

before the Linnean Society shortly before his death, being his last work.

We might now indicate what influence Mr. Darwin has had on mental and other sciences: how that, through his general nobility of character, and his moral attributes rising pre-eminently above his intellect, he has been able to effect the greatest revolution of modern times without creating more than a passing show of strife and bitterness: and how all his work was accomplished under physical difficulties which an ordinary man would have considered excuse enough to regard himself as a confirmed and helpless invalid; but feeling intensely how difficult it is to express in words what one feels regarding Mr. Darwin, we shall refrain from saying more. Those who knew the chaotic condition to which Biology had been reduced before the appearance of the *Origin of Species* in the memorable year of 1859, and who have had the opportunity of observing order take the place of confusion, and light that of darkness, can best testify to the mighty influence of Mr. Darwin and to the loss the cause of science has sustained in his death. As we lament our loss, let us however remember that, in one sense, the hero so many of us worshipped is still with us, and that he lived to see his great life-work completed and justly appreciated in all parts of the civilised world.

J. COSSAR EWART.

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EMILE PLANTAMOUR. By the Astronomer Royal for Scotland.

On September 7th of the present year, at the age of 67, died our Foreign Associate, Emile Plantamour, director of the Observatory of Geneva, and professor of both astronomy and physical geography in the university of the same city.

Victim at last to a sudden accession of consumptive disease, he died in full possession of his admirable mental faculties, and as universally regretted as he had lived generally respected, not only in his own, but in every other country where science is known and civilisation appreciated; for well had he exhibited throughout his whole career how much of kindly goodness, as well as intellectual ability, does so often characterise those who are snatched out of this world immaturely by that insatiable malady of the lungs.

Born on the 14th of May 1815 in Geneva—a year after his little father-state had escaped from its temporary subjection to the first Bonapartist empire of France, and had joined the Helvetic Confederacy—Emile Plantamour's commencing epoch was that of young Switzerland, and he ultimately became as excellent a representative as could be found anywhere of that peculiar yet admirable microcosm of a republic, whose strict observance of law and order the red agitators of Paris can by no means understand; and even the United States of North America, republicans and democrats alike, do not altogether comprehend how it can continue to exist so anomalously to them—"a republic without a president!" And yet it not only exists, but lasts and grows, produces wealthy families too, capable, as with the Plantamours, of educating themselves up to the highest pitch of usefulness to their State, without seeking any help from others beyond the use of the self-supporting institutions in that case already made and provided.

But just as the school, or "the old college," wherein the young Plantamour spent the earliest of his hard-working years of learning as a boy, was of that staid and solid character that might be expected in an institution founded by Calvin, soon after the Reformation, so the comfortable private means of the older Plantamour's, like that of so many other Genevan families, had been attained in a manner worthily corresponding thereto. For not by manufactures nor by commerce, still less by speculations or bubble companies, were those tidy little Alpine accumulations obtained, but by the magnificent moral control of the progenitors of the family and their successors, one and all determining to live, though put to any straits for a time, on half only of their yearly income, leaving the other half to grow at compound interest.

Emile Plantamour himself was still too young to think much of these things while at Calvin's school; but by the time he had passed through that institution, also through the higher academy of Hofroy, and then the classes of the Genevan University, he was called on to choose his future walk in life as a working member of the busy republican mountain hive. So he elected to be an astronomer—a Helvetian astronomer of course. But what is there peculiar in that prefix? This mainly, that while the Helvetian confederation forms so small a patch of country, surrounded by

great empires, it yet possesses more diversity of populations than any of them ; so that but for the mysterious cord of Helvetic unity, its French cantons would be ever fighting against the German, and the Italian against both. Wherefore, all the great and good citizens of that up and down mountainous land seem ever to have a most difficult problem of their own to work at, viz., how to keep up the vigour and elasticity, the frictional polish and emulating fervour of those several competing nationalities, while inducing them, nevertheless, to do all peacefully, and voluntarily to contribute each their best characteristics, so as to raise the united name of a Swiss republican for virtue and education, valour, prudence, and understanding, above that of all collections of men, if possible, ruled in any other manner. Wherefore, thus did M. Plantamour proceed on attaining to virile growth and privileges.

From the university of his native city he went to Paris, and studied for two years under Arago, that grand specimen of the Celtic Gaul ; a man of superb genius, of commanding presence, of daring flights into the connection and bearings of hitherto untrod branches of physical science ; and with whom occasional researches into the curiosities of magnetism, or the uncultivated jungles of meteorology, combined with public displays of fervid eloquence—took the place of regular observatory work, and was thought everything of, almost up to adoration, in the midst of a Latino-Celtic population.

After highly approving himself and his mountain-born abilities among that class of men, descendants of warriors and native chiefs of long, long ago,—Emile Plantamour went north to Königsberg, and there, under the grandest soul in all Germany for philosophical breadth, instrumental skill, and mathematical power in gravitational astronomy—though originally only a grocer's apprentice, the illustrious Bessel—he learned by what kind of steady work and calm devotion in a quiet home the Teutonic mind obtains some of its highest triumphs. While thus truly a student studying under Bessel, young Plantamour produced, as a thesis, a most creditable essay “ On the Determination of the Orbit of a Comet according to Olbers' Method from three Observations.” Next he went into Berlin, where, under the celebrated Encke, he learned the still more rigid work of meridian astronomy, besides enjoying the improving

society of the great traveller Humboldt, the magnetical mathematician Gauss, and the astronomical analyst Hansen.

Returning to Geneva in 1839, the venerable Alfred Gautier retired, and Plantamour, able now to look on astronomy from every side, or as a Switzer of each and every diversely tongued canton, was installed as director of the observatory, with powers to choose and direct accordingly. Wherefore thus he proceeded. Not with any of the two or three great observatories of the three or four gigantic countries, powerful governments, and populous nations around him, would he contend in their ancient and still prescriptive work of procuring new expressions for the oldest fundamentals of the grand classic astronomy of sun, moon, and principal planets; no fresh and always minutely differing values would he attempt for the exact quantities of precession and nutation, for the aberration of light, for refraction, and sun-distance; on each of which inquiries such myriads of pounds sterling have been, and still are, being spent, and libraries of books written in the great centres of civilisation; but, while fully appreciating both the grandeur and difficulty of those problems as much as any of the savants working at them, he chose more especially "the orbits of Comets" as the future distinctive subject of his observatory labours.

Comets, however, will not always come just when they are wanted; and so, for a time, we find the disciple of the German Bessel, remembering anew the Gallic Arago, and to such purpose, that the very earliest of his published memoirs in his new directorship, was on "Atmospheric Electricity." Then came two years observations of terrestrial magnetism. And next, duly considering the wants of those of his countrymen engaged in the staple industry of Geneva, watch-making, he organised a department in the observatory where watches and chronometers sent in by the local makers are submitted to a variety of scientific tests, the results published, and prizes awarded for the best time-keepers; with the happiest effects too in promoting improvements in that most delicate branch of all the mechanical arts.

But in 1843, Plantamour's own faithful waiting was at length rewarded by the apparition of one of the most splendid, and in every way remarkable, comets of modern times. Seen first in broad daylight close to the sun, and afterwards hurrying away into the

depths of space with a longer train than any known comet since Newton's day, this chief of comets, in 1843, opened a new epoch of activity among all the observatories; while Plantamour was the first of the computers to announce that in its perihelion passage this comet must have almost grazed the very surface of the sun. That it must have seen for two hours the sun's incandescent disc under an angle of practically  $180^\circ$ , and have been exposed for that length of time to a radiation sufficient to vapourise iron, platinum, and every known metal; yet had it lived, preserved its movement, and gone off at last apparently uninfluenced on its regular orbit. And what kind of orbit was that?

Ah! That indeed is the question; never more abundantly discussed too than at this moment in connection with a comet of the present year. Plantamour had been strong enough in his first theoretical university essay on the beauty of determining a comet's orbit from three observations; but he soon learned in practice that no three observations ever taken by man, much less the first three that are usually secured of such a sudden and unexpected intruder as the great comet of 1843, can give more than a very wide approximation to that one of all the orbital elements which the public most cares for, viz., its period; and thence the date when it will next be seen, as well as that when it was last visible. He showed indeed without controversy, that it was a closed orbit, and of no very great duration; but whether of 165 years, or 22, or even less—and why, in that case it had not been seen oftener, subsequent to its supposed record in 1868, he left for the future to determine.

And now comets followed one another quickly; the next with which Plantamour occupied himself being the second of 1844, called the Comet of Mauvais; and a most opposite one it was to that of 1843 in almost every particular. For this of 1844, though little more at any time than barely visible to the naked eye, remained within telescopic range for nearly nine months; was well and numerously observed during the whole of the time, and gave to M. Plantamour's calculations, perfected as they were in this instance by his careful introduction of corrections for planetary perturbations, a perihelion distance of so much as 78 millions of miles; and a period, reaching the hitherto unheard of extent, of 102,000 years, subject to an uncertainty of not more than  $\frac{1}{30}$ th of the whole.

Again in 1846 came the separation of Biela's comet into two. These were long followed up by Plantamour, both by observation and calculation; until he at length proved them to be each proceeding on its own independent course through space, quite uninfluenced by the other. It was but a small telescopic comet at any time, until that startling telegraphic announcement of Herr Klinkerfues to Mr. Pogson at the Madras Observatory, on December 2 (1872), thus concentrating the results of his long and difficult orbital calculations:—"Biela touched earth on November 27, search near  $\theta$  centauri." Pogson accordingly turned his telescope in that southern direction, and found a retreating, and already far-off patch of cometary matter in that quarter. But what had the inhabitants of the northern side of the earth witnessed on the 27th of November? A brilliant display of shooting stars so-called, or isolated meteoric stones, darting through the upper rarefied air at the rate of more than 1000 miles a minute, and taking the regular meteoric observers quite by surprise, as being an altogether abnormal and unexpected vision to them.

Here, accordingly, was admirable authority for Plantamour adding to the Besselian astronomy of cometary orbits, the physical studies of the Aragonian school. But his observatory was ill supplied with instruments of size and quality adapted to such researches, and neither the University of Geneva, nor the politicians thereof, were inclined to spend anything to improve them. So, by noble self-denial, and out of the economies of his ancestors, Plantamour supplied a fine equatorial, with objective of 10 inches aperture, with tower and revolving dome, to the establishment; and kept it thenceforward at excellent work for the credit of the community and the promotion of astronomy.

The situation, too, was deserving of being so powerfully instrumentalised. No less than 10 degrees of latitude further south than Edinburgh, raised on a plateau 1200 feet above the sea-level, in a drier and generally warmer air, and with far less of dreadful coal smoke belching around from blackened and blackening chimneys; a telescope could there be used to its full advantage; and the climate itself would afford, especially in the land, and to a countryman, of Saussure, a most deeply interesting study.

From his very first appointment to the observatory, Plantamour

had continued in the *Bibliothèque Universelle Journal*, the publication of the comparative meteorological observations begun to be taken long before, both at Geneva and at the Hospice on Mount St. Bernard; the earliest example it is said of a systematic study of the climate of elevated regions; and the results, discussed as they were by the hand of a master, were eventually published in his work entitled *The Climate of Geneva from 50 years of Observation*. To these again he added his brilliant studies of the physical geography of the region, chiefly from the astronomical and accurate point of view; conducting extensive levellings, both instrumental and barometric, over the highest ridges, and through the deepest valleys of Europe; determining also the force of gravity by pendulum observations in numerous localities, and their longitudes both by telegraphic signals and geodesic measures of the most exact kind.

In short, this admirable man, as our own learned and most devoted librarian, Mr. James Gordon—to whom I owe much of these materials, has kindly informed me—produced in his time no less than 83 distinct memoirs, varying in size from pamphlet to book, with a distribution of their subjects, something as follows,—

Cometary, observations and calculations . . . . .	27
Astronomy, general . . . . .	6
Eclipses, Solar transits, new planets or planetoids	8
Magnetic . . . . .	2
Atmospheric Electricity . . . . .	1
Meteorologic . . . . .	28
Hypsometric and Geodesic . . . . .	11

besides several other memoirs in conjunction with M. Hirsch and M. Birner, chiefly geodetic.

No wonder then that his local biographers have described, that even in his later years, when though over-shadowed by the threatenings of his eventually fatal disease, he yet worked a full eight hours a day; and at a kind of astronomical labour which does not exactly repose the mind. Yet through it all, they record that he was ever the gentleman, the man useful to the community, and always ready to give his services wherever they were asked. Oh! what abnegation of self, for who amongst us, living happily under an ancient, long consolidated, and much loved constitutional monarchy, can

presume to know the many republican calls that were made on Citizen Plantamour's time and attention.

"All the scions of our richer families," said a fine old specimen of a New York State country gentleman to me not long ago, "find it expedient to enter into politics, in order to understand the mind of the people, and endeavour to lead public opinion." So too did Plantamour, and with success. For he was listened to with deference whenever he spoke, even in the most radical assemblies. And if not personally present, the mere statement by any orator there that "Plantamour thinks so," would often suffice to carry the day.

And in Emile Plantamour there was something more and beyond mere political wisdom to admire. For when I had, on one occasion, the honour of receiving a letter from him; and which, beginning with a discussion of the Meteorology of the xiiiith vol. of the *Edinburgh Astronomical Observations*, went on to speak of various little local institutions he was interested in, as his Bible Society, his Scripture reading Society among the poor, and other similar institutions, a lady listening to my reading started to her feet and demanded "What French savant was capable of such ideas."

So then I had to explain, that although the letter might be written in the French language, the man himself was a Switzer; born in Geneva; and educated in a school founded by Calvin, and approved of by John Knox. Whence immediately she understood the possibility, or even recognised the origin, of that wide philanthropy joined to the highest science. And this meeting will doubtless similarly appreciate how much our Society has lost in every way by Emile Plantamour's recent demise; so very soon too, or within 18 months, after the Council had selected his name to occupy that honoured place amongst our Foreign Associates which the Royal Society of Edinburgh has always desired to see filled by some representative of that noble, though circumscribed, community dwelling amongst the higher Alps.

C. P. S.