

Barringer, Back to the Future: Airborne Geochemistry and Many Related Topics
Dr. Peter M.D. Bradshaw.

Reviewed by: Dr. Peter A. Winterburn.

*NSERC/AcmeLabs/Bureau Veritas Minerals Industrial Research Chair in Exploration
Geochemistry, Mineral Deposit Research Unit, EOAS, The University of British Columbia,
2020-2207 Main Mall, Vancouver BC, V6T 1Z4, Canada.*

Email: pwinterburn@eos.ubc.ca

To those employed in the mineral exploration industry after the mid 1990's, who saw the move from AAS as the standard analytical technique to ICP-OES and the subsequent introduction of laser-ablation as an optional front end to ICP-MS instrumentation, Barringer, by Peter Bradshaw, will arrive as quite an eye opener. The detailed revelations of the fundamental and advanced research being undertaken at that time by private research company – as opposed to an exploration and mining major, is quite phenomenal. That Tony Barringer and his associates were many years ahead of their time, in terms of exploration technique concepts and methodology is without doubt. The accelerated technical development and rapid adoption and application of new technologies by Barringer represents a period in time that has yet to be repeated in mineral exploration. The sub-title of the book, “Back to the future” adopting a phrase often whispered in conferences by Peter Bradshaw, is extremely fitting given that much of this work has essentially been forgotten by all but a selected few – I was one of the lucky ones to have seen some of the research in the mid 1990's whilst reviewing projects in southern Africa for Anglo American – and some of which will inevitably be re-invented rather than improved. It would have been fascinating to see what Tony would have been able to achieve with modern technology, drones, instrument miniaturization, ICP-mass-spectrometry, neutron activation generators, XRF tubes and detectors that fit in the hand. The possibilities seem endless.

The book is divided into 13 chapters each dealing with distinctive techniques and technological developments dominated by the overall theme of exploration geochemistry. As appropriate the book diverges to technical developments extending outside of mineral exploration. Extensive detail of each development is provided in each chapter including line diagrams and photographs

of the instrumentation, both still and ‘in action’. Developments are supported by numerous application case studies, both positive and negative, of where techniques were evaluated or applied in mineral exploration programs over or close to significant deposits, many of which will be familiar to most mineral explorers. Additionally, the book provides background on the various partnerships that were established with exploration companies in the 1960s and 70s to finance the development and testing of the equipment. Throughout the book, several examples are provided of field reports detailing the many problems encountered during operation, for instance collecting branches in the undercarriage of the aircraft during testing of the Airtrace Mk II system in Queensland, Australia. Such references bring to life what could otherwise have been presented as dry technical details. They also indicate a level of personal risk which would be considered unacceptable in modern exploration.

Chapter one documents the developments of the AIRTRACE system initially designed to collect and analyze gasses above mineral deposits, but which ultimately, in the Mk-III version, had developed to the collection of particulate material in the atmosphere at low-altitude. The particulate material collected on specifically developed 3M sticky tape was analyzed in the laboratory by laser-ablation-ICP-OES. A considerable number of technical developments and solutions were imported to the systems from developments outside of the earth science, illustrating Tony’s awareness that not all solutions would be found within the earth sciences or in analytical chemistry. Whilst the AIRTRACE produced interesting results in desert areas, additional research was required to understand how the techniques could be applied to areas covered in dense vegetation (Chapter 2). Barringer Resources undertook considerable ground breaking experimental research in biogeochemistry to understand better the release of materials from plant surfaces into the atmosphere. It is interesting to note that method developments were based on sound scientific principles with a desire to understand the process involved with experimentation as appropriate to verify the concepts being tested. This approach differed considerably from much of the more recent “suck-it-and-see” approach taken to mineral exploration developments with little associated sound experimentation or desire to genuinely identify and document processes. Chapter 3 details development of techniques to sample the so called “surface Micro-layer”, essentially the layer between solid materials – soil and plants - and the atmosphere. Hand held and helicopter borne devices both generated positive responses to

mineralization in orientation excesses. Chapter 4 and 5 move forward to the application of the AIRTRACE method to the real time analysis of hydrocarbons, and FLUORSCAN technique particularly in marine environments, in the search for oil and oil spills. As Bradshaw notes, oil exploration techniques are often shrouded in secrecy, hence what may have become of these developments is little known other than the observation that at least one major company followed through with some of the developments in aircraft of their own coupled with extensive flying.

Chapters 6 through to 13 document specific technical developments of Barringer Resources, many of which were not designed for mineral exploration, or which started life from exploration concepts, for example COSPEC for the detection of SO₂ originating from sulphide oxidation and GASPEC for remote sensing of hydrocarbons; but which found more appropriate application elsewhere, for example volcano and geothermal emission and environmental monitoring They do however clearly illustrate the breath of research ongoing at Barringer and the successful spin off of concepts that although not successful in exploration, had clear applications elsewhere outside of earth sciences. A particular example of note encountered often by the frequent air traveller being the IONSCAN, routinely still in use at airports for the detection of drugs and explosives. Of note, development of the LASERTRACE laser ablation system progressively coupled with new analytical instrumentation as it was developed, in particular early ICP-ES instruments. Combining LASERTRACE coupled with ICP-ES with the adhesive tape collection methods of AIRTRACE and standardizing to certified reference materials allowed for the analysis of samples at a rate of 1 per 10 seconds, equivalent to 1,500 samples a day.

Certainly within the earth sciences, it is questionable is such a rate of productive research and development by a single research group has occurred again. Perhaps the closest being the miniaturization of instrumentation made necessary by planetary exploration which we, as earth scientists, now carry the benefit from in the form of portable XRF, XRD and LIBS instruments. Tony Barringer also undertook considerable research and development in the field of geophysical applications, the parallel story would be a welcome addition.

Peter Bradshaw has put together a record of considerable value to anybody involved in research and development in rapid and remote sample collection and analytical technology in the earth

sciences and related fields. In addition, the book will have success in the general earth sciences community as being eminently readable combining a mixture of technical detail, challenges, opportunities and successes; and exploration application case studies, not all of which were resounding success, interceded with anecdotes from company employees bringing the day to day research and evaluation exercises to life.