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November 15th, 1848.—The session was, at the request of the Council of the Society, opened by the following Address from the President, Professor Oldham.

GENTLEMEN,

WE meet this evening, at the commencement of the eighteenth session of our Society, the first during which we assemble within the walls of our University; we meet under circumstances somewhat different from those under which we have hitherto assembled; with new prospects and with new hopes. It appeared, therefore, to your Council not undesirable that these circumstances should be briefly adverted to; that this change in our condition and prospects should be noted, and that the ground of these hopes should be placed before you; and on me, as President, has the duty necessarily devolved.

The Geological Society of Dublin was, as many here are no doubt aware, established in the year 1831, for the express object, as stated in the constitution of the Society, "of investigating the structure of the earth, and more particularly of Ireland," and it at once took a high position among the scientific bodies in this city. We are not unwilling to believe that much of this rapid distinction

was due to the gratifying fact, that the Society when called into being, was presided over so ably during its first two years, by the then head of this University, whose name is so gratefully remembered by all who have traced the progress of knowledge and of education in Ireland, and whose presence among us was felt to be a guarantee amply sufficient that our efforts would be wisely and effectively directed to the advancement of our science, and to the improvements in its applications to the purposes of art. And we would gladly wish that some of the fame which sheds a halo round the memory of the late Provost, to whom the improvements in education are so deeply indebted, should be shared by this Society, as one of the means for that advance, which his sagacity foresaw, and his energy carried out.

With varying but still marked success, the Society continued its meetings for many years. It elicited many papers of great interest and value, relating to important points in geology, both abstract and descriptive; and our Journal may safely be referred to, as containing communications full of valuable matter to geologists in general, and more especially to those who would make the geology of Ireland their peculiar study. But in the history of every such Association there comes a period, when, losing the excitement of novelty, several, who at first, perhaps, eagerly joined in the project, become cold in their service, or leave its ranks—when some trifling cause, which at other times would never be thought of, is a sufficient excuse for many to change their plans—or when a cessation of personal intercourse leads to the abandonment of common pursuits; and to some such cause it is not improbable that we must attribute the difficulties in which the Society found itself placed about the year 1841, when its regular income becoming insufficient for the purposes to which it was applied, it became necessary to give up the rooms it tenanted. Previously to this a considerable sum had been expended in the purchase of such books of reference as were considered of essential importance, and very considerable progress had been made in the bringing together a series of rock and fossil specimens, such as would facilitate the study of our science, the extent of which will be seen by a reference to the catalogue published by the Society, at that time, and drawn up by Mr. M'Coy.

To any one acquainted with the working of public bodies, it will be quite needless to remark on the injurious effect which such a

step as a removal, and consequent abeyance of a Society, however temporary, must necessarily exert on its prospects; and your Council could not, therefore, feel any surprise, however much they must have regretted it, to find that in consequence the annual income of the Society was for a time very considerably diminished. By great exertions on their part, however, apartments were secured in an unoccupied portion of the Custom House, well adapted for the purposes of the Society, and your collections removed there. Gentlemen, I would be wanting in my duty, were I not here to express the debt of gratitude which the Society owe to one of their oldest and warmest supporters, Mr. Hutton, for the ready and liberal manner in which they were accommodated in his own house during this interregnum. These apartments being granted to the Society, free of expense, so long as the public service should not require them, the entire of your funds became applicable for the more legitimate objects of the Society; and I need only point to the annual reports of your Council, and to the Treasurer's accounts annexed thereto, to prove that those funds have been most effectively and economically applied. Your collections continued to increase in number and value—donations poured in rapidly—your library of books, charts, and maps was rapidly progressing also, and every thing seemed to promise to the Society a successful career; your museum was freely thrown open to the public on two days in the week, and every aid that it was in the power of the Society to give, was afforded to the student of geology, or the investigator of its applications.

Such was the progress of the Society from the time of its location in the Custom House, in 1842, until the summer of 1847. The painful visitation of that year must still be fresh in the recollection of all; and while your members were each anxiously engaged in their individual efforts for the relief of the distress which surrounded them, and so employed, that there seemed but little prospect that sufficient attention could be given to the pursuit of scientific inquiries, (for it is not when the mind is harrassed by anxiety, and the feelings strung by the emotions of pity and distress, that we can calmly devote ourselves to such pursuits;) and while, consequently, the progress of your Society seemed, for a time at least, and *indirectly*, to be seriously menaced, the same distress affected you more *directly* in another way. The very great increase

in the number of persons employed in those public departments more immediately engaged in the alleviation of the general distress, necessarily demanded increased and immediate accommodation; and your Council was therefore called upon, rather suddenly, to give up the rooms they occupied, those rooms being imperatively required for the public service. Gentlemen, having been at that time one of your Secretaries, I can therefore speak with some knowledge of the facts, and assure you that no proper exertions were spared by your President and Council to avert this injury, as far as in them lay; but I think I need only refer to the circumstances of the time to prove that this necessity for increased office accommodation did in reality exist on the part of the public departments. Finding it, therefore, vain to seek a continuance of those apartments, it became essential that your Council should determine what they would recommend to the Society to be done with the collections, and what steps should be adopted to secure the effective working of the Society for the future; and, after many and well matured deliberations, it was decided unanimously, that the recommendations submitted to a special meeting of the Society in December last, should be adopted. You are aware of the purport of those resolutions, and of their being unanimously confirmed by the Society at large. The officers of the Society were authorised, and proceeded to carry out these arrangements, and in consequence of them we now meet within the walls of the University, and under the sanction of its governing body, who most warmly seconded the views of your Council.

This change, however, gentlemen, appears to involve many more important considerations than a mere change of our abode, and it has not therefore been thought desirable to pass it over without notice.

At the time of the establishment of the Society, it was not until after much deliberation that it was determined to found a Museum in connexion with that body. Strong and influential opinions against the advisability of that course were forwarded to several of the members then anxiously engaged in framing the constitution of the Society—opinions derived from, and sanctioned by, the experience of similar associations in London and elsewhere. But after full consideration of all these reasons it was ultimately determined by the Society to commence a Museum, and I most fully concur in the

wisdom of that determination, under the circumstances. There was at that time in this city, no collection whatever available for the geological student—of simple minerals there did exist some collections, though not very usefully arranged for the student; but of geological, in its proper sense, there was literary none. Now, it was perfectly essential for the success of the Society, that such a collection should be accessible; and most wisely, therefore, did its members devote much of their attention to such an undertaking; and previously to its transfer to the University, a collection had been brought together and arranged, quite sufficient to enable the student of geology to acquire all the aid requisite in his studies. Again: more recently, when the applications of geology became of importance, the Society most wisely, (and most effectively too, considering the means at its disposal,) established a collection illustrative of those applications, and were thus the first, in this country, to found a Museum of economic geology.

But these necessities, I believe, would not have existed, were there other collections in this city available for these purposes; and had this been the case, it does appear to me that it would have been a misapplication of the funds of the Society, to have devoted any portion of them to the accumulation of specimens illustrative of such inquiries, when such collections were accessible elsewhere—and such, I believe, was also the feeling of your Council. It became, therefore, a special object for their consideration, whether, in the progress of time, circumstances had so changed, as to render any alteration in their arrangements desirable. Their experience had taught them practically the justice of the forewarnings they had received at their commencement, and they had felt that the reasons urged then against the establishment of a Museum were not without good foundation. Nor while they had been so anxiously devoting themselves to the spread of geological knowledge, had they been unmindful of the exertions made by other bodies in the same direction They hailed with sincere gratification the appointment in this University of a Professor of Geology in 1844, and the nomination to the chair of one who had so long and so sucessfully cultivated the science—they saw with peculiar pleasure the subsequent placing of the Museum here, under the charge of one of your Secretaries, knowing full well that the untiring zeal and unfailing exertions of its director would render that Museum worthy of the institution to

which it was attached, and of his own high and well earned reputation—and they perceived, and rejoiced too in the fact, that the collections of the Royal Dublin Society, under the charge of their able and deeply-read Professor, Dr, Scouler, were greatly increasing in extent and value—while, as regarded the applications of geology to practical purposes, it was with unmixed pleasure they watched the establishment by her Majesty's government, of a Museum of Practical Geology, under the immediate control of one of their own members, Sir Robert Kane, in which the objects which they had attempted with their limited means would be effectively and liberally carried out—while the extension of the Geological Survey of Ireland, in connexion with that of Great Britain, (thus securing an unity of principle in the execution of the work,) was an additional proof that public attention had been effectually aroused in this country to the value of such pursuits, and that however little they may have gained in a pecuniary point of view, still they had been instrumental in advancing the science, by increasing the number of those interested in it.

Carefully considering these facts, they thought it would be worse than useless for them to attempt, with their very limited resources, to fulfil duties which had been liberally undertaken by others with abundant means at their disposal; they, therefore, recommended that all your collections should be handed over to the University, satisfied that by the exertions already made by that body, a sufficient guarantee was afforded that these collections would be effectively and judiciously applied for the advancement of the science. They felt also in some degree honoured by having it in their power to make an acknowledgment of those important improvements; while at the same time they trusted it would prove an encouragement to their further extension.

In pursuance of this arrangement we meet this evening, gentlemen, within the walls of that University where most of us first imbibed our love of knowledge, where our most lasting associations were formed, and to which we look back as the source of our purest and highest enjoyments. We meet, too, under the roof of one who has so ably seconded and carried out the enlarged views of our first President; and who, through good report and evil report, has steadily advanced our views, and aided our intentions. We meet in a new abode, and under new auspices, with increased hopes

for the future, and increased pleasure in the retrospect of the past. It would be idle to attempt to conceal from ourselves the importance of such a change. To be thus admitted into connexion with the University, and to be acknowledged by the heads of that body, is an admission and acknowledgment not so much of us as a Society, as of the value and utility of the objects for the cultivation of which we are associated, and of those objects also in their highest and most important end, viz.—as a means and as a branch of education; and this consideration naturally suggests a few remarks on the real end and aim of our studies, and on the means which we can bring to bear on their improvement.

Probably the best, because the simplest, definition of geology, consists in the literal translation of the term itself, and we would thus define it—as the science of the earth, or the history of the earth, taking these words in their full and extended significations. It would be quite out of place here to detain you with any statement, however brief, of the successive phases through which this study has passed, or even to allude to the wild speculations of the earlier inquirers, in which geology was mixed up with the dreams of mythology, or fancies in cosmogony—speculations to which, however, we think too much blame has been attached, for from the then state of the collateral sciences it was impossible that any very sound advance could be made in geology. But there have been two prominent epochs in the history of our science, to which we may profitably allude for a few moments, inasmuch as the doctrines then propounded and received, have exerted, and continue to exert, an influence on the progress of our study—I allude to the times of Werner and Smith.

Long before Werner sent forth from Freiberg his system of geognosy, several valuable attempts at classification of the rocks of our earth had been made, and much information obtained; but it was reserved for him to propound a general theory regarding their distribution and classification, the principal features of which I need scarcely say, were the universal distribution of certain formations in a certain order, and the general aqueous origin of all rocks. It cannot be doubted that the classification adopted by him was a retrograde movement as far as scientific principles were concerned. His views were derived from a limited examination of a very limited district in Germany, and hastily and unphilosophically generalised

into a scheme asserted to be applicable to the world at large; and in this scheme he almost totally neglected all the information which had been already obtained as regarded fossils, Gifted, however, with a power of throwing a charm about his subject, which drew to him from every quarter eager and attentive pupils, investing those speculations with an ideal generality which they possessed not in fact; and in some degree masking the physical improbabilities of his hypothesis by his own peculiar acuteness of observation and power of methodising, he excited a similar earnestness in the students at Freiberg, and by their travels his views became rapidly spread, and maintained for a long time a supremacy among geologists. The notion of the aqueous origin of all rocks was at once and seriously contested, because there were few districts which did not afford proofs of the untenability of such an hypothesis; and the futility of trusting to mere mineralogical or lithological characters was also shown very soon; but to upset the most dangerous part of his scheme—that of the universality of the formations—was not so easy, for this required extended examinations in many districts, and in large areas. This notion, therefore, continued to exercise a most pernicious influence on the progress of the science—an influence, I regret to say, by no means exploded; for even in one of the most recent papers on descriptive geology published in Great Britain, we find the unconformability in area of two distinct groups of rocks (the old Red and Silurian) stated with all the prominence of italics, "as a most important conclusion," derived from extended examination—while in a proper view of the case it would have been indeed a most important conclusion, and one to be established only by careful examination, but never anticipated, were they really coextensive. It is unquestionable, that much of the errors which such a scheme contains, arise from the appearances presented in an isolated and very restricted area being considered representative of those which are universal; and it is not improbable also, that had circumstances placed Werner in a district of a different character, his scheme might have been very materially modified.

The epoch of Smith and Cuvier was also marked by a rapid accession of knowledge in our science; and by the proposition of sounder and more generally applicable views, and the observations of Smith, which established the fact of successive groups of organized beings being found in, and confined to, successive groups of

strata, excited great and deserved attention; but while tending most essentially to advance our knowledge on the subject, appear to me to have exerted an injurious influence also, from which we have not as yet been altogether freed.

The interest which such laws gave to to the examination of the fossiliferous rocks was such as to excite to the study geologists of every country. The value of their aid as auxiliary to the inquiries of the geologist became so apparent, that he forgot they were valuable only as explained by the naturalist. The advantage of a knowledge of the remains of animals and plants found in rocks, as elucidating the structure and mode of formation of these rocks, was so apparent, that every geologist devoted himself to ascertaining this knowledge, forgetting at the same time, that the only means he possessed of acquiring it, was by a study of similar creatures now existing, and many, anxious to describe the fossils which they found, were led to do so without due knowledge, and trusting to mere external form as a distinction.

A new name was given to this so called *new* science, and Palæontology was looked upon, described, and stated to be (and even still is by many) a branch of geology. We have on more occasions than one before now, endeavoured to show the fallacy of this notion. There is, there can be, no *new* science of fossil remains. The only means we possess of knowing any thing whatever regarding the structures and habits of creatures found fossil, is by a knowledge of the structures and habits of creatures still living. The study of the one is only an extension and an essential part of the study of the other; the objects, the laws, the methods of investigation, which regulate the one, are the same as those which should regulate the other. The examination of a plant, and the deduction of just inferences from that examination, is as much the duty of the botanist, and of him alone, whether that plant was gathered this morning, or whether we find its remains in the rocks formed countless ages since. The investigation of the skeleton of an animal, or of the shelly covering of a mollusc, belongs to the zoologist and comparative anatomist, and to him alone, altogether independently of the locality where they may have been found.

And if in existing nature it may be fairly demanded, that he who will undertake to describe the habits and structures of existing animals, should himself examine into those habits, and investigate

that structure, and if the conclusions of him who will be content to take such information from others, and seek not to ascertain the circumstances peculiar to the existence of such creatures, but depend on external form alone—if, I say, the conclusions of such a man are justly reckoned as of little authority, how infinitely less confidence should be placed on the conclusions of those who, in the much more difficult task of unravelling the habits and structures of those organisms, which we only know from their remains, rest contented with examining the collections of others, and, regardless altogether of the many causes which may have produced variation of form, hasten to accumulate distinctions, and to string together catalogues, which, thus prepared, serve no other end than to confuse our knowledge.

We would not be understood as in this arguing against the collection and study of these organic remains. Of their extreme value we are satisfied; nay, we believe, that that value has hitherto been much, very much underrated, or at least very *erroneously* estimated: but we would in the very strongest terms protest against the idea which appears to have possessed the minds of many labourers in this field, that such a study can be undertaken without, or independently of, existing organisms; and we would assert, that no benefit whatever can arise, so far as the true end and aim of geology is concerned, from such examinations and such classifications, even of thousands of different forms.

Be they ever so multiplied, facts when isolated are but of little value. We want the power and the means of colligating them. We see not the causes or the circumstances which have contributed to the production of the phenomena; and we cannot, therefore, trace, or even attempt to trace, the consequences which must result from them. It is in this, as in every other physical science—indeed in every branch of knowledge, the connexion of cause and effect, (to use the terms ordinarily employed,) this intimate and necessary dependance of every existing phenomenon on previous ones, that we seek to know and to discover; and the moment that we cease to be able to refer phenomena to their causes, that moment our knowledge of them becomes barren of its effects, and comparatively useless.

In the study of organic remains, therefore, we must never cease to search into the conditions of their existence, the effects which a

change in these conditions may have produced, the duration of that change, whether temporary or not; and therefore, whether on the return of similar conditions, similar forms of life have not also returned. We must seek to discover the laws which governed their distribution—the centres from which they have spread—their maximum period and maximum places of development; and thus, and thus alone, can we hope to eliminate from them the full measure of that information which they are capable of affording; and thus, and thus alone, will the study of palæontology have contributed its due share to the progress of our knowledge. While at the same time it must always be borne in mind, that in such inquiries the physical evidence of the condition of the area must never be made to yield to conclusions derived from organic investigations alone. The phenomena of life are too complicated and too numerous ever to be placed in fair competition with the laws of matter, and in all cases where there appears an opposition in their testimony, natural history must be led by physics and chemistry, and the right of precedence here, as elsewhere, be given to the exacter sciences.

It is always a difficult task to alter the general opinion on any subject, however erroneous such opinion may be. Facts, when discovered for the first time, either appear to the observer to harmonize with, or to be discordant from, those already known; they are looked upon either as confirmatory of known laws, or else as apparently contradicting them; and thus it would seem a necessary consequence of the state of our knowledge, that we seek to explain them by a reference to facts which we consider as more known, because of more frequent occurrence. The observers themselves are supposed to be, and probably are, the best qualified to suggest the best explanation; and this explanation, thus given, is received and held on their authority; phenomena being thus, on their first discovery, attributed to laws with which perhaps they have no true relation, and so attributed, simply because we are not acquainted with their correlative phenomena, these laws continue to be supposed applicable to the facts, at least by the majority of persons, long after their inapplicability may have been proved. The tenacity with which so called "popular prejudices" are held, may furnish a familiar proof of the difficulty of removing from the public mind ideas which usage has made a part of early tuition. And it is to some influence of this kind, it is certain, that we owe the very inju-

rious effect which the once popular notion propounded by Werner, of universal formations occurring in all countries in the same definite order, long exerted on the investigations of geologists, and even still continues to exert.

Smith and Cuvier had taught them a safer and a surer guide to a knowledge of the successive phenomena which had occurred on the earth's surface, than the mere mineralogical examinations which Werner had inculcated, and yet they continued to apply to this new method of investigation the same laws, the same principles, which had been arbitrarily applied to the old one. The regularity and remarkable precision found by Smith to occur in the neighbourhood of Bath, and by Cuvier at Paris, was at once supposed, without the slightest investigation of the facts, to apply to all other districts; and the rocks of one country were sought to be *forced* into a parallelism or agreement with those of another. The truth announced—and cautiously announced—by Smith, that each group of beds was characterised by peculiar organic existences, not found in the beds above, nor in those below, was perfectly certain as regarded the district in which his examinations were carried on; but it ceased to be applicable—that is, applicable with the same distinctness or precision—to any other district where the conditions had been different. Because it was found in one limited area that it might safely be asserted, that rocks which contained the same fossils were of the same age, this proposition, perfectly true in that limited sense, was at once, though most illogically, asserted in a general sense. It was forgotten to be considered, that the existence of organized beings inevitably depends on a variety of conditions favourable or unfavourable to their continued life, and that, therefore, that existence may in one district be continued through a much longer or shorter period, accordingly as those conditions may prove of longer or shorter duration. The discovery of the value of fossils having shown the uselessness of mineral character alone as a means of classification, the study or observation of that character was entirely neglected, although it should have been remembered, that in most cases it is the only satisfactory evidence we possess of the physical circumstances of the area under examination at the period of the formation of the rocks.

Gradually, however, new and sounder views have taken their ground, and instead of searching after and recording facts, however

unconnected, or collecting fossils, merely for the sake of adding uncouth names to some useless catalogue, and then boasting of how many hundred species have been noticed, a more philosophical spirit of induction now reigns. The laws which influence the distribution of animals and plants at the present day are searched into; the effects of permanent alterations in the medium in which they exist, the mode of accumulation of given materials under given forces, and the modifications to which these are subject—these are all eagerly investigated; and by the application of the line and the measure, results are obtained hitherto unequalled for their accuracy.

To this end the labours of British geologists have in no small degree contributed, and the establishment of the Geological Society of London, with the express view of investigating and collecting facts, regardless of theory, was one of the most important steps. Recalled from the absurd and monstrous speculations of olden times, to the safer and more valuable induction of facts, its members, ably seconded by the geologists of France and Germany, have brought together an immense mass of evidence, and accumulated a surprising amount of information—evidence testified by so many unconnected observers from various countries, and whose prejudices were all so varied, and so opposed, and so entirely uncontradicted by any conflicting testimony, that the truths thus established become irresistible, and preclude for ever the possibility of theorists reverting to speculations of the ridiculous nature of those of the early investigators.

I have, however, little doubt, that this exclusive devotion to the investigation of facts, has itself had an injurious effect of another kind, viz.—that it has repressed all saliency and originality of thought, and given a new, and even more pernicious, direction to that tendency to speculate which is inherent in our nature. The impossibility of pleading ignorance of the facts, or of running counter to them, has led to hasty generalizations of those facts; and these generalizations, necessarily put forward by men of high and original stamp of mind, as great and comprehensive truths, are received and retained by others. Much yet remains to be done in the removal of such difficulties, and much has yet to be unlearned. It appears to me a false and dangerous philosophy, though sanctioned by many of the high names in our science, which seeks to separate the observer from the investigator, to limit some to "the

bag and the hammer," while others presumptuously arrogate to themselves the sole authority to reason on the facts. The eye of the mind must be educated and exercised as well as the eye of sense. It is unquestionably true, that without this exercise of our reason in speculating on the causes of what is before us, we may see what others have seen before, and thus confirm knowledge already possessed—but if our observations are to tend in the slightest degree to advance the bounds of that knowledge, or correct its errors, we must be fully aware of the supposed causes of these phenomena, and make our observations the test of their truth. We must know why, as well as what, to observe.

And not the least advantage resulting from such studies, considered as a means of education, consists in such habits of observation, which they necessarily produce, together with their inevitable consequences, viz.—that they call into being, and provoke the exercise of a process of self-education, without which no man is well taught. For although in this, as in every other physical science, where the great means of acquiring knowledge is by observation—although, I say, much must be received on the authority of others, unless we would have the human mind remain stationary, and allow the accumulated stores of information of one man, or one generation of men, to be lost to another, still each for himself must go over these observations—each must trace the steps in the reasonings founded on them, and stamp those reasonings with the impress of his own individuality—each must observe, each must compare, each must discover for himself. And this process seems unavoidable, because it is to the mass of learners impossible to convey by the description of others, however lucid they may be, a clear conception of material forms and arrangements, which must be seen to be understood. The students are thus compelled to go to the great book of the world itself for their information, if they wish that information to be accurate; they are compelled, to use the graphic terms of Leonardo da Vinci, to be "the children of nature, and not her grandchildren," and to compare the records of others with that original record which she has every where placed before their eyes—the writings of men with "God's epistle to mankind," the earth. And we may safely affirm, that such habits of observation and comparison once produced will continue to be exercised. I think it is Savage Landor who eloquently says, that "nature

cometh not into the market-place with sound of trumpet to proclaim her truths." They must be sought after patiently and carefully. We must devote ourselves to her service, if we would be honoured by her confidence. "Rerum natura," says Seneca, "sacra sua non simul tradit * * * illa arcana non promiscue nec omnibus patent; reducta et in intimo sacrario clausa sunt." * * * "servat, quod ostendat revisentibus."*

In the prosecution of such inquiries also, new methods of reasoning and new modes of research are called into action. The questions to be solved are not of our own imagining, they are ready prepared to our hands. We cannot start by our own suppositions, and setting down definitions demonstrate identities as determined by a reference to such definitions. We must compare, we must determine resemblances by a reference to types. and establish a similarity in effects by their analogy to known results of known causes: and hence it is the cultivator of the natural sciences alone who fully appreciates the value of Newton's rule of philosophizing—"Effectuum naturalium ejusdem generis eædem sunt causæ"—because it is he alone whose mind is trained to the habitual determination of the question, as to whether the effects be really of the same kind—"*ejusdum generis.*"

In this power of reasoning from analogy, in the necessity of estimating degrees of probability, and balancing varying amounts of evidence, and in the *educing* of the habits of thought consequent thereon, consists another and a very striking excellence of the natural history sciences as a branch of education. It was from a neglect of the proper exercise of such power, that the injurious effects of the doctrines propounded by Werner and Smith arose, to which we have already alluded.

And if in the study of the works of those authors, whose abilities have shed a lustre on the epochs in which they lived, we feel our emotions kindled, our imaginations delighted, our tastes matured, and our power over the complicated, but ever necessary, machinery of language increased—and if, by the higher sciences, our intellects are cultivated, and the dominion of our thoughts over the phenomena of the past and the future extended, while a spirit of rigorous exactitude is engendered, and an habitual demand for the demonstration

* Quest. Nat. vii. 30.

of a statement before it be admitted as a truth—and if in the investigation of ourselves as individuals, and as portions of the social system, we are led to habits of patient thought and important analysis, there yet remains, we are satisfied, a blank, which the natural history sciences alone are fully competent to fill; and we think that they will prove of essential service in the cause of education, by calling into active and continuous operation habits of thought, and educing powers of mind, for the exercise of which the other branches of an University education offer no sufficient field.

In thus alluding to the value which we believe inherent in the natural sciences as a branch or means of education we cannot but refer with extreme pleasure, to the recent establishment in the University of Cambridge of a Natural History Tripos, by which the honours assigned for the successful cultivation of these studies are placed on the same footing as those long awarded to classics and the exact sciences. This acknowledgment by such a body, and in such a way, of the utility of these studies, as a branch of education, cannot fail to operate most advantageously for their promotion.

But if this be really the case, and that our pursuits are truly of advantage, as parts of an educational system, it seems at once to suggest itself, that meeting now within the walls of a University, so long and so proudly pre-eminent for the freedom with which its educational advantages have been thrown open to all who desire to avail themselves of them, that we should view ourselves, even more than we have been wont to do, as an educational body, and as devoted as much to the improvement of others, as to the advancement of our own information. Let us not forget that we are all fellow-labourers in the great search after truth, fellow-pupils in the school of nature, fellow-students of that first book—the world; each ready and anxious to communicate to others any knowledge we may ourselves possess—each willing, and I trust, most anxious, to learn from others all that they can communicate. We may not, perhaps, be able to boast of many of those whom Bacon, in his philosophical fiction,* calls "merchants of light;" we cannot in Dublin, expect or anticipate that influx of communications on foreign geology which forms such a large proportion of the business of the Geological Society of London; but we have our "depredators," our "pioneers," our

* *Novis Atalantis.*—Bacon's Works, Vol. 4..

"lamps," and our "interpreters of nature." We can point to our Journal for the communications of many of these already, and we do hope for a continuance and increase of the number. And I cannot but express the hopes which have animated your Council, that we shall find a large accession of strength within these walls, and may justly anticipate a great increase in our knowledge on those higher points of speculative geology, to which the powers of the mathematician and physicist can alone be efficiently applied.

I must, however, be allowed a word of caution on such points, eagerly hoping, as I do, that the Society may soon congratulate itself on the high mathematical powers of some of its members being brought to bear on the investigation of its questions. I may be permitted to suggest, that in all such inquiries, the problem to be solved must be accurately ascertained, before its solution can be usefully given. I am led to allude to this, because geologists have been deprived of almost all the advantages which would have resulted from the contributions to physical geology, which mathematicians have already brought forward, by the simple but fundamental error, that the problem has been mistaken, and consequently the solution given, however accurate, is inapplicable to the purposes for which it was intended.

I have purposely avoided alluding to any of the *enjoyments* to be derived from such pursuits, although I keenly feel them myself, and believe the heart must be dead indeed to all such emotions which would not; but these enjoyments are not so much advantages resulting from the study of natural history, as inducements to that study; nor would I detain you with even an allusion to the many important ways in which our science addresses itself to the favour of the utilitarian, by the numerous practical results of great benefit which arise from its application. We have no fears that these practical applications of geology will ever be underrated or neglected in this University, which may claim the honour of being among the earliest to establish a distinct school for applied science, to which the chair of Geology is more immediately attached. And while we would on all occasions unite the endeavour to rise through successive steps of reasoning to the attainment of principles, with the limiting of these principles to particular operations—"ascendendo ad axiomata, descendendo ad opera"—we yet believe that the order in which these terms have been placed by the great author of inductive philosophy is the true one, and that these prin-

ciples must first be carefully ascertained, before they can be satisfactorily applied.

Much yet remains to be done, and done in so many ways that there is not one among us who cannot contribute. So extended is the circuit of our inquiries that every step we take, we are made to feel the necessity for the cordial aid and sympathy of others. To few individuals indeed is it given to possess that extent of knowledge which would enable them to range through all parts of our science; and even had this Society not existed, it would now be necessary to unite the efforts of many for the solution of our problems.

In looking back on our past career, if we have failed in ought let the failure be only a warning to avoid its cause, and overcome its difficulty: if we have succeeded, let our success be but an encouragement to further exertion. Remember the words of Demosthenes—

ὃ γάρ εστι χείριστον αὐτῶν ἐκ τοῦ παρεληλυθότος χρόνου, τοῦτο πρὸς τὰ μέλλοντα βέλτιστον ὑπάρχει. ἐπείτοι εἰ πανθ' ἃ προσῆκε πραττόντων, οὕτως εἶχεν· οὐδ' ἂν ἐλπὶς ἦν αὐτὰ βελτίω γενέσθαι[*]

But have we thus done our utmost? I fear not, and there is one mode in which many who perhaps may never have the opportunity of contributing original communications to our Society, may yet most materially aid the progress of others. I mean by additions to our library. And if a list of deficiencies, and of desirable additions, be laid before the Society, I will not think that our love has been so chilled, that there will not be found many who will be glad to have placed here some contribution which may link their name permanently with our progress.

Such, gentlemen, are our prospects for the coming session, and I hope most sincerely that at its close I shall be enabled to congratulate you on the fulfilment of these hopes, satisfied that any cause which may prevent such an issue must be one more general in its operations than as affecting us alone. So long since as 1831, the period of our first formation, the able professor of geology in Cambridge, speaking from the chair of the Geological Society of London, in words peculiarly applicable at present, and which seem almost prophetic, eloquently said—"Our studies have no part in those passions "by which mankind are held asunder—the boundaries of tribes and "nations are blotted out from our maps—the latest revolutions we

[*] Demos. Phill. 1.

"treat of, are anterior to the record of our race, and compared "with the monuments which we decipher, all the works of man's "hands vanish out of sight. If we have advanced with a vigorous "step for the last fifteen years, it has been during the peace of the "civilised world. The foundations on which we build are so "widely spread, that we require nothing less than a free range "through all the kingdoms of the earth—and if anything should "occur to cloud our prospects or retard our progress, it must be "accompanied by some moral plague which will desolate the face of "Europe. Against the visitation of such a calamity every man "whom I now address will join with me in heartfelt aspirations."

Permit me to add a word before concluding—to myself personally the meetings of the Geological Society have been sources of unmixed pleasure. I have been deeply interested at the time—I can recall the hours spent with you with still deeper enjoyment—the frank and cordial kindness I have experienced—the manly and ingenuous friendships I have formed, and the warm support I have invariably met with here, originating in the congeniality of common pursuits, have associated these meetings, in my mind at least, with all that is kindly in feeling and honourable in principle, and I would express my sincere hope, that I may be enabled to continue them in the same spirit. Controversies, no doubt, arise, and these are inseparable from the ever progressive character of the study; and perhaps there is no stronger proof of the vigorous and healthy manhood of our science than the fearless courage with which every statement is canvassed, and its evidence investigated, before it is allowed to take its place beside truths already established; yet these discussions, conducted as they have been with good feeling and mutual respect, snap no tie of friendship, and chill not the warmth of our intercourse. Let private differences here give way to the common good: no envious rivalry, but that generous and benevolent impulse of honourable emulation which prompts while it enables mutual assistance: no seeking after victory to the neglect of truth. Let our meetings continue to be distinguished by that freedom of discussion and freedom of intercourse—that unflinching expression of opinion, coupled with an equally unflinching kindliness of feeling, which have hitherto marked them; and I feel assured that they will prove to others, as they have done to myself, the source of warm personal attachments, and of healthy intellectual enjoyments.

November 15th, 1848.—"On Oldhamia, a new genus of Silurian fossils," by EDWARD FORBES, Esq., F.R.S.,F.L.S., Professor of Botany, King's College, London, and Palæontologist to the Geological Survey.

THE rarity of organic remains in the Cambrian, or oldest portion of the silurian strata, renders every addition to its fauna of great palæontological interest. The earliest fossils which have yet been discovered seem to be certain plant-like impressions, or casts discovered by Professor Oldham, at Bray-head, in Wicklow, and referred to by him in his communication to this Society in 1844. These bodies present the appearance in most specimens of a central filiform axis, with fasciculi of short radiating branches proceeding from its sides at regular intervals, or of bundles of such filiform rays without an axis. A close examination of them shows, that each branch is formed of a series of articulations, marking the positions of minute cells. The entire body presents a striking resemblance to the arrangement of parts in certain zoophytes, as in *Sertularia cupressina*, but are also consistent with those exhibited in many BRYOZOA, as in *Gemellaria* and *Cellaria*, an alliance more in accordance with the minute structure. I propose the name *Oldhamia* for these remarkable fossils, in honour of their discoverer, who has in them made us acquainted with what in all probability is a group of ascidian zoophytes, or rather compound tunicated molluscs, in stratified rocks of very early date, and has thus furnished an additional, and important fact in contradiction of the crude notion, that the earliest forms of animals are the most rudimentary.

"On the maps and sections of the County of Wicklow, published by the Geological Survey," by PROFESSOR OLDHAM, F.R.S., President of the Society, and Director of the Geological Survey of Ireland.

THE President explained in detail the geological map of the County of Wicklow, just published, entering on the classification of the rocks, their subdivisions and mineral character, and the method of constructing the sections; and detailed the principal points in which the researches of the officers of the Geological Survey had led to conclusions different from those previously published.

The details of these researches will be published in connexion with the Geological Survey of Ireland.

December 13th, 1848.—"Proposal for the general adoption of a new and uniform principle for laying down Geological Sections," by ROBERT MALLET, Esq. C.E.,M.R.I.A., &c.

ON examining the sections accompanying the many geological memoirs which now occupy this field of scientific literature, it is in vain that we look for any general or uniform principle upon which they have been laid down. In each case the author appears usually to have chosen some arbitrary line of section, for the most part across the line of strike, more or less obliquely, and giving his preference chiefly to the localities where the dips are largest and most precipitous, and the succession of strata the most complex and involved.

No reference to any particular azimuth has been deemed of the least import; nay more, it has seldom been deemed indispensable, that the line of section should be taken in one right line; and instances may be quoted in abundance of valuable memoirs by geologists of acknowledged standing, in which sections are projected out into one plane from a sinuous line, meandering over the country in various azimuths, whose directions have been chosen, wherever the author fancied would give the "most illustrative section" of his particular views; sometimes apparently through mere caprice, and most commonly more with reference to producing a striking, and gaudy display of colour and form, when attached to the wall of the Society or lecture-room, than with a view to present the best and fairest anatomy of the country considered as laid open to the eye.

The result is, that the existing sections, accompanying memoirs and reports, are of extremely limited value—of none, if the time and labour bestowed on their production be considered; and from their isolated existence, and arbitrary choice of direction, they admit of no inference whatever being drawn from them, as to the nature of any other section of the same country, at a distance, (whether parallel or across,) which may not be actually given. Nor, again, do the two or three sections as ordinarily given, enable any correct notion to be formed usually, as to the physical features of the country proposed to be described.

Thus for example, a section across Devonshire, taken nearly north and south, though giving a "highly illustrative" view, per-

haps, of the succession of strata would, alone, give a most erroneous notion of the physical character of the surface of that county, and no just indications of the class or degree of forces, that were concerned in its formation; but if in addition to this section, we examine another, taken from Landsend, say to Shepton-mallet, nearly at right angles to the former, the imagination becomes at once informed as to the true physical character of the three adjacent counties. We see at a glance, that the billowy contour, which the north and south section of Devon presents, is no true representation of the general character of the surface of the county. We look to the east and west section, and we find the sharp configuration of Cornwall gradually rounding into the more subdued hilly forms of Devon. And as we pass again into Somerset, we find formations of finer materials have impressed on its surface the peculiarity to which its scenery is due—rich flat alluvial valleys, level as seas, with long meandering hilly promontories projecting into them, and dividing them from each other, like forested continents, with waving seas of grain between. Yet north and south sections only, of each of the three counties, might be in physical contour very much alike.

To take a larger example. If we suppose a geologist of our day possessed of materials for a map of south America, he would probably choose for his "most illustrative" sections, one right along the chain of the Cordillera; and, perhaps, one or two more, chosen at random from this or that spot to some other, where the interval contained some point which he deemed needed enforcement or "illustration." His sections presenting a tremendous jumble of "anticlinals," and enormous disturbances, many of which, though close together in section, might have very little real connexion, and depending for very much below the surface line on inference, or too often on fancy, would convey no real or just notion of the physical surface of the continent; nor, indeed, convey any information whatever, beyond a confused and, perhaps, often erroneous statement of the succession of strata.

We shall recur, however, to this example, to show how different would be the result, if his sections were sufficient in number, and chosen in right directions.

The proper uses of geological sections may probably be comprised under three heads:—

1. To give the physical features of the country correctly; and,

thus, by addressing the educated imagination through the eye, to enable distinct ideas to be formed, as to the sort and degree of the forces concerned in its conformation and configuration.

2. To give a true picture of the succession of strata, and their true relations at distant points of surface; and as far in depth as may be *certainly inferred*, but no further.

3. To supply economic information, such as relates to coal measures and mines—mass and character of loose surface materials, and their relation to the subjacent rock, or those from which they may have been formed—quarries, agriculture, drainage, &c.

I presume it will not be contended that these conditions are even imperfectly fulfilled by the present order of geological sections. My object, then, is to propose a new method which shall fulfil these conditions and others besides, and which shall, if adopted generally by geologists, confer upon this part of our science, that uniformity and mathematical character, which its present and prospective positions, and its intimate relations with exact science already warrant.

My proposition is, that in future all geological sections, whether those belonging to private memoirs, or to great connected works, as in national surveys, should be laid down and published, under the following conditions, viz:—

1. That all geological sections shall be laid down in the planes of great circles, passing through lines, running due north and south, or due east and west; in other words, in latitude and in longitude.

2. That where *several* sections of a given district are capable of being had, (and they are always desirable) they shall be laid down parallel to each other, and at equal distances apart, whether running north and south, or east and west.

3. That all sections be plotted to equal horizontal and vertical scales, and all referred to the half-tide level, for datum line.

Where several such sections, both north and south, and east and west are laid down, they become in fact a sectio-planographic model of the district referred to. They may be conveniently laid down upon square-ruled paper, and may be drawn parallel to each other, with their respective base or datum lines, placed at distances equal to those of the planes of section, so that in most instances, the two sets of sections at right angles may mutually intersect

without confusion, and be laid down upon the same sheet, whose surface may also represent a skeleton map of the surface of the country, i.e., both sets of sections may be laid down on a copy of the uncoloured map.

From two such sets of parallel, normal sections, it will be obvious to any geometer, that any number of intermediate sections, in any required azimuths, may be inferred by well known methods, and laid down, as required, on separate sheets; and it is also plain, that instrumental means may be devised for mechanically transferring such intermediate sections, from the normal ones, and plotting them. So that when once the requisite number of north and south, and of east and west parallel sections are obtained, the whole district in question is laid open, and may be, as it were, further anatomized, in whatever directions, not only the original geological explorer may then deem "most illustrative," either of the country or of his particular views, but also in whatever directions future observers or critics may require, either for purposes of the field or of the closet, without again having to refer to anything beyond the normal sections and surface map.

I propose that north and south, and east and west, sections should collectively be called *normal sections;* and as very frequent reference will be requisite to the respective directions of sections in description, I would further briefly call every north and south section, or one in latitude, a *makrotome*, every east and west section or one in longitude, an *eurutome*, and every intermediate or inferred section in some other azimuth, a *mesotome*. Where an extended and connected survey of a kingdom is made, and such normal sections are adopted, their multiplication will render an easy mode of reference to any one, without tediously naming the places of its extremities, desirable. For this I propose, that the normal sections on the meridians of latitude and longitude, should be taken as origins, and called *principal normal sections;* and that those normal sections occurring between such be referred to by number. Thus, a principal normal section, east and west, on the meridian of longitude, passing through latitude, 52°, for example, will be the eurutome 52°, and all made parallel, and north of it, between it, and the eurutome of 53° will be designated as Eu. 1, Eu. 2, Eu. 3, &c., and in the same way for makrotomes; while the extremities and directions of mesotomes, may be at once indicated by referring

to the points of intersection of eurutomes and makrotomes, between which they are drawn as extremes, thus—

52° Eu. 1. × 7° Ma. 2. . . . . 53° Eu. 5 × 7° Ma. 20.

would express a section running diagonally through a portion of the south of Ireland, in a direction north-west and south-east, and whose position might be found upon any map.

For much smaller areas of survey, perhaps this notation might be a little modified.

Let me repeat here, however, that my proposed method comprises two distinct propositions, capable of being adopted separately or together. The one, *that all geological sections be made in great circles of latitude or longitude;* the other, *that many such equidistant parallel sections be given* as an important instrument of record in all cases.

It remains for me to add a few words in illustration of some of the advantages which I conceive geology must derive from the adoption of this method.

In glancing at a chart of the world, or at the surface of a terrestrial globe—however the eye at first be distracted by the utter irregularity of outline, the apparent confusion of surface and of all things thereon—we soon begin to perceive that all this complicated mass of seeming accident has nevertheless distinct relations to, and has been in fact formed by the great cosmical forces, acting upon, and in, the globe—that the globe itself has a perfect symmetry; that the great agencies of light, heat, electricity, magnetism, act symmetrically upon it, that is to say, with exact relations to revolution in, and plane of, orbit, and to its rotation and axis. Advancing one step we see the tides, winds, ocean-currents, climates, seasons, dependant upon the former, less apparently symmetrical, because involved mutually and in more multiplied conditions. And again advancing, we can perceive, although, we are as yet unable to trace fully, that the shapes, sizes, and bulk of continents and islands—the boundaries of land and sea—the lengths and directions of river courses—the existence of inland lakes and seas—of parched deserts—of rainless regions—of those of ever-dripping clouds—of thick-ribbed ice—of heat without a shadow—are still dependant upon these few great ruling symmetric forces; or in a word, that every form and phenomenon, which we are capable of observing upon our planet, whether

great or small—in time past or present—upon the earth's surface or below it—and however apparently paroxysmal or irregular—have reference in position, in extent, and in degree, to those great symmetric forces, which actuate the vast machine. If, then, geology aim at ultimately building up, from the ordination of these materials, a true cosmology, a real history of our planet—and to such unquestionably it tends, however feeble may have been our past approaches—it is plain that all our records of terrestrial conditions, all our surveys and sections, should properly keep in as close connection as possible with that *relation of symmetry, which is the condition of the forces upon which physical geology rests.*

Sections, therefore, in great circles of latitude and longitude, are *truly* normal sections, because *the only* sections which are really normal to the great ultimate powers of our earth—and as truly normal, whether only a yard in length, or girding the world.

When, hereafter, such sections shall be extended over vast spaces, it is difficult now to foresee the value and extent of the knowledge which they must convey through the eye; when they shall connect themselves over continents, with climate, temperature, and seasons, past and present, and through these, with all the relations of organic life—when they shall be sufficiently extended, to connect in one view, and enable the imagination to apprehend—which it must do before the reason can comprehend—the relations between the interior structure of our globe, with the forces acting upon its depths from without, and the structure and physical character of its crust, and the beings which inhabit it.

Let us recur to our example of South America, and assume sections, cutting it into parallel strips of a few miles wide, both north and south, and east and west. We already know enough to see with what interest we might observe in the makrotomes, the long prevailing swelling outline of the land—the great river courses—the deep depressions—the sudden uprearing of the serrated crests of the Andes; and in the eurutomes, as the eye traversed over them, from south to north, we should see the rocky land abruptly plunging into the oceans on either hand, but soon stretching out on the right into the elevated mighty table land of the Pampas, with the crests of the Cordillera, ramparting the Pacific, and the long sloping plains to the east that connect the Pampas with the Atlantic; such would be the first glance, but who shall set a limit to the amount of

physical information, which such a set of sections would convey, when the rocks below, in their relations of position, magnitude and nature were laid open to the eye, in direct connection with all the forces and conditions of the surface; what might we not gather at a look from such a picture?

Oneness and largeness of view are essentials to grasping the primal ideas of formative forces—the hypotheses, if not the theories, upon which geology depends. The want of these has at all times, but most strikingly in the epoch of Werner, retarded its progress. Of late a great advance has been made in the right direction by the publication of physical atlasses by Berghaus, Johnston, and others. These, however, do not meet the peculiar wants of geology, and with much desire to avoid that sanguine view which always follows a new thought, I cannot avoid the belief, that the extension of sections such as I now propose, would be found *an organon*, a machine of discovery in physical geology, such as the indeterminate calculus has been in its application to exact science.

Contoured maps have already been proposed; and in some places executed as aids to geological investigation. Without denying their utility, I cannot admit that they are any substitute for these sections; they give no connexion between the surface features and what is below; nor do they lead the mind through the eye to connect the formation, and configuration of the land, with the forces which have moulded, and which are acting upon it, and with its biological relations: for example, what information can a contoured geological map give of the relation at various points over a large area, between the nature and depth of loose superficial deposits, and the sort and positions of the rocky formations below, or of both, with the past and present forces which have ground down and distributed the former. But, again, contours can scarcely be extended beyond the land, yet it would be of great value that all geological sections should be produced as far as possible under the sea. How vast a proportion of the whole surface of our globe is hidden by the ocean; yet in it, and especially round our shores, the great and ceaseless elaboration goes on, by which new lands are formed, and the earth, which has "waxed old as doth a garment," is "changed as a vesture," and again fitted for the use of man. The mere outline of sea-bottom, if laid down according to the preceding plan, as far as soundings extend, would, in connexion

with the sectional geology of the adjacent land, and with the known tidal currents, give much new and valuable information; most so, if specimens of the sea-bottom dredged up at many known points were examined externally and chemically.

But one instance of such sea-bottom sections has met my eye. It is the chart of the German ocean given in Mr. Robert Stevenson's account of the Bell-rock Light-house, in which, with that intuition of symmetry, which belongs to the eye of the Engineer, he has made every section, in great circles of longitude; and, although the sections are not numerous, yet the chart conveys to the eye a clear notion of the aqueous forces that have conspired to produce the singular sea-bottom between the coasts of Scotland and Norway, England, Holland, and Denmark. In such sea sections, the half-tide level, of course, should become the datum, so that the sea surface should coincide in level with the base or datum line of the land sections.

Had this paper not already extended to too great length, I might proceed to show the value as economic instruments, which the mapping our own countries by such geological sections would give. Of what use, to coal-winning, quarrying, and mining, they would be —not only in opening to the eye the very bowels of the land, and laying bare the secret places of its treasures, but in showing the probable extents of subterraneous water sources; the directions of their outpourings and the best means of diverting them from the working below, or bringing them in springs and wells to the surface for use.

Of what value to the agriculturist in showing him the magazines of ancient rock, from which his soils have been transported—where these are fertile—where barren, and why; the direction and capability of local drainage, and its relations to the natural water-sheds of the land. But these and other such points I must leave to the sagacity of geologists, and conclude with but one more remark.

Actual models, geologically coloured, have been sometimes recommended as the best representations of districts.

To models belongs one defect, which they have in common with all geological maps. The actual surface of the land everywhere consists, partly of solid earth-fast rock—the skeleton, so to speak, of our mother earth; the other of masses of loose material, laying

scattered over it here and there—which, like clothing with flesh, rounds and smooths the outline of our landscape.

Now so far, no principle whatever appears to have been fixed by geologists, as to whether in any given map, they shall represent the subjacent rock formations only, over the whole surface, or the loose superficial deposits only, or how much of either; and, accordingly, most geological maps present a very puzzling mixture of loose *transported* materials, shown as the formation of the surface in one place, and fixed, or non-transported rock, at others. For example, if the actual surface materials be adopted, as those most proper to be mapped, and it is difficult to see any principle upon which any other choice has been made; then a geological map of Ireland would present little more than post tertiary gravels and peat; but its actual maps have partly shown these, and partly shown the rock below them, leaving both sides of the subject incomplete. Both should be shown, if possible, because both have intimate connexions, and are of scientific importance as well as of economic value; but neither map nor model can by possibility compass this —and while geologists would certainly make an advance towards a principle, by either giving us in their maps, the surface or the formative rock—either giving us the "rock or the rubble," and not sometimes the one, and sometimes the other; the greatest advance would be to construct our geological charts, so as to show both —and this condition, the system of parallel normal sections which I propose, can completely fulfil, as is obvious without further enlargement.

P.S.—Since this paper has been written, I have been favoured by a note from Professor Oldham, enclosing me a sheet of the Geological Survey of County Wicklow, upon which, in accordance with my suggestion made at our last meeting, (November 1848,) he has caused some normal sections to be drawn in. These, although further apart than they might have been, had there been more time for adding to their number, fully show the practicability and value of maps having both systems of normal sections laid down upon one sheet, and mutually intersecting. I cannot avoid congratulating my friend, Professor Oldham, upon thus being the first geologist to adopt, (with his usual zeal for improvement,) a system which I hope all geologists will accept, and extend the use of universally.

December 13th, 1848.—"On the Silurian fossils collected by the Geological Survey of Ireland, at Portrane, Co. of Dublin," by EDWARD FORBES, F.R.S., &c. Professor of Botany in King's College, London, and Palæontologist to the Geological Survey.

THE author communicated to the Society last session his observations on the silurian fossils of the Chair of Kildare, and shewed how the beds in which they were found were of a lower silurian age, and the equivalents of the "Bala beds" in Wales. By this determination, a base line for the Irish silurian strata was obtained palæontologically, and a great step gained towards their comparison with similar beds in the sister country. Since that time, considerable collections have been made at Portrane, and an examination of them has confirmed their identity with the Kildare beds, and the conclusions formerly inferred concerning the age of the latter. The published lists of Portrane species, given in Mr. Griffith's synopsis, drawn up by Mr. M'Coy, includes sixteen forms, one-half of which are corals, and the remainder are brachiopoda. A provisional examination of the Survey collections has yielded at least as many as seventy-seven, amongst which are twenty-three trilobites, ten gasteropods, four lamellibranchiata, and twenty brachiopoda. Several of these are new, and some of them very remarkable; more than forty of them are identical with species from the Chair of Kildare, including many of the most characteristic, as *Illænus Bowmanni*, very plentiful; *Sphærexochus calvus*; Spirifer *biforatus*, *insularis*, and *monilifer*; *Leptæna*, *sericea*, *quinquecostata*, and *depressa*; *Naticopsis concinna*; *Turbo rupestris*; and *Orthoceras gregarium*. Some other remarkable species are identical with characteristic forms from the silurians of Tyrone. The Portrane beds are locally peculiar for the quantities of corals they contain, and for the presence of *Trinuclei* in their limestones. These local peculiarities are often striking in beds equivalent to the Bala limestones.