WEBER STATE UNIVERSITY PROGRAM SELF-STUDY
Department of Geosciences
January 28, 2008

I. Program Review Process

A. Program Review Evaluation Team Members
John Shervais, Professor and Chair, Department of Geology, Utah State University
Kip Solomon, Associate Professor, Department of Geology and Geophysics, University of Utah
Eric Ewert, Assistant Professor, Department of Geography, Weber State University
Colin Inglefield, Associate Professor, Department of Physics, Weber State University

B. Program Review Process

Data for the self study were compiled using institutional records and annual reports for the Department of Geosciences. The self study incorporated input from department faculty and was largely completed during Fall 2007, then reviewed by the Dean of the College of Science. A review team, consisting of two external members and two members from Weber State University, was formed to examine materials, and conduct a site visit during Spring 2008.

II. Program Description

A. Program Mission

1. Mission Statement

The Department of Geosciences at Weber State University provides quality undergraduate education in the Earth sciences. We seek to provide an enriched learning environment through extensive interaction between faculty and students, emphasis on field studies and practical applications, use of technology-enhanced instruction, and mentoring of undergraduate research. The department offers majors in Geology, Applied Environmental Geosciences, and Earth Science Teaching, minors in Geospatial Analysis, Geology, and Earth Science Teaching, and a certificate in Geomatics. These programs provide students with the essential knowledge and skills needed to qualify them for additional education or employment. The department contributes to the broader mission of the University by providing general education courses that enhance student awareness, appreciation, and understanding of the physical environment and the scientific process. In order to promote faculty vitality and increase scientific knowledge, the department encourages faculty to engage in basic and applied research. Faculty also provide professional expertise in the Earth sciences to the community and public school system. We seek to continue building a solid base of personnel and facilities to serve Weber State University and northern Utah.
last revised 10/22/2007

The mission statement clearly defines our goals of preparing majors for further graduate studies and/or employment, providing general education that increases student understanding and appreciation of the Earth sciences, and promoting faculty research and service to the professional and local communities. We take advantage of our unique strengths, including emphasis on field studies, practical environmental applications, geospatial/computer applications, close student-faculty interaction, and mentoring of undergraduate research. Our curriculum covers the origin, evolution through time, and current nature of Earth, including relations to society, such as utilization of natural resources, protection of the environment, and mitigation of natural hazards. We use a variety of means to evaluate the success of our mission, including results of student outcomes assessment, annual faculty evaluations, student presentations of undergraduate research, and feedback from employers of our students.

2. Student Enrollment Patterns

Students are the primary focus of our program. Total student credit hours (SCHs) taught by Geosciences have ranged between 4500 and 5000 over the last 5 years (Appendix A). The small variation in hours roughly correlates with overall university enrollment trends. In detail, SCHs from online classes have increased, with online classes consistently filling very quickly during registration. However, we cannot expand class size nor add more online sections without additional faculty. The total number of majors in the department has been relatively stable, remaining close to 60 over the past 5 years (Appendix A). We had a total of 54 graduates over the last 5 years. Although there were fluctuations between years, no clear trend was apparent, with the larger number of graduates in 2002 and lower number in 2004 interpreted to reflect random fluctuations. The relative stability in number of majors and graduates is partly related to our emphasis on environmental and geospatial applications, where job opportunities continue to be strong. In detail, the number of Earth Science Teaching majors has increased, as the demand for qualified science teachers has become very high. We also plan to make students aware of growing opportunities in the petroleum industry, which may lead to increased numbers of majors in the future. Of our recent (2002-07) graduates, 26 were employed in geotechnical, geospatial, or other geologic areas, 12 continued on to pursue advanced degrees, and 8 were employed as Earth science teachers.

B. Curriculum

1. Degrees offered

The department offers majors in:

- Geology
- Applied Environmental Geosciences
- Earth Science Teaching.

We offer minors in:

- Geology
- Geospatial Analysis

• Earth Science Teaching,
and a certificate in
• Geomatics (Applied Mapping Sciences).
We also provide geoscience emphasis areas for the Bachelor of Integrated Studies, and an area for the Physical Science Composite Teaching major.

Our programs combine traditional geology, environmental, and geospatial classes with support courses in chemistry, mathematics, and physics, to provide students with solid backgrounds needed for employment and graduate school. A listing of degree requirements and course descriptions can be found at http://weber.edu/geosciences/.

2. General education and support courses

The department contributes to the liberal arts education of non-majors by offering physical science (PS) courses that enhance student understanding and appreciation of the natural environment, and scientific inquiry (SI) courses that promote understanding of the scientific method. Specific courses are:
Geo PS 1020 (Fossil Record);
Geo PS/SI 1030 (Earthquakes and Volcanoes);
Geo PS 1060 (Environmental Geosciences);
Geo PS/SI 1110 (Dynamic Earth: Physical Geology);
Geo SI 1115 (Physical Geology Lab);
Geo PS/SI 1130 (Introduction to Meteorology);
Geo PS/SI 1350 (Principles of Earth Science);
Geo SI 3010 (Oceanography and Earth Systems).

Content of general education courses is designed to provide students with an understanding of key geoscience concepts and relations to society (such as mitigation of geologic hazards, utilization of natural resources, and human interactions with Earth system cycles). Scientific inquiry courses all have regular homework exercises that stress problem solving and critical thinking skills. In multi-section classes, faculty discuss and agree on common textbooks and general goals. Faculty also share syllabi, homework exercises, and multimedia presentations, but develop their own specific materials.

The department provides support courses for other programs, including Construction Management Technology (CMT), Archaeology, Botany, and Geography. To meet needs of growing enrollments in the CMT program we offer additional night and online sections. Support courses and programs are
Geo 1060 (Environmental Geosciences)- CMT
Geo 1065 (Environmental Geosciences lab)- CMT
Geo 1110 and 1115 (Physical Geology and lab)- Archaeology, Botany
Geo 1130 (Meteorology)- Geography
Geo 3010 (Oceanography)- Geography
Geo 3150 (Geomorphology)- Geography
Geo 4100 (Engineering Geology)- CMT
Geo 3400 and 4400 (Intro and Advanced Remote Sensing)- Geography

Geo 4210 and 4220 (Intro and Advanced GIS)- Geography

The department also provides opportunities for students to obtain education off campus by offering courses through WSU Online and the Davis Campus. Over the last 5 years we have expanded off campus and online course offerings to include:
Geo PS/SI 1030 (Earthquakes and Volcanoes);
Geo PS 1060 (Environmental Geosciences)
Geo PS/SI 1110 (Dynamic Earth: Physical Geology);
Geo PS/SI 1130 (Introduction to Meteorology);
Geo 4100 (Engineering Geology).

Faculty have received training on the new Vista system for online classes, and have frequently modified classes to take advantage of newly available technologies. In the future we would like to increase our support to WSU Online and the Davis Campus, as these areas will likely experience enrollment growth. Increased support, however, will require additional faculty resources.

3. Comparison of program teaching efforts

We divide faculty resources between introductory classes and upper division classes for majors; some upper division classes also serve as support courses for other programs. Over the last 5 years, about 60% of our teaching credit hours (TCHs) have been for lower division classes and 40% for upper division classes. Corresponding SCHs are 85% for lower division and 15% for upper division classes. The larger percentage of lower division SCHs results from teaching larger enrollment lecture classes. We provide upper division classes for majors designed to prepare them for employment and/or graduate studies. Most upper division classes have relatively small enrollments and associated labs and/or field trips, which promote close student-faculty interaction and learning.

4. Course rotation

Most classes required for majors are offered yearly, so that students can complete programs in a timely manner. Some upper division courses with lower enrollments, including Geo 3060 (Structural Geology), Geo 4300 (Petrology), and Geo 4510 (Field Camp) and some elective courses are offered on an every other year basis. Specialized courses can be offered on an as needed basis using Geo 4750 (Special Topics). In order to facilitate timely graduation, we post a schedule of planned departmental classes and majors meet with an advisor at least once a year to review their progress. Table 1 lists course rotation for the last 3 years, and planned classes for the next 2 years.

Table 1. Course Rotation for 2004-2006 and Planned Rotation for2007-2008

Required Courses for Majors/Minors	F 04	S 05	F 05	S 06	F 06	S 07	F 07	S 08	F 08	S 09
Geo 1060 (Environmental Geos)	X	X	X	X	X	X	X	X	X	X
Geo 1065 (Environ Geos Lab)	X	X	X	X	X	X	X	X	X	X
Geo 1110 (Physical Geology)	X	X	X	X	X	X	X	X	X	X
Geo 1115 (Physical Geol Lab)	X	X	X	X	X	X	X	X	X	X
Geo 1130 (Meteorology)	X	X	X	X	X	X	X	X	X	X
Geo 1220 (Historical Geology)		X		X		X		X		X
Geo 2050 (Earth Materials)	X		X		X		X			X
Geo 3010 (Oceanography)		X				X				X
Geo 3060 (Structural Geology)			X				X			
Geo 3080 (Water Resources)	X		X		X		X		X	
Geo 3150 (Geomorphology)		X		X		X			X	
Geo 3400 (Remote Sensing I)	X		X		X		X		X	
Geo 4400 (Remote Sensing II)		X		X		X		X		X
Geo 3550 (Strat/Sed)		X		X		X		X		X
Geo 4060 (Field Methods)	X		X		X		X		X	
Geo 4210 (Intro to GIS)	X		X		X		X		X	
Geo 4220 (Advanced GIS)		X		X		X		X		X
Geo 4300 (Petrology)				X				X		
Geo 4510 (Field Camp)				X				X		
Geo 4570 (Teaching Methods)	X		X		X		X		X	
Elective Courses										
Geosci 3180 (Paleontology)	X				X				X	
Geosci 3210 (Quaternary Geol)				X				X		
Geosci 3250 (Geology of Utah)	X				X				X	
Geosci 3880 (Groundwater)		X		X		X				X
Geosci 4100 (Engineering Geol)		X		X	X	X	X	X	X	X
Geosci 4150 (Environ Assessment)			X					X		
Geosci 4550 (Geochemistry)		X				X				X

5. Curriculum updates

Curriculum for our major programs is carefully planned and updated based on student outcomes assessment, advances in the geosciences, changes in employment and graduate school opportunities, and input from employers. Curricular changes are discussed by faculty, and then go through a formal review process by the College of Science Curriculum Committee, University General

Education and Curriculum Committee, and Faculty Senate. Significant changes were recently made to the Earth Science Teaching Major to better prepare majors, and meet new standards for teacher preparation established by the National Science Teachers Association (NSTA) and the federal No Child Left Behind (NCLB) legislation. Courses added to the major are

Geo 2600 Laboratory Safety	1 cr hr	
Geo 3570 Foundations of Science Education	3 cr hr	[new course]
Geo 4800 Independent Research	1 cr hr	
Hist 3350 History & Philosophy of Science	3 cr hr	

Geo 3570 covers additional science teaching methods, and Geo 4800 is designed to provide an undergraduate research experience. We are also currently re-evaluating courses for the Geomatics Certificate to better prepare students for employment.

Faculty frequently update content and teaching methods for individual courses, including significant changes to Geo 3150 (Geomorphology, adding a greater field component), Geo 3400 and 4400 (Intro and Advanced Remote Sensing, adding greater writing components) Geo 4060 (Field Methods, expanding the final project capstone experience), and Geo 4210 and 4220 (Intro and Advanced GIS, incorporating significant software upgrades). We also discuss ways to integrate content between courses. We have recently changed our course scheduling to encourage majors to take Geo 3150 at the start of their sophomore year, which will expose students to more field applications early in their education, with the goal of improving student learning and retention.

6. Unique aspects of program

We take advantage of strengths and unique aspects of our program to provide students with a high-quality education. These strengths and unique aspects are briefly summarized below.

● Diversified curriculum. Our department blends traditional geology with geospatial analysis and environmental applications for the Applied Environmental Geoscience and Geology majors and Geospatial Minor, offers an integrative Earth Science Teaching major, and provides a Geomatics Certificate, designed to train students and professionals in geospatial computer applications. GIS and remote sensing classes, which include numerous geoscience applications, are housed in our department and incorporated into majors and minors.

● Close student-faculty interaction. The department has a dedicated group of faculty, and offers relatively small class sizes with extensive student-faculty interaction. Most upper division classes have labs where students work closely with faculty and use specialized equipment.

● Field experiences. We take advantage of our unique location at the boundary of the Basin and Range and Rocky Mountain provinces to provide numerous field experiences through our curriculum. The Field Methods (Geo 4060) and Field Camp (Geo 4510) courses serve as capstone experiences for our majors, in which students integrate a variety of techniques to understand various geologic processes. We have a cooperative program with Utah State University to run Field

Camp, which exposes students at both institutions to a greater variety of faculty expertise and projects. We also incorporate field trips into many of our upper division classes, offer separate field trip classes, and one faculty offers an annual field experience for students in southern Utah during the summer.. To support field studies we have obtained a variety of equipment, including GPS-PDA units loaded with ArcPad, a total station, soil sampling equipment, and portable field computers.

● Educational water well field. The department has a water well field on campus, which was built with help from the Utah Groundwater Association and U.S. Geological Survey. This well field provides our students (and visiting students from Utah State University and University of Utah) with hands-on experiences conducting aquifer tests and water sampling. Students also use industry-standard software (MODFLOW and AquiferTest) for groundwater modeling.

● GEAR lab. We utilize our Geospatial and Environmental Applied Research (GEAR) lab, equipped with computer hardware and industry-standard software, extensively in courses and for undergraduate research. The lab also houses a large format printer used by various programs in the College of Science.

● AFM lab. An atomic force microscope, jointly obtained and administered with the Department of Physics, provides undergraduate students unique access to analytical equipment, both in labs and for undergraduate research projects.

● Internships. Many students have received internships in the environmental and geospatial areas from local industry and government agencies, some of which have turned into permanent employment. We continue to build ties with industry and government, and encourage students to take advantage of internship opportunities.

● Undergraduate research. Most of our majors undertake some form of undergraduate research or service learning projects with a faculty mentor. Research projects have been on such diverse topics as artificial aquifer recharge, paleontology and stratigraphy of Cretaceous strata, eolian processes, wetlands, evolution of curved mountain belts, and weathering mechanisms analyzed using Atomic Force Microscopy (AFM). Over the last 5 years 19 student have authored or co-authored 17 abstracts and papers, which are listed in Appendix G. We are fortunate to live in a geologically diverse area with endless research opportunities and to have a significant level of funding available for undergraduate research.

● Student clubs and activities. We have two active student organizations: Geosciences Club and a local chapter of Sigma Gamma Epsilon (SGE), which is the national academic honor society for geoscience students. Both are sanctioned and registered with the University Office for Clubs and Organizations. GeoClub sponsors weekend mineral and fossil collecting trips, a department snack bar in our majors room, and various social gatherings, including the year-end department picnic. SGE club sponsors guest speakers, field trips, and an annual service project to help organize and run multiple events for the Utah Science Olympiad. Recently (2007), SGE students received the Outstanding Service Award from the Center for Science & Math Education for their long-term contributions to Science Olympiad. Importantly, GeoClub and SGE have started a

tradition of pooling resources and fund-raising efforts to offset costs of students attending the Rocky Mountain Section Meeting of the Geological Society of America. Over 25 Geosciences students have attended GSA section meetings over the last 3 years. Both student groups are currently making plans to send students to the upcoming (2008) joint Rocky Mountain-Cordilleran section meeting in Las Vegas, NV.

C. Student Learning Outcomes Assessment and Planning

1. Learning outcomes for majors

The department has developed a set of learning outcomes for majors consistent with our mission statement. Specific learning outcomes are listed below.

Graduates should understand how scientific methodology is applied in the geosciences.

Graduates should have a thorough knowledge and understanding of core concepts in the geosciences, including the following areas:

a- processes occurring at different types of lithospheric plate boundaries;

b- major physical and biological events in Earth history, and the methods used to interpret this history;

c- surface processes and their impact on development of landforms, and ability to identify and interpret landforms;

d- structural processes and ability to interpret structural relations from geologic data;

e- rock forming processes, ability to identify common minerals, and interpret environments in which rocks formed;

f- physical and chemical relationships of major geological cycles and their interactions with Earth systems.

Graduates should possess a set of fundamental skills that can be applied to a variety of situations, including:

a- problem solving skills- the ability to formulate strategies, apply quantitative calculations to solve problems related to geologic processes, and interpret data in various graphical forms;

b- communication skills - the ability to express geoscience concepts orally and in writing, and to clearly present results from laboratory and/or field work.

Data on these outcomes are collected each year from exit interviews, analysis of writing samples and projects in key classes, including Geo 1220 (Historical Geology), Geo 3550 (Stratigraphy and Sedimentology) and Geo 4060 (Field Methods), test results, and feedback from employers. Test results and exit interviews indicate that graduates are overall well prepared in knowledge areas. Analysis of writing samples and projects indicate students have overall good communication and problem solving skills applied to geoscience concepts. We have recently started administering and compiling data for the Praxis exam on

content knowledge to Earth Science Teaching majors. During exit interviews, we also ask graduates to provide feed back on strengths and weaknesses of the program. Strengths indicated by a significant portion of graduates are: dedicated faculty, close student-faculty interaction, diverse/flexible curriculum, field applications in many courses, the educational water well facility, student research opportunities, and incorporation of the GEAR lab into the program. Weaknesses indicated by some graduates are a desire for additional field applications and access to more lab equipment.

2. Learning outcomes for physical science general education

The department has a faculty member serving on the University Physical and Life Science General Education Assessment Committee. Learning outcomes for natural and physical science general education developed by this committee and recently (2007) approved by the Faculty Senate are listed below.

After completing the natural sciences general education requirements, students will demonstrate their understanding of general principles of science.
Nature of science. Scientific knowledge is based on evidence that is repeatedly examined, and can change with new information.
Integration of science. All natural phenomena are interrelated and share basic organizational principles. Scientific explanations obtained from different disciplines should be cohesive and integrated.
Science and society. Science provides explanations that have significant impact on society, including technological advancements, improvement of human life, and understanding of human influences on Earth's environment.
Problem solving and data analysis. Science relies on empirical data, and such data must be analyzed and interpreted in a rigorous manner.
Students will demonstrate their understanding of the following features of the physical world.
Organization of systems: The universe is understandable in terms of interconnected systems.
Matter: Matter comprises an important part of the universe, and has physical properties that can be described over a range of scales.
Energy: Interactions within the universe can be described in terms of energy exchange and conservation.
Forces: Equilibrium and change are determined by forces acting at various organizational levels.

Faculty recently (2007) completed a survey addressing to what extent they cover and how they assess these goals. Currently we use results of homework, writing exercises, and test scores to assess student learning and development of problem solving and critical thinking skills within the context of individual courses. Based on these results, most students taking Geo PS/SI 1350 (Principles of Earth Science), which importantly has a 3-hour lab, appear to gain a reasonably good understanding of the scientific method, knowledge of Earth systems, and improved problem solving skills. However, results are mixed for our other general

education classes that lack associated labs. Also given the cafeteria style of general education classes at WSU and lack of integrative assessment, it is unclear if natural science goals are being met for most students (note that a student may take all classes to satisfy physical and life science general education requirements outside the College of Science). More meaningful assessment will require cooperation across disciplines, coordinated through the University Physical and Life Science General Education Assessment Committee.

3. Use of outcomes assessment

Changes to our major program based on assessment results, include: modifications to the Earth Science Teaching major to include an undergraduate research component and more science teaching methods; increasing the field component in Geo 3150 (Geomorphology), combined with encouraging students to take this class early in their major; expanding the scope of the capstone project in Geo 4060 (Field Methods); increased coverage of Earth history and structural process across the curriculum; increased writing component in Geo 3400 and 4400 (Intro and Advanced Remote Sensing), and incorporating more geoscience applications into Geo 4210 and 4220 (Intro and Advanced GIS). We continue to focus on strengths identified by students, including close faculty-student interaction, providing a diverse curriculum, incorporating the well field and GEAR lab, and emphasizing field applications. To address weaknesses indicated by some students, we have obtained new equipment, including petrographic microscopes and a display system for teaching, high-precision surveying and GPS-PDA units, and additional soil sampling and water analysis equipment.

We have made minor changes to content of general education courses to further stress an Earth systems approach. Implementing significant modifications to improve the overall natural science curriculum, however, will require cooperation across disciplines and a campus wide commitment to the goals of a liberal arts education. Adding a natural science laboratory requirement, in which students would obtain, analyze, and interpret multiple data sets (such as in Geo 1350), is likely the best way to improve student understanding of the scientific process. This would, however, require additional faculty and/or lab instructors and more space (Phase II of the Science Lab building), but we believe the investment would be very worthwhile. Another challenge for improving general education is the inadequate math and science preparation of many entering students. Increasing cooperation with K-12 education in Weber and Davis counties, increasing math and science requirements in high school, and adding a lower level math prerequisite (such as Math 960 or 1010) to all natural science general education science classes would improve student preparation and allow classes to be taught at a higher level. One of our faculty has taught for Developmental Math and is currently chairing the search committee for a Director of this recently created program. We plan to work closely with Developmental Math to better integrate math and science education for entering students.

D. Academic Advising

Students declaring a major in geosciences have an initial meeting with the department chair to discuss general goals. A separate file is created for each major, minor, or BIS student, and is updated until graduation; files are also kept after graduation. Students are assigned to different advisors depending on major/minor: Geology- Dr. Eaton; Earth Science Teaching- Dr. Ford; Applied Environmental Geosciences- Dr. Matyjasik; Geospatial Minor and Geomatics Certificate- Dr. Hernandez; and general- Dr. Wilson. Most students meet with their advisor at least once a year to check progress and plan courses for the next year. Faculty advisors work with students to develop a form of planned course work for each semester until graduation; this form is updated annually. Planned future course offerings (2 year cycle) are posted for students to use in general planning. Students are also encouraged to meet with other faculty to discuss areas of interest and career choices, and faculty work with students to obtain internships and admittance to graduate programs, and regularly write reference letters. One faculty gives an annual presentation to the Geosciences Club on undergraduate research opportunities, preparation for graduate school, and writing effective resumes.

Additionally, students meet with the College of Science Academic Advisor (Ali Miller) for advice on general education and other general university requirements. Students also work with and are on an emailing list from the College of Science Career Services representative (Greg Neilson). Career and internship opportunities of particular interest to geoscience students are posted in our majors room.

We collect data on advising by asking questions on frequency and quality of advising during exit interviews with graduates. Exit interviews indicate that graduates met regularly (at least annually) with an advisor, and were overall very satisfied with the quality of advising.

E. Faculty

1. Faculty background and demographics

The department currently has 6 full-time faculty, and 3 adjunct instructors that teach part time on a regular basis, with a combined full-time-equivalent faculty (FTE) that has varied from 8 to 9 over the last 5 years (Appendix B). All full-time faculty have a PhD in the geosciences, with a combined 77 years of teaching experience (Appendix C). Faculty cover a variety of expertise areas, including sedimentology, stratigraphy, paleontology, environmental geology, hydrogeology, Earth science teaching, geomorphology, GIS, remote sensing, geologic hazards, mineralogy, petrology, structural geology, and tectonics. All full time faculty are currently male. Vitae of full time faculty are included in Appendix F. Diversity has been a criteria for past hires, and efforts will be made to increase diversity during future hires. All adjuncts have an advanced degree,

along with extensive teaching or regulatory experience. Two are male and one is female.

2. Faculty mentoring, professional development, and evaluation

Faculty, in consultation with the department chair, set goals for the next year and evaluate goals from the previous year during an annual meeting. Teaching assignments are made by consultation between the chair and faculty, with a normal teaching load of 24 TCH per academic year. The chair goes over student teaching evaluations each semester with faculty and adjuncts to identify strengths and weaknesses. New faculty receive mentoring from the chair, and are made aware of the Policies and Procedures Manual and tenure expectations. New faculty also exchange materials and ideas with other faculty who have more teaching experience. The department provides funds for professional development and travel (one meeting per year if presenting), with additional funds available through the Research, Scholarship, and Professional Growth Committee, and from external grants. Each faculty has a research space. Faculty can also apply for sabbaticals, subject to administrative approval. We have had a total of 3 years of sabbatical leave split between 3 faculty over the last 5 years (with teaching loads covered internally).

Faculty are evaluated in teaching, research, and service each year by the department chair as part of a standardized faculty review process. Results are then reviewed by the Dean, in consultation with the department chair. Faculty are also evaluated as part of the formal tenure and ranking process, including reviews by Department Peer Review, Department Ranking/ Tenure, and College Ranking/ Tenure Committees, and by the Dean. Standardized student evaluations are given in at least two courses per year for each faculty (in practice almost all courses taught by faculty have student evaluations), and for all courses taught by adjuncts. Faculty and adjuncts use results of student evaluations and comments to help improve delivery methods, content, and assessment methods. Annual faculty reviews indicate frequent lab improvements, course updates, use of new pedagogic techniques, attendance of workshops, and obtaining grants for instructional improvement.

3. Faculty teaching

Faculty use a range of teaching pedagogies, depending on personal style and course. Example syllabi in Appendix H illustrate various faculty approaches to teaching and student learning. Most faculty use multimedia presentations, taking advantage of our two multimedia classrooms and portable display projector. Faculty incorporate extensive hands-on labs, computer applications, and field experiences into upper division courses, so that students gain practical and technical experience. In both general education and upper division courses, faculty emphasize the relevance of the Earth sciences to everyday life. Faculty also stress problem solving, data synthesis, use of information resources, and communication skills, including term papers, group projects, poster presentations, seminar-style discussions, and oral presentations. We strive to provide close

student-faculty interaction in a supportive environment that encourages questioning, learning, and creative thinking. Faculty have also attended national workshops that focus on various pedagogies, and incorporated ideas into their classes.

Averages of student evaluations are high for most questions and for most classes, with departmental averages for a summary question (Considering all of the above, what is your overall rating of the teacher?) ranging from 5.9 for general education classes to 6.1 for upper division classes (on a scale of 1- poor to 7- excellent). Student comments are mostly positive. Faculty have also been recognized for excellence in teaching by their peers, receiving the George and Beth Lowe Innovative Teaching Award and being selected to give the annual WSU "Last Lecture".

Examples of significant teaching innovations over the last 5 years include:
Analysis of volcano locations and types of activity using Google Earth in general education classes;
Mini research and writing project using internet resources to analyze earthquake patterns in general education classes;
Use of real-time weather data and analysis software licensed from the American Meteorological Society in general education classes;
Updated aquifer test and water sampling exercises using our educational water well field;
New exercises for Field Camp held in conjunction with Utah State University, and expanded capstone experience in Field Methods where students form consulting teams to analyze geologic hazards and produce a geotechnical report and multimedia presentation;
Field geospatial and surveying projects using new GPS-PDA units and total station;
Development of a petrographic display system for teaching;
New demonstrations and lab exercises using the atomic force microscope.

4. Faculty research and mentoring of students

Although our department is small, faculty are involved in a variety of research activities. Faculty published 38 peer-reviewed papers (including 2 student-coauthored papers), and 41 abstracts over the last 5 years. Faculty have published in internationally recognized journals, such as American Journal of Science, Geomorphology, Journal of Structural Geology, and Journal of Paleontology. Faculty gave invited presentations at international conferences, such as the 2002 Penrose Conference on three-dimensional deformation of orogenic belts held in Switzerland, and the 2006 Backbone of the Americas co-hosted by the Argentina Geological Society and Geological Society of America, and one faculty was a Fulbright Fellow in the Czech Republic. During the last 5 years, faculty received research grants from the National Science Foundation, National Forest Service, National Park Service, and Bureau of Reclamation totaling over $260,000. Faculty also received internal grants for instructional improvement, research, and computer improvements, and a NSF instrumentation

grant to purchase an Atomic Force Microscope, in collaboration with the Physics Department at WSU.

As part of their research and teaching efforts, faculty regularly involve and mentor students in projects. Students have presented results at section and national meetings of the Geological Society of America, American Physical Society, and Sigma Xi Research Society, and at the WSU Annual Undergraduate Research Symposium. Funding has been obtained from competitive student research proposals to the Office of Undergraduate Research (over $12,000 awarded since 2004) and external grants obtained by faculty. Mentoring activities for each faculty member are briefly described below, and student publications and presentations are listed in Appendix G.

Dr. Eaton has involved 10 students in research projects studying Cretaceous strata in southern Utah, and has also hosted many other students at his research center for field studies each summer. Utilizing funding from the National Park Service for a paleontologic inventory of Bryce Canyon, 8 students participated in extensive studies during the 2006 and 2007 field seasons. All of these students got extensive field experience measuring sections, determining sedimentary environments, and learning paleontologic field methods. As an outgrowth of summer projects, 2 students are analyzing the petrology of Cretaceous strata, and 5 students are undertaking faunal analysis of brackish water and other microvertebrate localities of differing ages.

Dr. Ford has mentored 8 students in research and service learning projects. Students have been involved with studies of wetlands in the Uinta Mountains, formation of hoodoos in Goblin Valley (in collaboration with Dr. Hernandez), and eolian processes at Coral Pink Sand Dunes. Service learning projects have involved Earth Science Teaching majors developing after-school science clubs at elementary schools. A new area of research involving students will focus on potential degradation of wetlands in the Uinta Mountains related to global warming, in collaboration with Drs. Matyjasik and Hernandez.

Dr. Hernandez has been involved with a range of collaborative research projects incorporating students. Projects have included formation of hoodoos in Goblin Valley (in collaboration with Dr. Ford), ecosystems of Great Salt Lake (in collaboration with Zoology), and multiple student projects using GIS.

Dr. Matyjasik involved 8 students on modeling of the artificial recharge in the Weber River Basin, and another 8 Geosciences and Physcis students in ongoing research utilizing the Atomic Force Microscope (AFM), collaborating with Dr. Colin Inglefield of the Physics Department. Projects using the AFM have included mobility of lead in apatites at low pH typical for some soil/bacteria systems, effects of drying/wetting cycles on mineral surfaces, and analysis of weathering and biological activity on mineral surfaces in arctic climates. A recently funded grant will specifically focus on potential changes to weathering of mineral surfaces associated with global warming on Spitzbergen, with colleagues from Poland.

Dr. Yonkee has involved 4 students in field research studying curved fold-thrust systems in the Wyoming salient of the Sevier orogenic belt. This is

collaborative project with Bryn Mawr College and Los Alamos National Laboratory funded by the NSF. Students have been involved in collecting structural data, paleomagnetic samples, and strain analysis. Students have interacted with faculty and students from other institutions, providing an enriched learning environment, and all students have either started or are planning to soon start graduate studies.

5. Faculty service

All full-time faculty in the department have served on university and college committees, two faculty have chaired university committees, and three faculty have served on the Faculty Senate over the past 5 years. Faculty have also served on various tenure and promotion committees, and faculty search committees for other programs. One faculty received the WSU Outstanding Faculty Governance Award, and currently serves on the Executive Committee of th Faculty Senate. Faculty have provided extensive professional service, including review of manuscripts and grants, serving on thesis committees, chairing sessions at national meetings, and serving as officers for professional organizations. One faculty is current National President of Sigma Gamma Epsilon, the national honor society for students in the Earth sciences, and one facutly served as Local Chair for the 2005 National Meeting of the Geological Society of America held in Salt Lake City.

F. Program Support

1. Staff

The department currently has one half-time secretary (Appendix D). Staff, in consultation with the department chair, set development goals using the Performance Review and Enrichment program (PREP). Staff attend professional development classes/ seminars given by the university, but opportunities are limited due to the half-time nature of the secretary position. Staff are annually evaluated by the chair using PREP, which reviews performance of basic job functions and addresses how well goals from the previous year were met.

The department does not have a lab manager/ instructor position, which requires faculty to spend more time preparing labs, and more significantly, maintaining computer hardware and software in our GEAR lab (a stressful and time consuming task). Increasing enrollments in introductory labs, particularly Geo 1065 (Environmental Geosciences lab) that is a required support course for the Construction Management Technology program, have reached the point where we need to offer additional sections (we have let in over 30 students in some lab sections). However, without additional personnel, such as lab instructor, or a qualified adjunct willing to teach such work intensive classes (which we have unsuccessfully tried to find), we are facing difficult decisions on how to meet various teaching needs.

2. Library

Students use library materials for writing exercises, literature searches, labs in a number of classes, and research projects. We have a departmental librarian and a liaison in the Stewart Library to coordinate new purchases. The department has made a major effort to improve coverage of library materials, with purchase of additional books. Another significant improvement has been licensing of electronic (online) access to a wide range of Elsevier geosciences journals. Traditional (hard copy) journal subscriptions, however, are difficult to maintain due to high costs, and additional electronic access to other journals is still needed. Geoscience data base search engines, such as GeoRef, are available and an excellent interlibrary loan system (Illiad) is in place.

3. Facilities and Equipment

We have a wide range of specialized facilities and equipment that are listed below.

Atomic Force Microscope laboratory (obtained jointly with Physics from NSF Instrumentation grant, also includes environmental cell for measurement of surfaces in fluids).

Geospatial and Applied Environmental Research (GEAR) laboratory- includes 15 computers (with 3 to 5 new computers obtained each year to replace older machines), server, 2 laser printers, 1 large-format printer, digitizing tablet, site licenses for industry standard ESRI ArcGIS and Leica Geosystems ERDAS Imagine software, and other software (including MODFLOW).

Education water well field- includes 5 wells, water pump, piezometers, water sampling equipment, water chemistry equipment (probes, spectrophotometers, and chemicals), permeameters, and groundwater flow analog model.

Meteorological station, with computer display and software.

Seismograph station, with display.

Multimedia classrooms (SL320 and LL124), and a portable projector and computer for multimedia presentations in other classrooms.

Surveying and field equipment- 1 total station, 2 leveling transits, 6 field GPS units and 6 higher precision (2- to 5-m) GPS units with PDAs and ArcPad for recording and plotting data in the field, 2 GPS receivers and base station with 1 m precision, field laptop (ToughBook) computer, soil auger and sampling equipment, Brunton compasses, stereoscopes, and high resolution digital cameras.

Microscopes- 8 new petrographic scopes and 10 older petrographic scopes, automated point counting system, 15 binocular scopes.

Petrographic display system for teaching, with high resolution color video camera, computer, high resolution display device, and software.

Image analysis system with research grade petrographic microscope and software.

Rock preparation equipment- saws, grinding wheels, and crushing equipment.

Grain size analysis system with research-grade sieve set.

Screen washing facility for separating microfossils.

Extensive rock, mineral, fossil, and thin section collections, including petro-tectonic suites.

Topographic map, geologic map, and aerial photograph collections.

Faculty and staff computing equipment- computers, scanners, color laser printer.

The department has significantly improved facilities over the last 5 years, and has generally adequate equipment to provide students with training in many computer, geospatial, and environmental applications. Strengths include our education water well field, GEAR lab, extensive rock and thin section collections, and new petrographic display system. Recently, faculty submitted collaborative instrumentation grants with other departments in the College of Science to develop a scientific visualization lab and obtain an XRF microprobe, but the grants were not funded at this time; consideration is being given to modifying and resubmitting proposals, including a proposal to obtain an environmental SEM. We would also like to develop a course in geophysics focused on environmental applications, which would require new equipment, such as ground-penetrating radar, shallow seismic survey system, micro-gravimeters, and appropriate software. Although we have made improvements, additional support is needed to purchase more analytical equipment and more effectively maintain existing equipment. A major challenge will be to increase space for accommodating more equipment and supporting increased faculty-student research.

4. Administrative Support and Budget

The department currently has an adequate annual budget to meet basic needs. Over the last 5 years, the department annual budget, excluding faculty and staff salaries, has increased from $15,000 to $20,000, which has been used mostly to pay hourly wages of student assistants, purchase equipment, support travel costs, and cover general operating expenses (e.g. phones, xeroxing, office supplies). The Dean has provided additional one-time funds to purchase key equipment, including 8 petrographic microscopes and a total station. The Dean has also provided some matching funds for internal grants, which have been used to purchase new computers for the GEAR lab, GPS-PDA units for field work, and a petrographic display system for teaching. Private donations of about $1,000 per year, exclusive of scholarships, have been used to help purchase equipment. Additionally, we recently ontained a $3,000 donation to help cover costs of field trips for students. The department has student fees in introductory labs (Geo 1065 and 1115) and for computer-intensive geospatial classes (Geo 4210, 4220, 3400, 4400) with an estimated revenue of about $4,000/year. These funds are used to replace and improve lab supplies for larger enrollment introductory labs, and to help cover high costs of computers and software licensing in the geospatial classes. We have also entered into a cooperative program with other Utah institutions of higher learning to obtain a campus site license for industry-standard GIS software, and have received funds from other WSU constituencies that use the software to help cover costs. However, covering on-going software licensing costs remains a challenge.

Funding for undergraduate research is now (since 2004) available through the Office of Undergraduate Research. Students apply on a competitive basis for

research funding for the academic year and/or summers. Geosciences students have received over $12,000 in funding (not including travel to meetings) from this source since 2004, with additional support coming from various faculty grants. The department has received about $10,000 annually for scholarships, which has allowed us to support a number of majors during the regular academic year. We have also received support from the Utah Geological Association and recently from the Golden Spike Gem and Mineral Club to support scholarships for Field Camp.

5. Institutional support

The College of Science has a liaison in the Development Office who we work with to obtain donations and cultivate ties with alumni. Faculty work with the Office of Sponsored Projects to obtain and help administer grants, but coordination could be improved. Implementation of the new Banner system has not been totally smooth, and problems still exist with student registration and prerequisites, and with graduation evaluation forms. WSU Online provides support to online classes, but technical problems with student access and appearance of some materials still occasionally arise. A major area of concern is IT support, which is not always consistent nor timely. Much of this concern could be relieved by hiring a computer technician for the College of Science. This person could help with network administration of department computer labs (including our GEAR lab which is a time consuming task currently undertaken by Dr. Hernandez), support and security of faculty computers, updating of department web pages, and general support of faculty and student research that typically involves computer applications. This would free up faculty time that would be better focused on teaching and undergraduate research.

G. Relations with External Communities

The department supports K-12 education in the community. We continue to be closely involved with the Center for Science and Math Education, with one faculty serving on the Steering Committee for the center and specifically focused on Earth science teaching. Faculty have been actively involved with the Science Olympiad, science and engineering fairs, MESA program, giving lectures in the public schools, and offering summer workshops for in-service teachers. The department also provides an introductory Earth science course designed for elementary education majors, and has seen an increase in Earth Science Teaching majors.

We have extensive contacts with governmental agencies, including the Utah Geological Survey, U.S. Geological Survey, National Forest Service, Weber Basin Conservancy District, county, and city planning groups. Faculty have undertaken collaborative projects with some of these agencies, and faculty serve on outside committees, such as the Weber County Health Department Advisory Committee. One adjunct faculty works for the Utah Department of Environmental

Quality. One faculty has a major grant from the National Park Service to conduct a paleontological survey of Bryce Canyon, which has employed many students. We have also developed contacts with geotechnical firms who provide feedback on performance of graduates they hire. Many of these contacts have also resulted in student internships. Key contacts with external communities are listed in Appendix E.

We support GIS applications across the campus, including managing a site license for ArcGIS that is used by multiple programs, Stewart Library, and Facilities Management. One faculty heads the local GIS Users Group and provides training sessions on GIS to interested faculty.

Faculty are actively involved with professional organizations. One faculty is current National President of Sigma Gamma Epsilon, the national honor society for students in the Earth sciences, and one facutly served as Local Chair for the 2005 National Meeting of the Geological Society of America held in Salt Lake City. Faculty also provide service to the professional community by reviewing manuscripts and grants, and chairing sessions of professional meetings.

H. Results from Previous Program Review and Future Directions

1. Strengths and challenges identified by previous review

The previous (2002-03) review identified a number of strengths, which we continue to build on, and challenges, which we continue to address. These are briefly discussed below.

Strengths

(i) Faculty

The department has an excellent, collegial faculty, dedicated to providing students with a high quality learning environment. Faculty teach general education, online and service courses, and major courses. All faculty regularly update course content and teaching pedagogies, and have excellent working relations with students. Faculty advise students and help students obtain internships, employment, and acceptance to graduate schools. Faculty conduct extensive research and grant writing, and engage majors in their research, including extensive work during the summers. Faculty also provide significant service to the university and professional community, serving as committee chairs and officials for various organizations.

(ii) Students

We have an excellent group of motivated students, which can be measured by their successes in undertaking research, participating in internships, finding employment, and entering graduate programs. Most majors have been involved in some form of undergraduate research or service learning projects over the last 5 years, with 19 student having co-authored abstracts and papers. Since 2003, 20 students have either received internships, part-time jobs, or full-time positions in the geospatial area, 15 students have received internships or jobs in the

geotechnical area, 8 have been employed as Earth Science teachers, 12 have continued on to take graduate studies, and other students have been employed in the minerals industry. Graduates are working for government agencies (U.S. Geological Survey, Utah Geological Survey, National Forest Service, Utah Automated Geographic Reference Center), the private sector, and as K-12 school teachers. We have two active student organizations, Geosciences Club and SGE, that participate in service activities and raise funds to help send students to professional meetings.

(iii) Curriculum

We continue to integrate traditional geology with geospatial analysis and environmental applications within our majors and minors. We promote close student-faculty interaction, incorporate numerous field experiences, and utilize the educational water well field and GEAR lab into courses. For general education classes, we emphasize understanding of key geoscience concepts and relations to society (such as mitigation of geologic hazards, utilization of natural resources, and human interactions with Earth system cycles), as well as improved problem solving and critical thinking skills.

Challenges

(i) *Staffing*

Staffing remains a major challenge, which will only increase as enrollments grow in the future (the Utah State Board of Regents projects an 80% increase in enrollments at WSU over the next 20 years). As described under recommendations, we were able to refill the GIS position in 2003, but have not been able to add a laboratory instructor position. Over the last 5 years faculty workloads have been full, and several faculty have taught overloads to cover growing needs for online and support courses, including classes during the summer term. Combined with the extensive research and service commitments of faculty, including an increased emphasis on student research, there is concern about faculty burnout unless the expanding workload can be partly alleviated by increased staffing.

(ii) *Space*

Space is currently adequate, but with anticipated enrollment growth, additional teaching rooms and office rooms for new lecture/ faculty positions will be needed. Because of the long time frame required for any major building project, priority should be given to planning and construction of Phase II of the Science Lab Building. Our present building continues to age, despite some remodeling efforts.

(iii) *Equipment and maintenance*

We have been able to improve laboratory and teaching facilities, partly through internal grants, donations, and funds supplied by the Dean. Significant improvements include, new computer hardware and maintaining industry-

standard software for the GEAR lab, purchases of additional field equipment, improved rock and thin section collections, petrographic display system for teaching, and new student petrographic microscopes. We continue to seek resources for additional improvements to facilities, including more analytical equipment and systematic maintainence of computer hardware/ software. Of particular importance is the need for consistent, high-quality computer support, which could be accomplished by hiring a college computer technician.

2. Recommendation of previous review

The previous (2002-03) review identified three main recommendations. Our responses are summarized below.

(i) Increase Staffing- Fill temporarily frozen GIS position and obtain new lab instructor position.

We successfully filled a tenure-track position in GIS with the hiring of Dr. Michael Hernandez in 2003. Dr. Hernandez has extensive expertise in GIS and remote sensing, including applications to geologic hazards. Importantly, Michael has developed excellent classes in the geospatial area, built bridges with other programs including Geography, fostered ties with local government and industry resulting in student internships, obtained and managed a campus site license for industry-standard GIS software, obtained new computer equipment through internal grants, and been primarily responsible for maintaining our GEAR lab. We have thus been able to not only maintain, but improve the geospatial program.

Filling a lab instructor position remains a high priority for our program, but has not been realized due to budgetary constraints. We were able to hire an adjunct with a PhD on a semester by semester basis from 2003 to 2006, who taught part time (about 6 hours of classes per semester) and had an office in our department. She recently chose to leave, in part because of the low adjunct pay rate. As enrollments grow in introductory labs and service courses, and pressure increases to offer more online courses, we will need to fill a lab instructor position.

(ii) Explore effects of class scheduling on graduation.

Some courses are offered on an alternate year schedule due to limited staffing and relatively low enrollments in these courses. We post schedules of planned course offerings, and students meet with an advisor at least once a year to check progress toward graduation and plan courses for the next year(s). Student are specifically asked about the quality and frequency of advising during exit interviews. These interview have not revealed major problems with scheduling or ability to graduate in a timely manner.

(iii) Increase funding and development efforts

Donations to the department have increased over the last 5 years, allowing support of more scholarships and purchases of equipment. We recently receieved a $3,000 donation to help cover costs of student field trips, and support for a second field camp scholarship. However, we still plan to further increase

development efforts. We are currently putting together a department newsletter for alumni, and updating our department web page to encourage alumni participation. The department has developed an alumni data base, which is updated as new information becomes available. We scheduled an alumni social event in 2004, but did not receive adequate response to cover costs and the event had to be canceled. We are now planning a scaled back alumni dinner, which we hope will be the start of more extensive events in the future.

3. Future Directions

The department has developed a set of future goals, which are described below. Specific goals reflect our mission of preparing majors for employment and graduate school, contributing to the general education of non-majors, conducting research involving students, and providing service to the profession and community.

(i) Retain well qualified faculty, including better monetary compensation and support.

The department will work to retain and better support our excellent faculty. Recent salary increases have helped boost faculty morale, but compensation still lags behind national averages and some equity issues remain. As faculty are being asked to do more with less, stress has increased, and we will seek ways to provide more reassigned time for mentoring student research and service activities.

(ii) Expand faculty expertise and build bridges with other disciplines as part of a comprehensive Geosciences program.

As enrollments grow, we will seek additional faculty positions to better cover the areas of meteorology/ paleoclimatology, geomicrobiology, geochemistry, geophysics, and geotechnical engineering, allowing us to build a comprehensive geosciences program. Such positions would also foster interdisciplinary ties with other programs, including Botany, Chemistry, Geography, Microbiology, and Physics.

(iii) Fill laboratory technician/lecture position.

The department will seek a laboratory lecture position. We offer hands-on labs that are time and computer intensive, and increasing enrollments in lower division labs will soon require teaching additional sections. A lecturer would help with time-intensive lab preparation and teaching, contribute to increased online offerings, and alleviate increasingly tight time pressures on faculty.

(iv) Provide high-quality curriculum that prepares majors for graduate studies and employment.

Faculty will continue to update curriculum based on advances in the geosciences, technological changes, and evolving student employment

opportunities. We will continue to stress understanding of key geoscience concepts, communication and problem solving skills, and practical applications that prepare students for life long learning. We will also continue to emphasize our unique aspects by incorporating numerous field experiences, providing practical and computer applications through the GEAR lab and educational water well field, and promoting close student-faculty interaction.

(v) Contribute to the general education of non-majors.

We will continue to support the liberal arts mission of the university by teaching general education courses that increase student understanding of the scientific method, improve critical thinking skills, increase appreciation of the natural world, and help students become responsible citizens capable of making informed decisions about important societal issues in an increasingly technical, complex, and populated world. We will work with the University Committee on General Education to better evaluate natural science learning outcomes, and use results to improve the overall program. We plan to explore support for adding a natural science laboratory requirement, which we believe would significantly improve science general education. We also plan to work closely with Developmental Math to better integrate math and science education.

(vi) Recruit majors.

Students are our primary focus, and we will seek growth in the quality and quantity of majors. We are in the process of updating our department brochure (to be printed in color), and significantly updating our department web page to better emphasize unique aspects of our program. We are also developing a multimedia presentation that illustrates different geoscience careers and educational opportunities offered by our program, which we plan to distribute to 9th grade Earth science teachers and to Career Services. We plan to continue participating in Majors Fest, giving lectures for MESA, and supporting Upward Bound. We are currently exploring development of an introductory field trip specifically designed as a recruiting tool, which will illustrate dynamic Earth processes and career opportunities to students with a potential interest in geosciences.

(vii) Support science education.

Increased support of Earth science education is a high priority. We will continue to be actively engaged in providing educational outreach programs to local schools and community groups, serving as judges for the State Science & Engineering fair, and conducting events for the Science Olympiad. We plan to continue working closely with the Center for Science and Math Education (CSME) to increase the number of teaching majors, improve academic preparation of teaching majors, and provide professional development for in-service teachers.

(viii) Promote faculty and student undergraduate research.

We will continue to encourage faculty to conduct research, including work with students, that is both synergistic and time intensive. New funding sources

from the Office and Undergraduate Research, support from the Research and Professional Growth Committee, and ability of faculty to obtain externally funded grants have allowed us to expand undergraduate research opportunities, but additional resources and more reassigned time for student mentoring are still needed. We will incorporate research results and methods into upper division classes that utilize extensive hands-on labs, seminar-style discussions, and group projects.

(ix) Improve computer support and maintainence.

Providing students with high-tech applications is extremely important in preparing them for employment and graduate school. We will continue to seek ways to periodically upgrade computers, maintain software licences, and provide competent, technical support for departmental computer needs. A key goal is to obtain a computer technician for the College of Science, who would help with network administration of department computer labs, faculty computers, updates to department web pages, and facilitate computer research applications.

(x) Improve laboratory facilities.

We will seek additional equipment and continued maintenance of existing equipment used to provide high-quality labs. We plan to further improve surveying, soil sampling, and water analysis equipment, as well as explore ways to obtain more student petrographic microscopes, geophysical equipment, and engineering geology equipment. We will also explore ways to obtain specialized analytical equipment, such as a bench-top XRD and environmental SEM, and development of a 3-D scientific visualization lab. Addition of new space will be critical as lab enrollments grow, more students participate in research, and new faculty are added, making it critical to begin work on Phase II of the Science Lab Building/ Science Complex.

(xi) Improve distance learning offerings and support to the Davis Campus.

The department will explore ways to offer additional online sections, incorporate improvements in delivery technology, and carefully evaluate student learning outcomes to improve course quality. Currently we offer online versions of Geo 1030, 1060, 1110, and 4100, but all online sections of these courses have filled each semester. The department will also explore ways to offer more classes at the Davis Campus, eventually including labs. Increasing support for the Davis Campus and WSU Online, however, will require new faculty and better technical support.

(xii) Foster ties with industry and government agencies.

The department will continue fostering ties with the external community, including the Utah Geological Survey, U.S. Geological Survey, National Forest Service, county, and city planning groups. We will also continue supporting collaborative projects with outside groups, such as the Weber County Health Department Advisory Committee, Weber Basin Conservancy District, Utah Department of Environmental Quality, and National Park Service. Such ties have

resulted in numerous student internships (many of which have led to employment), input on curriculum, donations of funds to purchase equipment, and guest lectures. This is an ongoing process, and as more of our graduates become employed in industry and government agencies, the network of contacts will grow.

(xiii) Improve funding.

The department will continue to work with administration to further increase department budgets and one-time funding of equipment needs. We have seen an increase in donor funding, and plan to cultivate additional ties with alumni, including development of an annual departmental news letter. We have implemented student fees for some labs to help support costs, but prefer to use other methods to cover increasing costs of software and equipment. We are now receiving more donations for field trips.

Appendix A
Student Staistical Summary

	2002-03	2003-04	2004-05	2005-06	2006-07
Student Credit Hours*	4,548	4,932	5,062	4,854	4,626
Student FTE	101.07	109.60	112.49	107.87	102.80
Student Majors	65	53	59	59	58
Program Graduates					
Certificate	4	0	3	3	0
Bachelor Degree	21	10	4	7	12

* Student credit hours supplied by Institutional Research shown in the table do not exactly match those used in department annual reports, which were taken from 3rd week enrollments.

Appendix B
Faculty Statistical Summary

	2002-03	2003-04	2004-05	2005-06	2006-07
Faculty FTE Total	8.18	8.91	9.02	8.6	8.51
Adjunct FTE*	3.4	3.1	3.24	2.82	2.73
Contract FTE*	4.78	5.81	5.78	5.78	5.78

* Contract FTE numbers supplied by Institutional Research shown in the table only refer to insitutionally designated positions, not to actual teaching loads. Adjunct FTE numbers shown in table includes unpaid and paid overload classes taught by regular tenure-track/ tenured faculty, as well as classes taught by adjunct faculty.
Using 24 teaching credit hours per year as a basis for 1 FTE, classes taught by adjunct faculty actually correpsond to the following:
1.4 FTE for 2002-03; 1.5 FTE for 2003-04; 1.4 FTE for 2004-05; 1.5 FTE for 2005-06;
1.5 FTE for 2006-07.

Appendix C
Contract/Adjunct Faculty Profile

Name	Gender	Ethnicity	Degree	Rank	Tenure	Years Teaching WSU	Years Teaching Other	Areas of Expertise
Eaton, Jeffrey G	M		PhD	Professor	7/01/02	14	3	paleontology, sed/stratigraphy
Ford, Richard L	M		PhD	Professor	7/01/05	10	3	Earth science ed, geomorphology
Hernandez, Michael	M		PhD	Assistant		4		GIS, remote sensing, geologic hazards
Matyjasik, Marek	M		PhD	Professor	7/01/04	10	2	environmental geology, hydrology
Wilson, James R	M		PhD	Professor	7/01/87	24		mineralogy, general geology
Yonkee, W Adolph	M		PhD	Professor	7/01/97	15		structural geology, petrology, geochemistry
Barker, Helen	F		MS	Adjunct				physical geology
Herrot, Thomas	M		MS	Adjunct				meteorology
Larsen, David	M		MS	Adjunct				environmental geology

Appendix D
Contract Staff Profile

Name	Gender	Ethnicity	Job Title	Years of Employment WSU	Years of Employment Other	Areas of Expertise
Swider, Susan	F		½ time secretary	15		

Appendix E
Relastionships with External Communities

Name	Employer, Job title
Joshua Jones	Ogden City, GIS
Chad Montgomery	Weber County, GIS
Grant Willis	Utah Geological Survey, Chief of Mapping Division
Mike Lowe	Utah Geological Survey, Chief of Hydrology Division
Sharon Oldhorst	Center for Science and Math Education, Director

Appendix F
Vita of Tenure/ Tenure-track Faculty

RESUME

Jeffrey G. Eaton
Department of Geosciences
Weber State University
Ogden, Utah 84408-2507
(801) 626-6225
E-Mail:jeaton@weber.edu

EDUCATION:

Ph.D., Geology, University of Colorado, Boulder, August, 1987. Dissertation: Stratigraphy, depositional environments, and age of Cretaceous mammal bearing rocks in Utah, and systematics of the Multituberculata (Mammalia).
M.S., Geology, University of Wyoming, May, 1982.
Graduate studies in Music, University of Wyoming, 1972-73.
Bachelor of Music Degree, Manhattan School of Music, New York, 1971.
Attended Knox College, Galesburg, Illinois, 1966-67.

EMPLOYMENT AND EXPERIENCE:

Teaching Positions:

Professor of Geosciences, Weber State University, 2004-present.
Associate Professor of Geosciences, Weber State University, 1998-2004.
Assistant Professor of Geosciences, Weber State University, 1995-1998.
Adjunct Faculty, Weber State University, 1993-1995.
Adjunct Professor, Northern Arizona University, 1990-92.
Scholar-In-Residence, Museum of Northern Arizona - Northern Arizona University, 1988-1989.
Visiting Professor, University of Oregon, Eugene, 1987.
Teaching Associate, University of Wyoming Department of Music, 1974-1979.
Head Teacher, Laramie Head Start Program, 1973-74.
Instructor, Brooklyn Conservatory of Music, 1967-71.

Museum Positions:

Research Curator, Utah Museum of Natural History, University of Utah, Salt Lake City, 1999-present.
Adjunct Curator of Paleontology, Utah Museum of Natural History, University of Utah, Salt Lake City, 1993-1999.
Research Associate, Utah Museum of Natural History, University of Utah, Salt Lake City, 1992-1993.
Associate Curator of Paleontology, Museum of Northern Arizona, Flagstaff, 1991-1992.
Assistant Curator of Paleontology, Museum of Northern Arizona, Flagstaff, 1989-1991.
Research Associate, Museum of Northern Arizona, Flagstaff, 1986-89.
Museum Graduate Assistant, University of Colorado, Boulder, 1982-84, collections management duties.
Curator, University of Wyoming Geological Museum, 1975-81.
Field research in Wyoming in association with the American Museum of Natural History, 1971-75.

Museum Exhibits:

Guest Curator, "Dinosaurs - A Global View," Utah Museum of Natural History, University of Utah, Fall, 1993.
Curator, with Drs. Gwen Waring and Larry Stevens, "The History of Extinction," opened at MNA in January 1989, and then traveled to the Dan O'Leary Museum, Moab, Utah; The University of New Mexico, Las Cruces; The Red Rocks Museum, Gallup, New Mexico; The Museum of Western Colorado, Grand Junction: The Price Prehistoric Museum, Price, Utah; 1989 through May, 1993.
Curator, with Dr. Michael Morales (principal investigator), reinstallation of permanent Museum of Northern Arizona Geology displays under National Science Foundation Grant MDR-8954719, 1989-92, $178,000.
Curator for traveling exhibit "Dinosaurs - A Global View," Museum of Northern Arizona, September, 1991 to January, 1992.

PROFESSIONAL MEMBERSHIPS:

Society for Sedimentary Geology (SEPM)
Society of Vertebrate Paleontology

Geological Society of America
Society for the Study of Mammalian Evolution
Utah Academy of Sciences, Arts & Letters
National Center for Science Education

HONORS

George and Beth Lowe Innovative Teaching Award, Weber State University, April, 2007.
Selected to give the WSU "Last Lecture" - A Brief History of Life - on March 27, 2007.
Tripennaculus eatoni, new species scicomorph lizard named". . . in honor of Jeffrey G. Eaton who discovered the type locality and has contributed significantly to the study, interpretation, and understanding of the biostratigraphy and paleontology of the Kaiparowits Plateau" by Randall Nydam and Gina Vovi, 2007, Journal of Herpetology, v. 41, no. 2, p. 211-219.
Alphadon eatoni, new species of marsupial named ". . . in recognition of his contributions to knowledge of Cretaceous mammals from the State of Utah" by Richard Cifelli and Christian de Muizon, 1998, Journal of Paleontology, v. 72 (3), p. 532-537.
Elected to Phi Kappa Phi - 1997.
Eatonichnus, new genus of trace fossil named " . . . in recognition of his many important contributions to the geology and paleontology of the Cretaceous and Tertiary of Utah" by Bown, T. M. and others, 1997, U.S. Geological Survey Bulletin 2153, p. 52.

SCHOLARSHIPS, FELLOWSHIPS, AWARDS:

Fulbright Research Scholar, 2002-2003, Microvertebrates of the Bohemian Cretaceous Basin, Czech Republic. Prague, September, 2002-May, 2003.
Fellowship, University of Colorado, 1986-87, $11,000.
Shell Oil Scholarship, University of Colorado, 1985, $1000.
Walker Van Riper Award, University of Colorado Museum, 1983 $1175; 1984 - $1000; 1985 - $945
Arco Fellowship, University of Colorado, 1983, $1200.
Harvey Donations Scholarship, University of Wyoming, 1981-82, $5000.

RESEARCH GRANTS:

National Park Service, "Inventory of Cretaceous Paleontology, Bryce Canyon National Park," 2006-2007, $90,000.
Hemingway Faculty Collaborative Grant, "Microbial survival in evaporated salts," with Mohammed Sondossi and Colin Inglefield, 2006, $2,700.
Research, Scholarship, and Professional Growth Committee, Weber State University, "Testing methods for recovery of fossil vertebrates," 2004, $1016.
National Academies COBASE Program, "Cretaceous anurans of southern Utah," 2002, $3,400.
Research, Scholarship, and Professional Growth Committee, Weber State University. "Development of a fossil microvertebrate screening facility," 2001, $620.

Petroleum Research Fund Grant ACS-PRF# 34595-B8, "Developmental history of Sevier Foreland Sub-Basins, Upper Cretaceous, southwestern Utah," 1999, $27,720.

Research, Scholarship, and Professional growth Committee, Weber State University, Hemingway Grant, "Attending and presenting a paper at the 'VII International Symposium on Mesozoic terrestrial ecosystems'," 1999, $2,300.

Research, Scholarship and Professional Growth Committee, Weber State University, "Developmental history of the Sevier foreland sub-basins, Late Cretaceous, southwestern Utah" (additional support to the PRF Grant), 1996, $665.
Petroleum Research Fund Grant ACS-PRF# 30989-GB8, "Developmental history of Sevier foreland sub-basins, Late Cretaceous, southwestern Utah," 1996, $20,000.
Utah State Historical Society, Support for Paleontological Research and Education, 1991, $650.
National Science Foundation Grant EAR-900456O, "Stratigraphy and faunas of Cenomanian-Turonian strata, southwestern Utah," 1990, $31,974 (co-principal investigator with Dr. J. I. Kirkland).
National Geographic Research Grant 3965-88, "Cenomanian terrestrial faunas of the Dakota Formation, southwestern Utah," 1988, $8,500.
Research Grant, Museum of Northern Arizona, 1987, $10,000.
Ceja Oil Research Grant, University of Colorado, 1985, $1,000.

National Science Foundation Grant EAR-7904369, "Vertebrate paleontological and paleomagnetic exploration of the southeastern Absaroka Range, Wyoming,," 1979. $41,821 (co-principal investigator with Dr. P.N. Shive).

TEACHING GRANTS

Research, Scholarship and Professional Growth Committee, Weber State University, "Preparation of petrographic thin section suites for teaching," 1997, $1,620 (with Dr. Adolph Yonkee).

PUBLICATIONS:

Refereed Papers *submitted*:

Eaton, J.G., Cenomanian (Late Cretaceous) Mammals from Cedar Canyon, southwestern Utah, and a Revision of Cenomanian *Alphadon*-like Marsupials: submitted to a volume in honor of Dr. Michael Woodburne.

Refereed Papers Published

Nydam, R. L., Eaton, J.G., and Sankey, J., 2007, New taxa of transversely-toothed lizards (Squamata: Scincomorpha) and new information on the evolutionary history of "teiids": Journal of Paleontology, v. 8, no. 3, p. 538-549.

Eaton, J. G., 2006, Late Cretaceous mammals from Cedar Canyon, southwestern Utah, *in* Lucas, S.G., and Sullivan, R.M, eds., Late Cretaceous vertebrates from the Western Interior: New Mexico Museum of Natural History and Science Bulletin 35, p.373-402.

Eaton, J. G., 2006, Santonian (Late Cretaceous) Mammals from the John Henry Member of the Straight Cliffs Formation, Grand Staircase-Escalante National Monument, Utah: Journal of Vertebrate Paleontology, v. 26, no. 2, p. 446-460.

Korth, W.W., and Eaton, J.G., 2004, Rodents and a marsupial (Mammalia) from the Duschesnean (Eocene) of the Sevier Plateau, Utah, *in* Dawson, M.R., and Lillegraven, J.A., eds., Fanfare for an Uncommon Paleontologist: papers on Vertebrate Evolution in honor of Malcolm C. McKenna: Carnegie Museum of Natural History Bulletin, No. 36, p. 109-119.

Eaton, J.G., 2004, New screen-washing approaches to biostratigraphy and paleoecology, Cretaceous of southwestern Utah. *in* Dawson, M.R., and Lillegraven, J.A., eds., Fanfare for an Uncommon Paleontologist: Papers on Vertebrate Evolution in honor of Malcolm C. McKenna: Carnegie Museum of Natural History Bulletin No. 36, p. 21-30.

Goldstrand, P. and Eaton, J.G., 2004, Paleocene to Early Oligocene Basin Evolution, southwest Utah, *in* Young, R., and Spamer, E.E., Colorado River - Origin and Evolution: Grand Canyon Association Monograph No. 12, p. 25-29.

Eaton, J.G., and Kirkland, J.I., 2003, Nonmarine Cretaceous vertebrates of the Western Interior Basin, *in* Harries, P.J., (ed.), High-Resolution Stratigraphic Paleontology, Klewer Academic Publishers (Boston), p. 263-313.

Tibert N.E., Leckie, R.M. Eaton, J.G., Kirkland, J.I., Colin, J.-P., Leithold, E.L., and McCormick, M., 2003, Recognition of relative sea-level change in Upper Cretaceous coal-bearing strata: A paleoecological approach using agglutinated foraminifera and ostracodes to detect key stratigraphic surfaces, *in* Olson, H., and Leckie, R.M., eds., Microfossils As Proxies for Sea level Change and Stratigraphic Discontinuities, Society of Sedimentary Geologists (SEPM) Special Publication 75, p. 263-299.

Eaton, J.G., 2002, Multituberculate mammals from the Wahweap (Campanian, Aquilan) and Kaiparowits (Campanian, Judithian) formations, within and near the Grand Staircase-Escalante National Monument, southern Utah. Utah Geological Survey Miscellaneous Publication 02-4, 66 p.

Eaton, J.G., and Cifelli, R.L., 2001, Multituberculates from near the Early-Late Cretaceous boundary, Cedar Mountain Formation, Utah. Acta Palaeontologica Polonica, v, 46, no. 4, p. 453-518.

Eaton, J.G., Laurin, J., Kirkland, J.I., Tibert, N.E., Leckie, R.M., Sageman, B.B., Goldstrand, P.M., Moore, D.W., Straub, A.W., Cobban, W.A., and Dalebout, J.D., 2001, Cretaceous and Early Tertiary Geology of Cedar and Parowan canyons, western Markagunt Plateau, Utah, *in* Erskine, M.C., Faulds, J.E., Bartley, J.M., and Rowley, P.D., eds., The Geologic Transition, High Plateaus to Great Basin - A Symposium and Field Guide: Utah Geological Association Publication No. 30, Pacific Section AAPG Publication GB78, p. 337-363.

Eaton, J.G., And Kirkland, J.I., 2001, A preliminary assessment of diversity patterns of nonmarine vertebrates in the

Cretaceous Western Interior of North America: VII International Symposium on Mesozoic Terrestrial Ecosystems, Asociación Paleontológica Argentina, Publicaciónes Especiales 7, p. 85-89.
Yonkee, A.W., and Eaton, J.G., 1999, Geology of the Northern Wasatch Front, Utah: Utah Geological Association field trip road log, September 11, 1999, *in* Spangler, L.E. and Allen, C.J., eds., Geology of Northern Utah and Vicinity: Utah Geological Association Publication 27, p. 379-407.
Eaton, J.G., Hutchison, J.H., Holroyd, P.A., Korth, W.W., and Goldstrand, P.M., 1999, Vertebrates of the Turtle Basin Local Fauna, Late Eocene, Sevier Plateau, south-central Utah, *in* Gillette, D.D., ed., Vertebrate Paleontology in Utah: Utah Geological Survey Miscellaneous Publication 99-1, p. 463-468.
Eaton, J.G., Cifelli, R.L., Hutchison, J.H., Kirkland, J.I., and Parrish, J.M., 1999, Cretaceous vertebrate faunas from the Kaiparowits Plateau, south central Utah, *in* Gillette, D.D., ed., Vertebrate Paleontology in Utah: Utah Geological Survey Miscellaneous Publication 99-1, p. 345-353.
Eaton, J.G., Diem, S., Archibald, J.D., Schierup, C., and Munk, H., 1999, Vertebrate paleontology of the Upper Cretaceous rocks of the Markagunt Plateau, southwestern Utah, *in* Gillette, D.D., ed., Vertebrate Paleontology in Utah: Utah Geological Survey Miscellaneous Publication 99-1, p. 323-333.
Eaton, J.G., 1999, Vertebrate paleontology of the Paunsaugunt Plateau, Upper Cretaceous, southwestern Utah, *in* Gillette, D.D., ed., Vertebrate Paleontology in Utah: Utah Geological Survey Miscellaneous Publication 99-1, p. 335-338.
Eaton, J.G., 1999, Vertebrate paleontology of the Iron Springs Formation, Upper Cretaceous, southwestern Utah, *in* Gillette, D.D., ed., Vertebrate Paleontology in Utah: Utah Geological Survey Miscellaneous Publication 99-1, p. 339-343.
Cifelli, R.L., Nydam, R.L., Eaton, J.G., Gardner, J.D., and Kirkland, J.I., 1999, Vertebrate faunas of the North Horn Formation (Upper Cretaceous-Lower Paleocene), Emery and Sanpete counties, *in* Gillette, D.D., ed., Vertebrate Paleontology in Utah: Utah Geological Survey Miscellaneous Publication 99-1, p. 377-388.
Cifelli, R.L., Nydam, R.L., Gardner, J.D., Weil, A., Eaton, J.G., Kirkland, J.I., and Madsen, S.K., 1999, Medial Cretaceous vertebrates from the Cedar Mountain formation, Emery County: The Mussentuchit Local Fauna, *in* Gillette, D.D., ed., Vertebrate Paleontology in Utah: Utah Geological Survey Miscellaneous Publication 99-1, p. 219-242.
Kirkland, J.I., Cifelli, R.L., Britt, B.B., Burge, D.L., DeCourten, F.L., Eaton, J.G., and Parrish, J.M., 1999, Distribution of vertebrate faunas in the Cedar Mountain Formation, east-central Utah, *in*, Gillette, D.D., ed., Vertebrate Paleontology in Utah: Utah Geological Survey Miscellaneous Publication 99-1, p. 201-217.
Eaton, J.G., and Cifelli, R., 1998, Cretaceous vertebrates of the Grand Staircase-Escalante National Monument, *in* Learning From the Land: Grand Staircase-Escalante Science Symposium Proceedings, BLM/UT/GI-98/006+1220, p. 365-372.
Hutchison, J.H., Eaton, J.G., Holroyd, P.A., and Goodwin, M.B., 1998, Larger vertebrates of the Kaiparowits Formation (Campanian) in the Grand Staircase-Escalante National Monument and adjacent areas, *in* Learning From the Land: Grand Staircase-Escalante National Monument Science Symposium Proceedings, BLM/UT/GI-98/006+1220, p. 391-398.
Eaton, J.G., Munk, H., and Hardman, M., 1998, A new vertebrate fossil locality within the Wahweap Formation (Upper Cretaceous) of Bryce Canyon National Park and its bearing on the presence of the Kaiparowits Formation on the Paunsaugunt Plateau: National Park Service, Technical Report NPS/NRGRD/GRDTR-98/01, p. 36-40.
Kirkland, J.I., Britt, B., Burge, D.L., Carpenter, K., Cifelli, R., DeCourtin, F., Eaton, J.G., Hasiotis, S., and Lawton, T., 1997, Lower to middle Cretaceous dinosaur faunas of the central Colorado Plateau: a key to understanding 35 million years of tectonics, sedimentology, evolution and biogeography: Brigham Young University Geology Studies, v, 42, part II, p. 69-103.
Eaton, J.G., Kirkland, J.I., Hutchison, J.H., Denton, R., O'Neill, R.C., and Parrish, J.M., 1997, Nonmarine extinction across the Cenomanian-Turonian boundary, southwestern Utah, with a comparison to the Cretaceous-Tertiary extinction event: Geological Society of America Bulletin, v. 109. no. 5, p. 560-567.
Feist, M., Eaton, J.G., Brouwers, E. M, and Maldonado, F., 1997, Significance of charophytes from the Lower Tertiary variegated and volcaniclastic units, Brian Head Formation, Casto Canyon area, southern Sevier Plateau, southwest Utah, *in* Maldonado, F., and Nealey, L.D., eds., Geologic studies in the Basin and Range-Colorado Plateau transition in southeastern Nevada, southwestern Utah, and northwestern Arizona, 1995: U.S. Geological Survey Bulletin 2153, p. 29-37.
Eaton, J.G., 1995, Cenomanian and Turonian (early Late Cretaceous) multituberculate mammals from southwestern Utah: Journal of Vertebrate Paleontology, v. 15, p. 707-882.

Eaton, J.G., 1993, Origin and dispersal of marsupials: National Geographic Research and Exploration, v. 9, no. 4, p. 406-413.
Goldstrand, P.M., Trexler, J.H., Kowallis, B.J., and Eaton, J.G., 1993, Late Cretaceous to early Tertiary tectonostratigraphy of southwest Utah: *in* Morales, M., ed., Aspects of Mesozoic Geology and Paleontology of the Colorado Plateau: Museum of Northern Arizona Bulletin 59, p. 181-188.
Eaton, J.G., 1993, Mammalian paleontology and correlation of uppermost Cretaceous rocks of the Paunsaugunt Plateau, Utah: *in* Morales, M., ed., Aspects of Mesozoic Geology and Paleontology of the Colorado Plateau: Museum of Northern Arizona Bulletin 59, p. 163-180.
Eaton, J.G., Goldstrand, P.M., and Morrow, J., 1993, Composition and stratigraphic interpretation of Cretaceous strata on the Paunsaugunt Plateau, Utah: *in* Morales, M., ed., Aspects of Mesozoic Geology and Paleontology of the Colorado Plateau, Museum of Northern Arizona Bulletin 59, p. 153-162.
Eaton, J.G., 1993, Therian mammals of the Cenomanian (Late Cretaceous) Dakota Formation, southwestern Utah: Journal of Vertebrate Paleontology, v. 13, p. 105-124.
Nations, J.D., and Eaton, J.G., eds., 1991, Stratigraphy, depositional environments, and sedimentary tectonics of the western margin, Cretaceous Western Interior Seaway: Geological Society of America Special Paper 260, 216 p.
Eaton, J.G., and Nations, J.D., 1991, Introduction; Tectonic setting along the margin of the Cretaceous Western Interior Seaway, southwestern Utah and northern Arizona, *in* Nations, J.D., and Eaton, J.G., eds., Stratigraphy, depositional environments, and sedimentary tectonics of the western margin, Cretaceous Western Interior Seaway: Geological Society of America Special Paper 260, p. 1-8.
Eaton, J. G., 1991, Biostratigraphic framework for Upper Cretaceous rocks of the Kaiparowits Plateau, southern Utah: *in* Nations, J.D., and Eaton, J.G. eds., Stratigraphy, depositional environments, and sedimentary tectonics of the western margin, Cretaceous Western Interior Seaway: Geological Society of America Special Paper 260, p. 47-63.
Eaton, J.G., and Nelson, M., 1991, Multituberculate mammals from the Lower Cretaceous Cedar Mountain Formation, San Rafael Swell, Utah: Contributions to Geology, The University of Wyoming, v. 29, p. 112.
Eaton, J.G., Kirkland, J.I., and Kauffman, E.G., 1990, Evidence and dating of mid-Cretaceous tectonic activity in the San Rafael Swell, Utah: The Mountain Geologist, v. 27, p. 39-45.
Eaton, J.G., 1990, Stratigraphic revision of Campanian (Upper Cretaceous) rocks in the Henry Basin, Utah: The Mountain Geologist, v. 27, p. 27-38.
Eaton, J.G., Kirkland, J.I., and Doi, K., 1989, Evidence of reworked Cretaceous fossils and their bearing on the existence of Tertiary dinosaurs: Palaios, v. 4, p. 281-286.
Eaton, J.G., and Cifelli, R., 1988, Preliminary report on the Late Cretaceous mammalian faunas of the Kaiparowits Plateau, Utah: Contributions to Geology, University of Wyoming, v. 26, no. 2, p. 45-51.
Eaton, J.G., Kirkland, J.I., Gustason, E.R., Nations, J.D., Franczyk, K.J., Ryer, T.A., and Carr, D.A., 1987, Stratigraphy, correlation, and tectonic setting of the Late Cretaceous rocks in the Kaiparowits and Black Mesa Basins, *in* Davis, G.H., and VandenDolder, E.M., eds., Geologic diversity of Arizona and its margins: excursions to choice areas: Geological Society of America Field Trip Guidebook, Arizona Bureau of Geology and Mineral Technology Special Paper 5, p. 113-125.
Eaton, J.G., 1987, Stratigraphy, depositional environments, and age of Cretaceous mammal-bearing rocks in Utah, and systematics of the Multituberculata (Mammalia): Ph.D. thesis, University of Colorado, Boulder, 308 p.
Eaton, J.G., 1987, The Campanian-Maastrichtian boundary in the Western Interior of North America: Newsletters on Stratigraphy, v. 18, p. 31-39.
Cifelli, R., and Eaton, J.G., 1987, Marsupial from the earliest Late Cretaceous of Western U.S.: Nature, v. 325, p. 520-522.
Eaton, J.G., 1985, Paleontology and correlation of the Eocene Tepee Trail and Wiggins formations in the North Fork of Owl Creek area, southeastern Absaroka Range, Hot Springs County, Wyoming: Journal of Vertebrate Paleontology, v. 5, p. 345-370.
Sundell, K.A., Shive, P.N., and Eaton, J.G., 1984, Measured sections, magnetic polarity and biostratigraphy of the Eocene Wiggins, Tepee Trail and Aycross Formations within the southeastern Absaroka Range, Wyoming: Earth Science Bulletin, v. 17, p. 1-48.
Eaton, J.G., 1982, Paleontology and correlation of Eocene volcanic rocks in the Carter Mountain area, Park County, southeastern Absaroka Range, Wyoming: Contributions to Geology, University of Wyoming, v. 21, p. 153-194.
Sundell, K.A., and Eaton, J.G., 1982, Stratigraphic relations within the southeastern Absaroka volcanic sequence,

northwestern Wyoming, *in* Reid, S.G., ed., Geology of the Yellowstone Park area, northwestern Wyoming: Wyoming Geological Association Guidebook, 33rd Annual Field Conference, p. 65-71.
Eaton, J.G., 1980, Preliminary report on paleontological exploration of the southeastern Absaroka Range, Wyoming, *in* Gingerich, P.D., ed., Early Cenozoic paleontology and stratigraphy of the Bighorn Basin, Wyoming: University of Michigan Papers on Paleontology, no. 24, p. 139-142.
Kielan-Jaworowska, Z., Eaton, J.G., and Bown, T.M., 1979, Theria of metatherian-eutherian grade, *in* Lillegraven, J.A., Kielan-Jaworowska, Z., and Clemens, W.A., eds., Mesozoic mammals: the first two-thirds of mammalian history: Berkeley, University of California Press, p. 182-191.

Refereed Abstracts Delivered at Meetings (JGE as senior author)

Eaton, J.G., 2007, Cenomanian (Late Cretaceous) mammals from the Dakota Formation in Cedar Canyon, southwestern Utah: Geological Society of America, Rocky Mountain Section Annual Meeting, Abstracts with Program, v. 39, no. 5, p. 6.
Eaton, J.G., 2007, Bryce Canyon National Park Paleontological Inventory – A model for undergraduate science education: Geological society of America, Rocky Mountain Section Annual Meeting, Abstracts with Program, v. 39, no. 5. p. 15.
Eaton, J.G., 2005, Review of Cretaceous mammalian paleontology: Grand Staircase-Escalante National Monument, Utah: Geological Society of America, Abstracts with Programs, Annual Meeting, Salt Lake City, v. 37, no. 7, p. 115.
Eaton, J.G., 2005, Vertebrate Paleontology in the Cretaceous Sequence of Bryce Canyon National Park, Paunsaugunt Plateau, Utah: Geological Society of America, Abstracts with Programs, Annual Meeting, Salt Lake City, v. 37, no. 7, p. 331.
Eaton, J.G., 2005, Santonian mammals from southern Utah and implications for the Aquilan Land Mammal "Age": Geological Society of America, Abstracts with Programs, Rocky Mountain section meetings, v. 37(6), p. 35.
Eaton, J.G., 2004, New approaches to Cretaceous microvertebrate sampling, Utah: Geological Society of America, Abstracts with Programs, Rocky Mountain and Cordilleran section meetings**,** v. 36(4), p. 76.
Eaton, J.G., 2002, Multituberculate mammals from the Wahweap (Campanian, Aquilan) and Kaiparowits (Campanian, Judithian) formations, Grand Staircase-Escalante National Monument, southern Utah, and implications for biostratigraphic methods. Rocky Mountain Section, Geological Society of America, Abstracts with Programs, v. 34, no. 4, p. A-6.
Eaton, J.G. and Kirkland, J.I., 1999, Diversity patterns on nonmarine vertebrates in the Cretaceous Western Interior of North America; Abstracts VII International Symposium on Mesozoic Terrestrial Ecosystems, Buenos Aires, 1999, p. 22. Delivered in Buenos Aires, Argentina, September 30, 1999.
Eaton, J.G., Maldonado, F., and McIntosh, W.C., 1999, New radiometric dates from Upper Cretaceous rocks of the Markagunt Plateau, southwestern Utah, and their bearing on subsidence histories: Geological Society of America, v. 31, p. A-11.
Eaton, J.G., 1998, New discoveries in the nonmarine Cretaceous of southwestern Utah: Journal of Vertebrate Paleontology, v. 18(3), p. 39A. Delivered at annual meetings in Snowbird, Utah, Oct. 2, 1998.
Eaton, J.G., 1997, Cretaceous vertebrates of the Grand Staircase-Escalante National Monument. Delivered at the Grand Staircase-Escalante Natural Science Symposium, Cedar City, Utah, November, 1997.
Eaton, J.G., Willsey, S.P., Yonkee, W.S., Tilton, T.L., and White, T., 1997, The geometry of the Late Cretaceous Sevier Foreland Basin, southwestern Utah: Geological Society of America Abstracts with Programs, v. 29, no. 6, p. A-278. Delivered at annual national meetings in Salt Lake City, October, 1997.
Eaton, J.G., and Hutchison, H., 1995, A late Eocene fauna from undescribed strata overlying the Claron Formation, Sevier Plateau, southwestern Utah: Rocky Mountain Section, Geological Society of America, Abstracts with Programs, v. 27, p. 10. Delivered at annual regional meetings, Bozeman, Montana, May, 1995.
Eaton, J.G., 1995, Relationship of North and South American latest Cretaceous-earliest Tertiary vertebrate faunas: Rocky Mountain Section, Geological Society of America, Abstracts with Programs, v. 27, p. 9. Delivered at annual regional meetings, Bozeman, Montana, May, 1995.
Eaton, J.G., 1995, Eustacy, paleoecology, and Cenomanian-Turonian (Late Cretaceous) nonmarine extinction, southwestern Utah: Rocky Mountain Section, Geological Society of America, 1995 Abstracts with Programs, v. 27, p. 9. Delivered at annual regional meetings. Bozeman, Montana, May, 1995.

Eaton, J.G., 1994, Vertebrate Paleontology of Cretaceous rocks in Bryce Canyon National Park: Geological Society of America, Rocky Mountain Section, Abstracts with Programs, v. 26, no. 6, p. 12. Delivered at annual regional meetings, Durango, Colorado, 1994.

Eaton, J.G., and Kirkland, J.I., 1993, Faunal change across the Cenomanian-Turonian boundary, southwestern Utah: Geological Society of America, Cordilleran and Rocky Mountain Sections, Abstracts with Programs, p. 33-34. Delivered in Reno, Nevada, May, 1993.

Eaton, J.G., 1992, Towards a Late Cretaceous nonmarine biostratigraphy, southwestern Utah: Society of Economic Paleontologists and Mineralogists 1992 Theme Meeting, Mesozoic of the Western Interior, p. 24. Delivered at annual national meetings, Fort Collins, Colorado, August, 1992.

Eaton, J.G., 1992, Tectonic history of the Cretaceous Sevier Foreland basin, southwestern Utah (abstract): Society of Economic Paleontologists and Mineralogists 1992 Theme Meeting, Mesozoic of the Western Interior, p. 24. Delivered at national annual meetings, Fort Collins, Colorado, August, 1992.

Eaton, J.G., 1990, Therian mammals of the Cenomanian (Late Cretaceous) Dakota Formation, southwestern Utah: Journal of Vertebrate Paleontology, v. 9, p. 21A. Delivered at national annual meetings, Lawrence, Kansas, 1990.

Eaton, J.G., and Morrow, J.R., 1990, Preliminary report on the paleontology of Cretaceous rocks and stratigraphic implications, Paunsaugunt Plateau, southwestern Utah (abstract): Abstracts of the symposium on southwestern geology and paleontology, Museum of Northern Arizona, p. 6. Delivered at Flagstaff, Arizona, 1990.

Eaton, J.G., and Morrow, J.R., 1989. Problems of Cretaceous Stratigraphy, Paunsaugunt Plateau, southwestern Utah: Abstracts of the Symposium on Southwestern Geology and Paleontology, Museum of Northern Arizona, p. 6. Delivered in Flagstaff, Arizona, 1989.

Eaton, J.G., 1988, Cretaceous multituberculates of Utah: Journal of Vertebrate Paleontology, v. 8, p. 13A-14A. Delivered at national annual meetings at Alberta. Canada, 1988.

Eaton, J.G., 1987, Biostratigraphic framework for Late Cretaceous nonmarine sequence, Kaiparowits Plateau, southern Utah (abstract): Geological Society of America, Abstracts with Programs, p. 650-651. Delivered at annual national meetings, Phoenix, Arizona, 1987.

Refereed Coauthored Abstracts Delivered by Other Authors

Gordon, C. L., Cifelli, R. L., and Eaton, J. G., 2007, New eutherian mammals from the Kaiparowits Formation (Judithian), Utah: Journal of Vertebrate Paleontology, v. 27, no. 3, p. 83A.

Tibert, N., Colin, J-P., Leckie, M., Kirkland, J. I., and Eaton, J.G., 2005, The taxonomy and biostratigraphy of Cenomanian and Turonian (Late Cretaceous) Ostracoda from the Western Interior Basin, southwest Utah, USA: Geological Society of America, Abstracts with Programs, Annual Meeting, Salt Lake City, v. 37, no. 7, p. 367.

Wheeler, S.J., Hammer, C.L., Montgomery, C.L., Emdin, W.F**,** and Eaton, J.G., 2002, Paleontology of the Henefer Formation, northeastern Utah: The Journal of the Utah Academy of Sciences, Arts, and Letters, v. 79, p. 171.

Kirkland, J.I., and Eaton, J.G., 2002, Late Cretaceous freshwater fish from southern Utah with emphasis on fossils from the Grand Staircase-Escalante National Monument (GSENM): Rocky Mountain Section, Geological Society of America, Abstracts with Programs, v. 34, no. 4, p. A-5..

Brouwers, E., and Eaton, J.G., 2000, Ostracode faunas from Upper Cretaceous units of the Kaiparowits Plateau, southern Utah: Geological Society of America National Meetings, Abstracts with Programs, Reno, Nevada, October, 2000, p. 201.

Goldstrand, P., and Eaton, J.G., 2000, Paleocene to Early Oligocene Paleogeography, southwestern Utah, *in* Young, R. A. ed., A Working Conference on the Cenozoic Geologic Evolution of the Colorado River System and the Erosional Chronology of the Grand Canyon System: June, 2000, p. 27-29.

Tibert, N.E., Leckie, R.M., and Eaton, J.G., 1999, Recognition of relative sea level change in Upper Cretaceous coal-bearing strata: a paleoecological approach using agglutinated foraminifera to detect key stratigraphic surfaces: Abstracts of the American Association of Petroleum Geologists Annual Meeting, San Antonio, Texas, p. A138-A139, April, 1999.

Goldstrand, P., and Eaton, J.G., 1996, Upper Eocene-Oligocene(?) depositional systems and basin development, southern Utah: Geological Society of America, Rocky Mountain Section, Abstracts with Programs, v. 28, p. 69.

Bown, T.M., Hasiotis, S.T., Maldonado, F., Brouwers, E., and Eaton, J.G., 1995, Trace fossils of ants and wasps (Hymenoptera) from the lower Tertiary Claron Formation of southwestern Utah: Rocky Mountain Section, Geological Society of America, Abstracts with Programs, v. 27.

Parrish, J.M., and Eaton, J.G., 1991, Diversity and evolution of dinosaurs in the Cretaceous of the Kaiparowits Plateau, Utah: Journal of Vertebrate Paleontology, v. 11, supplement to no. 3, p. 50A.

RICHARD L. FORD
Department of Geosciences
Weber State University
2507 University Circle
Ogden, Utah 84408-2507
(801) 626-6942 rford@weber.edu

EDUCATION:

University of California, Los Angeles
Ph.D., Geography (with an emphasis in geomorphology), December 1997.
Dissertation: *Dynamics of salt-marsh accretion on a back-barrier delta, Morro Bay, California.*

University of New Mexico, Albuquerque
M.S., Geology, May 1986.
Thesis: *The effect of Quaternary climatic change on alluvial-fan sedimentation in the Harquahala Plain, Sonoran Desert, west-central Arizona.*

Virginia Polytechnic Institute and State University, Blacksburg
B.S., Geology (*with Distinction* and *Phi Beta Kappa*), June 1978.

TEACHING EXPERIENCE & PROFESSIONAL DEVELOPMENT:

Full Professor, Weber State University, Department of Geosciences: 2007-present, tenured as of July 1, 2005.
[Visiting Assistant Prof. 1996-1998, Assistant Prof. 1998-2002, Associate Prof. 2002-2007]

Courses taught: Physical Geology (1110), Physical Geology Lab (1115), Meteorology (1130), Environmental Geosciences (1060), Environmental Geosciences Lab (1065), Earthquakes & Volcanoes (1030), Oceanography (3010), Water Resources (3080), Geologic Field Methods (4060), Geomorphology (3150), Quaternary Geology (3210), Geology Field Camp (4510), Physical Geography (Geosci 101), Principles of Earth Science for Elem. Ed. Majors (1350) and Pre-Algebra (Math 0950).

Workshop Participant, *Chautauqua/NSF Workshop – Glaciers in Alaska*, June 18-21, 2005, University of Alaska – Anchorage.

Workshop Instructor, WSU Center for Science & Mathematics Education, Inservice Teacher Workshop/USOE Endorsement course, Summer 2004 & 2007. Courses taught: Meteorology for Teachers (GEO 5920).

Selected participant in *NSF/NAGT Workshop on Teaching Math Skills in a Geoscience Context*, July 24-28, 2002, Carleton College, Northfield, Minnesota.

Selected participant in *NSF/AMS/USNA Maury Project: Physical Oceanography Workshop*, July 16-27, 2001, U.S. Naval Academy, Annapolis, Maryland.

Selected participant in *NSF/NAGT Workshop on Innovative Teaching and Course Design in the Geosciences*, July 7-11, 1998, College of William & Mary, Williamsburg, Virginia.

Associate Instructor, University of Utah, Department of Geography.
1993-1996. Courses taught: Physical Geography (Geogr 120), Modern Natural Disasters (334); Urban Environmental Geography (333), Resource Conservation & Environmental Management (335), and Geomorphology (320).

Associate Instructor, University of Utah, Department of Geology and Geophysics.
1993-1995. Courses taught: Introduction to Environmental Science (GG 107), Architecture of the Earth (Lib Ed 134), and Earthquakes & Volcanos (GG 103).

Workshop Instructor, *National Geographic Society* Teacher Workshop on Water Resources, San Francisco, CA.
Summer 1993. Course taught: physical geography/water resources for K-12 teachers, field-trip leader.

Teaching Fellow, University of California, Los Angeles, Department of Geography.
1988-1992. Assisted in the teaching of: Physical Geography; Biogeography; Environmental Geography; Geomorphology; Coastal Geomorphology; and Hydrology.

Teaching Assistant, University of New Mexico, Department of Geology. 1981-1983.
Courses taught: Physical Geology Lab; Historical Geology Lab; Mineral Resources Lab; assisted in: Environmental Geology; Natural Science (remedial science).

Assistant Instructor, Virginia Polytechnic Institute & State University, Department of Geological Sciences.
Summer 1981. Assisted in the teaching of Geologic Field Methods (summer field camp).

RESEARCH EXPERIENCE:

Research team member, 2007-present. Polygonal crack patterns in the Jurassic Navajo Sandstone as a terrestrial analog for weathering features on Mars.

Co-Principal Investigator, 2006-present. Hoodoo distribution and assessment of human impacts at Goblin Valley State Park, central Utah.

Co-Principal Investigator, 1999-present. Eolian geomorphology and general geology of Coral Pink Sand Dunes State Park, southern Utah.

Co-Principal Investigator, State of Utah, 1997-1999. Wetland geomorphology of the Reader Lakes area, Uinta Mountains, Utah. Research funded by a grant from the Environmental Protection Agency.

Dissertation research, UCLA, 1989-1995. Morphologic analysis and mapping of deltaic environments and measurement of modern sedimentation rates in a coastal salt marsh, Morro Bay, California.
Advisor: Antony R. Orme.

Thesis research, UNM, 1982-1986. Morphostratigraphic and soil-stratigraphic mapping and analysis of Quaternary alluvial-fan and eolian deposits in the Harquahala Plain, Sonoran Desert, Arizona.
Advisor: Stephen G. Wells.

Research Assistant, UNM, 1984. Geomorphology, Quaternary stratigraphy, and plane-table mapping of desert piedmont deposits, Silver Lake area, California. PI: S.G. Wells and L.D. McFadden.

Research Assistant, UNM, 1982. Petrologic microscopy of modern arenaceous sediments. PI: R.V. Ingersoll.

Senior Thesis, VPI&SU, 1978. Engineering geology investigation of the landslides along U.S. Route 460 near Newport, Virginia. Advisor: W.D. Lowry

APPLIED SCIENCE EXPERIENCE:

- Utah Professional Geologist (#2250), December 2003-present, licensed by experience/education.
- California Registered Geologist (#4489), July 1988-present, licensed by examination.

Consulting Environmental Geoscientist (part-time), January 1989-August 1993; types of projects: geologic, soil, and hydrologic investigations of sites in conjunction with environmental impact assessments.

Environmental Geologist/Hydrogeologist, Gallop GeoResources, Simi Valley, California,
August 1987-December 1988; primary duties: hydrogeologic site assessments and soil investigations related to hazardous material contamination from underground storage tanks.

Petroleum Geologist, Texaco USA, Western Exploration Division, Los Angeles, California,

October 1984-July 1987; primary duties: reservoir analysis, paleogeographic mapping, wellsite geology, and seismic interpretation. Staff Geologist (1986-1987): administrative assistant to the Division Geologist, reviewed all drilling proposals, edited maps, acted as a liaison between various departments and wellsite geologists,
tracked deadlines, organized and cataloged well data, prepared and presented oral briefings, prepared written summary reports. Lead Geologist (North Aleutian Group, 1985-1986): coordinated the exploration activities of 3 other explorationists. Resigned from Texaco in July 1987, declining a transfer with promotion, to pursue a Ph.D. at UCLA.

Petroleum Geologist, Texaco, USA, Southern Exploration Division, New Orleans, Louisiana, July 1978-May 1981; primary duties: regional subsurface mapping, exploratory prospect generation, and development drilling proposals. Staff Geologist (1981): duties as above. Educational Leave-of-Absence granted in June 1981 to pursue a master's degree at the University of New Mexico.

Geologist-in-Training, Herbert & Associates (Soil & Geotechnical Engineers), Virginia Beach, Virginia, July-September 1977; primary duties: driller's assistant/rotary core drilling, preparation of borehole logs and sample descriptions.

BIBLIOGRAPHY:

Papers Published in Refereed Journals and Books:

"Polygonal cracks in bedrock on Earth and Mars: Implications for weathering" *Icarus*, in press, by M.A. Chan, W.A. Yonkee, D.I. Netoff, W.M. Seiler, and R.L. Ford.

"Nearest neighbor methods applied to dune field organization: the Coral Pink Sand Dunes, Kane County, Utah, USA" *Geomorphology*, v. 83, p. 48-47, 2007, by D.E. Wilkins and R.L. Ford

"Geologic hazards of the Wasatch Front" in Pederson, J., and Dehler, C.M., eds., *Interior Western United States*: Geological Society of America Field Guide 6, p. 505-524, 2005, by B.J. Solomon, F.X. Ashland, R.E. Giraud, M.D. Hylland., B.D. Black, R.L. Ford, M.W. Hernandez., and D.H. Hart, D.H.

"Montane wetland hydrochemistry: Uinta Mountains, Utah" *Hydrological Science and Technology*, v. 19, p. 251-266., 2003, by M. Matyjasik, R.L. Ford, and N. Keate.

"Geology of Coral Pink Sand Dunes State Park, Kane County, Utah" in D.A. Sprinkle, T.C. Chidsey, and P.B. Anderson, eds., *Geology of Utah's Parks and Monuments*, Utah Geological Association Publication 28, p. 365-389, 2000, by R.L. Ford and S.L. Gillman.

"Late Quaternary geomorphic history of Silver Lake, eastern Mojave Desert, California: an example of the influence of climatic change on desert piedmonts," in J. Lintz, ed., *Western Geological Excursions*: Reno, Nevada, Mackay School of Mines, Geological Society of America 1984 Annual Meeting Guidebook, v. 1, p. 122-136, 1984, by S.G. Wells, L.D. McFadden, J.C. Dohrenwend, T.F. Bullard, B.F. Feilberg, R.L. Ford, J.P. Grimm, J.R. Miller, S.M. Orbock, and J.D. Pickle.

"The effect of grain size on detrital modes: a test of the Gazzi-Dickinson point-counting method: *Journal of Sedimentary Petrology*, v. 54, p. 103-119, 1984, by R.V. Ingersoll, T.F. Bullard, R.L. Ford, J.P. Grimm, J.D. Pickle, S.W. Sares, and G.L. Weadock.

Selected Consulting Reports on Environmental Geology:

"Geomorphology and hydrology of selected wetlands of the Uinta Mountains, Utah", February 2000, submitted to Utah Wetland Coordinator (State contract 986266), funded by an E.P.A. grant, by M. Matyjasik & R.L. Ford.

"Environmental geology of The Highlands (tentative subdivision/specific plan use permit), City of Rocklin, California," May 1993, 22p.

"Geologic site-assessment report for Baldwin Contracting Company's Hallwood Aggregate Mine, Yuba County,

California," July 1992, 20 p.

Selected Papers Given at Professional Meetings:

"Polygonal crack systems in the Jurassic Navajo Sandstone: A weathering analog to Mars" (with M.A. Chan, A. Yonkee, W.M. Seiler, and D.I. Netoff). A paper presented at the 2007 Annual Meeting of the *Geological Society of America*, Denver, CO, October 2007.

"Investigations into the morphology and spatial distribution of hoodoos at Goblin Valley State Park, Emery County, Utah" (with S.L. Day, S.A. fellows, and M.W. Hernandez). A poster presented at the Rocky Mountain Section Meeting of the *Geological Society of America*, St. George, UT, May 2007.

"Multiproxy evidence for late Holocene climate change, Coral Pink Sand Dunes, Utah" (with D.E. Wilkins and K. Nicoll) A poster to be presented at the 2007 Annual Meeting of the *Association of American Geographers,* San Francisco, CA, April 2007.

"Polygonal cracking and "Wopmay" weathering patterns on Earth and Mars: implications for host-rock properties" (with M.A. Chan, W.A. Yonkee, and W.M. Seiler). A paper presented at the *38th Lunar and Planetary Science Conference*, Houston, TX, March 2007.

"Using ground-penetrating radar to image terrestrial analogs of Martian aeolian deposition" (with W.P. Clement and D.E. Wilkins). A poster presented at the 2006 Winter Meeting of the *American Geophysical Union*, San Francisco, CA, December 2006.

"Peat ages and geomorphology of patterned fens in the Reader Lakes area, central Uinta Mountains, Utah, U.S.A." (with Marek Matyjasik and Nancy Keate). A paper presented at the *Uintas 2006 – Interdisciplinary Assessment Symposium*, Alta, UT, May 2006.

"Little Ice Age behavior of the Coral Pink Sand Dunes, Kane County, Utah " (with David Wilkins and Kathleen Nicoll). A poster presented at the 2005 Annual Meeting of the *Geological Society of America*, Salt Lake City, UT, November 2005.

"Digital elevation models in geomorphic reconnaissance: mapping the extent of proglacial Lake Swan, north-central Montana" (with Cameron Lindsley). A poster presented at the 2004 joint Rocky Mountain/Cordilleran Section Meeting of the *Geological Society of America*, Boise, ID, May 2004.

"Nearest-neighbor analysis and karst geomorphology: an introduction to spatial statistics". A poster presented at the 2003 Annual Meeting of the *Geological Society of America*, Seattle, WA, November 2003.

"GPR and GIS use in documenting a distinctive mode of star dune formation." (with D. Wilkins and W. Clement). A poster presented at the XVI International Congress of the *International Union for Quaternary Research* (INQUA), Reno, NV, July 2003.

PROFESSIONAL AFFILIATIONS:

American Meteorological Society (AMS)
American Quaternary Association (AMQUA)
National Assoc. of Geoscience Teachers (NAGT)
National Science Teachers Association (NSTA)
American Geophysical Union (AGU)
Geological Society of America (GSA)
National Earth Science Teachers Assoc. (NESTA)
Utah Geological Association (UGA)

ACADEMIC AWARDS AND HONORS:

1992 Sigma Xi, The Scientific Research Society, UCLA.
1983 The Society of Sigma Gamma Epsilon, National Honorary for the Earth Sciences, UNM (Beta Mu Chapter).
1981 Scholarship for first year of graduate study, Department of Geology, University of New Mexico.
1978 Co-Senior of the Year, Department of Geological Sciences, VPI&SU.
1978 The Phi Beta Kappa Society, VPI&SU (Mu of Virginia).

1977 The Honor Society of Phi Kappa Phi, VPI&SU.
1976 Scholarship to attend Indiana University Field Camp, Montana, Dept of Geology, Indiana University.
1975 Phi Eta Sigma, Freshman Honorary Society, VPI&SU.
1974 Academic Dean's List, VPI&SU, Fall Quarter 1974-Spring Quarter 1978.

UNIVERSITY, PROFESSIONAL, AND COMMUNITY SERVICE:
2007-present. Chairman, Search Committee / Director of Developmental Math (COS Committee).
2006-present. Member; Research, Service, & Professional Growth Committee (University Committee).
2005-present. National President, The Society of Sigma Gamma Epsilon (Earth Science Honor Society).
1999-present. Member, Center for Science and Mathematics Education Steering Committee (COS Committee).
2005-present, Member, Natural Sciences Museum Committee (COS Committee).
1999-present. Chapter Officer, The Honor Society of Phi Kappa Phi (WSU chapter) – President 2002-2003.
1998-present. Faculty Advisor, WSU Chapter of Sigma Gamma Epsilon.
1997-present Events Coordinator, Utah State Science Olympiad, WSU.
1996-present Judge, State Science and Engineering Fair, WSU.
2003-2006. Senator, College of Science, WSU Faculty Senate.
2002-2005. Member; Admissions, Standards, & Student Affairs Committee (University Committee).
1999-2002. Member, Curriculum and General Education Committee (University Committee).
1998-2005. National Vice President for Western Region, Sigma Gamma Epsilon (Earth Science Honor Society).
1998-99. Board of Directors (elected), Friends of Great Salt Lake.
1993-99. Education Volunteer, Utah Museum of Natural History.

Michael W. Hernandez, PhD
2507 University Circle, Room 203M
Department of Geosciences
Weber State University
Ogden, UT 84408-2507
Email: mhernandez@weber.edu

ACADEMIC INTERESTS

Teaching: GIS, Remote Sensing, Natural Hazards
Research: Applications of GIS and remote sensing to geologic process studies and geomorphology

EDUCATION

Ph.D., Geography, University of Utah, Salt Lake City, Utah
- Graduated December 2004
- Dissertation Title – "A Procedural Model for Developing a GIS-Based Multiple Natural Hazard Assessment: Case Study – Southern Davis County, Utah"
- Advisor: Dr. Merrill K. Ridd

M.S., Geology, Louisiana Tech University, Ruston, Louisiana
- Graduated November 1990
- Research Area: Natural Hazards and Environmental Geology
- Thesis: "Distribution, Development, and Risk Mapping of Landslides in Northeastern Louisiana"

B.S., Geology, Louisiana Tech University, Ruston, Louisiana
- Graduated May 1984

PROFESSIONAL EXPERIENCE

Weber State University, Department of Geosciences (July 2003 – Present)
- Assistant Professor (December 2004 – Present) / Instructor (July 2003 – November 2004)
  - **Teach all the upper division core courses in geospatial technologies.**

Remote Sensing I (Introduction to Remote Sensing)	**GEO 3400**
Remote Sensing II (Advanced Digital Image Processing)	**GEO 4400**
Introduction to Computer Mapping & GIS	**GEO 4210**
Technical and Application Issues in GIS (Advanced GIS)	**GEO 4220**

  - Mentor/supervise students involved with undergraduate research projects and cooperative work **experience (internships).**

Independent Research	**GEO 4800**
Cooperative Work Experience	**GEO 4890**

  - **Teach the following lower division geosciences courses.**

Earthquakes and Volcanoes	**GEO PS/SI1030**
Environmental Geosciences Lab	**GEO 1065**

- Faculty Advisor / Director
  - **Geomatics (Applied Mapping Sciences) Certificate Program (Advisor)**
  - **Geospatial Analysis Minor (Advisor)**
  - **Remote Sensing and Geographic Information Systems Laboratory (RSGISL) (Director)**

University of Missouri – Columbia, Department of Geography (June 2000 – July 2003)
- Research Fellow
  - **Research Specialist, U.S. Department of Agriculture North Central Soybean Research Program and Precision Agriculture Grants Analyzed utility of spaceborne/airborne imagery and GIS for precision agriculture applications.**
  - **Center for Local & Regional Government Applications of Remote Sensing Technologies**

(CLARA) Responsible for management of remote sensing/GIS projects and graduate research assistants funded through the NASA Earth Science Enterprise Directorate. Developed and coordinated all research and training agendas for projects. Provided instruction at training seminars. Developed web-based remote sensing training modules. Coordinated all budgetary issues with co-principal investigators. Oversaw management of lab computers and equipment.

- **Instructor, Geographic Information Systems I (GEOGR 347) Fall 2002**
  Instructor, Geographic Information Systems II (GEOGR 447) Spring 2001.

Energy & Geoscience Institute at the University of Utah, Geomatics Lab (1995-2000)

- **Geomatics Specialist (part-time)**
  Performed and managed geospatial components (remote sensing, GIS, GPS, and digital cartography) of research projects. Remote sensing experience included multispectral analysis on Landsat TM satellite imagery for mineral suite identification and lineament mapping. Skilled in both raster and vector GIS functions used for geospatial analysis. Advised scientists on which geospatial processing techniques were required to produce the desired geospatial information. Coordinator for the urban growth modeling project in Salt Lake and Southern Davis Counties, Utah. Utilized geospatial data developed from previous phases of urban analysis to create a rule-based raster model for predicting urban growth in the corridor covering Salt Lake Valley and southern Davis County, Utah. Collaborated with regional planners to refine growth exclusion zones, determine growth vectors based on future land use, and develop robust rules that influence urban growth along the Wasatch Front.

U.S Air Force Reserve, HQ 18AF / Tanker Airlift Control Center, Scott AFB, IL (1996-present)

- **Exercise / Contingency Airlift Director (Tanker Airlift Control Center)**

Rank: Major ***Security Clearance: Top Secret***

Plan and control airlift participation in worldwide contingencies and joint military exercises. Develop deployment and redeployment airflows for strategic airlift, tanker, and airdrop assets. Train new airlift directors. Ten years operational experience with supporting COCOM and JFACC needs for strategic airlift.

University of Utah, Department of Geography (1994-1999)

- **Instructor / Teaching Assistant**
  Full teaching responsibility for two courses: "The Earth's Surface Environments" (Physical Geography) and "Geographic Computer Literacy" courses. Periodic guest lecturer in "Image Analysis I", "Introduction to Quantitative Methods", and "Introduction to Geographic Information".

United States Air Force (1987-1994)

Rank: Captain

- **Airlift Director**, 437th Airlift Wing, Charleston AFB, South Carolina (1994).
  Planned and managed airlift assets in support of military exercises, contingencies, and presidential support activities. Supervised three officers and four enlisted personnel.
- **Command Post Duty Officer**, 437th Airlift Wing, Charleston AFB, South Carolina (1993).
- **Assistant Chief, Operations Plans Flight**, 351st Missile Wing, Whiteman AFB, Missouri.

- **ICBM Missile Combat Crew Member (Instructor and Evaluator)**, 351st Missile Wing, Whiteman AFB, Missouri (1988-1992).

PAST TEACHING EXPERIENCE

University of Missouri – Columbia

- **Instructor** – Geographic Information Systems I (Introduction to GIS), GEOGR 347 (Fall 2002).
- **Instructor** – Geographic Information Systems II (Advanced GIS), GEOGR 447 (Spring 2001). Informal student evaluation: Very Good.
- **Guest Lecturer** – Remote Sensing, GEOGR 345, (Fall 2000).
- **CLARA Seminar Instructor** – Principles of Remote Sensing, Image Processing, Image Analysis, Fundamentals of GIS, Geospatial Database Development, GIS in Local Government.

University of Utah

- **Instructor** – Geographic Computer Literacy, GEOGR 100 (1994-96). Average student evaluation score: 3.24/4.00 (eight quarters).
- **Instructor** – Physical Geography, GEOGR 120 (1995, 1997). Average student evaluation score: 90% student expectations met or higher (2 quarters).
- **Guest Lecturer** – Image Analysis I, GEOGR 511.
- **Guest Lecturer** – Introduction to Quantitative Methods, GEOGR 1000.
- **Guest Lecturer** – Introduction to Geographic Information, GEOGR 180.
- **Guest Lecturer** – Geography of the Middle East, GEOGR 365.

U.S. Air Force

- **Classroom Instructor –** Missile Combat Crew Monthly Recurrence Weapon System Training Course.
- **Simulator Instructor –** Weapon System and Emergency War Order Scenario Training.
- **Course Developer/Instructor –** Lesson plan development and presentation to address individual crew training requirements.

HONORS AND AWARDS

1995-96 Outstanding Graduate Student, Department of Geography, University of Utah
1989 Outstanding Young Men of America
1982 National Dean's List for Colleges and Universities

PUBLICATIONS AND REPORTS

Peer-reviewed manuscripts

- Hernandez, M.W., 2006, Multi-hazard Assessment Through Remote Sensing and GIS Analysis, in Chapter 10: Documenting Dynamics of Human Settlements (Author/Editor: Ridd, M.K.; Contributing Authors: Bjorgo, E., Camp, L.E., Card, D.H., Chung, J.M., Dudley-Murphy, E.A., Gillies, R.R., Hipple, J.D., Hernandez, M.W., Hofmann, P., Jurgens, C., Lam Nina N.S.-N, Massasati, A.S., Merola, J.A., Mesev, V. Nash, G.D., Quattrochi, D.A., Wheeler, D.J.) *The Manual of Remote Sensing, 3rd Edition: Volume 5: Remote Sensing of Human Settlements* (*in* M.K Ridd and J.D. Hipple, editors), ASPRS Publications, Washington D.C., pp. 637 – 642.
- Solomon, B.J., Ashland, F.X., Giraud, R.E., Hylland, M.D., Black, B.D., Ford, R.L., Hernandez M.W., and Hart, D.H., 2005, Geologic hazards of the Wasatch Front, Utah, *in* Pederson, J.L. and Dehler, C.M., eds., *GSA Field Guide 6: Interior Western United States*: Geological Society of America Field Guide Series, v. 6, pp. 505-524.

- Hernandez, M.W., 1998, Earthquake Hazards along the Wasatch Fault, *GeoSystems Today: An Interactive Casebook* (*in* Ford, R.E. and Hipple, J.D. editors), John Wiley & Sons, Inc., New York, online publication: http://www.wiley.com/college/geocases/cases/case1/index.html.

Peer-reviewed abstracts

- Day, Summer L., Fellows, Steven A., Hernandez, Michael W., and Ford, Richard L., 2007, Investigations into the morphology and spatial distribution of hoodoos at Goblin Valley State Park, Emery County, Utah: Geological Society of America, Abstracts with Programs, Rocky Mountain Section (59th Annual) Meeting, St. George, Utah, May 7 - 9, 2007.
- *Hernandez, M.W., 2005, GIS-based multiple natural hazard assessment of southern Davis County, Utah: A physiographic "bottleneck" along the Wasatch Front: Geological Society of America, Abstracts with Programs, Salt Lake City, Utah, 16 – 19 October 2005, v. 37, (CDROM).
- Tarantino, R., Cluff, T., Jones, J., Lindsey, C., Pope, B., Matyjasik, M., and Hernandez M.W., 2004, Artificial recharge of the Delta Aquifer, Weber County, Utah: Geological Society of America, Abstracts with Programs, Rocky Mountain (56th Annual) and Cordilleran (100th Annual) Joint Meeting, Boise, Idaho, May 3 – 5, 2004, v. 36, no. 4, p. 93.
- *Hernandez, M.W., 2001, Implementation of a GIS-based multiple natural hazard assessment in the Wasatch Front, Utah: Preliminary results from the southern Davis County pilot study, *in* Proceedings of the ASPRS Annual Conference (CDROM), St. Louis, April 2001.
- *Hernandez, M.W., 1999, Developing a strategy for creating a GISci-based multiple natural hazard assessment for the Wasatch Front: Oral presentation at the Association of Engineering Geologists 42nd Annual Meeting, Program with Abstracts, Salt Lake City, Utah, September 26-29, 1999.
- Burns S.F., Hernandez, M., Mutchler, J., Smith, S., and Siddiqui, A., 1995, Landslides in Louisiana: Geological Society of America, Abstracts in Programs, New Orleans, Louisiana, November 6-9, 1995, v. 27 (6): A142.

** presented at professional meetings.*

Other published works

- Hernandez, M.W. and Armstrong, J., 2007, Development of the Interdisciplinary GIS Program at Weber State University: Its Growing Impact on Undergraduate Research: *CUR Quarterly,* March 2007.

  This article has been accepted and will be published in the March 2007 release of the *CUR Quarterly*. It describes my ongoing efforts to develop a sustainable GIS program at WSU that will support teaching and interdisciplinary research. I explain my two-phase approach to establishing and expanding GIS on campus, including the stages in each phase, the associated costs, and challenges we face now and in the future. Dr. John Armstrong and I also present examples of undergraduate GIS-based research at WSU.
- Nash, G.D., and Hernandez, M.W., 2001, Cost-Effective Vegetation Anomaly Mapping for Geothermal Exploration, *in* Proceedings: Twenty-Sixth Workshop on Geothermal Reservoir Engineering: Stanford University, Stanford, California, January 29-31, 2001, SGP-TR-168, 8 p.
- Nash, G.D., and Hernandez, M.W., 1996, The Development and Use of a Comprehensive Regional Digital Geospatial Database for Geothermal Exploration in Central Nevada, U.S.A., *in* Proceedings of the Eleventh Thematic Conference on Applied Geologic Remote Sensing: ERIM, Las Vegas, Nevada, p. II-630 – II-639.
- Burns, S.F., Hadley, W.O., Mutchler, J.W., Smith, S.M., Hernandez, M.W., and Siddiqui, A.S., 1992, Development of Design Criteria for the Prevention of Slope Failures, Louisiana Transportation Research Center, Baton Rouge, Louisiana, Report 210., 231 pages.

Manuscripts in review and preparation

- Hernandez, M.W., (in prep; expected submission in January 2008), A method for integrating multiple hazard assessments to form a composite hazard view: Lessons learned. Planned for submission to *Natural Hazards: Journal of the International Society for the Prevention and Mitigation of Natural Hazards.*

Other unpublished works

- Hernandez, M.W., 2004, A procedural model for developing a GIS-based multiple natural hazard assessment: Case study – Southern Davis County, Utah: [Ph.D. Dissertation], University of Utah, Salt Lake City, Utah, 402 p.
- Hernandez, M.W., Morton, C., Cooper, R., Falke, T., Cauthon, M.L., 2002, Developing a geospatial database for the City of Boonville, Missouri, using IKONOS high-resolution imagery for base mapping: NASA Earth Science Enterprise / Earth Science Applications Directorate Internal Report, Center for Local & Regional Government Applications of Remote Sensing Technologies, University of Missouri-Columbia, Columbia, Missouri, June 21, 2002.
- Hernandez, M.W., Morton, C., Cooper, R., Falke, T., 2002, Developing a geospatial database for Linn County, Missouri Regional Airport economic development corridor, using IKONOS high-resolution imagery for base mapping: NASA Earth Science Enterprise / Earth Science Applications Directorate Internal Report, Center for Local & Regional Government Applications of Remote Sensing Technologies, University of Missouri-Columbia, Columbia, Missouri, June 21, 2002.
- Berquam, B., Hernandez M.W., Hipple J.D., 2002, Exploring the use of Landsat imagery for land cover mapping in Black Hawk County, Iowa: NASA Earth Science Enterprise / Earth Science Applications Directorate Internal Report, Center for Local & Regional Government Applications of Remote Sensing Technologies, University of Missouri-Columbia, Columbia, Missouri, February 18, 2002, 16 p.
- Riesenberg, K., Hernandez M.W., Hipple J.D., Davis C.H., Auvil H.J., 2001, Detecting changes in land cover across the Prairie Band of Potawatomi Indian Nation Reservation, Kansas using Landsat TM imagery: NASA Earth Science Enterprise / Earth Science Applications Directorate Internal Report, Center for Local & Regional Government Applications of Remote Sensing Technologies, University of Missouri-Columbia, Columbia, Missouri, December 20, 2001.
- Hernandez, M.W., 1990, Distribution, development, and risk mapping of landslides in northeastern Louisiana: [M.S. Thesis], Louisiana Tech University, Ruston, Louisiana, 433 p.

PAPERS / ADDRESSES TO PROFESSIONAL GROUPS

- Armstrong, J., Hernandez, M., Palen, S., and Rague, B.W., 2006, The Scientific Analysis and Visualization Initiative at Weber State University: Oral presentation, 2nd Annual Faculty Forum: A Celebration of Scholarship and Creative Activities, Weber State University, Ogden, Utah, March 2, 2006.
- *Hernandez, M.W., Berquam, B., Hipple, J. D., Davis, C. H., and Xue, Z., 2002, Land cover/Land use mapping in Black Hawk County, Iowa: An example of training remote sensing applications in a local government: Poster presentation, ASPRS-ACSM Annual Conference and FIG Congress, Washington, DC, April 22-26, 2002.
- *Hernandez, M.W., 2002, Demonstrating a procedural model for a multiple natural hazard assessment along the Wasatch Front, Utah: Oral presentation, 98th Association of American Geographers Annual Meeting, Los Angeles, CA, March 19-23, 2002.
- *Hernandez, M.W., 1999, Creating a GIS-based multiple natural hazard assessment for Southern Davis County, Utah: Oral presentation, 95th Association of American Geographers Annual Meeting, Honolulu, Hawaii, April 1-4, 1999.
- *Hernandez, M.W., and Nash, G.D., 1998, Using multi-temporal analysis to evaluate seasonal spectral signatures of geobotanical anomalies: Poster presentation, 94th Association of American Geographers Annual Meeting, Boston, MA, March 25-29, 1998.
- *Hernandez, M.W., and Nash, G.D., 1996, Lineament mapping of Wood Hills, NV using various image processing methods on Landsat TM data: Oral presentation, Utah Geographical Society 14th Annual Fall Meeting, Salt Lake City, Utah, October 11, 1996.
- *Hernandez, M.W., 1986, Distribution and development of landslides in north-central Louisiana: Invited oral presentation, Louisiana Academy of Sciences Annual Meeting, Shreveport, Louisiana, October 28, 1986.

** presented at professional meetings.*

FUNDING AND GRANT EXPERIENCE

2007

- *Essential PC Workstation Upgrades for the Geospatial & Environmental Applied Research (GEAR) Lab* (Weber State University Academic Resources and Computing Committee Funds, $5, 310 including matches from other sources; PI, Michael Hernandez, Other members, Adolph Yonkee and Marek Matyjasik). The project involved the purchase of five desktop windows PC duo core processor workstations to replace older workstations that suffered hardware malfunctions and were no longer serviceable. These workstations are used to run the latest remote sensing and GIS software as well as groundwater modeling and structural geology software that support lab assignments taught in GEO 3060, 3080, 3400, 3880, 4210, 4220, and 4400, as well as undergraduate / faculty research projects. . **FUNDED - $5,180**.

2006

- *CCLI Phase I: The Scientific Analysis and Visualization Initiative* (National Science Foundation Course, Curriculum, and Laboratory Improvement (CCLI) Program Phase I, $150,000). Proposal submitted May 10, 2006. PI – Dr. John Armstrong; Co-PIs – Dr. Michael Hernandez, Dr. Stacy Palen, Brian Rague. We proposed to extend the SAVI collaboration by incorporating specialized courses in science and technology. This pilot program would develop an interdisciplinary course in Scientific Analysis and Visualization, including opportunities for internships in research and industry, and close collaboration with industry partners to assess the skills and abilities of students in the pilot program. A cycle of course design, course instruction, internships, and assessment would create new learning materials and teaching strategies, and allow the investigators to develop a report of "Required Skills and Best Practices" that will assist in developing faculty expertise. NOT FUNDED. Plan to submit a revised version in 2007.
- *Portable field geospatial data collection equipment to support student instruction in geosciences courses and undergraduate research* (Weber State University Dee Family Technology Award, $4,161.28 including matches from other sources; Co-PIs, Michael Hernandez, Adolph Yonkee and Rick Ford). This project involves the purchase of six portable PCs (PDAs) and four Compact Flash GPS receivers to develop GPS and GIS field mapping and data collection exercises for five geosciences lab and field courses (GEO 4060, 4210, 4220, 4400, and 4510) and support both undergraduate and faculty field research. **FUNDED - $4,161.28**.
- *Lind Lecture Hall Rooms 125 & 126 multimedia system upgrades* (Weber State University Academic Resources and Computing Committee Funds, $15,351 including matches from College of Science; Co-PIs, Michael Hernandez (writer) and Dan Bedford; written on behalf of College of Science). This project funds the upgrade of audiovisual equipment in both 150+ seat rooms to improve both visual and sound quality and support simultaneous operations (when temporary partitions retracted between two rooms) for special events such as awards ceremonies, distinguished lecture series, and panel discussions. LL 125 is used for classes taught by Geography, Chemistry, Math, and Zoology departments. LL 126 is used for classes taught by Botany, Zoology, Chemistry, and Math departments. **FUNDED - $7,851.**

2005

- *Weber State University Bridges to the Doctorate* (National Institutes of Health grant application, $647,120, PI – James B. Hutchins, Associate Provost for Academic Programs). Three-year project that seeks to create a new program that aims to increase the number of underrepresented minorities in the northern Utah area who receive doctoral degrees in the biomedical sciences. Particular focus is on the economically disadvantaged (largely persons of Mexican descent). Role: Advisory board member, developed GIS-based maps used in proposal. NOT FUNDED.
- *Weber State University Bridges to the Baccalaureate* (National Institutes of Health grant application, $648,408, PI – Julie Snowball, Director, Career and Technical Education; Co-PI James B. Hutchins). Three-year project that seeks to develop a program to assist Utah's underrepresented and economically disadvantaged students to succeed in high school in order to better transition into postsecondary

education. The program will identify, recruit, and mentor students interested in biomedical sciences from junior high school through completion of their 4-year Baccalaureate degree. Role: Advisory board member, developed GIS-based maps used in proposal. NOT FUNDED.

- *GEAR (Geospatial & Environmental Applied Research) Lab workstation replacement* (Weber State University Academic Resources and Computing Committee Funds, $5,410 including matches from other sources; Michael Hernandez (writer); Project team: Marek Matyjasik, Adolph Yonkee, and Rick Ford). The project involved the purchase of four desktop windows PC workstations to replace four older workstations that suffered hardware malfunctions and were no longer serviceable. These workstations are used to run the latest remote sensing and GIS software as well as groundwater modeling and structural geology software that support lab assignments taught in Geosci 3060, 3080, 3400, 3880, 4210, 4220, and 4400, as well as undergraduate / faculty research projects. **FUNDED - $5,410**.
- *Need for commercial high-resolution multispectral and panchromatic satellite imagery for updating student lab assignments and class projects in remote sensing and Geographic Information Systems (GIS) courses* (Weber State University Research, Scholarship and Professional Growth Funds, $2,208, including $400 matching from other sources, Project Director: Michael Hernandez). Purchase industry-standard, high-resolution multispectral commercial satellite imagery to incorporate into the remote sensing and GIS courses (Geosci 3400/4400 and 4210/4220). Students will now be prepared to work with modern imagery that they can expect to use across many geospatial technology professions. **FUNDED - $2,208.**
- *Great Salt Lake Basin hydrological observatory* (National Science Foundation grant, $1,000,000+). Authored the remote sensing applications/requirements section of proposal. Not a PI. Multi-institutional effort (University of Utah, Utah State University, and Weber State University). The project objective was to set up a hydrological observatory that was equipped with science staff and equipment that would support field research activities for scientists from the member institutions as well as others who paid for its services. The observatory was also going to be a database repository for many different types of data associated with the Great Salt Lake that scientists could use to support their research. Submitted April 2005. NOT FUNDED.
- *ESRI university site license funding for full suite of GIS software applications secured from five stakeholders* (3 year commitment: 2004 - 2007) – College of Science, College of Social & Behavioral Sciences, Department of Geosciences, Stewart Library, and Facilities Management. **FUNDED - $15,980**.
- *GEAR (Geospatial & Environmental Applied Research) Lab & SL 328 classroom upgrades* (Weber State University Academic Resources and Computing Committee Funds, $5,169 including matches from other sources; Co-PIs, Michael Hernandez, Marek Matyjasik, Adolph Yonkee, Jim Wilson, Rick Ford, and Jeff Eaton). The project involved the purchase of three desktop windows PC workstations to increase the number of workstations available for the increased number of students enrolled in geosciences courses using the lab (Geosci 3060, 3080, 3400, 3880, 4210, 4220, and 4400). These workstations are used to run the latest remote sensing and GIS software as well as groundwater modeling and structural geology software, as well as undergraduate / faculty research projects. A new portable LCD projector was also purchased to be used on both the GEAR Lab and SL 328, where no permanently fixed multimedia devices are installed. This enabled faculty to project graphic-intensive information and demonstrate software to students. **FUNDED - $5,169**.
- *Enhancement of College of Science poster display* (Weber State University Academic Resources and Computing Committee Funds, $9,785 including matches from college; Co-PIs, Adolph Yonkee and Michael Hernandez, written on behalf of College of Science). The objective was to purchase a large-format printer for the College of Science to print student and faculty research posters for local, regional, national, and international conferences. NOT FUNDED.

MEMBERSHIPS

- Geological Society of America, 2003 - present
- Sigma Xi, an international honor society of scientific and engineering research, 1987 - present
- Sigma Gamma Epsilon, National Honor Society in the Earth Sciences, 2005 - present

- American Society of Photogrammetry and Remote Sensing, 1995 - present
- The Association of American Geographers, 1994 - present
- Gamma Theta Upsilon, international geographical honor society, 1996 – present

TECHNICAL SKILLS

- Leica Geosystems ERDAS IMAGINE - image processing and raster GIS software suite
- ENVI - image processing software
- ESRI ArcGIS Desktop and Workstation software, ArcPad mobile GIS software
- ESRI ArcView 3.3 Desktop GIS software, including *Spatial Analyst* and *3D Analyst* extensions
- Trimble GPS systems (GeoExplorer 3 receiver & Pathfinder XB receiver)
- Trimble GPSconnect extension software to ArcPad
- Ashtech Locus GPS Survey System
- Operating Systems – Windows XP, UNIX, MacOS
- SPSS – Statistical analysis software
- Miscellaneous – MS Office, VISIO, and other productivity software
- Programming and MACRO languages – FORTRAN, BASIC, AML
- WebCT Vista online course design and operations training; proficiency exams passed - December 29, 2005. Awarded WSU Online Certified Designer and WSU Online Certified Teacher certificates.

PROFESSIONAL DEVELOPMENT COURSES

- Contingency War Planning Course (CWPC) – Maxwell AFB, AL (going in July 2007)
- Air Command & Staff College (U.S. Air Force) – Distance Learning, February 2006
- Squadron Officers School (U.S. Air Force) – junior officer professional military education; emphasizes leadership, officership, and military history (6 week course), December 1992
- Dale Carnegie: Effective Public Speaking (1986)

PROFESSIONAL SERVICES

- **GIS Program Administrator –** Weber State University GIS site license implementation for both Ogden and Davis Campuses. Developed and currently manage the WSU GIS program. Duties include managing the campus GIS software licensing, performing installation, and handling technical issues and GIS application issues. Created and supervise the WSU GIS Users Group.
- **Event Coordinator** – Remote Sensing competition, Science Olympiad. Developed, administered, and graded the competition for 9^{th} – 12^{th} graders for the past three years (12 – 14 teams per year), 2004 - present.
- **Cartographer (web-based maps) and Student Mentor (folded map layout)** – Major university donor family reunion (Wattis family), June 21-23, 2007, Ogden, Utah. Donated my services (40 hours) to construct local maps showing stops of interest to family and mentored an undergraduate student who created the maps used in the folded map layout.

MAREK MATYJASIK
Abbreviated Curriculum Vitae
Department of Geosciences, Weber State University, Ogden, Utah 84408-2507
Phone (work): (801) 626-7726; Fax: (801) 626-7445
E-mail: mmatyjasik@weber.edu

Education:
Ph.D. Geology: Kent State University, Kent, Ohio, 1997
M.S. Geology: Warsaw University, Warsaw, Poland, 1988

Summary of Professional Experience :
Professor of Geosciences, Weber State University, 2006-present
Associate Professor of Geosciences, Weber State University, 2001-2006
Assistant Professor of Geosciences, Weber State University, 1997-2001
Special Term Research Appointment, Argonne National Laboratory, 1997-1998
Adjunct Faculty, Youngstown State University, Department of Geology, Youngstown, Ohio, 1996-1997
Adjunct Faculty, Kent State University, Trumbull Campus, NW. Warren, Ohio, 1995-1997
Senior Hydrogeologist, Eckstein and Associates, Inc.,Kent, Ohio, 1991-1997
Teaching Assistant**,** Kent State University, Department of Geology, Kent, Ohio,1991-1995
Teaching and Research Assistant, Warsaw University, Warsaw, Poland, Department of Geology, 1987-1991

Selected Relevant Responsibilities at Weber State University:
Services:
Advisor of Applied Environmental Major, 1997- present,
WSU College of Science Faculty Senator, two terms: 2002-2007
WSU Sigma Xi officer, 2001-present
WSU Academic Resources and Computing Committee, 2007- present
WSU Educational Well Field (first in Utah), arranged funding and supervised, 1998- present
College of Science Academic Resources and Computing Committee, 1997-2004, 2007

Teaching:
taught 11 different courses, with most evaluated by students as excellent, 1997-present;
Online teaching:
developed and thought 4 online lower and upper division courses in Geosciences,
obtained educational grant from Utah System of Higher Education to develop Utah first online course in Environmental Geosciences (Geo 1060)**.**

Outside Funded Research Grants and Projects:
U.S. Department of Agriculture Forest Service, 2007-2008. A classification system of ground water dependent ecosystems in alpine wet meadows (cauthored with Dr. Richard Ford and Dr. Michael Hernandez, Department of Geosciences), $37,000.
U.S. Bureau of Reclamation, 2003-2006. Artificial Recharge in the Weber River Basin, $60,000.
National Science Foundation**,** 2005. Instrumentation Grant, Atomic Force Microscopy, $71,000 (co- principal investigator with Dr. Colin Inglefield, Physics Department).
Utah Governor's Office of Planning and Budget Office, 2001.The fresh water - saline water interface and fresh-water and saline-water wetlands in the Great Salt Lake region, $ 10,000.
Utah Governor's Office of Planning and Budget Office, 1999. Hydrogeology and Geomorphology of Wetlands in the Uinta Mountains, (co-principal investigator with Dr. Richard Ford, Department of Geosciences), $18,000.

Weber State University Grants:
WSU Research, Scholarship and Professional Growth Grant, 2000-2001. Chemical reactions on apatite surfaces studied in Atomic Force Microscopy.

WSU Research, Scholarship and Professional Growth Grant, 2000-2001. Relationship between salinity and microbiology along the fresh water/ saline water interface.

WSU Research, Scholarship and Professional Growth Grant, 1998-1999. Fresh water/ saline water interface along the Great Salt Lake, Utah.

Other Professional Experience and Services:

Reviewer for: professional papers, reports and research dissertations for American Institute of Hydrology, American Water Rights Association, Acta Geologica Polonica - (translation to English), The University of New South Wales, Australia- Ph.D. dissertations, Weber County Health Department (professional reports).

Co-chairing a session at annual meeting of American Institute of Hydrology, Minneapolis, Minnesota, 2001.

Co-chairing a session at annual meeting of Geological Society of America, Salt Lake City, Utah, October, 2005**.**

Advisory Committees:

Member of Weber/Morgan County Health Department advisory committee for the Waste Water Management, 1999-present.

Member of the Governor's Wetland Management Plan committee to assist Utah wetland management, 1999-2000.

SELECTED RECENT PUBLICATIONS AND PROFESSIONAL PRESENTATIONS

Peer-reviewed Publications

Hurlow, H, **Matyjasik, M**, Lowe*, M., 2006. Artificial Recharge. (In review). Currently Utah Geological Survey Open File Report.*

Matyjasik, M., Ford, R., and Keate, N., 2003. Montane Wetland Hydrochemistry: Uinta Mountains, Utah. Hydrological Science and Technology, vol. 19, No 1-4, p. 251-264.

Matyjasik, M., Yonkee, W.A., and Barnett, D.A., 2002. Groundwater Flow in Fractured Aquifers in the Sevier Thrust Belt, Wasatch Mountains, Utah, USA. National Institute of Geology, Warsaw, Poland, p.85 -106.

Malecki, J. and **Matyjasik, M**., 2002. Vadose Zone - Challenges in Hydrochemistry. Acta Geologica Polonica, vol.52, No 4, p. 449-458.

Jarvis, T, A, Yonkee, and **M. Matyjasik**, 2001. Sustainability of Water Resources in a Fractured Bedrock Aquifer, Twin Creek Limestone, Wasatch Range, Utah. Hydrological Science and Technology vol. 18, No 1-4, p. 113-122.

Manecki, M, **M. Matyjasik**, C. Inglefield, J. Conlin, 2001. In-situ lead remobilization in soils. Hydrological Science and Technology vol. 18, No 1-4, p. 123-132.

Eckstein, Y, **M. Matyjasik,** B. Matyjasik, 2001. Dislocation of the continental drainage divide in Summit County, Ohio induced by excessive groundwater withdrawal. Hydrological Science and Technology, vol 17, No 1-4, p. 119-128.

Malecki, J., and **M. Matyjasik,** 2001. Characteristics of rain chemistry and its effects on groundwater chemistry in Poland. Hydrogeologic Science and Technology, vol 17, No 1-4, p. 247-258.

Matyjasik M., Knyszynski F, and Krajewski S, 2000. The hydrogeochemistry of groundwater in fractured bedrock aquifer in the Lublin Cretaceous Region, eastern Poland - natural chemical background versus contaminant induced changes. Hydrological Science and Technology, vol. 16, 2000, p. 43-49.

Malecki J., and **Matyjasik M.**, 2000. Characteristics of the vadose zone hydrochemistry with respect to Copper and Zinc ions. Hydrological Science and Technology, vol. 16, 2000, p. 55-61.

Eckstein, Y, Rosenthal E. and **Matyjasik M.**, 2000. Probing Fresh Ground Water Resources on a Small Carbonate Island, Bahamas. Geological Survey of Israel, 50th Anniversary, Current Research Vol. 12; p.50-58.

Matyjasik M., 1999. Limitations of surfactant-enhanced remediation resulting from sorption of nonionic surfactants. In Current Issues in Hydrogeology, Kielce, Poland, p. 231-239. Presented at Hydrogeologic Symposium, Kielce, Poland, September 1999.

Matyjasik M., Eckstein, Y., 1998. Use of Surfactants for Aquifer Remediation. In *International Congress of Hydrogeologists* Conference Publications, Las Vegas, October, 1998, p 261-268.

Malecki J., **Matyjasik, M**., 1998. Effects of Evaporation on Water Chemical Composition in the Vadose Zone. In *International Congress of Hydrogeologists* Conference Publications, Las Vegas, October, 1998, p.441-446.

Matyjasik M., Eckstein Y., 1997."Laboratory Experiments with Surfactant-Enhanced Aquifer Remediation". *American Institute of Hydrology. Third USA/CIS Joint Conference on Environmental Hydrology, Sep. 22-27, 1996, p. 128-145.*

Knyszynski F., **Matyjasik M**., 1991. South part of the Wieprz and Bug Rivers as an example of the area with the natural hydrogeochemical background in the Lublin Cretaceous Carbonate Region, Poland". *Vth Symp., Current Problems in Hydrogeology, Jachranka,* 1991, 146-153.

Malecka D., **Matyjasik M**., 1989. Water specific resistance as indicator of hydrogeologic conditions of the Waksmundzki River watershed", *Sci.Publ.Inst.Geotech., Technical University of Wroclaw, Poland,* vol.29, 239-245.

Published Abstracts

Matyjasik, M, Manecki, M., Inglefield, C., Toller, S., Marchlewski, T., Bajda, T., 2005. Precipitation by wetting-drying mechanisms observed on calcite and gypsum surfaces with Atomic Force Microscopy and Scanning Electron Microscopy. Annual Meeting of the Geological Society of America, Salt Lake City.

Chavez, T., S. Fellows, T. Price, J. Simpson, 2005a. Artificial Recharge in the Weber River Valley. WSU II Undergraduate Symposium. Presentation supervised by **M. Matyjasik**.

Chavez, T, **Matyjasik, M**., Hurlow, H, Price, T, and J, Simpson, 2005b. Modeling of groundwater flow affected by artificial recharge in the Weber River basin, Northern Utah. Annual Meeting of the Geological Society of America, Salt Lake City

Tarantino, R, T. Cluff J. Jones, 2004a. Artificial Recharge in the Delta Aquifer. WSU I Undergraduate Symposium. Presentation supervised by **M. Matyjasik**.

Tarantino, R., C. Lindsey, T. Cluff, J. Jones, **M. Matyjasik**, M. Hernandez, 2004a. Weber River Aquifer Artificial Recharge Pilot Study. Abstract published in Geological Society of America regional meeting materials.

Tarantino, R. T. and Cindy Gothberg, 2003. Ground water flow in the Ogden area. A presentation given to a local chapter of Association of Engineering Geologists, Salt Lake City.(supervised by **M.Matyjasik**).

Matyjasik, M., Yonkee, W.A., and Barnett, D.A., 2002. Groundwater Flow in Fractured Aquifers in the Sevier Thrust Belt, Wasatch Mountains, Utah, USA. National Institute of Geology, Warsaw, Poland, Symposium on Flow in Fractured Aquifers. November, 20, 2002.

Matyjasik, M., Ford. R., and N. Keate, 2002. Montane Wetland Hydrochemistry: Uinta Mountains, Utah. Annual Meeting of the American Institute of Hydrology, Portland, OR, October 13-17, 2002. Conference Proceedings, p. 19.

Manecki, M, **M. Matyjasik**, C. Inglefield, J. Conlin, 2001. In-situ lead immobilization in soils. Abstract in Conference Proceedings, Annual meeting of the American Institute of Hydrology, Minneapolis, October 15-17, 2001.

Jarvis, T, A, Yonkee, and **M. Matyjasik**, 2001.Transient storage and compressibility of fractured bedrock aquifers, implications for aquifer sustainability, Twin Creek Limestone, Utah. Abstract in Conference Proceedings, Annual meeting of the American Institute of Hydrology, Minneapolis, October 15-17, 2001. Conference Proceedings, p. 24.

Eckstein, Y, **M. Matyjasik,** B. Matyjasik, 2001. Dislocation of the continental drainage divide in Summit County, Ohio induced by excessive groundwater withdrawal. Abstract in Conference Proceedings, 2000 International Conference of the American Institute of Hydrology, North Carolina.Conference Proceedings, p. 23.

Malecki, J., and **M. Matyjasik,** 2001. Characteristics of rain chemistry and its effects on groundwater chemistry in Poland. Abstract in Conference Proceedings,2000 International Conference of the American Institute of Hydrology, North Carolina. Conference Proceedings, p. 39.

Matyjasik, M., D. Lombardi, N. Keate, B. Wachocki, 2000. Wetland water chemistry in the Great Salt Lake area, Utah. Abstract accepted at the annual meeting, Geological Society of America, Reno, Nevada, November, 2000. Meeting program, p. 102.

Ford, R., **M. Matyjasik**, and N. Keate, 2000. Geomorphology and hydrology of a montane patterned fen, Uinta Mountains, Utah. Abstract at the Annual Meeting of the American Association of Geographers, Pittsburgh, Pennsylvania, April 4-8, 2000. (Published only on the conference website and CD).

Matyjasik M., Knyszynski F, and Krajewski S, 1999. The hydrogeochemistry of groundwater in fractured bedrock aquifer in the Lublin Cretaceous Region, eastern Poland - natural chemical background versus contaminant

induced . Abstract presented at the Forth Conference on Environmental Hydrology and Hydrogeology. American Institute of Hydrology. San Francisco, November, 1999.

Malecki J., and **Matyjasik, M.**, 1999. Characterisctics of the vadose zone hydrochemistry with respect to Copper and Zinc ions. Abstract in the Forth Conference on Environmental Hydrology and Hydrogeology. American Institute of Hydrology.

Matyjasik M., 1999. Limitations of surfactant-enhanced remediation resulting from sorption of nonionic surfactants. Presented at Hydrogeologic Symposium, Kielce, Poland, September 1999.

Malecki, J., **Matyjasik, M.**, and M. Kadzikiewicz, M., 1998. Cu and Zn concentration variability under different hydrogeochemical conditions in the vadose zone. American Geophysical Union annual meeting, San Francisco. Conference Proceedings, p. 356.

Matyjasik M., Eckstein, Y., 1998. Use of Surfactants for Aquifer Remediation.Abstract in International Congress of Hydrogeologists Conference Proceedings, Las Vegas, October, 1998. Conference Proceedings, p. 49.

Malecki J., **Matyjasik, M**., 1998. Effects of Evaporation on Water Chemical Composition in the Vadose Zone. In *International Congress of Hydrogeologists* Conference Publications, Las Vegas, October, 1998, p. 47.

Matyjasik M., Eckstein Y., 1997."Laboratory Experiments with Surfactant-Enhanced Aquifer Remediation". *American Institute of Hydrology. Third USA/CIS Joint Conference on Environmental Hydrology, Sep. 22-27, 1996.*

Matyjasik M., and Eckstein Y, 1997."Solubilization and Mobilization of Ethylbenzene in a Saturated Porous Medium by Injections of Nonionic Surfactants".*Annual Meeting of Geological Society of America, October 20-23. Salt Lake City.*

Eckstein Y., Manecki M., and **Matyjasik M**, 1997."Hydrochemical evolution along the water cycle and fresh-water mixing processes on North Andros Island, Bahamas".*Annual Meeting of Geological Society of America, October 20-23. Salt Lake City.*

Malecki J., and **Matyjasik M**, 1997. Effects of Mineral Composition of Sandy Soils on the Chemical Characteristics of Ground Water in a Shallow Aquifer-Interpretation of the Pilot Field Test Results. *Annual Meeting of Geological Society of America, October 20-23. Salt Lake City.*

Matyjasik M, and Eckstein Y, 1997. Surfactant-Enhanced Remediation of Saturated Ottawa Sand Contaminated by Ethylbenzene. *Annual meeting of AAPG, Lexington, Kentucky.*

Matyjasik M., Eckstein Y, 1996. Surfactant-enhanced remediation of aquifers contaminated by ethylbenzene", presentation submitted for *AGU conference, San Francisco, December 1996.*

Matyjasik M., Eckstein Y., 1996. Mobilization of residual ethylbenzene from aquifers - application of biodegradable non-ionic surfactants, presentation accepted at *GSA Annual Meeting, October 1996.*

Matyjasik M., Eckstein Y., 1996. Laboratory experiments with surfactant-emhanced aquifer remediation, presentation at *International American-Russian conference in hydrology, September, 1996.*

Matyjasik M., Eckstein Y. and Noffsinger D.,1995 "Laboratory Experiments of Vadose and Saturated Zones Decontamination from Aromatic Hydrocarbons".*Symp.Current Problems in Hydrogeology, Krakow, Poland, June 1995,p.349-360.*

Matyjasik M., Eckstein Y., 1995. Laboratory scale investigation of the effect of chemical surfactants on hydrocarbon contatminants remediation from saturated porous systems", presentation at *International Geochemical Goldschmidt Conference, May 26, 1995*.

Eckstein Y., Manecki M., **Matyjasik M**., Rosenthal E., 1994. Hydrochemical Stratification and Processes in three 'Blue Holes' on North Andros Island, Bahamas", abstract at *GSA Annual Meeting, October 23-27, 1994, Seattle.*

Matyjasik M., Eckstein Y., 1994. High Performance Liquid Chromatography As a Powerful Solute Transport Analog Model, poster presentation at the *GSA annual meeting, October 23-27, 1994, Seattle*.

Matyjasik M., Eckstein Y., 1993. Aquifer Response to an extremely long pumping test", poster presentation at *GSA annual meeting, October 25-28, 1993, Boston*.

Eckstein Y., **Matyjasik M.**, Mirzayev S., Sydykov G., Veselov V., 1993. The Aral Sea - a Case of hydrogeological disequilibrium, or when the ideology clashes with the environment", talk at *GSA annual meeting, October 25-28, 1993, Boston*.

Knyszynski F., **Matyjasik M.**, 1991. South part of the Wieprz and Bug Rivers as an example of the area with the natural hydrogeochemical background in the Lublin Cretaceous Carbonate Region, Poland". *Vth Symp., Current Problems in Hydrogeology, Jachranka,* 1991, 146-153.

Malecka D., **Matyjasik M**., 1989. Water specific resistance as indicator of hydrogeologic conditions of the Waksmundzki River watershed", *Sci.Publ.Inst.Geotech., Technical University of Wroclaw, Poland,* vol.29, 239-245.

VITA

JAMES R. WILSON

EDUCATION

Degree/emphasis		Institution	Year Earned
Ph.D.	Geology	University of Utah	1976
M.S.	Geology	University of Tennessee	1973
B.S.	Mathematics	Auburn University	1967

TEACHING EXPERIENCE

1982 – present
Associate Professor, Professor Dept. of Geosciences Weber State University
Teaching Responsibilities: Physical Geology, Earthquakes and Volcanoes, Earth Materials, Water Resources, Physical Geology Lab (current)
Past teaching has included Ground Water, Environmental Geology, Senior Seminar, X-ray Diffraction, and Geochemical Exploration.

1976 – 1982
Assistant Professor Dept. of Geology Univ. of Wisconsin-Eau Claire
Teaching Responsibilities: Physical Geology, Geology of the National Parks, Mineralogy, Water Resources, Physical Geology Lab, Ground Water, Environmental Geology, and Geochemical Exploration.

ADDITIONAL PROFESSIONAL EXPERIENCE

1985-1986 Summer employment by the U.S. Forest Service.

1967-1970 Computer programmer, Computer Sciences Corp., NASA Marshall Space Flight Center, Huntsville, Alabama

SOCIETY AFFILIATIONS

Geological Society of America
National Association of Geology Teachers
National Speleological Society

PUBLICATIONS

Foit, F. F., Robinson, P. D., and Wilson, J. R. (1995) The crystal structure of gillulyite, $Tl_2(As, Sb)_8S_{13}$, from the Mercur gold deposit, Tooele County, Utah, U.S.A.: American Mineralogist, v. 80, p. 394-399.

Wilson, J. R. (1995) A Collector's Guide to Rock, Mineral, and Fossil Localities of Utah: Miscellaneous Publication 95-4, Utah Geological Survey, Salt Lake City, UT.

Wilson, J. R., Sen Gupta, P. K., Robinson, P. D., and Criddle, A. J. (1993) Fangite, Tl_3AsS_4, a new thallium arsenic sulfosalt from the Mercur Au deposit, Utah, and revised optical data for gillulyite: American Mineralogist, v. 78, p. 1096-1103.

Wilson, J. R., and Wilson, P. N. (1992) Sulfide mineralogy at the Barrick Mercur Gold Mine, Utah *in* Wilson, J. R., editor, Field Guide to Geologic Excursions in Utah and adjacent areas of Nevada, Idaho, and Wyoming: 45th Annual Meeting of the rocky Mountain Section of the Geological Society of America, Ogden, Utah: Miscellaneous Publication 92-3, Utah Geological Survey, Salt lake city, UT. p. 343-347.

Wilson, J. R., and Wilson, P. N. (1991) Occurrence and paragenesis of thallium sulfosalts and related sulfides at the Barrick Mercur Gold Mine, Utah *in* Energy and Mineral Resources of Utah, 1990 Guidebook, Utah Geological Association Publication 18, Utah Geological Survey, Salt Lake City, UT, p. 75-82.

Wilson, J. R., Robison, P. D., Wilson, P. N., Stanger, L. W., and Salmon, G. L. (1991) Gillulyite, $Tl_2(As, Sb)_8S_{13}$, a new thallium arsenic sulfosalt from the Mercur gold deposit, Utah: American Mineralogist, v. 76(3&4), p. 653-656.

Wilson, J. R. (1990) "The Public Land Survey System", "The Potentiometric Surface", and "The Work of the Wind" *in* Busch, R. M., editor, Laboratory Manual in Physical Geology – AGI/NAGT: Merrill Publishing Co., Columbus, Ohio, p. 64-66, 76, 91, 118-124.

Wilson, J. R. (1984) Speleothems as examples of chemical equilibrium processes: Journal of Geological Education, v. 32(2), p. 86-88.

Wilson, J. R. (1979) Glaciokarst in the Bear River Range, Utah; in GSA Alpine Karst Symposium, NSS Bulletin, v. 41(3), p. 89-94.

Wilson, J. R. (1977) Lineaments and the origin of caves in the Cumberland Plateau of Alabama: NSS Bulletin, 39(1), p. 9-12.

Administrative Experience

Chair, Dept. of Geology, University of Wisconsin-Eau Claire. 1975-1976.

Chair, University Curriculum Committee, Weber State University, 1998-2002.

Executive Committee, Faculty Senate, 2006-present.

Vita
William Adolph Yonkee

Work Address
Department of Geosciences
Weber State University
Ogden, UT 84408-2507
(801) 626-7419, email: ayonkee@weber.edu

Home Address
4665S 1575 E
Ogden, UT 84403
(801) 337-5517

I. Educational and Professional Background

A. Education

Institution	*Discipline*	*Degree Earned*	*Dates*
University of Wyoming	Geology	B.S.	1976 - 1980
University of Wyoming	Geology	M.S.	1980 - 1983
University of Utah	Geology	Ph.D.	1985 - 1990

M.S. thesis: Mineralogy and structural relationships of cleavage in the Jurassic Twin Creek Formation within part of the Crawford thrust sheet, Idaho and Wyoming, 180 p.
Ph.D. dissertation: Geometry and mechanics of basement and cover deformation, northern Wasatch Range, Sevier orogenic belt, Utah, 253 p.

B. Professional Employment

Institution	*Position*	*Dates*
University of Utah	Post Doctorate Research Fellow (1)	1989 - 1990
Utah Geological Survey	Geologist (2)	1990 - 1991
Weber State University	Assistant Professor	1991 - 1994
	Associate Professor	1994 - 2001
	Professor (3)	2001 - current
Weber State University	Department Chair (4)	1997 - current

(1) Responsibilities: structural and geochemical studies of seismogenic normal fault zones.
(2) Responsibilities: geologic mapping of study areas, preparation of multipurpose reports.
(3) Responsibilities: full-time position in Department of Geosciences (tenured 1997), teach structural geology, petrology, geochemistry, field methods, field camp, and general education courses, conduct research, and participate in service activities.
(4) Responsibilities: facilitate faculty development and growth of programs, administer budget, and coordinate faculty and staff evaluations for Department of Geosciences.

C. Awards

1976-1980	Superior Student Scholarship, University of Wyoming
1980-1982	Research Fellowship, University of Wyoming
1983	Hill Foundation Fellowship, University of Wyoming
1985-1988	Academic Research Fellowship, University of Utah
1998-2002	Endowed Scholar, Weber State University

II. Research

A. Current Research Interests

1. Evolution of curved mountain systems, including integrated structural, paleomagnetic, and thermochronologic studies.
2. Relations between fluid-rock interaction and deformation within fault and shear zones.
3. Fluid-flow properties of fracture networks, with applications to bedrock aquifers.
4. Multipurpose geologic and hazards mapping.
5. Weathering-related crack systems, with applications to Mars analogs.
6. Neoproterozoic strata of the western Cordillera and record of "Snowball Earth".

B. Funded Grants

2004 - current Collaborative Research: Three-dimensional kinematic history of the Wyoming salient: implications for development of curved orogens: National Science Foundation (total $226,000, with co PIs A. Weil [Bryn Mawr College] and A.J. Sussman [Los Alamos National Laboratories]).

2006 Development of petrographic display system for teaching and research: Weber State University Research and Professional Growth Fund and Utah Geological Association (total $12,000 with Jeff Eaton).

2001 Surveying and soil sampling equipment for field-based teaching in the geosciences; Weber State University Research and Professional Growth Fund ($3,000, with Rick Ford).

2000 Computer software for geoscience classes: Weber State University Academic Resources and Computing Fund ($2,000).

1998 Development of petrographic image analysis system: Weber State University Academic Resources and Computing Fund (total $13,800).

1997 Preparation of petrographic thin section suites for teaching: Weber State University Research and Professional Growth Fund ($1,620 with Jeff Eaton)

1993 - 1997 Integrated kinematic and rheological analysis of thrust sheet emplacement, Willard thrust system, northern Utah: National Science Foundation ($85,000).

1993 - 1996 Field and microstructural analysis of deformation in footwalls of thrust faults: significance for geometry, kinematics, and mechanics of thrust fault evolution: Petroleum Research Fund of the American Chemical Society ($88,000, summer research fellow with PI- J.P. Evans [Utah State University]).

1992 - current Geologic mapping of the various quadrangles (Ogden, Fremont Island, Snow Basin), Utah: Utah Geological Survey (Contractor).

1989 - 1990 Structure and mechanics of geometrical barriers and structural boundaries: U.S. Geological Survey Earthquake Hazards Reduction Program ($85,500, post-doctorate research fellow with PI- R.L. Bruhn [University of Utah]).

Currently pending- grant proposal with P. Link [Idaho State University] and Carol Dehler [Utah State University] to the National Science Foundation on chronologic, zircon provenance, and stable isotopic studies of Neoproterozoic strata in Utah and Idaho.

C. Publications

Papers

Chan, M., Yonkee, W.A., Netoff, D.A., Seiler, W.M., and Ford, R.L., in press, Polygonal cracks in bedrock on Earth and Mars: implications for weathering: Icarus

Yonkee, W.A., 2005, Strain patterns within part of the Willard thrust sheet, Idaho-Utah- Wyoming thrust belt: Journal of Structural Geology, v. 27, p. 1315-1343.

Yonkee, W.A., and Lowe, M., 2004, Geologic map of the Ogden 7.5 minute quadrangle, Weber and Davis Counties, Utah: Utah Geological Survey Map M200. (includes report on geologic hazards and resources)

Yonkee, W.A., Parry, W.T., and Bruhn, R.L., 2003, Relations between progressive deformation and fluid-rock interaction during shear-zone growth in a basement-cored thrust sheet, Sevier orogenic belt, Utah: American Journal of Science, v. 303, p. 1-59.

Matyjasik, M., Yonkee, W.A., and Barnett, D., 2002, Groundwater flow in fractured bedrock aquifers of the Sevier thrust belt, Wasatch Mountains, Utah: Bulletin of the National Institute of Geology, Poland, v. 404, p. 85-106.

Jarvis, T., Yonkee, W.A., and Matyjasik, M., 2002, Storage and compressibility of fractured bedrock aquifers, implications for aquifer sustainability, Twin Creek Limestone, Utah: Hydrologic Science and Technology, v. 18, p. 113-122.

Yonkee, W.A., Willis, G.C., and Doelling, H.H., 2000, Petrology and geologic history of the Precambrian Farmington Canyon Complex, Antelope Island, Utah, *in* King, J.K., and Willis, G.C., eds., The Geology of Antelope Island: Utah Geological Survey Publication 00-1, p. 5-36.

Willis, G.C., Yonkee, W.A., Doelling, H.H., and Jensen, M., 2000, Geology of Antelope Island State Park: Utah Geological Association Publication 28, p. 291-313. (also includes CD with field trip guide)

Yonkee, W.A., 1998, Brittle-ductile fault rocks of a basement-cored thrust sheet, *in* Snoke, A.W., Tullis, J.A., and Todd, V.R., eds., Atlas of mylonitic and fault-related rock: Princeton University Press, p. 186-193.

Yonkee, W. A., DeCelles, P., and Coogan, J., 1997, Kinematics and synorogenic sedimentation of the eastern frontal part of the Sevier orogenic wedge, northern Utah: Brigham Young University Studies, v. 42 Part 1, p. 355-

375.

Evans, J.P., Yonkee, W.A., Parry, W.T., and Bruhn, R.L., 1997, Fault-related rocks and deformation processes of the Wasatch normal fault: Brigham Young University Studies, v. 42 Part 2, p. 279-298.

Bruhn, R.L., Parry, W.T., Yonkee, W.A., and Thompson, T.,1994, Characteristics of fracturing and hydrothermal alteration in normal fault zones: Pure and Applied Geophysics, v. 142, p. 609-644.

Doelling, H.H., Yonkee, W.A., and Hand, J., 1994, Geologic map of the Gold Bar Canyon quadrangle, Grand County, Utah: Utah Geological Survey Map 155.

Yonkee, W.A., and Mitra, G., 1993, Comparison of basement deformation styles in parts of the Rocky Mountain foreland, Wyoming, and Sevier orogenic belt, northern Utah: *in* Schmidt, C. J., Chase, R. B., and Erslev, E. A., eds., Laramide basement deformation in the Rocky Mountain foreland of the western United States: Geological Society of America Special Paper 280, p. 197-228.

Yonkee, W.A., 1992, Basement-cover relations, Sevier orogenic belt, northern Utah: Geological Society of America Bulletin, v. 104, p. 280-302.

Bruhn, R.L., Zhu-en, Y., Yonkee, W.A., and Daning, W., 1991, Structure of the Warm Spring and northern Thousand Springs fault segments, Lost River fault zone, Idaho: Possible effects on rupturing during the 1983 Borah Peak earthquake: Tectonophysics, v. 200, p. 33-49.

Bruhn, R. L., Yonkee, W.A., Parry, W. T., 1990, Structural and fluid-chemical properties of seismogenic normal faults: Tectonophysics, v. 175, p. 139-157.

Yonkee, W.A., Parry, W.T., Bruhn, R.L., and Cashman, P.H., 1989, Thermal models of thrust faulting: Constraints from fluid inclusion observations, Willard thrust sheet, Idaho-Utah-Wyoming thrust belt: Geological Society of America Bulletin, v. 101, p. 304-313.

Mitra, G., Hull, J.M., Yonkee, W.A., and Protzman, G.M., 1988, Comparison of mesoscopic and microscopic deformational styles in the Idaho-Wyoming thrust belt and the Rocky Mountain foreland, *in* Schmidt, C. J., and Perry, W. J., Jr., eds., Interaction of the Rocky Mountain Foreland and the Cordilleran thrust belt: Geological Society of America Memoir 171, p.119-142.

Mitra, G., and Yonkee, W.A., 1985, Spaced cleavage and its relationship to folds and thrusts in the Idaho-Utah-Wyoming thrust belt of the Rocky Mountain Cordilleras: Journal of Structural Geology, v. 7, p. 361-373.

Papers currently in preparation

King, J., Yonkee, W.A., and Coogan, J., *in prep*, Geologic map of the Snow Basin 7.5 minute quadrangle, Weber and Morgan Counties, Utah: Utah Geological Survey Map. (interim geologic map has been published)

Yonkee, W.A., Weil, A.B., Coogan, J.C., and Sussman, A.J., *in prep.*, Three-dimensional kinematic evolution of the Wyoming salient, Sevier fold-thrust belt: internal strain patterns from early layer-parallel shortening to final orogenic curvature: for submission to Geological Society of America Bulletin (draft available upon request).

Weil, A.B., Yonkee, W.A., and Sussman, A.J., *in prep.*, Three-dimensional kinematic evolution of the Wyoming salient of the Sevier fold-thrust belt: reconstructing thrust sheet rotations from paleomagnetic studies of the Triassic Ankareh Formation: for submission to Geological Society of America Bulletin.

Weil, A.B., Yonkee, W.A., and Sussman, A.J., *in prep.*, Anisotropy of magnetism (AMS) studies of the Triassic Ankareh Formation, Sevier fold-thrust belt: relations to internal strain and rotation patterns: for submission to Journal of Geophysical Research.

Yonkee, W.A., *in prep.*, Regional kinematic evolution of the Willard thrust sheet, northern Utah- implications for emplacement of thrust megasheets: for submission to American Journal of Science.

Abstracts

Yonkee, W.A., Weil, A.B., Coogan, J.C., and Sussman, A.J., 2007, Three dimensional kinematic evolution of the Wyoming salient of the Sevier orogenic belt: Geological Society of America Abstracts with Programs, v. 39.

Chan, M., Yonkee, W.A., Ford, R.L., Netoff, D.A., and Seiler, W.M., 2007, Polygonal crack systems in the Jurassic Navajo Sandstone: a weathering analog for Mars: Geological Society of America Abstracts with Programs, v. 39.

Weil, A.B., Yonkee, W.A., and Sussman, A.J., 2007, Reconstructing the kinematics of thrust sheet rotations in the Wyoming salient: American Geophysical Union Meeting.

Yonkee, W.A., Weil, A.B., and Sussman, A.J., 2006, Strain patterns from the Wyoming salient of the Sevier fold-thrust belt: evolution from early layer-parallel shortening to final orogenic curvature: Geological Society of America Abstracts with Programs, v. 38.

Weil, A.B., Yonkee, W.A., and Sussman, A.J., 2006, Anisotropy of magnetic susceptibility of Triassic red beds from the Wyoming salient: evolution from early layer-parallel shortening to final orogenic curvature: Geological Society of America Abstracts with Programs, v. 38.

Yonkee, W.A., Weil, A.B., and Sussman, A.J., 2005, Determining the 3-D kinematic history of the Wyoming salient of the Sevier fold-thrust belt: preliminary results of strain studies: Geological Society of America Abstracts with Programs, v. 37.

Weil, A.B., Sussman, A.J., and Yonkee, W.A., 2005, Determining the 3-D kinematic history of the Wyoming salient of the Sevier fold-thrust belt: preliminary results from a paleomagnetic investigation of the Triassic Ankareh Formation: Geological Society of America Abstracts with Programs, v. 37.

Sussman, A.J., Yonkee, W.A., and Weil, A.B., and 2005, Determining the 3-D kinematic history of the Wyoming salient of the Sevier fold-thrust belt: preliminary fracture analysis and implications for multiple generations of elastico-frictional deformation: Geological Society of America Abstracts with Programs, v. 37.

Yonkee, W.A., Parry, W.T., and Bruhn, R.L., 2003, Relations between progressive deformation and fluid-rock interaction during growth of fault and shear zones in a basement-cored thrust sheet, Sevier orogenic belt, Utah: Geological Society of America and Geological Society of London, Earth Systems Processes, Programs with Abstracts, 35.

Yonkee, W.A., 2000, Strain studies incorporating bootstrap analysis and Monte Carlo simulations: Geological Society of America Abstracts with Programs, v. 32.

Willsey, S.P., Yonkee, W.A., and Sheik, H., 1997, Kinematic analysis of footwall deformation, Willard thrust system, Sevier orogenic belt, Utah: Geological Society of America Abstracts with Programs, v. 29.

Eaton, J.E., Willsey, S.P., and Yonkee, W.A., 1997, The geometry of the Late Cretaceous Sevier foreland basin, southwestern Utah: Geological Society of America Abstracts with Programs, v. 29.

Evans, J.P., Yonkee, W.A., and Fessinger, D.W., 1996, Short duration field camps: educational objectives and techniques for time and financial savings: Geological Society of America Abstracts with Programs, v. 28, p. 203.

Yonkee, W.A., 1996, Mechanics of an exhumed fault zone, Willard thrust, Utah: Geological Society of America Abstracts with Programs, v. 28, p. 188-189.

Evans, J.P., Yonkee, W.A., and Brown, C.M., 1995, Mesoscopic and microscopic analysis of footwall folding, Mitten Park fold-thrust structure, UT & CO: Geological Society of America Abstracts with Programs, v. 27, p. 11.

Yonkee, W.A., 1995, Structural evolution of the northern Wasatch Range, UT, during the Sevier orogeny: Geological Society of America Abstracts with Programs Rocky Mountain Section, v. 27, p. 61.

Yonkee, W.A., 1994, Variations in finite strain and deformation styles within the Willard thrust sheet, Sevier orogenic belt, Utah: Geological Society of America Abstracts with Programs, v. 26, p. 526.

Yonkee, W.A., 1992, Mechanisms of basement deformation within a thrust fault zone, Sevier orogenic belt, northern Utah: Geological Society of America Abstracts with Programs, v. 24.

Yonkee, W.A., Parry, W.T., and Bruhn, R.L., 1990, Fluid-rock interaction during growth of shear zones: American Geophysical Union Abstracts, v. 71, p. 1584.

Yonkee, W.A., and Bruhn, R.L., 1989, Structure of a fault segment boundary, Wasatch fault zone, Utah: Geological Society of America Abstracts with Programs, v. 21, p. 265.

Bruhn, R.L., and Yonkee, W.A., 1988, Fracture networks in fault zones: Implications for fault zone permeability and mechanics: American Geophysical Union Abstracts, v. 69, p. 1172.

Cashman, P.H., Bruhn, R.L., Parry, W.T., and Yonkee, W.A., 1986, Regional variations in crustal rheology and structure, Sevier orogenic belt, Utah: Geological Society of America Abstracts with Programs, v. 18, p. 559.

Yonkee, W.A., and Bruhn, R.L., 1986, Geometry and mechanics of basement deformation, Sevier orogenic belt, Northern Utah: Geological Society of America Abstracts with Programs, v. 18, p. 798.

Yonkee, W.A., Mitra, G., and Hull, J., 1984, Basement-cover relationships in Laramide foreland thrust sheets of the Wyoming Province: Geological Society of America Abstracts with Programs, v. 16, p. 702.

D. Field work (selected)

2004 - current	Structural and paleomagnetic studies of the Wyoming fold-thrust belt.
1995 - current	Structural, strain, and thermochronologic studies of the Willard thrust sheet, Utah.
1993 - current	Consultant for hydrogeologic mapping and fracture analysis, Utah.
1990 - current	Geologic mapping of various quadrangles for the Utah Geological Survey.
1989 - 1990	Structure and mechanics of seismogenic normal fault systems, western U.S.
1985 - 1988	Structural and geochemical studies of basement-cored thrust sheets, Utah.
1980 - 1984	Kinematic and microtextural analysis of Rocky Mountain foreland uplifts.
1980 - 1984	Structural and petrologic studies of cleavage, Idaho-Utah-Wyoming thrust belt.

III. Teaching

I have extensive teaching experience at Weber State University, with a normal teaching load of 14 contact hours per semester prior to becoming department chair and about 8 contact hours per semester since becoming chair. My primary teaching responsibilities include structural geology, petrology, geochemistry, field methods, field camp, global tectonics, and general education courses. I have also taught Geology of Utah, Historical Geology, Senior Seminar, and Geoscience Field Trips as needed, supervised Independent Study projects, and contributed guest lectures to the Honors Program. I have received overall excellent student evaluations in all courses, and am committed to extensive use of field experiences, innovative teaching methodologies, and continual upgrading of course content.

A. Courses taught and average student evaluations

Course number and title	*Avg. Student Evaluation*[(a)]
Geo 1030 (3 hrs) - Earthquakes and Volcanoes	5.9
Geo 1110 (3 hrs) - Physical Geology	5.8
Geo 3060 (4 hrs) - Structural Geology	6.5
Geo 4060 (3 hrs) - Field Methods	6.6
Geo 4300 (4 hrs) - Petrology	6.6
Geo 4550 (3 hrs) - Geochemistry	6.5
Geo 4510 (5 hrs) - Geology Field Camp [(b)]	--
Geo 4630 (3 hrs) - Global Tectonics	6.8

[(a)] Mean of class averages for student evaluations to question #10 “Considering all of the above items, what is your overall rating of the teacher?”, on a scale of 1(lowest) to 7 (highest).

[(b)] The field camp course is taught in conjunction with Utah State University, and student comments rather than numeric ratings are used.

B. Teaching innovations (selected)

Geo 1030	Earthquakes and Volcanoes. Developed homework exercises that promote problem solving and critical thinking skills. Examples include: evaluation of local seismic risks; use of Internet resources to gather information on current earthquake and volcanic activity; and analysis of volcanic hazards. I also incorporate current events and abundant visuals into lectures. Lecture materials are made available online for students.
Geo 3060	Structural Geology. Developed laboratory and field exercises that emphasize active student learning. Examples include: data collection and computer analysis of local folds, faults, and fracture systems; multi-day field trip to analyze fold-thrust relations; and strain analysis of local samples.
Geo 4060	Field Methods. In collaboration with other faculty revised curriculum and developed new exercises. Exercises include: analysis of shorelines of Pleistocene Lake Bonneville; hydrogeologic mapping of bedrock aquifers; relations between synorogenic conglomerates and thrust faulting; and a capstone project in which student groups develop and present a consultant report on geologic hazards, combining geologic mapping, analysis with GIS, and background literature reviews.
Geo 4300	Igneous and Metamorphic Petrology. Developed all new laboratory exercises and made significant curriculum revisions. Innovations include: development of thin section and rock suites from various petro-tectonic settings; use of image analysis techniques to study microtextures; and local field trips to study volcanic and metamorphic rocks. Secured funding for purchase of 8 new petrographic microscopes ($32000) and am currently in process of developing a new petrographic display system for teaching.
Geo 4510	Geology Field Camp. Implemented curriculum changes and developed a cooperative program with Utah State University. Extensive new exercises that I helped develop and team teach include: structural analysis of fold-thrust belts; hydrogeologic mapping and aquifer testing to understand groundwater flow; mapping of surficial deposits and total station surveying of active landslides; and petrologic analysis of an Archean greenstone belt. A new exercise starting with the 2004 camp involved students working in groups and using aerial photographs to map most of a 7.5 minute quadrangle, and then develop a model of relations between folds, thrust faults, and synorogenic deposits. We continue to cooperate with Utah State on this program, exposing our students to a wide range of methods, faculty expertise, and interaction with other students.
Geo 4800	Independent Study. Mentored undergraduate research projects on footwall deformation beneath thrust faults, relations of thrusts to synorogenic deposits, geologic mapping, and structural analysis of curved fold-thrust belts.

IV. Service

A. University

1997- current	Chair for Department of Geosciences. As chair, I help facilitate faculty development and growth of programs, administer budgets, coordinate faculty and staff evaluations, advise student majors, and coordinate outcomes assessment of our programs. Important accomplishments I helped facilitate include: developing the first educational water well field in Utah in conjunction with the U.S. Geological Survey and Utah Groundwater Association; remodeling a new multimedia class room and upper division computer lab; developing a microtextural and petrologic image analysis system; developing a department meteorological station; and acquiring computer hardware and software for the Remote Sensing and GIS lab. Our department has implemented a number of curricular revisions over the last ten years, including development of an Applied Environmental Geoscience Major and Geomatics Certificate. I also coordinated the 1996 Departmental Strategic Planning Report and Review, 2002 Departmental Program Self-Study and Review, and am currently working on the 2007 Program Self-Study.
1992-current	Served on various college and university committees including Faculty Senate (1995-1998), College of Science Dean Search Committee (2003, Chair), College of Science Curriculum Committee (1996-present), and University Physical and Life Science General Education Assessment Committee (2001-

present).

1996-1997 Departmental coordinator for curriculum revisions during semester conversion.

B. Professional

2007 Session Chair, Geological Society of America National Meeting

2006 Session Chair, Geological Society of America National Meeting

2004 - 2005 Local Chair for the Geological Society of America 2005 National Meeting held in Salt Lake City, Utah.

1990-current Reviewer of manuscripts for professional journals including American Journal of Science, Geology, Geological Society of America Bulletin, Journal of Geophysical Research Journal of Structural Geology, and Tectonophysics. Also reviewer of technical reports and geologic maps for the Utah Geological Survey.

1990-current Reviewer of grant proposals for the National Science Foundation, Petroleum Research Fund, and National Earthquake Hazards Reduction Program of the U.S. Geological Survey.

2000 Field trip co-leader, Geology of Antelope Island, Utah: Utah Geological Association.

1999 Field trip co-leader, Geology of the northern Wasatch Front, Utah: Utah Geological Association.

1997 Field trip co-leader, Hinterland to foreland transect of the Sevier orogenic belt, Nevada, Utah, Wyoming: Geological Society of America National Meeting.

1997 Field trip co-leader, Wasatch fault zone, Utah: Geological Society of America National Meeting.

1994 Theme Session Chair, Rheological and structural evolution of contractional orogenic belts, Geological Society of America National Meeting.

1993 Provided detailed editorial review of textbook entitled "Earth Structure: An Introduction to Structural Geology and Tectonics" by van der Pluijm and Marshack.

1992 Reviewed book entitled "Thrust Tectonics" by McClay; review published in the Journal of Geological Education.

1992 Technical Program Chair, Geological Society of America Rocky Mountain Section Meeting.

1992 Field trip co-leader, Mesozoic tectonics of the northern Wasatch Range, Utah: Geological Society of America Rocky Mountain Section Meeting.

Appendix G
Student Publications Resulting from Undergraduate Research Research (2002-2007)

Day, S.L., Fellows, S.A., Hernandez, M.W., and Ford, R.L., 2007, Investigations into the morphology and spatial distributiojn of hoodoos at Goblin Valley State Park, Emery County, Utah: Geological Society of America Abstracts With Programs, Rocky Mountain Section meeting, v. 39 (5), p. 43.

Emerson, R., 2007, Petrology of the Cretaceous Straight Cliffs-Wahweap Formations transition, southern Utah. Geological Society of America Abstracts with Programs, Rocky Mountain section meeting, v. 39 (5), p. 13. Also presented at the WSU Fourth Annual Undergraduate Research Symposium. [Eaton]

Urinona, A., 2007, Petrology of the Moroni Formation, central Utah: WSU Fourth Annual Undergraduate Research Symposium, p. 46. [Eaton]

Ford, R.L., Matyjasik, M., Keate, and *Fellows, S.A.*, 2006, Peat ages and geomorphology of patterned fens in the Reader Lakes area, central Uinta Mountains, Utah, U.S.A.: Uintas 2006 – Interdisciplinary Assessment Symposium, Alta, UT.

Toller, S., 2006, Wetting-drying processes observed on mineral surfaces: Sigma Xi Research Society annual meeting. Recieved Excellent Presentation award. [Matyjasik]

Chavez, T, Matyjasik, M., Hurlow, H, Price, T, and *Simpson, J.*, 2005, Modeling of groundwater flow affected by artificial recharge in the Weber River basin, Northern Utah: Geological Society of America Abstracts with Programs, National Meeting, v. 37.

Chavez, T., Fellows, S., Price, T., and Simpson, J., 2005, Artificial recharge in the Weber River valley: WSU Second Annual Undergraduate Research Symposium. [Matyjasik]

Goodin, J.R., 2005, Petrology of Sandstone from the Drip Tank Member of the Straight Cliffs Formation and the lower Wahweap Formation**,** Cretaceous, southern Utah. Geological Society of America Abstracts with Programs, Rocky Mountain section meeting, v. 37 (6), p. 9. [Eaton]

Matyjasik, M, Manecki, M., Inglefield, C., *Toller, S.*, Marchlewski, T., and Bajda, T., 2005, Precipitation by wetting-drying mechanisms observed on calcite and gypsum surfaces with atomic force microscopy and scanning electron microscopy. Geological Society of America Abstracts with Programs, National Meeting, v.37.

Thompson, C.R., 2005, Biostratigraphic utility of Santonian-Campanian (Late Cretaceous) nonmarine ray (Rhinobatoidea) teeth, southern Utah. Geological Society of America Abstracts with Programs, Rocky Mountain Section meeting, v. 37 (6), p. 9. [Eaton]

Goodin, J. R., 2004, Preliminary study of parasequences in the Lower Cretaceous Aspen Shale, Wanship Area, Utah: Geological Society of America Abstracts with Programs, Rocky Mountain Section Meeting, v. 36 (4), p. 91. Also presented at the WSU Second Annual Undergraduate Research Symposium. [Eaton]

Jones, J., and *Treasure, B.*, 2004, The Ogden Canyon conglomerate: Geological Society of America Abstracts with Programs, Rocky Mountain Section meeting, v. 36 (4), p. 91. [Eaton]

Lindsley, C., and Ford, R.L., 2004, Digital elevation models in geomorphic reconnaissance: mapping the extent of proglacial Lake Swan, north-central Montana: Geological Society of America Abstracts With Programs, Rocky Mountain Section meeting, v. 36 (4), p. 92-93.

Tarantino, R., Lindsey, C., Cluff, T., Jones, J., Matyjasik, M., and Hernandez, M., 2004, Weber River aquifer artificial recharge pilot study: Geological Society of America Abstracts with Programs, Rocky Mountain Section meeting, XX.

Tarantino, R, Cluff, T., and Jones, J., 2004, Artificial recharge in the Delta aquifer: WSU First

Annual Undergraduate Symposium. [Matyjasik]
Thompson, C.R., 2004, A preliminary report on biostratigraphy of Cretaceous freshwater rays, Wahweap Formation and John Henry Member of the Straight Cliffs Formation, southern Utah: Geological Society of America Abstracts with Programs, Rocky Mountain Section meeting, v. 36, no. 4, p. 91. [Eaton]
Manecki, M., Matyjasik, M., Iglefield, C., and *Conlin, J.C.*, 2002. In-situ Pb remobilization in soils: Hydrological Science and Technology, v. 18, p. 123-131.

Appendix H
Example Course Syllabi

Course Syllabus
Earthquakes and Volcanoes- Geosci 1030
Spring 2008

Instructor: Adolph Yonkee; office SL 202M; phone 626-7419; email ayonkee@weber.edu; office hours Monday through Friday 10:00-11:00 AM, or by appointment

Text:. Tarbuck and Lutgens, Earth: An Introduction to Physical Geology (Custom Edition) Additional materials in the form of handouts, web URLs, videos and other resources will be provided for you in class. The information in these materials is important and may by included on tests.

Purpose of Course. This course is designed to introduce you to two spectacular aspects of geosciences, earthquakes and volcanoes, and their relations to Earth processes, including global plate tectonics. The skills you are expected to learn include scientific inquiry, problem solving, and an appreciation of the Earth's dynamic systems.

Grading

Homework, 6 @ 25 to 50 pts each	200 pts
Midterm tests, 2, 100 pts each	200 pts
Final test	100 pts
Total:	500 pts

A	>93	A-	90-93		
B+	87-90	B	83-87	B-	80-83
C+	77-80	C	73-77	C-	70-73
D+	67-70	D	63-67	D-	60-63
E	<60				

Homework. To improve problem-solving skills and understanding of scientific inquiry, 6 homework assignments involving analysis of geologic data will be assigned during the semester. Late homework will be accepted up to 3 days following the due date, but your grade will be reduced by 10% for each day it is late. Doing the homework *is critical* for success.

Tests. Tests will be based on information presented in class, homework concepts, reading assignments, and additional materials (handouts and videos). Tests will be taken in class on announced days. Make up tests will only be given for a valid excuse with documentation.

Classroom Conduct. All cellular telephones and pagers must be turned off in class. As a courtesy to fellow students, please do not hold personal conversations or engage in behavior that may be disruptive to others. Regular attendance of class is very helpful for understanding concepts (and thus receiving a better grade). You should stay for the entire class period (if you must leave early, please inform me prior to class and sit near a door).

Academic Honesty: If you are caught cheating in this class, you will be subject to academic discipline including the imposition of University sanctions. A description of cheating and possible sanctions may be found in the Student Code Section IV, available through Student Services. Every student should understand and adhere to WSU policies on academic honesty.

Support Services: Any student requiring accommodations or services due to a disability should contact Services for Students with Disabilities (SSD) in the Student Service Center. SSD can also arrange to provide course materials in alternative formats if necessary.

Course Outline (provisional) *Homework*

Week 1 (1/7-1/11) **reading- Ch 1**

Introduction	
Earth Structure	
Week 2 (1/14-1/18) **Ch 1** (cont)	
Earth systems-1	*1. Earth structure, Earth systems*
` Earth systems-2	
Week 3 (1/21-1/25) **Ch 2**	
Plate tectonics- continental drift	
Plate tectonics- sea floor spreading	
Week 4 (1/28-2/1) **Ch 2** (cont)	
Plate tectonics-boundaries	*2. Plate tectonics*
Plate tectonics- plate motion	
Week 5 (2/4-2/8)	
Plate tectonics- driving mechanisms	
Test 1 on 2/7	
Week 6 (2/11-2/15) **Ch 3**	
Atoms and chemical bonds	
Rock-forming minerals	
Week 7 (2/18-2/22) **Ch 4, 5**	
Igneous rocks	
Volcanic deposits and landforms	*3. Volcanic rocks and landforms*
Week 8 (2/25-2/29) **Ch 13**	
Divergent boundaries- ocean ridges	
Divergent boundaries- rifts	
Week 9 (3/3-3/7) **Ch 14**	
Convergent boundaries	
Convergent boundaries- Mt St Helens	
Spring Break	
Week 10 (3/17-3/21)	
Hot spots	
Volcanic hazards and forecasting	*4. Kilauea, volcanic hazards*
Week 11 (3/24-3/28)	
Mount Pinatubo	
Test 2 on 3/27	
Week 12 (3/31-4/4) **Ch 10**	
Faults and origins of earthquakes	
Seismic waves	
Week 13 (4/7-4/11) **Ch 11**	
Measuring earthquakes-1	*5. Measuring earthquakes*
Measuring earthquakes-2	
Week 14 (4/14-4/18) **Ch 11** (cont)	
Earthquake hazards	
Earthquake forecasting	*6. Earthquake forecasting*
Week 15 (4/21-4/25)	
Utah earthquakes	
Summary	

Final Test 7:00 AM Thursday May 1, LL 124

ENVIRONMENTAL GEOSCIENCES
Geo 1060

Instructor: Dr. Marek Matyjasik
Office: 204M
Work Phone #: 626 7726
e-mail: MMATYJASIK@WEBER.EDU
Home Phone #: 479 3351
Office hours: T, Th 10:00 - 11:30
Class Time: T,Th: 11:30 - 12:45

Text: "Environmental Geology"
by Edward A. Keller, 2000.

Few words about Environmental Geology:

- Environmental Geology is the study of the relationship between humans and their geologic environment.
- Environmental Geology is about the fragility of the Earth.

" It is so incredibly impressive when you look back at our planet from out there in space and you realize so forcibly that it is a closed system - that we don't have unlimited resources, that there is only so much air and so much water. You get out there in space and you say to yourself 'That's home. That's the only home we have, and the only one we are going to have for a long time.'We had better take care of it, we don't get a second chance." by Edgar Mitchell, Apollo 14 astronaut.

TENTATIVE CLASS SCHEDULE

WEEK	REQUIRED READING ASSIGNMENTS
1	Introduction, Environmental Problems (Chapter 1)
2	Plate Tectonics (Chapter 2)
3	Earth Materials (Chapter 2, Part 2)
4	Soils, Erosion and Pollution (Chapter 3)
5	Rivers and Floods (Chapter 5)
6	Slope Stability and Landslides (Chapter 6)
7	Review for Exam 1; Earthquakes (Chapter 7)
8	Exam 1; Earthquakes; part II (Chapter7)
9	Volcanoes (Chapter 8)
10	Coastal Hazards (Chapter 9)
11	Water Management and Groundwater (Chapter 10)
12	Water Quality and Pollution (Chapter 11)
13	Waste Management (Chapter 12),
14	Mineral Resources and Environment (Chapter 14)
15	Energy and Environment (Chapter 15)

GRADES to be determined by total points accumulated at semester end.

MAKEUP for missed exams and quizzes with valid excuse only.

GRADE DISTRIBUTION:

MIDTERM	33%
FINAL	33%
QUIZZES (6 quizzes, 4% each)	24%
TERM PAPER	10%

GRADING SYSTEM:

90 - 100 %	= A
80 - 89 %	= B
70 - 79 %	= C
60 - 69 %	= D
< 60 %	= E

ATTENDANCE AND PARTICIPATION:
Students are expected to attend and participate in every class. Class attendance is very important. While reading assignments are very important to a full understanding of the course material, they are not to be substituted for regular class attendance.

TERM PAPER: This is to be a project reporting a topic related to environmental hazards and the impact of humans on the geologic environment. A specific topic is to be selected by the student at the end of the second week of the semester and reported to the lecturer. Research will be done throughout the reminder of the quarter. An oral presentation will be given the last week of classes.

The grade will be based on organization and research/writing skills, and content. The report is to be 5- 10 pages in length, typewritten and double spaced. The report will have an additional title page . You are expected to use a minimum of three references. These references must be from current scientific journals, magazines, or books. The report is due on Monday in the last week of classes (one week before the final exams week).

EXAMS:
Material for exams will come from lectures and assigned readings. The exams will consist of multiple choice and short essay questions. Exams may be rescheduled only by prior arrangement with a valid excuse.

UNIVERSITY A.D.A. POLICY:
Students with medical, psychological, or learning limitations who desire academic adjustments or accommodations should contact the Center for Students with Disabilities (SC 181). This contact should occur at least 10 days prior to the time an academic adjustment or accommodation is needed

INTRODUCTION TO METEOROLOGY

GEO PS/SI 1130 (3 cr hr) — R.L. Ford
MWF 10:00-10:50 am — Weber State University
Lind Lecture Hall 124 — Spring Semester 2008

Course Syllabus:

BASIC INFORMATION:

Instructor: Richard L. Ford, Ph.D. — Phone: 626-6942
Professor of Geosciences — e-mail: rford@weber.edu

Office Hours: Monday thru Friday: 9-10 am; and by appointment
SL 208M (Science Lab Building, mezzanine level between 2nd & 3rd floors)

PLEASE DO NOT HESITATE TO CALL OR COME SEE ME IF YOU HAVE ANY QUESTIONS OR CONCERNS REGARDING THE COURSE.

□ **Name & number of another student in this class:** _____

Textbook: Available at the University Bookstore.
Severe & Hazardous Weather (2nd ed., 2005) by Rauber, Walsh, & Charlevoix, Kendall/Hunt, 558 p., plus CD.

COURSE DESCRIPTION & OBJECTIVES:

Geoscience 1130 is an introductory survey of meteorology, that branch of the geosciences that seeks to increase our understanding of Earth's atmosphere. This course will examine the fundamental atmospheric processes as a means of understanding the dynamic aspects of weather and climate.

The objectives of the course are for students to gain an understanding and appreciation of:

1. the nature of scientific inquiry, in general, and meteorologic inquiry in particular;
2. the way the Earth's atmosphere functions and how it interacts with other Earth systems (hydrosphere, biosphere, and lithosphere) to produce weather and climate; and
3. the importance of geoscience knowledge to human endeavors, with specific reference to meteorological hazards, air pollution, and global warming.

Students will also develop skills in data collection and analysis, map and imagery interpretation, hypothesis testing, and critical/scientific thinking.

COURSE REQUIREMENTS & GRADING:

Student performance will be evaluated on the basis of three (3) midterm exams, homework assignments, and a comprehensive final exam. The relative weight of these components is given below:

Midterm Exams (3 @ 100 pts. each)	300 pts.	50 %
In-class & Homework Assignments	150	25
Final Exam	150	25
TOTAL	600 pts.	100 %

GRADING (con't):
Final letter grades (A, A-, B+, etc.) will be awarded based on the following approximate scale – I reserve the right to make slight adjustments in the various cutoffs based on class performance.

A	≥550 pts	B-	472-489	D+	394-411
A-	532-549	C+	454-471	D	370-393
B+	514-531	C	430-453	D-	352-369
B	490-513	C-	412-429	E	≤351

COURSE POLICIES & EXPECTATIONS:
• *EXPECTATIONS:* Keep in mind that this is a 3-credit-hour, physical-science course; students are expected to spend three hours per week in class and about 4-6 hours per week outside of class on related course requirements -- such as reading the textbook, completing homework exercises, reviewing lecture notes, and studying for exams.

• *ATTENDANCE:* You are expected to be in class every day, be on time, and to not leave early. There is a direct correlation between your attendance and the final grade that you will earn. While the reading assignments will help you gain a fuller understanding of the course material, they are not to be substituted for regular class attendance. The course lectures and your participation via questions and discussion are your most important educational resource.

• *CLASSROOM ETIQUETTE:* I strongly encourage your questions and shared experiences during class. However, do not hold conversations with classmates whenever the professor or another student is speaking. **Please turn off pagers and cell phones while in class.** Your undivided attention in class is in order and an atmosphere of mutual respect is a must.

• *EXAMS:* The exams will consist of multiple-choice, true/false, matching, and/or short answer questions based on material covered in lecture and the textbook. You may be also asked to interpret maps, graphs, and/or photographs. The midterms will cover only the material presented since the previous exam. The first part (approx.100 pts.) of the final exam will be essentially a fourth midterm, covering the material presented since the third midterm; the second part (approx. 50 pts.) will be comprehensive over the entire semester, covering the "big ideas" presented during the first part of the course. **NOTE:** *Exams may be rescheduled only by **prior** arrangement with a valid excuse.*

• *HOMEWORK EXERCISES:* A number of in-class and homework exercises will be assigned during the semester which will emphasize the development of analytical and computational skills. Points will be deducted for late homework assignments; those that are more than 3 days late will not be accepted. It is expected that you will turn in a product to be graded that reflects your efforts and personal understanding of the material; simply copying someone else's work will not be tolerated.

• *ACADEMIC INTEGRITY:* WSU students are expected to adhere to University policies with respect to academic ethics and honesty (see section IV. D. of the Student Code). Academic dishonesty (cheating on exams, plagiarism, etc.) will result in a loss of credit for the assignment or exam and/or a reduced grade for the course.

• *UNIVERSITY A.D.A. POLICY:* Any student requiring accommodations or services due to a disability must contact the Services for Students with Disabilities (SSD) in room 181 of the Student

Services Center, 626-6413. SSD can also arrange to provide course materials (including this syllabus) in alternate formats if necessary.

COURSE CALENDAR:

DATE:	LECTURE TOPICS:	ASSIGNED READINGS:
● ***PART I -- INTRODUCTION TO THE SCIENCE OF METEOROLOGY***		
WK 1	Course Introduction: What is Science?;	
1/7-1/11	Origin, Evolution, & Composition of the Atmosphere;	
	Atmospheric Structure & Ozone Depletion.	
● ***PART II -- DESCRIBING & MEASURING THE ATMOSPHERE***		
WK 2	Introduction to Air Temperature;	Ch.1
1/14-1/18	Reasons for the Seasons (Equinox & Solstice);	
	Introduction to Air Pressure & Wind;	
	☺ **Monday 1/21 – Martin Luther King Holiday – No Class**	
WK 3	Atmospheric Moisture: Humidity;	Ch. 1 (con't)
1/22-1/25	Introduction to Clouds;	
WK 4	Weather Data & Measurements;	Ch. 2
1/28-2/1	Doppler Radar & Weather Satellites;	
	Catch-up & Review.	
WK 5	**Monday, February 4 – EXAM 1**	
2/4-2/8	Weather Maps;	Ch. 3
	Weather Forecasting.	Ch. 4
● ***PART III -- ATMOSPHERIC PROCESSES & WEATHER SYSTEMS***		
WK 6	Atmospheric Stability;	Ch. 5
2/11-2/15	The Nature of Wind;	Ch. 6
WK 7	☺ **Monday 2/18 – Presidents' Day Holiday – No Class**	
2/19-2/22	Development of Highs & Lows;	Ch. 7
	Air Masses & Weather Fronts;	Ch. 8
WK 8	Weather Fronts (con't)	Ch. 8
2/25-2/29	Mid-Latitude Cyclones;	Chs. 9 & 10
WK 9	Catch-up & Review.	
3/3-3/7	**Wednesday, March 5 – EXAM 2**	
● ***PART IV -- HAZARDOUS WINTER WEATHER***		
	Ice Storms & Lake-Effect Snowstorms;	Chs. 11 & 12
☺ **SPRING BREAK: March 10-14**	☺**Classes Resume on Monday, March 17**	
WK 10	Mountain Snowstorms;	Ch. 15
3/17-3/21	Clod Waves & Blizzards;	Chs. 13 & 14
	Mountain Windstorms.	Ch. 16
● ***PART V -- THUNDERSTORMS, TORNADOS, & HURRICANES***		
WK 11	Thunderstorms;	Ch. 17
3/24-3/28	Hail, Lightning, & Downbursts;	Chs. 19, 20, & 21
	Tornados;	Ch. 18

WK 12	Tornados (con't)	
3/31-4/4	Catch-up & Review.	
	Friday, April 4 – EXAM 3	
WK 13	El Niño & La Niña;	Ch. 22
4/7-4/11	Hurricanes;	Ch. 23
● ***PART VI -- FINAL TOPICS***		
WK 14	Drought & Heat Waves;	Chs. 25 & 26
4/14-4/18	Climate Classification;	
	Climate Change/Global Warming;	
WK 15	Global Warming (con't);	
4/21-4/25	Air Pollution & Urban Heat Islands.	
	Friday, April 25 – Last day of class – Final Exam Review.	

****** FINAL EXAM — THURSDAY, MAY 1 – 9:30-11:30 am ******

Geosci 1220 – HISTORICAL GEOLOGY

Syllabus – Spring Semester, 2007

Instructor: Jeff Eaton

Office Hours: 8-9, MWF; 8:30-10:00, TTh, or by appointment. Office – Rm. 207M; phone 626-6225; e-mail: jeaton@weber.edu

Required Texts:

Class: Historical Geology, Wicander and Monroe, 2004, 4th edition, Thomson Brooks/Cole, ISBN: 0-534-39287-3.

Lab: Deciphering Earth History, Gastaldo, Savrda, Lewis, 2004, (4rd edition): Contemporary Publishing Company of Raleigh, Inc. ISBN: 0-89892-316-6.

Purpose of Class: To acquaint the student with the physical and biological history of our planet (lecture) and the methods used to interpret this history (lab).

Basis for Grade: Two one-hour exams worth 100 points each and a comprehensive final worth 200 points (total of 400 points based on exams). There will be occasional pop quizzes on critical material and on text reading. **Reading the text is an important part of this class**. There are fifteen labs, each is worth 20 points (300 points). Labs are also an important component and will be graded critically. Labs are due by **Monday** of each week and 5 points will be deducted for each day a lab is late. There is also a short paper due at then end of the class that is your review of a journal article (worth 50 points). There is a total of 750 points (+ any pop quizzes).

Jan. 8: Introduction: purpose of class, goals and objectives, expectations, and basis for grade.
Jan. 10: Concepts of the history of the Earth: Chapter 3, p. 33-36. (check Chapters 1-2 to make sure you understand those concepts).
Jan. 10: **LAB 1** Lab Manual Exercise 1 (also look at **Chapter 6, Sedimentary Rock Properties, p. 94-101**) - Description and Classification of Sedimentary Rocks, answer all questions and examine rock samples in drawers.
Jan. 12: Geologic time concepts and methods: Chapter 4, p. 56-69.
Jan. 15: **Martin Luther King Day - no classes.**
Jan. 17: Rock, fossils and time (stratigraphic principles): Chapter 5 (lecture carried on in lab 2).
Jan. 17: **LAB 2** - Interpretation of Sedimentary Rocks (samples in marked drawer), Lab Manual Exercise 2.
Jan. 19: Review of Plate Tectonic concepts: Chapter 3, p. 39-54.
Jan. 22: Depositional environments: Chapter 6, p. 102-112
Jan. 24: Review of organization of life.
Jan. 24: **LAB 3** - Relative Time and Sequence of Events - Lab Manual Exercise 3.
Jan. 26: Evolutionary concepts: Chapter 7, p. 114-127.
Jan: 29: Classification: Chapter 7, p. 127-134.
Jan. 31: Hadean and Archean – tectonics. Chapter 8, p. 136-142.
Jan. 31: **LAB 4** – In lab - strikes, dips, and measuring sections, handout. Lithostratigraphy, Exercise 4 in Lab Manual.
Feb. 2: Hadean and Archean – atmosphere and origin of life. Chapter 8, p. 143-150.
Feb. 5: Proterozoic – tectonics: Chapter 9, p. 153-160.
Feb. 7: Proterozoic – atmosphere and life: Chapter 9, p. 160-171.
Feb. 7: **LAB 5** - Biostratigraphy, Exercise 5 in Lab Manual.
Feb. 9: Early Paleozoic – tectonic overview, Appalachians and Taconic Orogeny: Chapter 10, p. 174-191.
Feb. 12: Late Paleozoic – Paleogeography and the Kaskaskia sequence: Chapter 11, p. 194-200.
Feb. 14: Late Paleozoic –Absaroka sequence: Chapter 11, p. 201-212.
Feb. 14: **LAB 6** - Radiometric Dating Techniques, Exercise 7 in Lab Manual.
Feb. 16: Catch-up and review.
Feb. 19: **President's Day Holiday - no classes**
Feb. 21: **EXAM I** – in this classroom
Feb. 21: **LAB 7** - Geophysical Applications in Stratigraphy, Lab Manual Exercise 7 and Contour Interval handout.
Feb. 23: Paleozoic Invertebrate Life – Cambrian: Chapter 12, p. 216-223.
Feb. 26: Paleozoic Invertebrate Life – Ordovician-Permian: Chapter 12, p. 224-230.

Feb. 28: Paleozoic life – Vertebrates: Chapter 13, p. 234-244.
Feb. 28: **LAB 8** - Fossil Preservation and Taphonomy, Lab Manual Exercise 8 (see specimens in drawer). **Burgess Shale video.**
March 2: Paleozoic life – Plants: Chapter 13, p. 245-252.
March 5: Mesozoic tectonics - the breakup of Pangaea: Chapter 13, p. 255-262.
March 7: Mesozoic tectonics – the west: Chapter 13, p. 262-275
March 7: **LAB 9** - Evolution, Lab Manual Exercise 9.
March 9: Mesozoic life – invertebrates to dinosaurs: Chapter 14, p. 278-290. **LAST DAY TO WITHDRAW FROM INDIVIDUAL CLASSES with a "W".**
March 12-16: **Spring Break - no classes.**
March 19: Mesozoic life – birds, mammals, and mass extinction: Chapter 14, p. 290-298.
March 21: Cenozoic – global and western tectonics: Chapter 16, p. 302-318.
March 21: **LAB 10** – Precambrian and Cambrian life. Handout (Precambrian and some Early Paleozoic Life forms) and Lab Manual Exercise 10 (see drawer for specimens).
March 23: Cenozoic – southern and eastern tectonics: Chapter 16, p. 319-324.
March 26: catch-up and review
March 28: **EXAM II (only through Mesozoic!)** – in this classroom.
March 28: **LAB 11** - Later Paleozoic Life, Lab Manual Exercise 11.
March 30: **Meet in class to get exam back – go to library to see where Geology journals are.**
April 2: Cenozoic life – invertebrates and the start of mammalian diversification: Chapter 19, p. 348-356.
April 4: Methods in Paleontology.
April 4: **LAB 12** - Post-Paleozoic Life: The Mesozoic and Cenozoic Eras, Lab manual Exercise 12. **Sea Garden video segment.**
April 6: Cenozoic life – mammals of the Tertiary: Chapter 19, p. 357-364.
April 9: Quaternary – Stratigraphy & beginning of the Ice Age: Chapter 17, p. 328-336.
April 11: Quaternary – glaciation and its causes: chapter 17, p. 337-346.
April 11: **LAB 13** - Paleoecology, Lab Manual Exercise 13.
April 13: **No class** – work on your term paper!
April 16: Pleistocene faunas and extinction; Chapter 19, p. 365-368.
April 18: Early Primates: Chapter 19, p. 371-374.
April 18: **LAB 14** - Paleoclimatology, Lab Manual Exercise 14.
April 20: Hominids: Chapter 19, p. 375-384.
April 23: Perspectives on the future of Earth's history. **Writing exercise due – penalties for late papers.**
April 25: Review material from first 2 exams.
April 25: **LAB 15** - Selected Regional Geologic Histories, Lab manual Exercise 15.
April 27: Catch-up and Review. **LAST DAY OF CLASSES.**

Final Exam: Wednesday, May 2, 7:00 – 9:00 AM, in this classroom.

Review Paper due April 23: You are to select a single article from a geological journal that is relevant to some major aspect of Earth History. You are to write a short paper (about 3 pages). This paper should be organized as follows: **Introduction** (why this paper is of important to Earth History); **Contents of the Paper** (what is the basic argument presented and what is the evidence for their argument); **Conclusions** (do you think the paper achieved its goals – can you see holes in their arguments – be creative and thoughtful here). Include a copy of the paper you are reviewing with your paper so I can look at what you have read and submit **2 copies** of your paper (I will return you an annotated copy and keep one copy as a baseline of writing skills - your name will be removed from that copy). This paper is worth 50 points.

Geosci 3550 – Sedimentology and Stratigraphy

Syllabus – Spring Semester, 2007

Instructor: Jeff Eaton – Office SL 207M; office hours: 9-10 MWF, 8:30-10:00 TTh, or by appointment. Phone 626-6225; e-mail: jeaton@weber.edu

Textbook: Sedimentology and Stratigraphy by Gary Nichols, 1999, Blackwell Science. ISBN 0-632-03578-1.

Purpose of class: To provide the student with a basic conceptual background in sedimentary rocks and processes by both field and laboratory experience to provide a basic understanding and appreciation of the role of stratigraphy in geologic studies.

Basis for grade: There will be three exams, each is worth 100 points (a total of 300 points). As the exams will be based on both lecture **and the text**, it is very important to read the text. There are 13 graded laboratory exercises and each is worth 15 points (for a total of 195). Labs are due on **Tuesday** and 3 points will be deducted for each school day a lab is late. You will also turn in your project from the field trip and points will be given in terms of the quality and thoroughness of your project (up to 50 points – I have to see what projects I come up with!). There is a final term paper worth 125 points (see details below). The possible point total for the entire class is about 695. ***Note***: exams comprise less than half your grade.

Sediments

Jan. 9: Introduction, basis for grade, overview of class, Chapter 1. Clastic sediments – types, Chapter 2, p. 10-18; clastic sedimentary rock description, Chapter 2, p. 18-24 (continued in Lab 1-2).
Jan. 11: Biogenic, chemical, and volcanic sediments. Chapter 3.
Jan. 11: **LAB 1** – assignment of keys & lockers, organization of field trip, concepts surrounding term paper, and more on clastic rock description, discuss GEOREF, go to library (no lab to hand in).
Jan. 16: Sedimentary processes. Chapter 4, p. 37-53.
Jan. 18: Sedimentary processes, continued, begin Sedimentary structures. Chapter p. 54-61 (to be continued in Lab 3).
Jan. 18: **LAB 2** – Clastic sedimentary rock description.

Sedimentary Environments

Jan. 23: Environment and facies. Chapter 5.
Jan. 25: Continental sources of sediments. Chapter 6, p. 76-86.
Jan. 25: **LAB 3** – Flume **video**, bedforms (**animations**), and sedimentary structures.
Jan. 30: Continental sources, continued; Continental environments of deposition: Chapter 6, p. 87-88.
Feb. 1: Glaciers and ice caps. Chapter 7.
Feb. 1: **LAB 4** – Texture and grain size analysis (handout on pipette analysis).
Feb. 6: Arid continental depositional processes. Chapter 8, p. 96-101. Arid continental depositional environments. Chapter 8, p. 101-110.
Feb. 8: River environments. Chapter 9, p. 111-120.
Feb. 8: **LAB 5** – Thin section making handout and primer in sedimentary petrology.
Feb. 13: River deposits. Chapter 9, p. 121-127.
Feb. 15: Lacustrine environments. Chapter 10.
Feb. 15: **LAB 6** – Sedimentary petrology lab #2.
Feb. 20: **EXAM 1**
Feb. 22: Marine realm. Chapter 11.
Feb. 23: **LAB 7** – Sedimentary petrology lab #3 – point counting.
Feb. 27: Deltas. Chapter 12, p. 149-162. **TERM PAPER TOPIC DUE**
March 1: Estuaries. Chapter 12, p. 163-166.
March 1: **LAB 8** – Carbonate rock description and classification.
March 6: Coastlines. Chapter 13.
March 8: Shallow seas, clastic environments. Chapter 14, p. 180-185. Shallow seas, carbonate environments. Chapter 14, p. 186-193.
March 8: **LAB 9** – Carbonate petrology lab.
March 9: **Last day to withdraw from individual classes with a "W".**
March 12-16: **Spring Break – no classes.**

March 20: Deep marine clastic sedimentary environments. Chapter 15, p. 194-202. Deep marine pelagic sedimentary environments. Chapter 15, p. 202-207.
March 22: Volcanogenic environments. Chapter 16.
March 22: **LAB 10** – Fence diagrams & paleofacies reconstructions.
March 27: **EXAM 1I**
March 29: Post-depositional processes. Chapter 17. **TERM PAPER OUTLINE DUE, with references.**
March 29: **LAB 11** – Using contour lines in modeling the subsurface.

Stratigraphy

April 3: Stratigraphic concepts & lithostratigraphy. Chapter 18.
April 5: Time and Fossils in Stratigraphy – no text readings (read Barrell – on reserve)
April 5: **LAB 12** – Stratigraphic methods & Stratigraphic cross sections.
April 10: Biostratigraphy. Chapter 19.
April 12: Dating and correlation. Chapter 20.
April 12: **LAB 13** – Field methods lab (short lab prior to fieldtrip, no assignment).
April 13-15 (Friday-Sunday): **Field Trip to San Rafael Swell**
April 17: Sequence stratigraphy. Chapter 21, p. 264-276.
April 19: Sequence stratigraphic environments and sea-level change. Chapter 21, p. 276-289.
April 19: **LAB 14** – Sequence stratigraphy and an exciting video!
April 24: Subsurface Stratigraphy. Chapter 22.
April 26: Sedimentary Basins. Chapter 23.
April 26: **LAB 15 - Presentation of term papers** (no lab to hand in)
April 27: Last day of classes. **TURN IN 2 COPIES OF YOUR TERM PAPER.**

FINAL EXAM: Wednesday, May 2, 9:30-11:30 in this room.

Term Paper

The term paper should be a substantial effort that is a major part of your grade. You are to pick a project that discusses some aspect of sedimentation and stratigraphy of a geologic unit (or units). The paper may emphasize either stratigraphy or sedimentology, but should address both (unless it is exclusively a library research paper, see below). The paper must reflect both a comprehensive literature survey (using GEOREF, Google Scholar, etc.) **and** least some attempt at a field study if that is possible.

A topic for your paper is due **February 27**; an outline of your paper, and some references, is due on **March 29**. **TWO** copies of your paper are to be submitted to me – one is returned with corrections and comments and I keep one for my files; papers are due on **April 27** (papers accepted later, but with deductions for lateness).

The papers are to be typed and double-spaced and submitted in **GSA format** (in terms of titles, headings, how references and figures are cited in the text, and the format of the reference cited section; *see* ***Geology*** or the ***Geological Society of America Bulletin*** in the library). Points are taken off for spelling errors. Each figure should be labeled in sequence (Figure 1, Figure 2, etc.) and should be referred to in the most appropriate place in the text. All ideas that are derived from other sources should be cited. e.g. "Rocks are hard (Eaton, 1998)." Make it clear which interpretations are yours and which are from other sources.

Papers will be graded reflecting the amount of effort put into the paper, the quality of that work if appropriate (which in this case relates to the quality of observations and the collection of data in the field), and your thoroughness in terms of checking the literature and reviewing the literature. In order to get an "A" I expect to see original thinking and synthesis – at this level in your Geoscience education you should be moving well beyond "book reports." The paper will count for 100 points. Your presentation and hand out (abstract and critical figures) will count for 25 points each.

Web sources are highly unreliable and dependence upon that kind of source (or other non scientific sources) will result in considerable loss of points.

GEOSCIENCE FIELD METHODS

GEOSCI 4060 (3 cr hr) — R. Ford
W 10:00-10:50 am / Th 12:00-6:00 pm — Weber State University
SL 320/The Field — Fall Semester 2007

Course Syllabus:

BASIC INFORMATION:

Instructor: Richard L. Ford, Ph.D. — Phone: 626-6942
Professor, Dept. of Geosciences — e-mail: rford@weber.edu

Office Hours: M, Tu, & F: 10-11 am; W: 12-2 pm; and by appointment
SL 208M (Science Lab Building, mezzanine level between 2nd & 3rd floors)

PLEASE DO NOT HESITATE TO CALL OR COME SEE US IF YOU HAVE ANY QUESTIONS OR CONCERNS REGARDING THE COURSE.

Textbook: (Available at the University Bookstore)

Geology in the Field by Robert R. Compton (1985). John Wiley & Sons. 398 p.

COURSE DESCRIPTION:

Geoscience 4060 is a capstone course dealing with the collection and analysis of field data for various geoscience applications. Topics include introductory surveying, geologic mapping of bedrock and surficial deposits, measuring stratigraphic sections, GPS systems, and analysis of geologic hazards. Students will also develop expertise in preparing geologic reports, maps, and oral presentations.

Prerequisites: Geosci 2050, Geosci 3150, and Geosci 3550; or consent of the instructor.

COURSE REQUIREMENTS & GRADING:

Weekly Projects (approx. 9 @ 40-60 pts. ea.)	450 pts	64 %
Final Project & Presentation	150	22
Lab Practical Exam	100	14
TOTAL	700 pts.	100 %

Total Points / 7 = Final Percentage Score

Grading Scale Based on Final Percentage Score:

93-100 A	90-92 A-	87-89 B+	83-86 B	80-82 B-	77-79 C+
73-76 C	70-72 C-	67-69 D+	63-66 D	60-62 D-	≤59 E

COURSE POLICIES & EXPECTATIONS:

• *EXPECTATIONS:* Keep in mind that this is a 3-credit-hour, upper-division course that is

designed to be a capstone experience in your geoscience education; students are expected to spend an average of 6-7 hours per week in class (lecture & field) and about 3-6 hours per week outside of class on related course requirements -- such as completing weekly field assignments, reading the textbook, and preparing the final term report and oral presentation.

• *WEEKLY ASSIGNMENTS:* Specific instructions for each week's field project will be given on separate handouts. Typically, a field project will involve the collection, interpretation, and analysis of geoscience data and the preparation of maps, cross-sections, and/or data tables (spreadsheets). Weekly projects will be due the following Monday. This will allow graded assignments to be returned and discussed in class on Wednesdays. Late assignments will be penalized 10% for each day they are late.

• *FINAL GROUP REPORT/PRESENTATION:* The final project is designed to simulate a typical site assessment that a consulting geoscientist may be called upon to perform. You will work together as a project team to prepare a professional-quality geologic report (w/maps, tables, and other graphics) and present your findings in an oral presentation. Detailed report requirements will be given in a later handout.

• LAB PRACTICAL EXAM: A short written exam will emphasize basic topographic and geologic map skills and the use of the Brunton compass.

• *ACADEMIC INTEGRITY:* WSU students are expected to adhere to University policies with respect to academic ethics and honesty (see section IV. D. of the Student Code). Students are encouraged to discuss the assignments and to learn from each other. However, it is expected that you will turn in a product to be graded that reflects your efforts and personal understanding of the material; simply copying someone else's work will not be tolerated.

• *RISKS & SAFETY ISSUES:* You will need to sign the standard waiver for WSU before participating in field trips. Some risks are involved with this class, which is provided to you on a voluntary basis. Field projects are conducted under a variety of conditions and settings, some of which require moderate amounts of physical exertion. Please be prepared for a variety of weather conditions, from hot and dry to cold and wet. Student safety is important, and students and faculty should work together to ensure a safe learning environment. The following list identifies some possible sources of risk for this class.

1. Some projects will involve driving to field sites in university vehicles. Only authorized individuals may drive. Alcohol is strictly prohibited in university vehicles.

2. In the field, you will be hiking across a range of topography. Be prepared for a variety of weather conditions and have adequate clothing. Make sure to carry water and avoid over-exposure to the sun. Please be especially careful to avoid dislodging rocks. Wear safety glasses when using a rock hammer. Rattlesnakes, ticks, and other wildlife may be present and should be left alone.

3. Some projects will be conducted away from medical services. A first aid kit will be available,

but you should also carry a personal first aid kit for minor injuries.

EQUIPMENT:

Below is a list of suggested field and drafting supplies that you will need for the course:

- knapsack/day pack
- water bottles/canteen
- sunscreen, sunglasses, hat
- rain gear/wind breaker (cool temps and/or light rain will NOT stop us!)
- hand lens
- mechanical pencil, Rapidograph-type pens (sizes 0.1, 0.3, & 0.5 most useful
- engineer's scale or ruler (English & metric units)
- sturdy hiking shoes/boots
- personal first aid kit
- clipboard/map case
- rock hammer
- safety glasses
- colored pencils (set of 8-12)
- protractor
- scientific calculator

The Department of Geosciences will supply the following equipment items:

- Brunton compass
- pocket stereoscope
- hardbound field notebook

COURSE CALENDAR: *Changes may be required due to weather conditions.*

Wk	Field Project (location, date)	Readings
1	Topo & geologic map review / Brunton compass (SL 328, 8/30)	Chs. 1, 2, 3
2	Mapping surficial deposits (North Ogden, 9/6)	Chs. 5, 6, 10
3	Surveying Topographic Profiles (Antelope Is., 9/13)	
4	Joint field trip with *Structural Geology* and *Paleontology* classes:	
	(sw Wyoming, Fri-Sun, 9/21-23 – no class on Thursday 9/20)	
	Measuring a stratigraphic section &	Chs. 4, 11
	Mapping folded strata	Chs. 7, 9
5	Preparation of map, cross-section, stratigraphic column, and report (9/27)	
6	Introduction to the total station (location TBA, 10/4)	
7	Mapping volcanic rocks	Ch. 13
	(Wildcat Hills, Sat. 10/13 – no class on Thr. 10/11)	
8	Mid-term Break (no class 10/18)	
9	Mapping metamorphic rocks (TBA, 10/25)	Chs. 12, 15
10	Final Project 1 (22nd Street Trailhead area, 11/1)	Ch. 16
11	Final Project 2 (22nd Street Trailhead area, 11/8)	
12	Final Project 3 (Group meetings & report preparation, 11/15)	
13	*Thanksgiving Holiday – Thursday, November 22 – No Class*	
14	Lab Practical Exam (SL 320, 11/29)	
15	Final Project Presentations (SL 320, 12/6)	

☺ ***No Exam During Finals Week*** ☺

Course Syllabus
Petrology Geosci 4300
Spring 2008

Instructor: Adolph Yonkee; office SL 202M; phone 626-7419; email ayonkee@weber.edu
Office Hours: Monday through Friday 10:00-11:00 AM, or by appointment

Text: Winter, J.D., 2001, An Introduction to Igneous and Metamorphic Petrology: Prentice-Hall, 697 p.
Additional readings will come from other texts and articles in professional journals on reserve.

Grading

Weekly labs + field trip, 10 @ 30 to 50 pts each	400 pts
Midterm tests, 2, 100 pts each	200 pts
Final test	200 pts
Total:	800 pts

A	>93	A-	90-93		
B+	87-90	B	83-87	B-	80-83
C+	77-80	C	73-77	C-	70-73
D+	67-70	D	63-67	D-	60-63
E	<60				

Purpose of Course. This course is designed to give you an understanding of basic rock forming processes, the ability to identify and classify igneous and metamorphic rocks, and an appreciation for the dynamic nature of Earth's geosphere. This is an intensive class with many new concepts, and you will need to come prepared for class by keeping up on reading and lab assignments.

Labs. Weekly assignments will be distributed in lab each Friday and will be due the following Friday. Late labs will be accepted up to the Thursday following the dew date, but your grade will be reduced by 10% for each day it is late (unless you have a legitimate excuse). Doing labs **on time is critical** for success. One lab will involve a local field trip to observe igneous and metamorphic rocks.
Midterm and Final Tests. Midterm tests will be taken in the Science testing center, and will be about 90 minutes long (tests will be given approximately during weeks 6 and 11, exact times to be announced). Tests will consist of short answer, diagrams, and shorter problems, and will be based on class notes, lab concepts, and readings. The final test will consist of two parts: (i) a take home part with longer questions; and (ii) a comprehensive test taken in the testing center.

Notes:
If you are caught cheating in this class, you will be subject to academic discipline including the imposition of University sanctions. A description of cheating and possible sanctions may be found in the Student Code, available through Student Services.
Any student requiring accommodations or services due to a disability should contact Services for Students with Disabilities (SSD) in the Student Service Center. SSD can also arrange to provice

course materials in alternative formats if necessary.

Course Outline (preliminary)	*Labs*
Week 1 (1/7-1/11) Chs 1, 2	
Introduction to igneous petrology	
Igneous rock classification	*1. Igneous rocks- hand samples*
Week 2 (1/14-1/18) Chs 3, 4	
Igneous textures	
Igneous structures	*hand samples (cont)*
Week 3 (1/21-1/25) Chs 8, 9	
Chemistry of igneous rocks- 1	
Chemistry of igneous rocks- 2	*2. Igneous rock chemistry*
Week 4 (1/28-2/1) Outside reading	
Intro to optical mineralogy	
Optics of uniaxial minerals	*3. Intro to optical mineralogy*
Week 5 (2/4-2/8)	
Optics of biaxial minerals	
Optics of igneous minerals	*4. Igneous rocks- thin sections*
Week 6 (2/11-2/15) Chs 5, 6, 7	
Phase diagrams- 1	
Phase diagrams- 2	*thin sections (cont)*
Week 7 (2/18-2/22) Chs 10, 11, 12	
Magma generation and diversification	
Layered mafic complexes	*5. Stillwater suite*
Week 8 (2/25-2/29) Chs 13, 14	
Ocean ridge igneous activity	
Ocean intraplate igneous activity	*6. Ophiolite suite*
Week 9 (3/3-3/7) Chs 16, 17	
Island arc igneous activity	
Continental arc igneous activity	*7. Yosemite arc suite*
Spring Break	
Week 10 (3/17-3/21) Chs 15, 18, 19	
Granitoids	
Continental rift igneous activity	*Archean crust- discussion*
Week 11 (3/24-3/28) Chs 21, 22	
Introduction to metamorphic petrology	
Metamorphic rock classification	*8. Metamorphic minerals + textures*
Week 12 (3/31-4/4) Chs 23, 25	
Metamorphic structures and textures	
Metamorphic facies	*Field trip*
Week 13 (4/7-4/11) Chs 26, 27	
Metamorphic reactions-1	
Metamorphic reactions-2	*9. Skarn suite*
Week 14 (4/14-4/18) Ch 28	
Metamorphism of pelitic rocks- 1	
Metamorphism of pelitic rocks- 2	*10. Barrovian suite*
Week 15 (4/21-4/25) Chs 29, 30	
Metamorphism of calcareous rocks	
Metamorphic fluids	*Discussion/ work on take home*