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BIOGRAPHY.

EMILE-MICHEL-HYACINTHE LEMOINE.

BY DAVID EUGENE SMITH, PH. D., PROFESSOR OF MATHEMATICS IN MICHIGAN STATE NORMAL SCHOOL, YPSILANTI, MICHIGAN.

SO EXTENSIVE has become the modern geometry of the triangle that one scarcely realizes that it has almost entirely developed within the last quarter of a century, and that most of its discoverers are still among the living. Lemoine, Brocard, Neuberg, Tucker, and W. J. C. Miller whose mathematical work in the *Educational Times* has done so much for the subject,—these and many others have lived to see their labors crowned with honor by lovers of geometry.

To none of these more than to Emile-Michel-Hyacinthe Lemoine is due the honor of having started this movement, and to him is the following brief sketch devoted.

M. Lemoine was born at Quimper, Finistère, in the west of France, Nov. 22, 1840. His father, a retired captain, who had been in all of the campaigns of the Empire after 1807, placed him as foundation scholar in the military Prytanée of La Flèche, whence he proceeded to the École Polytechnique. He entered this great breeding place of mathematicians at the age of twenty, the year of his father's death, and completed the course in due time. Instead of accepting any of the careers offered by the State to all graduates of the Polytechnic School, M. Lemoine determined to make his own way. Indeed, for the next few years, although engaged in science teaching in Paris, he seems to have run the round of pleasure of which that city is the home *par excellence*. Of great versatility and exceptional conversational powers, with an originality that fascinated and a per-

sonality that impressed his large circle of friends, he lived the life of a *dilettante* in the best sense of the term, and drank at the fountains of pleasure, of politics, of the arts, and of the sciences.

In these days Lemoine led as varied a life in education as in the less scholastic walks. We find him a student in the École des Mines, then *preparateur* of M. Janssen at the École d'Architecture,—supplying the place of his former professor, M. Kiœs, in the preparatory course of the École des Beaux Arts,—perfecting his knowledge of chemistry in the laboratory of Wurtz, for whom he always had a great admiration and between whom and himself there was much affection,—frequenting the courses of the École de Médecine, the hospitals and the clinics,—dabbling in philology,—and ending up by trying the law for a year. This last fancy he was forced to forego because he found himself in disgrace with the Empire through his republican principles and his liberal views on church matters. During these years, too, Lemoine traveled as his income would allow, and when his income failed him he not infrequently traveled as tutor in some wealthy family. Thus it was that he started out in his work as a teacher, full of life and health and hopes, although possibly scattering his attention too much for a career of highest success.

But however the result may have been, an unforeseen accident nipped the experiment in the bud. In 1870, when only a little more than twenty-nine years old, a laryngeal difficulty put an end to his teaching, and required him to leave Paris and seek rest at Grenoble. In the army for a time, he returned to Paris a couple of months after the Commune, and for a number of years filled divers positions in the engineering line. Finally, in 1886, he was appointed city engineer at the head of the gas department, a position which he still holds.

It is, however, with his mathematical work that we are concerned directly. In 1871 he, together with eight or ten other mathematicians, issued the circular which started the Société Mathématique of France. He was among the first to follow and to assist d'Almeida in founding the Journal de Physique and the Société de Physique. He joined with Wurtz, Friedel and others in the organization of the Association Française pour l'Avancement des Sciences. It was while yet a boy in his teens at La Flèche, that, in 1858, he published a short note in the Nouvelles Annales de Mathématiques, which discussed certain properties of the triangle. But it was at the Congrès de Lyon of the Association Française pour l'Avancement des Sciences, in 1873, that he presented his brief but noteworthy paper *Sur quelques propriétés d'un point remarquable de triangle*, and thus, as Casey says, made himself known as the founder of the modern geometry of the triangle. In the same year he published a short note in the Nouvelles Annales on the same subject. In 1874 he presented at the Congrès de Lille a second paper on the geometry of the triangle, entitled *Note sur les propriétés du center des médianes antiparalleles dans un triangle*, a point which has since been quite generally known as the *Lemoine point*, althoueh it is also called the *symmedian point* in England, and the *Grebe point* in Germany. The first paper (1873) contains among others the familiar theorem which may now be

stated thus: "The three parallels to the sides of a triangle through its Lemoine point meet the sides in six concyclic points (the first Lemoine circle)." By the Lemoine (symmedian) point is meant the point of concurrence of the symmedians of a triangle. Since the appearance of these two papers, Lemoine's name has been familiar to all readers of the mathematical journals in every country, and it is for these contributions that he seems destined to be known, rather than for his *Géométrographie* which he considers his greatest work.

La Géométrographie, of which he had the first ideas in 1888, was suggested by him in a memoir, on a more general theme, presented to the Congrès d' Oran of the Association Française pour l'Avancement des Sciences. The title of the paper is *De la mesure de la simplicité dans less Sciences mathématiques*, but for lack of time the study was limited to the simplicity of geometric constructions. On the same subject he published a short note in the *Comptes Rendus* of the Academy for that year,—more strictly *Sur la mesure de la simplicité dans les constructions géométriques.* Since then he has published numerous articles on the same or kindred subjects, in various journals, among them Mathesis (1888), Journal des mathématiques élémentaires (1889), Nouvelles Annales de Mathématiques (1892), in which last named article he considers especially the Problem of Apollonius. Finally, in 1892, at the Congrès de Pau and again at Besançon in 1893 and at Caen in 1894, a series of papers was presented on *La Géométrographie ou l'art des constructions Géométriques*, which may be considered as closing the subject of "geometrography" as applied either to the geometry of the rule and compasses alone, or to those constructions which admit the square, as in descriptive geometry.

Next in importance to the subject of "geometrography," M. Lemoine ranks his work on Continuous Transformation which permits of forming without effort, almost mechanically, a great number of formulæ and theorems relative to tne triangle and to the tetrahedron. The principal memoirs which he has presented on this subject are the following: *Sur les transformations systématiques des formules relatives au triangle*, Congrès de Marseille 1891; *Étude sur une nouvelle transformation dite transformation continue*, in Mathesis for 1891; *Une règle d'analogies dans le triangle et la specification de certaines analogies à une transformation dite transformation continue*, in the Nouvelles Annales for 1893; and finally a memoir entitled *Applications au tétraèdre de la transformation continue.*

Three other geometric studies have been undertaken by M. Lemoine, which deserve especial mention. One is the study of *Triangles Orthologiques.* Steiner demonstrated that if two triangles ABC, $A'B'C'$ are such that the perpendiculars drawn from A, B, C, respectively, on $B'C'$, $C'A'$, $A'B'$ are concurrent, then, reciprocally, the perpendiculars drawn from A', B', C', on BC, CA, AB, respectively, are concurrent. Lemoine calls these triangles *orthologiques* and makes them the basis of a theory developed in several memoirs, notably in one presented at the Congrès de Limoges in 1890. He has also published three papers on the application of geometry to the calculus of probabilities, in the Bulletin de la Sociéte Mathématique (1883), the Nouvelles Annales (1884), and

the proceedings of the Congrès de Grenoble (1885). And finally, there should be mentioned a memoir presented at the Congrès de Nantes in 1875, entitled *Étude systématique du tétraèdre equifacial* (in which the four faces have equal area.)

But in some respects the crowning labor of M. Lemoine is the creation of *L'Intermédiaire des Mathématiciens*, the details of which should be told as a matter of historic interest, especially as they have not heretofore appeared. This publication, although still in its infancy, is known throughout the mathematical world. It consists simply of questions and answers, questions which one asks for information and not for the mere pleasure of displaying some puzzle, questions which bring one into a kind of personal relation to his co-workers whether they be in Russia or South Africa. The idea of the journal is purely M. Lemoine's, and for some time it had been in his mind, but unhappily with no thought of its realization, until the genial influence of a quiet dinner and some good cigars brought about its fruition. M. Laisant had long been a friend of Lemoine's, and it was no uncommon thing for the former to dine with the latter at his home in Rue Littré. On such an occasion, in March, 1893, as they were enjoying a quiet smoke after dinner, the talk ran as usual into mathematics, and Lemoine suggested the idea of the journal. Laisant at once saw the value of the scheme and urged his friend to join him in carrying it out. M. Lemoine replied that it seemed impossible both because he was much occupied with other matters, and because of ill health (from which, unhappily, he is still suffering). Nevertheless, M. Laisant was so persuasive and the influence of the dinner and the cigars so happy that before they separated the project had taken such form that the very next day it was laid before their friend Gauthier-Villars, the great mathematical publisher, and the journal was ushered into being. "Before dinner, nothing could have persuaded me," M. Lemoine writes, "that this idea which I had formed for others would ever be realized by me ; after dinner, the journal was a possibility ; the next day, it was an accomplished fact." Its publication began in January, 1894, and each editor serves during six months of the year.

As one surveys the labors of Lemoine it would seem, from present appearances, that his most valuable work is the foundation of *L'Intermédiaire*, a publication which bids fair to continue for generations because it is really needed. His most original mathematical work seems to be his "geometrography,"—purely a creation of his own, and a contribution which enters into the mathematical work of the military schools of Brussels and Turin, the polytechnic schools of Zurich and Milan, and more or less in many other places. The work which will bring his name to the most readers is his study of the modern geometry of the triangle. In general it may be said that his contribution to geometry has been the very valuable work of showing that the synthetic field is by no means exhausted ; that Euclid left something for this generation to accomplish ; and that an original mind can find abundant material in even so simple a figure as the simplest polygon. How suggestive is this of the vast field which awaits investigators of the more complex geometric figures !

This sketch should not close without a brief reference to the influence that M. Lemoine has exerted in the realm of music. The soirées of M. and Mme. Lemoine are justly celebrated, and each week of the winter sees an assemblage representing the *anciens élevées* of the École Polytechnique, the École Normale, the Marine, and in general a good part of the scientific, literary, and artistic circles of Paris, to listen to a musical programme as original as the mathematical labors of the host. These soirées have exerted a great influence in a musical way, the type which they have fixed being adopted by many societies in and about Paris. One amusing feature of these meetings is the name which designates them. If the writer may be pardoned a personal allusion, he once attended an examination in the École Polytechnique by M. Hermann Laurent. It was one of the most severe he had ever seen,—an exceptionally bright young man submitted to an oral examination that would certainly have floored most American professors,—the examiner, a dyspeptic looking man as cold and as keen as steel and apparently as unsympathetic as ice, though in reality one of the most genial of men. To this justly celebrated mathematician, M. Laurent, is due the name of M. Lemoine's soirées, "La Trompette." Long ago he one day remarked to M. Lemoine in a jesting way, as the latter was excusing himself to attend one of his musical reunions, "Stay here with me, let the trumpet alone." Struck by the name, Lemoine adopted it, and *La Trompette* has ever since designated the delightful soirées with which the Paris cultured world is familiar.

A final word concerning the modesty of M. Lemoine. He estimates his position exactly. He says that he is not a mathematician. He has no claim to rank with Hermite, Poincaré, Picard, Painlevé, Appell, Jordan, Bertrand, Tannery, Darboux, or any of that famous circle which is making Paris such a center of study in the fields of higher modern mathematics. But all mathematicians feel that he has done a noteworthy work in other lines, and for this his name will be known and prominently known in the history of mathematics.

Ypsilanti, Michigan, March, 1896.

WHERE MATHEMATICIANS ARE NEEDED.

By ERIC DOOLITTLE, A. M., Chicago, Illinois.

There is no study of which the conceptions are more grand, nor of which the theorems are more comprehensive and profound than the study of Physical Astronomy. There is no study affording an application of Pure Mathematics in which the perfect harmony of its various parts is more evident; none in which