bluest imaginable sky, broken by three or four projections of brilliant cloud. Our views toward the north were lovely beyond description; the sea nearer to us was the deepest blue, toward the shore becoming purple; then came a long golden beach; behind that deep green hills; behind these a line of purple hills; still farther back blue mountains, and then over all a series of clouds of varying shades. On the evening of the 9th, off Cape Corrientes, we had a heavy shower, a thing that six weeks in the rainy reason had rendered familiar to us. But the next morning we were in a different climate, cool, dry, and pleasant; and gliding on smooth seas, we reached the western edge of the Gulf of California on the evening of the 11th. By noon of the 12th we had a strong head-wind which seemed positively cold after the sweltering heats of Panama and Acapulco. At sunrise on the 13th we anchored in Magdalena Bay, where we remained thirty hours, seeing only the two great islands which form the outer defences of this magnificent harbour. We found here a small colony gathering orchilla, a lichen (*Roccella*) from which cudbear is made. The plant only grows in comparatively rainless regions, and grows very slowly, so that the gathering of a crop leaves the field barren for many years. The bushes on which this lichen grows are of but few species, and most of them of very odd appearance. The animals in the sea were very interesting, and our thirty hours yielded us a rich harvest.

Good weather and favourable winds brought us into the harbour of San Diego by noon on Sunday, August 18. We had not been here long before a telegram ordered the *Hassler* to return to the Mexican coast and sound for a rock reported to have been seen in a certain place. The *Hassler* obeyed, and was gone several days, searching for a rock which probably does not exist, the scientific party meanwhile remaining in San Diego. It was a delightful place for the naturalists and for us all. It was our own country, and we were at home; and among hospitable people who at once made us feel at home. A few Chinese (washers and ironers and fishers) seemed to be the only low people in the place, if we except a few Indians in tents in the adjoining fields. All the rest—I speak of the new town—seemed to be industrious, respectable Americans, Germans, or Spanish. The harbour is a long crescent. The protection is from a long range of hills running southward in a promontory to the west, and two flat islands on the south connected with each other and the continent on the east by a narrow strip of sea beach. On the north side of this crescent are numerous little villages, two of which, Old San Diego and New San Diego, are of considerable importance. In the new town two daily papers are published, and a steamer leaves five times a month for San Francisco. While we were there the town was intensely excited over the arrival of Col. Scott and other railroad magnates, to make arrangements for the commencement of work on the western division of the Texas and Pacific Road. The town has been built in faith that a railway communication with the Atlantic must at no distant day be opened with this the best harbour in the southern part of California. But hope deferred had begun to make the heart sick. Those who had not means of living had begun to consider the expediency of retreating to some place of greater activity. But the visit of Col. Scott, and the arrangement made by him with the citizens of the town, have put every one at San Diego into high spirits, and they look forward now, I think reasonably, to the rapid growth of their city.

The harbour is excellent. It needs some care to prevent the San Diego River from filling it with sand, to prevent the ocean from breaking the beach that connects the island, and thus obviate the present "scour" in the main entrance; and to prevent wharf and other "improvements" in the distant future from doing the same mischief. The situation of the town is fine, on a gentle slope, with a hard pan foundation for building. The climate is wonderfully equable, it is rather too dry, but windmills are cheap; the direction of the wind is so uniform that the windmill need only be set for west winds; and with a windmill to irrigate one can raise any crop. Many plants, as olives, figs, grapes, &c., only need irrigation for a time and then strike root deep enough to reach perennial moisture. Frosts come only at intervals of many years and are then exceedingly light. We ate tomatoes gathered from bushes that had yielded fruit freely every week in the year for three years past. The melons were of an excellence surpassing anything I have ever tasted. The city is well laid out, and the nucleus of citizens already there is of sterling quality. The Horton House, which is the principal hotel, is admirably kept in the neatest and most comfortable style, with gas, water, and other conveniences, and a good table. One can make oneself at home there as well as in any city of larger size. I met also many persons in private at whose houses I had evidence that some of the best fruits of English and German, French and Spanish civilisation are acclimated here. In zoology our naturalists found a rich field. Fifty-three different species of fish, and sixty or seventy species of other animals, were added to their collections, many of these species being of very rare and valuable kinds, and several probably new. Most of these were found in such abundance that the Professor could take just as many as he chose, as many, that is, as he thought he could make useful at home.

On August 28 we parted with real regret from our new-made but most cordial and hospitable friends at San Diego, and, being again greatly favoured by the weather, we made the Golden Gate on the 31st at sunrise, and dropped our anchor in the harbour of San Francisco at 9 o'clock. The expedition proper here ended, but Prof. Agassiz, with Dr. Steindachner, will remain to gather what they can in this harbour before returning. Their success during the whole voyage in collecting valuable specimens of fish and other animals has been truly wonderful; new and unknown species have apparently been everywhere awaiting their arrival to reveal themselves; rare and valuable fishes have come freely and in numbers to give themselves up, and the more ordinary species have come into their nets in superabundance, so that we have thrown back living into the sea very frequently more than half of what the seine brought up. The whole number of fish brought home from the voyage will probably exceed 30,000, and the other animals of all descriptions will probably swell the number of specimens brought home to over 100,000. It is, however, the quality and kinds that give value to their collection rather than the mere numbers; and the *Hassler* Expedition will have prominent place in the history of zoology, because of the number of new species discovered, as well as for the valuable collection of materials on which original anatomical investigations may hereafter be made. In the history of physics the exhibition will also be remembered, not for the deep-sea dredgings which circumstances beyond the control of the officers of the vessel prevented it from making, but for the valuable geological observations made for the first time in the south temperate zone by an observer thoroughly conversant with the action of glaciers and the glacial sheet north of the equator; the observer who first detected the marks, now apparent to every eye, which demonstrate the existence of glacial sheets before the birth of the present glaciers, even in their most extended form. During nine months the little company have received the courteous attention of the officers of the *Hassler*, and enjoyed the rare privileges which the Superintendent of the Coast Survey and Secretary of the Treasury had granted; nine months of continuous and varied enjoyment. The *Hassler* came round South America to survey the Pacific coast of the United States, but the long voyage has not been idle. It has been employed incidentally in a manner not less valuable than the work to which the vessel is specifically devoted.

ON THE FERTILISATION OF A FEW COMMON PAPILIONACEOUS FLOWERS

II.

VICIA SATIVA.—In the general structure and character of petals, stamens, and pistil, this flower agrees with Lathyrus; but there is a remarkable difference in the shape of the keel, and correlatively in the hairs or brush on the style.

In Lathyrus, as we have seen, the upper part of the elastic style is curved, so that the curvature corresponds with the curvature of the keel; the back or outside of the style presses against the inside of the keel, and is not furnished with hairs, there being no space for pollen on that side, whilst the inside of the style is covered with hairs set upwards, so as to sweep out the pollen which accumulates on this side.

In *Vicia sativa* the keel forms a less regular curve, whilst the style, instead of following the curvature of the keel, is set on at right angles to the ovary, and is straight and perpendicular throughout its whole length. There is, therefore, a large nook or corner outside the style, and between it and the keel, into which the pollen gets. Correlatively the style is not furnished with abundant hairs on the inside, as in Lathyrus; but there is a little tuft of stiff hairs on the outside, a little below the stigma, set on upwards so as exactly to brush out the pollen from the nook of the keel, when the keel is pressed down by an insect (see Fig. 9).

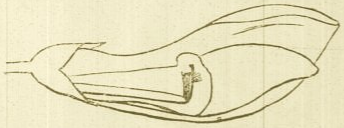

FIG. 9.—*Vicia sativa* (keel and pistil).

Vicia sepium is similar in construction to *V. sativa*. I have not observed whether there is nectar within the staminal tube of *V. sativa* or *V. sepium*, but feel assured that it is to be found there.

Vicia Faba. In the several positions of its buds and pods, Faba (broad bean) differs from Pisum and Lathyrus, and agrees with Phaseolus. The buds are upright; in the flower they are horizontal, and in the pod they are again upright; but the blossom, when open, is, as in all the other cases, horizontal, so as to afford a good lighting place for bees which seek the nectar in the interior of the staminal tube. This tube, the separate stamen, the shape of the keel of the style with its brush, are similar to those of *V. sativa*.

Robinia pseud-Acacia.—This plant bears its flowers in a pendent raceme; consequently, the position of the flower is reversed. The fifth sepal should be uppermost, and the vexillum lowest, with its back to the peduncle; and this is the position of the unopened buds. But as they approach maturity, *i.e.* as the blossom opens, the pedicel of each flower takes a half twist, so as to bring the flower into what we may call the normal position of Papilionaceæ, but with the vexillum uppermost and upright, or nearly so, and the wings and keel horizontal, the open side of the keel being uppermost. The keel is obtuse, and is free from the wings.

The filament of the tenth stamen is joined to the others in the middle, with apertures between it and the others at the base, and there is a cavity at the base of the staminal tube containing nectar. The stigma has a very small brush round it, and there are a few hairs on the inside of the style which seem to sweep out the pollen. The flowers are much frequented by bees.

Wistaria sinensis.—The pendent raceme of this plant displays, as regards the position of the buds and flowers, the same features as that of *Robinia pseud-Acacia*, which it also resembles in the free boat-shaped keel, the semi-separated tenth stamen, and the nectar-holding cavity of the staminal tube. It differs in having no hairs on the style, a difference possibly connected with the character of the pollen. But as the flower does not usually produce seed in this country, it seems unsafe to speculate on such a point.

Onobrychis sativa, or Sainfoin.—In the long raceme of this plant, the pedicels of the flower are nearly perpendicular in the bud, horizontal, as usual, in the flower, and again, after flowering, resume a position approaching the perpendicular. The wings are very small, and are not attached to the keel, and seem to play no part in fertilisation. On the other hand, the keel is large, boat-shaped, prominent,

FIG. 10.—*Lotus corniculatus* (keel).

and being joined together to the apex, and having the petals folded over one another when not joined, affords a broad and easy alighting place for insects. The tenth stamen is separate at the base, and the staminal tube so formed that it may contain nectar. Whether it does so or not I have not observed. The filaments are stiff, and the pollen sufficiently dry and dusty to come out in abundance on pressure being applied to the folded top of the keel. The stigma comes out first, and often remains outside the keel, whilst the stamens, on pressure being removed, resume their position.

Trifolium repens (Dutch Clover).—These flowers, being in an umbel, afford a good foothold for bees, and do not require an alighting place on each flower so much as in the case of larger and separate blossoms. Nevertheless, they are upright in the bud, inclined in the flower, pendent and recurved after blossoming. No flowers are upright in full blossom, and consequently the centre or summit of the umbel becomes bare. The flowers thus tend to the usual position, even though in an umbel.

The claws of the wings and keel are united, and form a half tube, containing within them the staminal tube. The tenth stamen is perfectly free, and the staminal tube, as usual in such cases, contains nectar. Bees are fond of the flowers, and must, in entering the half tubes of the keel and wings, meet the stigma and carry away pollen.

FIG. 11.—*Lotus corniculatus* (dilated filament).

Trifolium pratense.—The position of the flowers in the umbel changes as in *T. repens*, though in a less marked manner.

The long claws of all the petals, including the vexillum, are united so as to form a complete tube, at the bottom of which is much nectar. The limb of the keel is open at the top, but the aperture is small, so that an insect entering cannot fail to touch both stigma and anthers.

The filaments of the nine stamens cohere to one another, and to the tube of the corolla from the point of union of the petals, so that there is no separate staminal tube. The tenth stamen is entirely separate for its whole length. Looking to the course of the apparent veins of the petals and stamens on the tube, it seems as if the vexillum really formed the tube, and as if the nine united filaments of the stamens by themselves would

leave a large aperture, and were widely separated from the tenth stamen. If so, it is curious to see the nectar-holding cavity so often formed by the stamens here formed by the vexillum. The entire freedom and wide separation in the tenth stamen, in a flower displaying such a tendency to cohesion, is also curious. Possibly this is necessary in order to preserve a sufficient aperture to give access to the nectary.

Lotus corniculatus.—The flowers of this plant again, though in umbels, when open assume the normal position with the vexillum uppermost.

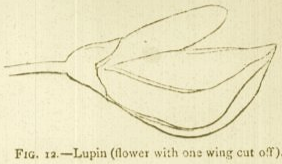

FIG. 12.—Lupin (flower with one wing cut off).

The wings are free from the keel. The keel is long, pointed, and united for some distance above as well as below, with an aperture at the apex (see Fig. 10). The tenth stamen is free, and is separate from the others at the base; the staminal tube is stiff and enlarged at the base into a cavity, which contains nectar. The pollen is moist and abundant. The style is capitate and stiff, but without hairs or brush. How then can the moist pollen be forced out of the narrow mouth of the long pointed keel so as to meet an entering insect? In a very curious way. Five

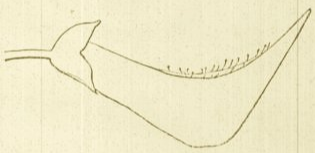

FIG. 13.—Lupin (keel).

of the stamens, viz. those of the inner whorl, are shorter than the others, and their filaments are dilated at the top. These filaments are stiff, and, I believe, continue to grow after the five anthers of the other whorl have shed their pollen. The dilatation of the filament is wedge or club-shaped, the broad end of the wedge being uppermost (see Fig. 11). Consequently, on any pressure being applied to the keel, the broad ends of these wedges, supported by their stiff filaments, collect the pollen, and push it before them to and out of the mouth of the keel, where it is seen to adhere to

FIG. 14.—Lupin (Stamens in bud)

the body of the insect which is passing down the keel. It is to be observed that the shape of the dilated filament is such that, whilst pollen might work past it from below upwards, the broad flat upper end of the filament meeting the narrowing tube of the keel can scarcely allow it to pass downwards.

Garden Lupin (common tall blue and white).—In the long raceme of this plant the pedicels are nearly perpendicular in the bud, become horizontal whilst the blossom is open, and rise so as to approach the perpendicular again afterwards. The wings are attached to each other below, are blunt, and are folded over at top so as to afford an excellent resting place. They are not attached to the keel, and move downwards more easily than it does. The keel is very long, very pointed, and the upper edges are slightly connected with an opening at the apex so as to form an approach to a tube. The apex just appears between the wings. The upper edges of the keel are furnished with a few hairs (see Figs. 12 and 13).

The filaments of the stamens are entirely joined together so as to form a close fitting tube round the ovary. There is no cavity within the tube for nectar, no apertures into it at the base, and it is too long and too close fitting for an insect to thrust its proboscis down.

FIG. 15.—Lupin (keel with one side cut off).

There is a cavity at the back and base of the vexillum in which I have not been able to find nectar. But the bees, which constantly visit these flowers, certainly go to this cavity for what they want, and not to the staminal tube. Five of the stamens compose, I believe, what must be the outer whorl, are longer in their filaments than the other five, and have longer anthers (see Fig. 14). These are mature, and before the flower opens have shed their pollen, which remains in a moist mass towards the mouth of the pointed keel. Their filaments then wither and contract. The other whorl of stamens are shorter, and the anthers much

FIG. 16.—Lupin (style and stigma).

smaller, but they are later than the first whorl, and their filaments grow and remain stiff after the filaments of the first whorl have withered. They consequently, on pressure being applied to the keel, thrust the mass of pollen upwards to its mouth. The style is long, and a ring of hairs surround the stigma, of which the upper and inner are the longest, and all of which are set upwards, so that on pressure being applied to the keel the hairs sweep out the mass of moist pollen which the stamens have thrust to the mouth (see Figs. 15 and 16). It is quite pretty to watch the little stream of bright orange pollen

FIG. 17.—*Ulex* (Gorse).

emerging from the narrow aperture of the blue keel, and between the bright blue wings.

The shorter yellow and blue garden lupins and *Lupinus arboreus* are similarly constructed. In the latter flower the folding over of the wings at the top, and the cavity at the base of vexillum, are strongly marked.

What is the use of the hairs on the edges of the keel?

Ononis arvensis.—The vexillum in the opened flower is perpendicular or a little bent back; and the wings, which are small, are also perpendicular, so that an insect may light either on the vexillum or on the wings, and has to thrust itself between the vexillum and the wings.

The keel is long and pointed as in Lotus and Lupin: and the stamens push out the pollen as in those flowers.

The stamens are quite monadelphous, the staminal tube is close fitting, and there is no nectar and no space for nectar within it. The humble-bee certainly does not put his proboscis down the tube, but between the tube and the vexillum.

Anthyllis Vulneraria.—This flower being in an umbel needs no peculiar position to give insects a foothold. Its peculiarity is that the large calyx, the sepals of which cohere up to their narrow mouth, forms a dilated tube or vessel which contains abundance of nectar. The limbs of the wings are attached to the keel, but the claws of all the petals are long, narrow, threadlike and perfectly free, so as to leave free access to the nectar when the proboscis of an insect has once passed the mouth of the flower.

The aperture between the vexillum and the coherent wing and keel is however very narrow, so that an insect in passing it cannot fail to push the keel outwards and bring out the stiff style and stamens. The filaments are entirely joined together, and form a long close fitting tube in which there is space neither for nectar nor for the proboscis of an insect.

Ulex nanus (Autumn Gorse.)—This flower is upright in the bud, assumes the usual horizontal position when in blossom, and reverts to the upright position in the pod. The bud is protected by a stout, large and hairy calyx, and the pod is stout and hairy.

The wings are perfectly free from the keel, and the rounded lobes of the keel are separate from one another at the extremity and for a considerable part of the lower side, so as to make the flower comparatively open. The stamens and pistil are stiff, and come out on the keel being pressed down; and the pollen, which is dusty, comes out in a cloud.

The staminal tube is perfectly closed and close fitting. There is no cavity in it for nectar, and no aperture at the base. There are traces of nectar on the veins and in the hollows of the vexillum, especially on the midrib and in the hollow towards the base. The bees are fond of it. They settle on the keel and thrust their heads between it and the vexillum, pushing the latter upwards. In struggling to do this their legs are in violent motion on the top of the keel, pressing it down. In doing this they invariably open it, make the anthers project, and dust their own body with pollen ready to meet the stigma of the next flower (see Fig. 17).

The contrast between the free wings, the obtuse and semi-attached lobes of the keel, the stiff filaments, the hairless style, and the dusty pollen of Ulex, and the adherent wings, closed keel, moist pollen, and brush-clad style of Pisum, Vicia, Lathyrus, &c., and the correlation between these differences, having regard to the ultimate object in both cases, viz. the conveyance of pollen by an insect, are very striking.

Ulex Europæus is similar to *Ulex nanus*, and I have seen bees upon it in April. But are there enough of these insects abroad during the winter season, when this flower blossoms, to fertilise it?

Genista Anglica.—The wings are separate from the style, the keel is straight and horizontal, but is reflexed after maturity, probably when it has once been visited by an insect. The anthers have stiff filaments and dusty pollen, all of which is shed when the flower is once opened.

The style is stiff, and coils back on the opening of the keel, whilst the stigma is oblique. When so curved back the stigma would touch an entering insect. I have not ascertained where the nectar is in this flower, but probably not in the closed and close-fitting staminal tube.

Sarothamnus (Broom.)—The keel is perfectly free from the wings, is obtuse and closed when the flower first opens. In this stage the style is bent against the keel in such a way that its stigma (which is at the extremity) is turned away from an entering insect. At a touch the keel opens and falls down by a sort of hinge, and does not recover its position. The stiff stamens shed their dusty pollen, as in Ulex and Genista. The elastic style at the same time coils itself inwards towards the vexillum. In a few moments it has curved back so far as to complete one spiral coil, and bring the stigma round so as to meet an insect subsequently entering. In opening the flower with the finger or a pencil, the stigma does not catch its own pollen, but after recoiling can hardly fail to rub the next body which enters.

The staminal tube is complete, and there is no space for nectar or aperture into it. I have not ascertained where the nectar is to be found, but not, I think, in the thin, close-fitting staminal tube.

Cytisus (*qu. nigricans?*)—common in London greenhouses.—The raceme is terminal; the peduncle is nearly horizontal. The pedicels are set on all round the peduncle, but in blossoming are so bent upwards as to make the vexillum of each flower nearly upright, and the keel and wings nearly horizontal, *i.e.*, so as to bring the flowers into the normal position.

The separation of the petals, the reflexion of the keel, the closed staminal tube, and the dusty pollen, are the same as in Sarothamnus and Genista. There is no nectar, and no place for any in the staminal tube.

The above details seem to point to some generalisations concerning papilionaceous flowers.

1. The position of the flowers in blossom, whatever their other wants and habits, is such as to make them attractive and convenient to insects. In general the showy vexillum is upright, and the keel and wings horizontal. This is effected in various ways: by the raising and straightening of the stalk, as in Pisum and Lathyrus; by the lowering of it, as in Faba, Phaseolus, and Ulex; or by giving the pedicel a half twist, as in Robinia, Wistaria, and Laburnum.

2. The cohesion of the petals (which in this single tribe is so various) is in each flower correlated to the position of the nectary, the structure of the fertilising apparatus, and the nature of the pollen. Thus in Ulex, Genista, and Sarothamnus, the cohesion of the petals is at a minimum, the wings do not adhere to the keel, and the keel itself is comparatively open. Correlatively the filaments are stiff and the pollen dusty, and the insect gets freely dusted with it, without aid from any union of the petals. In Pisum, Lathyrus, Vicia, Phaseolus, and others, the wings not only serve as a landing place for insects, but, being united to the keel, serve to pull it down and force out the pollen. In Trifolium, the coherence of the petals is at a maximum, and produces a complete long tube containing much nectar, and having the organs of fertilisation in the access afforded by its narrow mouth. In Anthyllis the claws of the petals are so thin and so free from each other as to afford no receptacle for nectar, whilst the staminal tube is closed and tight fitting, but the want of a nectary is made up by the cohesion and form of the calyx. The various degrees of cohesion between the petals of the keel—from the comparatively free keel of Genisteæ, through the prolonged acute keels of Lupin and Lotus, and the oblique keel of Lathyrus, to the spiral tube of Phaseolus—and the adaptation of each of these forms to its own stamens and pistil, is no less remarkable.

3. The degree to which the cohesion of the stamens is carried (so remarkable a feature in this tribe) appears to depend on the necessity for access to nectar. In

those flowers in which the stamens are monadelphous, viz., Ulex, Sarothamnus, Genista, Cytisus, Ononis, Lupin, there is no symptom of nectar within the staminal tube, no space for it, and no access to the interior. In some, at any rate, of these, viz., Ulex, Ononis, and Lupin, the bees certainly resort to other parts of the flower. On the other hand, where the tenth stamen is entirely free, or where it is separated at the base, so as to give an insect access to the interior of staminal tube, as in all the other flowers I have described, there is a cavity for nectar within the staminal tube, and there is nectar within this cavity.* As regards the double aperture, viz., one on each side of the base of the separate stamen, which so often occurs, Mr. Darwin suggests that, one aperture being necessary, the law of symmetry will account for there being two.

4. Other points in the structure of the filaments, anthers, and pollen seem also to be more or less related to and to depend upon the same function of fertilisation by insects. In Ulex, Genista, and Sarothamnus, where the flower is open, and in Lupin and Lotus, where the agency of the filaments is required to drive the pollen out of the keel, the filaments are stiff. In Phaseolus, where the style performs this function, they are limp. In Lotus and Lupin, the peculiar form and growth of the second whorl of stamens, and their adaptation to this function, is most remarkable. In Pisum, Lathyrus, Vicia, Phaseolus, and Lupin, where the pollen is moist, there is an apparatus for sweeping it out. In Ulex, Genista, and Sarothamnus, where it is dusty, the flower simply opens and it comes out of itself.

5. The structure of the style and stigma is in every case adapted so as to bring the latter in contact with an entering insect. In some cases, *e.g.*, in its emergence from the spiral keel in Phaseolus, and in the recoil of the style in Sarothamnus, this is effected by a very elaborate process. But the most peculiar function of the style in many of these flowers is that of sweeping out the moist pollen of its own flower from the keel. For this purpose it appears to be furnished with hairs or bristles, placed in different flowers on different parts, but always so placed as to perform the function in question. In Pisum, and, generally, in Lathyrus, the brush is on the inside of the style ; in *Lathyrus grandiflorus* on both sides ; in Phaseolus all round the style, but more thickly on the side next the entering insect than on the other ; in Vicia on the outside of the style ; in Lupin at the very extremity ; but with all these differences it is always so placed as to find the pollen and sweep it out of the variously constructed keels. In this respect these flowers remind one of the brush-clad styles of the Campanulaceæ.

6. It is scarcely necessary to repeat that the nectar is found in various parts of the flower—within the staminal tube, in the vexillum, and in the calyx. But in all cases the correlation of the parts is such that an insect seeking the nectar must touch the stigma and carry away pollen.

These generalisations, if even partially correct, seem to me to be of considerable interest, not simply as illustrations of the mode in which insects fertilise flowers by carrying pollen from one to the other, but because by connecting the facts of morphological structure with living physiological functions, they give meaning and interest to the former, and possibly indicate the direction in which the true cause of that structure is to be sought.

It is but right to add that there is one genus, *Coronilla*, which, so far as I have been able to observe it, forms an exception to the above generalisation ; but I have not been able to procure sufficient flowers to enable me to state any positive conclusion with respect to this genus ; and I only mention it in order to call the attention of other observers to it.

T. H. FARRER

* I have not actually looked for and found nectar in *Onobrychis sativa* and *Lathyrus macrorhizus*, but have no doubt that it is there. I have found it in all the rest.

NOTES

DURING the absence of Prof. Tyndall in America, the opportunity is being taken to rebuild the laboratories of the Royal Institution on a considerably enlarged scale.

IT will be seen from our University intelligence that Mr. E. Ray Lankester, Scholar of Exeter College, Oxford, has been appointed Deputy to the Linacre Professor of Anatomy and Physiology at the University.

THE open Scholarship in Natural Science at St. Mary's Hospital Medical School has been awarded to Mr. Alfred Tilley, and the Exhibition to Mr. W. H. Weddell. Both these gentlemen are students of the London University.

THERE are now no fewer than five separate organisations at Cambridge for the improvement of female education—all of them thriving. 1. The examination of women, senior and junior girls, and of schools managed by a syndicate, of which the Rev. G. F. Browne, M.A., St. Catherine College, is the secretary. 2. A system of lectures for women, associated with four exhibitions, and a fund for assisting governesses, managed by a mixed committee of ladies and gentlemen, of which H. Sidgwick, M.A., Trinity College, and Mrs. Bateson, St. John's College Lodge, are the treasurers. 3. A series of classes by correspondence arranged by Mrs. Peile. 4. A lending library for students, managed by Miss J. Kennedy. 5. A college for women, called Merton Hall, of which Miss A. J. Clough is the principal. We understand that this last establishment is rapidly filling. The lectures commence this week.

THE Vestry of St. George's, Hanover Square, advertised some time ago for a medical officer of health and analyst for the parish, and a considerable number of candidates have, we understand, come forward. It has been suggested in various quarters that the Vestry would do well to appoint two officers instead of one ; and on this point minds are divided. While some are in favour of a double appointment (with, we suppose, double pay ?) others say that the Vestry are not likely to do this, and that it is undesirable that they should, seeing that their real want is an accomplished scientific sanitarian, who will, if necessary, appoint an assistant to do the routine chemical work, just as he has an inspector to do the routine sanitary work, but who will supervise everything and be responsible for everything. It is further urged that it is absurd to suppose that chemical knowledge is not continually required from a medical officer of health, quite apart from the provisions of the Act for the Adulteration of Food and Drugs, and equally absurd to suppose that a medical man without previous special sanitary experience is at all fitted to become at once medical officer of health to so important a parish as that of St. George's, Hanover Square. We confess we have a leaning to the latter view.

AT the last meeting of the Council of the Pharmaceutical Society, it was resolved unanimously that the resolution passed in 1862, prohibiting ladies from attending the lectures, be rescinded, and that ladies be admitted as students to the lecture classes of the Society. At present but one lady has taken advantage of the privilege offered ; but as soon as the resolution becomes more widely known it is probable that the liberality of the Society will be recognised by ladies, who will avail themselves of this excellent opportunity of studying practical chemistry and botany. The lectures on chemistry are by Prof. Redwood ; those on botany by Prof. Bentley, commencing early in October. The chemical lectures are continued three days a week until the end of July ; the botanical lectures, lasting for the same period, being delivered on two days in the week. During the summer months they are delivered in the Botanical Gardens, Regent's Park.

A RUSSIAN lady, who desires to be anonymous, but is rumoured to be "still very young, and a native of Siberia," has

offered 50,000 roubles for a medical course for ladies, to be given at the Imperial College of Physicians. Classes are to be formed ostensibly for midwifery, but this will not exclude the higher studies of medicine. The course is to be one of four years' duration. The threat from Zurich no longer to admit the "unprepared Russians" proves thereby a wind that blows somebody some good. "I hear," says the correspondent of the *School Board Chronicle*, "that Madame Souslof's practice at St. Petersburg is actually undermining that lady's health."

THE nationalities represented at the International Commission on the Metric System recently sitting at Paris, are the following:—Great Britain, Germany, Austria and Hungary, Bavaria, Belgium, Denmark, Spain, France, Greece, Italy, Holland, Portugal, Russia, the Papal See, Sweden, Norway, Switzerland, Turkey, Wurtemburg, United States, Chili, Argentine Republic, Colombia, Equador, Hayti, Nicaragua, Peru, San Salvador, Uruguay, Venezuela. We believe, though it is a fact not generally known that Her Majesty's enlightened Government at first refused to allow England to be represented!

THE foundation stone of the New Watt Institution and School of Arts, Edinburgh, was laid on Wednesday, 9th inst., in Chambers Street, the spacious new street which runs on the north side of the College, and in front of the Industrial Museum.

THE vestry of Lambeth have appointed Mr. James Muter, F.C.S., analyst to the borough.

DR. J. E. EDDISON will deliver a course of eight lectures on "The Physiology of Circulation and Respiration," in connection with the Leeds Philosophical and Literary Society. The lectures will be strictly elementary, and as much practical illustration as possible will be introduced. The following single lectures will also be delivered during the ensuing season:—"Hill and Valley Sculpture," by Prof. Archibald Geikie, F.R.S., November 5 and 7; "The Meteorology of the Sun in connection with that of the Earth," by Prof. Balfour Stewart, F.R.S., December 3; "Radiant Light and Heat," by Prof. Balfour Stewart, December 13; "The Sense of Hearing," by Michael Foster, M.D., F.R.S, January 21, 1873; "The Primitive Social Condition of Man," by E. B. Tylor, F.R.S., February 4; "The Exploration of Moab," by the Rev. Canon Tristram, F.R.S., March 4; "On some new Phenomena associated with Magnetism," by W. F. Barrett, March 18.

THE following is the syllabus of the twenty-third session of the Manchester Scientific Students' Association:—The Physiography of Europe during the Pleistocene Age, by W. Boyd Dawkins, F.R.S., October 14. On the Glandular Hairs of the Fraxinella, Nettle, and Malpighia, by Charles Bailey, October 21. On Comparative Anatomy, by Herbert W. Oakley, October 28. On the History of a Mountain, by John Plant, November 4. On Meteors and Meteorites, by Rev. Joseph Freestone, November 18. On Horology, by Thomas Armstrong, December 2. And the following syllabus of papers is announced to be read at the Microscopical Club:—Glandular Vegetable Hairs, first paper, by Charles Bailey, October 3. On some Improvements in Oxy-hydrogen Illumination as applied to Microscopic Objects, by John Barrow, October 24. The Tetraspores of the Algæ, by John Hardy, November 14. The Polyparies of the British species of Hydrozoa, by Thomas S. Peace, November 28. The Micro-Spectroscope, by John Angell, December 12.

DURING the latter part of September, we learn from the *Times of India*, Bombay was visited by terribly destructive rains, causing not only serious injury to property, but great loss of life. Among the many instances of destruction on September 19 was that which occurred at the Library of the Asiatic Society—the largest collection of books, perhaps in India. The library is located in a series of rooms in the northern wing of the Town Hall, and before the commencement of the monsoon the roof had, as usual, been inspected, and, as it was supposed, made thoroughly water-proof. Whether owing to bad repairs, or to the excessive force of the downpour, the water found its way into one of the rooms—the room in which the librarian has his office—and completely saturated and more or less destroyed about three thousand volumes, chiefly works on jurisprudence. The expensive illustrated books, which are kept in the same room, fortunately escaped the general drenching. The injured volumes were spread out in the Town Hall to dry, but it is feared that the larger number of them are totally destroyed.

AURORÆ BOREALES were visible on the 3rd of August at Stettin and Cracow, on the 4th at Emden, on the 8th in North America, on the 9th at Emden and Thurso, on the 15th at various localities in England and Stettin. On the 7th of August a smart shock of earthquake was felt at Innsbrück, which was followed by three more on the 8th of the same month.

ON the 9th and 10th of September a severe hurricane passed over the islands of Guadaloupe, Martinique, Dominica, St. Kitts, Barbadoes, &c. Sixteen vessels, including the steamer *Isleman*, was wrecked at Martinique, and several lives lost. Every vessel in the port of Dominica was struck to pieces, and there also many lives were lost. Several ships were driven on shore at St. Kitts. The gale lasted all day on Tuesday, the 19th instant, the barometer commencing to fall from ten o'clock on the previous morning.

THE following is from the *Athenæum*:—A singular controversy has occurred at Constantinople. The Government have determined that instruction in the Imperial School of Medicine shall be given in Turkish, and have removed all the professors who cannot speak the national language. Of course this has occasioned an outcry on the part of the friends of those French-speaking professors who have spent many years in the country and have not chosen to acquire its language. The Turks say they started their school as a national school, and not as a foreign one; that the pupils receive inadequate instruction from its being conveyed in a foreign language; and that they have not been supplied, as they expected, with manuals in Turkish. The authorities have, therefore, determined to run the risk of the change, and attempt to get for this school, as for others, books and teaching in the vernacular. They maintain that, as medicine has for ages been taught in Arabic, it can be taught in Turkish.

THE *Moniteur Scientifique* informs us that at Proskau, in Upper Prussian Silesia, near the Prussian-Polish frontier, an agricultural college on a large scale has been established by the State, in which everything relating to agriculture, horticulture, arboriculture, and the rearing of cattle, horses, bees, and poultry is practically taught. In addition to several smaller lecture-rooms, there are two large amphitheatres, which will accommodate 200 students each; three separate chemical laboratories; a large distillery; beetroot sugar works; model brewery; museum for mineral and botanical collections; collection of agricultural implements; library containing 6,000 volumes; four farms. 5,000 hectares of forest land, and 4,000 hectares (= 2·47 acres to the hectare) of arable meadow land are attached to this institution, in which instruction is given by a staff of twenty-four professors. Proskau has 1,900 inhabitants, of whom 1,500 are Poles.

THE *Times of India* of August the 16th states that an agricultural society, to be called the "Bombay Presidency Agricultural Society," composed of influential gentlemen, has been organised in Bombay. The object of the society is to diffuse agricultural knowledge amongst the people in the Bombay presidency, by establishing a journal and issuing separate tracts on agriculture in Marathi and Guzerati, and, if possible, by founding schools for this special purpose. The journal and tracts will