Andrew Duncan & Greg Street

Grahame Sands Award

Brisbane March 2023

CITATION:

This award is based on an endowment made by members of the ASEG and the geoscience profession in memory of the late Grahame Sands, who was tragically killed in an aircraft accident in 1986, whilst developing and testing new equipment for geophysical survey aircraft. Because of Grahame's abilities to turn scientific theory into innovative application, the award is made for innovation in applied geophysics through a significant practical development of benefit to Australian exploration geophysics in the field of instrumentation, data acquisition, interpretation or theory.

The Grahame Sands Award for 2023 has been awarded jointly to Andrew Duncan and Greg Street, in recognition of their development of the Loupe electromagnetic (EM) system, representing a new-generation portable geophysical system of practical benefit in environmental and exploration geophysics applications.

Andrew Duncan graduated from Monash University, Victoria, in 1986 with First Class Honours in Geophysics. After a short period as Research Fellow in the Department of Earth Sciences at Monash University, Andrew joined World Geoscience Corporation (Questor Surveys Limited), based in both Perth, WA and Toronto, Canada, where he was responsible for the general development of airborne EM data acquisition and processing systems, which included the QUESTEM and SALTMAP digital airborne EM systems. In 1994, he established ElectroMagnetic Imaging Technology Pty Ltd, based in Perth, where he has been responsible for the development of technology for electrical geophysics. These developments have included the "SMARTem" multi-purpose EM geophysical receiver system, "Maxwell" EM processing/modelling software, the "DigiAtlantis" borehole TEM system, the "SAMSON" total field EM system and in recent years the "Loupe" conductivity profiling system. Andrew's work has been recognised by several awards, including the ASEG Grahame Sands Award for Innovation in Applied Geoscience in 1998, and the ASEG Laric Hawkins Award for Most Innovative Paper at the 2007 ASEG Conference.

Greg Street has been working with geophysical systems in mining, groundwater and environmental applications for over 40 years. Greg graduated from University of New England in 1974, with a BSc (Hons) Geology, and also received an MSc in Applied Geophysics from the University of London (1979), and a Diploma of Imperial College of Science and Technology (1980). His professional career has spanned corporate, government, contracting and consulting organisations in many diverse roles in Australia and more than 20 countries worldwide. During his career, he developed an interest in geophysical applications for environmental problems, and in 1991, he became Director – Environmental Services for World Geoscience Corporation in Perth. Amongst other prestigious awards, Greg received the ASEG Lindsay Ingall Memorial Award for the promotion of geophysics to the wider community in 2001 and was awarded Honorary Membership of the ASEG in 2021.

In 2013, Greg Street and Andrew Duncan founded Loupe Geophysics, a WA company which has developed the Loupe system, a new EM instrument to map electrical conductivity in the near surface to a depth of around 30 metres. Loupe is a portable, time-domain EM system specifically designed for rapid reconnaissance and near-surface conductivity measurements

To date the range of applications has included mapping seepage from tailings dams, mapping acid drainage from mine dumps, mapping combustible shale horizons in iron ore mines, detecting voids, mapping of sulphide ore near to surface, and routine exploration for base metals, diamonds, graphite, manganese, and gold. Other applications of benefit to the wider community are foreseen in the future, including mapping of potential groundwater aquifers or groundwater contamination, civil engineering studies, and archaeological mapping.

Loupe is designed to be used in continuous profiling mode at walking pace. The fast-switching transmitter current, high bandwidth receiver coils, rapid sampling of the received signal and small separation of transmitter and receiver are designed to facilitate measuring electrical conductivity of the near-surface with high resolution.

Development of the hardware and software for the Loupe system has been done, in the most part, by the engineering team at Electromagnetic Imaging Technology. In particular, Richard Tresidder, Phil Reid, Morikazu Fumita, Don Argent and Mark Stacey have contributed significantly to system development and Noelene Dorn has been involved in technical support and development of digital products from Loupe.

A completely portable time-domain EM system of this nature is unique. In the past, EM instrumentation for near surface work generally utilised frequency-domain systems, operating at fairly high frequency and generating only a single apparent conductivity value. The alternative was to use resistivity systems, which tend to be comparatively cumbersome, slow and limited in application to mapping conductive targets. The design of Loupe is such that less labour is required and access is relatively unrestricted.

Loupe operates effectively in the presence of interference from power transmission lines and other sources of noise that traditionally degrade the performance of EM systems in urban and mine areas. Particular attention with the design was to make the system safe, light and easy to use.

The Loupe system has been operating to date in Australia, UK, Italy, Sweden, Finland, South Africa, USA and Canada. The system was awarded the 2021 Australian Design awards in both engineering and design, and has also received a grant from Advanced Manufacturing Growth Centre to accelerate development and production of a Mark 2 version with no cable link between transmitter and receiver.

The Loupe system is an innovative Australian development that is benefiting not only the mineral exploration geophysics industry, but also demonstrating potential benefits to broader environmental, groundwater and engineering applications.

The ASEG is pleased to make this award to Andrew Duncan and Greg Street for the development of the Loupe system, which has demonstrated significant practical benefits to the mining and environmental industry in Australia and internationally.