be supplemented by a brief reference, at least, to his more important characteristics. He was not a man who desired fame, but devoted his whole life to one ideal—the discovery of truth. Although connected with a comparatively small institution, he never lost his enthusiasm for his work, and one of his very last investigations, on the lowering of the freezing-point of water produced by non-electrolytes, probably contains the most accurate measurements of these values which have ever been made.

Raoult as a man seems to have combined most of those qualities which are so much admired. We have abundant evidence of his kind-heartedness and genial disposition. A letter from his pen was always an inspiration to more strenuous effort in research, and invariably left the impression that the highest aim of man should ever be to increase the sum of human knowledge.

In Raoult not only France has lost her most prominent physical chemist, but the world has lost one of the leading men of science.

HARRY C. JONES.

CHARLES HERMITE.

THE fourteenth of January, 1901, should be marked with a black stone in the annals of mathematics. Then the eminent geometer, the incomparable man, the great Hermite, one of the glories most pure of France, was lost to science, and implacable death threw into mourning his family, his friends and his admirers.

As mathematician of the first rank he leaves to the glory of his country and of all humanity a superb scientific monument erected in sixty years, completely dedicated to 'his dear *analyse*' (to use one of his phrases) and to preparing, by the infusion of his genius placed at the service of teaching, that galaxy of illustrious mathematicians who now so much adorn our sister nation. Like Sturm, he united in an extraordinary degree the qualities of a professor who wins the love of his disciples to those of one who inculcates the love of science for science.

Endowed, like his compatriots Pascal and Clairaut, with singular precocity, we see him, yet a scholar of the lyceum Louis le Grand, win the prize for mathematics with a noteworthy thesis, and shortly after, as student of the Polytechnic School, attract the attention of Jacobi with his first works and place himself as of right in the first rank among the analysts of Europe.

It is not our object to make a minute analysis of the works of the great geometer, to which would be necessary time and competence that we lack. Our aim is much more modest; we seek to render what is heartfelt homage to the man we have so deeply venerated and from whom we have received infinite proofs of benevolence during the fifteen or sixteen years that we have had the honor to possess his friendship, in so many ways precious.

It is not possible, speaking of Charles Hermite, to fail to say how in the higher analysis, in algebra and in the theory of numbers, one encounters everywhere the footprints of his giant tread. How could we leave unmentioned his memoir on the exponential function, where in demonstrating the transcendence of the number e he opens the way which eleven years after conducted Lindemann to the demonstration of the analogous property of π, solving in negative form the celebrated problem which for two thousand years had in vain fatigued geometers?

Nor can we pass in silence the enormous contribution which Hermite brought to the *Theory of Forms:* his law of reciprocity, his admirable researches on associate covariants, his work on quintic forms, his memoir on the equation of the fifth degree and his celebrated theorem having Sturm's as corollary.

The works of Charles Hermite in the theory of functions are a new revelation of his genius. His profound investigations on Abelian functions, their division and their transformation, as also those relative to elliptic functions, form a monument of glory erected to French science, disclosing the sagacity of the grand analyst in the facility with which are deduced from the most lofty analytic investigations, corollaries which unveil difficult properties of the theory of numbers.

Neither can we neglect to mention the work, 'Sur quelques applications des fonctions elliptiques' (1885), of which only the first part was published: in this are found the beautiful applications of these functions which conduct him to the general integral of the equation of Lamé on the equilibrium of temperature of a homogeneous ellipsoid, which leads the author, in two particular cases, to the study of the rotation of a solid body around a fixed point (when there do not exist accelerating forces) treated by Jacobi, and to the consideration of the conic pendulum.

So far as we know, Hermite leaves two didactic works: his 'Cours de la faculté des sciences de Paris' (1891), and his 'Note sur la théorie des fonctions elliptiques' (168 pages), which serves as appendix to the 'Cours de calcul differentiel et integral,' of J. A. Serret (4th ed., 1894).

We have from him also two brief but interesting notes on the invariants of binary forms of the 5th and 6th order in the French translation of Salmon's 'Higher Algebra.'

The French geometer had the good fortune not granted all great men to see recognized in his lifetime by the scientific world his extraordinary merit. The 24th of December, 1892, his sixtieth birthday, the friends, the disciples, the admirers of the great geometer assembled at the Sorbonne to present him the gold medal struck in his honor by international subscription. The illustrious artist Chaplain cut upon it the bust of the one commemorated, and translated on to metal with admirable fidelity his venerable face, affable and frank, illuminated by the scintilla of genius.

The Minister of Public Instruction, M. Ch. Dupuy, presented to Hermite in the name of the President of the Republic the insignia of Grand Officer of the Legion of Honor, and the messages were read of those who from various parts of the world associated themselves with the splendid ceremony.

High testimony of admiration and sympathy was offered the great geometer more recently upon the occasion of the meeting at Paris, last August, of the International Congress of Mathematicians.

The Congress sent him a telegram of admiration and sympathy (he was at Saint-Jean-de Luz). This act caused vast satisfaction and profound emotion to the scientist, as he wrote me in one of his last letters.

Hermite retained to the last day of his life his privileged intelligence; but his body suffered. In a long letter of his, a few days before his death, he complained of his attacks of asthma and of the lack of appetite and of sleep: he seemed to foresee the nearness of his end, so that sending me one of his works, he said that this would be without doubt *the last!* and that he had in great part accomplished it at Saint-Jean-de Luz, where by benefit of the mild climate had reawakened his mathematical activity. This last work is a letter to Professor Pincherle published in Tomo V. of the *Annali di Matematica.*

He told us also that he had sent a brief article to the new journal, *Le Matematiche,* of Professor Alasia.

We will end by expressing a wish. We wish that those who have the authority would take the initiative toward an international subscription for a work containing an extended biography of the ever-memó-

rable geometer, and a minute analysis of his works; perhaps might be added some brief articles by very illustrious living mathematicians; something, in fine, which would be as a funeral crown offered to the memory of the great dead.

[Written by Juan J. Durán-Loriga for *Le Matematiche*, and translated by the English editor G. B. Halsted.]

THE EXTRA-NUPTIAL NECTARIES IN THE COMMON BRAKE, PTERIDIUM AQUILINUM.

THE common brake, *Pteridium aquilinum* Kuhn (*Pteris aquilina* L.) has for a number of years been used in educational institutions in this country as a laboratory type, more especially in connection with introductory courses in general biology in which both animal and plant types are used. That the presence of nectar-secreting organs in this form, therefore, should have been so generally overlooked as the writer has been led to believe, the more especially as they were made known to the botanical world as early as 1877,* is a matter of some surprise.

It is our purpose by means of the present paper to review the facts already published, and to present them, together with the writer's own observations, in order to draw to the attention of teachers of biology the fact of the presence, in a non-flowering plant, of an organ such as is thought of usually in connection with the phanerogams alone. Interest attaches to this structure, also, from the fact that a definite organ of secretion may be observed by students in a much-used laboratory type, thereby enhancing its value as such.

The extra-nuptial nectaries in *Pteridium aquilinum* were discovered by Francis Darwin (*l. c.*), and their microscopic appearance was briefly described by him in 1877. The possible biological meaning of these organs was also discussed.

Two years later, Bonnier* pointed out the presence of similar structures in certain genera of ferns, namely, in *Cyathea*, in *Hemitelia* and in *Angiopteris*, and briefly described some points in their anatomy. In addition, this author examined the nectar of the plant here under discussion.

In 1891, in view of the scanty description till then extant, W. Figdor† published a fuller account of the nectaries in *Pteridium*. This description includes the external appearance and the histology of the gland, and is accompanied by two illustrations. Later in the same year Figdor's paper was reprinted, accompanied by some notes and one illustration‡ additional, by H. Potonié. §

EXTERNAL APPEARANCE.

The nectaries in *Pteridium aquilinum* occur on the fronds at the bases of the pinnæ and pinnulæ on the morphological lower side of the leaf. The largest and most conspicuous are the lowermost, that is, those at the bases of the first pair of pinnæ. On one developing frond, therefore, one may observe a complete developmental series. When examined macroscopically the glands appear as approximately oval areas just below and extending somewhat into the angles formed by the mid-veins of the first and second, and second and third, orders. The external surfaces of the glands are smooth, because of the absence of the chaffy scales found elsewhere on the young frond.

* Darwin, Francis. *Jour. Linn. Soc.* **15**: 407. 1877.

* Bonnier, G. 'Les nectaires.' Ann. Sci. Nat. Bot. VI. **8**: 5-212. 1878.

† Figdor, W. 'Ueber die extranuptialen Nectarien von *Pteridium aquilinum*.' Oesterr. botan. Zeitschr. No. 9. 1891.

‡ Reproduced in Engler and Prantl's 'Natürlichen Pflanzenfamilien,' 1^4: 67.

§ Potonié, H. 'Die 'extranuptialen' Nectarien beim Adlerfarn.' Natur-Wiss. Wochenschr. **6**: 401. 4 O. 1891.