

Monday, 21st December 1857.

Professor Kelland, V.P., read from the Chair the following short Biographical Notices of MM. Thénard and Cauchy, two recently deceased Foreign Members of the Society.

In Dr Christison's excellent address at the last meeting, he presented you with biographical sketches of the recently deceased Home Members of this Society. I have been requested to complete his work, by adding a brief sketch of the lives of the two Foreign Members whom we have lost during the past session.

1. *M. Thénard*.—For the information which I have acquired relative to this excellent chemist, I am indebted to Dr Christison, who has furnished me with his personal recollections, and with a biographical souvenir of the deceased by one of his former assistants, M. Le Canu.

The association of the name of Thénard with the progress of Chemistry dates back to the period of history. His first contribution to the science was made so early as the year 1799; the subject being "The Oxygenated Compounds of Antimony, and their Combinations with Sulphuretted Hydrogen." His last was presented in 1856, fifty-seven years later, and is entitled "Memoir on the Bodies whose Decomposition is effected under the influence of the Catalytic Force." To detail all the discoveries of an author whose writings are scattered over so vast a period would be a work of some labour, and might justly be regarded by many of my hearers as a dry and unnecessary detail. A few of the more important only can be noticed.

We owe to him the production of muriatic ether. It is true, however, that Boullay in France, and Gehlen in Germany, made the discovery about the same time with himself. We owe to him also the discovery of oxygenated water, or the binoxide of hydrogen, and consequently that of the peroxide of calcium, of copper, &c., which it produces by reacting on the inferior oxides of these metals. M. Le Canu admits, in reference to this discovery, that a happy accident exhibited to M. Thénard the dissolution of binoxide of barium in water acidulated with nitric acid, without the disengagement of

oxygen; but he argues very justly that the merit consisted in the far-seeing power which could divine the existence of a definite combination of oxygen and hydrogen, essentially distinct from ordinary water.

M. Thénard had the good fortune to labour in conjunction with a host of great men—with Fourcroy, with Dulong, with Biot, with Dupuytren, but, above all, with Gay-Lussac. It is in this last connection, I imagine, that his name comes most frequently under the eye of non-chemical readers amongst us. Gay-Lussac and Thénard published, in conjunction, a series of most valuable memoirs, which were afterwards united in two volumes. Of these volumes Berthollet thus speaks: "They seem to constitute a new science, raised on the old sciences of physics and chemistry as their groundwork." Amongst the vast mass of discoveries which these researches make known, I have space to mention only two: 1. A highly important series of facts tending to throw light on the relation between the chemical and the electrical energy of the voltaic pile. For example, that acidulated water, as compared with pure water, increases the chemical action of the pile, but diminishes the electrical; and that those fluids which were found most efficient in exciting the chemical powers of the battery are the most rapidly decomposed when subjected themselves to its action. 2. The indication of the means of obtaining considerable quantities of potassium and sodium, by subjecting caustic potash and soda to the contact of iron at a high temperature; and the train of consequences which flowed from the facility of producing those metals. The Memoir which contains the process referred to appeared in the *Moniteur* of the 15th and 16th November 1808. In it was announced the existence of a particular radical, boron, which Davy described a month later in a valuable paper read to the Royal Society of London.

Not the least important, however, of M. Thénard's publications was his *Traité de Chimie*, which has gone through six editions. He had a happy talent for popularizing, without the sacrifice of strict scientific accuracy. His genius lay in arranging the parts, in developing truths in succession, in bringing out the characteristic facts, and causing the whole science to rest symmetrically on them. And the same power of popularizing and arranging was observable in his lectures. The courses which he delivered at the Athenæum, at the

Faculty of Medicine, at the *Ecole Polytechnique*, at the College of France, were admirable of their kind. Notwithstanding his intimate acquaintance with the subject, and his long experience as a lecturer, he never presented himself before an audience, without having carefully planned the lecture, and determined the exact order and position which every part should occupy. He used to say that each fact had its own proper place, where alone it could be exhibited in relief, and that it was the duty of the Professor to determine this place beforehand, just as much as it is the duty of an author to clear his sentences of feeble tautology, and to attach the right word to every idea. In consequence of this care, his lecture was always complete, always a continuous lesson on the subject in hand; free alike from deficiency and from exuberance.

It is indeed in his character as a lecturer, that M. Thénard is best studied. On the public platform, the peculiar idiosyncracies of the whole man came out spontaneously. Let me endeavour to present him to you, as he stands before his class. Imagine a vast amphitheatre capable of holding a thousand persons—every seat occupied—the very lobbies and passages crowded to overflowing. At the back of the contracted space allotted to the Professor and his apparatus, stands a huge black board, well covered with chemical formulæ. The assistant whose duty it has been to prepare the experiments, stands anxiously regarding his work. The lecturer enters. Your ideas, derived from Hogarth, have perhaps pictured to you a thin spare man with a hatchet face, and you start when your eyes rest on a figure placed in strong relief against the black board, whose firm build and massive countenance more than come up to the typical John Bull of your own land. His broad full eye, set off by a dark mass of hair, first glances at the apparatus, then rises and haughtily scans the audience, as if to measure their capacity, and finally drops on the assistant, who quails beneath its weight. The lecture begins. So clear, so forcible, so continuous, is the stream which flows from the speaker's lips—so appropriate, so neat and so well performed are the experiments, that the hour passes over quickly and insensibly. But should any accident happen; should the unfortunate assistant have mistaken his directions; woe betide him. The presence of a thousand persons places no restraint on the lecturer's indignation. On one occasion, when he had given way to an un-

usually violent outburst, an illustrious hearer, said to be Baron Humboldt, thought it his duty to interfere, and request the master to have a little more patience with his assistant. The request was granted, and all went smoothly during the remainder of the lecture. For two days sunshine continued. On the third day M. Thénard, on entering the room, perceived a portion of the apparatus in a condition which foretold the failure of the experiment. Placing himself right in front of the benevolent stranger, and looking him full in the face, with his finger pointing to the unhappy apparatus, he cried out in the theatrical voice which he inherited from the tragedian Talma, "Friend, I promised to restrain my anger, and I have faithfully kept my word; give me back my promise, or you will see me expire before your eyes." The stranger had no alternative but to bow assent. You may imagine what followed—I will not attempt to describe the scene.

Report says that the assistant was sometimes a match for the professor. On one occasion M. Thénard ironically commiserated him in these words, "Poor fellow, you will never do any good." To which the other replied, "Sir, you compliment me; it is the very same thing Fourcroy predicted of yourself when you were his assistant."

Beneath that rough exterior, and that fiery temper, there lay an honest conscience and a warm heart. Again and again did his assistants tender their resignation, but it was never accepted; and public exhibitions of anger were followed by private acts of kindness. When in 1832, M. Thénard lay ill of a fever, his two assistants, M. Le Canu and M. Clément Desormes, undertook the duty of sitting up alternately by his bedside. One night the latter was so ill of a cough that the patient forgot his fever, in his anxiety to watch over his nurse.

M. Thénard died full of years, and rich in honours and titles.

2. *Baron Cauchy*.—At the suggestion of Professor Forbes, I had drawn up a brief notice of the life of our mutual friend M. Cauchy, when the biographical letter of M. Biot fell into my hands. This letter has enabled me to add certain details which I had previously been unable to supply, and to which the present sketch owes its chief interest. As however M. Biot's statements, in one or two

instances, differ from my own, which are based, for the most part, on M. Cauchy's writings, I have allowed the latter to remain as I originally penned them.

In Baron Cauchy, the world has lost the last of those eminent cultivators of mathematical science who sprung up in the early part of the present century, formed in the school of Laplace and Lagrange. The names of Poisson, Gauss, Fourier, Abel, Jacobi, and Cauchy, form a constellation of abstract mathematicians, such as the world never before saw existing together, and will probably never see again. Agustin-Louis Cauchy was born on the 21st of August 1789, the period of universal confusion throughout France. His father, who was keeper of the archives of the senate, appears to have been exempt from the turmoils which embroiled every grade of society at that time. Perceiving the mathematical bent of his son's mind, he took pains to bring him frequently under the notice of Lagrange. This illustrious philosopher interested himself in the education of the lad, and gave the father a piece of advice which no doubt greatly surprised him, and which, coming from such a source, it is worth our while carefully to note. These were his words:—
 “Do not allow your son to open a mathematical book, nor to touch a single diagram, until he has finished his classical studies.” Sound and excellent advice under the circumstances. Preliminary education has for its object the cultivation of all the faculties, not the developement of any one to the exclusion of the others. It fulfils its functions as well when it tends to check and keep down an overwhelming bias in one direction, as when it aims at drawing out the dormant powers in another. The wisdom of the advice of Lagrange may be inferred from the whole life of Cauchy. In his classical studies he was eminently successful, and received the highest award of his class. The taste which he now acquired for languages never forsook him. In his later years he read deeply in patristic theology, and delighted in pouring forth his divinity for the instruction of the young. Nor did his exclusive devotion to classical study stand in the way of his professional advancement. After a single course of mathematics under a public professor, Duret, he presented himself, at the age of sixteen, for the entrance examination of the *Ecole Polytechnique*, and was ranked second on the list.

It is not necessary to trace, step by step, his advance in his pro-

fession. Suffice it to say, that he became *ingénieur en chef* in 1823, and was employed on many public works.

Prior to this date, however, he had been brought prominently before the world. The French Institute had proposed as the subject of the Prize Essay for 1816, the determination of the wave motion of a disturbed fluid. M. Poisson, who, as he himself states, had been for a long time engaged on this problem, sent in a first memoir on the subject in October 1815, followed by a second in December. There is reason to suppose, that one object which the Institute had in view in proposing this problem was to draw out M. Poisson. That any living man should have succeeded in wresting the prize from him, who was justly regarded as a giant in investigations of the kind, is matter of astonishment to this day. That that man should have been Cauchy, who justly looked up to Poisson as his model for imitation, and who, years after, acknowledges with gratitude his obligations to that great mathematician, as the guide of his early career, must have greatly surprised even Poisson himself; yet such was the fact. The prize was awarded to Cauchy on the ground of the greater generality and freedom from limitations which his solution of the problem presented. I am not sure that M. Poisson was satisfied with the decision. At any rate, his own memoir was immediately published, whilst that of M. Cauchy, who was not then a member of the Institute, lay twelve years in manuscript. In this case the Institute, by following their ordinary vicious practice, conferred a real benefit on science, by allowing M. Cauchy to add copious notes to his essay. The two works of Poisson and Cauchy now stand together as masterpieces of analytical investigation, and form the starting-points from which all future writers on the subject must commence their progress. Prior to this period, M. Cauchy had published several admirable papers on subjects connected with pure geometry; and the proof now afforded of the fertility of his genius would at once have secured him an admission into the Institute, had there been a vacancy. The termination of the brief struggle of the hundred days unhappily too soon created the desired vacancy, in a manner little to the benefit of M. Cauchy, who was named to fill it. The Institute had been remodelled by Napoleon in 1803, and the legitimate monarchy, on their second restoration, at once resolved to re-establish it in its original form. In effecting this

re-establishment it is not much to be wondered at that the Government should see fit to strike out the names of two members, Carnot and Monge—names not more distinguished by the brilliant talent of their possessors, than by their connection with that of the first consul Napoleon. Great as was Cauchy's genius, aimable as was his disposition, it could not prevent his sharing in the general feeling of disgust and dissatisfaction at the expulsion of Monge. Connected as the latter had been with the revolution, he had raised his hand when in power only as a shield to protect his colleagues from the proscription of the Reign of Terror. To sit in his place was to participate in the obloquy attached to his removal. Looking at the matter from this distance of time, however, we cannot impute the slightest blame to Cauchy. He was a legitimist by conviction. In the depth of his ardent piety he believed that the interests of religion were bound up with those of the monarchy; and as he never for a moment doubted the propriety of the act which placed his name on the roll, so he accepted the appointment without hesitation, firmly and conscientiously believing that it was his duty so to act.

About the same time he was appointed a professor adjunct in the *Ecole Polytechnique*. He occupied besides two other chairs. The lectures which he delivered are well known to the world under the titles of "*Cours d'Analyse Algèbre*," "*Leçons sur les Calculs, &c.*," "*Resumé des Leçons sur le Calcul Infinitesimal*," "*L'application de l'Analyse à la Théorie des Courbes*." He published also at this period various important memoirs, especially one on integrals taken between imaginary limits.

In 1826, he undertook the Herculean task of conducting and carrying on a scientific periodical, under the title of *Exercices de Mathématiques*, confined exclusively to his own writings. After the lapse of little more than four years the work had advanced into the fifth quarto volume, without any abatement of originality or of interest, when it received a sudden interruption. M. Cauchy, as we have said, was a warm adherent of the legitimate monarchy, and its overthrow was his own. Following the example of its predecessors, the new government demanded an oath of allegiance from all men holding public situations. This oath appears to have made no stringent demands, none which a scientific man might not safely have conceded, whatever his political principles. But M. Cauchy's conscience

was tender even to excess ; and although he had now a wife and two children depending on him, he resigned all his employments and retired into voluntary exile in Switzerland, sacrificing his prospects “ to devotion to the unfortunate, and the sincere love of truth.” The King of Sardinia, informed of the circumstance, created for him a Chair of Mathematics in Turin. This appointment he accepted, and lectured in the Italian language with great success. There he recommenced the publication of his *Exercises*, under the appellation of *Resumés Analytiques*. Having remained in Turin about two years, the voice of his sovereign (Charles X.) called him to Prague, to take part in the education of the Count De Chambord. At Prague he was rejoined by his wife and family ; and for the succeeding six years he attached himself to the persons of the royal exiles. Again he resumed his *Exercises* ; and having, I believe, plenty of spare time on his hands, he appears to have amused himself with lithography. In this new form he issued his publications ; and it is to be feared that a complete set does not exist. I have the impression that M. Cauchy informed me, with his own lips, that he did not himself possess copies of all his lithographed memoirs. At any rate, they are almost unknown even in France.

Charles X. died on the 6th of November 1837 ; and M. Cauchy’s functions as tutor to the Count of Chambord having ceased, he returned to Paris in 1838, and resumed his place at the Institute. He now took the title of Baron Cauchy, but whether by succession or by creation I do not know. Having no public occupation, he divided his time between the pursuits of science and the performance of deeds of benevolence. In both his voluntary labours he was indefatigable. The time he bestowed on each seemed to preclude the possibility of his having a moment for attention to the other. During the last peaceful nineteen years of his life he published in the different volumes of the Institute, and in the *Comptes Rendus*, upwards of FIVE HUNDRED memoirs, besides a multitude of reports and criticisms. This immense mass of work abounds in new thoughts, new methods, and sweeping generalizations, and may be regarded as a vast storehouse from which the next generation of mathematicians will draw their resources. It is to be regretted that M. Cauchy did not concentrate his attention more. Many of his papers are in a very rude state, containing only the germ of an idea, which

he failed fully to develop. In fact, during his later years he reminds one a little of Hooke, who was wont to rise at the conclusion of every memoir which he heard, and declare that he had something in store on the same subject. The notation, too, of some of his papers is a notation peculiar to himself; and the methods employed are often those of a new calculus, the *Calcul des Residus*, invented by him, but not generally adopted by mathematicians. All these circumstances will conspire to lock up M. Cauchy's papers for a considerable period. But no one hesitates about their value. In those subjects where the results of his analysis can be easily tested, such as in the determination of the motion of elastic media, with its application to the undulatory theory of light; or in the doctrine of planetary disturbances as applied to the movements of the small planet Pallas, M. Cauchy was, and will continue to be, the received authority.

No sooner had he settled at Sceaux, in the neighbourhood of Paris, than, for the fourth time, he commenced the publication of his *Exercices*, which he continued to the day of his death. The extraordinary amount of work thus performed by one man strikes the mind with astonishment. It is true that many of his papers are but the exhibition in type of the pages of his scribbling book. He had the habit during life of preserving all his loose thoughts and unsuccessful attempts, by working constantly on paper bound in volumes. Thus whatever he penned was sure to be preserved. We may perhaps be permitted to regret this circumstance, as its evident tendency was to present a bar to the operation of that polishing process which most writers find so essential to the success of their works. But M. Cauchy was not allowed to remain nineteen years in the silence of his study. On the 13th of November 1839, the *Bureau des Longitudes* called him to the place previously occupied by M. Prony. This was an unfortunate event. It was evident to all those who knew M. Cauchy that he would never consent to take the requisite oaths. Negotiations were accordingly at once set on foot by those who desired his presence amongst them, with the object of inducing the Government to dispense with the formality. Men of science of every shade of political opinion interested themselves in the matter; but without success. The Government did, indeed, consent to reduce the oath to the merest matter of form, but an

absolute dispensation it would not concede; and Cauchy was less likely to move towards the opposite party than they towards him. With an obstinacy quite puerile, to use M. Biot's phrase, he doubled on their path at every turn they took to encompass him. His resolve rendered all their efforts hopeless; and finally his appointment was cancelled. Those only who know what Cauchy was capable of, will be able to estimate the loss astronomy has sustained from this untoward event.

In 1848 France saw another revolution, and a new republican government. Oaths were now dispensed with, and M. Cauchy resumed his Chair of Mathematics in the Faculty of Sciences. But the events of the 2d December 1851 once more unseated him. Again, the scientific men of France (to their infinite credit be it recorded) used every effort to induce the newly constituted authorities to make his an exceptional case, and dispense with every formality. At first without success; but after a while, when the Emperor had become securely established in his government, he had the good sense to cause M. Cauchy to be restored to his chair, fettered by no conditions. Whether from conscientious scruples or otherwise, it is certain M. Cauchy never appropriated to his own use one farthing of his salary. The whole was devoted to deeds of charity. As the dispenser of blessings to the poor, he knew neither monarchists nor republicans. In the neighbourhood of Sceaux, where he resided, he was the prime mover in every labour of love. On one occasion the mayor remonstrated with him on the prodigality of his beneficence. His reply was, "Be not concerned; I am only the channel; it is the Emperor that pays the money," alluding to his salary as professor.

The scientific character of M. Cauchy requires no exposition. I am content to adopt the judgment of a competent authority, the Dean of Ely, pronounced nearly a quarter of a century ago, which will be fully confirmed by future eulogists. "M. Cauchy," he says, "is justly celebrated for his almost unequalled command over the language of analysis."

With the private life of a scientific man the biographer has properly little to do. But in the present instance, the brilliant virtues of the Christian shine so brightly upon his genius, that the latter, dazzling as it is, fails to eclipse the former. M. Cauchy's labours

among the infirm, the destitute, and the young, are the labours of a true apostle. His march was always forward; his watchword always duty. As seen by the eye of the man of science, he was absorbed in study; as seen by the eye of the man of God, he was absorbed in labours of love. In every scheme for the instruction, for the sustentation, for the elevation of his commune, he was ever active, ever devoted. No amount of labour, no sacrifice of time or of money, was too great for him. He was accustomed to wait on the mayor almost daily, and often several times in the day; and he brought with him all his resources of heart, of head, and of purse. Now to recommend a poor infirm man to the charity which primarily came from himself; now to suggest the adoption of an orphan whom he had hunted out; now to restore a wounded soldier to his family; now to organize a school; now to forward the working of an hospital. "He had (says the eloquent mayor of Sceaux) two distinct lives—the Christian and the scientific life—each so full, so complete, that it would have served to confer lustre on any name." A characteristic feature in his good works was that truly Christian one, that he conducted them without ostentation, and without assuming even the shadow of merit.

A little before his death, and when it was but too evident that his end was approaching, he was busily engaged with the curé of the parish in arrangements for the benefit of the people. Perceiving that he was overtaxing his strength, the curé besought him to take rest, adding, that in so doing, he would second the efforts of those who were praying for his restoration to health. His reply was in these words, and they are the last of his recorded words:—"Dear Sir, men pass away; but their works remain. Pray for the work."

I have a pleasing remembrance of the retired chateau at Sceaux, with its vine-trellised gardens; and of the beaming countenances of M. Cauchy and his agreeable family. In that retreat all was as bright as the summer sky. To the great and good man, whose loss we now lament, it was the dawning brightness of the morn "that shineth more and more unto the perfect day."