

**JACKSON SCHOOL OF GEOSCIENCES
ITAC VISION PLAN, AY 2009-2010**

SUMMARY OF REQUESTS

The Jackson School of Geosciences (JSG) is requesting a total of \$44,900 for one time special projects, and \$113,000 for innovative support of student learning using IT for AY 2009-2010 as summarized below. We are also requesting \$119,000 for recurring and IT infrastructure expenses (see proposal).

One-Time Special Project Allocations: Total \$44,900

#1 priority: 45 GPS receivers: @ \$420/unit: Total \$18,900.

#2 priority: 20 Ruggedized field PDAs: @ \$1300/unit: Total \$26,000

One-Time Innovative Support of Student Learning: Total \$113,000

Digital assisted petrology laboratories:

#3 priority: Undergrad lab: 20 cameras @\$3,000; 20 high res screens @ \$350; 1 central computer @ \$1400; 1 LDC projector @ \$1500: Total \$69,900

#4 priority: Grad lab: 12 cameras @\$3,000; 12 high res screens @ \$350; 1 central computer @ \$1400; 1 LDC projector @ \$1500: Total \$43,100

NEEDS AND PROPOSED USE OF FUNDS

We are planning for continued but controlled growth in our student population as our faculty expands and we build programs in new frontier areas of the geosciences. Our current and future growth requires more infrastructure and makes our need for additional IT end-user support critical. Moreover, classes covering the range of sub-disciplines within the geological sciences require use of different operating systems and software. Technological advances have made more effective teaching of highly visual material possible with properly designed classrooms. We need to integrate state-of-the-art digital methods for increasing student learning both in the lab and in the field. Solutions to each of these needs are addressed in the following sections.

Infrastructure Needs

End-User Support. Our greatest infrastructure need is for salary and fringe for our end-user support person who provides daily trouble-shooting and operational advice to approximately 560 users in our department. This person was hired this fall and is a recurring cost. We recently hired 15 new faculty and increased the size of our graduate and undergraduate program. We anticipate continued growth of our program. With the addition of this person, we are able to serve our mission by providing better support for our faculty and students better. Total: \$60,000

Life Cycle Replacement of Technology Classroom equipment. We have instituted a life cycle replacement and upgrading for the AV equipment in our technology classrooms. Our projected replacement needs for the 09-10 academic year is \$29,000

Software Licenses. We use dozens of different visualization, modeling, and analytical software programs in our classes and are required to pay yearly licensing and service fees

on most. Analysis and interpretation of geoscience data relies heavily on computers and specialized software programs. Our students can expect to use these same packages in their professional careers and thus the hand-on experience they receive in class is valuable to them and to the companies that recruit our graduates. Many of these programs are donated or provided to us at low cost, but others are not or we are still required to pay yearly licensing and service fees on the more complex packages. Three of the more expensive packages, ArcInfo, Comsol and VGStudio Max, are a recurring cost. We use ArcInfo to collect, manipulate, and analyze graphical and map data in lecture and field courses, VGStudio Max is the principal visualization package that we use in the Digital Morphology Visualization teaching lab, and Comsol is a modeling software is used by the hydrogeology program. With the addition of 3 new faculty involved in climate modeling and 2 additional computational geoscientists, we will have an increase in the need for new software licenses for classroom use. Total: \$30,000

One-Time Projects - H

Modern Field Mapping and Data Logging Equipment For Undergraduate Field Courses (GEO420K and GEO660) and the GIS/GPS Applications Class (Geo327G/386G)

Traditional techniques of measuring and recording geological observations in the field are rapidly being subsumed by digital technologies. Ruggedized field tablet computers and field personal digital assistants (PDAs), digital cameras, GPS receivers, digital geospatial data (e.g. digital topographic maps and orthophotographs) and Geographic Information System (GIS) software are complementing and in some cases replacing paper maps, aerial photographs and field notebooks. Our field courses began to integrate advances in these areas as early as 1996, and we have continued to do so, in a limited way, with the purchase of 45 “recreational-grade” and a few “mapping grade” GPS receivers, and three outdoor tablet computers. ITAC funds purchased of our first group of GPS receivers in 2002; our last purchase of was in 2004. This equipment has seen heavy and, like all student field equipment, hard use. Most of it has exceeded its expected lifetime and is no longer functional, despite periodic replacement of broken units. Our most pressing current need is 45 new recreational-grade GPS receivers to replace our existing stock. These are now an integral part of our undergraduate field courses (Geo420K, Geo660), which in the last 3 semesters contained a combined 130 students, with further growth expected. In addition to acting as stand-alone units, these receivers will also interface with the digital mapping equipment described below.

GPS receivers: 45 @ \$420/unit = \$18,900.

Our attempts to integrate anything more than hand-held GPS receivers into our field courses and into other undergraduate classes with a field component have been severely hampered by a lack of equipment. Our student field GIS/GPS digital mapping equipment consist of 3 aging field tablet computers and a single, 5 year old Trimble mapping-grade receiver. This equipment has also been heavily used, mainly by the ~ 40 students who annually enroll in our GIS/GPS Applications in Earth Sciences class. A new generation of cheaper, lighter, more rugged units with brighter outdoor screens and substantially longer battery life has matured over the last 5 years, as has complementary mapping software. Use of this equipment is now routine among professionals. Students in our

field class would benefit greatly by having access to such equipment, even if shared among small groups. Teaching experience with nearly all of the available hardware in this area (i.e. GPS/GIS-equipped PDAs, similarly equipped tablet computers, mapping-grade GPS receivers) in the past 8 years demonstrates that the most cost-effective and sturdy units for student use are ruggedized field PDAs that interface with standalone GPS receivers, like those requested above. Ruggedized PDAs adequate for field mapping use can be purchased from a number of manufacturers for about \$1300/unit. GIS/GPS software (i.e. ArcPad) for these units is available as part of the Department's ESRI site license. Twenty of these units would permit shared use among GEO660 students and individual use by students in our GIS/GPS applications course.

PDAs: 20 @ \$1300/unit = \$26,000.

Addition of this equipment to our teaching program will help us meet our goal of developing the finest geoscience curriculum in the world by enhancing the students' ability to use critical technology in the field to understand geologic structures and processes.

Innovative Support of Student Learning – Petrology labs - H

Digital visualization methods have changed the way geologic data is gathered and analyzed and have opened up a wide array of innovative ways to increase student learning. An integral part of geosciences is understanding the petrology of igneous, metamorphic and sedimentary rocks formed in the crust and uppermost mantle, with the core skill being analysis of thin sections of rocks under a petrographic microscope. Our current petrology teaching laboratories were designed for the past, with long benches facing windows to optimize light that could be reflected off mirrors into microscopes, despite the fact that all microscopes now have electric lights! Although we have highly sophisticated petrographic microscopes for research with the ability to do image analysis, digital photography, and specialized experiments and analysis, our students are not exposed to these fundamental techniques in our courses. Moreover, many innovative methods for increasing student learning of petrology have been developed and successfully introduced at other institutions. Addition of this equipment and lab design to our teaching program will help us meet our goal of developing the finest geoscience curriculum in the world by enhancing the students' ability to understand, analyze and interpret the petrology of rocks making up the Earth's crust and upper mantle.

We propose to redesign our microscope rooms with clustered microscopes facing inward with easy viewing of a large central display screen. Each microscope will be equipped with a digital camera so that 1) students can direct what's on their scope to the central display screen so that the instructor and the entire class can observe and discuss, and 2) students can record images for review and for their own personal archive. It's key here to have good, hi-resolution, actual digital cameras. Each student needs to have the capability to save high-quality images---and for this they need their own screen and computer access for composition, focusing, and brightness and contrast assessment plus an internet connection so that they can bring up articles, images from elsewhere, etc. during class for discussion, etc. Many digital teaching materials are available and will form an integral part of the students learning. Our undergraduate lab will be equipped

with 20 and our graduate lab with 12 new microscopes with the ability to attach a video camera. Funds for the undergraduate microscopes will come from the department's Undergraduate Instructional Equipment Fund, and for the graduate student lab we will request use of endowed curricular funds. Although all cameras will be networked into a central computer attached to a LCD projector, as well as attached to a high resolution monitor, students will want to use their own laptops as well to store, annotate, analyze and manipulate the images.

Undergrad lab: 20 cameras @\$3,000X 20 = \$60,000; high res screens @ \$350 X 20= \$7,000

Grad lab: 12 cameras @\$3,000 X 12 = \$36,000; high res screens @ \$350X 12= \$4,200

For each lab, central computer (\$1400) and LCD projector (\$1500), \$2900X2=\$5800

Total \$113,000

OVERVIEW OF CURRENT IT PROGRAMS AND INFRASTRUCTURE

Vision/Mission/Goals of the Jackson School of Geosciences

Mission: To advance understanding of the Earth, its resources, systems, and environment, for the lasting benefit of humankind.

Vision: To become the preeminent geosciences program in the country with international prominence in geology, geophysics, energy, mineral and water resources, and in the broad areas of the earth sciences, including the Earth's environment. To realize this vision, the Jackson School will pursue initiatives that

- Place the school at the forefront of research.
- Place the school at the forefront of education, student services, and student opportunities.
- Create the fabric of a great college.
- Increase our competitiveness for top talent.

The Jackson School's goal is to develop the finest geoscience curriculum in the world and to provide world-class, state-of-the-art teaching facilities using IT resources to implement best practices for student learning in the geosciences. To do so we need to create and maintain flexible, modern technology classrooms, state-of-the-art teaching laboratories, and the ability to use critical technology in the field. With the recent hiring of 15 new faculty, we will significantly broaden and expand our curriculum into new frontier areas. As our School continues to grow, our continued need for IT resources is paramount.

Department of Geological Sciences, located in the Geology building, is the sole department within the school. It serves our own 291 undergraduate and 182 graduate students as well as approximately 3,000 non-major undergraduates who take our diverse earth science courses as electives each year. Our undergraduate enrollment has expanded by 64% since we became a separate college in the Fall of 2005 and our graduate enrollment is one of the largest in the country.

IT Organization

The Jackson School of Geosciences consists of one academic department and two organized research units, the Institute for Geophysics and the Bureau of Economic

Geology. Each unit maintains its own IT personnel and structure and functions independently. This fall, the School set up an ad hoc IT committee to review and coordinate intra-school IT needs; the committee is composed of a senior systems analyst from each unit, 3 full time faculty, 1 faculty member with a joint appointment in each unit, and 1 research scientist from the Institute for Geophysics.

The department, which has sole responsibility for the academic program, currently has 2.75 FTE of classified staff positions to maintain the servers, network, instructional equipment, desktop computers (both PC and Mac), workstations (Linux), student computer labs and teaching labs, and provide end-user support for faculty, students, and staff. The department has an IT steering committee that assesses IT needs and priorities of the educational program and is composed of 3 faculty, an undergraduate student, a graduate student, and our IT staff.

IT Infrastructure

IT system:

In the department we maintain twelve servers that include web hosting, data storage, and shared software and licenses. We also have a server infrastructure that supports Citrix Provisioning Server, that has 80 lab and classroom computers that boot from shared virtual disks over the network. We have an aging Cisco 6500 router and eight ageing 48-port switches in the old wing that can handle 10/100Mb bandwidths and 60 ports that support 1Gb. There are a similar number of switches in the new wing. All switches in the old and new wings connect to the router with 1Gb fiber and the router is connected to the rest of the university with 2 1Gb fiber uplinks. We do not have a departmental firewall at this time. Individual desktop computers have security software from BevoWare. The Jackson Geology Building is nearly completely covered by the UTMNet wireless network with denser coverage in the larger classrooms.

Starting in January 2009 we will also occupy most of the top two floors of the E.B. Schoch building. We are in the process of upgrading the networking in this building with a Cisco 4500, which will allow more drops to offices and labs, and provide 1Gb to some workstations. The upgrade of the network will also have 10Gb connectivity between the two buildings and the other two Jackson School units on the Pickle campus.

IT – equipped classrooms and student labs:

The department has two computer classrooms: 1) a lecture style room primarily used for lectures and labs that integrate software demonstrations, 3D visualizations, and problem solving software; this classroom has 21 computers with 4 gigabyte RAM and dual monitor 20” screens and a large format printer. 2) a geophysics lab used in labs by students to analyze and interpret seismic data with 10 high performance workstations (2 CPU, 2.33 GHz, 8 Gigs) with 2 24” monitors all connected to a Sun SPARC Enterprise server (for Landmark, Mat Lab, etc.) with Sun StorageTek SAS Array – 9 TB Disk Space to hold high-end data, plus a large format printer.

The department has two student computer labs, one with 20 PCs and two printers for all students to use for more routine tasks (homework, word processing, email, etc.) and a higher end lab with 27 computers with 4 gigabyte RAM and single monitor 20” screens and two printers and a large format plotter for upper division undergraduates and graduate students. Using Citrix Provisioning Server, the computer lecture classroom and

high end student computer lab have the same image, and students can have the same software in the computer labs as they use in the classrooms to work on assignments and projects. In addition, the Citrix Provisioning Server allows the same computers to be used for both PC and Linux with a simple reboot to change the operating system, which greatly increases our flexibility in teaching. The geophysics and general purpose computer labs also use the Citrix Provisioning Server infrastructure to allow flexibility and speed in deploying new systems and software to our students.

The department also has a Digital Morphology Visualization lab containing seven high-end PC workstations running 64-bit Windows operating systems with a suite of specialized 3D visualization and graphical processing software. In addition to paleontology, there are many other potential Earth Science applications of this facility in geophysics, hydrogeology, and other fields.

The Jackson Geology Building has 19 technology classrooms with LCD projectors, PCs, Macs, and Doc cameras. Of these, 8 are used for labs associated with lecture classes and the rest are general purpose classrooms.

Security:

Our program-specific technology classrooms and labs are all protected by Locknetics SmartLocks. All faculty, staff, and students have been issued an iButton instead of keys to these rooms. Because of the different scheduling needs of the general purpose classrooms, we did not put SmartLocks on those rooms. The locks, door closers, software, and dedicated laptop for the security database were purchased with departmental and other funds.

Current and Proposed Funding Sources

ITAC allocation (08-09: \$78,517 for infrastructure and \$19,000 for one-time project use) is currently being used, as described above, to pay salary and fringe for our end-user support person who provides daily trouble-shooting and operational advice to approximately 560 users in our department, software licenses and annual fees, and life cycle replacement of our AV equipment in our technology classrooms and computers in our computer labs and teaching classrooms. We are requesting continued support of these activities.

Income from flat-rate tuition tech fees portion (08-09: \$129,000) currently covers the salary for 1.75 FTE IT staff; it is our expectation to continue to cover these costs through this funding source.

Endowed Jackson School funds of \$33,000/year have been promised to the Department starting 08-09 for deep cleaning the larger lecture halls twice a year and to pay the yearly cost of having CNS IT group provide daily maintenance (salaries for fluffers/help desk) our technology classrooms.

We propose to use funds from the Undergraduate Instructional Equipment fund to purchase microscopes for the new undergraduate petrology labs to go with the requested IT support.

Best Practices

We have implemented the use of Citrix Provisioning Server infrastructure which allows: 1) use of the same computers to run both PC and Linux operating systems; 2) our

teaching classrooms and student labs to have the same images so that students can do assignments and projects in the lab at all hours rather than have to schedule around classes in the lecture room; 3) more efficient use of IT staff time in that to update software, etc., they only need to change one computer and it is propagated to all; which in turn provides a better end-user experience because all of the computers are uniform with up to date software.

We have changed to using a print quota server hosted on a virtual server from ITS for all student printing which allows us to regulate the amount of color and black-and-white prints per student and eliminates significant waste.

We have moved all our students over to file storage through ITS which has many advantages. Students (and faculty) can connect through Web and see their data anywhere, not just in the building. Not only can they get to data easier, when they log on, they can use it as a terminal server and have access to communal ITS software including Microsoft office software, Mat Lab, etc. All the data is backed up externally, and we need fewer servers overall so that we use less space and require less staff maintenance.

We are in the process of migrating to the Austin domain. This allows a single logon for users and should help make us more efficient. We have moved administrative and committee files and data to a SharePoint site so that all sensitive data is protected but easily accessible by appropriate staff and faculty.

USE OF PREVIOUS ACADEMIC YEAR ALLOCATIONS

Allocation: The Jackson School received ITAC funds for recurring and infrastructure costs totaling \$78,517 and for special projects totaling \$19,000 for AY '08-09.

Request: We requested recurring and infrastructure expenses totaling \$182,500 for the following purposes: End-User IT Support (1.0 FTE) \$60,000; Annual Maintenance of 19 Technology Classrooms \$25,000; Deep Cleaning of Classrooms \$12,000; Replacement of 12 LCD projectors in Technology Classrooms \$36,000; Student Computer Lab (life cycle) \$30,000; Classroom Printers (life cycle, standardize) \$5,000; Software Licenses (VGStudio Max, Comsol, ArcInfo) \$14,500. For One-Time Special Project Allocations we requested \$155,000: Citrix infrastructure \$97,000; RAID array for data storage \$10,000; renovate 2.108 (first technology classroom) \$20,000; Solaris Unix server \$28,000.

Use of funds: This year from infrastructure and recurring funds, we have hired an end-user IT support person, we have replaced the LCD projectors, the student computer lab computers, and student printers, and as they come due will cover the software licenses. Of One-Time Special Project items, we did all but renovate 2.108. Even with some unexpected price reductions, these total costs exceeded that provided by ITAC. Because our needs were so critical and we were no longer providing adequate facilities for our students, the Jackson Fund provided extra funds on a one time basis to supplement the ITAC allocation.