

ROBERT CAMERON MACKENZIE
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Robert McKenzie (affectionately known as Mack to many of his colleagues) was one of our most eminent and distinguished clay mineralogists and thermal analysts, with an international reputation in both fields that brought him many honours and awards. He was instrumental in developing the Macaulay Institute for Soil Research in Aberdeen as a centre of excellence in soil mineralogy, particularly emphasizing analytical aspects, and played a key role in establishing clay mineralogy as a separate sub-discipline of the mineralogical sciences both in the national and international arenas. He was a pioneer in establishing thermal analysis as an accepted technique to be applied to a wide variety of materials in many different areas of study. He died on 4 July, 2000 following a short period of hospitalization.

Born on 7, May, 1920 near the village of Portmahomack on the shores of the Dornoch Firth, he received his initial education at Tain Royal Academy. He proceeded to the University of Edinburgh where he graduated with a First Class Honours in Chemistry in 1942 and quickly gained his PhD in 1944 for studies in the field of gas kinetics. He then chose to take up a post as a soil surveyor at the Macaulay Institute, and although this might seem to have been a rather unusual move for someone whose experience was essentially in experimental science, it did in fact initiate his career along the most fertile and productive lines. At that time, the Macaulay could perhaps best be described as a photo-research institute, with only a handful of scientific staff working in rather basic premises in a converted manor house. But already the staff included two scientists in the persons of Douglas MacEwan and George Walker, who would go on to achieve great renown in clay mineralogy, in addition to Bob Glentworth, a pioneering soil surveyor who had just completed the first detailed survey of agricultural soils in north-east Scotland. This provided an ideal background and stimulus for laboratory-based work of a soil mineralogical and chemical nature. His early work focused upon chemical pre-treatments of clays prior to their X-ray identification, but he soon came to realize that the amorphous and sesquioxidic components removed represented material just as deserving of study as the more crystalline clay minerals. Furthermore, such material by virtue of its fine grain size and association with mineral surfaces could have a disproportionate influence on soil properties and behaviour. In collaboration with Bruce Mitchell, he developed a number of chemical dissolution techniques aimed at the characterisation of poorly-ordered materials in soils, some of which became standard procedures in soil science.

At the same time he was seeking a more inclusive physical technique that could characterise both crystalline and amorphous materials and he was quick to see the potential of thermal analysis in this respect. Starting from a home-made DTA apparatus, he soon became an expert in the entire field of thermal analysis and its mineralogical applications. In particular, he embarked upon a systematic investigation by DTA of soil clays from Scotland and, as the opportunity arose, from many other parts of the world, eventually acquiring an unrivalled knowledge of what could and could not be interpreted from this technique. This research culminated in the publication in 1957 of the first Mineralogical Society Monograph, *The Differential Thermal Investigation of Clays*, a book that Robert conceived, organised, contributed to and edited. Even today this volume is still regarded by many as the best book on the subject. Prior to and concomitant with this major achievement, he published extensively on a variety of clay mineralogical topics, including the mineralogy and chemistry of the smectitic minerals, iron and aluminium oxides in soils, the genesis of soil clays, as well as problems related to clay mineral classification and nomenclature. The latter topic interested him greatly, not least one suspects because it gave him the opportunity to delve into original historical sources, an activity that he returned to throughout his career. His accomplishments in this period were recognized by the award of a DSc degree from the University of Edinburgh in 1957 and by election to the Royal Society of Edinburgh in 1961.

In 1959 he was appointed as Head of Department (later the Division) of Pedology at the Macaulay Institute, thus being confronted with the inevitable conflict between personal research interests and managerial and administrative duties. However, an appropriate balance was indeed struck and under his leadership the Department flourished and gained in stature, increasing in personnel and acquiring the latest in sophisticated analytical equipment. Despite his life-long attachment to thermal analysis, he always recognized that thorough clay mineral analysis demanded a multi-instrumental approach and that each individual technique had its strengths and weaknesses. Independent review groups came and went but generally approved and supported the Department's research activities, which remained strongly focused on the mineralogy and chemistry of soils in relation to soil properties and behaviour. At the same time he continued his thermal analytical interests, finally compiling and editing a monumental two volume work on differential thermal analysis that was published by Academic Press in 1970 (Volume 1) and in 1972 (Volume 2).

It was a great boon to the Department that he was so well known in the international sphere and staff benefited from contact with a continual stream of students and visiting scientists from all parts of the world. Many of these visiting researchers went on to achieve eminence in clay mineralogy in their own countries and remember with affection and gratitude their time at the Macaulay Institute working under his supervision. In his many visits abroad, in response to invitations to give lectures or to advise on scientific matters, he always regarded the scientists he met as colleagues and fellow human beings, whatever the political system in which they had to operate, or even the political complexion of the scientists themselves. Thus, in the most frigid days of the Cold War, many contacts and friendships were made with Soviet and eastern European scientists. Undoubtedly, such a tolerant and humane attitude helped to foster a sense of community between clay scientists from the eastern and western blocs that transcended politics and was mutually beneficial.

Robert was always keen to encourage interest in clay mineralogy and thermal analysis through society activities and throughout his career played a leading role in this respect in both national and international spheres. He was an early member of the Clay Minerals group of the Mineralogical Society and served in variety of offices, including that of Chairman and Editor of the Group's journal *Clay Mineral Bulletin*. He was an editor of great skill and judgement and although his lengthy critiques and numerous amendments sometimes infuriated authors, a period of calm reflection usually convinced them that what was being suggested was not only correct but also a distinct improvement. He continued to serve as a valued member of the Editorial Board of Clay Minerals until 1995.

Following his term of office as Convener of the Scientific Committee of the highly successful International Clay Conference held at Oxford in 1978 he became a natural choice to serve as President of the "Association Internationale Pour l'Etude des Argiles", under whose auspices the international clay conferences are organised. To many, he embodied the very essence of the "English" gentleman, (despite being a true Highland Scot), unfailingly courteous and fair-minded, but with a patrician demeanour which invested his lectures and pronouncements with an aura of authority. As is turned out these qualities were very much needed in his term as President of AIPEA, where he was faced with the difficult task of revising the organisation's statutes and bye-laws and presenting them for approval at the General Assembly, an undertaking that was successfully accomplished.

In the field of thermal analysis, he was closely involved in the setting up of a Thermal Methods Group in 1965 under the auspices of the Society for Analytical Chemistry and became its first chairman. He jointly organised the first International Conference on Thermal Analysis in Aberdeen in 1965, leading to the founding of the International Confederation for Thermal Analysis (ICTA) in 1968. For a long time, he served as Treasurer of this organization and although ICTA funds were always rather limited, there were some amusing occasions when they were managed as if they belonged to the sphere of high finance. Following a decision that ICTA funds would be held in Swiss Francs, he visited a bank in Zurich and explained to the counter clerk that he was the treasurer of this organization which would receive funds from many different countries. Without further ado and with the counter clerk acting under the assumption that such a distinguished personage would undoubtedly have control of a multi-million dollar fund, he was immediately whisked into the inner sanctum of the highest bank official available. This official then proceeded to dispense the bank's exceedingly generous hospitality until it eventually came to light that the fund in question amounted to some hundreds of dollars rather than millions. It was typical of Robert that he was able to handle this incident with complete aplomb.

In the course of his distinguished career, he was the recipient of many awards and honours. For his contributions to thermal analysis he received the first Mettler Award in 1968, the Netsch GEFTA Award of the West German Thermal Analytical Society in 1982 and, particularly pleasing for him, the Gold Medal of the Society for Analytical Chemistry in 1980. His outstanding achievements in clay mineralogy were widely recognised in Europe and his awards included that of "Archiginnasio" from the City of Bologna during the International Clay Conference in 1981, the Emmanuel Boricky Medal from Charles University in Prague in 1983 and honorary membership of the Sociedad Española de Arcillas in Seville in 1987. At home the Clay Minerals Group conferred on him the title of "Distinguished Member" in 1983 in recognition of his outstanding scientific accomplishments in clay research and as an acknowledgement of his exceptional service to the Group. He is still the only member of the Group to have received this honour.

He retired from the Macaulay Institute in 1983 and at first, he may have regarded his retirement as premature. But with the winds of change in science funding blowing ever colder and with support for basic studies in soil mineralogy becoming more and more difficult to obtain, in addition to the profound structural changes to the Macaulay Institute and its research programme that would shortly be proposed, in all probability the timing of his retirement was exactly right. For some years he continued research into thermal analysis in the Department of Chemistry in the University of Aberdeen, but eventually his concern over his wife's ill-health meant that his academic activities had to be very much curtailed, although not altogether discontinued.

On the personal front, it was a privilege and a pleasure to be a colleague of his for so many years at the Macaulay Institute and an honour to succeed him as Head of Department. Of course it was an honour not without problems as he was an extremely difficult, if not impossible, act to follow. He married Hilda Bruce, a fellow member of staff at the Macaulay Institute, in 1950. She predeceased him in 1998. They are survived by their son Bruce and daughter Morag.

In preparing this notice I have been greatly helped by contributions from and discussions with several of his friends, colleagues and associates, including particularly J A Bain, D C Bain, D J Morgan, E Paterson and T J Maxwell. A shorter version of this notice was previously published in the journal *Clay Minerals* and I acknowledge with gratitude the permission of the Mineralogical Society to reproduce this material here.

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