Advances in Near-Surface Seismology and Ground-Penetrating Radar

Everett Rogers’ “diffusion of innovations” theory holds that people have different levels of readiness for adopting new technology (Rogers, 1983). He posits that individuals will roughly fall within one of five groups: innovators, early adopters, early majority, late majority, and laggards. Additionally, he categorizes the technology itself as “Bleeding Edge,” “Leading Edge,” “State of the Art,” “Dated,” and “Obsolete.”

To use the fax as an example, the innovators were people like Alexander Bain and Shmelon Bidwell in the late 1800s who worked on the bleeding edge since there was significant potential in the technology, but without numerous other fax machines in the system the concept was untested. In 1935, Western Union became early adopters at the leading edge with its Facsimile Telegraphy service, as the majority of Western Union facilities had the appropriate equipment to demonstrate the potential of the fax. Exxon created the first state-of-the-art fax machine in the mid 1970s (the Qwip), and those users became the early majority of adopters. Businesses and individuals who adopted the concept of faxing from the 1970s through the 2000s became the late majority. Today, the majority of fax-on-only equipment is considered “dated” or “obsolete,” and many would consider individuals just beginning to use fax technology in the laggard group.

The diffusion-of-innovations theory is clearly on display in the recently published Geophysical Developments volume (No. 15) Advances in Near-Surface Seismology and Ground-Penetrating Radar from the Society of Exploration Geophysicists (SEG). Volume editors Miller, Bradford, and Holliger—who would easily be considered as leading-edge adopters due to their training under the Bleeding Edgers such as Alan Green and Don Steeples—have assembled and edited 29 chapters (each suitable as stand-alone papers) in a comprehensive 487-page reference. The stated objectives of the publication are to provide work that “will serve as a reference for researchers in the next decade” while at the same time prove to be a “valuable supplement for graduate or advanced graduate courses.” Time will have to pass before the first objective can be tested. However, it is true that this book is a collection of excellent papers from early adopters of near-surface geophysics techniques; the contributions cover the state of the art, as well as making cases for several bleeding-edge and leading-edge techniques in near-surface seismology and ground penetrating radar (GPR).

The book begins with a “Reviews” section covering historical framework and leading-edge advances in stand-alone seismic surface wave analyses, as well as integration of crosshole GPR/seismic data and seismic surface-wave/body-wave data. Then follows a “Methodology” section of leading-edge work that captures many of the new developments in the wave-based near-surface geophysical techniques that may one day soon “catch on” and become industry standard. These papers cover a diverse range of topics in data processing (e.g., migration of GPR data), data analysis (e.g., GPR guided waves, the generalized reciprocal method for seismics), and improved development of attribute extraction (e.g., geostatistical structure from seismic reflection images, estimating soil permittivity from GPR). The Reviews and the Methodology sections are well written, generally presented in a coherent sequence, and each includes a wide range of clear, appropriate color and grayscale figures.