## GRANTS AND CONTRACTS

### Overview

Obtained $15M+ funding, 1986 - present
Written 125+ technical proposals, 1986 – present

USBM proposals (funded). 1985-1994: Geomechanical and geophysical technology for evaluating rock masses for in situ mining, Funding: Advanced Mining Program ($960k); 1986-1995: Assessment of damage and integrity of mine structures, Funding: Health and Safety Program ($780k); 1989-1993: Cavity detection using geophysical methods, Funding: Abandoned Mine Land Program ($575k); 1991-1995: Characterization and remediation of acid mine drainage from a metal-mine waste impoundment, Funding: Advanced Mining Program ($550k); 1990-1995: In situ leach mining of unsaturated Chalcocite ore, Funding: Advanced Mining Program ($450k)

USGS proposals (funded): 1997-2001: Upper Illinois River Basin study, Funding: National Water Quality Assessment Program ($8M); 1999, Variably-saturated transport in 2-dimensions - VST2D, Funding: Toxics Program ($35k). 2001-2002: Agricultural land-use survey - understanding effect of drought on dry-land wheat farming, Funding: National Water Quality Assessment Program ($150k). 2003-2004: (1) Preferential flow and transport in the High Plains aquifer, Funding: National Water Quality Assessment Program ($75k); (2) Improvements to conceptual wildfire-induced flood models, Funding: Venture Capital Fund ($35k). 2005-2007: National Maps - source/process studies of selected contaminants associated with mineral deposits, Funding: Mineral Resources Program ($150k). 2006-2012: Alternate modeling paradigms and methods to evaluate uncertainty, Funding: Mineral Resources Program ($500k). 2008-2011: Stochastic mineral-resource software development, Funding: Mineral Resources Program ($1M). 2013: Joint inversion of disparate data, Funding: Mineral Resources Program ($175k). 2014: Seismic-magnetotelluric joint inversion to improve understanding of sediment-hosted gold deposits (Battle Mountain-Eurkea mineral belt, Carlin-trend), northern Nevada, Funding: Mineral Resource Program ($150k).

USGS proposals (unfunded). 2008: (1) Improved model for predicting probable amounts of metals in undiscovered deposits, Venture Capital Fund, Geologic Discipline; (2) Joint inverse and cooperative strategies for hydrogeophysical characterization and transport prediction, Venture Capital Fund, Geologic Discipline; (3) A new method for predicting wildfire-induced debris flows and their uncertainty, Venture Capital Fund, Geologic Discipline; (4) Development of joint inverse methods for improved characterization and assessment of ground-water, mineral, and petroleum resources, Mendenhall Post-Doc Opportunity; Joint inverse and cooperative strategies for hydrogeophysical characterization and transport prediction, Venture Capital Fund, Geologic Discipline. 2009: Development of joint inverse methods for improved characterization and assessment of ground-water, mineral, and petroleum resources, Mendenhall Post-Doc Opportunity. 2010: Improved model for predicting probable amounts of metals in undiscovered deposits, Venture Capital Fund, Geologic Discipline. 2011: Computational hybrid modeling for improved imaging, characterization, and prediction in earth systems, Mendenhall Post-Doc Opportunity. 2012: (1) Climate-change effects on aquatic populations in urbanizing basins, Northeast Climate Science Center; (2) Hybrid modeling of climate-change effects on aquatic populations, Southwest Climate Science Center. 2012: (1) Application of computational intelligence in mineral-resource assessments, Mineral Resource Program; (2) Hybrid modeling of climate-change effects on aquatic populations, submitted to Southwest Climate Science Center; (3) Climate-change effects on aquatic populations in urbanizing basins, submitted to Northeast Climate Science Center; (4) Intelligent selection of locations for future airborne data collection, North Platte, South Platte and Twin Platte Natural Resource Districts, Nebraska Environmental Trust Fund. 2014: Evaluation of GeoModeller joint-inverse software for USGS application to deep crustal studies, Mineral Resource Program.

External Proposals (funded). 1996: (1) Tomographic imaging of deep underground metal mines, Funding: NIOSH ($45K), (2) Vadose-zone leaching of agricultural chemicals, Funding: ARS ($35k). 2002-2004 (1) Post-wildfire technical assistance to the United States Federal Emergency Management Agency, Funding: FEMA ($550k). (2) Stochastic modeling of the effects that Sulphur Gulch reservoir may have on Colorado River near Grand Junction, CO, Funding: NCWCD and DW ($950k). 2003-2004: (1) Development of predictive equations using knowledge discovery techniques, Funding: NIOSH ($35k), (2) Technical assistance with coastal flood predictions, El Salvador, Funding: OFDA ($65k). 2004-2005: Post-wildfire flood potential in Willow & Mitchell creek watersheds, Funding: FEMA ($135k). 2005-2006: Tensor magnetic gradient system, Strategic Environmental Research and Development Program, Funding: ARMY ($55k). 2005-2006: Technical assistance with real time flood warning system, Haiti, Funding: UNDP ($120k). 2005-2007: Technical assistance with hazards risk mitigation and emergency preparedness, Romania, Funding: WB ($900k). 2006-2008: Technical assistance with mineral and water-resource assessment, Mauritania, WB ($1.2M). 2009-2010: Evaluation of measures to mitigate ground-water flooding in Bishkek region of Kyrgyzstan, Funding: CRDF ($65k). 2010-2011: UXO Discrimination, Funding: Strategic Environmental Research and Development Program, ARMY ($40k). 2009-2010: Joint evaluation and prediction of subsurface attributes from hydrogeologic and airborne geophysical measurements using data mining and knowledge discovery techniques, Funding: FAPESP ($50k). 2011-2012: Technical assistance with water-resource assessment, Mauritania, Funding: WB ($100k). 2010: Water and environmental security: NATO advanced research workshop: climate-change effects on water resources– issues of national and global security, Izmir, Turkey, Funding: NATO ($65k). 2010-2011: Improved crustal and upper mantle imaging using disparate geophysical data and joint inverse techniques, Funding: CNPQ ($35k). 2011: Estimation of Subsurface Attributes Using Hydrogeologic and Geophysical Measurements (Hydrogeologic Framework for Glacial Aquifers), Funding: State of Nebraska ($25k). 2012-2013: (1) Near real-time imaging of heterogeneity in a glacial aquifer (Geophysical Remote Sensing – "The Chameleon**")**, Funding: ARMY ($65k); (2) Reliability of geophysical instrument response to unexploded ordnance, Funding: ARMY ($250k). 2013: Evaluation of uncertainty in Amazonian gold occurrence using airborne radiometric data and soft computing, Funding: FAPESP ($35k). 2013-2014: Hierarchical scenarios of climate change from the perspective of evolutionary landscape dynamics, Funding: FAPESP ($35k). 2015: Our rising tide – evaluating the regional impact of sea level change in New Zealand, Submitted to GNS Science, Strategic Development Fund ($150k). Estimation of aquifer structure and properties from hydrogeophysical data with machine learning techniques, Funding: Geoscience Australia ($40k).

External Expressions of Interest (request for full proposal). 2015: (1) Data-driven forecasting of conditional monthly climate-change trends, Submitted to Zealand Ministry of Business, Innovation, & Employment, China Research Alliance (Michael J. Friedel, GNS Science; and Professor Chenghu Zhou, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing, China, zhouch@ireis.ac.cn). (2) Intelligent satellite-remote sensing for characterization of groundwater systems, Submitted to Zealand Ministry of Business, Innovation, & Employment, China Research Alliance (Michael J. Friedel, GNS Science; and Chenghu Zhou, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing, China, zhouch@ireis.ac.cn).

External Proposals (submitted). 2015: (1) Groundwater, Probabilistic modeling of Canterbury lithological data for input into numerical hydrological models, Environment Canterbury Regional Council, New Zealand; (2) Groundwater as an adaptation for climate change, Submitted to Zealand Ministry of Business, Innovation, & Employment, China Research Alliance (Michael J. Friedel, GNS Science; and Professor Jian-yao Chen, Department of Water Resources and Environment, School of Geography and Planning, Sun Yat-sen University, Guangzhou, China chenjyao@mail.sysu.edu.cn) ($242k)

External Proposals (development). 2015: Groundwater resource and vulnerability assessments in SW Pacific island nations, USGS, Geoscience Australia, GNS Science, Aarhus University, SW Pacific Government Agencies, 2016 submittal to WB ($???M)

**U.S. funding agencies**

U.S. Department of Agricultural, Agricultural Research Service (ARS)
U.S. Department of Homeland Security, Federal Emergency Management Agency (FEMA)
U.S. Department of Army, Engineer Research Development Center (ARMY)
U.S. Department of Interior, Bureau of Mines (USBM)
U.S. Department of Interior, Geological Survey (USGS)
U.S. Geological Survey, National Water Quality Assessment Program (NAWQA)
U.S. Center Disease Control, National Institute of Occupational Safety and Health (NIOSH)
U.S. Department of Energy (DOE)
U.S. Department of State (DOS)
U.S. Geological Survey (USGS)
Northern Colorado Water Conservancy District (NCWCD)
Denver Water (DW)

**International funding agencies**

Civilian Research & Development Foundation (CRDF)
Fundação de Amparo à Pesquisa do Estado de São Paulo, Brazil (FAPESP)
National Council for Scientific and Technological Development (CNPQ)
North Atlantic Treaty Organization (NATO)
U.S. Agency for International Development, Office of Federal Disaster Assistance (OFDA)
United Nations Development Program (UNDP)
World Bank (WB)