THE UNIVERSITY OF LOWA

Department of Earth & Environmental Sciences



A Message from the Chair of the Department of Earth and Environmental Sciences



Welcome to the Department of Earth and Environmental Sciences at the University of Iowa! We are a growing program with 14 faculty, over 200 undergraduate majors, and more than 30 graduate students. Our faculty includes a diverse array of geological expertise and our research areas include the entire spectrum of the Earth and Environmental Sciences. We offer

undergraduate degrees in Geoscience and Environmental Sciences in addition to graduate degrees in Geoscience (MSc and PhD). Nearly all of our graduate students receive funding as Teaching Assistants (TAs) or as Research Assistants (RAs) and our time to degree is regularly achieved in four years for a Bachelor's Degree (BS or BA), two years for a Master's (MSc) or four years for a PhD. Additionally, the Geosciences and Environmental Sciences have some of the highest starting salaries for any degree major upon entering the job market!

Our department has a wide range of analytical tools and equipment for research including an LA-ICP-MS, Electron Microprobe, SEM, Thin-Section Laboratory, Morphometrics Labs, Macro- and Micro-Paleontology Labs, Mineral Separation Labs, Analytical Chemistry Clean Lab, Soil Sciences Lab, Hydrogeology Labs, Geomorphology Computing Facility, Geophysics Lab, Core Analysis Lab, and one of the largest University-Based Paleontological Repositories in the country. The pages that follow provide more information about the opportunities offered by our department and we hope to see you at the University of Iowa!

Sincerely,

C. Thomas Foster - Department Executive Office (Chair)

The Department of Earth and Environmental Sciences is a unit of the College of Liberal Arts and Sciences at the University of Iowa

Front Cover Image - National Park Service Photo

THE UNIVERSITY OF IOWA www.uiowa.edu www.clas.uiowa.edu www.clas.uiowa.edu/ees



Department of Earth and Environmental Sciences



Department of Earth and Environmental Sciences Education

The department of Earth of Environmental Sciences offers a range of degree opportunities within Geoscience and Environmental Sciences at the B.S., M.S., and Ph.D. levels. Additional teacher licensure opportunities are available as is a Certificate in Sustainability that can be applied to any major, including those outside of the department. A brief outline of available degrees is included below, and complete details are available on the web at the addresses listed below.

GEOSCIENCE

hTT

www.catalog.registrar.uiowa.edu/liberal-arts-sciences/earth-environmental-sciences/geoscience-bs/

B.S. in Geoscience B.A. in Geoscience Minor in Geoscience B.S. or B.A. with Teacher Licensure M.S. in Geoscience Ph.D. in Geoscience

ENVIRONMENTAL SCIENCES

www.catalog.registrar.uiowa.edu/liberal-arts-sciences/environmental-sciences/environmental -sciences/bs

B.S. in Environmental Sciences B.A. in Environmental Science Minor in Environmental Sciences B.S. or B.A. with Teacher Licensure B.A./M.A.T. Science Education Subtrack Certificate in Sustainability

Environmental Sciences students enter one of four 'tracks' during their course of study depending on their particular interests and programmatic focus.







Jonathan M. Adrain

Professor Ph.D. - University of Alberta (1993)

Paleontology

Dr. Adrain's research focuses on the systematics and evolutionary patterns of Paleozoic trilobites and ancient marine diversity and global change events. His research group includes work on cladistics of trilobites as well as the paleobiology of machaeridians.



William D. Barnhart

Assistant Professor Ph.D. - Cornell University (2013) Geodesy, Geophysics, Active Tectonics

Dr. Barnhart's research includes topics ranging from earthquake and lithospheric deformation to the growth of geological structures and active landslide dynamics and rheology. He studies earthquake interaction and triggering, aseismic slip and strain, induced seismicity, remote sensing geodesy, inverse and numerical modeling and subduction zone earthquake cycles using an array of techniques and equipment. He utilizes tools such as InSAR, optical imagery pixel tracking, GPS, inverse theory, seismology and geological/geomorphic field observations to evaluate the potential for earthquake and seismological hazards and to understand active tectonics.







Christopher A. Brochu

Professor

Ph.D. - University of Texas at Austin (1997)

Vertebrate Paleontology

Dr. Brochu's research focuses on archosaur phylogeny, systematics, and historical biogeography. His research group combines morphology and molecules for phylogeny reconstruction as well as divergence time estimation and evolutionary patterns. Dr. Brochu's research frequently includes phylogenetic nomenclature, in addition to the use of computed tomography in paleontological applications.



hin

Bradley D. Cramer

Associate Professor Ph.D. - The Ohio State University (2009) Earth History, Bio-Chemostratigraphy

Dr. Cramer's research focuses on Earth System Science and investigating global change events in deep-time with an emphasis on pre-Mesozoic stratigraphy. His work integrates biostratigraphy, stable and radiogenic isotope chemostratigraphy, sequence stratigraphy, and high-precision geochronometry to evaluate the causeand-effect relationships within the Earth System. He specializes in lower Paleozoic Earth history but frequently works on topics ranging from the Proterozoic to the Permian in sections around the world.





Jeffrey A. Dorale Associate Professor Ph.D. - University of Minnesota (2001) Geochemistry, Global Change

Dr. Dorale's interests include Quaternary paleoclimatology and environmental geology. He uses isotopic and elemental tracers and chronometers to reconstruct past environmental conditions, with an emphasis on records preserved in caves. Recent projects have focused on terrestrial records of vegetation and precipitation dynamics during the last interglacial-glacial-interglacial cycle, regional groundwater resources, and the record of global sea level change.



Emily S. Finzel

Associate Professor Ph.D. - Purdue University (2010)

Basin Analysis and Tectonics

Dr. Finzel's research focuses on sedimentary processes in modern and ancient sedimentary basins. She is particularly interested in deciphering the tectonic record contained within stratigraphic sections by applying several different tools, including sedimentologic analyses, geologic mapping, detrital geochronology, trace element geochemistry, sandstone petrographic and heavy mineral analyses, thermochronology, and finite element numerical modeling. Dr. Finzel specializes in basins along tectonically-active convergent margins but she works on all types of basin deposits that span much of geologic time.





C. Thomas Foster

Professor Ph.D. - Johns Hopkins University (1978)

Metamorphic Petrology

Dr. Foster's research includes topics in metamorphic petrology, high-temperature reaction kinetics and material transport, tectonics on the Colorado Plateau, metamorphosed ore deposits, fossil shape analysis, and modeling of geological processes. In his research, he utilizes metamorphic petrology, igneous petrology, aqueous geochemistry, structural geology, field mapping, and the application of mathematical models and computer techniques to evaluate geological processes.



Jane A. Gilotti

Professor Ph.D. - Johns Hopkins University (1987)

Structural Geology and Tectonics

Dr. Gilotti's research interests include the geodynamics and tectonics of collisional orogens, especially the Caledonian-Appalachian mountain belt. She is particularly interested in high-pressure/ultrahigh-pressure metamorphism and subsequent exhumation of overthickened crust, deformation mechanisms, material properties and the rheology of rocks discerned from her studies of shear zones.



Bill McClelland

Professor Ph.D. - University of Arizona (1990)

Tectonics and Geochronology

Dr. McClelland's research includes the fields of geochronology, economic geology, and tectonics with a focus on tectonic processes along convergent margins and the timing of tectonic and mineralizing events within orogenic systems. He utilizes U/Pb geochronology to establish the interplay of transpressional and arc processes in the formation, migration, and accretion of lithospheric fragments or terranes and the exhumation of ultrahigh-pressure rocks resulting from continent-continent collisions. His work integrates U/Pb geochronology with regional tectonic synthesis, mapping, thermobarometry, thermochronology, and quantitative structural analysis.



Jessica R. Meyer

Assistant Professor Ph.D. - University of Guelph (2013)

Hydrogeology

Dr. Meyer's research focuses on field-based characterization of groundwater flow systems in heterogeneous geologic settings with emphasis on understanding the relationship between the hydraulic and geologic structure of the subsurface. Currently, Dr. Meyer is applying this approach to advance quantitative characterization of sedimentary rock flow systems in three ways: 1) using hydraulic head profiles as a fundamental diagnostic tool for flow system characterization, 2) defining the relationship between hydraulic conductivity contrasts and stratigraphy, and 3) advancing our understanding of bedrock aquitards.







David W. Peate Professor Ph.D. - The Open University, U.K. (1989) Geochemistry, Igneous Petrology

Dr. Peate's research focuses on igneous geochemistry. He is interested in how magmas form and how their compositions are modified as they move through the crust to be erupted at the Earth's surface, particularly in continental flood basalt provinces and in mafic monogenetic eruptions. He is currently investigating the origins of basaltic magmatism away from the plate boundary in Iceland, and on the South China Sea rifted margin. Research with students includes analysis and interpretation of elemental and isotopic compositions of volcanic rocks and minerals, using analytical facilities in the department (ICP-MS, electron microprobe, pXRF). He is also interested in wider applications of geochemistry to topics such as environmental effects of large igneous provinces, impact cratering, sedimentary geochemistry, and geoarchaeology.



Mark K. Reagan

Professor Ph.D. - University of California - Santa Cruz (1987)

Igneous Petrology, Geochemistry

Dr. Reagan's research focuses on the petrology and geochemistry of volcanic rocks. His principle research areas include the use of short-lived radionuclide abundances to study degassing and crystalization processes in young lavas and tephras. He is currently investigating Kilauea, Mt. St. Helens, Mt. Erebus, Augustine, Merapi, Llaima, and several other intraplate, rift, and subduction-related volcances. His research also includes the petrology and geochemistry of Eccene lavas erupted from the Izu-Bonin-Mariana forearc to determine the causes of subduction initiation and the evolution of subducting slab-mantle wedge systems.



Ingrid Ukstins

Associate Professor Ph.D. - Royal Holloway University of London (2003)

Volcanology, Igneous Petrology, Planetary Geology

Dr. Ukstins' research involves utilizing a multi-disciplinary approach to understanding explosive volcanic systems - magma petrogenesis, eruption and emplacement mechanisms of both mafic and silicic pyroclastic deposits, and the holistic interpretation of volcanic stratigraphic sequences. She is also involved in planetary geology projects including the application of remotely operated vehicles (rovers) for studying the geology of other planets, and utilizing Earth-based analogues to understand planetary processes, such as the environmental conditions on early Mars and the potential for life.



Frank H. Weirich

Associate Professor Ph.D. - University of Toronto (1982)

Geomorphology, Hydrology

Dr. Weirich's work includes research on high-energy environment sediment dynamics, fire impacts on fluvial systems, mass wasting and overall landform dynamics, dynamic process measurements, basin-scale experimentation, multi-dimensional sensor arrays, the use of geophysical techniques in geomorphology and GIS-based integrated watershed studies.





Lecturers, Visiting & Adjunct Faculty

Tiffany S. Adrain - Curator of the Paleontology Repository Collection Raymond R. Anderson - Adjunct Assistant Professor - PreCambrian Midcontinent Impacts David L. Campbell - Adjunct Professor - Geophysics Rhawn Denniston - Adjunct Assistant Professor (Cornell College) - Paleoclimates Kenny Horkley - Research Scientist - Electron Microprobe Laboratory Manager Mary E. Kosloski - Lecturer - Paleontology/Paleoecology Keith Schilling - Adjunct Assistant Professor - Hydrology Ben Swanson - Visiting Assistant Professor - Fluvial Geomorphology Kate Tierney Cramer - Lecturer - Carbonate Sedimentology/Chemostratigraphy Emily Walsh - Adjunct Assistant Professor (Cornell College) - Petrology and Tectonics Brian J. Witzke - Adjunct Associate Professor - Stratigraphy/Sedimentary Geology

Emeritus Faculty

Richard D. Baker - Emertius Professor of Palynology
E. Arthur Bettis - Emertius Professor of Paleopedology & Quaternary Geology
Robert L. Brenner - Emeritus Professor of Stratigraphy
Ann F. (Nancy) Budd - Emeritus Professor of Paleontology
Robert S. Carmichael - Emeritus Professor of Geophysics
Lon D. Drake - Emeritus Professor of Engineering Hydrogeology
Philip H. Heckel - Emeritus Professor of Sedimentary Geology
Gilbert Klapper - Emeritus Professor of Micropaleontology
George R. McCormick - Emeritus Professor of Vertebrate Paleontology
Keene Swett - Emeritus Professor of Sedimentary Petrology
You-Kuan Zhang - Emeritus Professor of Hydrogeology

Adjunct/Emeritus Faculty

Department of Earth and Environmental Sciences



Recent Course Offerings

1000-2000 level courses are undergraduate 3000-4000 level courses are combined graduate/undergraduate 5000-6000 level courses are graduate only

- 1000: First-Year Seminar 1020: Loess Hills Service Learning Trip 1030: Introduction to Earth Science 1040: Evolution and History of Life 1050: Introduction to Geology 1060: Big Ideas: Origins of the Universe, Earth & Life Pt. 1 1061: Big Ideas: Origins of the Universe, Earth & Life Pt. 2 1070: Age of Dinosaurs 1080: Introduction to Environmental Sciences 1085: Fundamentals of Environmental Sciences 1090: Introduction to Environmental Sciences Lab 1115: Big Ideas: The History & Science of Oil 1170: Geology of the US National Parks 1180: Geological Field Trip to Selected National Parks 1400: Natural Disasters 2001: Sophomore Field Trip 2310: Introduction to Climatology 2410: Mineralogy 2831: Geologic Field Methods 3000: Geologic Training Assignment 3001: Junior Field Trip 3020: Earth Surface Processes 3030: Conservation Paleobiology 3040: Earth & Environmental Science Writing 3070: Marine Ecosystems & Conservation 3080: Introduction to Oceanography 3090: Topics in Museum Studies 3100: Introduction to Applied Remote Sensing 3110: Chemical Evolution of the Oceans 3150: Sustainability Project 3160: Spring Break Field Trip 3200: Collections Care & Management 3210: Principles of Paleontology 3220: Evolution of the Vertebrates 3260: Wetlands: Function, Geography, & Management
- 3300: Sedimentary Geology 3360: Soil Genesis & Geomorphology 3380: Fluvial Geomorphology 3390: Integrated Watershed Analysis 3500: Igneous and Metamorphic Petrology 3770: Global Stratigraphy 3840: Structural Geology 4001: Senior Field Trip 4156: Scanning Electron Microscopy & X-ray Microanalysis 4200: Advanced Collection Care & Management 4420: Vertebrate Osteology & Phylogeny 4440: Phylogenetics & Biodiversity 4450: Morphometrics 4490: Elements of Geochemistry 4520: Isotope Geochemistry 4620: Approaches to Geoarchaeology 4630: Hydrogeology 4680: Field Methods in Hydrologic Science 4700: Evolution of Ecosystems 4720: Glacial and Pleistocene Geology 4750: Mineral & Petroleum Exploration Geology 4790: Engineering Geology 4800: Solid Earth Geophysics 4832: Geologic Field Analysis 4870: Applied Geostatistics 5010: Geoscience Seminar 5015: AAPG Fall Field Trip 5120: Global Change Seminar 5250: Environmental Seminar 5380: Process Geomorphology 5530: Geochronology 5820: Tectonics and Basin Analysis 6250: Paleontology Seminar 6390: Advanced Watershed Analysis Seminar 6570: Tectonics and Petrology Seminar 6920: Advanced Structural Geology

Courses Offered





UI Paleontological Repository

The collections of the University of Iowa (UI) Paleontology Repository comprise over one million specimens, including >25,000 type and referred specimens, cited in >900 publications, of which >7,000 are primary types. They consist of invertebrate, vertebrate, and plant fossils of all geological ages. The collections represent the fifth largest university collection in North America (Allmon and White 2000).

iTEA Lab - Iowa Trace Element Analysis Laboratory

Thermo X-series II ICP-MS + collision cell NewWave 213nm laser + He ablation gas Cetac autosampler in clean housing. The ICP-MS facility allows determination of trace element concentrations down to sub-ppb levels (ng/mL) in a wide variety of sample types (rocks, minerals, metals, glasses, solutions, waters, digested samples) as either solutions or solid materials. iTEA also includes a metal-free clean analytical lab for wet chemistry.



Scanning Electron Microscope (SEM) Laboratory

Hitachi S-3400N, variable-pressure scanning electron microscope (SEM) capable of imaging specimens with no metal coating, or specimens that are slightly hydrated or porous, as well as conventionally processed specimens; equipped with a Bruker AXS Quantax 400 X-ray microanalysis system; XFlash silicon drift detector with excellent energy resolution and light element detection, providing ultra-fast acquisition of line scans and elemental maps.



Iowa Geological Survey Core Library

The library includes rock samples from over 38,000 sites around the state, including strata from nearly every geological period of Earth history. Additionally, the library contains almost 465,000 feet of drill "core" (cylinders of rock drilled for research programs) and rock samples and is located at the Oakdale Facility ten minutes from Trowbridge Hall. It would cost over \$185 million to commercially drill and recollect the samples reposited in the library today.



Petrographic and Rock Preparation Laboratory

The petrographic and rock preparation laboratory is a full-service laboratory for internal and external customers offering a variety of rock and specimen preparation options, including the production of high-quality research thin sections and preparation for other analytical methods. The laboratory is also used as a teaching and training facility to offer instruction to students in preparation methods for their own research.

Quaternary Materials Laboratory



The University of Iowa Quaternary Materials Laboratory is fully equipped to carry out soils and sediment grain-size (pipette and SediGraph) and sand fraction sieve analysis. The lab also has wet-chemistry facilities, a C-H-N elemental analyzer, a Flotech flotation system, and owns and operates a heavy duty Giddings soil coring rig for collecting intact core of unlithified sediments and soils.

Facilities









Electron Microprobe (EM) Laboratory

The new JEOL JXA-8230 electron microprobe has a WDS system with 5 wavelength dispersive spectrometers with large PETL/LIFL/TAPL and LDE1, LDE2, LDEB and TAPJ crystals for detection of light to heavy elements from Be through Au. The EPMA also includes a panchromatic cathodoluminescence system, optical microscope, EDS, and LAB6 electron gun.

Sedimentary Geology Laboratory



The Sedimentary Geology Lab is equipped with state of the art hardware and software for petrographic thin section and mineral separate data capture and analysis. Specific equipment includes a Nikon Eclipse 50iPOL polarizing microscope for petrographic studies including a digital microscope camera with a separate teaching head for two-person simultaneous viewing, a Petrog digital stepping stage with accompanying software for petrographic analysis, and a Nikon SMZ18 research stereomicroscope.

Environmental and Hydrogeology Research Laboratories



The E&HR Labs include permeameters and tensionometers; pumping and slug/bail test units with transducers and data-loggers; water-quality analysis facility; advanced groundwater modeling and geostatistics software; advanced data logging systems for field research; 3-D sensor arrays (wind and water systems); and facilities for field instrumentation design and construction. The University of Iowa is also home to the Iowa Institute for Hydrologic Research, which contains the Iowa Geological Survey as a research unit and partner.

Core Analysis and Biostratigraphy Laboratories



The Core Analysis Lab offers ample lay-out space for drill cores to be photographed and sampled. Nearly 400 feet of core can be laid out at a single time. The facility includes micro-drilling equipment for geochemical sampling. Biostratigraphic Laboratories in the Department include acid digestion fume hoods for micropaleontological and macropaleontological biostratigraphic analysis using HCl and Formic Acid digestion methods.



Morphometrics Laboratory

The Morphometrics Lab includes a variety of state of the art software and hardware for morphometric analyses including a NextEngine 3D Scanner HD, a Microscribe G2X that can take three dimensional X-Y-Z landmark coordinates, taking measurements every two mm, and a Reflex Microscope for 3D measurements on a much smaller scale than the Microscribe. The lab also contains several additional digital stereomicroscopes.



Environmental Instrumentation & Geomorphic Computation Laboratories

The Instrumentation Lab include storage, testing, and teaching facility focusing on field instrumentation; assembly, housing, and testing of climatic, meteorological, fluvial, water quality and associated environmental instrumentation data recording systems and sampling systems. The Geomorphic Computing Lab includes high-end visualization, digitizing, remote sensing, and GIS systems as well as high-end multiprocessor workstations.

Facilities







For more information about private or corporate support for the Department of Earth and Environmental Sciences, or to update alumni location information, please contact the University of Iowa Foundation. The address, phone number, and web address are provided below. Your inquiry will be treated confidentially.

> Adam Blind The University of Iowa Foundation Levitt Center for University Advancement P.O. Box 4550 Iowa City, Iowa 52244-4550 +1 (319) 335-3305 or +1 (800) 648-6973 email address: adam-blind@uiowa.edu

The University of Iowa

www.uifoundation.org www.uiowa.edu www.clas.uiowa.edu www.clas.uiowa.edu/ees



Department of Earth and Environmental Sciences

THE UNIVERSITY OF LOWA Department of Earth and Environmental Sciences

Research and Teaching - International, National and Statewide Impact (2008-2018)

Countries, states and counties visited by University of Iowa -Department of Earth and Environmental Sciences Students and Faculty to conduct research, present research, for field trips, or public outreach

Palo

Cerro Gordo

> Poweshiek

University of Iowa - Department of Earth and Environmental Sciences Students and Faculty Worked in 63 Countries and Territories, 46 States, and 60 Iowa Counties

hm

Antarctica - Argentina - Australia - Austria - Belgium - Belize - Brazil - Canada - Canary Islands - Chile - China - Columbia - Costa Rica -Cuba - Czech Republic - Denmark - Dominican Republic - Ecuador - England - Ethiopia - Estonia - Faroe Islands - France - Germany -Grand Cayman - Greenland - Guam - Hungary - Iceland - India - Indonesia - Iran - Iraq - Israel - Italy - Japan - Kenya - Malawi - Mexico Namibia - Netherlands - New Zealand - Norway - Panama - Portugal - Puerto Rico - Romania - Saipan - Somalia - South Africa - South Korea - Spain - Sweden - Switzerland - Taiwan - Tanzania - Thailand - Uganda - United States - Uruguay - Venezuela - Wales - Yemen

THE UNIVERSITY OF IOWA

Department of Earth and Environmental Sciences 115 Trowbridge Hall, Iowa City, Iowa 52242, USA (Phone): +1-319-335-1818 (Fax): +1-319-335-1821 www.clas.uiowa.edu/ees

