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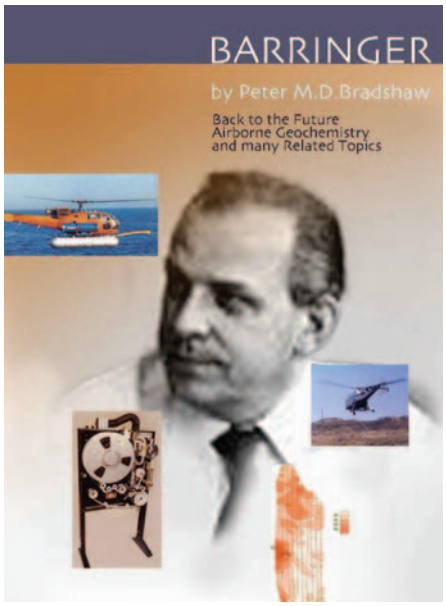
Barringer, Back to the Future: Airborne Geochemistry and Many Related Topics

By Peter M.D. Bradshaw



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In the years after the Second World War mineral exploration grew exponentially, driven by advances in instrumentation and development of airborne survey methods. Large areas could now be scanned for mineral potential without having to put people on the ground (of course that still would be needed to follow-up on targets found in regional surveys). Not surprisingly, many early discoveries were in Canada, Australia, and the western United States, where there was a good base of technical expertise, and vast areas that were relatively unexplored in the geological sense, but still fairly accessible on existing transportation infrastructure.

Many of the successes came from new companies willing to gamble on untried methods, needing only a small core group with knowledge in the geosciences and electronics to get started. One of these was Barringer Research in Toronto, founded by Tony Barringer in 1961 (based in Denver after 1977). Their INPUT time-domain EM system was credited with discovering numerous base-metal deposits collectively worth billions of dollars. They went on to develop several other geophysical devices and geochemical sampling and analysis systems. Their equipment was adapted for many other uses, such as tracking oil spills and other environmental problems, security scanning for drugs and explosives, detecting nuclear tests, and monitoring heavy water levels in nuclear power plants.

Rather than cover the complete range of Barringer Research's work, this volume concentrates on the airborne geochemical systems developed in the 1960s and 70s. These systems provided rapid sampling of trace elements as pathfinders to mineral deposits, oil fields, or pollution sites, often in conjunction with geophysical measurements deployed on the same aircraft. The approach included collecting both atmospheric gases (e.g. mercury, sulphur dioxide, hydrocarbons) and particulates (in the air or from contact with vegetation or the soil surface), which could be analysed for many elements. Many practical problems arose in the transition from lab to field, requiring innovations in material collection, sample analysis, and logistics (e.g. how to mount the devices in aircraft, get a sufficient amount of material, and avoid entanglement of towed sensors).

The book opens with brief introduction to Tony Barringer and his company, then is organised into three parts with 13 independent review papers as chapters. The first part (about half of the text) describes systems used in exploration, primarily for minerals but also covering the search for oil and gas, and monitoring oil spills. AIRTRACE and SURTRACE captured gases and particulates, and FLUOROSCAN detected hydrocarbons on water surfaces. System components are given in detail, followed by discussion of operational procedures and examples of successful field use. A detailed review of bio-geochemistry gives the context of relating the survey results to metals (and potentially valuable metal deposits) in the ground.

Part Two reviews systems for environmental and security screening, specifically COSPEC (a correlation spectrometer for detecting sulphur and nitrous dioxides), GASPEC (other gases), and IONSCAN (a spectrometer the detecting explosives and drugs, extensively used in airports).

Some analytical systems are briefly described in Part Three, for example an airborne mercury spectrometer, and the LASERTRACE system that was the key to real-time analysis of particulate samples (laser ablation removes particulates from the sticky tape collection device and passes them to an ICP (induction coupled plasma) multi-element spectrometer). In the 1980s, Barringer adapted satellite remote-sensing technologies to portable surface use (HHRR, a handheld ratioing radiometer, and REFSEC, a reflectance spectrometer).

Many people who were directly involved in these projects contributed to the book (Barringer employees, academic researchers, and industry staff). Bradshaw is the lead writer, with nine others credited on different sections, and more than 70 listed under 'assisted in the compilation'. The text contains many insights into the practical problems that arise in getting a new technology to work in the field. It also touches on the business side, with examples of funding new projects, field testing with partners, and deciding to suspend the project when the probability of financial success becomes remote.

The book presents an impressive amount of technical detail in a clear, concise style, adding numerous personal stories to demonstrate that real people are behind these innovations, and things frequently go off course. Each chapter has references to original published accounts of the subject systems. The illustrations are excellent, including schematics and photographs of the instruments; photographs from field tests; and summary tables, graphs, and maps of survey results. As a nod to the broader range of the company's successes, the book ends with a brief description of the INPUT system, and a list of Barringer's many U.S. patents.

The book would have benefitted from more background on the development of exploration technologies and airborne systems, and more detail on how Barringer Research fits into that time and place. Despite this minor weakness, it is an impressive book, one that will be of value to anyone interested in the practical side of developing innovations in the geosciences. It is also worthwhile for its insights into the multi-pronged approach to exploration, as the overlaps between airborne geophysics and the geochemical systems described here are broad and illuminating.

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