

Barringer, Back to the Future: Airborne Geochemistry and Many Related Topics by Peter M. D. Bradshaw, ISBN 978-0-09691014-5-1, 2015, Association of Applied Geochemists, 2015, 159 p., US\$68.

Originally from England, Tony Barringer founded Barringer Research Limited (BRL) in Toronto, Canada, in 1961 (later moved to Golden, Colorado, in 1977). To geophysicists, his earliest and best-known invention was induced pulse transient (INPUT), an airborne electromagnetic method first introduced in the early 1960s, which has been credited with more than two dozen major mineral discoveries worth more than US\$100 billion. Later geophysical developments included COTRAN, RADIOPHASE, and E-PHASE.

This book, however, concentrates on Barringer's groundbreaking contributions to airborne geochemical systems developed in the 1960s and 1970s, which were applied to both minerals and oil and gas exploration. The approach included collecting both atmospheric gases (e.g., mercury, sulphur dioxide, and hydrocarbons) and particulates, which could be analyzed for many elements. In addition to hardware development, Barringer directly or indirectly funded research into botany, microbiology, weak-leach geochemistry, laser ablation, and multielement analytical methods, statistical methods, and the marriage of these topics with geophysical techniques.

The opening chapters contain a brief summary of Barringer and BRL by Peter Bradshaw. The main content consists of 13 independent reviews of different systems, each authored by geochemists who actively worked with the equipment and acquired data with nine other contributors (mostly ex-BRL employees). A list of former BRL employees and people working for other organizations who assisted in the compilation of this volume is included in Acknowledgments.

Part One includes systems developed for minerals and oil and gas exploration, including AIRTRACE (airborne geochemistry for subcropping, blind and buried mineral deposits, and hydrocarbon exploration using particulates generated from microseeps with an emphasis on marine environments); SURTRACE (surface microlayer and vegetation sampling for mineral exploration); and FLUOROSCAN (identification of hydrocarbons on the water surface from an aircraft by laser fluorescence in hydrocarbon exploration and monitoring of oil spills). Part Two discusses systems including COSPEC (correlation spectrometer for remote sensing of SO and NO for environmental purposes, and monitoring SO related to volcanic activity); GASPEC (remote detection of gases for exploration, environmental monitoring, and chemical warfare); and IONSCAN (ion mobility spectrometer for explosives and drug detection). Part Three contains descriptions of LASERTRACE (laser ablation analysis of geologic, plant, and related material); HHRR (portable/handheld ratioing radiometer); REFSPEC (reflectance spectrometer); sensitive mercury spectrometers for the detection of mineral deposits; airborne

mercury pollution and underground nuclear tests; and an instrument to monitor the loss of heavy water (DO) in nuclear plants. In an acknowledgment to Barringer's most financially successful development, a brief summary of the INPUT system is included in an appendix.

The chapters vary in length, from two to 26 pages. The technical details are presented in a clear, concise style with numerous photos, diagrams, and schematics of the equipment and maps, profiles, and spreadsheets of survey data, as well as interesting anecdotes of particular applications and successes. Survey results for each system are presented in approximate chronological order and, as such, also represent the improvements with time of the instrumentation and in understanding the factors that affected operations and interpretation. A list of patents awarded to BRL in the United States is included at the end of the book.

The book extensively discusses Barringer's development of instrumentation and analysis techniques for environmental monitoring and security. In fact, these instruments have been the most commercially successful (apart from INPUT). This book provides an extremely useful service in documenting the technical details and successes of some of the most innovative technical developments in geosciences in the 20th century. Very little of the information appears to be available publicly (try searching the Internet), and I suspect that most of the original data will pass along with the various authors.

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