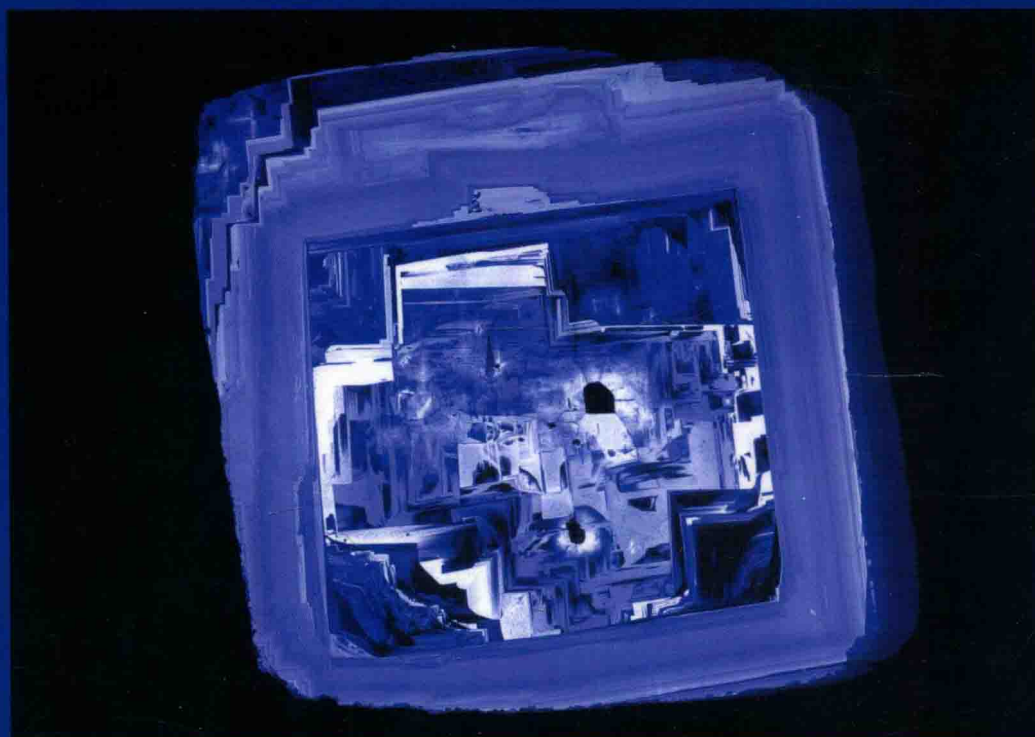


VOLUME 2

8TH INTERNATIONAL KIMBERLITE CONFERENCE SELECTED PAPERS

The J. BARRY HAWTHORNE Volume



Edited by

R.H. MITCHELL | H.S. GRÜTTER | L.M. HEAMAN
B.H. SCOTT SMITH | T. STACHEL

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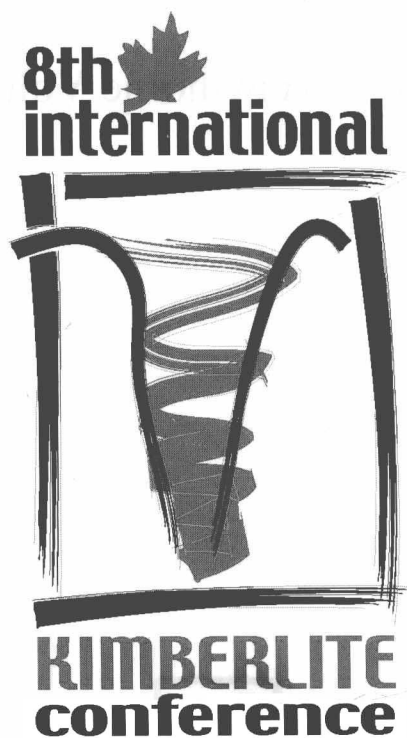
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8TH INTERNATIONAL
KIMBERLITE CONFERENCE
Selected Papers

VOLUME 2

The J. Barry Hawthorne Volume



This volume, and its companion, contain selected papers from the 8th International Kimberlite Conference (in the same format as they appeared in Lithos volumes 76 and 77). The Conference was held in Victoria, BC, Canada, 22-27 June 2003.

Special Issue

**Selected Papers from the 8th International Kimberlite Conference,
Victoria, BC, Canada, 22–27 June 2003
Volume 2: The J. Barry Hawthorne Volume**

edited by

ROGER H. MITCHELL
HERMAN S. GRÜTTER
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Selected papers from the 8th International Kimberlite Conference, Victoria, BC, Canada, 22–27 June 2003







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Foreword

The Eighth International Kimberlite Conference was held in Victoria, British Columbia, Canada from June 22 to 27th, 2003. These two volumes record some of the presentations made at the conference and are dedicated to Roger Clement (Volume 1) and Barry Hawthorne (Volume 2); in recognition of their contributions to, influence on, and encouragement of, kimberlite and upper mantle studies over the past 35 years.

The conference was attended by 585 full delegates who listened to 86 oral presentations and perused 185 posters. Many of these presentations gave for the first time detailed information on the geology and petrology of the kimberlites discovered in Canada during the past decade, the mantle-derived xenoliths and xenocrysts they contain, together with data on the diamonds from the recently opened Ekati and Diavik mines. An especially innovative feature of the conference was the opportunity for delegates to examine some of these newly discovered kimberlites at the "Large Core Exhibit" where approximately 2 km of drillcore was on display. The conference was preceded and followed by field excursions to the Ekati and Diavik diamond mines in northern Canada. Other field excursions visited areas in which kimberlites, lamproites and alkaline rocks occur in Colorado, Wyoming, Montana, British Columbia and Ontario.

Kimberlite conferences, which typically are held every four years, are unusual in that they bring industrial and academic geoscientists together in a symbiotic forum. This is a direct consequence of both

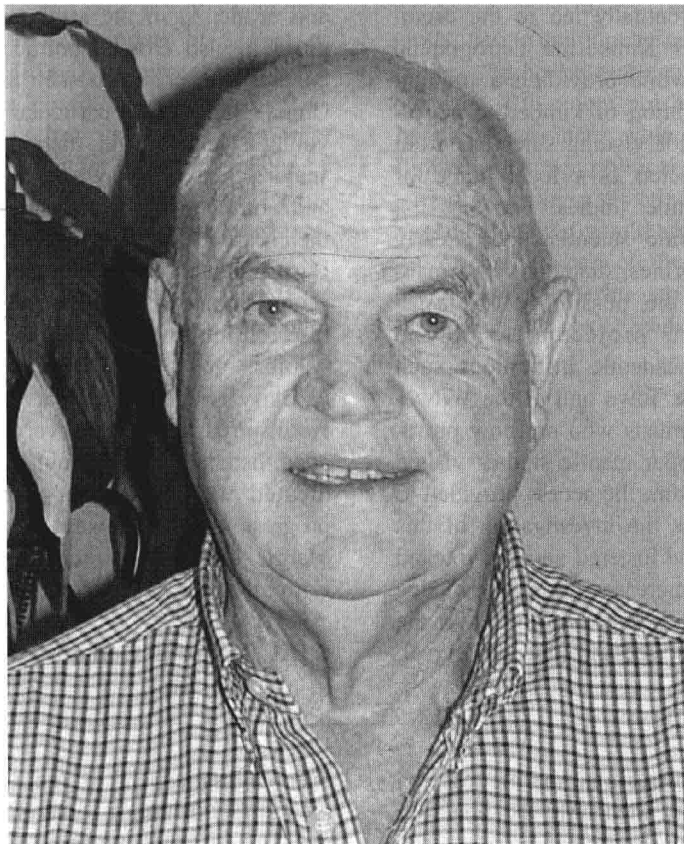
groups realizing that this mutual cooperation is a catalyst leading to improved exploration techniques for kimberlites and better evaluation methods of diamond deposits, coupled with an increased understanding of kimberlite geology, diamond genesis and upper mantle petrology. Each conference culminates with the publication of a proceedings volume. Papers presented in these volumes usually record important steps in our understanding of a particular topic. Commonly, these build upon the results of the preceding conference. This incremental approach results in the proceedings volumes having lasting scientific value. Thus, geoscientists today still quote the seminal papers published in the proceedings of the first conference held in 1973!

These two volumes present 86 papers drawn from the oral and poster presentations. The volumes are organized according to themes reflecting the character of the conference. Volume 1—the Clement Volume—details advances in kimberlite geology, mineralogy and petrogenesis. Volume 2—the Hawthorne Volume—describes studies of diamonds, eclogites, the upper mantle and cratons together with exploration methods for diamond-bearing rocks.

The editors of these proceedings consider the papers included in these volumes to be novel and substantive, and that they will stand the test of time and be widely quoted in future studies of kimberlites, diamonds and the upper mantle.

8IKC Editorial Committee

Preface



J. Barry Hawthorne

Volume 2 of the Proceedings of the Eighth International Kimberlite Conference is dedicated to John Barry Hawthorne in recognition of his pivotal role and visionary contributions to kimberlite geology, diamond studies and upper mantle petrology.

Early in his long and successful career with De Beers, Barry Hawthorne provided fundamental

insights to kimberlite geology. His 1975 paper proposing the composite geological model for many southern African pipes is still applicable. His earlier but less well known work on kimberlite sills, some of it undertaken with Barry Dawson, showed that kimberlites were undoubtedly magmas, a crucial but unresolved issue at the time. Although Barry Haw-

thorne was an excellent scientist, his greatest contributions to science have been as an *eminence grise* who had the foresight to recognize that the diamond industry and academic research workers could form a mutually beneficial association. Barry had vision and the desire to change things. With far-sighted leadership, he revolutionised what was happening in De Beers, especially during his time as Chief Geologist in Kimberley starting in 1970. Barry's recognition of the importance of sound science in exploration, evaluation and mining eventually led to the establishment of the De Beers Kimberlite Petrographic Unit (KPU). The KPU, while providing a training ground for a future generation of kimberlite petrologists, became a Mecca for visiting scientists from all over the world and acted as a focal point for kimberlite and upper mantle studies. For the first time, international academic scientists had nearly unlimited access to kimberlites, diamonds and mantle-derived material and the possibility of unsurpassed diverse research projects. He forged associations with many academic institutions such as the Universities of Cape Town and of the Witwatersrand. Many of the scientists who are now prominent in kimberlite and upper mantle studies visited Kimberley and benefited from the access provided to mines and samples. It was the investigation of this material and the research he fostered and fast-tracked that led to the enormous increases in our knowledge of the upper mantle and kimberlite petrology over the last three decades. The success, and indeed survival,

of kimberlite conferences has depended directly on these study materials. Without the cooperation of De Beers, and particularly Barry's enthusiastic support, the 1st International Kimberlite Conference would have not been the phenomenal success that it was. Barry brought an enlightened attitude into this field of geology around the world. He awakened kimberlite research into a new era. He opened doors and created opportunities. He is largely responsible for the unusual relationship that exists between industry and academia in the kimberlite conference community. He also crossed political barriers and initiated contact with countries such as the Soviet Union and China. Barry had a particular interest in encouraging young scientists and there is no doubt that many senior scientists today owe their scientific reputations and ability to gather research funds for students to their earlier association with Barry and the KPU. Barry initiated endless research studies most from an economic perspective. The advances made in applied research in turn stimulated the diamond industry as a whole.

Barry is an extraordinary role model and mentor. He inspired the best in everyone, motivated, encouraged, listened, offered guidance, challenged, communicated well with everyone, covertly monitored progress and was always supportive. With his wife Margie, he is always incredibly hospitable and friendly to all in the 'kimberlite family'.

8 IKC Editorial Committee

Having been out of mainstream kimberlite research for 15 years and having attended only the first four Kimberlite Conferences, my participation in 8 IKC was both an exciting and rewarding experience. This was particularly so as many of the papers presented at the Conference represent the culmination of studies initiated between 1970 and 1990 and many of the researchers who pioneered these studies of kimberlite, its associated minerals and the Upper Mantle continue to make major contributions in this unique field of Earth Science.

Sadly, some of the stalwarts of the early Conferences have passed away or have retired from active involvement in research. Despite this, the most

encouraging aspect of the Conference was to see the number of young researchers whose contributions made a profound impact on the proceedings. Clearly, the "Old Guard" are being adequately replaced. In addition, as the number of Conference participants continues to increase at each meeting, it would appear that the future of the IKC movement is assured.

However, before lapsing into a possibly unwarranted mood of complacency on this score, the reasons for the ongoing success of the Conferences should be examined. Of paramount importance has been the discovery of new fields of kimberlite and other diamond-bearing rock types, which, in most

instances, have their origins in the Upper Mantle. Along with these new discoveries, there has been a change in the perception of many exploration and mining companies regarding the value of what was previously regarded as irrelevant "academic research". This has allowed improved access to mining sites and increased levels of funding and support for research.

Another extremely important factor has been the quality, capability and willingness of the organisers to make each Conference a success in a unique manner; this along with the support of a host of both young and old dedicated volunteers who seem to relish the challenges posed by running a meeting of this nature. There has also been an impressive series of venues chosen for the Conferences as well as the organisation of outstanding field excursions, often in the face of formidable logistical obstacles.

The development of a wide variety of new techniques in the fields of exploration, geophysics and rock and mineral analysis, amongst others, has also played a significant role in stimulating research and achieving a clearer understanding of the true nature

of kimberlites, their related rock types and their origins.

So what does the future hold for Upper Mantle and kimberlite research? The venue for the next Conference is India, which hosts some of the least visited kimberlites and oldest known diamond fields. The organisers have shown enthusiasm and willingness to take up the burden and they clearly intend to make 9 IKC a success. The opportunity to visit the Subcontinent and obtain rock and mineral specimens and undertake field studies should provide considerable motivation to continue research on a broad front. In the future, it is hoped that new discoveries will be made but even if this does not happen there are still many African occurrences, which have not been adequately studied. However, political and security considerations may play a role in selecting the venue for 10 IKC.

On balance, it would appear that provided funding for research does not diminish dramatically Upper Mantle and kimberlite studies are likely to continue for at least the next decade.

J. Barry Hawthorne

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