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GEORGES MILLOT 1917–1991

Georges Millot died suddenly on 10 September 1991, in Strasbourg. He was born on 24 May 1917, in Troyes, Aube, where he received his primary education. After his secondary education in Paris, he entered the famous Ecole Normale Supérieure (1939) where he successfully passed the "agregation" examination of Sciences (1942), obtaining a first-class degree. Then he prepared and received his "thèse de doctorat ès Sciences" degree from the University of Nancy (1950).

He began his professional career as an Assistant Professor at the University of Nancy and as a Professor at the Ecole Nationale Supérieure des Mines and at the Ecole Nationale Supérieure de Géologie in Nancy (1942–1954). In 1954, Georges Millot joined the University of Strasbourg, where he held various positions: Head of the Geological Institute of Strasbourg (1954–1981), Head of the Centre de Sédimentologie et de Géochimie de la Surface (1963–1981), and Dean of the Scientific University of Strasbourg (1962–1965). In 1981, he retired as a Professor Emeritus being still in charge of many functions at the French Academy of Sciences where he had been elected in 1977 as a life member.

Georges Millot worked for about 50 years in different areas of science, but particularly in clay geology. Among the 224 papers he wrote or co-authored, about 150 were concerned with clay minerals or clays. He was the author of three books including Géologie des Argiles (1964), translated into Russian (1968) and English (1970), which is often still quoted in the present-day reference lists of papers on clays and clay minerals.

When Georges Millot began his research in 1942, clay minerals were already well-defined by mineralogists, but geologists had hardly begun to describe the occurrence of these minerals in sedimentary rocks, weathering materials and soils. He dedicated himself to establishing a detailed inventory of clays and for this purpose he perfected or improved different techniques such as extraction by ultrasonic waves (1948), examined the influence of drying and saturation tests for X-ray identification of clay minerals (1964), and studied the identification of simple and mixed-layer clay minerals in mixtures (1959). As early as 1949 he proposed a nomenclature of clay textures which is still used today. However, Georges Millot did not confine himself to that initial necessary inventory stage, and from the thorough study of clay minerals and clays, his research evolved with major contributions in a number of areas.

(1) "Birth" of clay minerals during weathering; influence of environments and climates on the nature of clay minerals; geochemical budget of weathering processes by isovolumetric calculation.

(2) Evolution of clay minerals during sedimentation including three processes: heritage of inert allochtonous

material, transformations in relation to the environmental conditions, and authigeneses. Clay minerals were thus found to be typical of their genetic milieu.

(3) "Death" of clay minerals during burial of sediments, i.e., in diagenetic and metamorphic formations where recrystallization of clay minerals takes place resulting in micas or other silicates. The "birth" and "death" of clay minerals are governed by symmetrical mechanisms.

(4) Geochemistry of the Earth's surface. Georges Millot proposed this term for the geochemical cycle of silicates, the superficial part of which is represented by the history of clay minerals, i.e., "birth", evolution and "death". This concept was extended later to the geochemistry of oxides (Fe, Mn, Al), of silica (flint, silicifications) and of carbonates (calcretes). The rules governing supergene mineral and/or metal accumulations were formulated.

(5) Geochemistry of landscapes. This term was also proposed by Georges Millot and referred to the influence of climate and tectonics on weathering processes and on the formation of landforms. In particular, he studied the planation of continents by intertropical weathering and pedological processes.

(6) Other more specific topics were also studied such as (i) isovolumetric replacement of silicate minerals or rocks (épigénie) during weathering and supergene accumulation which progressively leads to a monomineralic or monometallic state e.g. in calcretes or in ironcrusts; (ii) clay mineral populations of individual particles; as weathering increases, populations with various compositions follow each other, with statistical shifting from one species to another, etc.

(7) Applied clay mineralogy. At the beginning of his career Georges Millot carried out many studies on flint clays, bleaching earths, bentonites, etc, and on the use of clay minerals in the construction industry and agronomy. In 1949, he initiated the application of clay genesis to petroleum exploration and this method has been used by all the French companies for a long time. He also studied the effect of pollution on monuments and took part in the restoration of Strasbourg cathedral.

In 1963, Georges Millot initiated the Association Internationale pour l'Etude des Argiles (AIPEA) which has retained its French title. From 1969 to 1972, he was President of the Groupe Français des Argiles and of the Commission des Argiles du Centre National de la Recherche Scientifique. From 1972 to 1975 he was Editor-in-Chief of the Bulletin du Groupe Français des Argiles and President of the European Clay Groups. In 1974, he was Chairman of the 2nd Meeting of the European Clay Groups in Strasbourg, and was the first French Associate Editor of Clay Minerals when it became the Journal of the European Clay Groups in 1976. In 1989, he was President of the Honorary Committee of the 9th International Clay Conference (AIPEA) held in Strasbourg.

Georges Millot received many honours and medals: Commandeur des Palmes Académiques, Officier de l'Ordre de la Légion d'Honneur, Officier de l'Ordre National du Mérite, Officier du Mérite Agricole, and Chevalier de l'Ordre des Arts et Lettres; he was honoured several times by the Société Géologique de France (Prix Gosselet, 1963; Prix Gaudry, 1983), by the Académie des Sciences (Prix Millet-Ronssin, 1964), and by the Belgian Geological Society (Médaille Dumont, 1966). He was also elected as a life member of the French Académie des Sciences (1977) and as associate member of the Belgian Royal Academy of Sciences, Letters and Arts (1975). He was Doctor Honoris Causa of the University of Madrid, Spain (1979), Pavia, Italy (1981), Neuchâtel, Switzerland (1981), and Ankara, Turkey (1991). He also founded a Geochemistry Award at the French Académie des Sciences and a prize for Applied Geology at the Société Géologique de France.

Georges Millot was an excellent teacher who fired with enthusiasm numerous generations of students and scientists, giving his lessons and teachings with passion and real delight. Likewise he motivated and inspired about 70 postgraduate students he supervised in the preparation of their theses, and the many post-doctorate fellows who spent some time in Strasbourg. Discussions in the field, in the laboratory or in his office were often tough because of his preoccupation with scientific rigour, but he was always friendly. Everybody who approached Georges Millot was treated as an equal and came out enriched, reassured, with the feeling of having given his best. Under his luminous leadership, the clay team created by Georges Millot in Strasbourg had a marvellous history.

Georges Millot was a pioneer of clay geology in France, a very active member of the community of clay scientists, and a bright scientific and human personality. May I tell the English-speaking clay scientists that he was deeply disappointed not to have had the opportunity of learning English. Being a fluent French speaker, he was sorry not to be able to communicate better orally with his foreign friends.

HÉLÈNE PAQUET

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