JACKSON SCHOOL OF GEOSCIENCES
ITAC VISION PLAN, AY 2008-2009

SUMMARY OF REQUESTS

The Jackson School of Geosciences (JSG) is requesting a total of $182,500 for recurring and IT infrastructure expenses, $155,000 for one time special projects, and $168,000 for innovative support of student learning using IT for AY 2008-2009.

Infrastructure and Recurring Expenses	**$182,500**
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
One-Time Special Project Allocations	**$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
One-Time Innovative Support of Student Learning	**$168,000**
Tablet computers/PDAs for GIS & field mapping	$55,000
Digital assisted petrology laboratories	$113,000

OVERVIEW OF CURRENT IT PROGRAMS AND INFRASTRUCTURE

Vision/Mission/Goals of the Jackson School of Geosciences

The Jackson School's goal is 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 and state-of-the-art teaching laboratories that match the quality of our curriculum and allow us to expand that curriculum into new frontier areas. We intend to

systematically renovate and upgrade our classrooms and teaching laboratories. Although we were once on the leading edge – having the first technology auditorium and the first technology teaching laboratory in the university – we have not been able to keep pace with the need for constant upgrading of equipment or been able to implement new innovative teaching technologies.

Department of Geological Sciences, located in the Geology building, is the sole department within the school. It serves our own undergraduate and graduate students as well as approximately 1,500 non-major undergraduates who take our diverse earth science courses as electives each year. Our undergraduate enrollment has expanded by 53% from 177 to 271 majors since we became a separate college in the Fall of 2005 and our graduate enrollment is one of the largest in the country at 157 students.

Integral to our instructional activities are the 19 technology classrooms and labs in the Geology building. Six are general purpose rooms while the rest are specific to our academic unit (see table at the end of this document). Keeping the equipment up to date and in good working order and providing adequate security for the rooms are top priorities for us.

Geoscience investigations are unique in their broad use of both visual and analytical methods. We use specialized software in many of our courses to teach students specific skills, to display complex three-dimensional images and demonstrate analytical and interpretation techniques, and to help prepare students for professional careers in which they can expect to use these same software products. Technological advances have created innovative digital approaches to teaching highly visual material which we wish to incorporate into our curriculum.

IT Programs Requiring Recurring Funds

Geoscience IT infrastructure and other programs that require recurring funds fall into two categories: support staff salaries and maintenance of equipment. The Department currently has approximately 2.0 FTE of classified staff positions to maintain the servers, network, instructional equipment, desktop computers, student computer labs, and course websites as well as provide end-user support. One FTE is a full time person whereas the other is divided between several individuals with other responsibilities, primarily helping students with the use of software and trouble shooting technical problems associated with class work or thesis research. With around 500 fixed and mobile users (faculty, students, and staff), our ability to provide end-user support is stretched unacceptably thin. For the last year we have contracted with ITS to get a part-time person so that we can try to cover immediate, short-term needs. Our request for salary for an end-user support person (1.0 FTE) is a high priority for our ITAC proposal this year.

Continued maintenance of our technology classrooms is critical to our ability to serve our growing student population. Life-cycle replacement of equipment, standardization of equipment, and expansion of some rooms are important recurring IT expenses.

IT Infrastructure

We maintain twelve servers that host web, more than 500GB of data, and shared software and licenses. They are attached to a tape backup system. During Spring of 2007 with our ’06-07 ITAC allocation, we upgraded our servers so that we could do a first

level backup with a set of dedicated hard drives and initiated the use of a virtual server. We have a Cisco 6500 router and eight 48-port switches in the old wing that can handle either T10 or T100 bandwidths. There are a similar number of switches in the new wing. All switches in the old and new wings connect to the router with fiber. We do not have a departmental firewall. Individual desktop computers have security software.

Our program-specific technology classrooms and labs are now 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.

The Geology building is nearly completely covered by the UTNet wireless network with denser coverage in the larger classrooms. Expansion of wireless coverage was accomplished in Fall 2006 with the help of the College of Natural Sciences.

We have a teaching classroom with 21 desktop PCs networked to a server and a printer. This classroom, one of the first technology classrooms to be built on campus, is in heavy use during the long semesters because students can obtain hands-on experience in creating and running a variety of computer models.

The Department maintains an undergraduate computer lab with 12 computers and two printers. We have a graduate computer lab with 20 computers, a large-format color plotter, and two printers.

All faculty, research staff, administrative staff, and most graduate students have personal computers which are attached to the building's network. Most printers are networked, although classroom printers are reserved for classroom, not administrative or research, use.

Our Digital Morphology Visualization lab became operational in Spring of 2006. The lab contains 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. College of Natural Sciences (CNS) ITAC funding from '05-06 was used to help build this exciting new instructional lab. Products generated through teaching and research in the lab are used as lecture components in many of our non-major undergraduate courses.

Current and Proposed Funding Sources

Maintenance and expansion of our IT infrastructure is funded by the Undergraduate Instructional Equipment fund, our ITAC allocation, and unrestricted Jackson School funds provided to the Department.

Best Practices

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 by outsourcing some of the current mundane tasks so that our IT staff have time to work on more critical matters. We have also moved all 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

The Jackson School received ITAC funds for recurring and infrastructure costs totaling $78,517 and for special projects totaling $20,000 for AY ’06-07. We outsourced the daily maintenance of all 19 technology classrooms in the Geology building to the College of Natural Sciences IT group and, based on their recommendation, had the large classrooms cleaned twice during the year. We started the process of upgrading the technology classrooms, maintained the printers, and used some of the money for software licenses for new modeling software. We used our one-time projects allocation to upgrade our servers to do a first level of backup with a set of dedicated hard drives and to initiate use of a virtual server. The table below summarizes our use of these funds. All of the items listed below were included in our AY ’06-07proposal.

Jackson School Use of ’06-07 ITAC Allocation

Infrastructure - total	**$78,517**
Technology Classroom Maintenance	$20,000
Classroom deep cleaning (twice x 6 rooms)	$12,300
Licenses for modeling software	$5000
Replacement & upgrading of technology classroom equipment (7 doc cameras, LCD projector for 2.324 – large auditorium, 5 flat screen monitors, 6 PC computers)	$31,000
Printing supplies (toner, ink cartridges, etc.)	$10,200
One-time Projects	**$20,000**
Department Server Upgrades (PowerVault MD 1000 Rack, 15 Bay external storage array; Dual Core Xeon Processor) to do first level of backup and initiate use of a virtual server.	$24, 000

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 different operating systems and software. This requires separate labs, significantly more computers, or a mechanism for easily changing systems and software. Although we were once at the forefront, most of our technology classroom hardware is more than 4 years old and is designed for an older, standard delivery of material. Technological advances have made more effective teaching of highly visual material possible with properly designed classrooms. We need to renovate and upgrade our computer classrooms and at the same time integrate state-of-the-art

digital methods for increasing student learning. Solutions to each of these needs are addressed in the following sections.

Infrastructure Needs

End-User Support – high priority. We are requesting salary and fringe for an end-user support person to provide daily trouble-shooting and operational advice to the nearly 500 users in our department. The ratio of user to available support services is not acceptable for a department of our size and with our level of computationally intensive instruction and research. With the expected continued growth in our undergraduate program, funding for this position is a high priority for us. We currently contract with ITS for a part-time person to cover immediate, short-term needs, but this is insufficient for current needs let alone an expanded program. A dedicated staff person who can provide end-user support will allow our IT manager to engage in long-range planning and implementation of our strategic goals. Additionally, we will serve our mission by providing better support for our faculty and students better. Total: $60,000

Annual Maintenance of Technology Classrooms – reoccurring needs. Outsourcing the daily maintenance of all 19 technology classrooms in the Geology building to the CNS IT group has proven to be extremely cost-effective. The rooms are clean, all of the equipment works, and user satisfaction is very high. When users do have problems with equipment or connectivity, the CNS IT team responds within minutes. We have included this cost in our ’08-09 proposal. On the recommendation of the CNS IT team, we now do have the large classrooms cleaned twice a year. Seat fabric, carpets, even acoustic wall boards are steam-cleaned and gum and stains are spot-cleaned. It is important that we create a positive atmosphere for all students using our building. Total: $37,000

Replacement and upgrading of technology classroom equipment – short term, high impact projects. Last year we initiated the replacement and upgrading of the equipment in our technology classrooms. This process will take several years to complete. CNS has identified 12 LCD projectors in our classrooms that need to be replaced in the immediate future for us to be able to continue to provide visually acceptable presentations. Total:$36,000

Teaching and Student Computer Labs – short term, high impact projects. We would like to initiate a life-cycle replacement program in our student computer labs and expand the undergraduate lab by adding more desks and computers. Even though many students have their own computers, they use the labs to prepare course assignments as well as posters and presentations for meetings and other professional activities. Some computers in the undergraduate computer lab are hand-me-downs from faculty and staff. While we believe that we provide our students with a superior set of research tools in our labs and classrooms, the dramatic increase in our undergraduate program is a signal that we must be prepared for increasing demands on already old hardware. The proposed life-cycle replacement program will help address this issue. Additionally, to standardize printing for all of our users, we would like to begin a life-cycle replacement program for classroom and teaching lab printers. If we purchase several printers of the same vintage,

make, and model then we can realize some economy of scale in purchase of toner and other supplies and standardize the user printing experience. Total: $35,000

Software Licenses. The practice of modern geosciences requires us to examine and manipulate many different types of images and data. Our ability to interpret these data relies heavily on computers and specialized software programs. We use dozens of different visualization, modeling, and analytical software programs in our classes. 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 we are still required to pay yearly licensing and service fees on the more complex packages. We have included the yearly maintenance fees for three of the more expensive packages, ArcInfo, Comsol and VGStudio Max, as a recurring cost in our request. 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. Total: $14,500

One-Time Projects

Citrix Computer Upgrades

We propose to make our entire IT infrastructure flexible and dynamic by purchasing Citrix servers and software that provides "a comprehensive application delivery infrastructure that leverages server, application and desktop virtualization". In doing so, we will set up virtual servers that will maximize the use of our classroom facilities and allow us to expand into new frontier areas of the geosciences, most of which are computationally intensive. Concurrent with this change in our IT infrastructure, we wish to upgrade two of our heavily used computer classrooms.

With the Citrix Computer software, we will no longer need separate UNIX and Microsoft computer labs. One professor could teach a class with Landmark Geographic GIS software on Linux, and then an hour later another professor could teach a class with Arcview GIS on Microsoft. Currently, we have two classroom computer labs, GEO 3.216B and GEO 2.108. These labs have very different teaching environments. GEO 3.216B is for more computing intensive, geophysical research with a layout promoting conferencing and 2.108 has twice as many computers for larger classes, with everyone facing the front projecting screen.

Our vision is to install the Citrix Software in these 2 computer labs, 3.216B with new higher end, computational intensive computers, and 2.108 with a larger quantity of new lower end computers. The 3.216 Computer Lab has eight SGI Unix computers that are seven years old, and badly need to be replaced. With new, high end computers, we will be able to install additional computationally intensive software for climate and hydrological modeling, finite-element modeling, and other geophysical modeling. We would also need a RAID array to manage the terabytes of data generated by these programs. For most GIS software, it is extremely useful to have two monitors, for example one monitor for a map, and the other one for the seismic data selected on the map or databases. When no classes are taking place, students working independently would be able to choose which application on either Unix or Microsoft Windows, they

would like to use. In the labs, one student could use a Microsoft OS based application, next to another using a Unix based application.

The greatest advantage with this proposal is instructors would be able to chose which classroom lab they would prefer, regardless of application, or OS required by that application. The lab would become a teaching tool for many more students than it currently serves.

Costs of Citrix Computer Upgrades
Citrix Software, around 30 computer licenses, 30x$600 = $18,000
Computer replacements for 2.108 21x$1,400 each = $ 29,400
Computer replacements for 3.216B 8x$3,500 each = $28,000
Citrix Servers, two are needed 2x$8,000 = $16,000
Disk Space for users and applications, $6,000 = $6,000
Total $97,400

Raid array for data storage: $10,000

Renovation of Original Technology Classroom. GEO 2.108 was one of the first technology classrooms to be installed by CNS. The technology in this room is far from standard in appearance and operation compared to other rooms and is now more than 5 years old. The classroom, which contains 21 desktop PCs linked to a server, is in high demand among the geoscience faculty because students can work on computationally complex problems in a classroom setting and receive immediate feedback and help. As discussed above the computers will be replaced and dual monitors will be purchased for each computer for visualization and manipulation of multiple interrelated data or image types. Concurrent renovation will include rewiring the room to install a touchpad for starting the audiovisual system, lowering the screen, controlling the lights, etc., installing a podium-style console to house the equipment, and replacing the projector, document camera, and PC. Additionally the computers will be set up so that whatever the professor is projecting on the screen can be shown on all of the computers.
Renovation: Total: $20,000

Solaris UNIX Server. Another important but somewhat lower priority item is the purchase of a high end Solaris UNIX server. In the past, we have purchased one or two low end desktop Solaris UNIX servers because we never have had sufficient funds in one year to purchase a high-end server. Because students want the fast computing power available, they all log onto the same, most recently purchased desktop, and the minimal resources are quickly used up, which forces some users onto even slower Solaris desktops from previous year purchases, which they must log on to individually and check what resources are available. UNIX computers can be used remotely as easily as locally, sitting directly in front of the computer. The modern approach to using UNIX computers is to spend a lot of money on one high end server that can support many users concurrently. This server would be able to process a Matlab program that would normally take days, in just a few hours.
Total: $28,000 High-end Unix Server – (for example SunFire X4500 Thumper)

Innovative Support of of Student Learning

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. We have two proposals for innovative projects with cutting-edge uses of IT to support student learning.

Petrology labs: An integral part of geosciences is understanding the petrology of igneous, metamorphic and sedimentary rocks formed in the crust and uppermost mantle. Our current petrology teaching laboratories were designed 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.

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-res, actual digital cameras (regular, not cooled-CCD). 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

Integrating Ruggedized Tablet Computers/PDAs Into Introductory and Advanced Field Methods Courses (GEO420K and GEO660)

Traditional techniques of measuring and recording geological observations in the field are rapidly being subsumed by digital technologies. Ruggedized tablet computers and 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 complimenting and, in some cases, rapidly replacing traditional use of 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" GPS receivers, 3 outdoor tablet computers, 3 "mapping-grade" GPS receivers, licensing for GIS software and a senior elective course in GIS/GPS Applications in Earth Sciences (GEO327G). Although we presently have enough handheld GPS receivers for shared use in our large enrollment (~ 60 students) introductory (GEO420k) and more advanced field geology (GEO660; ~ 35 students) courses, field instruction that integrates tablet computers and mapping-grade GPS receivers is presently limited to field trips associated with the senior elective GIS/GPS class. With an enrollment each semester of 20 students, even this arrangement is less than ideal, with 3 or 4 students having to share one instrument. With the maturity of outdoor tablet computers/PDAs, GPS and GIS software integration, the increasingly greater use of these instruments by employers of our graduates, and with nearly 10 years of experience in integrating these instruments with traditional field instruction, the time has come to make GPS- and GIS-equipped tablet computers and/or similarly equipped PDAs available to students in our all of our field courses. To do so requires a substantial increase in our present inventory of instruments. Outlined below are 2 options, one based on the purchase of PDAs and another based on the purchase of tablet computers, that would allow enough instruments for pairs of students in GEO420k to share one device.

PDA option:
Ruggedized PDAs with a built in GPS receiver or with accessory slots that can accommodate a GPS are available from a number of manufacturers for about $1500. This is a small fraction of the cost of a state-of-the-art "mapping grade" GPS receiver (e.g. Trimble Geoexplorer), which is about $5500. We have taught field exercises with GPS-equipped PDAs and have found them perfectly adequate for field instruction. Though lacking the larger screen "real estate" of a tablet computer, longer battery life, a light weight form factor, a brighter outdoor screen, and relatively simple GIS software make these in some ways superior to tablets. 35 of these instruments could be purchased for about $55,000. The Department annually renews software licenses that include the GIS software (ArcPad) needed for these instruments. 20 of these instruments ($30,000) would allow all those enrolled in the senior elective class individual access and permit pairs of GEO660 students to share but would not be enough for use in GEO420K.

Tablet computer option:
Tablet computers have the advantage of a larger screen and, with a standard Windows operating system, run the same software available on desktop or laptop machines. For field use they suffer from greater weight and shorter battery life. We have tested, with students, the two most commonly used tablets for geologic mapping and data collection, the Xplore tablet PC and the Panasonic Toughbook. We presently own 3 Xplore tablets. To purchase an additional 18 of these, with spare batteries, carrying harness/case, and spare stylus, at about $3,000/unit, would be $54,000.
Preferred option: 35 Ruggedized PDAs with a built in GPS receiver = $55,000

Room	Classification	Physical	Additional Media
2.102	GP	old wing classroom	connection for laptop
2.108	GEO lab	old wing computer laboratory with card reader lock	VCR, color printer
2.202	GP	new wing classroom; no blinds	connection for laptop, VCR, Mac
2.216	GP	new wing classroom; no blinds	connection for laptop, VCR, Mac
2.218	GP	new wing classroom; no blinds	connection for laptop, VCR, Mac
2.306	GEO lab	old wing classroom	no connection for laptop
2.308	GEO lab	old wing classroom	no connection for laptop
2.310	GEO lab	old wing classroom	no connection for laptop
2.324	GP	new wing lecture hall	connection for laptop, VCR, Mac
3.104	GEO lab	old wing hydro lab	
3.106	GEO lab	old wing paleo lab	
3.108	GEO lab	scope lab	
3.114	GEO lab	scope lab	
3.116	GEO classroom	old wing classroom	
3.120	GEO classroom	old wing classroom	

3.202	GEO classroom	new wing small classroom; no blinds	connection for laptop
3.204	GEO classroom	new wing classroom; blinds	connection for laptop
3.218	GEO classroom	new wing classroom; blinds	connection for laptop
3.222	GP	new wing classroom; blinds	connection for laptop, VCR