S. R. TAYLOR
HONOURED WITH BOWEN AWARD 1989

S. R. Taylor, is a distinguished geochemist and Honorary Fellow of the Geological Society of India. He is the recipient of the honoured Bowen Award. We have pleasure in reproducing below extracts from the citation by Kevin Burke and response by S. R. Taylor made at the award ceremony.

Citation

Ross Taylor graduated with a B.Sc. degree from Canterbury College of the then University of New Zealand in 1948 and an M.Sc. in 1951. He followed the footsteps of Ernest Rutherford and other distinguished New Zealanders (including a surprisingly large number of AGU Fellows in proportion to the small population of New Zealand) by going abroad to further pursue his scientific education.

Ross followed Brian Mason, who had taught him briefly during his undergraduate career, to Indiana [University in Bloomington], and this in itself was innovative. The majority of New Zealanders then went to Europe and most of them to Britain. Ross's Indiana Ph.D. dealt with the origin of some New Zealand metamorphic rocks as shown by their major and trace element composition. It is somewhat reassuring (to me but perhaps not to all) that a second part of Ross's thesis work dealing with volcanic rocks of the Banks Peninsula was not written up for more than 20 years. Mason had been introduced to the emission spectrograph when working with Goldschmidt in Oslo and at Indiana had access to, what were then, very good analytical facilities. With hindsight it can be seen that Ross was setting off on a path that he has followed for much of his career. He has used the major and trace element (as well as the isotopic) compositions of materials to show their origin. The materials he has tackled have varied in scale (though not progressively) and now include tektites, meteorites, the island arcs, the continents, the

lower continental crust, the mantle of the Earth and the Moon. He is presently writing a book on the chemistry of the Solar System, so perhaps his horizons are continuing to widen.

From 1954 to 1958 Ross was in Oxford where Wager, driven by a desire to validate his model for the Skaergaard intrusion, was expanding British trace element geochemistry. Emission spectroscopy was the favoured analytical technique and much of Ross's Oxford work was with Louis Ahrens using that method. It was using that method (and presumably as a result of discussions during the lengthy tea-breaks of British academic) that Ross completed his rarely cited study of the anomalously high caesium content of trilobite skeletons. This topic seems to me worth revisiting. Has anyone yet shown why trilobites concentrated caesium?

In 1958 Ross followed Louis Ahrens to Cape Town from Oxford. His interests by then included spectrochemical analysis, trace elements and the alkali metal distribution in rocks. He had already begun to work with Knut Heier on this last topic and this period is also marked by his first papers on tektites.

In 1961 he went to the Australian National University in Canberra, where he is now a Professorial Fellow. He has been there ever since, playing a leading role in the metamorphism of what was initially a 'Department of Geophysics' into the 'Research School of Earth Sciences.' The rapid establishment of the 'ANU Group' as leaders in the study of the solid Earth under Jaeger and the continued excellence under successive directors is an often-told story. The excellence has come from a small number of distinguished senior scientists with diverse but overlapping interests working with outstanding students in an intellectually stimulating environment. Use of a limited, but carefully selected, range of laboratory methods and first class technical support complete the picture of a uniquely successful institution.

At ANU it was logical for Ross to turn to spark-source mass-spectrography. No other available analytical method provided data on all of his beloved rare earth elements. While working with this unique technique (that has perhaps always been underused) he was immensely active on the major and minor element geochemistry of tektites, the continents and the andesitic rocks of the island arcs af the Southwest Pacific.

Ross was an established geochemist of international standing by the time the Apollo era approached. He was visiting Harold Urey in La Jolla [Calif.] in 1967 and it was not surprising that he was invited to take part in planning for the initial sample studies. What might not have been so predictable was the extent to which he became immersed in lunar studies. Four of his six books relate to lunar and planetary topics. He has spent more time at the Lunar and Planetary Institute than most of its directors and only last month [November 1989] he gave the keynote address in a session on the Moon at the annual meeting of the Geological Society of America.

During the last twenty years Ross's terrestrial interests have focused on the evolution of the continental crust. Surprises have included Ross's demonstration that Archean shales commonly have no europium anomaly and that the continents are too siliceous to represent entire arcs. The literature on continental evolution is burgeoning as seismic reflection data and xenolith studies play a larger role and as the history of the better known continents is being established by a broad range of methods. The book that Ross published in 1985 with Scott McLennan, *The Continental Crust; Its Composition and Evolution,* came at a critical time in these

developments. More recent papers with his collaborator Rudnick show Ross assessing the possible role of basaltic underplating in the evolution of continents.

In his long career Ross Taylor has applied geochemistry of major and minor elements to fundamental problems in the evolution of the terrestrial planets. He has done so by careful application of a variety of analytical techniques and he has placed his results in the broad framework of the evolution of the Solar System by writing books and articles that are useful both to specialists and to a broader audience. He has been active in community service as an editor of half a dozen journals. He is president of the Meteoritical Society and has been ready to offer wise counsel both formally and informally to many in our community. His point of view as an Australasian has been characteristically independent and this has proved very helpful to me and I hope to others. On behalf of the Volcanology, Geochemistry, and Petrology Section of AGU and of his many friends I am honored to present Stuart Ross Taylor as the recipient of this year's [1989] Bowen Award.

National Research Council
Washington, D. C.

KEVIN BURKE

Response

It is a considerable honor to receive the Bowen Award and I thank the Volcanology, Geochemistry, and Petrology Section of the American Geophysical Union for it, and Kevin Burke for his kind words.

My career has been influenced by many people. Growing up on a farm in New Zealand was a good, if peaceful, introduction to life and I was fortunate to have supportive parents and family who encouraged me to seek wider horizons. Robin Allan, Professor of Geology at Canterbury, presented geology in such an entrancing light, that I switched majors from chemistry to pursue the interesting prospects which he and Brian Mason opened up.

When I went to Indiana as a graduate student, my initial task was to proofread the galleys of the first edition of Brian's *Principles of Geochemistry*. I also learned much about emission spectroscopy in Dick Leininger's laboratory, so I was well equipped, when I went to Oxford, to help Louis Ahrens set up trace element geochemistry. He asked me to coauthor the second edition of his book *Spectrochemical Analysis*, which was to have unforeseen consequences a decade later in Houston.

At Oxford, where I went at the suggestion of Henrich Neuman, I also acquired from Bill Wager and Malcolm Brown, an understanding of layered intrusions which later helped in trying to understand lunar evolution. Knut Heier, with whom I did a lot of work on trace elements in feldspars, was a frequent visitor from Oslo. Harold Urey visited Oxford in 1956. His lectures about the Moon, meteorites and tektites started me on other tracks. Perhaps his chief influence was to open the possibility that one could seriously study objects as remote as the Moon, long before we imagined going there. In Oxford, I also met my wife Noel, who was working with Dorothy Hodgkin in organic crystallography. She has ably supported me and borne with my frequent absences in this country.

After several years in Oxford, I followed Louis to Cape Town, where we set up a still-flourishing geochemistry department, now run by Tony Erlank, another former

student. By the time I went to Canberra, I was heavily involved in the great controversy over the origin of tektites, a battle which taught me a lot about the influence of personalities in science. As Kevin has mentioned, I became involved in spark-source mass spectroscopy, and the whole question of accurate trace element analysis has continued to interest me, as a subculture in its own right, and as a necessary prelude to serious work in geochemistry. It has turned into a longer battle than I would have imagined when I first worked with G-1 and W-1, and is still not resolved.

I also did a lot of early work with Alan White, Jim Gill and Dave Whitford on island arcs and continental growth before the Moon came to dominate my life for over a decade. This is mostly the fault of Robin Brett, who turned up in Canberra on leave, in 1967. This event started another phase in my life. He invited me to Houston in May 1969, where I was then rather easily persuaded to stay to run the optical emission spectrograph set up to analyze the first samples to be returned from the Moon. It was certainly my most important and critical work. It took all my physical and intellectual energy to do it on two months notice, and, as Wellington remarked after the battle of Waterloo, 'It was the nearest rum thing you ever saw in your life.' Just as my early work with Louis Ahrens on analytical chemistry turned out to be a preparation for unpredictable events, so my association with Bill Wager and Malcolm Brown prepared me to think about magma oceans and a super-Skaergaard model for the Moon, which I developed with that indomitable Czech Petr Jakes and in later work on the highland crust with Ted Bence. It now seems clear to me that we understand the composition, evolution and origin of the Moon much better than that of the Earth.

I kept one foot on the Earth during this time by pursuing a previously neglected topic. The problem of the composition and evolution of the continental crust turns on obtaining an adequate sampling of that complex body. Being lazy, and not wanting to collect and analyze a million samples, it became clear that Nature has already done this, if only we can interpret the geochemical record in sedimentary rocks. I was fortunate to collaborate in this work with Scott McLennan, who understood both sedimentary rocks and geochemistry, having learned the latter subject from another New Zealander, Bill Fyfe. Scott and I have managed to write over 30 papers and a book and still continue this collaboration at long distance. Roberta Rudnick has assisted me greatly in attempts to understand the nature of the lower crust, a more difficult topic.

Many other friends and colleagues have made my journey a pleasant one. Denis Shaw and I have had a long editorial association extending over 20 years. I have a host of friends in the lunar and planetary community, including the other members of the Taylor clan. The Lunar and Planetary Institute has been a second home and has provided me with unique opportunities to work with many people in this country, where I have always been made extremely welcome. It is a pleasure to record this example of international collaboration, and to thank you once again for this award.

Australian National University,
Canberra

ROSS TAYLOR

(Reproduced from EOS, February 27, 1990)