

Preface—Dedication to Keith Bell

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During the 2008 V.M. Goldschmidt Conference at Vancouver, British Columbia (Canada), a full one-day special session was held entitled, “*Carbonatites, alkaline silica-undersaturated and potassic rocks: Probes of the subcontinental mantle—A symposium dedicated to Keith Bell*”. The keynote address was given by D.G. Pearson (University of Durham) and the session was chaired by M. Wilson (University of Leeds) and A. Simonetti (University of Notre Dame). The special session included a total of more than 30 contributors reporting research on a wide range of alkaline rock types and carbonatites. In particular, the carbonatite-related studies presented several novel findings such as the first iron and tungsten isotope data measured from carbonatites. The special event culminated with long-time friend and colleague John Gittins’ presentation of a commemorative plaque containing a sample of natrocarbonatite lava erupted from Oldoinyo Lengai in 1993. Several of the carbonatite-related studies presented at the Goldschmidt Conference session are contained within this special issue.

A perusal of recent literature indicates that many researchers are making serious efforts to understand the geological and geochemical relationships between flood basaltic magmatism within large igneous provinces (LIPs) and associated alkaline intrusive complexes. This volume contains several invited papers that focus on this discussion through their investigations of the petrography, mineral and rock chemistry, and isotopic compositions of flood basalts and associated intrusive alkaline complexes.

Keith obtained a BSc degree in geology from the University of Leeds and a Doctor of Philosophy from Oxford University in 1964. At the Universities of Texas (Dept. of Geology) and Toronto (Dept. of Physics), he conducted postdoctoral research on alkaline rocks and carbonatites collected in Uganda. Collaboration with J.L. Powell in the late sixties and early seventies resulted in several papers on the Sr isotopic composition of carbonatites and alkalic rocks. Keith spent 6 months with Powell at Oberlin College (Ohio) in 1968 to write up their work. The Bell and Powell (1969) study was one of the first, if not the first, to show that isotopes could be used to reflect mixing/contamination in igneous systems.

Keith then accepted a position at Carleton University in 1970. He later served as Director of the Ottawa-Carleton Geoscience Centre (1988–1991)—at that time the Centre was one of the largest graduate teaching and research institutes of Earth Sciences in Canada representing the combined expertise of the Dept. of Earth Sciences at Carleton University and University of Ottawa. A solid-state mass spectrometer was available in the Dept. of Physics at Carleton built by J. Cole and D. Menagh. This was then replaced, using funds from NSERC, with the first multi-collector (5 collectors) mass spectrometer (Finnigan-MAT 261) set up in North America with J. Blenkinsop. Keith in collaboration with Blenkinsop, Cole, and Menagh demonstrated that carbonatites could be used to monitor the secular evolution of the mantle (Bell et al. 1982). In 1991, Keith was invited to the USSR as a visitor to the Dept. of Mineralogy, Leningrad State University. He visited the Kola peninsula and did joint work with A.K. Bulakh and A. Zaitsev, with papers resulting from this collaboration. In the early-to-mid 1990s, Keith worked with A. Simonetti on a wide range of carbonatite projects and one of the highlights was documenting Sr, Nd, and Pb isotope disequilibrium among different liquidus phases in primitive nephelinites from Napak volcano, Uganda (Simonetti and Bell

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1993). Other papers involved the trace element and isotope geochemistry investigations of Oldoinyo Lengai (Tanzania), and proposing the co-relation between mantle plumes and carbonatites in both west-central India (Simonetti et al. 1995) and East Africa (Bell and Simonetti 1996). Over the past 20 years, their research collaborations have resulted in 14 peer-reviewed co-authored papers.

Subsequent work on alkaline rocks and carbonatites continued in collaboration with A. Rukhlov (NATO post-doctoral fellow) and G.R. Tilton (University of California, Santa Barbara), the latter using Pb isotopes that resulted in publication of a summary of their work in EOS. The work with Tilton clearly indicated that parts of the mantle below the continents had isotopic signatures similar to those of OIBs and not MORBs! Keith later turned his attention to the carbonatites and alkaline rocks of Italy in collaboration with F. Stoppa, G. Lavecchia, and G. Rosatelli (G. d'Annunzio University, Chieti) and F. Castorina (La Sapienza University, Rome). On the basis of an extensive compilation of radiogenic isotopes from many Cenozoic igneous rocks, they showed that only three isotopic end members are needed to generate mixing arrays, two of which are similar to those found in oceanic islands (EOS 2004). This work is ongoing.

Keith helped organize two important meetings with regard to carbonatite research; the first was the 1986 annual GAC/MAC meeting that ensued with publication in 1989 of "Carbonatites: Genesis and Evolution" (ed. K. Bell); the second in 1997 that resulted in Special Volume 39 of the *Journal of Petrology* (eds. Bell, Kjarsgaard, and Simonetti) "Carbonatites into the twenty-first century". He was also a co-coordinator (with J. Keller and L. Kogarko) of the IGCP Project 314 of IUGS-UNESCO on "Alkaline and Carbonatite Magmatism". Keith is proud of the fact that he has co-authored eight papers in the journal *Nature* and has written two "News and Views" articles for this same journal.

Keith's research endeavours also involved using his expertise in isotope geochemistry on non-carbonatite-related topics. He teamed up with J. Franklin and other members of the Geological Survey of Canada for a first attempt at using Pb isotope signatures of glacial till to delineate VMS deposits (Bell and Franklin 1993) and extended the application for use in glacial dispersion patterns (Bell and Murton 1995). In addition, with J.W. Card (research associate), he showed that the daughter products of radon could be used for uranium exploration; patents were obtained in several countries including Canada and the USA.

Finally, as a former PhD student of Keith's, I have many fond memories of my years working with him at Carleton University—obviously, too many to be encapsulated here. He was an excellent mentor and his drive for knowledge and research is relentless, stimulating, and infectious. Many students and postdoctoral fellows who had the privilege of working with Keith have had similar experiences and here

is just a small sampling of their thoughts. Hassan Mirnejad, University of Tehran (former PhD student) writes, "*Keith was an amazing teacher. His popular Isotope Geology course attracted a large crowd of students from both the Universities of Ottawa and Carleton. He was also a great supervisor and I personally would not have been able to complete my Ph. D. if it were not for Keith's understanding and patience.*" Julian Murton, University of Sussex (former postdoctoral fellow) writes, "*Our collaborative research work dealing with the Pb isotope geochemistry of glacial till as a tracer for delineating VMS deposits was exciting and fun, for Keith's great enthusiasm and knowledge about isotope geochemistry was infectious and stimulating. Keith's excellent leadership on this project showed us the value and excitement of interdisciplinary research. Keith is also a master of words, carefully weighing each word and finding a nice balance of expression between clarity and concision: a meeting of scientific rigour and literary flair.*" Elizabeth Spencer, Carleton University (formerly Dunworth, former PhD student) adds, "*His door was always open—he was a great supervisor who stimulated thoughts and encouraged new research, but he was never dictatorial—he gave me a fairly free rein and let me make my own mistakes and encouraged me to learn from them; he was always happy to discuss and debate and ask and answer awkward questions.*"

Lastly, I wish to thank the chief editors of this journal, Rainer Abart and Johann Raith, for supporting this special issue as a dedication to Keith Bell. Special thanks go to associate editor L.G. Gwalani (Lalou) for initiating the idea of dedicating this issue to Keith, and for his usual outstanding editorial work. Kathryn Moore is also thanked for her guest editorial work and managing editors Judy Pieren and Edward Sarmiento for their assistance and patience. Listed below are references to some of the more interesting papers and books that Keith has been involved with.

List of selected papers with graduate students and collaborators

- Bell K (Ed.) (1989) Carbonatites: genesis and evolution. Unwin-Hyman, 610 pp
- Bell K, Blenkinsop J, Cole TJS, Menagh DP (1982) Long-lived heterogeneities in the upper mantle - evidence from Sr isotopes. *Nature* 298:251-253
- Bell K, Castorina F, Lavecchia G, Rosatelli G, Stoppa F (2004) Is there a mantle plume below Italy? *EOS* 85:541,544-546
- Bell K, Franklin JM (1993) Application of Pb isotopes to mineral exploration in glacial terrains. *Geology* 21:1143-1146
- Bell K, Keller J (Eds.) (1995) Carbonatite Volcanism: Oldoinyo Lengai and the Petrogenesis of Natrocarbonatite. *International Association of Volcanology and*

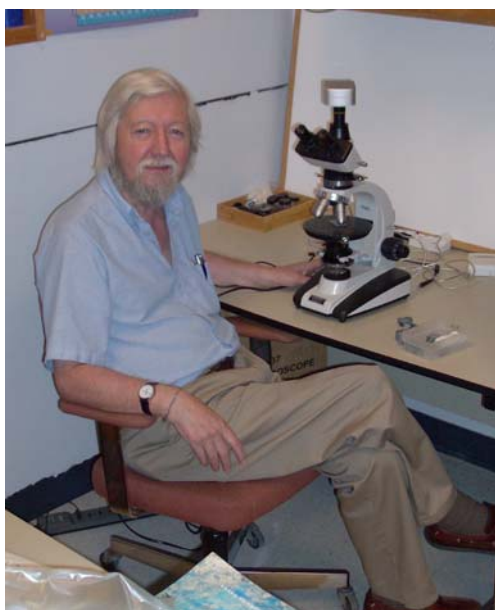


Keith Bell—photo taken in Lviv, “city of lions”, western Ukraine, 2000

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Keith Bell—photo taken at Carleton University, Ottawa, 2008



Group photo “Keith with some of his research group, 2001. Back row: A. Timmermans, I. de Jong, S. Gregory, S. Farrell, and E. Yu. Front row: A. Rukhlov, K. Bell, H. Mirmejad.”

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