THE NEW PROFESSOR OF ENGINEERING AT GLASGOW

IT has already been announced in NATURE that the Crown authorities have appointed Prof. James Thomson, C.E., LL.D., to succeed the late Prof. W. J. M. Rankine in the Glasgow Chair of Engineering and Mechanics; and as that gentleman has been deemed worthy to occupy the Chair that was long filled by a man of world-wide eminence, it may not be undesirable to give a brief sketch of his professional and scientific career.

Prof. Thomson is the elder brother of Sir William Thomson, and son of Dr. James Thomson, a former Professor of Mathematics in the University of Glasgow. The early part of his education was obtained in the Royal Belfast Academical Institution, and he completed his studies in Glasgow, where he obtained the degree of M.A. in 1840, with honourable distinction in Mathematics and Natural Philosophy. During the year 1841–42, he was a student in the class of Civil Engineering and Mechanics under Prof. Lewis D. B. Gordon, C.E., Rankine's predecessor, and even then he was distinguished for his accurate mathematical and physical knowledge, and for his ready appreciation of the principles of applied mechanics. He afterwards became an industrious pupil in the Horseley Iron Works and Manufactory, near Tipton, in South Staffordshire, and subsequently he entered the service of Mr. (now Sir) William Fairbairn, in whose workshops on the Isle of Dogs and in Manchester he had the benefit of assisting to execute engineering works of the greatest magnitude, and of great variety. After prosecuting his profession for several years in England and Scotland, he ultimately settled down in Belfast as a civil engineer.

When the Professorship of Civil Engineering in Queen's College, Belfast, became vacant in the year 1857, Mr. Thomson obtained the appointment. He has now occupied that position for a period of fifteen years.

Besides attending to the duties of his class, Prof. Thomson carried on an extensive practice as a consulting engineer, both at home and abroad, chiefly in connection with water supply, irrigation, the drainage of sugar plantations in Demerara and Jamaica, and other swampy lands, and in designing machinery for the same, and in other hydraulic works. One of his earliest inventions was the well-known Vortex Turbine, which affords an admirable example of an unusual combination of great scientific knowledge and practical skill in the same person. This application of mechanical principles is one of the most successful means of turning water power to advantage that has hitherto been placed at the service of the engineering profession. Many examples of the Vortex Wheel are now in successful operation in various parts of the world, and the invention was deemed to be so important that the Privy Council renewed the patent when the ordinary period of fourteen years had expired. Another of his useful inventions is the Jet Pump and Intermittent Reservoir for the drainage of swampy lands.

Among Prof. Thomson's inquiries in the domain of pure physics a prominent place must be given to those which he instituted regarding the lowering of the freezing temperature of water by pressure. This he determined by theoretical considerations entirely, and the result announced by Prof. James Thomson was afterwards exactly confirmed by the experiments instituted by his distinguished brother. The "arrival by theory without the aid of experiment at so extraordinary a physical fact, calls to my mind most forcibly," says Joule, "the discovery of Neptune by Adams and Leverrier, and is one great step towards the position to which we may eventually hope science to attain, when a perfect acquaintance with theoretical principles will enable us to dispense with the appeal to experiment so necessary, in most cases, at the present time." This discovery and its experimental verification immediately suggested a perfect solution of the problem of the descent of glaciers, and it has since led to many kindred discoveries in pure science. Like his predecessor, Prof. Thomson has extensively contributed to the advancement of science through the medium of the British Association. On five separate occasions he has been selected as the Secretary of the Mechanical Section of that body, and he has been a number of times specially deputed to make reports and conduct experimental researches for the solution of questions in practical engineering. The tendency of Prof. Thomson's mind may be, to some extent, judged of by the character of the papers on physical, mathematical, and mechanical subjects which he has published or communicated to various scientific bodies. They are nearly forty in number, and are published in full or abstract in the *Cambridge and Dublin Mathematical Journal*, the *Edinburgh New Philosophical Journal*, the Transactions of the Royal Societies of London and Edinburgh, the Proceedings of the British Association, and the Transactions of the Institution of Engineers in Scotland.

Prof. Thomson's honorary degree of LL.D. was obtained from the University of Glasgow about two years ago. His formal induction by the Senatus of the University took place last month, and his professional duties in his *alma mater* will commence in the ensuing winter session. JOHN MAYER

THE FERTILISATION OF THE WILD PANSY

AMONG the accurate and acute observations of C. C. Sprengel towards the close of last century,* which have received but scant attention from his successors, even down to our own day, was one on the subject of the colouring of variegated flowers. This botanist, with an insight into the mutual relationships of animal and vegetable life far in advance of his age, suggests that this colouring may serve as a guide to insects in seeking for the honey which serves for their food, and the search for which is so powerful an agent in the conveyance of the pollen, and the consequent fertilisation of the flower. Sprengel pointed out that in almost all variegated flowers the variegation follows a regular pattern, and that when it consists of streaks or stripes, these streaks almost invariably point to the nectary, or the receptacle of the sweet secretions which form the food of insects, in whatever part of the flower it may be situated. With this idea as a starting point, an interesting line of inquiry may be carried out as to the connection between the presence of scent and the absence of variegation in flowers. It will be found as a general rule, though not without exceptions—and it would be very interesting to attempt to trace the reason of these exceptions—that those flowers which possess a powerful odour are (in the native state) self- or whole-coloured, while brilliantly variegated flowers are, as a rule, scentless. On the hypothesis that each of these properties has for its object the attraction to the flower of the insect necessary for the fertilisation of its seeds, it is easy to be seen that the presence of both in the same flower is needless; and hence we find that Nature is in the habit of husbanding her resources, and not supplying needlessly to the same flower two different provisions for securing the same end.

Having had an opportunity during the present spring of observing the structure, with reference to the phenomena of fertilisation, of the flower of the common Wild Pansy (*Viola tricolor* sub-sp. *arvensis* of Hooker's "Student's Flora") I have thought a description of it might be of interest to the readers of NATURE, and especially to anyone who is able to contrast the phenomena in the variegated and scentless pansy with those in the scented and almost whole-coloured sweet violet.

The corolla of the wild pansy consists of five petals

* Das entdeckte Geheimniss der Natur im Bau und in der Befruchtung der Blumen: von Christian Konrad Sprengel. Berlin, 1793.

(Figs. 1, 2), the two upper ones of which, *a*, *b*, have no colouring, the two lateral petals *c*, *d*, have each one conspicuous broad streak, and are furnished near the base with a tuft of hairs; while the lowest, *e*, has a number of streaks, usually either 5 or 7, and is also provided with a tuft of hairs near the base; this petal is prolonged below into a spur. All the streaks, on both the lateral and the lowest petal, point exactly towards the centre of the flower *f*, where are the stamens and pistil. The stamens (Figs. 3, 4, 5) are also five in number; the filaments, *a*, are very short; the anthers, *b*, form a circle surrounding the pistil, closely applied to it, and also closely touching one another at their edges; each anther has the connective, *c*, prolonged above into an orange-coloured appendage; and these also, somewhat overlapping one another, form a complete ring round the pistil. Two of the stamens are prolonged below into remarkable kneed appendages, both of which project down into the spur of the lower petal, partially filling it up. The pistil (Figs. 6, 7) consists of a nearly globular ovary, *a*, an irregularly curved style, *b*, much narrower below, and furnished in front with a remarkable wedge-shaped black line, *c*, and of a single stigma, *d*, hooded in shape, the viscid stigmatic surface of which is contained in a deep cavity near its summit. In the open flower, this stigma (*e*, Fig. 3) has a most grotesque resemblance to a monkey's or old man's face. The anthers open laterally and rather within, for the discharge of the pollen, so that it falls naturally on the lower part

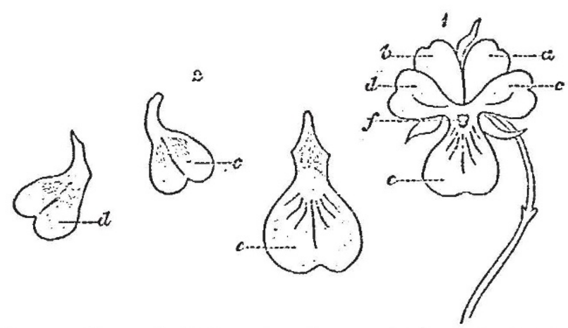

FIG. 1.—1, Flower of *Viola arvensis* *a*, *b*, upper petals; *c*, *d*, lateral petals *e*, lower petal; *f*, centre of flower. 2, The petals separated; *c*, *d*, lateral petals; *e*, lower petal.

of the style, which they completely invest, and it is difficult to see how, without artificial means, any of it will reach the stigma; the flower is also distinctly protandrous, the stigmatic cavity not being fully matured till the flower has been some time open and the pollen fully discharged. The "nectary," or part specially devoted to the secretion of the honey, is the termination of the two appendages of the stamens which project into the spur of the corolla (indicated at *f*, Figs. 3 and 5). When the sweet juice is collected here in sufficient quantities, it drops down into the bottom of the spur, to which all access of rain is prevented by the hairs that fringe the petals around the entrance of the passage to the spur.

With regard to the fertilisation of the violets, which, as has been mentioned, can obviously scarcely take place without foreign aid, Sprengel gives a long and very full description of the manner in which the sweet violet is visited by bees and humble bees, the insertion of whose proboscis into the spur of the corolla, and then its withdrawal, will necessarily remove some of the pollen, and bring it into contact with the stigma either of the same or of a different flower. It seems hence to have been assumed rather than observed that the wild pansy is fertilised in the same manner; although Sprengel states that he has not usually seen this species visited by bees, and Müller's observations* are by no means decided. My own view is that the wild pansy is fertilised chiefly, if not entirely, by very minute insects of the Thrips kind. During a long observation one morning this spring of a field in which these flowers were very abundant, I never once saw them visited by a humble-bee or other large species, and the only insect observed to frequent them was a little species of Thrips, and these only in small numbers, which I attribute to the circumstance that my only opportunity was the first warm sunny morning after a long period of cold weather, when but few insects had yet left their winter retreats. Sprengel indeed says that the wild pansy is greatly frequented by Thrips, although he believes the fertilisation to be effected by bees.

If this view be correct, the markings of the flower furnish the insect with a most remarkable series of guide-posts (or, as Sprengel terms it, "Saftmaal") to the nectar which serves as its food. The streakings on the lateral and lower petals form a sure guide, as soon as the little visitor reaches the flower, all converging (as shown in Fig. 1) to the centre of the flower and summit of the ring formed by the connectives of the anthers. Here even a minute Thrips can with difficulty force its way between the style and the closely adjacent ring of anthers, the deep orange tips of which would naturally attract it; but here it meets with a most curious and valuable assistance

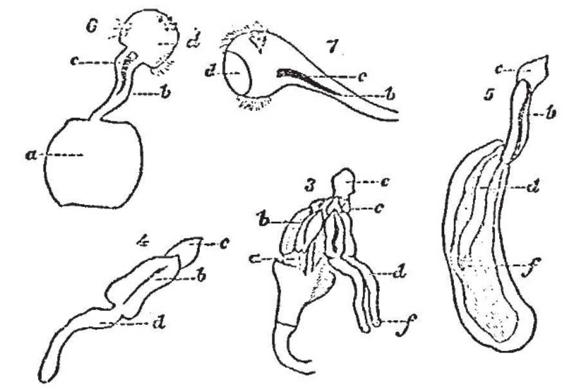

FIG. 2.—3, Pistil and stamens; *a*, filaments; *b*, anthers; *c*, connectives; *d*, appendages to lower stamens; *e*, stigma; *f*, honey-glands. 4, Lower stamen (enlarged); *b*, anther; *c*, connective; *d*, appendage 5, The same, seen within the spur of the corolla. 6, Pistil; *a*, ovary; *b*, style; *c*, wedge-shaped streak; *d*, stigma. 7, The same, seen laterally at a later stage.

in the wedge-shaped streak on the front side of the style (as seen at *c* in Figs. 6 and 7), the broad upper end of which is distinctly visible above the anther-ring, tapering downwards to a sharp point near the bottom of the style, where the insect would be at once landed on the upper part of the kneed appendages, along which it has now simply to descend until it reaches the nectar, the object of its journey. The style is much narrower towards the base than above, and hence there is room for a considerable accumulation of pollen here, as it escapes from the anthers. The insect must necessarily carry away a considerable quantity of the pollen in its descent and ascent of the style; whether for the purpose of pollenising the stigma of the same or of a different flower is not at first sight clear. The heteracmy of the flower (*i.e.* the male and female organs being mature at different periods) favours the idea of cross-fertilisation, which may very well happen from the active little Thrips visiting many flowers in the course of a day. The ovules of the wild pansy are indeed abundantly fertilised, much more generally, in fact, than those of the sweet violet, the mature capsules of which frequently result from the unopened, self-fertilised, "cleistogenous" flowers, which have not, as far as I am aware, been observed in the pansy.

ALFRED W. BENNETT

* Die Befruchtung der Blumen durch Insekten und die gegenseitigen Anpassungen beider: von Dr. Hermann Müller. Leipzig, 1873.