The Department of Geological Sciences offers a Doctor of Philosophy (PhD) degree in Geological Sciences and the Master of Science (MS) degree in Environmental Sciences, Geological Sciences, and Geophysics.

### Programs

#### Master of Science


#### Doctor of Philosophy


### Certificates

- Graduate Certificate in Geospatial Information Science and Technology (GIST) ([http://catalog.utep.edu/grad/interdisciplinary-programs/gcertificategist/](http://catalog.utep.edu/grad/interdisciplinary-programs/gcertificategist/))


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Research Interests: Aeolian processes, particularly mineral dust and the relation of dust generation to geomorphology, weather, and climate, and the detection and assessment of dust through remote sensing; the environmental geochemistry, source appointment and biogeochemistry of trace elements; the geomorphology, sedimentology, and geochemistry of saline lakes and playas; evaporite mineralogy; earth system science, especially the relationship between landforms, climate/weather, and ecosystems; mesoscale meteorology and air pollution meteorology; the application of X-ray spectrometric techniques in earth and environmental sciences; natural resource management in arid and semiarid lands; and applications of meteorology to homeland security.


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Education: BS, Yale University; MS, Harvard University; Ph D, Harvard University

Research Interests: Statement of Research Interests 1. Economic Geology, 2. Geochemistry, Origin of Mineral Deposits. My Ph.D. topic was a geochemical study of a mineral deposit in Peru. This theme has always been maintained in my research portfolio with Mexico being the target of most of this research. I currently have 2 students doing supported research within this topic, Mike Feinstein supported by Golden Predator, Joe Lori by Quatarra Resources. 2. Economic Geology?Uranium Upon arriving to teach at UTEP in 1975, I quickly got involved in uranium deposits in Mexico, at Pena Blanca, Chihuahua. The government agency, URAMEX, eventually sponsored three of their geologists to come to UTEP for their Masters degrees, and gave us permission to study their deposits. My model of volcanogenic model was well received, and I organized 2 symposia with field trips for the
American Association of Petroleum Geologists and for the International Atomic Energy Agency, and I edited resultant publications of each organization. I have visited China as a guest of the Beijing Research Institute for Uranium Geology, twice. The IAEA has called on me several times to serve as Sponsor of IAEA Fellows for their stays in the USA, and to serve as Foreign Technical Expert, most recently in Argentina and Egypt. I attended and made presentations at 3 of their meetings in 2009-2010. The IAEA is interested in publishing our book, written with 2 collaborators, Uranium Geochemistry of the Middle East. 3. Environmental Geochemistry? Uranium With the demise of uranium deposit geochemistry in 1985, I became more interested in the geochemistry of nuclear waste. In 1987 Yucca Mountain was designated to be the repository site, and $13B of research and study began. I realized that the Nopal 1 uranium deposit at Pena Blanca, Chihuahua, could serve as a Natural Analogue to Yucca Mountain, and Pena Blanca entered the global inventory of nuclear analogues. Funding for us took off in the early 2000s, when the US Department of Energy drilled 3 deep holes at Nopal 1, Pena Blanca. I was invited to participate in data acquisition and interpretation from those samples. Four national labs and three universities put together a group proposal for $3.5M which was funded. UTEP got 10%. Research at Pena Blanca continues, and our Final Report is being written. Roberto Velarde is a PhD candidate and part of his dissertation relates to Pena Blanca. 4. Environmental Geochemistry - general By the middle 1980s, uranium exploration geology activity was zero, and mineral exploration was to suffer from a 15 year period of relatively low commodity prices. Where are our students going to get jobs? I evolved to include environmental geochemistry in my teaching and research, initiating courses in this topic on the graduate and undergraduate level, and beginning a long series of students from the Environmental Science and Engineering Program at UTEP. Funded projects included the biogeochemistry of chromium working with scientists at Texas A&M, and the spectral response of laboratory-made saline soils. My most recent ESE student was Elia Marquez, who studied arsenic in groundwater in the region. A continuing activity of mine is the use of remote sensing in both environmental and regional geological activities. My teaching of environmental geochemistry expanded into Mexico in the 1990s when I taught in the Graduate School of Universidad Autonoma de Cuidad Juarez for 7 years. In 2001 I began a series of continuing scientific interactions in the Middle East. These academic activities in Mexico and the Middle East have led to numerous environmental research projects. Earth-based geochemistry and remote sensing led me to the following. 5. Regional Geochemical Mapping Regional geochemical mapping (RGM) is a global scientific activity that consists of taking many located samples over an area, and having them analysed for many chemical constituents. The National Geochemical Survey database is vast and underused. The data is largely unprocessed although a few maps have been produced. My UTEP RGM research group has a publication on New Mexico using this data, and we have finished processing Colorado. Our approach is to proceed in greater detail and more samples on a state by state basis. A second manuscript is complete, and we are working with Cybershare, UTEP, on a proposal to expand to the entire USA. 6. Regional Geology of southwestern Chihuahua, Mexico Since arriving at UTEP in 1975, my interest in economic geology and the origins of mineral deposits (topic 1 above) took me to the Sierra Madre of Chihuahua. This has been a constant theme in my research and teaching. I have supervised 9 students on both MS and PhD levels with topics there. Field trips there with students were made annually for a long time, but have been discontinued today for safety. I have guided, sometimes with colleagues, many professional field trips there, and co-edited 4 guidebooks on the region. The accompanying figure shows the locations of areas of study of several of my students. Studies vary from remote sensing to age dating to rock geochemistry to zircon and microprobe chemistry. Students have made many presentations at professional meetings. Funding became easier from industry since 1993 when complete foreign ownership of companies was permitted. Our profile from the stable craton, across rapidly thinning crust west into oceanic crust, documents changes of styles to extensional forces, and the location of mineral deposits at the juncture of select structural elements. 7. Sulfosalts Crystal Chemistry Sulfosalts are a family of minerals found in sulfide mineral deposits. They also contain crystal structures and physical properties which are unique. Two recent doctoral students of mine, Guy Crawford and Steve Selleipack, from the Material Science Program at UTEP, synthesised exotic element sulfosalts and determined crystal structures by Ab Initio techniques.

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Research Interests: My current projects include: determining 3-D Earth structure from analysis of US Array data and other data in the southern Rio Grande Rift; exploring techniques for joint inversion; studying aftershocks of large earthquakes in Nepal and Mexico; studying volcanic structure in the East African Rift System in Kenya; studying local earthquakes in the El Paso, TX region; and understanding the link between earthquakes, in particular, the mechanisms for dynamic triggering. I also have projects that focus on educational aspects of science; in particular, we fund early geoscience undergraduates as part of the Academic Year - Pathways Research Experience Program (AY-PREP), and National Science Foundation grant.

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