MEMORIAL OF ALFRED LACROIX

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On March 16, 1948, the Mineralogical Society of America lost one of its most eminent foreign correspondents, A. Lacroix, a man of world-wide reputation.

François Antoine Alfred Lacroix was born at Mâcon, France, on February 4, 1863. His grandfather, Tony Lacroix, who had been Vauquelin's technician at the Museum of Natural History in Paris and whose hobby was mineralogy, must have had an influence on his vocation. After studying pharmacy, A. Lacroix very soon turned to geology and mineralogy. He worked under A. Des Cloizeaux and F. Fouqué, whose son-in-law he was later to become. In 1887 he was an assistant at the "Collège de France" and also worked at the "Service de la Carte Géologique de France"—the French Geological Survey. In 1889 he obtained his doctorate with a dissertation on pyroxene gneisses and wernerite rocks. In 1893, as Professor of Mineralogy at the Museum, he succeeded his master Des Cloizeaux, whose chair he occupied with distinction until his retirement in 1937. He completely reorganized the mineralogical exhibits in the Museum, increasing both their attractiveness and their pedagogical value, and he turned the Mineralogical Laboratory of the Museum into a widely renowned research center. Elected to the "Académie des Sciences de l'Institut de France" in 1904, he became its Perpetual Secretary on June 8, 1914. He dedicated himself to the high duties of this office, fulfilling them until his death with great competence, and integrity.

A. Lacroix's work is monumental and quite varied, dealing with mineralogy, geology, petrology, vulcanology, and even the history of sciences. On the occasion of a historical sketch he was writing about the "third seat" of the Mineralogy Section of the Academy of Sciences, in a few striking words he discreetly pointed out the nature of his work. "On January 11, 1904," said he, "the Academy returned to the study of minerals. It elected a mineralogist who was studying physical and chemical properties of mineral matter, no longer as an end in themselves, but as means of characterization for natural history purposes; who, in the field and in the laboratory, was finding his life work in a union of mineralogy, geology and the physics of the earth; a naturalist lured by research in far away colonies, roaming all over the world in the pursuit of volcanoes, their eruptions and their products. You will not be surprised," he then added, "if I leave a gap in this account."

From Lacroix's work considered as a whole, we sense a remarkable

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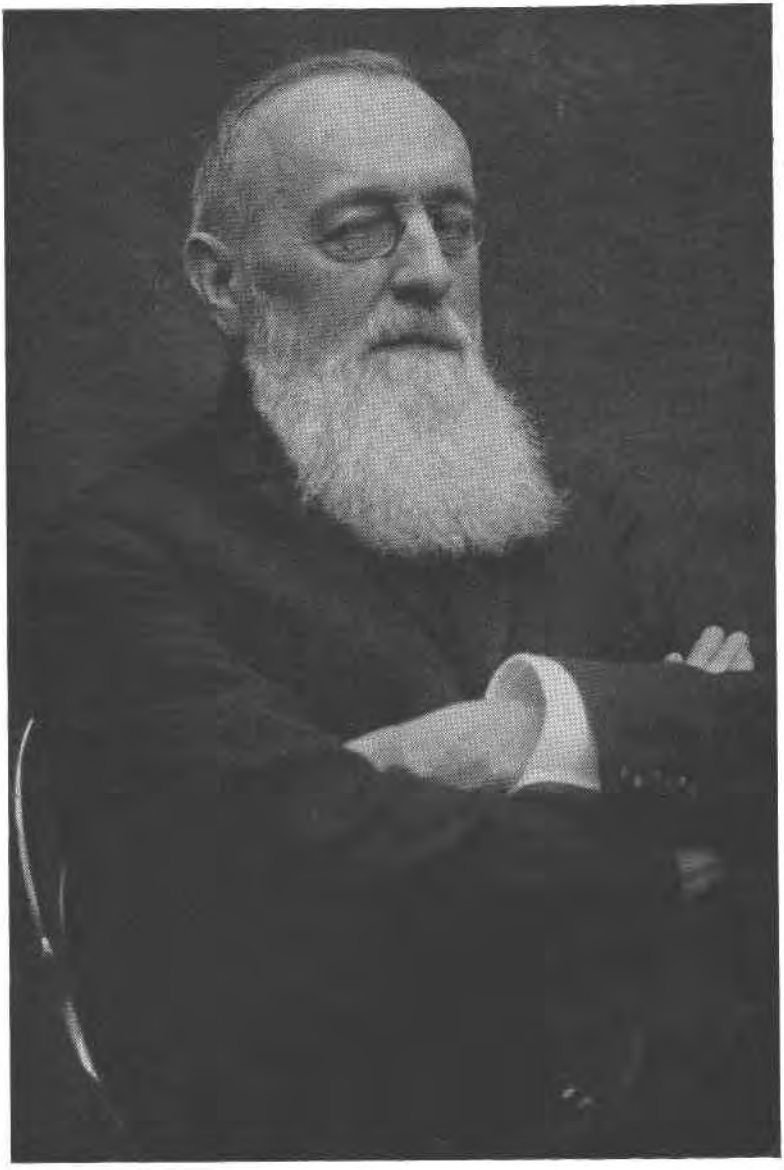

ALFRED LACROIX
1863–1948

continuity of ideas, based on a widened interpretation of the concept of mineral species, which he redefined and enriched. His "Minéralogie de la France et de ses Colonies," published from 1893 to 1913, and his "Minéralogie de Madagascar," which appeared in 1922 and 1923, were conceived on a completely new plan. By accumulating and correlating a considerable number of original observations pertaining to crystallography, optics, and lithology, he showed how necessary it is to maintain a proper balance between the various methods of observation, if one's purpose is not merely to give an accurate description of isolated minerals but rather to understand their mode of occurrence, associations, genesis, and transformations in nature. Thus he studied in detail the role which minerals play in the constitution of rocks, and removed the artificial boundaries that had so long separated mineralogy and petrography. By careful observations, made mainly in the Pyrénées, he renewed our knowledge of contact metamorphism, by proving the existence of endomorphic transformations suffered by granitic magmas in contact with limestone. His conclusions supported the theory that mineralizers and volatile emanations of eruptive magmas play a dominant role in metamorphism, a theory long advocated by French petrographers, especially by Auguste Michel-Lévy. His investigations on the *enclaves* of volcanic rocks have thrown light on the metamorphism produced by lavas. He showed that basic rocks differ from acid rocks in the effect they have on their *enclaves*; the former exert a purely thermal action, while the latter give rise to chemical alterations. In a masterly memoir (1907) on the silicated products of the 1906 eruption of Mount Vesuvius, he treated the transformations of lavas under the action of volatile magmatic emanations and introduced the now classical concept of autopneumatolysis. Not only did A. Lacroix study the materials ejected by volcanoes (Auvergne, Aetna, Vesuvius, Santorin, Iceland, Antilles, Japan, Java, Réunion, Comoro Archipelago, Madagascar, New Hebrides, volvanoes of the Pacific, Tibesti), he also spent a great deal of time scrutinizing the mechanism of volcanic eruptions. Thanks to his work on Mount Pelée, we now understand how domes and *nuées ardentes* are formed.

For a long time A. Lacroix had been interested in the classification of eruptive rocks, not with the limited aim of a systematician, but rather with the idea in mind of determining their mutual relationships and their conditions of formation, by including in their discussion both mineralogical observations and quantitative chemical data. From the classification proposed by the American petrographers Cross, Iddings, Pirsson, and Washington, he borrowed the idea of magmatic parameters and, by making a judicious use of it, he was able to account for the formation of several lithologic types the origin of which had remained unclear, for instance

those which he called the doliomorphous types, the heteromorphous types (mineralogically different rocks with identical chemical compositions), the pegmatitoid types, etc. Combining the knowledge gained from the syntheses performed by Fouqué and Michel-Lévy, by Bowen, and by a few others, with the results of his own numerous observations on artificially molten rocks (as in the case of the products of the fire of St. Pierre, Martinique), he was able to determine the conditions of stability for certain constituents of eruptive rocks.

A. Lacroix particularly studied the formation of pegmatites, especially the Madagascar pegmatites, which he compared with those found in U.S.A. He first made the distinction between potassium pegmatites and sodium-lithium pegmatites. He stressed the existence of two crystallization stages in the latter: first a constructive one, then a destructive one yielding new minerals at the expense of minerals formed during the first stage. In his classical work on laterite formation, he explained the mechanism of concentration of iron and aluminum hydroxides during the alteration of silicate rocks in tropical and subtropical climates. The study of terrestrial rocks led him to that of meteorites. Applying the same chemical-mineralogical principles that he used with terrestrial rocks, he gave the stony meteorites a rational classification, based on the study of a great many falls, many of which were new and had occurred in the territories of the French Union. The specimens collected by A. Lacroix over a period of more than fifty years have considerably enriched the mineralogy collection of the Paris Museum of Natural History. As to the petrography collection, he himself created it; with representatives of almost every known rock type, each accompanied by a chemical analysis and thin section, it is a working tool second to none.

A. Lacroix was a fearless traveler. His many assignments took him to various regions of the earth: Scotland, England, Ireland, Scandinavia, North America (both Canada and U.S.A., where he particularly visited the Atlantic Coast, the Great Lakes, the Rocky Mountains, the Yellowstone Park, Colorado), Germany, Greece, Asia Minor, Japan, Malaya, Java. He was a pioneer in colonial mineralogy. He visited Martinique, Guadeloupe, Guinea, Madagascar, and Indochina. The observations he brought back on geology, mineralogy, and vulcanology proved to be of great theoretical and practical significance. Notably, we owe him the discovery and study of the Madagascar uranium minerals.

Finally, A. Lacroix felt a great inclination for the history of sciences. He was given an opportunity to contribute to the latter in fulfilling his duties of Secretary of the Academy of Sciences, one of which was to write up the biographies of deceased members of the Academy. To this obligation of his, we owe four volumes of fascinating studies, entitled "Figures

de Savants," on the life and work of many French geologists, mineralogists, and naturalists.

From the start the originality and power of A. Lacroix's work was recognized by scientific circles. He was a "Grand Officier" of the Legion of Honor, belonged to all the Academies, had received honorary memberships and doctorates *honoris causa* from about sixty universities, foreign institutes, and learned societies. He was a correspondent of the New York Academy of Sciences since February 17, 1899; honorary member of the same academy since December 20, 1909; correspondent of the Academy of Natural Sciences of Philadelphia since January 16, 1923; correspondent of the Mineralogical Society of America since December 27, 1926; honorary member of the New York Mineralogical Club since September 16, 1923; correspondent of the American Museum of Natural History in New York. He had been awarded several famous medals; he was the third Penrose Medalist.

The last years of his life were saddened by a cruel blow, the loss of his wife, on December 22, 1944. Madame Lacroix had been his faithful companion and devoted coworker of many years, and she had accompanied him on all his travels.

Highly conscientious, open minded, just, kind, friendly to everyone, a man with a very keen mind and a sense of humor slightly ironical at times, A. Lacroix aroused a deep loyalty and a deferential devotion in his students and colleagues. He will remain one of the outstanding figures of French thought.

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