occurring in a coarse calcareous slate, and I should judge makes a part of the mass which encloses the plaster, being between the upper and lower beds. It is in this slate that I should place the Eurypterus remipes. It has not yet been found within the plaster region, but in the series of the plaster region, below Waterville, and in a rock or mass which extends east through the district, having a gypseous shale below it, and the Manlius water lime series above it.

Manlius water lime group. This group embraces all the beds of water lime south of the Erie canal, which are burnt for cement. It is very constant in its character, and I have traced it from Cayuga lake to the hills in the rear of Hudson. It affords the most profitable limestone for burning of the whole series of limestone rocks, and from this cause it is always chosen when present, requiring less wood to calcine a given measure than the other limestones. From Cayuga to Hudson river, kilns are arranged by the sides or upon the top of this rock.

This group is admirably characterized by its fossils, and before these were well known, its blue limestone was often confounded with the Trenton limestone. Its layers are dark blue and drab; the latter furnish the water lime, the former the caustic lime. Its fossils are Atypa plicata, Pterinea ———, Stenoscisma bisulcata, Littorina perantiqua, Cytherina ———, Leptæne punctulifera? Tentaculites, &c. &c. At the bottom of this group, or top of the last, we find the Catenipora labyrinthica.

Pentamerus Limestone. This limestone comes in from the first district as a thick mass, and with numerous fossils as to individuals, but runs out before reaching Onondago valley, its fossil disappearing in some of its localities, so as to make its recognition difficult. Its characteristic fossil is the Pentamerus Knightii, which is usually in great abundance, also, an Atrypa, resembling the Wilsoni and the Euomphalus profundus.

Delthyris shaly limestone. This mass makes its appearance to the east like the former, and ends in a like manner, carrying with it the Delthyris Macropleura, Strophomena rugosa, Orthis resuprinata, Orthis, resembling the Concentrica Delthyris pachyoptera. The Delthyris bilobata, which is peculiar to this rock, I have not yet seen in the third district. The Platyceras ventricosum is an abundant and a characteristic fossil of this rock.

Scutella limestone. This is likewise a rock of the first district, but its fossil being more persistent than those of the two former rocks, it is readily traced to Oriskany falls, the ridge to the east of Minsville and Fosters' mill, on Oneida creek. The peculiar fossil from whence its present name is derived, I have not observed in the third district, but all others that are common to it and give to its character there, exist in the 3d district; such as the Atrypa, resembling the hastata, strophomena tuberulifera, Apiocrinites, Asaphus micrurus, &c. &c.

Oriskany Sandstone, exists, with interruptions, through the district. At Oriskany-falls, it reposes upon the last named sandstone; but from Madison county, west, in consequence of the absence of all the intermediate masses, it lies upon the Manlius water lime group. This rock in its lower part abounds in fossils, and of a large size, showing that at that period the circumstances were highly favorable for the development of this kind of animal life, among them we find the Atrypa elonga, Delthyris arenosa. This rock is the fourth position of iron ore, but not yet found of a quality suitable for smelting.

Fucoides Cauda-Galli. This series so extraordinary for the peculiar fossil which it contains and from whence its name is derived, is also a rock of the first district. It continues through Otsego and Herkimer counties, but further west I have not yet seen it. It is an argillaceous mass in places somewhat sandy, of a black or dark green, which becomes lighter, and by long weathering blanches. It readily strikes the eye by its contrast with the other rocks and by the peculiar markings of its fossil, so strongly resembling the plumage of the male of the barnyard fowl.

Schoharie layers. These layers I have not yet seen in the district, but I have found detached pieces of limestone which evidently were severed from them. These are the layers so abundant in fossils, and have furnished such numbers to the collectors of Schoharie. Among its fossils are Phragmoceras arenatum, Lituites bidulphii, Spirorbis tenuis, Calymene Rowii, &c.

Onondaga limestone. This is the limestone or marble so well known and so extensively wrought, from Auburn to Cherry-Valley. West of Oneida county it is the stone which is used for all the exposed masonry of the enlarged Erie canal.

In the bottom layer of this rock, pebbles of black sandstone are often seen, having been derived from the breaking up of the Oriskany sandstone. These pebbles were concretions in the sandstone, and they may be seen in situ on the farm of Mr. Eastman, on the road from Waterville to Paris Hill.

The Onondaga limestone abounds in Testaceous fossils, the most characteristic ones have not yet been named. It contains a new species of Pentamerus, which is met with in all its localities that I have examined. The atrypa Nasuta is confined to this rock.

"*Corniferous limerock*" of Prof. Eaton. The lower part of this mass often presents a limestone more or less mixed with aigillaceous matter, forming a shaly rock, whilst the upper with few or no exceptions exhibits from one to even ten parallel ranges of nodular flint, whence its name. This occurrence of flint is not peculiar to this rock, for it occurs in the Onondaga, the pentamerus and other limestone rocks but less frequently. It has however two fossils by which it may always be known, the Platyceros dumoso, and the Cyrtoceras ——, many specimens of the latter may be seen in the limestone flags, with which parts of the city of Utica are paved.

Seneca limestone. This is the last of the immense series of limestone and other rocks, which form the northern termination of the great east and west elevation, which extends through the State. All of them from the Manlius waterlime group, are only found on the south side of the Erie canal, and were it not for the deep valley of excavation whose course is north and south, they would merely exhibit a superficial northern outcrop. They all disappear in the order enumerated, one passing under another, and finally the whole are covered in their progress south by the shales and the sandstones which succeed to them, the former sinking deeper and deeper, as newer or higher rocks in the series appear, the whole series or class ending only with the coal of Pennsylvania. The characteristic fossil of the Seneca limestone is the Strophomena lineata. The rock in some localities swarm with them; they are more abundant to the west of Oneida creek, than to the east of that creek.

Marcellus shales. The colour of these shales are of deep black from carbon. In some localities from the accumulation of its colouring matter it appears as well characterized coal, exciting high expectations of abundance by excavation and in every attempt disappointing its explorers. From place to place along the long line of its extension east and west, pits may be seen which were dug for coal.

These shales contain in some localities layers of limestone separated by shale, in others the layers are interrupted from diminution of material appearing elsewhere as Septaria, and finally disappearing altogether. In Oneida Creek and near Manlius square, there are two layers of limestone which abound in Fossils consisting chiefly of Goniatites and Orthocera and confined to this rock. At Cherry Valley, the shales are abundant in fucoides retaining their carbonaceous material, and it is probable that the shales owe their carbon to vegetation of their kind. At Cherry-Valley the shales are interposed or separated by irregular layers of limestone, their surfaces covered with knobs, the result of irregular accretion.

Upper shales of Marcellus. These are less highly coloured than the lower ones. They contain no fossils for one or two hundred feet, or more where thickest. They are disposed to break into small fragments, flat and showing a tendency to a peculiar concretionary structure, exhibiting slight stains from iron rust, owing to minute particles of pyrites. The whole of this mass has been formed from mud, whose particles were of great tenuity. This mass is thickest to the west, thinning out to the east. At the village of Marcellus, Onondaga county, both these shales may be seen to the greatest advantage. Going from

Marcellus to Skaneateles, we find in ascending the shales, that fossils begin to appear, the first is an orthis; a new species appearing here for the first time, and continues with many interruptions through several groups, if there be but one species of it. Still higher we find the shales of Skaneateles, which cover the north end of both sides of the Lake of its name, and which at present we consider as a mass, or series distinct from those above or below.

Skaneateles shales. These are highly fossiliferous, but the fossils do not differ from those of the Moscow shales that I am at present aware of. The great thickness of rock between the two masses is the reason why we at this time separate them.

Hamilton group. In this group we have shales and sandstone, the former dark blue, olive, &c. West Hamilton is the locality where it is well characterized, also Cazenovia, Pompey Hill, &c. being one of the south rocks whose range is uninterrupted through the district, covering considerable ground south and north. In this rock we find the Dipleura, DeKayi, Orthoceris constrictum, Cyrtoceras maximum, Posidonia lirata, Goniatites punctatum, Conularia ——, a large Orbicula, with abundance of Aviculæ, Pterenea, &c. with a re-appearance of the Fucoides cauda galli, should the species be the same. In this group we find many layers suitable for building purposes, and quarries are numerous along its range, being the best stone either north or south, for some distance. Near to Cayuga lake this group is separated from the next one by an encrinal limestone, which is not observable toward Madison.

Moscow shales. These shales are various as to hardness, smoothness, &c. They are found at Tully Four-Corners, under the limestone; Ludlowville, below the falls, under the same limestone; at Moravia, Montville, near Sherburne, New-Berlin, Otsego lake, &c. &c., the range occurring south or above the former group. This is also a highly fossiliferous mass, having plants, with Testaceous and Crustaceous remains in great abundance; among them we find the same fucoid last mentioned, Delthyris undulatus, D. granulosa, D. distans, Orthis concentrica, Strophomena lineata, S. carinata, Crypheus Greenii, C. calliteles, &c. Many fossils are common to the last three divisions, the whole together making a mass which cannot be less than from six to eight hundred feet where the thickness is greatest.

Tully limestone. Fossils are characteristic, but not yet named. The Atrypa —— of the same family as the Wilsoni is only found in this rock. This rock is met with in many places west of Tinker's falls, and is burnt for lime.

Black shale. This mass has very few fossils consisting of an Orthis, two Lingulas and a few other shells. It contains septaria.

Sherburne Flagstone. Found near Sherburne, Chenango county; the flags there being of the finest quality. The stones are of various grades of thickness alternating with greenish or olive coloured shale; Fucoides resembling the stems of plants are frequent in this rock, and also fragments of plants like the grasses. The flagstone mass extends from Cayuga lake through the district.

Ithaca group. Consisting of sandstone and shales, forming a thick mass, highly fossiliferous. Names not given to the fossils. The top part of this mass terminates in a series of thin sandstone flags with fucoides resembling those below the group, and which separates the succeeding group from the Ithaca.

Chemung group. This forms the narrows of the Chemung river, whence its name. Fossils abundant and characteristic.

Montrose sandstone, or sandstone of Oneonta; this is the last or upper rock of the third district; it consists of many veins of gray sandstone, and sometimes of red sandstone; when weathered it exhibits a peculiar structure, to all appearance owing to the manner in which it was deposited from water; in this rock we often find the remains of terrestrial plants, and sometimes they are thrown together in such numbers as to form a thin mass of coal, extending for a few feet, but only an inch or more in thickness; this rock is found in Otsego, Chenango and Broome counties; it covers the whole of the upper part of Susquehannah county, in Pennsylvania, and being there an abundant rock, and surrounding the town of Montrose, I have thought it well to apply its name to this rock.

We regret that we have not been able to obtain the names of more of the fossils which are found with the different rocks, those we have given being but a fraction of the whole number which they contain. One of the difficulties has been the want of a suitable place to unpack and arrange the specimens collected. Another from many of the fossils belonging to like rocks in Europe, to which we find not one but two, and even more names, in consequence of having been described by different persons of different countries, ignorant of the labors of each other.

It is in natural history as in all things else, that the discoverer is entitled to the benefit or advantage of his discovery, and the name which he affixes, is the received or accepted one, if it be appropriate ; that is, for example, should it be one for a species, it must not be given or used in a genus having a specific name of the same kind, for in that case, as confusion would result, and as it was his business to prevent, and he did not, his right, consequently, is lost. No one can doubt the sacredness of this right, but like every practical right or advantage, it often greatly tends to retard the progress of natural history, where concert of action, or knowledge of what each is doing, does not exist. It often happens that two or more may find the same object, and each may give to it a different name, and the difficulty is often still further increased by imperfect descriptions or worse drawings or plates. So incumbered is some parts of the Fossil department, by man's doings, that the labor of collecting the fossils, arranging them in the order in which they occur, giving to each a place, a name and a description, is small in comparison with determining what has been described, and what has not been described ; what name ought to be adopted, and what name ought not to be adopted.

Two reasons have urged me to make the above observations. The desire to make known the difficulties experienced in that part of our duty, connected with the fossil department, and to ascertain what means are best to put that department in the same state of advance, with the other departments.

Secondly, it is possible that the fossil department may seem to many, not only unimportant, but even trivial, and every way unconnected with the interests of man. Such, too, may not be aware that one of the great primary laws of creation is, that effects are but the consequences of causes, and that causes are but the antecedents of effects, proving that all that exists, has existed, and shall exist, are enchained together as parts of one great whole or system, the unravelling of which was given by its great Creator, to the only part of his creatures whom he declared to have formed in his image. Do we not every where invariably find that the power of man increases with every advance made towards unravelling this system; and ought we to neglect even the smallest part of it, since each part is a link of the chain which extends from the least created, to the highest created being.

Annexed is the report of Mr. Carr, assistant of this district, who was aided by Mr. Alfred I. Green, of Albany. These two gentlemen collected 28 boxes of specimens, making, with those collected by myself, 42 in all, for the last season.

LARDNER VANUXEM,
State Geologist.

Erratic blocks.—In the more northern parts of the counties of Cortland, Chenango and Otsego, masses of granite, some of which are of an enormous size, are seen along the road north of Truxton. These diminish in size and number as you go south. In the southern counties but very few were met with, and those small in size. So far as I have been able to determine by observation, in the southern counties particularly, as well as in the more northern, they are principally confined to the hills and rocks found in the vallies; their position is such as to favor the idea of their having rolled down from a higher level.

EZRA S. CAR, *Assistant.*

FOURTH ANNUAL REPORT

Of the Survey of the Fourth Geological District, by James Hall.

To His Excellency WILLIAM H. SEWARD,
Governor of the State of New-York.

SIR :

I have the honor to present the following report of the progress of the survey in the Fourth Geological District.

The counties which form the subject of the present report are Steuben, Allegany, Cattaraugus, Livingston and Genesee. Erie and Chautauque still remain to be examined, besides some portions of Cattaraugus, and a re-examination in other counties, which will be the subject of the next annual report.

The rocks which come within the limits of the counties examined the past season are the Onondaga saliferous group, including the plaster beds, the hydraulic limestone, the Onondaga and Seneca limestones: to the last succeeds the thick group of fossiliferous shales, known as the Marcellus shales, dark slaty shale, compact calcareous blue shale, olive shale, the shales of Ludlowville, the shale of Moscow and the upper black shale.*

With the absence of the Tully limestone, another stratum, though of inconsiderable thickness, becomes more fully developed. This is a crinoidal limestone, which always holds its place between the Moscow and Ludlowville shales, and extends throughout the fourth dis-

* The Tully limestone does not form a member of the series in the counties under consideration, though its place next above the Moscow shale is easily identified. From the absence of this limestone the upper black shale succeeds the Moscow shale.

trict. It may be termed crinoidal limestone, "*par excellence*," for the stems of encrini are often one or two feet in length, and many of them an inch in diameter. This mass has often been mistaken for the Tully limestone, in the western part of the State, and thus given rise to some confusion regarding the rocks above and below; but this difficulty I have been able to explain. All the cited localities of the Tully limestone, west of the Genesee river, exhibit only the crinoidal limestone, and instead of being between the Moscow and upper Black shale, is below the Moscow, and between it and the Ludlowville shale. This fact readily accounts for the highly fossiliferous shale above the supposed Tully limestone on Lake Erie.

The group mentioned in the report of last year as succeeding the upper black shale, and consisting of sandstone, shale, &c. developed on Cayuga and Seneca Lakes, and more particularly at Penn-Yan, becomes on the Genesee, a mass of green crumbling shale, of one hundred and ten feet thickness. It is exposed on the Cashaqua creek, above the junction of the Genesee Valley canal and the Dansville branch, and at the Shaker's Mill, on the same stream; hence the name of Cashaqua shale.

When first quarried this rock appears in thick masses, which, after a little weathering, falls into cubical or angular fragments. It contains, occasionally, thin concretionary layers of sandstone; these are not continuous, and may be no essential feature of the rock. The fossils are two or more species of Cyrtoceras, a large and beautiful species of Pterinea, Orthis, Posidonia, &c.

In the order of succession the Ithaca group follows the Cashaqua shale; but in the Genesee valley, and the counties examined this season, that group is entirely wanting, and will probably not be identified farther west than Seneca Lake. The Cashaqua shale is succeeded by a thick mass of shale and flagstones, or thin strata of sandstone, at intervals of a few feet, and often a few inches. The sandstone layers do not often exceed six or eight inches, and generally are not more than four inches in thickness. In the lower part of this mass the under surfaces of the sandstone are covered with large straight fucoides, and often present the appearance of having been deposited on a surface of shale, which had previously been smoothed and slightly scratched by running water, bearing light and fine materials in its current. Throughout the greater part of this group the lower surfaces of the sandstone strata are covered with short, rigid fucoides, of the size of a pipestem and larger. These are generally not more than four or five inches long, and so arranged as to present a rude imitation of Hebrew characters. Along the Genesee river this group commences a short distance above Mt. Morris, and continues to the lower falls at Portage. Along this whole distance it may be seen rising into perpendicular cliffs, of from one hundred to two hundred and fifty feet in height, and is only partially obscured in a few places by land slides. From being more extensively exposed along the Gardeau Reservation than in any other place I have seen, I give this the name Gardeau, or *Lower* Fucoidal Group, in contradistinction to one above, next to be described.

In following up the bed of the Genesee river from Mt. Morris to Portage, a place presenting an assemblage of magnificent scenery, scarcely surpassed, we find a decided change in the rocks, commencing with the platform or table rock of the Lower falls. The sandstones below are fine grained, and generally one side covered with a glazing of shale, while the table rock has no glazing of shale, is coarse grained, and presents a different aspect. The latter also abounds in a species of Fucoides, which for the most part is vertical, apparently having been growing on the muddy bottom, while the sand was deposited quietly around it, proving at least a nearly quiescent state of the waters of that period. This species of fucoid scarcely exceeds in size a common pipestem, apparently very flexible, though we rarely find them curved. Occasionally, indeed, they appear as if the tops had been bent downwards and fastened to the bottom, while the sand enveloped them in that position, the stem presenting in the stone a portion of the circumference of a circle or ellipse. This species of fucoid is found in nearly all the sandy strata from the Lower falls upward to the top of the group, the upper rock of which is a mass of sandstone, more than one hundred and fifty feet thick. It is in this mass of sandstone that the tunnel for the passage of the Genesee Valley canal is being excavated. At the northern extremity of the tunnel, where the rock is uncovered, the surface presents numerous round dots, which are the ends of the fucoides, and which, on breaking the rock, are found to proceed downwards, developing the stem for many inches. At this place also, the surface of the sandstone is much worn and scratched, as if by a powerful current, bearing heavy materials. This may be termed the Portage or *Upper Fucoidal Group*. There are no other rocks in the district better characterized by fossils than the two groups just described, and the fucoides are almost the only fossils contained in them.

The two groups just described, occupy a thickness of more than 1,000 feet, and are interposed between the Cashaqua shale and the Chemung group. Indeed, if we consider the Chemung group as commencing with the occurrence of its characteristic marine fossils, then several hundred feet more of rocks may be noticed as intervening between the upper Portage rock and that group.

The rock succeeding the upper Portage rock, consists of greenish olive sandy shale, or very shaly sandstone, the whole mass of a homogeneous appearance, and never slaty. The only fossil seen in this rock is a species of fucoides with a striated surface, and these are by no means numerous. This is succeeded by a dark, nearly black, sandy, highly micaceous shale, with septaria. It contains iron pyrites, and where exposed, is of an iron rust colour, externally. Some thin masses of gray sandstone are interstratified, which contain fossils referable to the Chemung group. The Chemung group occupies a large area in the southern counties, and with the exception of a small thickness above, forms the highest mass in these counties.

The Gardeau and Portage rocks are well entitled to the place of distinct groups, both from their general mineralogical character as well as from their fossils, both differing from rocks above and below. In the Portage group, a single specimen of Cyrtoceras has been found, and in the upper part of the Gardeau rock, a few of the fossils of the Cashaqua shale were found; but this must be considered accidental, and forms no character by which the rocks may be identified.

In some of the upper sandstone strata of the Gardeau group, there is an apparent tendency to concretion, though the masses are distinctly laminated. The upper surface of the stratum appears as if it had been compressed while soft, and exhibits numerous irregular concave depressions, the stratum thinner at this point, and the laminæ apparently more closely compressed. There occur in the shale of this part of the group, nodular or concretionary spherical masses, of from six to twelve inches in diameter; these masses usually consist of a solid nucleus, and at the outside to the depth of two or three inches, radiating outwards; when broken, these radiating portions present somewhat the appearance of the lignilites or magnesian striations in the hydraulic limestone. Some similar cause may have produced these, but it cannot be entirely the same. The same substance sometimes takes the form of thin interrupted courses in the shale, and the concretions are generally much flattened.

These groups are found in greater or less perfection throughout the fourth district; their maximum thickness is probably in the Genesee valley, from which place they gradually diminish in thickness east and west.

At the commencement of my labors the past season, my first object was to ascertain, if possible, a definite termination to the upper groups noticed in the report of last year, and also, something which would show more clearly and conclusively the connexion of these groups with the coal measures, as well as the characteristic and decided separation of the two. In following up the Tioga river beyond the limits of the State of New-York, I found the Chemung group succeeded by a red sandstone, which for the most part would pass for a rock destitute of fossils, but which however contains some peculiar remains which will be noticed directly. The commencement of this rock, and the upper limit of the group below, is well exhibited near Tioga, Pa. and also near Covington. Above the red sandstone we have greenish and grey sandstones which are succeeded by the rocks containing coal.

To Mr. Taylor is due the credit of pointing out the existence of this rock, and its analogy to the old redsandstone of Europe. This analogy is farther confirmed by the fossil remains of the rock, which I believe have never before been noticed. In tracing this rock westward we find it bordering the southern limits of the State and in Alleghany co. extending north of the line. It apparently thins out in this direction as the only representative we find of it on the Genesee river is a mass of about six inches thickness, containing a large proportion of iron in its composition which gives it more the appearance of an iron ore than a sandstone.

In several places where this rock is exposed along the Tioga river, it contains fragments of bones, and scales of a fish, which prove on comparison to belong to the Holoptychus nobilissimus, of Agassiz, and which is a characteristic fossil of the Old Redsandstone, of England. It contains also the remains of another fish, the scales of which are larger than those of the Holoptychus. These scales in form resemble those of the Lepidotus. The length of the scale is two inches, and the breadth exceeds an inch and a half. The broader and greater part of the scale is covered with a substance resembling shagreen, while the narrower portion is slightly punctured as if small spines or bristles grew on it. The fin is about ten inches long and imperfect. It probably belongs to an undescribed genus of sauroid fishes.

The thickness of this rock on the Tioga exceeds 400 feet. Owing to an uplift producing an anticlinal axis near Covington, the thickness of the rocks between the coal measures of Blossburgh and the New-York line, has been over rated.

Passing westward the redsandstone is not equally a guide to the proximity of the carboniferous strata, as just noticed, it thins out rapidly in this direction, and I have not yet identified it beyond the Genesee. At this place, near the mouth of Dyke creek, at Wellsville, it contains fragments of bones resembling those at Tioga. They appear as if transported with the materials of the rock, which consists of sand or fine pebbles, bearing evident marks of the wearing action of water.

This rock forms the limit between the Silurean and Carboniferous systems and may be regarded as one of the most important of the whole series. All the coal deposits of any importance will be found above this rock, and from what we now know, none of them extend within the limits of our State in the Fourth District. When this rock shall have been farther examined, and its characters and associations better defined, it will doubtless prove to hold the same relations to all our coal fields, as its equivalent does to the same rocks in England.

Since the publication of Mr. Murchison's work, we have been enabled to establish with great certainty, the analogy of our rocks with those of the Silurean system, as developed in England and Wales. In this country, however, the greater undisturbed range, and apparently better developement of particular members, with more numerous species of organic remains, enables us to limit our subdivisions within narrower bounds, and thus offer greater facility for the study of particular groups. Since, then, all obscurity in this system of rocks is removed, we may go on with more confidence and satisfaction in our examinations, every observation adding to our convictions of the perfection of order of arrangement, and to our admiration of the grandeur and beauty of the whole. The publication of Mr. Lyell's Principles of Geology was termed an era in the science, and the same may be said of Mr. Murchison's work; it forms an era and an important one in the development of the older fossiliferous rocks which have been so long enveloped in obscurity. It offers inducements to the study of the same which have never before been presented; since, particularly in this part of our country the rocks of the Silurean System are better developed than any other; while the means of studying them with guides have been entirely wanting. Thus the student, after weary months of labor, abandons the subject in despair, being unable to identify the rocks or fossils with any system heretofore published, and having made too little progress to systematize the whole, distrusts what he does know, because it seems inapplicable to what he supposes the same rocks or their equivalents in another country.

The descriptions of the counties are given in the order in which they were examined, it being more convenient to describe them separately than together, besides the facility for reference which it affords.

STEUBEN.

The topographical character of this county I have heretofore had occasion to notice. On the level of the higher grounds, the surface is only moderately uneven, and except the ravines and water channels, presents a gently undulating or rolling appearance, being by no means the rough and broken country which has been represented or might be inferred from travelling along the main roads in the valleys, with the steep escarpments of the hills rising on either side.

Nearly all the ravines and banks of streams in the northern part of the county exhibit the upper and lower Fucoidal groups, and they have already been described, as seen at Hammondsport and at Reading, in the eastern part of the county, also at Conhocton and Dansville. The middle and south are occupied by the Chemung group, which extends to the southeastern part, and thence into Pennsylvania, while in the more elevated lands of the west, this group is nearly or entirely limited within the county, and is succeeded by reddish or chocolate colored shales, which approach the Old Red Sandstone. These shales in some places contain a few fossils, which may possibly identify them as belonging to the Old Red system.

In Conhocton, a mile south of Bloodscorner, rocks appear in the point of the hill, which divides the valleys towards Liberty and Dansville; at this place they are sandstone and hard sandy shale, which crumbles but is not slaty. The layers of sandstone are used for purposes of building. The fossils found were a few imperfect shells of Leptæna and crinoidal joints. From this place, south to near Liberty

Corners, fragments of similar rocks are scattered over the side of the hill forming the western slope of the valley. These probably belong to the lower portions of the Chemung group, and succeed the Fucoidal masses of the north. One mile north of Liberty-Corners, on the hill east of the valley and river, appear many fragments and large masses of a highly calcareous rock almost entirely composed of fossil shells of Leptæna, Orthis, and Delthyris. This is used for a fire stone, for which by its crystalline and seamy structure it is well adapted. I have not been able to find the rock in place, but the position of the numerous fragments gives evidence that it is not far distant.

From Liberty Corners to Bath, along the valley of the Conhocton, few rocks appear in place; the hill sides, though often abrupt, are covered with soil, and in many places strewed with flat and angular fragments of rock, evidently from a mass not far beneath. Nearly all the declivities towards the deep valleys are similarly covered, like the talus of a cliff on a lake shore; and probably the cause was the same. The water when at nearly or quite the elevation of the tops of the present hills would wear away their rocks, fragments of which falling down without being subject to erosion by transport, would cover the declivity. A section of almost any of our lakes, with their banks, will present analogous appearances, except that the water has remained longer and worn the fragments more in the present than in the ancient lakes.

The rocks of Bath and its vicinity and thence to Painted Post, have been described in a previous Report. During the past season, they have been more exposed in quarrying for the thin courses of sandstone which are intercalated between thick masses of shale. They all belong to the Chemung group; those south of Bath consisting of greenish blue sandstone, with grey and greenish sandstone below, contain the characteristic fossils of that group. On the Tioga, above Painted Post, more minute examinations were made at the rail road cutting; and a section exhibiting in detail the changes and varieties of the rocks exposed. Four miles south of that village, a greenish and brownish shale with brown sandstone is succeeded by concretionary strata. This mass is entirely destitute of fossils, not even a trace of such being found; while manganese infiltrations are abundant, and almost every fragment of shale exhibits beautiful forms, resembling delicate vegetable structures. For several miles south of Painted Post, except in the cut mentioned, no rocks in place are visible, though the hill side is covered with fragments which denote the character of the rocks beneath.

The high banks on either side of the river valley expose the outcropping edges of the strata, and numerous small quarries are opened for the extraction of the thin layers of sandstone every where interstratified with the shale. The hills are capped by thin layers of sandstone, with less shale than below, reddish or brownish in color, with abundance of scales of mica. These upper portions, so far as observed, are less distinctly characterized by fossils.

The rocks, at the south line of the State and near the river level, consist of hard thick strata of grey sandstone, a part containing abundance of Leptæna and Delthyris, and succeeded by a thick concretionary mass. The grey sandstone forms a fine material for building, and more durable than any other in this part of the country. Farther west and a little south of the county line, a thick mass of concretionary sandstone, with regular strata of grey sandstone is seen in the north bank of the Cowanisque creek.

In order to give any definite information regarding the connexion of these rocks with those of known character above, I have found it necessary to extend my examinations as far as Tioga, Pa. seven or eight miles south of the State line. At this place the upper member of the fossiliferous group of New-York passes beneath the Old Red Sandstone, dipping south at an angle of from 6° to 8°. The Old Red Sandstone, which I shall have occasion to refer to in the description of other counties, is at this place about 400 feet thick, brick red in color, with beds of softer or shaly rock of the same color, and contains fucoids and bones of fishes.

The Old Red Sandstone approaches the south line of the county towards its western limits; and may possibly extend within on some of the highest hills.

In a section made from Dansville south through the valley to the Canisteo, and thence along Bennett's and Troup's creek to the south line of the State, nearly the same kind of rocks prevail in the same order of succession; also in the valley from Patchins to Loon lake and Howard.

The valley of Loon lake has already been mentioned as the continuation of the Hemlock lake and Springwater valleys. In the neighborhood of the lake, large accumulations of alluvium rise in rounded hills 50 or 60 feet above the general level, and skirt the valley on either side; while beyond, the hills containing the rocks rise to a much greater elevation. The commencement of the fossiliferous strata of the Chemung group is at a little distance north of Loon lake. Few sections are exposed, and our observations are limited to the loose masses on the surface, and a few shallow ravines where five or six feet of rock are seen.*

Several places on Neil's creek, south of Loon lake, exhibit good sections of rocks consisting of grey siliceous sandstone with Leptæna, Delthyris, &c. and alternating with beds of shale. These points are near where the creek turns from a southern to an eastern course; again two miles further east, and at Rice's Cottage tavern, similar masses of sandstone, both siliceous and shaly, are found upon the surface from near the mouth of Neil's creek, to Howard. These rocks are doubtless the same strata which occupy the hill tops about Loon lake; though at this place 200 feet higher. The exposed edges of the strata split into thin layers, but if penetrated beyond the reach of weathering, it would probably afford good building stone.

The country known as Howard Flats, is formed of alluvial hills and ridges but little elevated above the general level; and being a high and not well defined valley, presenting outlets in various directions. I could not ascertain the depth of the alluvium, but the deepest wells do not reach its termination; and the absence of an impervious stratum in the gravel renders it often difficult to obtain water in sufficient quantities.

In passing from Howard to the Canisteo valley, at Hornellsville, we cross the highest hills in this part of the county. The rocks consist of portions of the last group; shaly sandstone, shale and siliceous sandstone, all containing fossils, are found along the whole distance.

The northern alluvium, confined to lower levels, is not seen along the road from Howard to Canisteo; and the soil is a clayey gravel formed from the substrata and not highly water worn. In descending into the valley of the Canisteo, we again come upon the northern alluvium, which is the soil of the valley, and covers the lower slope of the hills.

* Loon lake is situated in a high valley; the hills on the east and west rise to a considerable height, but on the north and south there is almost a continuous level, forming an extensive swamp; the lake has no immediate outlet, but its waters supply Neil's creek which rises in the swamp, half a mile south. From the north end of the lake an artificial outlet supplies water for mills, and is continued as far as Patchins.

From the village of Dansville, south, we find the same succession of rocks. The lower Fucoidal group is well exposed along the Canaseraga creek for six miles south of Dansville. The sandstone layers containing the fucoids are hard and furnish excellent flagging stones. South and above the latter, we find the upper Fucoidal group; visible at intervals along the road to Arkport; and at Whitney's falls, just within the line of Alleghany county, a portion of this group, more than 100 feet thick may be seen, with the peculiar fucoid penetrating the strata vertically.

One mile west of Arkport, where the Canisteo river comes into the valley from the west, appears the first evidence of a change from the Fucoidal groups below, to the Chemung group above. This is, by the presence of a small coralline (Aulopora ?) which is found abundantly in the Chemung group further east. In following the valley of Canisteo from this point, the descent nearly corresponds with the dip of the strata; consequently we observe few changes, and none but the lower rocks of the Chemung group are visible before coming to the mouth of Bennett's creek. Along this creek, sections of rocks appear at intervals, and consist, as the others, of sandstone and shale, each in turn predominating, though more generally the shale. Five miles from the Canisteo, on Bennett's creek, there is a thick mass of sandstone, overlaid by calcareous sandstone, containing abundance of fossils of Leptæna and Delthyris. The stone is very firm and durable and easily quarried, in blocks of necessary size for bnilding; and the part containing fossils is much used as a fire stone, in the backs and sides of fireplaces, ovens, &c.

Nine miles from the Canisteo, at La Grange, in the town of Greenwood, the rocks are seen both along Bennett's and Rigg's creeks; and at the point of land near their junction are several strata of sandstone, proper for grindstones. The whole thickness is from eight to ten feet, and the layers from two to eight inches. Seven hundred dollars worth of grindstones have been obtained from this quarry in one year, and only fifty feet of the courses opened; and should the demand warrant it, the supply might be increased ten fold.* In ascending Rigg's creek, these strata disappear beneath the surface, and are succeeded by greenish shale, with thin layers of silico-calcareous rock with fossils. This shale contains iron pyrites and decomposes rapidly. The grindstone strata are visible on

* This quarry belongs to Mr. Benjamin F. Brundage, to whose kindness and hospitality I am indebted for facilities in examining the rocks of this vicinity.

the west bank of Bennett's creek, and extends a mile north to Rock creek, and were also traced up the latter a mile above the junction. Its outcropping edges are found in the hills farther north; but the better situations for quarrying are along the banks of the small streams. The character of the mass is, however, variable, and its fitness for grindstones cannot, in all places, be relied on. At the mouth of Rock creek, it is much harder than at the quarry on Rigg's creek.

The exposed portions of the strata are greyish brown, slightly stained with iron, rather porous and soft, and containing scales of mica. The rock above and below the grindstone portions is green shale; this below abounds in some places with fossils, as at Rock creek; Delthyris, Leptæna, Pterinea, Orthis, Lingula and Orbicula are here found. Above, the green shale, fifty feet thick, is not fossiliferous. It contains some thin layers of sandstone, and is succeeded by a stratum of sandstone about ten feet thick. This latter contains fossils, while the grindstone mass embraces few or none. The upper sandstone is also more coarse and hard than that below, and well fitted for building, underpinning and ordinary fire stone. This is again succeeded by greenish shale. This point is between 400 and 500 feet above the Canisteo, and 1,500 feet above tide water.

The source of Bennett's creek is about 800 feet above the Canisteo, and the surrounding hills are several hundred feet higher. On the land of Mr. Davis at LaGrange, a salt spring rises in the green shale; the water is turbid and emits bubbles of hydrogen gas. Several years since salt was made at this place, and previously by the Indians. There are, however, no inducements for digging, for so far as we know, no salt springs of importance are found in this rock, and it is probably only such a one as might occur in any marine formation.

While in this neighborhood, I heard of a vein of lead ore, from which the Indians formerly obtained a supply, and lately re-discovered by one of the inhabitants. The locality being kept a secret, I obtained of the person who was said to have discovered it, a piece of the ore, which proved to be a soft talcose rock, the talc in shining scales. This of course could have been obtained only from a boulder; but either from ignorance or intention to deceive, it was represented as coming from the bed. There are many respectable and intelligent persons in this and adjoining counties, who fully believe in the existence of veins of lead ore, from the prevalent tradition that the Indians formerly obtained it in the vicinity. This, like many others of the kind, is unfounded; there being every reasonable proof that no lead ore exists, except it be in minute particles, scattered through a great mass of rock. The assertion, also, that the metal was cut out with an axe, proves the story to be a fabrication, as the common ore of lead is brittle and cannot be cut in this manner.

Four or five miles south of the village of Lagrange, a sandstone is quarried on the land of Mr. Marshall, and used for hearth stones, tombstones, &c. Grindstones are obtained in Canisteo, on the land of Mr. Carter; in Woodhull, on the land of William Stroud, Esq. and elsewhere; in Jasper, on the land of Col. Towsley. These quarries supply all the surrounding country. They are of great economical importance; and the occurrence of similar rock in so many different places renders it probable that the mass is continuous.

From Lagrange I proceeded southward and passed over to the head waters of Troup's creek. In the bed and banks of this stream about three miles from the Pa. line, sandstone and green shale appear; the sandstone contains a mass of one foot thick, composed of shells of Delthyris; the shale contains shells, crinoidal joints and corallines. Farther south on the stream, the rocks are principally reddish or chocolate colored shales and sandstones, with a few fossils. This mass forms the highest rock in this part of the country.

The dip of all the rocks is to the south, at a mean of less than one degree. They are all highly bituminous, and the surfaces of many of the springs are covered with petroleum.

ALLEGANY.

The general elevation of this county is higher than Steuben and Chemung, while the rocks are the same; a difference produced both by a greater thickness of the mass, and a dip to the east or southeast.

The northern portions of the county are occupied by the lower and upper Fucoidal groups, or the Gardeau and Portage rocks; the lower of the two is however rarely visible, except in deep ravines or water courses. The upper portions of the Portage rocks form the cascades and deep escarpments along the line of their northern outcrop; in many places extending beyond the limits of the county into Livingston, and Genesee. At the falls on the Canaseraga, in the town of Burns, the Portage rocks are much exposed; but it is at Portage, as has been before described, that these rocks are fully developed, and may be seen in perpendicular cliffs, from 200 to 350 feet high. The same rocks are traced along the Genesee valley for several miles, when they are succeeded by the olive shaly sandstone and black micaceous shale, which occupy a part of the towns of Eagle, Pike, Centreville, Burns and Portage. The thin layers of sandstone interstratified with the black shale, and also those usually succeeding it, are quarried on the Wiscoy a mile west of Pike Centre, near Pike Hollow, and at many other places along the outcrop and in the ravines and valley sides.

The upper part of the Portage group consists of a mass of slightly argillaceous sandstone, compact and fined grained, from 150 to 200 feet thick; in some places containing pyrites which stains the rock an iron rust color. This sandstone is quarried in blocks from one to three feet thick, and of any required size; it breaks easily when first quarried, but becomes very firm when exposed to the vicissitudes of climate.

The Tunnel, at Portage, is excavated in this rock, and the bank of the river above exposes it for 150 feet, where it is cut for the passage of the canal; and again it appears at the west end of the bridge at Portageville. At these places large quantities of the rock are quarried and dressed in blocks of various sizes for use on the locks, aqueducts, &c. of the Genesee Valley canal. At two or three other places within three miles south from Portage, the same rock is quarried in the shallow ravines along the valley of the Genesee river.

The requisition for stone along the line of the Genesee Valley canal has greatly increased the value of good quarries, and even indifferent ones yield a large profit.

Succeeding the black micaceous shale, are the sandstones and shales constituting the Chemung group, which is every where visible in the ravines and banks of streams. Its northern limit extends through the southern part of the towns of Centreville, Hume, Grove and Burns, and its characters are better developed in the next range of towns. In this county, more particularly along the Genesee river and west, the group differs in lithological characters, and consequently in some degree in fossils, from the same rocks in Steuben and Chemung; the latter containing the more sandstone, and the shale having an admixture of siliceous matter, that renders the whole harsh to the touch. In the ravines along the Genesee river, a much larger portion is pure aluminous shale, of a deep green or bluish green color; in this, at intervals, there are courses of nearly pure sandstone; sometimes a single layer of a few inches, at other times several, forming a mass of four to ten feet thick.

A very good exhibition of this group, and better than is elsewhere seen, in Allegany county, is on the Caneadea, from Rushford, near McCall's mills to the mouth of the creek. The rocks consist of numerous alternations of shale and sandstone, the latter often in layers of two or three inches, and other larger ones, which are quarried for lock-stones, building stones, and grindstones.

The following section commences near McCall's mills and terminates near the level of the Genesee river. The numbering is from the lowest to the highest rock :

	Feet.
17. Hard siliceous sandstone, in thin courses, often having lines of irregular deposition and slightly conglomerated,....	20
16. Bluish green shale, with thin layers of Fucoidal sandstone,	15
15. Green micaceous shale,..................................	15
14. Thin layers of sandstone separated by shale,............	2
13. Shale like No. 15,......................................	15
12. Shale, with six thin layers of sandstone, the lower layer of eight inches, being irregularly deposited,............	14
11. Green sandy micaceous shale,........................	9½
10. Sandstone, the surface corrugated as if water had evaporated from it while yet soft. (A few rods east of this point the layer thins to 4 inches.).........................	3
9. Greenish shale like No. 11,..........................	10
8. Sandstone quarry, grindstone grit. (Farther west this mass consists of two layers of sandstone, each one foot thick, with four feet of shale.)........................	8
7. Greenish shale,..	12 to 15
6. Concretionary sandstone, the upper portions sometimes regularly stratified, (variable in thickness,)............	8
5. Greenish and somewhat micaceous shale. The upper 20 feet is traversed by irregular, vertical and inclined seams, distinct from joints, which cause it to split in those directions, presenting a surface as if chopped with an axe. A striated fucoid is common to this part of the mass. The	
Carried forward,..........................	313

Brought forward,...................................	
lower portion contains some fossil shells, the first seen in the section, the upper strata being destitute of any fossils except fucoides,...................................	100
4. Sandstone in two courses, variable in thickness, quarried at a bridge above Bannister's grindstone quarry, and used for aqueduct stones,...................................	3
3. Frequent alternations of thin layers of sandstone with green shale, fossiliferous,...................................	40
2. Green shale, with numerous fossils, shells, and fucoides,...	70
1. A mass consisting principally of green shale, with occasional very thin layers of sandstone. Few fossils in the lower part of the bed. *Not accurately measured*, probably more than	100
	447½

The fossils of the green shale are a few thin shelled Pterinea, Orthis and Delthyris, and a striated species of fucoid is constantly present, both in the shale and the layers of sandstone. In the upper part of this section, there is another species of fucoid, vertical to the strata, presenting in the numerous and closely arranged stems, a slight resemblance to a syringapora.

The surface of No. 10 has the appearance of a muddy sand, after the evaporation of a shallow pool of water; the surface presenting little irregular depressions, divided by angular ridges. I have also noticed a similar appearance, though not to so great extent, in some of the other sandstones.

Nearly all the sandstones of the above section, when of sufficient thickness, are fit for building stone. The upper stratum, No. 17, is the most purely siliceous, and consequently the most durable. No. 4 consists of two courses, one of them two feet thick, easily quarried and dressed; and used in large quantities on the canal. No. 8 contains several courses of variable thickness; it affords a good material for grindstones, for which it is quarried on the land of Mr. Bannister. I did not learn the amount annually taken from this quarry, but judging from the numerous and distant points where the "Rushford grindstones" are sold, it is greater than any other in the district. The stones are drawn to a mill on the stream near the quarry, and after being roughly rounded are placed in a lathe and turned smooth.

In the western part of Rushford, the sandstone, No. 1, of the section, is extensively used for cellars, walls and foundations. The stone is here taken from the loose masses that lie on the surface, particularly on the northern slopes of the hills. Portions of these masses present a slightly conglomerated appearance; the pebbles generally do not exceed the size of a pea, and many times the mass consists of rounded grains of sand not larger than a mustard seed.

Rocks similar to the last, but none of the same strata, are seen in Black creek, Crawford's creek and White creek. In the banks of Black creek, at Rockville, some thick masses of sandstone alternate with green shale, which is slightly calcareous and contains abundance of fossils. The most numerous of these is of a mytiloid shape. Two of the sandstone masses are about six feet thick each, and divided into courses of from two to three feet. They are quarried, for use on the canal, under the direction of Judge Chamberlayne and Mr. Dimock. This sandstone contains a large proportion of moisture, and requires to be quarried and dried before exposed to frost, otherwise it is liable to crack.

Similar sandstone is quarried half a mile southwest, on the line of the canal; it contains fossils of Orthis and Delthyris; and a mile and a half south, and 60 feet higher than the last, a sandstone is exposed on the bank of a small stream. The layers are thin, but extremely siliceous and durable.

The rocks at Rockville are all highly bituminous, the sandstone so much so that it scents the clothes of the workmen; and the water of the springs, though clear, has the taste of bitumen.

Southeast of Rockville, on White creek, we find a greenish shale, with a concretionary sandstone, which in some places becomes a conglomerate in the upper part of the layers. When not concretionary it is fit for grindstones. Sandstone appears in nearly all the ravines in this neighborhood.

The bed of the Genesee river, at the Transit bridge, is in a mass of very fossiliferous sandstone, some portions of which are slightly conglomerated.

At Hull's mills, near Angelica, the rocks are exposed in the bank of the creek, for 50 feet or more in height. They consist principally of shale, which contains the fossils common to the Chemung group, with others, the large pecten-like Avicula. The lower portion of the mass is a hard grey sandstone, containing, in some parts, great numbers of fossils, among which Delthyris and Leptæna are most abundant. A species of Orbicula is also very numerous, and a species of Pterinea? noticed only at the transit bridge and at this place. This sandstone has been quarried for purposes of building; it is durable and presents a very good appearance.

About a mile and a half south of Angelica, sandstone has been quarried, though the greater portion of the rock exposed is shale. The sandstone has been used in the construction of a mill near the quarry; portions are at first extremely friable and scarcely cohere. Like most sandstones of this region, it contains a large proportion of moisture.

Van Campen's creek, near Hobbieville, exhibits shale and sandstone strata, somewhat similar to those at Angelica, but less abounding in fossils. The only peculiar one at this place, is a large Orbicula; the others are of the usual kinds found in all the rocks of this region. The sandstone along this creek was quarried by Judge Church, and used in building more than thirty years since; it still remains firm, though somewhat iron stained from the decomposition of pyrites.*

At Philipsburgh, two and a half miles south of Hobbieville, we find a change in the rocks, which is indicated by their fossils more than their lithological character. Green shale is the predominating portion of the mass, and with some, thin strata of sandstone occupies the bed of the river for an eighth of a mile, and together with the vertical bank, presents a thickness of 40 feet or more. The strata dip at a little more than 60 feet in the mile, or nearly one degree. The upper strata of the mass are sandstone, the lower part of which is concretionary. The lower half of the whole mass contains a great number of fossils, many of them characteristic of the Chemung group, and several others which have not been collected elsewhere. The sandstone containing fossils is hard and durable; this, as well as some of the softer portions, has been used in constructing the dam at this place.

Above Philipsburgh, on the Genesee, rocks similar in character occur in several places in the bed and bank of the river. At Vandermark's

* My acknowledgements are due to Judge Church, as well for his hospitable entertainment as for many valuable facts regarding the geology and agriculture of Allegany county.

Creek, five miles from Philipsburgh, we find the green shale, not so highly fossiliferous, and with it thin courses of coarse-grained sandstone, containing abundance of a large species of Delthyris. This fossil occurs in a rock of similar texture in many places of the same elevation, and may be found to constitute a definite point, or to mark the termination of some group; certain it is that along this line we find scarcely any fossiliferous rocks above it. This sandstone, and the contained fossils, very much resembles that near the south line of the State, on the Tioga river, and again on Troup's creek, in Steuben; and loose masses are found at intervals along nearly the same line from the Genesee river to the eastern limit of the District. In all cases where we approach the State line south, there is greater difficulty in ascertaining the connexions between rocks. The ravines and water courses are not so deep, and the natural sections are not so well exposed.

The next place south of Vandermark's creek, where rocks are seen, is on Dike creek, near Wellsville, at an elevation of 60 or 70 feet above the Genesee, and between 1500 and 1600 feet above tide water.

The rock at this place consists principally of grey sandstone, embracing a brick red or brownish mass six or eight inches thick. This is composed of sand, or rounded particles of quartz, with much argillaceous matter, splitting into laminæ, half an inch or an inch in thickness, and is so highly impregnated with iron that it stains the hands nearly as much as the Oolitic ore of Wayne county, but is not, like that, unctious to the touch. It is considered by the inhabitants as a stratum of iron ore; but its specific gravity proves the proportion of metal to be too small ever to repay working. Single joints of crinoidea occur in this and the grey rock below. On close inspection, the materials of this mass appear to have been subjected to much wearing action, and many specimens exhibited numerous fragments of bones, apparently belonging to fish, and similar to those found in the red sandstone on the Tioga.*

This rock, examined here and several miles south, is succeeded by a mass consisting of greenish grey sandstone, often appearing as if deposited from opposing currents, and in all respects resembling that

*See page 393.

succeeding the red sandstone on the Tioga. Should these facts be established, it will prove the thin red rock to be the continuation or equivalent of that great mass of the old red sandstone.

In examinations further south, I have not been able to discover the red sandstone, neither along the Allegany and its tributaries, and I am informed by Mr. Horsford that he saw nothing of it in his journey down that river as far as Warren, Pa. which brings us to the northern limits of the coal.

From the fact that this red sandstone does not appear to have been recognized as a thick mass east of the Tioga, it affords us some valuable facts regarding the manner of deposition in many of our rock masses, being in deep basins of greater or less extent, some rising rapidly from the centre, and causing the abrupt thinning out of the deposits; others, from their more gentle ascent, admitting the gradual thinning of the strata, and their continuance over a greater area. The condition of the ancient surface, together with the different sources of materials deposited, have caused many difficulties in identifying strata at distant points. The latter is a subject of great interest; for we can readily perceive that a mass of lime or sand-rock, although now spread over a great extent, must have had an origin elsewhere than at the point where we may chance to examine it; and we reasonably infer that the thicker portions of the mass are nearer the source of the material, from whence it flowed over the bottom of the ancient ocean in the state of soft mud, its direction being determined by a current, or otherwise, until it thinned out at a distance from its origin, in proportion to the quantity of material supplied.

Whenever it happened that sand and mud, or clay in a state of extreme comminution, were furnished from the same source, the sand would be first deposited, and the clay last; while particles of carbonate of lime might be intermediate. In the strata of western New-York, materials of the same nature appear to have come from different directions; thus we find the Lockport limestone thinning out in its eastern extension, and again the Tully limestone thickest at the east and growing thin towards the west.

The source of sand appears to have been at the east; for all the strata of the upper rocks grow more sandy in that direction, and more argillaceous in going west: either clay was furnished from the west, or more probably from its facility of transportation it was carried beyond the sand, its origin being the same. The Oriskany sandstone thins to a few inches as we proceed westward. The rock described in the present report as the Cashaqua shale, containing but a few concretionary masses of argillaceous sandstone, is on the eastern shore of Cayuga lake represented by a mass, the greater part of which is sandstone; also in Seneca county it is mostly sandstone.*

The changes in character of strata, and their probable sources, will be treated of more fully hereafter. Mr. Vanuxem has detected rocks of volcanic origin in the saliferous group at Syracuse; and Mr. Rafinesque some time since expressed an opinion that all the salt springs proceed from volcanic causes or from a "*salz*." It may be hereafter demonstrated that the thick mass of calcareous marls, &c. of the Onondaga saliferous group proceeded from a mud volcano, and were spread over the surface much in the same manner that chalk in Europe is supposed to have done. There are also many reasons for supposing the Lockport limestone to have had the same origin; or more probably to have been affected after deposition, by similar causes.

To return from this digression. The strata above the red rocks at Wellsville, those on the Shenunda creek and towards the Pennsylvania line, contain no fossils. The mass greatly resembles that above the red sandstone elsewhere; and the great elevation of the points examined, considered with the difference in altitude between this and the Tioga, may lead us to expect these rocks in place as far north.

Conglomerate.—Occasional fragments and boulders of this rock are found in the elevated lands of Steuben, and the eastern part of Allegany.

About three or four miles south of Wellsville, the side hill and valley east of the Genesee are strewed with masses of the same, consisting of small and large pebbles of white quartz with coarse sand. From the great numbers of fragments, we would infer the rock to be in place near; and in a former section this position was given to the conglomerate: though from careful investigation I am not able to find it in this vicinity, the position is undoubtedly correct; for it appears on the hills west of the Genesee, in Scio, and several other points. Its thickness,

* This mass holds the same position as the Sherburne Flagstones of the third district.

however, is not so great as, from its extending over so great a surface, I had heretofore supposed.

In Scio it is found on the high grounds near the sources of some small streams flowing into the Allegany and Genesee. For the most part the rock appears in large detached masses, being divided by the joints into rhombic blocks; one of these measured 44 by 60 feet, and 15 feet in thickness. Approaching the rock in place the masses are larger and closer together, being but slightly moved out of place, and the spaces between them diminishing from a distance of five or six feet to fissures of a few inches. The sides of the blocks appear water-worn, or deeply weathered; and the upper surfaces slope in the direction of the hill, probably from the removal of the rock beneath. The mass seems to have contracted on dessication, and the joints, since enlarged by the percolation of water from above, form within the rock passages of greater or less extent, communicating with each other. The peculiar features in other localities will hereafter be mentioned.

This mass is composed of pebbles of crystalline quartz, white or rose colored, from one to two inches in diameter, and generally elongated or egg-shaped. In the early settlement of the country this rock was used for mill stones; but in much the greater part the pebbles are too large and it is too friable for this purpose; its use is now superseded.*

Previous to visiting this place I was informed that a bed of coal two feet thick had been found beneath this conglomerate; it was represented as having been used in the blacksmiths' forges. On further inquiry I could not learn that such a bed was known; the only person who could give any information of its existence had seen small pieces not more than one-half inch in diameter.

This rock is the only one seen between Wellsville on the Genesee and Bolivar, a country which is entirely a wilderness.

In the town of Genesee, about three miles north of the Pa. line, and near the centre of that town, the conglomerate, essentially the same as at Scio, occurs on the highest hills.

* The conglomerate is an excellent material for roads; and if thrown down in moderately large pieces, would soon, from its friable nature, be broken down, forming a fine gravelly surface superior to the McAdam roads.

On the little Genesee, a few rods north of the Pa. line, sandstone and shale with fossils appear in place; this is at nearly the level of the stream, 200 or 300 feet below the conglomerate. I saw, also some detached masses, resembling the red rock at Wellsville, and a reddish soil which may be caused by the outcrop and disintegration of the same stratum. Along the southern line of the county the rocks are interrupted by the valley of the Oswaya creek; and thus we have no means of tracing their continuation or connexion with the formations of Pennsylvania.

The valleys being high, the elevation of the hills above them is less than in the northern part of the county; the slopes are less abrupt, and deep ravines fewer; consequently we have not the same facilities for examination. In this region of country the hills have been fashioned by the water-courses, ancient and modern; in primitive countries the position of the mountains has given direction to the streams.

At several places in the western part of this county, as at Cuba, we find rocks of shale and sandstone similar to those already described; and quarries are opened to some extent.* About 50 or 60 feet of rocks of shale and sandstone, some of the latter concretionary, are seen in the banks of a small stream at Bissell's quarry, a mile southeast of the village. The harder portions are used for cellars, &c. At another quarry south of the village, on the land of Ira Weaver, some of the sandstone has been used for grindstones; the rocks contain large numbers of Leptæna and Delthyris.

All the rocks in this vicinity are highly bituminous; and the last named quarry is not more than half a mile from the famed oil spring, which will be mentioned in another place.

West of the village of Cuba is another more extensive quarry on the land of Judge Chamberlayne; this affords sandstone in thicker masses, and better fitted for building than the others.

Between Cuba and Friendship rocks scarcely appear in place, though they are not far beneath the surface. In most of the high grounds of the southern counties the soil is shallow; the substratum being but a few feet beneath it.

* Mr. Talcott, resident engineer, politely accompanied me to the principal quarries in this vicinity.

CATTARAUGUS.

The general surface of Cattaraugus county maintains about the same elevation as Allegany; the Genesee in the former, and the Allegany river in the latter, also take their rise in about the same altitude, and continue their course with nearly the same descent, though flowing in nearly opposite directions. Although this county is crossed by numerous streams of considerable size, still there are few situations where a good view of the rocks can be obtained. The valley of Ischua creek, which extends nearly across the county from north to south on its eastern side, exposes the strata only in a few places. The Cattaraugus creek pursues its course the whole distance in the outcrop of the strata, consequently developing but one or two rocks.

The rocks of this county are a continuation of the same groups noticed in Allegany county. The Gardeau and Portage groups form the northern boundary of the county, and are exposed along the Cattaraugus creek. These are succeeded by the same shales and sandstones as before noticed in Allegany. There appears, however, a general diminution in thickness of all the masses to the westward; and many which in Allegany are of great thickness, appear here much diminished. This must necessarily be the fact, since all the upper groups thin out partially or entirely before reaching the State of Ohio, where the lower limestones are brought into the immediate vicinity of of the coal measures. When the examinations in Chautauque county are completed, we shall be able to present some more correct data regarding the rate at which these rocks diminish in thickness going west.

Notwithstanding that the rocks are exposed at few places, still from the great elevation of the country and the thinness of alluvium, they are found at moderate depths below the surface. On the south branch of the Cattaraugus creek, there are several points where rocks are exposed, but there are no deep excavations. In the southwest part of Freedom, on lot No. 19, there are several courses of sandstone and shale, exposed in a deep ravine, along which the road winds. Some of the sandstone courses are two or three feet thick, others but a few inches. It is quarried for grindstones, being of the same quality as the Rushford grindstone rock, and in fact is a continuation of the same mass. The strata above the grindstrone rock, are characterized by the peculiar fucoid so abundant in the same rocks on the Caneadea. In some of the sandstone courses there are numerous small nodules of shale, which render the rock unfit for grindstones. The quarry has not been opened to any considerable extent, but is favorably situated for working, being on a triangular point of a hill, at the junction of the ravine with the valley of the creek.

In the southeast part of Machias, on lots No. 8, 11, and 19, there is an extensive outcropping of a thick mass of sandstone; it extends along the northern escarpment of a hill for more than half a mile. The whole thickness of the mass could not be readily ascertained, but it is probably ten or fifteen feet, and in layers from one to four feet thick. This mass from being more indestructible than the shale above and below, has been left projecting beyond it, and has broken down in large masses for several rods in width along its line of outcrop, presenting an appearance like that on a lake or sea shore when a rock is undermined and falls down. These fragments are from two to thirty or forty feet square, and split readily in any direction. The stone is coarse grained and rather friable, though it may be considered durable from remaining of such dimensions, though so long exposed to the weather. The dressed stone is delivered at the quarry at one shilling per foot, and the same at Ellicottville, sixteen miles distant, at four shillings per foot. I have seen no place in the southern counties where stone can be wrought with equal facility, or obtained of such dimensions. A few fragments of Delthyris are the only fossils found in this rock. This point is about sixteeen miles from the canal at Hinsdale. The stone is wrought principally at two quarries, one belonging to Mr. Butler, the other to Mr. Jewel.

About one mile and a half west of Hinsdale village, on the road to Ellicottville, in the bank of a small stream, there are some thin layers of compact sandstone, and also micaceous and shaly sandstone of an olive colour. Leptæna and Delthyris are abundant in the rock at this place. Farther north, the same strata become concretionary. The Ischua creek, one mile and a half above Hinsdale is crossed by rock, which causes a fall in the stream. Three miles north of Olean point, the rocks are exposed on the east side of the valley near the top of a hill; a soft sandstone and sandy shale constitute the principal part of the mass. At several other places between Hinsdale and Olean, quarries might be opened with little labor.

The channel of the Cattaraugus creek exposes the rocks of the Cashaqua and Gardeau groups, throughout the greater part of its course in this county. Being a valley or water-course of recent excavation, its sides exhibit perpendicular cliffs, often rising to the height of more than two hundred feet. The stream often flows over a rocky bottom, showing that it has never been a deeper valley.

Conglomerate. The conglomerate already described as occurring in Allegany county, is found in several places in Cattaraugus county. One of these localities is south of Olean. After crossing the Allegany and proceeding through the woods about three miles in a southerly direction, we observe the first indications of the conglomerate. The elevation of this place cannot be less than five hundred feet above the Allegany river. It occurs in masses of small size, which increase in number and dimensions as we approach the rock in place, which is probably thirty or forty feet thick. Coarse gray sandstone is interstratified with the conglomerate. The pebbles consist of crystalline quartz frequently an inch or two in diameter, externally white, but often rose-coloured within. The materials are probably of northern origin, and were transported to their present situation by a more rapid current than we have any evidence of in the lower rocks. This change in the character of the rocks is an interesting one, more particularly from having taken place previous to the deposition of the coal strata, and was probably a change dependent upon circumstances producing those deposits.

Approaching the rock in place, the fragments lie apparently scattered irregularly over the surface, but on drawing near to the ledge, we find them nearer together, and arranged in a kind of order. This order or arrangement proceeds from the direction of the joints; and these immense blocks are separated first a few inches, then one, two, three feet, &c. and finally they become so far separated that the direction of the joints cannot be traced. This arrangement of the huge blocks has caused the fanciful name of ruined city to be applied to the place, and it requires but little aid of fancy to convert these broad fissures into streets and aisles, and the huge masses on either side into dilapitated buildings. Sometimes a fragment above has slipped and covered two lower ones, or the soil above conceals the joint. Then we have subterranean passages and courts, now the abode of bears and wolves, where in a few moments we may exchange the light of day for mucky darkness, occasionally broken by a glimmer through the rock fissures or broken soil of the roofing.

The fact, that the coal of Blossburgh, Warren, and some other places in Pennsylvania is overlaid by a conglomerate, has excited expectations of finding that mineral in Cattaraugus Co. The supposed place of the coal is beneath the conglomerate, and the reason alleged, it not being seen in the outcrop is, that the rocks deposited previous to the coal dip south at a greater angle than the coal beds, that the conglomerate resting upon the latter has its northern edge projected beyond the coal and resting on the rocks beneath. Were this supposition the fact, we should still expect to find the coal in the escarpments on the east and west sides of the hills, and it will be recollected that the conglomerate occupies only the summits of the highest hills, and is not continuous in an east and west direction or line of bearing. Under these circumstances, and knowing nothing more of the rocks and their association, it would be unwise to undertake boring through the conglomerate in search of coal.

So far as our examinations have yet progressed, I see no reason to suppose the carboniferous strata beneath the conglomerate. On the contrary, we believe this rock to be below all the workable coal beds at least, and this opinion is founded on the lithological and fossil characters of the rocks below it. Thus far, I have not been able to trace the immediate connexion of this rock with those beneath, but there cannot be more than one hundred feet intervening between it and the rocks examined.*

As this subject had become one of considerable interest to several gentlemen in Cattaraugus Co. I was anxious to obtain all the information in my power; and knowing the formation in question to be more extensive in Pennsylvania, I addressed a letter to Prof. Rogers on the subject. His views fully confirm what has been stated, that no coal can be expected beneath this conglomerate. He considers the conglomerate above the coal as an entirely distinct rock from the one of which we have been speaking.

During the next season, I hope to be able to show the exact connexion of this rock with the fossiliferous groups of New-York, and also its relation to the coal measures of Pennsylvania. For the present it can only be regarded as of limited extent, and extremely variable thickness, and although in one place a well defined mass, it may be in another very inconsiderable. We may perhaps hereafter, be able to identify

* Mr. Vanuxem in his report of 1836, has described the position of this and other masses of conglomerate.

this rock as the equivalent of the millstone grit of England, which lies beneath all the coal measures. So far as I have been able to trace its connexion with rocks above and below, it holds the same place in the series. This view of the matter will sufficiently account to those interested, why I am unwilling to recommend any expenditure in boring or other explorations in this rock or beneath it.

The rules of science are as immutable as the laws of creation, and so long as we profess to be guided by science, we must submit to its requirements. Because, as in this instance a rock, possessing certain lithological characters, is observed, we are not to infer from that alone, that the rock may contain the same minerals as another of like character, without taking into consideration the difference of position or associations.*

LIVINGSTON COUNTY.

The county of Livingston exhibits principally a continuation of the same rocks as are found in Ontario county, and described in the report of last year. Beginning on the north these rocks are the Hydraulic limestone, Onondaga and Seneca limestones, the extensive group of fossiliferous shales succeeded by the upper black shale; the Cashaqua shale, the Gardeau and Portage groups. The latter occupies only some of the high grounds in the southern part of the county.

The most prominent feature in this county is the great valley of the Genesee river, which passes nearly through the centre of the county from north to south. This valley in connexion with others, will be described at the end of the report.

Hydraulic limestone.—The northern part of Caledonia presents a view of the hydraulic limestone, which is quarried in several places within the town, and also at a little distance north, along the northern slope of the terrace. This rock underlies the village of Caledonia, and from this place its northern limit is southeasterly to the Genesee river. The oblique direction of the outcrop of this and the succeeding rocks on either side of the Genesee is owing to the denuding action, formerly in operation along this great water course, which removing the superincumbent masses, exposes those below farther south and at a lower level. This causes the line of outcrop to bend to the southward on

* For a continuation of the report on Cattaraugus county see Appendix, Mr. Horsford's report.

either side of the valley as we approach the river, and after crossing, it again turns to the north, till it comes in a line with the general east and west strike of the rocks.

The hydraulic limestone has been burned at Caledonia and used in some works near this place, but it was found to possess too little cohesive power, and did not sustain the structures. This is the only trial that I am aware having been made of the cement from this place. I see no sufficient reason why some parts of it may not make as good cement as the same rock in other places. Were it the proper place to introduce the subject, much might be said on the causes of failure in preparing and using the lime made from this rock at various places.—In the first place the component parts of the rock should be known, the character and proportion of sand depending on the composition of the lime, and the variable composition of the sand rendering different proportions necessary for the same lime. The composition of sands necessarily varying at different localities, has often more influence on the compound than the lime itself. The mode of preparing, quantity of water &c. used in preparation, all have an influence, and an important one.

For a distance of two or three miles southeast of the village of Caledonia, thin flat masses of the drab limestone are scattered over the surface, in many places in sufficient quantities for enclosures; its out-cropping edges often approach so near the surface as to be turned up by the plough. Three and a half miles southeast of Caledonia the drab limestone is quarried in large quantities for use on the Genesee Valley canal. The quarry is owned by Mr. Wadsworth of Geneseo. There are about twenty feet in thickness of the rock exposed; the lower part is in thin layers of a bluish color, striped with lighter bands. The succeeding courses are from two to two and a half feet thick, of a drab color striped with darker; it is easily quarried, splitting into masses of any dimensions, and becomes very hard and brittle on exposure. The upper seven feet of the mass is often in one course, though generally divided into two; this portion, and a course of two feet below, contain numerous irregular cavities, often filled with greenish clay, gypsum, sulphate of strontian, blende &c. In some of these cavities there are remains of some coralline fossils, the greater part having been dissolved out, probably by the action of sulphuric acid, which formed with the lime gypsum and with strontian its sulphate.

The same causes which here produced the small nodules of gypsum, were in operation over a large extent, to form the immense quantity which occupies a place in the rocks beneath the drab limesone. Owing to this circumstance only, we find no fossils in the gypseous rocks, for none could exist in a sea where sulphuric acid was a free ingredient.

The continuation of the drab limestone on the east side of the river is found in Rush and Mendon, and has already been noticed in the survey of Monroe county.

Onondaga limestone.—The Onondaga limestone succeeds the last described rock; it scarcely extends into the town of Lima, but it forms the substratum of the northern portion of Avon, and in the river valley extends as far south as the centre of the town. This rock is quarried in the Conesus Lake outlet, and on a small stream a short distance further east; at these places only a few feet of the upper part of the mass is seen. It is easily quarried in blocks of large dimensions, and is nearly free from hornstone. The stone is wrought for use on the Genesee Valley canal. The fossils at this place consist chiefly of Strophomena rugosa, Atrypá affinis, Delthyris, and some fragments of Trilobites. The greater portion of this rock on the east side of the river is covered by a deep alluvium which renders it difficult to trace its bearing and outcrop with extreme accuracy.

On the west side of the river, this rock first makes its appearance in the southeast conner of Caledonia, near the town line. At this place a very extensive quarry has been opened, on the west bank of a small stream, on land of Mr. Christie. From this place large quantities of stone have been taken for the construction of locks, aqueducts &c. for which purpose no better stone can be found. It is entirely free from seams, and is easily quarried and dressed. The whole thickness exposed does not exceed ten feet; the courses varying from one to two and a half feet. None of the layers are continuous of the same thickness, sometimes a thick one thins out entirely and its place is taken by two thin ones, or a thin layer in one place becomes a thick one at a few rods distance. Sometimes the courses are separated by a thin irregular course of hornstone, at others this hornstone is in the centre or near the surface of a layer of limestone. The presence of hornstone in the limestone injures the mass for working, and no blocks are dressed which contain large nodules of hornstone. In some parts of the quarry, fossils are abundant, while in other parts very few are found; individuals of the Cyathophylli are often found of very large size.

The price of the stone lying in the quarry is fifty cents per cubic yard. Several thousand dollars worth of stone have been taken from this quarry within the two past years.

From Christie's quarry the limestone pursues a northwesterly direction; passing just to the south of Caledonia village, it crosses the road a little west of that place, and pursues the same direction to the top of the terrace on the south side of Allen's creek. West and northwest of Caledonia, large numbers of fossils are found in this rock; these consist of Cyathophyllites, Favosites, and other corallines with Strophomena, Orthis, Delthyris, &c. In this part of the town the lowest portion of the rock is thick bedded and compact; above this it contains a large proportion of hornstone, and in some places is composed almost entirely of that substance. Being in irregular shaped masses and surrounded by limestone, which decomposes on exposure, it is left scattered over the surface in rough and shapeless forms. These fragments are crossed in every direction by innumerable fissures which are expanded by freezing water, and the whole falls into small fragments, which in many places literally cover the surface for many acres. Where the road crosses this part of the rock it has the appearance of being made in a bed of flints.

From the jagged and irregular appearance of the hornstone rock as it occurs in detached masses, it has received the familiar and expressive name of "*chawed rock*." This rock is the best material for road-making which western New-York affords. Where it approaches the surface the soil is rather barren, producing only a growth of dwarf oaks, but when there is a tolerable proportion of finer materials it produces a fertile soil. A large proportion of the native growth along this terrace consists of oaks.

In several places along this range of limestone there are appearances indicating uplifts in the strata, but the greater part if not all of these are fallacious, and caused merely by some of the strata being undermined and afterwards having fallen down of their own weight. These points present a ridge of the rock dipping in two directions, but in all those which I have examined, the dip to the north is abrupt and the rock terminates within a short distance. In some places there are downheaves of small extent, which have been caused by the solution and removal of the mass below, leaving that above to sink down. Notwithstanding this fact however, sink holes are of rare occurrence, through-the limestone region, and none of them of the character of those in Albany and Schoharie counties where the rock contains a greater thickness.

Marcellus Shales.—The Onondaga limestone is succeeded by the "Marcellus shales," the Seneca limestone being absent. These shales possess their usual essential characters, the middle portions quite compact and highly bituminous, becoming more slaty above and below.—The compact part of the shale usually contains large septaria; these sometimes consist of large silico-argillaceous masses without seams of crystalline matter. This rock follows the same course as the limestone, commencing on the east near the north line of the county, it passes southwest to the Genesee river; thence its course is northwest though the town of Caledonia, passing into Genesee county near the north line of this town.

On the Conesus outlet near the lower saw-mill at Avon, this shale may be seen resting on the limestone. About thirty-five feet from the bottom of the shale there is a stratum of limestone one foot thick, sometimes concretionary, and containing Orthocera, fragments of trilobites &c. For several feet below this, the rock is black, slaty and very fragile. A few feet of the shale above this limestone is black and slaty; it abounds in fossils of Orthocera, Orthis, Leptaena, Pterinea and a very small species of Orbicula. Above this the mass graduates into a greyish or bluish grey slaty shale, and contains few fossils.

This shale is seen in the ravines and hill-sides, on the west side of the Genesee, extending through the northeast corner of York, and thence through the southwest part of Caledonia. Mr. Hallenbeck of Mumford accompanied me to a place in the south part of this town, where a digging for coal had been made in the black shale. The indications which induced digging at this place were the black and highly bituminous character of the shale, thin seams of coaly matter and petroleum. I did not learn to what depth the excavation extended, but presume it to have been less than forty feet, for at that depth the Onondaga limestone would have been reached. The excavations were made at two places, one on each side of a small shallow valley which was originally worn in this shale. North of the valley, on the farm of Mr. McLean the same shale was penetrated in digging a well. Some portions of the rock are so highly charged with bitumen as to burn when thrown into a hot fire. In these shales as well as in the upper black shale, numerous excavations for coal have been made, and in each one alike fruitless.

It is unnecessary to give a detailed description of all the shales succeeding the last, as their lithological characters are nearly similar till we come to the upper black shale. Those shales heretofore described under several different names, and all containing their peculiar and characteristic fossils may be found along the outlet of Conesus lake in the ravines btween that and Geneseo ; on Jacock's run and another small brook farther south.

At one place near Wadsworth's mills on the farm of Mr. Moore, the Moscow shale was excavated in large quantities and ground, in the belief that it was gypsum. This delusion however lasted but for a year or two, and it is now abandoned. Containing much calcareous matter it is a good material for enriching sandy soils ; and there are many places where the decaying cliffs of this shale have produced, with the creek alluvium a very fertile soil. The shale, alone, on decomposing forms a clayey soil and packs too much on drying.

On Jacock's run the Ludlowville and Moscow shales can both be seen, separated by the thin mass of crinoidal limestone. Here as elsewhere in the district, the Moscow shale is known by its fossils, the Calymene and Cryphæus, while the Ludlowville shale contains Atrypa concentrica, and large numbers of Cyathophylli and other corallines. These fossils are very characteristic of the two shales, still in some localities the Cyathophylli and smaller corallines occur in the Moscow shales, but are not characteristic of this mass.

At York the Ludlowville shale is exposed on a small stream near the village ; the fossils are chiefly Cyathophyllites and Favosites, both in great perfection and beauty ; among the former there is a specimen placed in the State collection, consisting of twenty-six individuals of the species turbinatum, all closely grouped together. The shale is succeeded at this place by the Crinoidal limestone which contains, besides great numbers of encrinal columns a species of Avicula, resembling the A. reticulata of Murchison. This shell is a very constant fossil of the crinoidal limestone, and may be found in most localities. In the same ravine, several hundred feet lower, may be seen the hard calcareous shale, or shaley limestone, mentioned in the report of 1839, as occurring at Tyler's on Seneca Lake and at Orleans in Ontario county. At several other localities these shales may be seen, but being of little economical importance, no more will be said of them at present.

At Moscow the locality which gives name to the upper member of this group of fossiliferous shales we have them exposed, containing the characteristic fossils in great perfection. These are the Calymene bufo, Cryphæus calliteles, Atripa affinis, A. prisca, and two or three species of Delthyris. The principal locality is in the beds and banks of Beard's creek, on the land of Jerediah Horsford Esq. More than fifty species of fossils have been found at this place.

The Moscow shale is also exposed in a ravine and the bed of a small stream near the residence of the Hon. G. W. Patterson. These localities are in a deep valley of denudation and much below the general elevation of the surrounding country, the surface of which is occupied by the upper black shale.

Upper Black Shale.—In the ravines both east and west of Moscow we find the Upper black shale, also in a hill crossed in going from Moscow to the new bridge across the Genesee, and in the hill side ascending from the valley to Geneseo. The same shale is seen in Fall brook where the water leaps a hundred feet from the top of this rock. It underlies the village of Geneseo; it is seen in many places on the road east from that place, and in the ravines between them and Conesus lake. In this neighborhood the black shale is succeeded by a thin stratum of impure limestone, which has been burned for lime at one place near Moscow.

At the bridge crossing the Genesee near Mount Morris the black shale is exposed, possessing all its essential characters—being bituminous, containing thin seams of coal, great numbers of septaria, sometimes irregularly scattered, at other times in regular courses.

The arrangement and distribution of these septaria depended upon the supply of material; and the tendency to concretionary forms proceeded from the amount of material being too small for a continuous stratum, which together with the homogeneous state of the particles caused them to take this form. Sometimes we see a single insulated mass and no others in the same parallel of stratification; at other times we find them distant from each other but in the same plane of stratification. Again we may find a course of them in the same plane and each of them separated only a few feet from the other. Still again when the supply was greater we find a continuous stratum or bed, as in the case on Seneca Lake, where the regular course of septaria in the upper part of the black shale becomes, from increase of material, a continuous stratum three or four feet in thickness. This change is seen in many cases near the thinning out of a mass; the supply of matter diminishing till it is traced only by distant nodules or concretions.*

Near Geneseo, Moscow and Mount Morris the black shale is characterized by the presence of great numbers of Posidonia, which is almost the only fossil it contains. Two species of Lingula, an Orbicula, and an Orthis are characteristic of this shale in other places.

In several places this rock is traced for several miles from its northern outcrop on the hills, to its final disappearance south in the bottom of the valleys. This is owing to the circumstance that the valleys are excavated in the direction of the dip of the rock. Its final disappearance is in the bed of the Genesee, two miles south of the Mount Morris bridge.

Cashaqua shale.—A hundred feet of this rock is exhibited at the gorge at Mt. Morris, limited below by the black shale just described, and above by the Gardeau group. It also appears in many ravines in the south and southwest part of Leicester; in the vicinity of Mount Morris, in the Cashaqua creek, whence it takes its name; in the ravines on the east of the valley, and at a higher elevation southeast from Geneseo and approaching nearly to the village.

The Gardeau and Portage groups already described are the southern rocks of the county. These are seen in the deep gorge of the Genesee, and in almost all the ravines and water courses of the southern towns. Among numerous localities as we approach Dansville may be mentioned, Stony brook in Sparta where several hundred feet of these rocks are exposed. The shale in the upper part of this ravine has been ground and used as plaster. Several years since, this gorge was swept by a freshet which covered many acres of land in the valley, and changed the course of the stream.

* Those masses which are properly termed septaria, consist chiefly of compact carbonate of lime, aggregated in a spherical form, and divided in various directions by seams of crystalline matter, carbonate of lime, sulphate of baryta, &c. The masses often inclose cavities containing other crystalline substances, and also petroleum. Again other masses and often part of the same course are not crossed by seams; but are nevertheless the result of the same laws, differing only in this, that after aggregation, no part was separated by crystallization.

There are several quarries between this place and Dansville in which it is difficult to find any characteristic fossils. The rocks consist of thick layers of sandstone with intervening masses of shale; and near Dansville give more marked evidence of the group to which they belong. Quarries have been opened on both sides of the valley, where materials are now obtained for locks, bridges &c. on the Genesee Valley canal. The group also affords the finest flagging stones in the district; these are known by the presence of the fucoids already mentioned.

GENESEE COUNTY.

In this county we find the rocks of Livingston, with the addition of the Onondaga saliferous group on the north, which extends through the towns of Bergen, Byron, Elba and Alabama, and into the northern parts of Leroy and Stafford.

The most northern portions of this mass consist of greyish or greenish grey marl, homogeneous in texture, and very compact when first exposed, but crumbling rapidly. Thin courses of reddish and chocolate colored marl are seen in some places in the northern part of the county. Farther south and along the centre of these towns it is more grey or ash colored, contains thin seams of fibrous gypsum and selenite, and occasionally small masses of granular gypsum. This part of the mass is exposed only in wells which from the difficulty in obtaining water, are often dug to the depth of 70 or 80 feet. The grey marl and gypsum is found to contain large seams or joints apparently water worn; these without doubt act as drains and carry off the water from above.

Some wells in this part of the group yield an acid water. One of these, belonging to Mr. Gifford, of Bergen, I examined in company with the Rev. Mr. Griswold*; the water is said to contain acid enough to curdle milk; and though not sensible to the taste is considered unfit for use. The famed acid spring in Bergen rises from this rock. Some of the wells in the immediate vicinity, and in the same formation, yield good water.

A little north of Bergen Centre the greenish marl comes to the surface, and is excavated for the passage of the rail-road. Two miles west of that place the same marl is seen in the roads and in the banks

* I am particularly indebted to the hospitality and attention of this gentleman, who has given much attention to the Geology of the vicinity.

of the small streams; and approaches the surface over the greater part of this neighbourhood.

The grey or ash colored marls just described, are succeeded by bluish, slaty and drab colored impure limestone, which embrace large beds of gypsum. These occur mostly in the north part of Leroy and Stafford. Gypsum is also found in the western part of Elba, near the junction of the Pine-hill road, with the Batavia and Lockport turnpike; which is the most northern point that I have found it, in the county. At this place some 30 or 40 tons were quarried; but the masses being small, and about eight feet below the surface, requiring the removal of all the superincumbent earth and stone; the work proved unprofitable and was abandoned. That which was quarried still lies on the ground.

In the vicinity of this quarry, and for some distance west, there are sufficient indications of gypsum in the peculiar irregularity of the surface; being raised into little mounds, which give the appearance of heaps of earth deposited on the level soil. The thin bluish or drab limestone, is also found near the surface, and often ploughed up in the fields.

In the north part of Leroy plaster is obtained in large quantities, on lots 118, 144 and 132. The quarries in the first are of white gypsum, and free from seams and intermixture of clay; it is covered with a bluish kind of limestone with shaly seams, and splitting into laminæ $\frac{1}{4}$ or $\frac{1}{2}$ an inch thick. In the others, the gypsum is clay colored with seams of clay; this when exposed crumbles rapidly; the rock above is a drab limestone, resembling in general appearance the hydraulic limestone. In this I fonnd some few fossil shells of a species of Pterinea. Some parts of the rock are filled with small round pores the size of a mustard seed; such are also seen in the soft limestone, a few feet below the hydraulic or drab limestone.

The masses are all more or less spherical; the surrounding rocks being raised in the centre, presenting a fractured convex surface, dipping on every side of the mass.

The quarries last mentioned, belong to Messrs. Bannister, Collins and Clifford; the white gypsum to Mr. Hughes and Mr. Cash. The plaster is sold at the bed for fifty cents per ton; when ground, from $3.00

to $3.50 per ton. The different beds in this county, furnish about 3,000 tons annually.*

The formation described, belongs apparently to the second or middle series of gypsum beds; the upper, like that at Seneca falls and Vienna,† is not seen, neither have I been able to find the lower series; but although similar, in general character it would appear that the white gypsum above described, which is half a mile north from the others, must be at a different elevation, as well from its position, as from its associated rocks. The general direction of the masses is N. W. and S. E.; as appears both from the beds, and from their re-appearance in the western part of Elba.

The alluvial excavation along the valley of Black and Bigelow creeks, has either removed the gypsum or covered it so deeply with alluvium, that it is not reached in ordinary excavations; but unless so removed, the whole distance across the country is probably underlaid by it, though its depth may be too great for profitable exploration.

The gypsum is succeded by various colored marls, mostly bluish, greenish and drab or ash colored; some hard and very calcareous; others, soft, crumbling, and forming a tenacious clay.

Hydraulic limestone.—The drab limestone, hydraulic limestone, is the next succeeding mass. The essential characters of this rock have already been described; its thickness is variable, and also the proportion of sand, clay and carbonate of lime. Its connexion with the Onondaga limestone above, is seen to advantage, at the falls on Allen's creek, two miles north of Leroy, and also at Morgansville, where the Black creek descends from the limestone terrace to the level of the country north. At this place the following section is exposed.

	Feet.	Inches.
7. Onondaga limestone, in several courses,..........	3	
6. Oriskany sandstone,..............................	0	4
5. Hydraulic limestone in thin courses,.............	4	
	—	—
Carried forward,.......................		

* Mr. Hughes informs me, that the plaster dug from one acre, yielded a nett profit of $2,000, and the land is in as good condition for cultivation as before.

† See Geological Report of 1839, pp. 291 and 305.

	Feet.	Inches.
Brought forward,		
4. The same, mostly in thick layers, one being six or eight feet thick, highly silicious, with irregular cavities,	22	6
3. The same, in thin, greyish layers, with seams of blue marl,	12	
2. Bluish marl, crumbling into irregular angular fragments,	5	
1. Greyish and greenish marl, with some portions very compact, ten or twelve feet of the lower part filled with small cavities or pores, like those in the rock covering the gypsum,	19	
	65	10

The drab limestone is not so thick at this place as at some others which I have examined.

This rock forms the northern escarpment of the great limestone terrace, extending from the Genesee to Lake Erie, and also seen in the counties east. It passes through the towns of Leroy, Stafford, Batavia, and the south part of Alabama, forming the lower falls on the Indian reservation. I am not aware that it has been used for cement in this county, though it is doubtless good for this purpose.

Onondaga limestone.—This rock occupies the summit of the terrace ; extending from Livingston county westward, it passes, with variable width, to the north of the village of Leroy, underlies Stafford, Morganville, &c. the north part of Batavia and Pembroke. A few feet of the lower portion of this rock is in regular courses, with little or no hornstone ; the succeeding 40 or 50 feet consists principally of hornstone, being a rough, ragged mass, called the "*chawed rock.*" This, in some places, contains large numbers of coralline fossils.

From Leroy village to the falls, a section of rocks shows the black shale, Onondaga limestone, (the Seneca being absent,) the hydraulic limestone and the marls below ; there is scarcely a point in this distance where the rocks are concealed. The whole thickness, including the "*chawed rock,*" is less than 100 feet. Along this stream are fine opportunities for quarrying, though little improved.

About two and a half miles north of the village of Leroy, and west of the creek, there is an extensive quarry, in the Onondaga limestone, belonging to Mr. Rich. The rock at this place appears in courses, varying from six inches to two feet; it is almost wholly composed of fragments of encrini and other fossils, crystalline in texture, yet quite tough: the thick courses are often divided by seams; these, when of clay, cause the blocks to separate, at other times produce no injury. From the quarry, the rock is taken to a mill a mile south of the village, and sawn into slabs and blocks; it is afterwards polished and used for fire places, mantlepieces, &c. The polished stone has often a very beautiful appearance, and is highly prized by the collector, on account of displaying the internal structure of fossils cut through in the process. The crinoidal joints are often of a different color from the surrounding mass, a variety which increases the beauty of the stone. The polished slabs are sold from $1.00 to $1.50 per surface foot; the price varying with the labor bestowed. About $2,000 worth of the sawn stone is sold annually, besides several hundred dollars worth of the cut and rough stone of the quarry. Half a mile west of this quarry is another, from which, at the time I visited it, $800 worth of stone had been sold since the commencement of working it in the spring.

The dip of the rock at Rich's quarry, is southeast about 10°. This is probably owing to local causes, as the removal of the rock beneath by the action of water.

There are numerous places where quarries can be opened, when the demand for this kind of stone shall be sufficient; these will all hereafter, be a source of wealth to the owners of the soil, though it may be absurd to estimate their prospective value.

Lime is burned at many points along this range, supplying the immediate neighborhood, and also the country north and south. A great proportion of lime used on the Genesee Valley canal, will necessarily be obtained from this range of rock, there being no source of lime south except the marl beds. In Stafford, Batavia and Pembroke, this rock appears in very numerous localities. Two and a half miles from Batavia village, and half a mile from the north line of the town, a mass is exposed, being the hydraulic limestone, with some thin layers above, and the greater part consisting of the "*chawed rock*." This latter is most annoying to the cultivator, and when it overspreads the surface in large masses, almost totally forbids cultivation. This is seen in several places of small extent, in the south part of Alabama. The growth of timber on such land, consists chiefly of oak.

On the Indian reservation, this rock appears at the upper falls, and in the stream below; also between this and Pembroke. The thickness of the mass is very variable, as is seen in the quarries, where thick masses at one place may be merely recognized; in another, by layers of a few inches. West of Batavia, the terrace is not so well defined, though there is little difficulty in tracing the course of the limestone.

The shales above the limestone are seen to less advantage in the county of Genesee than in any other of the same range. At Leroy, the Black shale or Marcellus shale, succeeds the limestone, and is well exposed in the bed of the stream at that village. It contains large masses of Septaria, which are more calcareous than those of this shale in most places. The compact portions of the shale have been quarried for fire stones, and the Black stone store is built of the same material. I here found a fossil, the only one I have ever seen in the compact part of the shale; it resembles the scale of a fish.

The upper part of this mass exhibits the one foot stratum of limestone,* with its contained and accompanying fossils. Farther south, we find the other members of this series, at Clifford's mill, at Roanoak, and a little north, where it consists of those portions that are nearly destitute of fossils, and consequently of less interest. In the Four mile creek near Roanoak, the same shale is seen.

The Ludlowville shale, is found in two or three places in the town of Covington; one a mile north of Pavilion, another a mile and a half southwest, in the bank of the creek near Sprague's mill. The Strophomena carinata, is almost the only fossil I saw at the first place; at the latter, are Orthis, Delthyris, Leptæna, &c. The rock in place, is scarcely visible at either of these localities; at the first, it appears as a bank of clay, produced by the decomposition of the mass, leaving the fossils. This clay is used for bricks. At the latter, the decomposing edges of the strata are covered with gravel, &c. the fossils being washed out by rains.

At one or two places near Bethany Centre, the upper shales of this series are seen; and near the village of Darien on the Eleven mile

* See page 420.

creek, there is a natural section showing the Ludlowville shale, the Crinoidal limestone, the Moscow shale, and near the same place the upper black shale. The Ludlowville contains its usual fossils, Favosites, Cyathophylli, &c. the Atrypa concentrica, and A. affinis, Delthyris and Leptæna. The crinoidal limestone has fewer fossils than usual, but the Avicula reticulata ? is numerous. The Moscow shale appears much thinner than elsewhere, and exhibits fewer fossils. The black shale contains Posidonia. There are other localities of less importance on the same stream.

The next range of towns south, as well as a great portion of Sheldon, Orangeville, Warsaw and Perry, are occupied by the Cashaqua shale and the Gardeau rocks. The southern towns, with the more elevated portions of the range next north, are underlaid by the Portage rocks ; and in Arcade we find the commencement of the Chemung group, grits, &c.

In passing south, through the towns of Darien, Bennington, Sheldon, &c. we find that the rocks, mostly shale, lie near the surface almost continuously, except in the valleys. Ploughing often turns up the black shale, or the green Cashaqua, and the road sides expose the same at frequent intervals. These shales are left in little eminences above the general level of the country, and being covered with alluvium, are often mistaken for alluvial hills ; whereas, the soil is thin, and the removal of a few inches frequently exposes the rock. These knolls are seen along the road south, from Long's Corners through Darien to Bennington. This condition of the surface, previous to the deposition of the alluvium, appears to have resulted from the action of the waters of a lake or ocean, where numerous currents and counter currents might wear away the intervening masses, leaving the projection of the little mounds of shale as we now see them.

In several places slight "*diggings*" have been made, upon the indications of some thin seams of coal. Three miles south of Wyoming or Middlebury there have been excavations at two points, and at one of these a boring of 30 feet. At the time I examined the place, the owners, Messrs. Marvin and Joseph Everest, were about contracting for a deep boring, in the sanguine expectation of finding coal. The first inducement to this undertaking was an observation from an Englishman; that the water resembled that from coal mines : (having a bituminous odor ;) and some other person observed that the shale resembled that of the coal mines of Pa. To one unacquainted with the coal shale, this may appear sufficiently like it, yet it has none of the essential characters except color; and black shale exists in all the formations of New-York. Neither is the bituminous character of the rocks an indication of coal; for all the rocks of western New-York, even the limestone and sandstone, are bituminous.

The black shale at this place belongs to the Gardeau group; and had the boring proceeded, alternations of green and black shale, with thin layers of sandstone would have continued to the Cashaqua shale, which is seen at the ravine in Wyoming; and below this the upper black shale, &c. It cannot be too often repeated that it is in vain to seek for coal in rocks so situated.

In the ravine west of Warsaw some of the Gardeau rocks are exposed. In the ravine southwest of the village are found rocks of the Portage group, though mostly destitute of the characteristic fucoid. In this ravine there is a waterfall of 110 feet; which, together with the rocks above and below, gives a thickness of 200 feet at this place; they are principally shale with thin layers of sandstone.

The upper mass of this group may be seen at the falls on Allen's creek, near the north line of Gainesville and about three miles south of Warsaw village. On elevated ground fiom Sheldon to Warsaw, this mass with its vertical fucoid appears in several places along the road.

The county of Genesee appears to have been less affected by deep and violent currents than most others of the same range; and consequently the rocks are exposed at fewer points.

Physical Geography.—Valleys, &c.—The physical geography of western New-York, and indeed of the whole State, is a subject of much interest, but one to which, thus far, little attention has been given. One great difficulty has arisen from the want of knowledge of the elevations in different parts of the State. Of many places which have been surveyed, we have no published accounts, and of others no exact knowledge has been obtained. The published reports do not always give the information sought with regard to particular points. The surveys for rail-roads and canals, passing through the lowest valleys, do not give the elevation of the higher points, and we are still left with only an approximate knowledge of the subject for which we are seeking.*

* The tables of elevations published by Professor Henry, in the 1st volume of the Transactions of the Albany Institute, are of great interest and importance.

The absence of all strata superior to the coal series, (if we except some small tracts of Tertiary towards the eastern part of the State,) in New-York and Pennsylvania, prove that this great area has never been submerged beneath the ocean for any length of time, since the period of these ancient depositions. We have proof, however, of the violent action of water in the denuding and excavating agency, in the production of valleys and water courses. These phenomena may have been caused in part by a sudden submergence, and the rapid passage of a wave over the surface. The subsequent changes may have resulted from an inland sea, which for a long period remained in possession of a large portion of the interior of the continent, ranging at various elevations. This, in its subsidence, gave rise to small lakes, on the more elevated grounds, which, from accumulating waters, burst their barriers and communicated with those of a lower level or passed off through the present water courses to the ocean.

The theory of an inland sea was advanced many years since; but if we may judge from the manner in which the subject has been treated, it was considered visionary, at least. My attention was called to this subject by Mr. Roy, civil engineer, of Toronto, U. C. who has made many important observations regarding the former elevations of this sea or lake. These observations, which have been carried on by levelling, at different and distant places, sustain the opinion that this lake was stationary at different periods at certain elevations, where well defined margins are still observable. Such points have been observed in New-York, and we need only to refer to one at present; that is the ridge road or lake ridge, extending from Sodus to the Niagara river.

These margins or shores of the ancient inland sea, are at the following elevations above tide-water, as marked on a plan or section constructed by Mr. Roy. At some of these margins, it remained stationary for a long period, at others for a short time only, depending probably on the facility with which the barrier at the great outlet was reduced.

Feet above the level of the Lake inland.	Feet above the level of the sea.
O. 762	996
L. 680	914
G. 420	654
E. 344	518
D. 308	542

Feet above the level of the Lake inland.	Feet above the level of the sea.
C. 280	514
B. 208	442
A. 108	342
Level of Lake Ontario,	234

That an inland sea existed, subject to successive drainage, at outlets of different elevations, and consequent changes of level and reduction of extent, is rendered probable, and even certain by facts. If we glance at the topography of the United States, we find an immense basin, bounded on the north by the range of mountains extending through Canada to the far west, on the east by the New-England range, extending southwesterly, by the Highlands of New-York and the Alleganies to Pennsylvania; thence west and south towards the Mississippi river. From our present knowledge, we cannot speak with certainty regarding the continuation of this barrier beyond the Mississippi, but it is quite probable that it extends to the base of the Rocky mountains.

Previous to the denuding action which has produced the present water courses, these ranges presented a barrier to the enclosed waters of 1,000 or 1,200 feet above the level of the ocean. It has subsequently been broken through by the St. Lawrence, the Susquehannah, the Hudson, and partially by the Mohawk at Little-Falls. It is rendered quite probable, also, that the Connecticut river once formed the outlet of this immense sea. The vast quantity of boulders, and other transported materials, covering the surface of Long-Island, and which can be traced to rocks in place in Connecticut, prove that a violent and powerful current has at one time flowed down the valley of this river. A stream of the magnitude of the St. Lawrence, Mississippi and Susquehannah united, would produce this effect, and such a stream probably flowed down this valley, as the outlet of the great inland sea, till that was reduced below the level of 1,000 feet above tide water.*

All the outlets to this great basin are of comparatively modern origin, and furnish no valid objection against the existence of an ancient inland sea, which covered a large portion of the interior of this continent. In

* The elevation of the valley of the Connecticut, near its head waters and its junction with the valley of St. Johns river, is less than 1,000 feet above the ocean, as I am informed by Mr. Roy, who suggested that this might have been an original outlet of the ancient inland sea.

regard to the St. Lawrence, we have some information of the evidence that this river formerly flowed out at a much greater elevation, and that it has excavated for itself a channel in the rocky strata towards its mouth. We have also more conclusive evidence of this fact, in the course of the Susquehannah, and also in the channel of the Mohawk, excavated through the primitive barrier at Little-Falls. The Hudson has at one time found a barrier in the Highlands, which has been removed by the combined agency of its own waters and those of the St. Lawrence,* or indeed of a much larger amount of water than now flows in both these rivers.

Thus far we have no data to guide us regarding the barrier across the Mississippi, or precisely at what point it existed. It appears, however, to have been one of the last formed outlets to the inland sea.

In the western part of the State of New-York, many of the valleys may have been deepened or partially formed by the passage of the waters of this sea to the great outlet south, (the Susquehannah.) The lowest elevation between the valley of Cayuga lake, and the Susquehannah at Owego, is 981 feet. This corresponds nearly with the base of the highest margin of this sea, which Mr. Roy has observed in Canada, (viz: 996 feet,) at which point he observes, the inland sea must have remained stationary for a long period. The elevation of the valley between Seneca lake and the Chemung river, is 890 feet. Mr. Roy recognizes in Canada, a well defined margin at 914 feet. It therefore follows, that a discharge of twenty four feet in depth, took place through this valley at that period; and we have evident marks, in the character of the valley and the transported materials, that a violent current has passed through it. At this period, we know that the discharge by way of Owego to the Susquehannah had ceased. The valley from Seneca lake to the Chemung river, must have been the principal, or almost

* It may be objected to this view of the subject, that the barrier across the Hudson at the Highlands, could never have been 1,000 feet above tide water. This may always have been the elevation of these hills, and the Hudson, in that case, formed one of the earliest outlets of this sea. There may have been, also, some change in the level of the land since that time, for we know that the tertiary of Lake Champlain is deposited upon rocks which are scratched and worn by the current formerly flowing in this valley, and which came by the way of the St. Lawrence. Since that time, this basin has been submerged beneath the ocean, the tertiary fossils have lived, died and been covered with clay, sand, &c. and the whole raised to its present elevation; whether it be the same, or higher or lower than it was before the submergence we cannot at present determine,

the only outlet when the water was at this elevation; all the valleys farther west, being higher, and therefore only partial outlets when the elevation of the water was greater.

The opening of other channels, (probably the St. Lawrence and Mohawk,) at a lower level, caused the discharge by the Chemung to cease, and from this period we have only these two outlets for the sea on the east. The discharge in these directions, continued till the separation of the upper and lower Lakes, which took place when the inland sea was reduced to about 600 feet above tide water.

After the discharge by the Mohawk had ceased, which it did when the waters subsided to the elevation of 400 feet, the course of the St. Lawrence was by the valley of Lake Champlain and the Hudson river. The observations of Prof. Emmons, show that when the waters of this sea were at an elevation of about 300 feet above the ocean, an extensive discharge took place from the south end of Lake Champlani, as is evidenced by the polished surfaces and the wearing away of the rocks. At this period, a large proportion of the waters of the inland sea were discharged by the St. Lawrence and Champlain, into the valley of the Hudson. The partial obstruction at the Highlands, was the cause of the immense accumulation above; and the flow by the Mohawk having nearly ceased, the eddying currents deposited the immense body of clay and sand, forming the plains between Albany and Schenectady, and which extend still farther north and south.*

These conclusions seem incontrovertible, so far as regards the eastern portion of the great basin once occupied by the inland sea. The Allegany could never have formed an outlet, but as before observed, must have discharged into this sea. There are no valleys communicating between the Allegany and Lakes Erie or Ontario, at a lower elevation than 1,200 feet. This river itself, within the State of New-York, has an elevation of nearly 1,200 feet above tide water.

A barrier across the Mississippi of less than 700 feet above tide water, would turn all the waters of that immense valley, by way of the great lakes, and down the St. Lawrence. Of the existence of such a

* The sand of these plains, as well as the great numbers of sandstone, boulders and pebbles, are clearly referable to the Potsdam sandstone, which once formed the barrier at the south end of Lake Champlain. See the reports of Dr. Emmons and Mr. Mather.

barrier we do not doubt, but at present, we have too little accurate knowledge to point out its location, or the means by which it has been removed.

The excavation of the basins of the great Lakes, is a subject still involved in obscurity, if we suppose the relative levels of land and water to have been always what they now are. The deepest of these are 600 feet below the level of the ocean. The original excavation of the bed of Lake Ontario, was in the rocky strata, which have been removed to the depth of from 200, to nearly 400 feet below the level of the ocean. Subsequently this basin has been filled, or partially filled with alluvial materials. The shores where rocks are not visible, consist of clay, sand and gravel, possessing the same character on either side of the lake, and evidently the same deposit.* Whether this deposit ever extended entirely across the lake, or only to some distance from the present shores may be a matter of question.

The great depth of the bed of Lake Ontario, proves beyond doubt, that it could not have been excavated whilst the present depth of water existed, even by the most powerful current. The occurrence of the tertiary of Champlain, proves that place to have been depressed at least 300 feet below its present elevation ; if that depression was communicated westward, the former bed of Lake Ontario may have been laid nearly dry, by the waters having found a ready outlet to the ocean. If at this period all the waters of the great inland sea, passed in this direction, the bed may have been excavated. It would however, better account for this great depth, could we prove that its bed had been raised, and after being excavated, again submerged. May not the depression of the eastern portion of the State, have caused a corresponding rise to the westward ?

The valleys of Western New-York, so far as examined, all aid in proving the foregoing statements ; and if we can find that those which are excavated deepest have been the largest water courses, we have another fact in proof of our position. The discharge by way of Cayuga lake to the Susquehannah, continued till the inland sea was reduced below the level of 980 feet. Seneca lake and the valley south, conti-

* The shores of the lake generally present, as the lowest stratum, a blue or variegated marly clay, surmounted by a few feet of white or yellowish clay, and above this, sand. Sometimes gravel is deposited in what appear to have been excavations in this clay.

nued to be an outlet till the level of this sea was reduced below 890 feet above the ocean. Now we find the depth of Cayuga lake to be less than 400 feet, and that of Seneca lake more than 500; both are excavated in the same rock.

In tracing these valleys we find them all continuing southward, and beginning at the north we find the greater part of them tending towards the Susquehannah, which no doubt at a very early period found an outlet to the inland sea. The valleys of Cayuga, Seneca, Crooked, Canandaigua, Honeoye and Hemlock lakes, all communicate with the Susquehannah, by the Chemung and Conhocton rivers.

The most extensive, and well defined valley west of Seneca lake, is the Genesee. The term Genesee valley, is usually applied to that portion between Rochester and Dansville, this maintaining nearly the same elevation; that followed by the Genesee south of Portage, being a distinct valley. The conditions under which this valley has existed, will be an explanation for the others, as they have nearly all been more or less under the same influences. In whatever manner we choose to explain the production of this valley, we must admit that it is a valley produced by excavation, and that this portion of country was originally covered by rocks, which formed continuous strata with those now seen on either side. From all facts yet observed, it appears that such valleys have been excavated by violent and powerful inundations, which have torn up rocky strata, and carried forward the materials to places farther south. The course of the advancing or excavating wave in this case, was from nearly north to south, passing all that portion in Livingston county from Rochester to Dansville, when its course is well defined. Beyond this point it passed southevsterly by way of Arkport, Hornellsville, Canisteo, &c. to the Chemung river, and thence to the Susquehannah. This valley could never have formed an outlet for the inland sea for any length of time, for its elevation between Dansville and Hornellsville, is more than 1,100 feet above the ocean. It is here very obvious, that the original valley did not follow the course now taken by the Genesee river, for we find that stream descending to the level of this valley from Portage, by falls and rapids of more than 500 feet.

It would appear that the excavating wave divided near the junction of the Caneseraga and Cashaqua creeks; the larger portion excavating the valley to Dansville, Hornellsville, &c. the other by Portage and

Angelica, or the one in which the river now flows from its source to Portage. At the south line of the State, this valley is probably not less than 1,600 feet above the ocean. When the waters were at this elevation, the margins of the ancient sea could scarcely have been defined, for having so many outlets, it would remain at no settled elevation for any considerable period.

The subsequent condition of this valley has been one of great interest. After the waters had ceased flowing in so many directions, and the inland sea was reduced to its first stationary point, that portion south of Portage, was left as a lake of the same dimensions as the valley at the present time, with all the small streams and the sources of the Genesee flowing into it. This lake discharged its waters by a gradual descent into the inland sea, which at that period was little below it. At subsequent periods the inland sea was so far reduced, that the lower valley, or that between Rochester and Dansville, was left a shallow lake, having its outlet by way of the Irondequoit, and more recently, by way of Rochester. During these periods, the streams flowing into the valley, at, and about Dansville, brought down loose materials which were deposited over the bottom of the lake, the finer materials being carried forward suspended in water. This was also the condition of the discharge from the upper lake, by way of Portage; pebbles, sand and mud were brought down, the coarse materials being deposited first, while the finer were carried forward and deposited in more quiet water.

An examination of the Genesee flats furnishes sufficient proof of this theory. For many feet in depth the deposit consists of fine sand and clay, intimately mixed, the same materials which are now being deposited in every lake by its tributaries. The evidence does not rest here, for if we examine this deposit, we find lines of stratification or deposition, the direction sloping from south to north, and the very same which we should expect, if the materials composing it were pushed gradually forward over the bottom. The first deposit would be made at the embouchure, and would consist of a mass sloping off towards the centre of the lake; the next would follow this, a second and third deposit in the same way, would continue the slope towards the north. As we advance towards what we suppose to have been the inlets of this lake, we find the materials of such character, that they could not have been brought down by any except a powerful current.

To understand this more fully, we may take for example any of our shallow lakes or ponds, which are now being filled up by materials brought from the higher grounds, by freshets and the small tributary streams.

While this state of things existed in the lower valley, nearly the same process was going on in the upper one. The fine materials brought down by the streams, were spread over the bottom, while the coarser were left on the margin, at the mouths of the inlets. The outlet by the Cashaqua, seems to have been early closed and another formed by wearing the chasm from Portage to Mt. Morris. During this period, the lake was drained to near the present level of the river bed. The different and successive margins or shores of this lake are in many places clearly recognizable, but in others they are obliterated. The first opening for the water of this lake was from Portage, in nearly a direct line to Rogers' bridge, through a gorge now filled with alluvium. After the water was drained in this manner, from some cause, and probably the sudden drainage of a small lake at a higher level, a great accumulation of water occurred, which, carrying everything before it, swept down the alluvium, which completely blocked up the course of the stream, producing that immense deposit to the north of Portageville. The consequence of this catastrophe was the accumulation of water in the lake above, to such an elevation, that it found a passage over the surface along the present course of the river from Portageville to the Lower falls. The direction of the outlet being once given, the wearing process commenced and the result has been the production of that immense chasm in which are situated the three falls. The descent of water over these falls and intervening rapids, amounts to about 400 feet. The perpendicular cliffs of rocks below the second fall are 350 feet high.

Here then, are two eras, clearly distinguishable, in which the different portions of this gorge have been excavated, and both of them since the present configuration of the surface had become generally settled; and long since that period, when the whole was submerged beneath the ocean.

In the excavations in the alluvium now at progress at the north end of the tunnel at Portage, we find the first deposit somewhat regular, and consisting of materials in which those of northern origin form a part. This deposit appears to have been partially excavated and another deposit spread over it, of materials from the south, consisting of flat masses of sandstone and scarcely worn pebbles, with loam, &c. distinct from that below. This deposit proceeded from a second eruption, after the first opening was closed up, and was probably made at the period when the river commenced flowing in its present course.

There are several other places between Portage and Mt. Morris, where the direction of the river has been changed since it commenced its course through these rocks. The chasm for two or three miles above Mt. Morris bridge, appears more recent than some portions between that place and the lower falls, and it is not improbable that a portion at least of the waters of this river flowed through a gorge little to the north of the present one. The valley by way of Silver Lake, has at one time served as a water course, probably for the waters of the lake above Portage.

A partial history is thus presented of the changes which have taken place in the Genesee valley; further and more minute investigation will doubtless detect others, though of less importance and magnitude than those enumerated. Although the same phenomena are exhibited in other valleys, I have seen none where they are exhibited so clearly.

The Genesee valley is a prominent feature in the surface of the counties of Livingston and Allegany, all the others are of minor importance, or lateral and tributary valleys. That of Conesus Lake is an inconsiderable one, the depth of the lake being but fifty-seven feet; the valley in its continuation south joins the Genesee valley north of Dansville.

The valley of the Caneadea creek has probably drained a lake which once existed in the neighborhood of Rushford village. Many of the deep ravines, some of them with small streams still flowing into them, are the outlets to higher lakes which have been thus drained.

The principal valleys west of the Genesee, are for the most part not so well defined or continuous, though some of them are deep. In Genesee county, we have the valleys of Allen's and Tonawanda creeks; towards the sources of these streams the valleys divide, and gradually rise to near the general level of the surrounding country, still their course can be traced joining the valleys extending south to the Allegany. The more elevated country, between these north and south valleys has once been occupied by lakes which have been gradually drained, some in one direction and some in the other.

The great depressions on the south and west, the valleys of the Allegany river and Lake Erie, have given direction to all the water courses of Cattaraugus county and the southern part of Genesee.

The valley of the Olean creek from the north joins the Allegany at Olean, and at this junction is much expanded. This valley may be viewed as taking the course toward the source of the Allegany, having the same direction as the valleys farther east. West of Olean, we have the two valleys from the north, known as the Great and Little valleys, which join the Allegany at its most northerly bend. From this point it would have been little deviation from the general course, for these valleys to have followed the Allegany valley, either southeast towards its source, or southwest in the present direction of the stream. Reasoning from analogy with other valleys of this region, we should suppose such to have been the former direction of the excavating power of these valleys. The evidence at Lodi and other places in that neighborhood, clearly prove the existence of a large north and south valley in that direction; the same appearances exist at the sources of Great and Little Valley creeks, and the south branch of the Cattaraugus.

The course of the Cattaraugus creek is in a bed or valley of recent excavation, produced by the accumulation of water at its source, and the sources of its tributaries.

The Ischua creek flows in the bottom of an ancient valley, which at Hinsdale is joined by the Oil creek, also in an ancient valley. The valley of the Ischua, is easily traced north as far as Machias, when it spreads out to considerable extent. Between this place and the Allegany, it presents a general broad flat plain, gradually descending to the south, and limited on each side by ranges of hills. Its further continuation north by the valley of Lime Lake, thence northward to the Cattaraugus is in some measure obscured by alluvial hills. For some distance south of Machias, the bottom of the valley is covered with a fine loam, resulting doubtless by deposition from water, while all this portion was covered by a lake.

The Great and Little valleys, the Conewango and Cold-Spring valleys, all apparently result from the division of one large northern valley, which at Waverly takes these several directions. The country about the sources of the Conewango is extremely level, giving rise to extensive swamps.

South of the village of Lodi, and between the Cattaraugus creek and the Conewango, the side of this valley exhibits numerous terraces in the alluvium, proving the former elevations of the lake, which has been finally drained, leaving indications of its former existence in the swamps just mentioned.

The facts here stated regarding these valleys, are such as should be expected, when we take into consideration the condition of this continent as it emerged from the ocean, or was deluged by a mighty wave. The water would flow off rapidly in every direction, till it fell below the barrier, which on every side confined it. Even above this point, however, there may have been places so surrounded, as to have retained the water at much greater elevations. These would form elevated lakes, which from time to time have burst their barriers, and swept over the country below; or by a gentle and gradual drainage have formed those deep ravines, through some of which still winds an insignificant stream, the only representation of its former grandeur. From time to time the great inland sea found new outlets, which drained off a portion of its waters, changing the surface of the country, and deluging whole tracts with alluvial matter carried down by its resistless torrent.

From what has been said regarding the ancient direction of the waters, we are prepared to find the alluvial soil composed of northern materials. The current of which we have every where abundant evidence, traversing the country from north to south, breaking up the strata and carrying forward their materials in its course, deposited the debris in the state of boulders, pebbles and sand, in every place where it passed.

As this wave excavated deep valleys, and left large portions in the form of hills, the materials were deposited at the lower levels by the more gentle currents which followed the first. Thus we find that the valleys, and hill sides to a certain elevation, are covered often to great depth, with a soil of foreign materials. These may be traced to rocks in place farther north; limestones of the northern counties, and granitic rocks from Canada, worn and rounded, and mixed with all the intervening ones on their southern course. Sometimes the deposits are local, the materials consisting of a few rocks in the immediate vicinity; in such cases we shall probably find a local cause, as the outbursting of a lake, or the embouchure of a large water course.

From the conditions under which the transported soil was brought into its present position, it must necessarily be of varied character. Where thrown down by a violent current, it is a confused mass of sand, gravel and pebbles; where deposited by less rapid waters, finer materials are found; and where the waters had become more quiet, clay which remains longest in suspension, is spread over the surface. Many causes may have modified the results.

The soil of the hills consists principally of the comminuted materials of the substrata, and varies with the nature of those. It is generally, rather clayey gravel, or loamy, and contains numerous angular, or slightly rounded fragments of the underlying rocks. Primitive boulders are sometimes found on the surface, but their great proportion is confined to near the limits of the alluvial transported soil. The hill soil, is never very deep, the rock being frequently reached in ploughing; and when removed from the more abrupt declivities, the surface of the solid rock is found covered with flat angular fragments of all dimensions, which have apparently been but loosened from their original position, and have fallen down the hill.

The formation of this soil, and the occurrence of the great number of angular fragments, can only be explained on the supposition, that the hills have been covered with water; which gradually retiring, and being agitated by winds and somewhat by currents, has broken up the rocks, and formed the soil without removing it out of place. It does not appear that there were any violent currents, these only affecting the parts near the outlets, and above a certain elevation, the whole might have been very gradually drained by numerous outlets, and no rapid current caused in any direction. Subsequent effects of freezing and thawing, rains, &c. may have modified the character of this soil, for the frost usually penetrates to the rock beneath. And much indeed bears evident marks of having been formed by the gradual decomposition of the mass, with no more change than may be produced by the actual vicissitudes of the climate.

We have then in the southern counties two soils, essentially differing from each other. The rocks of this region being nearly destitute of lime, it follows that the soil resulting from them, bears the same character; that of the valleys being produced by the destruction of northern rocks, contains the materials of those rocks, or a large proportion of lime. These facts are known to every farmer, and wheat is never grown on the upland soil, although the conclusion may not have been attained by the same course of reasoning, the results are the same, relied on and confirmed by practice.

As a general rule, the finer materials of the valley soil, will be found towards its outlet, and the coarse near its head and along its margins, the latter being irregularly accumulated, according to the direction and quatity of the water received and transmitted. Sometimes the finer deposits are found covering the coarser, or vice versa; this must be either from a change in the direction of the main current, or the suppression or augmentation of some lateral one. The valley or one side may be covered with coarse materials, and directly opposite may be a finer deposit; this results from similar causes.

In the Genesee valley near Angelica, we find an extensive plain of sand, supporting a large growth of pines; it presents some features differing from the surrounding valleys. The circumstances of its formation were these: while this upper valley remained a lake, the Angelica creek, then a much larger stream, flowed into it a little distance south of the present outlet, in a direction nearly at right angles to the current passing through the lake from south to north. The meeting of these two currents formed an eddy, which crossed to the eastern side of the lake, and deposited the finer materials, which the more rapid stream had before held in suspension.

Similar eddy currents have produced accumulations of sand, clay, &c. over greater or less areas; and these differing from the surrounding soil, are often characterized, as in the present instance, by a different vegetation. Maple and beech trees grow luxuriantly over the alluvial soil; while evergreens prevail among the hills, whose forests of dark and stately pines have a character peculiarly wild and sombre.

Swamps.—The swamp deposits consist usually of a substratum of clay or sand, covered with vegetable, muck or peat, with sometimes an intervening layer of marl. The history of many of these, comes almost under observation. First, a shallow pond deposits the clay, &c. held in suspension; next succeeds a growth of aquatic plants, which decaying, cover the bottom; this is annually repeated until the pond becomes a marsh; other plants succeed, and the accumulation goes on.

Lastly, when dry by evaporation or drainage, the vegetable matter has become compact, and firm enough to form peat, and is used for fuel The deposit of marl takes place prior to the growth of vegetation; and results from the percolation of water through the alluvial soils, which contain large proportions of lime. When swamps occur in places where there is no alluvium or limestone, there is no marl.

The number of swamps containing muck, is exceedingly numerous. This deposit in the fourth geological district, has but in few instances become sufficiently tenacious to be called peat; though it burns as readily, and is equally good for fuel. In drying, it falls to powder, not containing enough undecomposed particles to cause the mass to cohere. Sometimes the muck is deposited on a sandy bottom, when it is never so abundant as on clay. This understratum of clay is often very valuable for bricks. In many places, when the swamps shall have been drained, and time allowed for the muck to become more compact, and other vegetation to succeed the present, many of these deposits will become valuable fuel.

Tufa and Marl.—These terms are applied to the same substance in different states of aggregation; both being a deposit of lime, from solution in water. The former is hard and porous, embracing vegetable impressions, and leaves and branches, which have been replaced by lime. This form results when the deposit is made from water passing over a surface or oozing from a hill side; in the latter, the lime is precipitated under water in shallow lakes, ponds, &c. and from its manner of deposition, cannot cohere.

A bed of tufa, which appears to be not very extensive, is seen in a hill N. E. from Dansville, on the land of Mr. Brewer. This has been burned for lime. Large quantities are obtained for that use at another locality in the same town, which I did not visit. On the Canisteo, a mile and a half from Bennetsville, a spring rising at a level of 60 or 70 feet above the river, deposits calcareous matter. Near the source of the spring, the lime has accumulated, and the stones for some distance in its course are covered with the incrustation. Several similar springs are found in the neighborhood.

Two miles northeast of Arkport, tufa is burned for lime, which thence supplies that part of the county. It was formerly burned at a place south of the village. At Pogues Hole, on the Canesaraga, at Troupsburgh, anu in other places, tufa and marl are burned for lime. Two and a half miles east of Angelica, a bed of tufa has been worked for several years; the best portions only are used, and so little care taken, that much is unnecessarily destroyed. A mile and a half east of Portage, near the residence of Mr. Paine, there are several beds; and two of small extent near Roger's bridge; one of these is opposite the lower falls; the other at the entrance of the gorge below the little flat, on which Lefoy's mill stands.

Two deposits of marl occur in the town of Rushford; one underlying a swamp, on the land of Judge Mc Call; the other near the road. Also at Caneadea, there is a small deposit a little above the level of the valley. At neither of these localities has it been used for lime.

In Livingston county a mile east of Caledonia, an extensive deposit of marl occurs in a recently drained swamp. Another north of this town, and extending into it, was described in the Report of 1838.

Near Batavia, several small swamps or ponds contain marl, and also the springs or ponds, the source of Spring creek. About three or four miles north of Leroy, between the gypsum beds and Bergen, there is a large marl swamp; the extent of the deposit I did not learn, but it is probably great, resulting as it does, from the marls and slates of the gypseous formation. Two and a half miles south of Leroy, on the land of Archibald Stewart, and an adjoining farm, a marl bed covers about twenty acres, with an average depth of probably eight feet; a few rods from the margin being five, a little distance farther nine, and the centre fifteen feet. This marl is covered by muck, from one to two feet thick. Mr. Stewart has applied the marl as manure, and finds ample returns.

In examining Silver lake, I found the bottom in many places covered with a growth of Chara, which when first thrown out looks green, and on a little exposure becomes white and brittle, readily crumbling to powder; they are almost wholly composed of carbonate of lime. The same species is found abundantly in the outlet of the Caledonia spring; and so rapid is its growth, that frequent removals are required to prevent it from impeding the water in the sluiceways to the mills.

Towards the inlet, the bottom of the lake is covered with marl several feet deep, but I was not able to ascertain whether it occupied the whole area. From sounding, the bottom appeared soft. The marsh at the head of the lake was not examined ; it probably contains marl.

In all deposits of tufa and marl, a large quantity in the bottom of the bed is earthy, and considered unfit to burn for lime; these portions either in their actual state or burned, can be advantageously used for agricultural purposes. Lime burned from this, and made into a compost with the black muck of swamps, would be an excellent manure for all the lands of the southern counties ; and even the hardpan, which is considered almost worthless, may be reclaimed, and rendered fertile by the judicious application of muck and lime. The importance of this subject cannot be too strongly urged. While the farmer is perhaps cultivating a poor, hard soil, too compact for vegetable growth, his lands include perhaps a muck swamp, which is considered nearly worthless. Now by ditching his swamp, and carrying its contents on his field, both are essentially improved. The soil of these swamps, when reclaimed, is superior to the higher grounds.

Whiting Merry Esq of Wheatland, has for many years been making experiments with these substances, and the results meet his most sanguine expectations. In using either marl or muck, fifty loads are mixed with two hundred and fifty loads of barn manure, straw, &c. and allowed to remain in a heap for several months. The marl compost used on grain lands, produces stronger and better straw, with larger crops.

The muck compost, was used on a field previous to sowing with wheat; twenty acres received a " top dressing" of twenty loads to the acre, and ten acres were left unmanured. From the twenty acres, were obtained twenty six, and from the ten, only seven bushels per acre ; the latter being as good or better land, and sown with the same grain. The average crop the same year, on a soil somewhat superior to this field, was nine bushels per acre.

In the spring of 1839, a field was " top dressed " with twenty loads in the same manner, and planted with corn, it yielded 60 or 70 bushels to the acre. In addition to the increased crops, the land is thus made light and easily tilled. The addition of a little lime to the muck composts, is of great importance.

No manure can be better adapted to the unproductive hardpan soil, which covers some of the hills in the southern counties. The deficiency of lime and vegetable matter can be thus supplied, and the soil rendered light and productive.*

Clay.—Almost every town contains this substance, in sufficient purity for brick making. It underlies many of the swamps, is found along the sides of the Genesee valley, and in almost all the low grounds, it appears as the last deposit of the subsiding waters.

Springs.—Those of pure water are abundant in the southern counties, gushing out from the hill sides, and sending cool and refreshing streams along the valleys.

Hydrosulphuretted springs are very numerous. The most important of these are at Avon, Livingston county; these have already been examined by Dr. Beck.† They have their origin like those of Manchester, Ontario county, in the hydraulic limestone, near its junction with the limestone above. The upper spring is at too high a level for this, but from information obtained, the water rises from a rock, fourteen feet below the surface of the soil where it appears. The Avon springs, are very copious and highly impregnated. There are three or four at nearly the same level as the lower spring, and one still lower in the valley, has recently been fitted up for the accommodation of visiters.

So far as my observations extend, all the copious sulphur springs in the fourth geological district, arise from the hydraulic limestone. Small springs of this kind, occur in nearly all the shales above the Onondaga limestone. One of these is found at Moscow, several in Steuben, at Cuba, in Allegany; and in Cattaraugus.

---

* For important information on the use of peat or muck, see the Report of Dr. Jackson, Geologist to the State of Maine, for 1839.

NOTE.—Among the applications of marl to economical purposes, the following is, I think, new. During the last summer, I met in Ontario county, an itinerant, who was vending an article for cleaning knives, silver, brass and copper utensils, and it was likewise recommended as a *dentifrice*. Large quantities had been sold to universal satisfaction. The fine variety, proved to be a fine pulverulent marl, moulded into the form of a brick; it still contained small freshwater shells. The other was a more siliceous variety, probably containing some of the microscopic infusoria. In many places where this was sold, thousands of loads could be obtained within a mile.

† See Report of Dr. Beck, for 1838.

Carburetted Hydrogen.—This gas, rises from springs and streams in many places in the southern counties; and can be detected by applying the flame of a taper to the bubbles, which readily ignite.

The oil spring of Cuba, was noticed in Mr. Vanuxem's Report of 1837. There is a similar one in Freedom, Cattaraugus county.*

Springs slightly impregnated with saline matter occur in a few places; one of these is on the land of Mr. Davis, in Greenwood. Mr. Horsford mentions one near Rutledge village, Conewango.

The most copious, and strongly impregnated saline, which I have found in the fourth geological district, is in a marsh, in the town of Elba, Genesee county, on the land of John G. Satterlee. This spring rises from the true saliferous formation, and therefore merits a more extended notice. When I saw it, the water was flowing from one place in quantity, about as much as a common pump would supply; decidedly, and strongly salt to the taste. The vegetation is destroyed for several rods around the opening, and there are indications of another spring coming into this from the west. In the adjoining lot east, there is a spring, and several more in the vicinity; all however far inferior to the first mentioned. Salt was formerly manufactured from the water of this spring, or from wells dug in the margin of the marsh.

The rock is eighteen feet below the surface, and the portions brought up in digging, are a grey marl, with gypseous seams and nodules; and it is apparently the marl below the first regular bed of gypsum. Several years since a well was dug to the rock, and below a boring of four inches diameter was made fifty feet further. A wooden tube of two inches calibre was then placed in the hole, and the water immediately rose several inches above the surrounding surface, and flowed out, keeping the tube constantly filled. At this period, and for some time a larger quantity of water flowed off than had risen in the well previous to the boring; and the vegetation for some distance was entirely destroyed. Since that period it has fallen into neglect.

Being in the same rock as the springs at Salina, it may at some time be thought worthy of investigation; especially if those waters diminish or deteriorate.

The acid spring mentioned by Dr. Beck, in the Report of 1838, and previously by Prof. Eaton, lies in the S. W. corner of the town of By-

* See Appendix.

ron. At present no water flows from it, though the soil a few inches below the surface is quite damp. The place presents a low, blackened mound of earth, entirely destitute of vegetation. The surface is composed of vegetable matter, intensely sour to the taste; this is underlaid by clay or sandy clay, equally sour. Dr. Beck, states this earth to contain no other principle than dilute sulphuric acid. Several large stumps stand upon this mound; the decayed roots, and perhaps the trees themselves have furnished the vegetable matter which is charred by sulph. acid.

I was informed, that in the early settlement of the country, a copious spring of intensely sour water issued from the top of the mound; that in digging about the spring, for the purpose of making it deeper, the whole was lost, and since that time it has only appeared in the spring of the year. The rocks below are the gypseous marls, and nearly, or quite the same as those of the sour wells in Bergen. The source of this spring affords sufficient water in the driest part of the year, to moisten the ground for the distance of several rods around.

Saline efflorescences.—These are abundant in some of the dark shales of the Gardeau group; in several places along the Genesee, several pounds of alum and copperas, may be obtained from an extent of a few yards. In the upper black shale, the same character is observed; and also to some degree in most of the other shales.

In Darien, Bennington, Sheldon and Orangeville, Genesee county, the waters of many springs are tinged with iron. This I suppose to be attributable to the proximity of the shaly rock; which containing iron pyrites, the decomposition causes the deposit from the water. The Crinoidal limestone of Darien contains pyrites, being overflowed by water, which leaves a rusty deposit.

In conclusion I have to say, that while I have omitted nothing that can be regarded as important to the interests of the inhabitants, or aiding them in the knowledge or direction of their available wealth, I have omitted details which can be of no present utility, and which may, by seeming to attach undue consideration to things which are only contingent and prospective, have a tendency to mislead. For example, masses of beautiful stone, marble, beds of peat, marl, &c. I have not calculated by the cubic foot or yard, as if already worked out and sold; whence the farmer or speculator, regarding only the ultimate value of his wealth, increases his price according to this essentially false estimate. For it must be considered that years are required to consume a marl bed, a peat bog, or a marble quarry; that the income depends on the demand; and though its stated value may be realized in twenty or fifty years, the capital invested in its purchase might, in the mean time, and otherwise employed, yield four fold. Like the products of a cultivated farm, the returns are constant and slow, differing from that only in the circumstance that it is not inexhaustible.

I would not be understood as attaching little importance to such property. To the farmer the value of a marl bed or a peat bog is immense; but I would say, that geologists, when occupied in such objects as calculating the value of a mass in dollars, while they degrade their science, defeat their own purpose; they mislead those who are guided by their representations, and foster the very spirit which their researches should allay, viz. *the mania of speculation.* If such a course is pursued, it requires no great foresight to perceive, that want of confidence, and finally distrust, will prevail, and geology be ranked with the art of the adventurer with the mineral rod. Besides, there is confessedly, room for error in estimating the contents of a bed or vein. In the 4th District, we know that beds of limestone, marble, grindstone grits, &c. are liable to thin out within a few rods, or they may continue for miles: in this state of the case, it is very unsafe to predict or infer that one stratum will extend for a distance of several miles because another one has been found to do so, when we know the greater number do not.

These reports are intended to be the medium of information to landholders, farmers and others, of what their domains produce, of their application and uses, and the value in general terms. These remarks may, perhaps, be out of place in a report of this kind, but I have been induced to make them, from the many examples which have come to my knowledge, where the value of a manufactured or wrought material of a mass is given, and the same applied to it in its present or natural state, from whence it is plain that loss and disappointment must follow. It has before been said that the permanent growth of wealth in the Western District consisted in the agricultural value of the land. The two northern ranges of counties affording a soil peculiarly adapted to grain growing, no country being superior to it; while the nature of the substrata, soil, hills, ravines, and numerous perennial springs of the southern tier of counties, characterizes them as grazing lands, and they only require a little more capital, and better means of communication, to become the abodes of plenty and contentment.

The following is a table of the rocks of Western New-York, in the order of succession, with their reference to the subdivisions of the "Silurean System." In most cases, the limits of these subdivisions are clearly ascertained, but it must be recollected that the Onondaga Saliferous group, or that mass containing all the plaster beds of the fourth District, appears to be wanting as a member of the Silurean system in England and Wales. The limestones of the Helderbergh and Schoharie accord better with the description of the Wenlock or Dudley limestone, than those of Western New-York, the latter being much thinner.

The Lockport limestone is evidently referable to the Dudley period, and so also are the Onondaga and Seneca limestones; consequently the saliferous group lying between these will be included in the group. The former of these limestones contains many fossils which are common to the Wenlock limestone, and at one locality in Monroe county specimens were collected containing great numbers of a small species of Orthis which occurs at Dudley, the specimens from both localities closely resembling each other, and each highly charged with the same fossil.

The table exhibits the arrangement so far as the limits of the groups have been ascertained, but the groups of the "Silurean System" do not well accord with the natural divisions of the rocks in New-York.

Old Red Sandstone.	Old Red Sandstone.
Chemumg Group. Gardeau and Portage Groups. Ithaca Group. Cashaqua Shale. Moscow Shale.	Upper Ludlow Rocks.
Ludlowville Shale. Calcareous blue Shale. Dark olive Shale. Marcellus Shale.	Lower Ludlow Rocks
Seneca Limestone. Onondaga Limestone. Oriskany Sandstone. Hydraulic Limestone. Onondaga Saliferous Group. Lockport Limestone.	Wenlock Limestone.

Rochester Shale. 2d Green Shale.	Wenlock Shale.
Pentamerus Limestone. Green Shale and iron ore. Medina Sandstone.	Caradoc Sandstone.

The following series exhibits the rocks of the 4th District in their order of succession, together with the names of a few of the most common and characteristic fossils. The list of fossils will be greatly increased when we succeed in ascertaining the names of species.

Old Red Sandstone.	Holoptychus Nobilissimus, Sauritolepis Taylori.* Fragments of teeth and bones of other fishes, probably the Megalicthys.
Chemung Group.†	A large Avicula is the characteristic fossil of many localities—Pterinea, Leptæna, Delthyris, Orbicula, three species, Tentaculites tenuis; several coralline fossils.
Portage Group.	Goniatite, rarely; Fucoides, vertical to the strata. The fucoid is the characteristic fossil.
Gardeau Flagstones.	Fucoides, arranged in short, rigid fragments, on the under side of the strata—seen on the surface of flagstones in many places. Other species of fucoides.
Ithaca Group.	Orthis, Leptæna, Delthyris, species undetermined; Fossil ferns.
Cashaqua Shale and Sandstone.	A large Avicula, Goniatite, Posidonia, Crinoidal joints, &c.
Upper Black Shale.	Posidonia lirata; Lingula, two species; Orthis, Orbicula.
Tully Limestone.	Atrypha ——— —, few fossils.
Moscow Shale.	Calymene bufo, Cryphæus calliteles, Homonolotus —, Atrypha affinis, A. prisca, Delthyris, several species.
Encrinal limestone.	Asaphus, (new species,) Avicula reticulata,(?) Crinoidal columns of great size.

* I have proposed the specific name of what I suppose to be an undescribed species and genus of a fossil Sauroid fish, in honor of Mr. R. C. Taylor, of Philadelphia, who first described the sandstone of Blossburgh, and suggested its analogy to the Old Red Sandstone of England.

† This group requires subdivision before it can be accurately described.

Ludlowville Shale. (upper part.)	Atrypa concentrica, Leptæna, Delthyris, Calamopora Gothlandica, Favosites, Cyathophyllum, several species.
(lower part.)	Several species of Pterinea, Strophomena carinata.
Compact, calcareous blue shale.	A few undetermined species are peculiar to this mass.
Black Shale, (pyritous.) Marcellus Shale.	Posidonia lirata, Orbicula, (small,) Orthis —, Pterinea ——, Leptæna Spinulosa ?
Dark, or olive Shale.	Orthis ——, Delphinula ——.
Seneca Limestone.	Strophomena lineata, Cytherina —, Favosites.
Onondaga Limestone.	Icthyodorulite, Odontocephalus selenurus(*Asaphus selenurus,*) Calymene bufo, or C. macropthalma, Atrypa Wilsoni, Strophomena rugosa, Læptæna indenta, Cyathophyllum ceratites, Favosites.
* Oriskany Sandstone.	Ichtyodorulites. The characteristic fossils, Atrypha elongata and Delthyris arenosa, are not found in this rock in the fourth District.
Hydraulic Limestone.	Orthis, Cytherina, Tentaculites,—usually in the upper portions of the mass.
Gypseous marls and shales, or Onondaga Saliferous group.	A thin shelled bivalve has been found in the rock overlying the plaster beds in Genesee county.
Red Shale.	Seen only in the eastern part of Wayne county.
Lockport Limestone.	Catenipora escharoides, C. ——,† Calamopora fibrosa, Cyathophyllum ceratites. Several other coralline fossils are peculiar to this rock. In its eastern prolongation, this rock is characterized by a species of Delthyris and Cytherina.

* In some places in the 4th District, this rock consists of a few inches of coarse sandstone or conglomerate, between the hydraulic limestone and the Onondaga limestone.

† This is an undescribed species, entirely distinct from C. escharoides, found in the Limestone in Ogden, Monroe county.

Rochester Shale.	Asaphus longicaudatus, Platynotus Boltoni, Homonolotus delphinocephalus, (Trimerus delphinocephalus,) Bumastis Barriensis, Calymene Blumenbachii,* Strophomena depressa, S. elliptica, S. modesta, Delthyris —, Orthis —, Caryocrinus loricatus, C. Ornatus, Gorgonia assimilis.
Limestone.	A large species of Orthis.
2d Green Shale.	Calymene Blumenbachii, C. bufo, Agnostis, Tentaculites, Orthis —, Strophomena —, Graptolites —,
Iron ore.	Fossils similar to those above and below. This mass is mostly wanting in the 4th District.
Pentamerus Limestone.	Pentamerus oblongus, Cateniphora labyrinthica, Favosites, &c.
Iron ore.	Fossils as above and below.
1st Green Shale.	Calymene, Delphinula —, Atrypa —, Strophomena depressa, Gorgonia.
† Medina Sandstone, red marl and shale.	Upper grey portions—Dictuolites Beckii. Below red and variegated—Lingula cornea, Planorbis trilobatus, Cyclostoma pervetusta. Cytherina, Fucoides Harlani, F. ——.

Of specimens illustrating the geology of the 4th District, there have been collected and deposited in the Geological Rooms, at the Capitol, thirty boxes, exclusive of those sent from Cattaraugus county by Mr. Horsford.

JAMES HALL,
State Geologist.

* It has been remarked that this fossil is found only in the Trenton limestone, and ceased to exist with the deposition of that rock. During the first season of my examinations in the 4th District, I found several fragments of this fossil, and during the last year I have obtained some fine and perfect specimens from the Rochester Shale. The same species, var. major, of Murchison, occurs in the shell grit of Eaton. It occurs also in the Green Shale below the Rochester Shale. See State Cabinet.

† This rock is the lowest in the 4th District, it being found bordering the shore of Lake Ontario, from Niagara river to the eastern limits of Wayne county. The Salmon river group, however, forms the bed of the lake, and in some places is probably at no great distance from the shore, as boulders and pebbles, containing the peculiar fossils of that group, are found on the lake beach in Niagara county and other places, and I have seen the same rocks in place on the north side of the lake, a few miles west of Toronto.

I would beg leave to acknowledge my obligations to the following gentlemen, who have manifested an interest in the progress of the survey, and to whom I am indebted for assistance in various ways: Hon. G. W. Patterson, Jerediah Hosford and Dr. Dwight, of Moscow, to Judge Smith and Mr. McKenzie, of Caledonia, Hon. Elisha Johnson, of Hornby Lodge, Portage, Mr. Rich, Mr. Miller and Mr. Clifford, of Genesee county; also several gentlemen named in the report. I would also acknowledge the polite attentions of Mr. Henry Wyckoff, of Lodi, Seneca county, whose name was omitted in the report of last year.

APPENDIX

TO THE

GEOLOGICAL REPORT OF THE FOURTH DISTRICT.

REPORT

Of E. N. Horsford, to James Hall, on the Geology of Cattaraugus County.

This county is among those of the Fourth District distinguished for their deep and extended valleys, and their ranges of elevated hills. The proportion of irregular surface throughout, but particularly in the southern part, is somewhat greater than it is in either of the counties in the same range, directly east. And, with the exception of the lowlands of the Allegany and Conewango, the amount of level land, compared with the area of the whole county, is in about the same degree less than it is in the other counties.

The valleys of Cattaraugus are remarkable for their uniformity, when viewed as great primeval water-courses, and for the prevalence, in different portions, of particular soils and dependent vegetation.

Their general direction is the same as that of the large valleys farther east,—from north to south. Toward their northern extremes, the beds of most of them expand gradually into plains of considerable width, limited by acclivities of gentle ascent on either side; while some branch into smaller and more irregular valleys. They become, also, more and more shallow, when examination is pursued to the north.

sea, down to the last subsidence of waters from the valleys. It differs essentially from either of the alluviums just described. Its materials have been transported but a short distance, and consist of fragments of sandstone in a siliceous clay, of such proportions, and of such texture, as to render cultivation difficult. Rank grass is produced from it, and oats are cultivated pretty well; but wheat can scarcely be grown at all; and such is the elevation, generally, that corn could rarely ripen, if the soil would promote its growth. It caps the hills, and walls the sides of the valleys; and is the cold compact soil which is regarded as the least productive of the alluviums of Cattaraugus.

Clay Beds.

In shallow beds, clay is found more or less in the valleys, but to no extent was it seen upon the higher lands.

That of the Conewango is by far the largest seen. It is observed at Randolph in several places and very possibly underlies a great portion of the immense lowlands and swamps.

It occurs in little "sags" upon the lands of Col. Hawley and Mr. Green in Great Valley. They are of a few square yards in extent, or a few square rods at the utmost; and will, from the small quantity of calcareous matter intermixed, be of value.

It is seen a mile west of Waverly in strata, and alternates with gravel and sand in an alluvial hill directly south of Waverly village.

A swamp on the land of Mr. Sweetland in Little Valley is underlain with it.

It is found about a mile south of New-Albion, an hundred yards from the mouth of a tributary to the stream along which the road passes.

Peat.

In the towns of Great Valley and Little Valley, the "sags" or depressions in which the clay is formed, contain more or less extensive bodies of peat. The largest is upon the land of Mr. Sweetland. About ten acres are spread over by the bog; and the depth of peat varies from a foot or two near the margin, to more than twelve towards the centre. As a manure and as a substitute for coal and wood, this bed in particular, and the smaller ones in proportion to their extent, must become of value. For the improvement of lands, the peat may be appropriated immediately and with great profit on most farms. The discussion of its various uses and the modes of preparation as a manure, may be found in the last year's report of Prof. Emmons.*

The occurrence of peat is generally indicated by the growth of dwarfish evergreens, and rank swamp herbage, and by the elasticity of the crust which supports them.

Marl and Tufa.

These deposits occupy in common with the clay, the superior place in the northern alluvium.

The largest bed by far, yet discovered in the county, is some two miles from Lodi, upon a small branch of the Cattaraugus creek. It lies southeast from the village, and about a quarter of a mile from the mouth of the branch. It has been owned and worked successively by different individuals. A kiln has been erected a number of years, and several thousands of bushels have been burned annually. But recently, great discredit has been brought upon the line of this locality by the too little attention to its burnings: so great as to induce purchasers to prefer going to Buffalo and Dunkirk for the stone lime rather than use it. If burned sufficiently, the tufa and marl limes are every way equal to the best of stone lime, except in solidity. From a safe estimate there are yet remaining 6,986 cubic yards, which, when burned, will furnish 151,590 bushels.

This bed and all others that may hereafter be found, will require careful management to furnish the region looking to the nearest northern point for a supply. There are considerable quantities of the tufa at this bed, in a granular state; which, when it shall be demanded by the scarcity of the compact variety, may perhaps be moulded into bricks by an admixture with the marl of some portions of the bed. Should the marl be found unfit for the purpose from its want of tenacity, the clay from the cliffs of the creek near may be used.

In the east part of Otto, upon the land of Mr. Sias, is a bed of marl that has been worked during the last four or five years. It is spread over between three and four acres, and is from a few inches to four feet deep. About one thousand bushels have been burned annually. With this marl there are no foreign substances, except now and then a

* Prof. Mather's report, page 216, contains two valuable letters upon this subject.

Cattaraugus alluviums, would uproot every expectation of finding mineral wealth in the soil. It might be quite possible to find a single piece of silver ore, as there have been found masses of primitive iron in such position; but when it is known that the metals are by far the smallest component parts of the earth's crust, and that most soils are fragments of this crust, gathered together by currents from widely separated localities, it will be no longer expected that, because a single piece of a precious ore is fallen upon, there are therefore indications that large bodies of ore, freed from admixture with foreign material, will be found in the same associations; or that even another piece may be procured at the same locality. And above all, it will be deemed the height of folly, to waste treasures in mere search, with no evidence of the near existence of the object looked for.

Boulders.

Of these there are more profuse distributions on the Cattaraugus, near Lodi, and in the course of the alluvium southward than any where else in the county. Trappæan, hornblendic, gneissiod, granitic and sienitic, and some others, are the representatives from more northern latitudes. One boulder of hypersthene was seen at the sulphur springs near Randolph.

Two boulders of iron, resembling the compact, fine grained, primitive ore, of the veins of McIntyre iron in the Adirondack lands, were found on the south branch of the Cattaraugus, near Little's mills. One weighs thirteen pounds. Both have been procured for the State collection.

Springs.

Springs of *Saline* impregnation are occasionally found. Several near Rutledge attracted attention in the early settlement of the town, from the numbers of deer who came to "*lick*" about them. Near one of these a shaft was sunk, in the hope that lower down the strength of the solution would be found greater. The proportion of salt was, we are informed, about a teaspoon full to a pail of water.

The *Oil spring* of Freedom, is in many respects like that of Cuba, in Allegany county. Its diameter is somewhat less, and the quantity of oil which in a given time rises to the surface is in proportion to its extent the same. But the association almost directly above of a sandstone, more highly bituminous than any other rock in the district, gives it an attraction which is not possessed by the Cuba spring. Between the lower outcropping of this sandstone and the spring there are about twenty-five feet of bluish aluminous shales, of the same character as those on the Cattaraugus creek, above Zoar. Excavations in several places about the spring have been made, in the hope of finding coal, which have revealed the rocks in the vicinity, and furnished some evidence concerning the origin of the petroleum. In one of the holes, about a dozen yards from the spring, after digging fourteen feet, a thin hard stratum was struck upon, too firm to yield to the pick-axe and spade, which had been the only instruments used in throwing out the softer shale. A bar was then obtained, and the hard layer perforated. The instant the hole was forced through, the pure, glossy, black petroleum, mingled with water, gushed up with great violence. In a short time the whole excavation was filled, and such was the quantity of pure oil upon the surface, that several gallons were carried away daily for a considerable time.* After this event, the issuing of oil at the old spring was lessened, and in process of time the passage to the source of the oil in the excavated spring became obstructed; so that now the whole quantity is less than it was in the early settlement of the country.

Carburetted hydrogen is emitted at this spring in small quantities. It is observed to escape from almost all waters, either stagnant or running, in the county. It is seen bubbling up through the waters of most large springs. The only place where the quantity is sufficient to maintain a constant flame, is at the mouth of a small stream coming in to the Cattaraugus, against the missionary house, about five miles above La Grange.

Sulphur springs are occasionally met with. One upon the land of Judge Leavenworth, near Randolph, is pretty strongly charged.

Several have been noticed issuing from the Cashaqua shales, at the bases of the cliffs upon the Cattaraugus creek and the South branch.

Rocks.

There is an obvious thinning out to the west, of some of the groups which were last year established in the section along the dividing line

* We are indebted to Mr. Roselle, the proprietor of the lands, for personal attentions, and the above information.

the general deposition. In some of them there is an admixture of the black oxide of manganese.

The rock is principally composed of white and yellowish quartz pebbles and sand. The former vary in size, from a large grain of sand to that of a hen's egg. One measured three inches in length. The thickness of the whole strata is variable. South of Olean, it is generally less than twenty feet, while at Rock City near Great Valley, some blocks are thirty-five, and at Merritt's mills upon the Allegany, ten miles below the State line, the cliff is more than one hundred and fifty feet in height.

QUARRIES.

From the abundance of timber in Cattaraugus, little need of good building stone has hitherto been felt, and, consequently, little exploration has been made for valuable quarries. Of those opened in different parts of the county, nearly every one will be found noticed in the list which follows.

The quarries against Olean, contain micaceous sandstone, and an olive shale, which is concretionary. The stone at the lower quarry are coarse, while at the one some fifty feet above, they are of a finer grain. The underpinnings and cellar walls of many buildings in Olean, have been obtained from them.

A quarry owned by Mr. Pratt, in a small alluvial hill, an hundred rods down the river, from the quarries above noticed, is nearly exhausted.

In a ravine which is entered just south of Pratt's quarry, there are found masses of a coarse sandstone, like that alternating with the conglomerate which is seen a few miles south. These masses are strewn along the ravine its entire length. In the hope of finding the rock in place, an expedition, in company with several gentlemen of the town,* was made to the summit of the mountain. All the way from the base, in following Pratt's ravine, to within a dozen yards of the very highest point, masses of the rock, coarse grained, micaceous and characterized by vertical fucoides, varying in magnitude from blocks of a cubic foot to those of several cubic yards, were found indiscriminately scattered about. So angular were they, so frequent, and so wholly above the

* Messrs. McMartin, Penfield, Richardson and others.

earth, that it seemed as if the ledge could be, at the most, but a few yards distant, at every place a stop was made. At the termination, there are no appearances that indicate the occurrence of a ledge; such as projection above and abruptness below, or large rectangular masses lying near each other, with matched edges. But on the contrary, their surfaces, their roughness, their association and position display nothing more striking at the highest point, than the groups a few yards from the base of the hill. Upon the highest point none were found; and it may be accounted for satisfactorily, upon the supposition that the fragments in question were component parts of one of the lower layers of the coarse sandstone and conglomerate, whose outcrop, a little farther south, has already been mentioned. If this occupied the plot terminating the ascent, it may all, in the agency of the great bodies of water which once lashed even the highest cliffs, have been easily wafted from the summit and distributed down the sides.

The same rock occurs in several places along the Allegany, in huge fragments, and is seen to be of the most durable character, from the unchanged angularity of the masses, notwitstanding their long exposure to the action of the current.

From examinations made in Pennsylvania, its true place is ascertained to be in the lower part of the conglomerate. Could it be obtained south of Olean, without too much excavation, its value as a material for public works, would bring it immediately into demand.

Nine miles below Olean, sandstone, slightly concretionary, has been quarried for the filling up of dams and other purposes.

The *Ischua stone quarries*, lying almost wholly in the town of Machias, contain stone with which there are none other in the county to be compared, either for beauty when dressed, for readiness in getting out, or for durability. They are a coarse sandstone, disposed in massive, and in thin layers, of such thickness, that blocks for every desirable purpose, from heavy columns to thin flagging stone, may be procured with facility. There are, indeed, no stone, except some of the limestones north, in all western New-York, that equal them.

Butler's quarries, three miles north of Franklinville, have been most extensively worked. The foundation walls of Irvine Hall, Ellicottville, were here procured. The quarries are in the visible outcrop, which extends for a considerable distance, with a gentle ascent behind, scarce-

Of specimens for the State collection, there were sent from Cattaraugus, eight boxes.

We are indebted for personal attentions and acts of kindness, to Messrs. Ewing & Leavenworth, of Randolph, and Col. Hawley, of Great Valley.

Respectfully submitted,

E. N. HORSFORD.

Assistant Geologist,

Fourth District, N. Y.

GLOSSARY OF TECHNICAL TERMS.

Alluvium. A recent deposit of earth, sand, gravel, peat, &c.; the term is applied to depositions which are now accumulating, as at the mouths of rivers, &c.

Alum rocks. Rocks which, by decomposition, form alum.

Amorphous. Bodies devoid of a regular form.

Amygdaloid. A rock more or less cellular in its structure, and at the same time abounding in cavities in the shape of an almond. It is one of the class usually called Trap rocks.

Anticlinal axis, ridge, &c. The line from which the strata of any formation dip in two directions, like the roof of a house.

Augite. A simple mineral of variable colours, passing from white through gray, green and black of different shades. It is a constituent of many volcanic and trappean rocks, limestone, granite, &c.

Basalt. A black or grayish black compact rock occuring frequently in a columnar form, as at the Giant's Causeway in Ireland. Many geologists consider it to have been formed by the fusion of augitic and feldspathic rocks under great pressure, as at the bottom of an ocean or deep sea; hence its compact structure.

Basin. Deposits lying in a hollow or trough-shaped excavation, are said to occupy basins.

Bed. A mass of mineral matter lying between the layers or strata of any rock.

Bitumen, bituminous, &c. An inflammable substance which presents itself under two forms, a solid and liquid; when in the former state, it is called *asphaltum.* In its liquid state it is like tar. Seneca oil is an example of it. Coals, slates, limestones are often bituminous.

Blende. A German name for sulphuret of zinc.

Boulders. Rocks which have been transported some distance from their original beds; they are more or less rounded by attrition and the action of the weather.

Botryoidal. Resembling in form a bunch of grapes.

Breccia. A rock or portion of a rock composed of angular fragments, cemented together by lime, iron, or some other substance.

Calcareous spar is crystallized carbonate of lime.

Calc sinter. A deposition of porous carbonate of lime, from the waters of mineral springs.

Carbon. A simple substance, known in a pure state in the diamond only. It is one of the combustible elements in coal.

Calciferous. Bearing or containing lime.

Carbonates. Compounds formed by the union of carbonic acid and a base.

Carbonic acid. An acid gaseous compound composed of carbon and

Garnet. A hard reddish or brownish mineral usually crystallized in the form of a solid having twelve rhombic or diamond shaped faces or planes.

Geology. A science which has for its object the investigation of the structure of the earth and the materials of which it is composed. Connected with these investigations, are deductions which may be derived legitimately from the known influences and effects of causes; these are employed as expressions of the modus operandi by which the earth has deen brought to its present state.

Gneiss. A stratified primary rock, composed of quartz, feldspar and mica.

Granite. An unstratified rock, composed of quartz, feldspar and mica.

Grauwacke, graywacke. The name was originally applied to a rock composed of grains and pebbles cemented together by clay. It belongs to the transition series. The name is applied also to a group of rocks in the same series, consisting of sandstone, slates or shales, alternating with limestone, sandstone, &c. The term is rather indefinite, yet very frequently used.

Green sand. Beds of sand, sandstone, limestone and marly clays, intermixed somewhat with greenish particles, belonging to the cretaceous period, and situated beneath the true chalk.

Greenstone. A variety of trap, composed of feldspar and hornblende.

Grit. Coarse grained sandstone.

Gypsum. A mineral composed of sulphuric acid and lime.

Hornblende. A mineral, usually of a dark green colour; crystallizing in long slender prisms.

Hornstone. A silicious translucent mineral, resembling flint, but tough and more difficult to break.

Incandescent. White hot—a degree of heat more intense than that at redness.

Iceberg. Floating masses of ice.

Ichthyosaurus. A fossil reptile, intermediate between the crocodile and fish. A fish lizard.

Induction. A consequence, conclusion or inference, or some general principle drawn from facts or phenomena.

Io-situ. Original position.

Isothermal. Equality of temperature. Zones, lines, &c. where an equality of temperature prevails are called *isothermal*.

Lacustrine, of or belonging to a lake.

Laminæ. Plates, sometimes used as synonymous with layers.

Landslip. Land which has slidden down an inclined plane, from its position in a bank or terrace. It is generally produced by water, which either undermines the mass of earth, or insinuates itself into it, so as to render it semi-fluid.

Line of bearing. The point of compass to which the anticlinal ridge or line runs, or is directed. When the antiangle ridge cannot be determined, the *line of direction* may be known by ascertaining the intersection of the planes of the strata with the plane of the horizon, that will be the line of bearing.

Lithological. The character of a rock or formation considered with reference solely to its mineral composition.

Lignite. Wood partially carbonized in the earth; it usually retains the vegetable structure. The change does not seem to have been effected by heat, but is the result of some chemical process, as the action of pure sulphuric acid in some instances, and of water in others.

Littoral, of, or belonging to, the shore.

Loam. A mixture of sand and clay.

Mural Escarpment. A rocky cliff, more or less inclined.

Mammillary. Protuberances on the surface of a mineral, which are segments of sphere; mammæ, breasts.

Mammoth. An extinct species of animal, allied to the elephant.

Marl. Any mixture of clay and carbonate of lime, which effervesces with acids.

Matrix. *Gangue*. The mineral mass which is in immediate contract with the ore of a metal, both of which constitute a vein.

Manganese. A hard black mineral, resembling the dark coloured hematites. It is the oxide of manganesium, one of the metals.

Megatherium. One of the extinct fossil quadrupeds, resembling the sloth.

Mechanical origin of, Rocks composed of sand, pebbles, &c. or sedimentary rocks generally, are said to have a mechanical origin. The term is used in contradistinction to rocks having a crystalline structure, which have a chemical origin.

Mica. Sometimes called isinglass. A mineral, which may be split into numerous elastic laminæ.

Mica slate. A primary rock, composed of fine grains of quartz, and generally small scales of mica. It is eminently fissile.

Miocene. An era or period subsequent to the eocene, and characterized by a greater proportion of animals analogous to those now living. Deposits formed during this period are termed miocene strata.

Molusca. Moluscous animals. Those soft animals, whose covering is a thick shell, as oyster and clam.

Monocotyledonous. One of the grand divisions of the vegetable kingdom. It includes the grasses, palms, liliaceæ, and whose seed have only one lobe.

Mountain limestone. A series of limestone strata immediately below the coal measures.

Muriate of Soda. The chemical name for common salt, because it is composed of muriatic acid and soda.

Naphtha. A very thin volatile inflammable liquid, of which there are springs in some volcanic districts.

New Red Sandstone. A series of sandy, argillaceous, and often calcareous strata, whose predominant colour is brick red, but contains many spots and stripes, which are gray and greenish gray. It is therefore sometimes called the variegated sandstone. It overlies the coal measures.

Nucleus. A solid central piece, around which layers of the same or other matter has collected. The kernel.

Old Red Sandstone. A rock belonging to the carboniferous group.

Oolite. *Oolitic*. A limestone composed of rounded grains, like the roe

Tufa, calcareous and silicious. Porous or earthy deposits from springs of water, containing lime or silex.

Tuff or Tufa, Italian. A name for a volcanic rock of an earthy texture.

Unconformable. See *Conformable.*

Veins. Openings or fissures in rocks, filled with stony or metallic matter.

Zoophites. Animals of the lowest order, as sponges, corals, &c.

GENERAL INDEX TO THE REPORTS.