

handling of the diverse topics which he passes under review." And though Lord Salisbury himself said in that address, "In presence of the high priests of science I am only a layman, and all the skill of all the chemists the Association contains will not transmute a layman into any more precious kind of metal," yet on that occasion he proceeded to give in a masterly fashion "a survey not of our science but of our ignorance." The references to the want of knowledge of the nature of the capricious differences which separate the atoms from each other; the description of the ether as "a half-discovered entity"; the explanation of the deep obscurity which at the time of the address still enveloped the origin of the infinite variety of life, and the impossibility of demonstrating the process of natural selection in detail, combined to make the Oxford British Association address comparable in importance with the great controversy at the same city when the Association met there thirty-four years previously.

The study of science was for many years the solace which Lord Salisbury sought from the cares of State, and it is far from fanciful to suppose that these investigations influenced his political outlook and contributed to his success in meeting the difficulties of government. But whether this is so or not, there can be no doubt that Lord Salisbury's acquaintance with physical and chemical science was of an intimate nature, and added greatly to the joy and comfort of the short years of his retirement.

Lord Salisbury held many other appointments and received numerous academic distinctions. Among these may be mentioned that from 1869 to the time of his death he was Chancellor of the University of Oxford, and his interest in higher education was also shown by the fact of his being a member of the Council of King's College, London. He was a Doctor of Civil Law of Oxford, and a Doctor of Laws of Cambridge University, as well as a Fellow of the Royal Society.

This brief notice of a great career may be fittingly closed with a paragraph from Dr. Traill's monograph. "Lord Salisbury's record is that of an English statesman who, while directing the affairs of his country abroad with singular skill and judgment, has also guided its domestic policy in the paths of wisdom and equity, and, though loyally submitting to the 'will of the majority' in all things lawful, has held it his first duty to maintain the just rights of every class, however small a minority it may constitute, in the State."

PROF. LUIGI CREMONA.

AN interesting account of the life and work of the late Prof. Cremona, by Prof. Blaserna, appears in the *Proceedings* of the Royal Society of Edinburgh (vol. xxiv.), an advance copy of which has been received. By permission of the general secretary of the Society, we print a free translation of Prof. Blaserna's contribution and extracts from a note appended to it.

Prof. Luigi Cremona was born at Pavia on December 7, 1830, and studied there until the year 1848, when he suspended his academic work to join the ranks of the Italian volunteers, and to take part in the heroic defence of Venice until the capitulation of that famous town. He then graduated in mathematics at Pavia, where he had among his teachers Francesco Brioschi, and among his fellow-students Eugenio Beltrami and Felice Casarati. Thereafter he taught in the Gymnasium at Cremona and in the Beccarian Lyceum at Milan.

In 1860 he was appointed to the new chair of higher geometry in the University of Bologna, then reorganised by the Italian Government, and thence he passed, in 1866, to the Polytechnic at Milan. When, after the year 1870, the Italian Government undertook the organisation of the great University of Rome, with its annexed engineering school, Cremona was called, in 1873, to be professor of higher geometry in the university and director of the engineering school, which he reconstructed and established in the old Convent of St. Pietro in Vincoli. The duties of this double post he discharged with fidelity and distinction to the last years of his life.

Although Cremona had been a pupil of Brioschi, an eminent analyst, his predilection was always for geometry, in which he may be said to have created a classical school. His numerous publications refer chiefly to the theory of algebraic curves and surfaces. All the problems that arose in this department of mathematics between 1860 and 1880 attracted his attention, and everywhere he left an indelible trace of the depth and the clearness which characterised his genius.

To general theory are dedicated the "Introduction to a Geometrical Theory of Plane Curves" (1862) and "Preliminaries to a Theory of Surfaces" (1866), two monographs in which he expounds, with originality of view and wonderful unity of method, results partly known and partly new. He demonstrated the fruitfulness of the theorems contained in the second of these memoirs by applying them to the study of surfaces of the third order, in the "Mémoire de Géométrie pure sur les Surfaces du troisième Ordre," which gained in 1886 the Steiner prize of the Academy of Berlin, and which will remain for all time a classic model of geometric research.

But the originality of Cremona appears still more distinctly in his study of the transformations to which his name is now attached. Already in the first half of the nineteenth century a theory had arisen of the projective transformations which change the points and straight lines of one plane into the points and straight lines of another plane, and side by side with these had also been examined the correspondences which transform straight lines into circles or conics. But the idea of treating from a more general point of view the transformations which change straight lines into algebraic curves of any order n whatever belongs to Cremona, who established the basis of this theory in two memoirs (1863-65), and afterwards extended it to space of three dimensions (1871-72), thus opening to geometers a vast field of research, which has not been exhausted at the present day.

While, by these works, of which I have mentioned only the most extensive, and by his splendid lectures, Cremona was firing the rising generation with the love of pure science, and thus exercising a great influence on original geometric research in Italy during the last thirty years, on the other hand he was never weary of showing his interest in the technical applications of mathematics. His little work on "Reciprocal Figures in Graphical Statics" is a beautiful example of this interpenetration of pure and applied science, an interpenetration which characterises another side of his broad genius. Always pursuing this order of ideas, he took assiduous care with his engineering students in Rome to keep science and practice side by side, inciting them to attain that just balance of different faculties of which he gave himself so fine an example.

Besides all this, Luigi Cremona was a statesman. Nominated a Senator of the kingdom in 1879, he took an active part in all the work of the Senate. He was, indeed, one of the most respected and influential of the

Senators, and his reports and speeches reveal a man of frankly liberal views and of firm and stable character. He was, for a short time, Minister of Public Instruction in one of the ministries of the Marchese di Rudini.

The fame of Luigi Cremona is world-wide. Almost all the foreign academies elected him a fellow. His death (which happened on June 10 last) has been a loss not only for Italy, but for science universal, in which his discoveries will long secure him a place of honour.

In the course of a note appended to Prof. Blaserna's valuable statement of facts as to Cremona's career, Prof. Chrystal remarks:—

In the year 1884, Cremona, along with Hermite and his son-in-law Emile Picard, was my guest during the tercentenary festival of the University of Edinburgh. Besides these three distinguished mathematicians, the following were present at the festival:—Helmholtz, Bierens de Haan, Cayley, Sylvester, Lord Kelvin, Stokes, Salmon, Lord Rayleigh, and Tait. The majority of these dined one evening with Lord M'Laren, and it is scarcely probable that there ever was such a feast of mathematicians before or since. Of this brilliant band of nineteenth century men of science, there remain with us now only Kelvin, Rayleigh, and Picard.

NOTES.

THE ninth International Geological Congress was opened at Vienna on Thursday last, when Dr. Tietze, director of the Imperial Institute of Geology, was elected president.

A REUTER telegram from Cape Town states that the Cape Legislative Council has agreed to a motion in favour of addressing a communication to the Imperial Government on the subject of the adoption of the metric system.

ACCORDING to the *Athenaeum*, a resolution was passed at the conclusion of the recent geodetic congress at Amsterdam requesting the various nations to carry out extensive measurements of gravity from the Atlantic towards the east through the lowlands of Europe and Asia, as well as in the plateau around Thibet. A clear conception of the variations of weight and of the distribution of bulk in the crust of the earth would be gained thereby in connection with astronomical determinations of longitude and latitude.

Science states that the commission sent by the U.S. Marine Hospital Service to Vera Cruz reports three propositions as having been demonstrated beyond doubt, namely, (1) that the cause of yellow fever is an animal parasite, and not a vegetable germ or bacterium; (2) that the disease is communicated only by the bite of mosquitoes; (3) that only one genus of mosquitoes, *Stegomyia Fasciata*, is the host of the yellow fever parasite.

THE *British Medical Journal* states that Dr. S. R. Christophers, who was associated with Dr. Stephens in the investigation as to malaria conducted on the west coast of Africa and in the Indian cantonments, has been notified by the Indian Government that the medical authorities desire him to proceed at once to India, with the view of his again taking up special work relating to malarial infection. Dr. Christophers is, it is stated, leaving almost immediately to enter upon his duties.

ACCORDING to a Stockholm correspondent of the *Times*, the Swedish steamer *Frithjof*, which on August 17 started from Stockholm for the relief of Dr. Otto Nordenskjöld's South Polar Expedition, will take on board at Bremerhaven provisions for three years and wireless telegraphy apparatus.

Such apparatus is also, it is stated, to be fitted on board the Argentine gunboat *Uruguay*, and it is thought that this vessel, which is iron built, will remain outside the ice while the *Frithjof* will push on as far south as possible. From Bremerhaven the *Frithjof* will go to Plymouth to coal, and then *via* Madeira to Buenos Ayres, where possibly an Argentine naval officer will join her. She will then go to Punta Arenas, whence her commander proposes to reach Snowhill, the supposed winter station of the Antarctic.

ON Saturday last the Canadian Government steamer *Neptune* sailed from Halifax, Nova Scotia, for Hudson Bay and Arctic waters on an expedition to last a year and a half. The object of the expedition is to conduct, on behalf of the Government, a botanical, geological, and natural history investigation. The party will take formal possession of the Arctic Islands and the shore of Baffin's Bay. The commander of the expedition will report on the alleged extensive American poaching in the Hudson Bay fisheries. The importance of the cod and halibut fisheries will be reported on.

A MESSAGE from Naples, dated August 22, states that the explosions of Mount Vesuvius are increasing in violence, and quantities of volcanic matter have been thrown to a height of about 200 yards. At half past 6 o'clock of the morning referred to, a slight earthquake shock was felt.

THE arrangements for the eighth International Geographical Congress, to be held next year at Washington, are, says the *Times*, taking shape under the care of a committee representing the ten geographical societies and mountaineering clubs of the United States, which have united to welcome the geographers of all nations to American soil. The congress will meet in Washington on September 8, 1904, and will hold daily sessions on September 9, 10, 12, 13, and 14. The subjects for treatment and discussion during the meeting at Washington are classified under the following heads:—(1) Physical geography, including geomorphology, meteorology, hydrology, &c.; (2) mathematical geography, including geodesy and geophysics; (3) biogeography, including botany and zoology in their geographical aspects; (4) anthropogeography, including ethnology; (5) descriptive geography, including explorations and surveys; (6) geographical technology, including cartography, bibliography, orthography of place-names, &c.; (7) commercial and industrial geography; (8) history of geography; (9) geographical education. The committee urges that early notice be given by those desirous of presenting communications or proposing subjects for discussion, July 1, 1904, being fixed as the latest date for submitting communications designed for printing in connection with the congress, and August 1 in the case of abstracts (not exceeding 1000 words in length) designed for insertion in the daily bulletin.

AN International Electrical Congress will be held at St. Louis, Mo., from September 12 to 17 of next year. The sections which have been proposed for the main body of the congress are:—*General Theory*.—Section A, mathematical and experimental. *Applications*.—Section B, general applications; Section C, electrochemistry; Section D, electric power transmission; Section E, electric light and distribution; Section F, electric transportation; Section G, electric communication; Section H, electrotherapeutics. Prof. Elihu Thomson has been elected president of the committee of organisation, and the general secretary is Dr. A. E. Kennelly, Harvard University, Cambridge, Mass.