Petroleum Club • 800 Bell (downtown)
Social 11:15 AM, Luncheon 11:30 AM

Cost: $30 pre-registered members; $35 for non-members & walk-ups; Emeritus/Life/Honorary: $15; Students: FREE

To guarantee a seat, you must pre-register on the HGS website (www.hgs.org) and pre-pay with a credit card.
Pre-registration without payment will not be accepted.
You may still walk up and pay at the door, if extra seats are available.

John S. Oldow
Department of Geosciences,
University of Texas at Dallas

Monitoring Growth of the Daisetta, Texas Sinkhole with Terrestrial Laser Scanning, Close Range Digital Photography, and GPS

On May 7, 2008, a major sinkhole developed in Daisetta, Texas about 60 miles northeast of Houston. The sinkhole, which was formed by the collapse of a void above a salt dome, grew in a single day from a minor sump to a hole with a diameter reported in the media as being more than 650 feet and a depth of over 250 feet. The collapse consumed several vehicles, drilling equipment, and several oil tanks, and resulted in the destruction of several buildings. On May 19, 2008, personnel from the Cybermapping Laboratory in the Geosciences Department at the University of Texas at Dallas mobilized to conduct an integrated survey of the area. Using state-of the-art equipment, we were able to create an accurate 3D photorealistic model of the entire sinkhole.

The University team deployed surveying instruments that included a Riegl LPM 800 HA laser profiler, a TOPCON Hyperlite RTK-GPS system, several digital camera systems, and a TOPCON IS Imaging Total Station to image and quantitatively assess the size of the collapse.

Several overlapping scans incorporating several million data points were completed around the sinkhole with the Riegl LPM 800 HA laser profiler and numerous digital photographs were taken from a variety of locations. The TOPCON IS provided control for integrating Light Detection and Ranging (LiDAR) scans and for registration of digital photographs to the LiDAR image. The RTK-GPS was used to establish global location control points. The integrated survey was completed in one day. The point cloud laser data were merged using Polyworks software and a triangulated mesh (TIN) was created. The positions of the photographs were fixed to the TIN using UTD software at an accuracy of one pixel. The result is an accurate 3D photorealistic (virtual) model of the entire sinkhole.

The sinkhole will be resurveyed in October 2008 and a new 3D photorealistic model developed to allow comparison with the physiographic feature measured in May. The two images of the sinkhole will be differenced using UTD software to develop a quantitative assessment of growth of the sinkhole over the intervening months. The differencing software takes into account the uncertainties associated with the original and rescanned conversion of point clouds to surfaces. Additional tests will be undertaken to assess the impact on accuracy of using different types of laser scanners. Monitoring of the Daisetta sinkhole provides the opportunity to develop protocols and workflows for near real-time measurement and quantitative assessment of change associated with geologic hazards. ■

Biographical Sketch

John S. Oldow (oldow@utdallas.edu) received a PhD in geological sciences at Northwestern University in 1978. He has served on the faculties of Texas Christian University, Rice University, and the University of Idaho, and in 2008 was appointed Head of Geosciences at the University of Texas at Dallas. Dr. Oldow's research centers on regional tectonics and processes related to active plate margins. Primary emphasis of this work is placed on deciphering the time-integrated history and three-dimensional geometry and kinematics of transpressional and transtensional deformational belts. His research projects are largely field based and include investigation of both active and ancient orogenic belts in many parts of the world. Related field work typically involves geologic mapping and the application of structural and stratigraphic analysis, potential-field geophysics, laser surface-imaging, and GPS geodesy to regional tectonic problems. Associated laboratory activities include use of digital data management systems (geographic information systems), reduction and modeling of geophysical and geodetic measurements, and the formulation of geologic models derived from stratigraphic, kinematic, and geophysical constraints and three-dimensional restorable cross-sections.

During his career, Dr. Oldow has received nearly continuous National Science Foundation support which, combined with generous support from the minerals and petroleum industries, has allowed him to pursue research activities around the world. He recently played a primary role in developing the NSF INTERFACE Facility, which is a collaborative research project involving several United States institutions in the pursuit of developing a national facility to establish a digital future for the geosciences.