1995 Schlumberger Lecture Award

Winner is Dr. Laura J. Pyrak-Nolte of the University of Notre Dame, Indiana, U.S.A.

The winner of this year's Schlumberger Lecture Award is Dr. Laura J. Pyrak-Nolte of the Department of Civil Engineering and Geological Sciences at the University of Notre Dame, Indiana, U.S.A.

The title of the Lecture is "The Seismic Response of Fractures." A preview lecture will be given at the 35th US Symposium on Rock Mechanics in June. The Award will be presented and the Lecture given at the 8th ISRM Congress (to be held in Tokyo, Japan) on the afternoon of Monday 25 September 1995.

Dr. Pyrak-Nolte has been chosen as the recipient of the Fourth Schlumberger Lecture Award because of her innovative and seminal contributions in the area of the mechanical, seismic and hydraulic properties of discontinuities. The following two paragraphs describe the focus of her lecture.

"From the laboratory to the field scale, four physical properties of a fracture are usually of interest, namely: hydraulic conductivity, mechanical stiffness, and attenuation and/or delay of seismic waves. Often one of these properties is measured that indicates the presence of fractures. For example, fractures or sets of fractures are often observed as zones of low seismic velocity. A key question is how do the seismic signatures of different fractures relate to the hydraulic and mechanical properties of the fractures. At a fundamental level, the link among these properties is the geometry of the fracture or fracture network. The geometrical properties of a single fracture include the aperture distribution, the spatial distribution of the apertures, and surface roughness. For a fracture network, there are additional geometrical properties such as fracture spacing, fracture orientation, spatial correlation among fractures, and interconnectivity of the fractures.

In this presentation, the interrelationships among the hydraulic, mechanical, and seismic properties of singles fractures are examined using laboratory data. In addition, laboratory and analysis techniques will be presented for extracting quantitative data on fracture network geometry and for determining fracture stiffness from interface waves. From phenomenological modeling and experimental measurements the seismic and hydraulic properties of a fracture are observed to be related through the specific stiffness of the fracture. Fracture stiffness depends on the geometry of the fracture, specifically on contact area and aperture distribution. Fractures with high apparent attenuation exhibit a higher flow rate."

Background to the Schlumberger Lecture Award and the previous recipients.

The Schlumberger Lecture Award is given annually and was initiated by the Schlumberger Company in 1992. The Award is for excellence in rock mechanics research. The recipient of the Award is generally expected to be in "mid career" and can be from any country. Each year the winner is chosen by an international Selection Panel chaired by Professor Hudson. The cash value of the Award is $5,000 (USD) and the recipient is asked to give the associated Schlumberger Lecture at one of the main rock mechanics symposia each year. This Lecture is subsequently published in the *International Journal of Rock Mechanics and Mining Sciences*.

The first Award winner in 1992 was Dr. Bernard Amadei of the Civil, Environmental and Architectural Engineering Department at the University of Colorado at Boulder, USA for his work on the mechanical properties of rock masses.

The second Award winner, 1993, was Dr. Peter Kaiser of the Geomechanics Research Centre at Laurentian University in Ontario, Canada for his work in a variety of rock mechanics areas including: underground excavations, time-dependent failure of tunnels, rock support, in-situ stress determination and back analysis.

The third Award winner, 1994, was Dr. Alexander Linkov of the Department of Mathematics at the Institute for Problems in Mechanical Engineering in St. Petersburg, Russia, for his work on the understanding of the behaviour of rock in the post-peak region of the complete stress-strain curve and the application of this understanding to rockburst problems.

All of the Schlumberger Award Lecture recipients have been of the highest caliber and the associated lecture of extremely high quality. The Selection Panel is confident that the standard will be maintained and would like to express here their gratitude to the Schlumberger Company for supporting this award which provides the much needed peer recognition of excellence in our subject of rock mechanics and rock engineering.

—J. A. Hudson