

always to place himself as far as possible on the foundation of objective truth, and never spared any labour to attain this object.

For scientific metaphysics he entertained disgust, but still more for the want of clearness and consistency, and often even want of truth by which human work during the development of the great questions of the day is usually impaired. Perhaps this was partly the reason why he gladly sought subjects for his studies as well as foundations for his views far back in the history of the world, a tendency to which finds its expression in the motto (of Rabelais) with which he introduces his first work, "Music and the Anglo-Saxons," "*En quoy coignesiez-vous la folie antique? En quoy coignesiez-vous la sagesse moderne?*" A stranger to all kinds of dissimulation, he often displayed his views in a striking contrast to the opinions of the present day; yet supported as they were by his prodigious knowledge, and exposed with a particular clearness, they could not fail to compel attention, whilst, at the same time, he usually softened the contrast by an equally brisk and good-natured humour. He was very religious, yet without a trace of bigotry, and to the last moment his heart showed a youthful warmth and sympathy for others. In this way he drew his contemporaries into close communion with himself in spite of differences in rank and views. He was, therefore, also the favourite of the academical youth of Upsala, who elected him honorary member of two of their so-called "Nations," or college societies; at the same time he was highly valued by the elder academical world for his learning and character. He was buried in Upsala churchyard. The inscription on the wreath which the Academy of Sciences in Upsala then laid upon the grave of this noble stranger strikingly portrays his character: "*Varietate disciplinæ et copia omnia cepit, simplicitate animi et liberalitate omnes.*"

He was elected a Fellow of this Society on January 12, 1849.

F. L. E.

ERNST FRIEDRICH WILHELM KLINKERFUES was born at Hofgeismar, in Hesse Cassel, on March 29, 1827; he was the eldest son of the surgeon of a Hessian regiment of Hussars. At an early age he was entrusted to the care of two aunts, who sent him first to the burgher school, and in his fourteenth year to the Gymnasium, at Cassel, where he found a home in the house of his uncle, the late Obergerichtsrath Dedolph. As a boy he is said to have been shy and studious, taking but little part in the ordinary amusements of his schoolfellows, although his affectionate disposition led him all the more keenly to enjoy the vacations spent with his brothers and sisters at their home, which was now at Spangenberg, where his father was professionally employed at the military hospital. Owing to the partiality displayed by Klinkerfues for the natural sciences, he left the Gymnasium for the Polytechnic School while yet in the

secunda, carrying with him the most flattering credentials from Dr. Weber, then director of the Gymnasium. On the death of his uncle Dedolph, Klinkerfues took lodgings in the house of an optician named Fiorino, in Cassel, and thus fell in with some old astronomical instruments, one of them being a reflecting telescope. He at once conceived a most ardent desire to learn the use of these instruments, a desire the more easily gratified in part, as his room in the "Colonnades" had a kind of balcony affording a free prospect of the heavens. At this time he began to study, with the greatest zeal, various astronomical books procured from the public library in Cassel, the Hessian "Landesbibliothek." Thanks to his training at the Gymnasium, he was able to read Lalande's "Astronomie," and later on Gauss' "Theoria Motus," in the original languages. After distinguishing himself at the Polytechnic School for industry and good behaviour, Klinkerfues passed his examination as surveyor (*Geometer*) in 1844, and eventually in 1846 was employed in the construction of the Main-Weser railway, but this did not prevent him from still drawing largely on the Cassel library for a supply of his favourite literature. Employed in the construction of the above-named railway, through the kindly interest of the director of the works (Obergerichtsrath Weiffenbach), Klinkerfues was stationed at Marburg, with special permission to attend the University lectures.

In this way Klinkerfues retained his post on the railway, and heard the lectures of the late Professor Gerling, besides taking part in the practical work at the Observatory; and, in common with a large class of zealous students, amongst whom were Professors Tyndall and Schönfeld, in the registration of the deflections of the magnetic needle. Klinkerfues' earliest observations of an eclipse of the Moon, some occultations, and also of *Ceres* and *Neptune*, are published in the 30th volume of the *Astronomische Nachrichten*.

Late in the spring of 1851, Klinkerfues resigned his post, and went to Göttingen with the warmest recommendations of Gerling, and with the somewhat reticent approval of Gauss, as we have just learnt through the publication, in No. 2573 of the journal just mentioned, of a most interesting letter from the great mathematician to Gerling, dated May 10, 1851. It is pleasant, however, to find that the same letter expresses the generous apprehension that undue caution on the writer's part may possibly have shaken Klinkerfues' intention of coming to Göttingen. In that University, however, Klinkerfues took up his residence in the summer session of 1851, and so far satisfied Gauss of his capabilities, that he was installed assistant at the Observatory at Michaelmas in the same year, having already taken part with Gauss and J. G. Westphal in the observation of the eclipse of the Sun on July 28. That autumn he computed two sets of elements of *Eunomia*, the first along with Westphal, who held the post of "Observator;" these were followed by elements of Comet IV., 1851. Shortly afterwards Klinkerfues

computed the difficult orbit of *Psyche*, preparing the way for the rediscovery of that planet in 1853. It is well known that Gauss was much gratified with the application of a special method given in the "*Theoria Motus*."

In June, 1853, Klinkerfues became more widely known through the discovery of Comet III. of that year, which afterwards became so bright as to be observed in the daytime at Olmütz and at Liverpool. This was the first of Klinkerfues' discoveries in this field, to which he afterwards added five other Comets—1854 III., 1854 IV., 1857 III., 1857 V., and 1863 II., besides independently finding Comets 1854 I., and 1855 II., the latter only one day after its discovery by Donati. To return to the year 1853—to all outward appearance nothing could be more promising than the career of the young astronomer, actively engaged in advanced theoretical studies, favourably known as a discoverer, and possessed of a phenomenal facility in the performance of elaborate calculations; and yet, even at this early stage, there is reason to fear that his private affairs were so seriously involved as materially to prejudice his further satisfactory advancement.

Gauss died on February 23, 1855, and the Göttingen Observatory was placed under the nominal direction of the well-known Professor W. Weber, with Klinkerfues as "Observer," in the place of Westphal, resigned. In this year Klinkerfues took his degree of Doctor of Philosophy, his inaugural dissertation being the essay, "*Ueber eine neue Methode die Bahnen der Doppelsterne zu berechnen*." In this year, also, he was made Assessor of the Royal Society of Sciences of Göttingen, but, unfortunately, was not destined to become a full member of that body. Amongst other labours about this time, an extensive series of zone-observations were commenced, in conjunction with Dr., afterwards Professor Schering, and various successive associates. The method of recording the declinations in these zones much resembled that introduced, with such signal results, by Gauss for following the variations of the magnetic needle. A mirror was fixed to the Transit-Circle, and in it were observed the reflected divisions of a fixed ivory scale, as seen through a large Transit instrument, mounted in the same meridian as the Transit-Circle a few paces to the north. Much labour was bestowed upon these observations, and about 6,000 mean places for 1860.0 were deduced; but owing, it is believed, to the discovery of certain systematic errors, they have not yet been published. There are besides, according to Professor Schering, about as many unreduced observations, and one cannot but join in the wish that these may eventually be utilised (see *Ast. Nach.*, No. 2573).

Klinkerfues was nominated Provisional Director of Göttingen Observatory in 1859, Extraordinary Professor of Astronomy in 1863, and eventually director of the Observatory for Practical Astronomy in 1868.

During these years of tardy advancement, Klinkerfues never managed to shake off the load of debt that oppressed him, and only to his singularly elastic and genial temperament can it be ascribed that he was still able to abstract himself from his troubles, and labour zealously in the enchanted field of original investigation. About 1864 he became absorbed in optical studies, more particularly in that of the refrangibility of light, as affected by the motion of its source, and the medium through which it passes. In these difficult investigations, his own experiments with an achromatic prism in 1865 led to no satisfactory results, although they were not without their value in directing attention to the subject, afterwards so successfully dealt with by the dispersive prism in the hands of Dr. Huggins and others. In like manner his imperfect experiments on the possible dependence of the constant of aberration on the thickness of the object-glass of the telescope employed, served but to prepare the way to the complete settlement of the question in the negative by Sir George Airy. About this time Klinkerfues published translations (into German) of Briot's "*Essai sur la théorie mathématique de la lumière*," and of Dr. Huggins' Nottingham lecture on Spectrum Analysis, as applied to the heavenly bodies. The latter passed through more than one edition; and in a much modified and expanded form, as a supplement to recent editions of Mädler's "*Wunderbau des Weltalls*," forms one of the most lucid elementary treatises on the subject.

In 1881 he rescued from oblivion T. Mayer's original lunar sketches, made about the middle of last century, a small number of copies of which were phototyped under the title of "*Tobias Mayer's grössere Mondkarte nebst Detailzeichnungen*," Göttingen, 1881; one of them is in the Society's library.

In his character of professor, Klinkerfues usually read three courses of lectures—on spherical, on theoretical, and on perturbational astronomy. In each of these departments his teaching was distinguished by the great variety of his methods of exposition. In his hands the most hackneyed subject assumed some fresh interest, or was regarded from some new and unexpected point of view. This is clearly exemplified in his published work, "*Theoretische Astronomie*," which will long remain a favourite work amongst students of astronomy. In this work the relation between shooting-stars and comets is dwelt on at length in a special section, in which the term "*radiant of convergence*" is introduced; hence, on the appearance of the great display of shooting-stars on November 27, 1872, Klinkerfues quickly came to the conclusion that the departing swarm of meteors ought to be visible in the neighbourhood of θ *Centauri*. How his telegram to Madras led to the observation by Mr. Pogson, on two occasions, of a cometic body in the region of the heavens indicated, is a part of the history of astronomy, although it is not universally admitted that the object so seen was associated either with the meteoric display, or with Biela's comet. Should the coinci-

dence, after all, have been only accidental, it would, indeed, be an occasion for the application of Schiller's lines, already quoted by Sir John Herschel in another connection—

Mit dem Genius steht die Natur in ewigem Bunde,
Was der Eine verspricht leistet die Andre gewiss.

Later on Klinkerfues devoted much care and thought to the improvement of the hair hygrometer, and eventually produced a bifilar instrument, of which the theory is as elegant as it is interesting. This instrument, when tested at even wide intervals, is calculated to be of great use whenever it is desirable to know the relative humidity of the air at a glance. An attempt to utilise this instrument in the local prediction of weather, notably of rainfall, was not without a considerable measure of success, although from the very nature of the problem its applicability to large areas may well be doubted. Other inventions, ingenious enough in themselves, served only to lead him into business engagements which he was totally unfitted to deal with.

Professor Klinkerfues' contributions to the daily journals ranged over a great variety of subjects, but all his papers were singularly readable, and often contained the most original and suggestive ideas. Occasionally, indeed, they were altogether of a quaintly humorous character, introducing, for instance, the alleged wonderful discoveries of an imaginary Professor Monkhouse, who read the past history of our globe in the reflections from the surfaces of the fixed stars. The Royal Society's Catalogue enumerates fifty-two of his scientific papers in addition to nine published in conjunction with J. G. Westphal. More than thirty years ago he was nominated corresponding member of the Academy of Antwerp, and was subsequently decorated with the Order of the Guelph by the late King of Hanover, at whose instance he observed the total eclipse of the Sun on July 18, 1860, at Cullera, in Spain.

It would be useless and almost impossible to attempt to describe how the warm-hearted and genial astronomer failed to take that position amongst his colleagues to which his undoubtedly great natural talents entitled him. His extreme carelessness of late years in his outward appearance was certainly much against him, but the unflagging zeal with which he delivered a whole course of lectures, if need were, even to a single student, ought to have told in his favour, as to some extent it doubtless did. But on one ground or other the title of *Professor ordinarius* was withheld from him to the last, although eventually the equivalent stipend was conferred upon him. Still the pleasure the official recognition of his ability would have afforded him may be gathered from the evident and warmly expressed satisfaction with which he regarded his election as Associate of our Society. But nothing could dispel the gloom that settled over him with the complete wreck of all his financial

s

plans, to which was added the load of failing health, perhaps mental as well as bodily, until at last he found in death a release from that life so fraught with care and anxiety. This took place on January 28th, 1884.

He was elected an Associate of this Society on November 10, 1882.

R. C.

MARIAN KOWALSKI was born at Dobrzyn, in the province of Plozk, on August 15, 1821.

He was the son of a Polish nobleman, and received his early education at the Gymnasium of Plozk, removing subsequently to Warsaw, where he was trained for an engineer. The prospect of success was not encouraging, and he therefore, in 1841, entered himself as a student at the St. Petersburg University. Being ignorant of the Russian language, though proficient in German, French, and Latin, he had many difficulties to contend with; but by giving private lessons, he managed to keep himself and a younger brother at St. Petersburg.

In 1845 he left the university, after receiving the gold medal for his essay on "The Principles of Mechanics." The next year he passed his Master's examination, and took his degree upon an essay "On the Perturbations of Comets," which he wrote in Russian. This essay was unfortunately never printed.

For the greater part of the year 1846 Kowalski lived and worked at the Pulkowa Observatory.

In the spring of 1847, the Russian Geographical Society sent an expedition, under the command of Colonel Hofmann, to explore the little-known region north of the Ural Mountains. Young Kowalski, who had obtained a reputation among the savants of St. Petersburg for his astronomical and mathematical ability, was appointed astronomer to the expedition, for the purpose of determining the position and height of the Ural Mountains between Tscherdyn in the Government of Perm and the Arctic Sea, to serve as a basis for charting the neighbouring rivers Ob and Petschora. Great difficulties were met with—climatic and otherwise—which permanently affected his health.

The results of this expedition were published in the first volume of "*Der Nördliche Ural und das Küstengebirge Paechoi*, 1883." In this work we find the positions of 186 stations laid down for astronomical observations, and the heights of 72 points in the Northern Ural Mountains, determined partly from trigonometrical and partly from barometrical observations.

Kowalski was requested by the St. Petersburg Academy of Sciences to undertake some magnetic observations during this expedition; and he succeeded in determining the magnetic elements of five stations in the extreme north, where he happened to stay. He also made many meteorological observations.

From these magnetic observations he made a mathematical investigation on "The Opposite Working of Two Magnets and