

**Geotechnical Engineering, Software Development**

**Expertise** Rock Mechanics, Soil Mechanics, Numerical Modeling of Geotechnical Processes

**Education** Ph.D. (Civil Engineering - Rock Mechanics), 1981  
University of Minnesota (Minneapolis)  
M.S.C.E. (Civil Engineering - Soil Mechanics), 1972  
B.S.C.E. (Civil Engineering), 1971  
Ohio University (Athens, Ohio)

**Registration** Registered Professional Engineer, State of Minnesota and Washington

**Professional Affiliations** Member: American Society of Civil Engineers, International Society for Rock Mechanics, Tau Beta Pi

**Honors** International Association for Computer Methods and Advances in Geomechanics 1994 Award for Significant Paper in the Category of Theory: Computational/Analytical for "Formulation of a Three-Dimensional Distinct Element Model" (R. Hart, P. A. Cundall and J. Lemos), *Int. J. Rock Mech., Min. Sci. & Geomech. Abs.*, 25 (1988).

**Professional Experience**

2000 – Present *Itasca Consulting Group, Inc., Minneapolis, Minnesota Principal*  
2012 – Present *Principal Software Advisor*  
1981 – 2011 *Director, Software Services/Senior Geotechnical Engineer*  
1980 – 1981 *University of Minnesota, Department of Civil & Mineral Engineering Assistant Professor*  
1976 – 1980 *University of Minnesota, Department of Civil & Mineral Engineering Research Fellow*  
1974 – 1976 *Shannon & Wilson, Inc., Geotechnical Consultants, Spokane, Washington, Engineer*  
1972 – 1974 *U.S. Army Engineer Bde (Cbt) (Abn Corps), Fort Bragg, North Carolina 1st Lieutenant*

**Project Experience**

*Director of Software Services and Development:* Coordinates software sales, services and development for Itasca's geotechnical software products (FLAC, FLAC/SLOPE, FLAC3D, UDEC, 3DEC, PFC2D and PFC3D). This includes scheduling and monitoring new code developments, coordinating and providing technical assistance to software clients and providing training courses for client organizations. Coordinates general training courses and symposia on software applications by code users. Oversees and prepares software

manuals and coordinates the testing and documentation of new features in Itasca software. Manages code developments and technical support services paid by clients for specific consulting projects. Coordinates software sales and support through software sales agents in 23 countries located around the world. Manages the preparation of software marketing materials. Coordinates the preparation of software demonstration packages for solicitation at conference exhibits and on Itasca's web site. Manages the 14-person software development, technical services and support staff.

*Numerical Analysis and Technical Review for Underground Nuclear Waste Isolation:* Developed, validated and applied computer models for numerous rock mechanics studies in association with nuclear waste isolation in tuff, basalt and salt. Program manager for rock mechanics design reviews for the Nuclear Regulatory Commission of the U.S. Department of Energy studies in connection with nuclear waste isolation. Member of technical review panels on near-field/altered zone coupled effects and on drift stability considerations at the Yucca Mountain Project. Performed review analyses of the Single Heater Test at the Exploratory Studies Facility at Yucca Mountain. Performed analysis of field data generated from large-scale block tests at the Near-Surface Test Facility for Rockwell Hanford Operations studies related to nuclear waste isolation in basalt. Developed fully coupled thermal-mechanical-fluid flow model for evaluation of coupled effects associated with underground nuclear waste isolation.

*Numerical Modeling Applied to Explosion-Induced Tunnel Damage:* Developed two-dimensional and three-dimensional modeling techniques with the distinct element method to investigate rock tunnel behavior for the U.S. Defense Nuclear Agency. Simulated the influence of rock joint patterns in three dimensions and dynamic loading of reinforced tunnels. Performed numerical development for block-motion research involving distinct-element modeling of explosion-induced differential motions of rock masses surrounding shallow- and deep-underground structures.

*Numerical Model Development for Deep Underground Mining:* Managed development of a three-dimensional distinct element model for numerical simulation of underground mining at Falconbridge Mines Limited, Ontario, Canada. Developed, tested and applied three-dimensional models to mining case history studies at Falconbridge, with the objective of applying the model for use in mine planning and design.

*Numerical Analysis for Practical Geo-engineering Application:* Applied numerical models in a variety of practical geo-engineering studies including slope-stability analyses, development of mine-design criteria for slopes undercut by coal mines, cut-and-fill mining methods and seismic analysis of dam stability. Provided instruction on application of numerical methods in geo-engineering studies to undergraduate and graduate engineering students and to engineering clients.

