Georgia Southern University
Statesboro, Georgia 30460
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Department of
Geology and Geography

Student Handbook

Version 2.00
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Experience is the hardest kind of teacher.
It gives you the test first,
and the lesson afterward.

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Introduction

Welcome to the Department of Geology and Geography at Georgia Southern University!

Selection of a major is probably one of the most important decisions you have made in your life so far. The faculty and staff of the Department are pleased to have you join us and we will do our very best to make your undergraduate studies rewarding and enjoyable.

As our name stipulates, this Department encompasses two closely related disciplines. If you want the text book definition: "Geology is the scientific study of the Earth." That is not too inspiring, so let us try this, "Geology is the science concerned with the Earth's past, present, and future." Or . . . "Geologists seek to understand how the Earth works and they apply this knowledge to unraveling the planet's history and anticipating its future." We will skip dictionary definitions of geography altogether and try to do better. We could say: "Geography concerns the relationships between location and all aspects of the physical, biological, and human worlds." Or . . . "Geography concerns the rich variety of events, peoples, landscape, climate, and biology that characterize the Earth's surface." However we choose to define our disciplines, we recognize both the intellectual and applied aspects of our fields.

As geologists and geographers ourselves, the faculty shares your fascination with the Earth, its internal and external processes, its 4.6 billion-year history, and the biological, cultural, and physical interactions upon its surface. We wish to share our knowledge and experiences with you, not just in the classroom, but also in laboratories and in the field. In both geology or geography, we will offer you a broad range of courses from which we will help you select those that best meet your individual needs. We will strive to keep you informed of the latest breakthroughs in the ever-changing Earth sciences field.

Just as we work hard to teach our classes, conduct research, and serve the community to the best of our abilities, we expect a similar commitment from our students. Although we

will provide instruction and guidance, you must take responsibility for your education. Above all, remember you are in college to learn. Just as there are no right answers in science unless you ask the right questions, you will not reach your educational goals unless you first establish them. Here is how you can start to do that. First, evaluate your academic strengths and weaknesses honestly; then build on your strengths and shore up your weaknesses. Second, realize that your attitude will be a key factor in how much you accomplish. If you enjoy learning, you will be prepared, punctual, and engaged in your education. Finally, know that as your professors we want you to learn and achieve academic success. However, we do not determine your grades -- you do. Every member of the faculty knows that studying and learning is hard work. We also know that learning is one of life's greatest joys. Working together we can create a vibrant, exciting, and enjoyable learning environment.

Any suggestions from students for improving the content of this handbook or for additional topics that might be covered are welcome and should be forwarded to any faculty member.

Dallas D. Rhodes, Chair
Department of Geology and Geography

GEOLOGY AND GEOGRAPHY FACULTY

More information on each faculty member in the Department of Geology and Geography can be found through the Department's Internet Web site at <http://cost.GeorgiaSouthern.edu/geo/Faculty.html >. The year in parenthesis on the first line of each entry indicates when that individual started at Georgia Southern. Some duplication in the listing of instructors for major's courses occurs because some courses are team-taught and others are taught sequentially by different individuals. The listing of a course does not guarantee that it will be offered over the short-term.

Clark R. ALEXANDER Jr. Adjunct Professor of Geology (1994)

Field(s) of Specialization: Marine Sedimentation
Education: B.S. Humboldt State University (1983); M.S. North Carolina State University-Raleigh (1985); Ph.D. North Carolina State University-Raleigh (1990)
Majors Courses Instructor:
Awards and Honors:
Senior Thesis Research Areas: Rates and processes of sediment accumulation and strata formation in estuarine, coastal, shelf, and slope environments; history of anthropogenic impacts on the coastal zone; sediment dynamics and coastal erosion.
e-mail: Clark@SkIO.peachnet.edu

Pranoti M. ASHER Associate Professor of Geology (1997)

Field(s) of Specialization: Igneous Petrology and Geochemistry
Education: B.Sc. (Geology), University of Bombay (1984); M.Sc. (Geology), University of Bombay (1986); Ph.D. (Geology), University of Connecticut (1995).
Majors Courses Instructor: GEOL 3541; GEOL 3542; GEOL 4530; GEOL 5132
Senior Thesis Research Areas: Igneous processes in large basaltic dikes and flood basalts, particularly in the eastern United States; Geochemistry and spectral analysis of zeolites, serpentines, clays, sulfates, and carbonates.
Awards and Honors: NSF-NAGT Workshop of Early Career Faculty (1999); NSF-NAGT-DLESE Teaching Petrology in the 21st century Workshop (2003)
e-mail: PAsher@GeorgiaSouthern.edu

Denise A. BATTLES Professor of Geology, Associate Dean, College of Science and Technology (1990)

Field(s) of Specialization: Geochemistry; Igneous and Metamorphic Petrology
Education: A.B. (Geology), Colgate University (1984); Ph.D. (Geology), University of California at Los Angeles (1990)
Majors Courses Instructor: GEOL 5130
Awards and Honors: Project Kaleidoscope Faculty for the 21st Century (1997)
Senior Thesis Research Areas: Petrographic examination of hydrothermally altered rocks; igneous or metamorphic petrology
e-mail: DBattles@GeorgiaSouthern.edu

James H. DARRELL Associate Professor of Geology (1970)

Field(s) of Specialization: Palynology, Geologic Education
Education: B.A. (Geology) Ohio Wesleyan University (1964); M.S. (Geology), University of Tennessee (1966); Ph.D. (Geology), Louisiana State University (1973)
Majors Courses Instructor: GEOL 5540
Awards and Honors: Past President, Georgia Academy of Science
Senior Thesis Research Areas: Beach Processes, Stream Quality, Sedimentology
e-mail: JDarrell@GeorgiaSouthern.edu

Jason N. DITTMER Assistant Professor of Geography (2003)

Field(s) of Specialization: Political Geography
Education: B.A. Jacksonville University (1998); M.A. Florida State University (1999); Ph.D. Florida State University (2003)
Majors Courses Instructor: GEOG 4430
Awards and Honors:
Senior Thesis Research Areas: geopolitics, electoral geography, and urban geography.
e-mail: JDittmer@GeorgiaSouthern.edu

Jonathan H. GEISLER Assistant Professor of Geography (2001)

Field(s) of Specialization: Vertebrate Paleontology, Coastal Plain Stratigraphy
Education: B.S. (Geology) and B.A. (Biology) College of Charleston (1995); M.A. (Earth and Environmental Sciences), Columbia University (1998); M.Phil. (Earth and Environmental Sciences), Columbia University (2000); Ph.D. (Earth and Environmental Sciences), Columbia University (2001)
Majors Courses Instructor: GEOL 1430; GEOL 5141
Senior Thesis Research Areas: Whale and Dolphin Evolution, Paleontology
e-mail: GeislerJ@GeorgiaSouthern.edu

Michael S. KELLEY Research Scientist (2001)

Fields of Specialization: Planetary Remote Sensing, Planetary Geology; Comparative Planetology
Education: B.S. (Geophysics) University of Connecticut (1989); M.S. (Geology) Rensselaer Polytechnic Institute (1995); Ph.D. (Geology) Rensselaer Polytechnic Institute (1999)
Majors Courses Instructor: Geol 4120; Geol 5890
Senior Thesis Research Areas: Planetary Geology, Asteroid and Meteorite Studies
E-mail: MKelley@GeorgiaSouthern.edu

Susan K. LANGLEY Assistant Professor of Geography (2000)

Field(s) of Specialization: GIS, Forest Ecology
Education: B.S. (Biology), University of Oklahoma (1993); M.A. (Geography), University of Oklahoma (1998); Ph.D. (Botany), North Carolina State University (2000)
Majors Courses Instructor: GEOG 3430, 4543
Senior Thesis Research Areas: Ecology, GIS
Email: Langley@GeorgiaSouthern.edu

Soren C. LARSEN Assistant Professor of Geography (2002)

Field(s) of Specialization: Economic, Cultural, Rural Geography
Education: B.S. (English), Illinois State University (1997); M.A. (Anthropology), University of Kansas (1999); Ph.D. (Geography), University of Kansas (2002)
Majors Courses Instructor: GEOG 3230; GEOG 3530; GEOG 4120
Awards and Honors: Fulbright Scholar, International Council of Canadian Studies Graduate Fellow
Senior Thesis Research Areas: Rural culture and economic development; Indigenous peoples; North America
e-mail: SClarsen@GeorgiaSouthern.edu

James S. REICHARD Associate Professor of Geology (1996)

Field(s) of Specialization: Hydrogeology
Education: B.S. (Geology), University of Toledo (1981); M.S. (Geology), University of Toledo (1984); Ph.D. (Geology), Purdue University (1995)
Majors Courses Instructor: GEOL 5541; GEOL 5542
Senior Thesis Research Areas: Local and regional hydrogeology and environmental geology
e-mail: JReich@GeorgiaSouthern.edu

Fredrick J. RICH Professor of Geology (1988)

Field(s) of Specialization: Palynology, Coal Geology
Education: B.S. (Geology), University of Wisconsin (1973); Ph.D. (Geology),The Pennsylvania State University (1979)
Majors Courses Instructor: GEOL 5142; GEOL 5330
Awards and Honors: AAPG Distinguished Lecturer, 1982-83; Full Member, Georgia Southern University Graduate Faculty
Senior Thesis Research Areas: Sedimentology, paleontology, paleoecology
e-mail: FRich@GeorgiaSouthern.edu

Sherry D. RICH Temporary Instructor (2000)

Field(s) of Specialization: Coal Geology
Education: B.S. (Geology), Dickinson College(1974); M.S. (Geology),The Pennsylvania State University (1984)
Majors Courses Instructor:
Awards and Honors:
e-mail: SRich@GeorgiaSouthern.edu

Dallas D. RHODES Professor of Geology and Chair, Department of Geology and Geography (1998)

Field(s) of Specialization: Geomorphology, Neotectonics, GIS and Remote Sensing
Education: B.S. (Geology), University of Missouri (1969); M.A. (Geology), Syracuse University (1973); Ph.D. (Geology), Syracuse University (1973)
Majors Courses Instructor: GEOL 4530; GEOL 5530
Awards and Honors: Phi Eta Sigma (1966); NDEA Title IV Fellowship, (1969-1972); President, Vermont Geological Society, (1975); NASA Summer Faculty Fellowships (1980, 1981); President, The Branner Club of Southern California (1989); W.M. Keck Foundation Grant (1990)
Senior Thesis Research Areas: Tectonic geomorphology of active strike-slip faults; paleoclimatic interpretation of clay dunes; applications of GIS
e-mail: DRhodes@GeorgiaSouthern.edu

Charles H. TRUPE Associate Professor of Geology (1998)

Field(s) of Specialization: Structural Geology, Tectonics, Metamorphic Petrology
Education: B.S. (Geology), George Mason University (1985); M.S. (Geology), University of North Carolina-Chapel Hill (1989); Ph.D. (Geology), University of North Carolina-Chapel Hill (1997)
Majors Courses Instructor: GEOL 3540; GEOL 4120; GEOL 4530; GEOL 5440
Awards and Honors: Sigma Gamma Epsilon (1985); University of North Carolina Kenan Fellowship (1986)
Senior Thesis Research Areas: Structural geology and tectonics of the southern Appalachians; metamorphic petrology; faults and fractures of the Coastal Plain
e-mail: CHTrupe@GeorgiaSouthern.edu

Wei TU Assistant Professor of Geography (2004)

Field(s) of Specialization: GIS, Urban Development, Environmental Issues
Education: B.S. (Geography), East China Normal University (1992); M.S. (Geography), East China Normal University (1995); Ph.D. (Geography), Texas A&M University (2004)
Majors Courses Instructor: GEOG 3741; GEOG 4541; GEOL 4530; GEOG 4543
Senior Thesis Research Areas: GIS and spatial analysis of urban and environmental issues, environmental policy and management.
e-mail: WTu@GeorgiaSouthern.edu

R. Kelly VANCE Associate Professor of Geology (1988)

Field(s) of Specialization: Economic Geology, Igneous Petrography, Geochemistry
Education: B.S. (Geology), University of Kentucky (1978); M.S. (Geology), University of Kentucky (1984); Ph.D. (Geology), New Mexico Institute Mining and Technology (1989)
Majors Courses Instructor: GEOL 3541; GEOL 3542; GEOL 5131, GEOL 5132
Senior Thesis Research Areas: Slate Belt petrology and ore deposits, Precambrian studies in the southwest United States
e-mail: RKVance@GeorgiaSouthern.edu

Mark R. WELFORD Associate Professor of Geography (1993)

Field(s) of Specialization: Biogeography, Geomorphology
Education: B.Sc. (Geography), Coventry University (1986); M.Sc. (Geography), University of Idaho (1988); Ph.D. (Geography), University of Illinois, Urbana-Champaign (1993)
Majors Courses Instructor: GEOG 3134; GEOG 3331; GEOG 3332; GEOG 4130; GEOG 4430; GEOG 4530; GEOG 5530; GEOG 5590
Awards and Honors: Project Kaleidoscope Faculty for the 21st Century (1998)
Senior Thesis Research Areas: Fluvial geomorphology; coastal island conservation and geodynamics; biogeography of Andean cloud forests
e-mail: MWelford@GeorgiaSouthern.edu

DEPARTMENT POLICIES AND STUDENT RESPONSIBILITIES

This handbook was written because faculty and students should have a formal source for information about the Department and its policies. The main purposes of this handbook are to familiarize you with the Department's faculty and facilities and with our rules and procedures. Geology and Geography majors are expected to read this handbook and to be knowledgeable of those sections that apply to them. As your academic career progresses and your circumstances change, you will need to consult other sections of this manual. Students who fail to follow the procedures and rules in the handbook will be warned and will have the consequences for repeat offenses provided to them in writing. These may include loss of privilege to use the Department's equipment or facilities. As students of Georgia Southern University, you are also expected to be familiar with the published Student Conduct Code and follow all of its regulations and procedures.

Geology and Geography majors are strongly encouraged to use the Department's facilities and equipment and to interact with all members of the faculty. However, students are responsible for their actions and are expected follow established rules and procedures. Some of these are listed below, but not all possible circumstances can be described. When in doubt, ask permission and use common sense before taking action.

Security Issues

After-hours access to the Herty Building is limited to the north door (near the handicapped access ramp). The door has a card-swipe lock; majors must see the Department secretary to arrange to have their ID cards coded. Each major may also obtain a student master key from the Department's Administrative Secretary. This unlocks the doors to Herty 1111 and 1118. These doors are normally locked at night and during weekends, holidays, and semester breaks. Never loan your ID card or key to anyone. Never prop open the outer doors to the Herty Building. After-hours use of the Herty Building's rooms and facilities is strictly limited to academically related activities (for example, studying, writing term papers, finishing assignments, or conducting research). After-hours use of rooms in the Herty Building other than rooms 1111 and 1118, or the equipment in them, is not permitted unless prior permission has been granted

by the faculty member in charge of that room (see pages 9-11) or the Departmental chair. When leaving a room or the building after hours, make sure the door(s) and windows are completely shut and locked. Violations of these policies will result in loss of access privileges.

Students should take reasonable precautions to minimize the risk of theft of valuable equipment, specimens, and their personal belongings. The simplest but most effective action is to lock doors and shut windows when leaving a room, especially one that contains audiovisual equipment or computers, even if you are only leaving it for a few minutes. Storage of particularly valuable, portable items (computers, cameras, VCRs, etc.) where they can be viewed through outside windows is an open invitation to thieves. Such items should be placed in locked cabinets, secured with locking cables, or otherwise protected. The campus Office of Public Safety (681-5234) should be notified if you observe suspicious activity in or around the Herty Building, especially late at night or on weekends or holidays. The Department cannot reimburse students for loss of their personal items if they were left or stored in the Herty Building.

Students should also take very seriously the issue of their own personal safety, particularly when working late. Special precautions should be taken if you must go by yourself across campus late at night to a residence hall, the Henderson Library, or a distant parking lot. Try to stay on lighted walks and learn the location of the nearest Security call box.

Safety in the Laboratory and the Field

Students and faculty frequently use equipment and chemicals in geology laboratories that, if misused, could result in serious injury or death. Students should only use equipment for which they have been thoroughly trained. All applicable safety equipment, such as goggles, dust masks, ear plugs, or gloves should be used. Certain types of clothing (such as sandals) may be inappropriate and unsafe when using various types of equipment or kinds of chemicals. Students should use hazardous chemicals only after they have been thoroughly instructed in their proper use by a faculty member (not another student) and follow all safety precautions. Majors must also follow all established protocols for disposal of hazardous chemicals.

Before using the equipment in a laboratory, find out the location of safety devices such as eye-wash stations and fire extinguishers, and learn how to use them. If an accident occurs, obtaining prompt medical attention (if necessary) should be the first priority, followed by notification of the Office of Public Safety if hazardous materials are spilled. Inform the faculty member in charge of the laboratory where the accident occurred as soon as possible.

Students need to be especially safety minded when conducting field work, especially in the vicinity of steep slopes, bodies of water, or other naturally hazardous regions. Although uncommon, geoscientists have suffered serious, and even fatal, injuries while conducting field work. Students should never go into the field alone. A field partner can save your life as well as your sanity.

Proper field attire is the most basic safety consideration. Bright colors should be worn during hunting seasons (it is probably prudent to avoid active hunting regions altogether). Always wear hardhats in mines and quarries. Look for loose rock on the high wall above you before obtaining samples.

As a field scientist, you must understand your legal obligations. Never trespass. Always obtain permission from land owners or mine managers before entering private property. Collecting geologic specimens (especially fossils) is often illegal on public lands such as national or state parks. Make sure you are aware of all regulations before collecting or prospecting on public lands and obtain permits if they are needed. Specimens collected illegally can not be used in scientific research.

Students with known allergies to plant toxins or insect bites or stings should bring medication with them into the field. Poisonous snakes live in almost every wilderness area in the Southeast; they will most often leave people alone, but caution needs to be taken.

Students taking part in organized field trips must always follow the instructions of faculty members or other designated field trip leaders.

Recycling and Energy Conservation

There are bins in the Herty foyer to place items for recycling, including aluminum cans, plastic bottles, paper, and cardboard. Majors should use these instead of regular trash receptacles for recyclable materials. To conserve energy, electric devices such as radios, fans, and lights should be turned off when they are not in use. However, fluorescent lights and computer equipment should only be turned off at the end of the day, because they take more energy to turn on than they do by remaining on all day.

Consumables

Majors are permitted to eat and drink in rooms 1111 and 1118 as long as the following procedures are followed. All waste is to be disposed of immediately in appropriate trash receptacles in the foyer. Nothing is to be left on tables or benches. Spilled or dropped food or beverages are to be cleaned up promptly. During regularly scheduled class times in these rooms, professors have the right to limit or forbid the consumption of food, drink, and smokeless tobacco products. Consuming food or drink is not allowed while working with computers or any other piece of electronic equipment. Food and drink are not allowed in most other rooms in the Herty Building, including the Earth Sciences Computer Applications Laboratory (Herty 1114) and the darkroom. As per the University campus-wide policy, alcoholic beverages may not be consumed (or even stored) by students in any room in the Herty Building.

Other Responsibility Issues

- Inform the responsible faculty member if a piece of laboratory equipment, microscope, computer, etc. malfunctions or is broken. Repairs cannot be made if only you know it does not work.

· If you observe a broken water pipe or water dripping from the ceiling, smell gas or smoke, or find any other evidence of a mechanical failure or emergency, report it immediately. During normal working hours, report such events to the Department secretary (if unavailable, to a faculty member). After hours, report them directly to the Office of Public Safety (681-5234).

· Behave and dress professionally whenever you are in a situation where you are representing the Department and Georgia Southern University. An example would be when attending a professional conference or meeting.

· Students should also act professionally when they make appointments to meet with faculty or staff. Be on time and bring with you any necessary forms, books, or materials. Cancel the appointment well ahead of time if you learn that you can not meet with the individual. Students should not contact faculty at their homes unless prior arrangements have been made or in the case of an emergency. Use e-mail or voice-mail to leave messages for faculty.

· Do not provide academic advice or assistance to other students (especially to nonmajors enrolled in core-curriculum courses) unless it is a topic for which you are proficient. If unsure, refer them to a trained tutor or faculty member. Bad advice is *worse* than no advice.

Student Conduct Code

· Like all Georgia Southern University students, majors are expected to follow the policies and procedures of the published Student Conduct Code. Geology and geography faculty members deplore academic misconduct (cheating and plagiarism) on the part of students and will not permit it to go unpunished. All students should carefully read the section on academic misconduct in the Student Conduct Code so they are fully informed and thus can avoid this problem. The Georgia Southern Student Handbook is available at <http://students.georgiasouthern.edu/sta/guide/>. When in doubt as to whether some action is plagiarism, especially when writing a term paper or thesis, consult with a faculty member.

DEPARTMENT RESOURCES FOR STUDENTS

Information

Various outlets provide topical information of interest to geology and geography majors. Students should check the Department Internet Web site <http://cost.georgiasouthern.edu/geo/> regularly for announcements and timely information. Information of particular interest to students may be found at <http://cost.georgiasouthern.edu/geo/students.html>. Notices for seminars, field trips, geology and geography news, GeoClub activities, and social gatherings are often posted on the bulletin board (The Epicenter) outside Herty 1100. If you walk by these blindly, you might miss out on a good time.

Scholarships

Many scholarships are available to Georgia Southern University students, and geology and geography majors are encouraged to seek these out. The H. Stanley Hanson Scholarship for geology majors honors the career and achievements of the Department's first chair. This $1,100 award is presented annually to a scholastically outstanding geology major. Criteria for selection include enrollment full time as a geology major, completion of at least 75 hours of academic courses (of which a minimum of 15 are from geology courses), and a minimum combined G.P.A. of 3.0 in all geology courses. The deadline for applications is generally in early March. Information and application packets may be obtained in the Department office.

A comparable scholarship for geography majors, the Daniel B. Good Scholarship, made its first award in the spring of 2003. This award (up to $1,000) is presented annually to a scholastically outstanding geography major. Criteria for selection include enrollment full time as a geography major, completion of at least 50 hours of academic courses (at least 30 hours at Georgia Southern), a minimum of 10 semster hours of credit in geography, and a minimum combined G.P.A. of 3.0 in all geography courses. The deadline for applications is generally in late February to early March. Contact Dr. Larsen or the Department office for information and application materials.

Employment

Geology majors are hired each semester to be tutors for the introductory geology classes. The tutors are usually seniors or juniors, have strong academic backgrounds, and the ability to work well with people. Those interested in being tutors should inquire in the Departmental office at the beginning of the fall and spring semesters.

Geology or geography majors with extensive computer experience are employed in the Geographic Information Systems (GIS) laboratory. Inquire with Dr. Langley about requirements and availability of positions. Individual faculty members may receive grants that provide funds for student assistants. Look for announcements!

Internships are sometimes available for qualified students, through the Department as well as with outside agencies. Current information about internship opportunities is available at <http://cost.georgiasouthern.edu/geo/gisinternships.html>. Students interseted in GIS-related internships should contact Dr. Langley.

Internships

What is an internship? Most internships are very much like “real jobs”. In other words, you apply, you are hired, you are (sometimes) paid a salary or wage or other compensation, and you are evaluated based on your performance. An internship may help you “get your foot in the door” for a permanent job in the future with a particular organization. Sometimes an internship is required by an organization before you are hired in a permanent position.

There are a variety of internships available for geology, geography, and GIS students. Many universities provide summer internship programs that are available only through the institution offering the program. Some federal, state, and local government agencies have internships available. A number of private companies or corporations also have internships. A few internships may offer university course credit instead of, or in addition to, monetary compensation.

Dr. Susan K. Langley is the internship contact person for the Department of Geology and Geography. Internship information is posted on the Geology and Geography Internships webpage at <http://cost.georgiasouthern.edu/geo/gisinternshis.html>. If you are interested in an internship on the webpage, you should contact the person listed in the

announcement. This is not a comprehensive list of all available internships; it contains information about internships that organizations have requested to be posted on this page. You should search for other internships that fit your needs.

An internship of any type may help you get the job you want in the future. Successful completion of internship indicates that you have work experience and are capable of completing tasks set before you and that you work well with others. Your internship supervisor may provide valuable letters of recommendation for you when you apply for a permanent position, regardless of whether the job you are applying for is with the organization you worked with or another organization.

Equipment and Facilities

1. Department Office--The Departmental office is located in Herty 1110. Students should ask the Department secretary or a faculty member before using any office equipment or supplies, even trivial ones like tape, paper clips, or the stapler. Such incidental items are normally provided, but majors are expected to purchase more costly supplies such as notebooks and computer diskettes. If taken out of the office, portable items like a tape dispenser, stapler, hole punch, or paper cutter must be returned immediately after they are used, and should not be allowed to migrate to Herty 1111 or 1118.

Students may use the phones in the office to make local and toll-free calls only, and *even then should first ask permission.* Majors can arrange for FAX messages to be sent to them on the Department's machine, provided that it relates to scholastic activity. The sender of the FAX should be instructed to clearly indicate the name of the intended recipient. The office maintains an IBM typewriter which students can use to fill out forms. With permission, the GeoClub may use the Department's copier for the business of the club.

Majors are welcome to use the catalogs and books in the office, but should not take them out of the room. Majors can check out videos from the Department's collection. A sign out sheet is kept with the videocassettes.

Majors can place outgoing campus and stamped U.S. mail in the Department's mailbox for pickup, which occurs twice daily (at about 10:30 AM and 2:30 PM). However, students are not allowed to ship packages or mail items at Department expense, or to use

official Departmental envelopes or stationary with letterhead. Majors should not be in the office after hours unless accompanied by a faculty member.

2. Earth Science Computer Applications Laboratory (ESCAL)-- The Earth Science Computer Applications Laboratory (ESCAL) currently contains two Sun Microsystems Ultra workstations, ten Gateway PCs, and four Macintosh computers, all hard wired into the Georgia Southern fiberoptic backbone to access the Internet. The lab also has two flatbed scanners and laser printers for the computers. For large printing tasks, there is a Hewlett Packard DesignJet 3500 plotter. Additional hardware items include a slide scanner, slide printer, and recordable CD drive. A variety of software is available for word processing, spreadsheet, and graphics applications, including ArcView and Arc/Info®. A library of CD-ROMs on geologic and geographic topics can be used on the ESCAL computers (these can not be checked out). ESCAL is open to majors in the Department and non-majors enrolled in upper-level courses. Majors can use ESCAL to send and receive e-mail, surf the Internet, write term papers, and conduct research. Students can not store files on the hard drives of ESCAL computers (use your own diskettes or Zip disks), nor are they allowed to add new software or change existing software on ESCAL computers. Use of ESCAL is not allowed unless authorized by Dr. Trupe, who is the Director of ESCAL. Majors can use personal computers located in Herty 1111 and 1118 if they do not have access to ESCAL. Other regulations regarding working in ESCAL are posted in Herty 1114. The University's policies concerning computer use may be found at <http://academics.georgiasouthern.edu/provost/policies/computeruse.html>, and in Appendix A of this handbook. Violation of these procedures may result in a student no longer being allowed to work in this lab.

3. Topographic and Geologic Maps--The Department maintains a number of topographic maps at various scales, including an almost complete collection of the USGS 7.5 and 15 minute quadrangles from the state of Georgia. These maps are stored in Herty 1103 and 1106. Majors planning field work or conducting research may use these maps, although they should not be taken into the field unless special permission has been obtained from a faculty member. The number of available geologic maps is much smaller than that of topographic maps, but some regions of Georgia are represented.

4. Departmental Darkroom and Photography Laboratory--The Department's basic photographic equipment and facilities are available for student use. These include a Cannon 35 mm camera with a zoom/macro lens, a lighted copy stand for taking still or

video images of specimens and drawings, and a darkroom. Students can develop black and white film and print black and white pictures in the darkroom. The Department also owns several digital cameras, whose images can be directly downloaded onto a computer. Student use of Department photographic equipment is limited to research projects only. Students interested in using the Department's photography equipment should contact Dr. Rich.

5. Applied Coastal Research Laboratory (ACRL)--The ACRL is located on Skidaway Island, a barrier island on the Georgia coast in the Savannah metropolitan region. It contains equipment and laboratory space for conducting research on coastal and near-shore marine processes. Students interested in using this research facility should contact Dr. Alexander. Information is also available at <http://cost.georgiasouthern.edu/geo/acrl.html>.

6. Rock Preparation Laboratory--The Department's rock preparation laboratory is in Herty 1119. Its equipment includes saws and grinders for cutting rocks and making thin sections. Before using any piece of equipment in Herty 1119, majors must learn how to operate it correctly and safely from Dr. Vance who is in charge of this room.

7. Georgia Southern Museum Paleontology Collection--The Georgia Southern Museum's <http://welcome.georgiasouthern.edu/museumnews/> research and teaching collection of fossils includes about 2,000 specimens of vertebrates and 10,000 specimens of invertebrates housed in Herty 1116. Most specimens are from the southeastern United States. Students wishing to use this collection for research or teaching purposes should contact Dr. Rich or Dr. Geisler.

8. Paleontology Preparation Laboratory--The Department maintains a well-equipped, modern laboratory devoted to the preparation, repair, and conservation of fossils in Herty 1117. Equipment used to collect fossils is also stored in this lab. Dr. Rich is in charge of facilities, equipment, and chemicals used in the extraction and preparation of fossil pollen samples from rocks and sediment. Dr. Geisler is in charge of all other equipment in this lab. Student use of the paleontology preparation laboratory is usually limited to majors conducting research under the supervision of Drs. Rich and Geisler.

9. Georgia Southern University Well Field--The Department has recently completed the installation of a network of 6 monitoring wells. This well field consists of 3 well clusters, each cluster contains a deep and shallow well and each well is instrumented with a data logger that continuously records water level and temperature. The monitoring well

network is intended for the instruction of both introductory environmental geology and upper division hydrogeology courses. Dr. Reichard is in charge of this installation.

10. Miscellaneous Field Equipment--The Department owns a variety of field equipment that can be checked out by students engaged in fieldwork research projects. These include Brunton compasses, rock hammers, sediment samplers, water quality test kits, and measuring tape. Personal field equipment of individual faculty members may be loaned to students on a case-by-case basis (it never hurts to ask).

11. Geographic Information Systems Laboratory –In the fall of 2003, Geographic Information Systems (GIS) instruction moved from the Spatial Analysis and Geographic Information Systems Laboratory in 1004 Carruth to a new GIS lab in Information Technology 2204. The new facility is a dedicated computer laboratory for cartography, geographic positioning system (GPS) data, remote sensing, digital image processing, spatial analysis, and geographic information systems (GIS).

Technical Books and Journals

Although the Internet is a great source of information, at present it can not provide all the necessary reference material needed to complete a well-written term paper or thesis. For published references, majors should first turn to the Henderson Library. It houses many technical books and journals on a wide variety of geoscience topics. If a needed book or article is not available in the Henderson Library, take advantage of the free interlibrary loan service. Books and copies of journal articles obtained by interlibrary loan can arrive in as little as a few days, and almost anything that has been published is available. Interlibrary loan items can be ordered on-line through the Henderson Library's Web site <http://library.georgiasouthern.edu/>.

Most faculty maintain private collections of books, journals, and copies of published articles in their fields of specialization. Depending on circumstances, these might be loaned to students, especially those doing a research project under the supervision of that individual faculty member. However, most faculty members can relate horror stories of valuable books lost or damaged by students, and are therefore hesitant to freely loan out items to students. Therefore it is suggested that you first attempt to obtain reference materials through the Henderson Library, and only ask faculty members if that method

fails. If a faculty member agrees to loan you books, issues of a journal, or reprints, write down a list with titles and authors, your name, and the date the material was borrowed (do this even if the faculty member does not ask you to do this). Leave this list with the faculty member as a record of what material was loaned to you and when you borrowed it. When in your custody, treat technical books and journals with great care. Replacement costs can easily exceed $100 per copy and out-of-print items may be irreplaceable. Return the material to the faculty member as soon as you are done using it.

Academic Advising

All Georgia Southern University students are provided with academic advising. In the College of Science and Technology, individual faculty members are the academic advisors of declared majors. In the Department of Geology and Geography, almost all full-time, permanent faculty members can act as official academic advisors for majors. Therefore, one of the first decisions you need to make after becoming a geology or geography major is to choose an advisor. This choice should be made carefully, because you will be working closely with this individual over the next several years. Students should weigh factors such as experience, personality, availability, and field of specialization when selecting an advisor. Probably a good strategy is to ask the opinion of some of the upper division majors who are more familiar with the faculty in the Department. Be aware that the faculty member you choose may already have as many advisees as they can handle, or may decline your request to be your advisor for some other reason (this is not a common occurrence in this Department). Meet with the Departmental chair if you are having problems selecting an advisor, or are having irreconcilable differences with your advisor (it is possible to change advisors).

The role of an academic advisor is to provide information and assistance, but *ultimately the student makes the final decisions* and *is responsible for their selection of courses and all graduation requirements*. The university requires that each student meet with their advisor before registration each semester, and that they meet regularly to plan academic programs to make sure the student is fulfilling all Departmental, college, and university requirements in a timely manner. Dates for preregistration/advising are published through the Registrar's web site <http://students.georgiasouthern.edu/registrar/> and the annual University Catalog. Make an appointment with your advisor well in advance, so that both of you can agree on a mutually convenient date and time. The meeting will usually last between 20 to 45 minutes. Prepare a list of course options before the meeting

using the course schedule to determine which courses are to be offered. As some courses may not be available, have backups planned.

All forms required for advising, preregistration, changing majors, etc. are available in the Department office or from the Registrar. Geology and Geography program checklists are included in Appendix B of this handbook.

Honors in Geology and Geography

Outstanding geology and geography students may pursue the Honors in Geology or Honors in Geography program. Students that have a minimum GPA of 3.2 after 45 hours of coursework are potential candidates for the program. The advisor recommends the student to the Geology and Geography faculty, who must approve the student's participation in the honors program. The student must maintain a high GPA and complete a senior thesis to graduate with honors. Appendix C contains more information about the program.

If you think you qualify for Honors in Geology or Geography, speak with your advisor to initiate the approval process. Upon completion of the program, your advisor will notify the University Registrar to add Honors in Geology or Honors n Geography to your transcript.

Course Offering Sequence

Geology and geography majors must be aware of the sequence of Departmental course offerings. Although some courses are offered every semester, others are offered once per year or every other year. Many upper-division courses, such as Mineralogy, Petrology and Petrography, Cartography, and Remote Sensing, are offered on alternate years. All majors should learn about the course offering sequence, and plan their schedules accordingly. Keep in mind that if you miss an upper division course it may be two years before you have an opportunity to take the class again. Additionally, many upper-level courses are prerequisites for other courses (e.g., Mineralogy must be taken before Petrology and Petrography). Appendix D contains a list of Departmental course offerings as of the spring 2004 semester, with the last semester the course was offered and the projected semester when it will next be offered. It is your responsibility to plan ahead so you do not miss required upper-level courses.

Undergraduate Research

Research specifically related to the senior thesis project is covered in a later section of this handbook beginning on page 13. Undergraduate research is becoming increasingly common on university campuses, and is now widely supported by many grant-funding organizations. This means there are many opportunities for undergraduate students to engage in research as part of their training for a career in the earth sciences. Whether or not you choose to participate in an undergraduate research program is entirely optional, but they can provide you with valuable training and experience that may eventually prove beneficial in obtaining employment or getting into a top graduate school. There are two basic types of undergraduate research opportunities: summer research and training programs, and participation with on-going research by Georgia Southern University faculty.

A wide array of summer research and training programs are available from sources outside Georgia Southern University. Some of these involve field work, others are more laboratory based. Some may be taken for academic credit, others not. Announcements of these summer programs usually begin to appear in the winter on the Internet (for example, at <http://www.geosociety.org/science/internships.htm>) or in publications like *Geotimes*, *GSA Today*, *Geology*, and *The Association of American Geographers Newsletter*. Commercial companies also hire summer interns.

Almost all faculty members of the Department of Geology and Geography are engaged in scientific research to one degree or another. Those whose research is funded by grants may have funds to hire assistants. Other projects may lend themselves to help from volunteers. Under special circumstances, students with special skills or backgrounds may become full collaborators with faculty on research projects. This work can also be done for academic credit by enrolling in GEOL or GEOG 5890.

STUDENT ACTIVITIES

GeoClub

The GeoClub is an official student organization and membership is open to all interested Georgia Southern University students. The club elects its own officers and sets its own dues. Most majors in the Department are members. The club promotes camaraderie among the majors by sponsoring field trips, social events, and other activities The GeoClub raises funds for their activities by the rental of mineral and rock specimens and topographic maps. See Drs. Asher or Vance or check the GeoClub web link <http://cost.georgiasouthern.edu/geo/geoclub.html> for more information. The annual dues are $10.

GeoClub members enhance their geologic education through field trips using club fund-raisers to subsidize costs. Past field trips include excursions to Colorado, New Mexico, Arizona, Utah, Texas, the Ozarks, and the central-southern Appalachians.

Seminars

Seminars are presented on an irregular basis throughout the semester by Geology and Geography faculty and by geoscientists from other institutions. All majors should attend these seminars. Not only are they a good source of information, but they are also instructive about how to effectively (or ineffectively) present scientific topics to an audience. Announcements for seminars are posted in the Herty Building and on the Department's Web site <http://cost.georgiasouthern.edu/geo/seminar.html>.

Local Research Competitions

The Georgia Southern University chapters of Sigma Xi and Phi Kappa Phi hold separate annual research competitions, which are open to students from many academic disciplines. These competitions are held in the spring and provide an excellent forum to learn how to present the results of your work to an audience. The faculty strongly encourages our students to participate in these competitions. Look for announcements early in the spring semester for application details.

Professional Organizations

Majors are encouraged to become members in professional organizations, such as the Geological Society of America, Association for Women Geoscientists, and the Association of American Geographers. Student membership fees are nominal and the rewards can be substantial. These organizations send out newsletters and have e-mail services, as well as other special services that may benefit you, such as information about jobs, summer internships and graduate schools. Many have scholarships for undergraduate research and travel to professional meetings. Student members also often receive the organization's technical journal and information about field trips and meetings.

Professional meetings provide a great opportunity for networking and are a terrific source of information about jobs and graduate schools, as well as keeping one abreast of the latest work being done in the geosciences. If you become interested in attending a meeting, you may be able to attend free as a volunteer worker (projectionist, registrar, ready-room attendant, etc.). The Department will often provide some support if you are giving the results of your own research in either a poster or platform presentation. Check with your research advisor, who will consult the Department chair, about possible funding. Among the meetings most often attended by Departmental majors are the Southeastern Section Meeting of the Geological Society of America and the annual meeting of the Georgia Academy of Sciences. Both of these meetings occur in the spring.

The following is a small sample of geoscience organizations that accept student members and the addresses of their Internet homepages:

Geological Society of America: http://www.geosociety.org/
Campus Representative: Dr. Rhodes
American Geophysical Union: http://www.agu.org/
Society of Economic Geologists: http://www.segweb.org/
Association for Women Geoscientists: http://www.awg.org/
Campus Representative: Dr. Asher
The Paleontological Society: http://www.paleosoc.org/
American Geographical Society: http://www.amergeog.org/
Association of American Geographers: http://www.aag.org/

THE SENIOR THESIS EXPERIENCE

Majors planning to graduate with a B.S. degree in either geology or geography are required to take a three course sequence that includes completion and presentation of a senior thesis. This is an option for students in the B.A. degree program. The courses, taken in this order, are: Introduction to Research Methods (GEOG or GEOL 4120); Senior Thesis Research (GEOG or GEOL 4820), and Senior Thesis Seminar (GEOG or GEOL 4610). GEOG/GEOL 4120 is usually taken in the spring semester in the junior year, followed by GEOG/GEOL 4820 either in the summer between the junior and senior years or in the fall semester of the senior year, and GEOG/GEOL 4610 in the spring semester of the senior year. A minimum grade of B in Introduction to Research Methods is required for a student to continue in the senior thesis course sequence.

Each senior thesis student works with a faculty advisor chosen by that student (this person is not necessarily the student's academic advisor). The advisor provides advice and support by helping the student formulate a topic, execute the research, and write the report, including reviews of each draft. Ultimately, the advisor assigns a letter grade reflecting the quality of the student's work in GEOG/GEOL 4820. It is possible to fail these courses (and therefore delay or prevent graduation) if the student does not perform to expected standards or repeatedly misses deadlines. The most common error made by our past students is not allowing themselves enough time to complete the research phase of their projects.

The primary purpose of the senior thesis sequence is to teach students how to plan, conduct, finish, and present scientific research. Its purpose is not to make you a highly trained specialist in a particular subdiscipline of geology or geography. Therefore the choice of a senior thesis topic, although ideally one that interests you, matters less than learning about the research process itself. You should not choose a senior thesis topic in which you have not received adequate instruction at the time when you do the research. For example, if you are not going to take GEOL 5142 (Stratigraphy and Sedimentation) until your final semester at Georgia Southern University, it would not be prudent to select of senior thesis that required advanced knowledge of stratigraphy or sedimentology.

Student Thesis Topics

Senior theses can take a number of directions, according to the interest and ability of the individual student. The amount of time the student has to complete the project must be given strong consideration in the selection process. Some topics by their very nature will require a lot of time, a long duration, or both. Although students are granted two credit hours when taking GEOG/GEOL 4820, the number of hours actually spent doing the research will be much greater than a normal two credit hour course, in fact they will typically exceed a four credit hour course. Do not expect to do satisfactory research while at the same time taking on a full academic load.

Most senior thesis topics can be subdivided into those, which are primarily field-based, and those, which are laboratory-based, although most projects have aspects of both. Field-based projects typically involve making observations in the field, such as distribution of rock units and structural features (mapping), collection of hand samples or cores, analysis of landforms, or analysis of a region's hydrogeology. Geographic projects may include analysis of urban development or the distribution of cultural systems or biologic organisms. These observations, coupled with laboratory analysis of collected samples are used to test a hypothesis. Laboratory-based theses topics have more emphasis on analytical work; in fact, no field component need be involved at all, because the work could be based on samples collected by others. Analyses could be petrographic (studying thin-sections), instrumental, or computer modeling. Possible examples are computer analysis of spatial patterns (GIS), mineralogic study of a body of rock or ore, analysis of a fossil assemblage, or geochemical analysis of samples.

Introduction to Research Methods

In this course, students learn how to plan a research project (including finding funds—always important!), how to use technical literature, how to write a formal research proposal, how to propose a scientific hypothesis and then how to find ways of testing it, and how to write up the research in a formal paper. Finally, students will select their senior thesis topics. If full of doubt and uncertainty, you may find it helpful discussing ideas with several faculty members of your choice even before you have established what you want to do. Some faculty members may already have projects just

waiting for the right student. Once you have selected a thesis advisor and a project, the two of you should come up with a detailed plan of action with firm deadlines. Poor planning can ruin even the best of projects.

Senior Thesis Research

Students will normally take this course while conducting the research (data gathering and interpretation) phase of the project. This is often done in the summer for field-based projects, although some projects can be done on weekends during the school year. If done correctly, students should have made all their observations and interpretations by the time they finish this course, and have produced a first-draft of the thesis.

The Thesis Itself

For most students, the senior thesis is their first piece of formal scientific research. The thesis is a double-spaced manuscript of at least 30 pages in length organized and referenced in the formal style of a published geoscience paper. See the Department's "Style Manual for Writing in Geology and Geography" (Appendix E) for specifics. Other good guides for use in writing the thesis are published papers in the Bulletin of the Geological Society of America or the Annals of the Association of American Geographers, although you and your advisor may agree on another style. The paper must include an abstract at the beginning. The typical structure to follow includes a short statement of the problem, and introduction to the field area, a description of methods used in going about solving the problem, a description of observations and the data, a discussion of what the data could mean (herein exercise the "Multiple Working Hypothesis" technique), and your conclusions, followed by acknowledgments and the references. The final copy (not the first draft) must be bound. An inexpensive vinyl covering, such as available at Kinko's, is fine. Several writing aids are available in the Department office; you are urged to look at these and take advantage of the superb help they offer. An excellent source of information is a book by Martha Davis called *Scientific Papers and Presentations* (Academic Press, 1997). Other resources will be discussed in the Introduction to Research Methods course.

Senior Seminar

This course is most usually taken in the student's final semester. Copies of the final version of the written thesis are completed and turned into your advisor and the instructor of GEOG/GEOL 4610. Your grade will be based both on content and how it is presented (grammar, spelling, style, citation of references, quality of figures, etc., which are covered in the Style Manual distributed with this handbook).

The other component to the senior seminar course is an oral presentation about 15 to 30 minutes in length during which you present your work to an audience. This is done late in the semester, in Room 1101 or 1107, and is open to all students, faculty, and staff in the Department, and any friends or interested parties from "outside." Usually attendance is rather small, however, so don't expect the intimidation of addressing a mob. The presentation is usually illustrated with overheads, slides, or computer-generated images. The presentation is meant to be formal, and done in the manner of addressing a group of professionals wishing to learn more about your topic of study. In other words, do not present a travelogue, a series of jokes, or a lecture on a general topic not relevant to your own research. You should practice your talk at least twice in advance of presentation. Your talk will make a strong impression among the faculty on the quality of your thesis. Remember that you must speak in a manner that involves projecting your voice. Do not mutter, mumble, or speak quite softly. Address the audience and not the screen. Prepare overheads or slides so that they are neat, clear, and can be easily read from the rear of the room. Organize your talk into the same sections that you use in organizing your written thesis (described above), so that it has a logical flow to it. During your practice runs, have a friend or two sit in and critique. Even better, practice with your advisor!

Well-developed student research may also be presented at sectional meetings, and sometimes the national meetings, of the Geological Society of America, the American Association of Geographers, and the Georgia Academy of Science.

BEYOND GRADUATION: PREPARING FOR GRADUATE SCHOOL OR EMPLOYMENT

Obtaining a bachelors degree, while a tremendous accomplishment, is only a means to moving on to the next phase of your life. For most students, this means either securing full-time employment or beginning graduate school. At least a year prior to graduation you should begin thinking seriously about life beyond graduation. Perhaps in thinking over your future it might be easier to begin by considering what you don't want to do first! This will help you "home in." Bear in mind that very few people at this stage of their lives know what they truly want to do, or can anticipate what they will eventually end up doing. Life is flow, and this is just another navigational change that can be made. For many students, the thought of continuing on in school is initially absurd (after all, you have been at it for about 13 years, a longer sentence than most convicted criminals get). New graduates commonly take some "time off," taking a part-time or temporary job, until they are ready to move on to graduate school or full-time employment. Economic or personal circumstances may also play a role in your decision about graduate school versus employment.

Employment opportunities for those with an undergraduate degree in geology or geography vary greatly, depending on your areas of expertise, desired work location, and salary expectations. You would be wise to have as many employer-friendly skills in your tool belt as possible. For example, working knowledge of GIS, computer graphics and software, Web site design, statistics, public speaking, and many others may help you land that perfect job. Long before graduation, discuss with your academic advisor which optional courses you should be taking to beef up your marketability. Many sources of information about employment opportunities are available. The Internet is perhaps your best general source, although the Department receives several letters every year from firms with open positions. Check with the Department Chair about these. A couple of Web sites to check out are: <http://www.agiweb.org/careers.html> and <http://www.nationalacademies.org>. Department alumni may be able to provide advice—they are listed on the Department's Web site. The Office of Careers Services (681-5197) offers several job fairs on campus each semester as well as advice on resume writing and other employment related issues.

If graduate school is in your future, by the end of your junior year you should start thinking about what you would specifically like to do in the way of graduate work. Where would you like to go? What sort of professor would you like to work with, and on

what? What are your long-term objectives? If applied work in hydrology or a geotechnical work appeals to you, then a master's degree will be sufficient. If college teaching or a research career appeals (e.g.--NASA, USGS, and JPL), then a Ph.D.'s the thing (although getting a masters degree first is still the most common route). As you start your senior year, scour the catalogs of graduate programs and other graduate school data shelved in the Department office. The Internet is full of information, as today almost every school and most Departments have their own Web pages (listed on <http://www.usd.edu/esci/geodepts.html>). A good place to start on the Web is <http://www.nap.edu/readingroom/books/careers/>. Consult with faculty if questions arise about particular programs you find interesting. Also, contact interesting schools for additional information, and do so unhesitatingly if you feel it would be helpful.

Plan to apply to a carefully selected group of schools (at least 4 or 5), with at least two being "back-up," and the rest being schools of choice. Send for applications the very moment you finalize your list at the end of September (for some schools you may be able to download them off the Internet). Application fees range from nothing to over $20. (the Department will not help defray these costs, by the way, so be prepared!). One key to finding a graduate school that will be strong in your field of interest is to look for programs with two or more faculty doing research in that field. This usually means that the Department is fairly well-funded in that subject. Application due dates generally range from December 15 to February 1, so make sure to give yourself plenty of time to fill them out. Completing five application forms could consume an entire weekend.

Some points to remember:

- It is a fact of life: the more highly rated a graduate program is, the more likely its students will obtain better positions after graduation. So, all else being equal, set your sights high. But to get into a top ranked graduate program you are going to need good grades, good test scores, and good letters of recommendation. Here is where those summer research programs or internships discussed above can pay dividends.

- You do not have to go to a school in the West, if all you want to do is research in the West. Many professors have field research programs far distant from their school of employment, and graduate students today routinely travel large distances to do their field work.

- Most geology graduate programs will require you to take a six-week summer field geology course if you did not take one as an undergraduate.

· If you are completely undecided about a specialty, consider universities with a large faculty and a broad range of specialties (e.g., a large state university with a good geology or geography program). Chances are they will have substantial resources, equipment, and funding no matter what field you eventually pick.

The GRE Tests

Remember what fun taking the SAT test was? Well, graduate-student-to-be, it is back in the form of the GRE (Graduate Record Examinations). The GRE comes in two parts; the general (math, verbal, analytical reasoning) and the subject tests. However, at the present time there are no GRE subject tests in geology or geography. The general test is now only offered on-line, with the closest testing station in Savannah. It might be better for you to take the general and subject tests on different dates. The Web site for the GRE is <http://www.gre.org/> and much useful information can be found there, including sample questions and a toll-free phone number to register for the general test.

Taking the general test early is important. The general test is considered more significant than the subject test by most graduate schools, and scores from the general test taken in December of your senior year may not arrive in the admissions office of graduate schools until 2-3 weeks after the application due date. In many cases this can decrease your chances of being accepted because some schools wait until all application materials are in before deciding individual cases, yet will make decisions on admitting some individuals for limited slots whose application materials have arrived early. By taking the test early, you can retake it and improve your score (if necessary).

In reviewing for the general GRE test it is a very good idea to brush up on vocabulary, math, and logic skills. A variety of "help" books are on the market, and the price is usually worth the practice tests and hints inside. For a fee (presently $20), the GRE organization will also help you out on-line with their GRE Diagnostic Service.

Letters of Recommendation (Adapted from "Resume writing for geoscientists" by Nancy Lindsley-Griffin.)

A letter of reference or recommendation is a written evaluation of your background and qualifications for a particular position. Letters are commonly required for employment and are always part of applications for graduate or professional schools. You should seek letters only from those who know you well enough to evaluate your background, strengths, and weaknesses. Choose referees who can address your specific qualifications for the job, school, or program you are pursuing. Professors are often uncomfortable trying to write letters for students who were not enrolled in at least one of their classes and who worked hard and earned a grade of B or better for their efforts. The more classes you have had with a professor and the better your work, the more likely it is that you will receive a strong recommendation. If your academic Department has employed you, your supervisor may be able to address your work habits and skills. Your academic and/or thesis advisor (if you write an undergraduate thesis) will probably know you, your record, and your strengths best and be in the strongest position to provide an insightful and positive recommendation.

Always ask permission of your referees before giving their names to anyone. This is good manners but it is also important in assuring that you will get a positive recommendation. Very few people would write a truly negative letter for someone who had requested a recommendation. If the person you ask does not feel they can provide a positive view of your work, they will probably tell you so, either directly or, more commonly, indirectly. If, for example, someone says to you, “I'm not certain I can write the kind of letter that will be helpful to you,” or “I don't think I know your qualifications well enough to be of much assistance,” thank them for their consideration and find someone else to write the recommendation.

The more information your referee has available, the more specific they can be in what they write. Specifics, rather than generalities, are the distinguishing property of the finest recommendations. Be considerate of your referee's time. Give your referee at least 2 weeks to write an initial letter for you. Once the letter has been written, and presumably saved as a word processor document, less time should be required to generate additional references. You should provide your referee with the following information (as applicable to your situation):

- Copy of the application form if there is one.

- Advertisement or position description. This is essential for employment applications.

- Information about the graduate program you are applying for including the name of professor(s) or the specialty area you are interested in.

- Copy of your current resume (be sure that your current e-mail address is included in case the referee needs to reach you for additional information).

- Unofficial copy of your transcript.

- Stamped envelope addressed to the person or institution to whom the letter needs to be sent.

- If you need several letters, be sure to give your referee all the required information carefully organized in a folder.

- Highlight deadlines on the advertisement or application form. Check with your referee a couple of days after you them provide the information, and a day or two before the deadline. The absent minded professor may be a stereotype, but slip ups happen.

Be courteous and keep your referees informed. When an application is successful, they should be among the first to know. If you are unsuccessful, you should still be certain to thank them for their efforts. The recommendation forms used for graduate and professional school applications contain a space for the applicant to indicate whether or not they will waive their right to see the letter. Waiving this right is a personal decision, but so is your professor's decision about whether or not to write a letter. Many people feel uncomfortable writing a letter that they know could be read by the person being evaluated. This is not necessarily because they intend to write a negative response, but because many people are sensitive to any kind of criticism. Because no one is without faults, truly excellent letters of reference, demonstrating real understanding of a candidate's strengths, usually comment on their weaknesses as well. Some professors may approach the issue by drafting a letter that they show to the student before it is sent. The student can then decide whether on not they wish to proceed. Remember that no one is obligated to serve as a referee, and some may refuse to do so unless they are certain that their recommendation will be confidential.

DEPARTMENTAL CHRONOLOGY

· 1966—The Department of Geology is founded at Georgia Southern College with two faculty positions.

· 1970—First geology majors graduate with bachelor's degrees from Georgia Southern.

· 1979—A twenty-five-foot-long fossil skeleton of a mosasaur (a Cretaceous marine reptile) is donated to Georgia Southern by the South Dakota School of Mines and Technology thanks to a close working relationship between geologists at both institutions. This specimen becomes the impetus for creation of an on-campus museum at Georgia Southern.

· 1980—During institutional reorganization, geography courses and faculty are moved from the former Department of History and Geography to a newly constituted Department of Geology and Geography.

· 1983—Department paleontologists Richard M. Petkewich and Gale A. Bishop successfully spearhead efforts to collect the "Vogtle whale" fossil in Burke County, Georgia, at the construction site of a Georgia Power nuclear electricity generating facility. This specimen proves to be North America's geologically oldest whale skeleton and of considerable scientific importance.

· 1987—The Georgia Southern Museum unveils its mounted, complete mosasaur skeleton as the permanent centerpiece of its Hall of Natural History. The specimen was prepared and mounted by Richard M. Petkewich and numerous geology students under his supervision, most notably Brian Meyer.

· 1988—Henry S. Hanson, the Department's founding faculty member and first chair retires; Fredrick J. Rich assumes his duties as Department Chair.

· 1991—V. J. (Jim) Henry, formerly on the faculty of Georgia State University, joins the Department on a part-time basis, making his laboratory at the Skidaway Oceanographic Institute in Savannah available to Georgia Southern faculty and students.

· 1992—Gale A. Bishop and colleague Nancy B. Marsh initiate the St. Catherines Sea Turtle Conservation Program, an annual, integrated teaching, research, and service program in sea turtle conservation on St. Catherines Island, Georgia.

· 1995—The Department greatly expands its floor space in the Herty Building following the exodus of the Department of Family and Consumer Sciences. The Earth Science Computer Applications Laboratory opens its doors as a result of funding by grants to Daniel B. Good and Gale A. Bishop.

· 1996-1998—Major renovations to student laboratories and research training facilities in the Herty Building are completed, funded by a 1.4-million-dollar collaborative National Science Foundation grant with the Department of Chemistry.

· 1997—Bachelor's degree program in geography begins at Georgia Southern; first graduates receive their degrees in 1999.

· 1998—Fredrick J. Rich steps down as the Department's second chair; Dallas D. Rhodes, formerly at Whittier College in California, becomes the third Chair of the Department.

· 1998—The Department's large lecture hall (Herty 1101) is renovated into a "smart" classroom with the addition of a computer and modern digital imaging hardware.

· 1999—Gale A. Bishop retires and becomes Emeritus Professor of Geology.

· 1999—Gale A. Bishop receives the University Excellence Award for Teaching and Richard C. Hulbert receives the University Excellence Award for Research.

· 1999—Department completes the installation of a network of 6 monitoring wells, funded by a National Science Foundation grant.

· 2000—Spatial Analysis and Geographic Information Systems (SAGIS) Laboratory opens in Carruth Hall.

· 2001—Fredrick J. Rich receives the University Excellence Award for Research.

· 2001—Daniel B. Good receives the Allen E. Paulsen College of Science and Technology Award for Excellence in Teaching.

- 2003—Daniel B. Good retires and becomes Emeritus Professor of Geography.

- 2002—James S. Reichard receives th Allen E. Paulsen College of Science and Technology Award for Excellence in Teaching.

- 2003—Vernon J. Henry, Director of the Applied Coastal Research Laboratory, Skidaway Oceanographic Institute in Savannah retires.

- 2003—Clark R. Alexander becomes Director of the Applied Coastal Research Laboratory at Skidaway Oceanographic Institute.

- 2003—GIS instruction moves from SAGIS to the new Information Technology Building.

- 2003—NSF-CCLI grant to Drs. Asher and Vance brings an XRD unit and sample preparation lab to the Department.

- 2003—The Chemistry Department leaves Herty and Geology and Geography gains additional space on the second floor.

For a comprehensive history of the Departmnet, visit <http://cost.georgiasouthern.edu/geo/history.html> .

Appendices

Appendix A – Georgia Southern University Computer Use Policies

Appendix B – Geology and Geography Program Checklists

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Appendix D – Course Offering Sequence, Spring 2004

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Appendix A

Georgia Southern University Computer Use Policies

Computer Use Policies

Purpose of the Policy

The following Computer Use Policies have been developed as a complement to relevant laws and policies to define acceptable and unacceptable computer use practices, to promote an understanding of responsible usage of University computing resources, and to protect and conserve those computing resources. The Policies are not intended to be exhaustive and Georgia Southern University reserves the right to limit, restrict, or extend computing privileges and access to its computing resources.

Policy Statement

In support of its mission of teaching, scholarship, and service, Georgia Southern University provides access to computing resources for students, faculty, staff, and other authorized users within institutional priorities and financial capabilities. The computing resources of Georgia Southern University, including facilities, hardware, software, networks, and computer accounts, are the property of the state of Georgia. The use of these resources is a privilege granted by Georgia Southern University to authorized users only. Georgia Southern University requires all persons authorized to use its computing resources to do so responsibly and in compliance with all state and federal laws, all contractual and license agreements, and all policies of Georgia Southern University and the Board of Regents of the University System of Georgia. Authorized users of the University's computing resources must act responsibly to maintain the integrity and security of these resources. Each user of a University computing resource is ultimately responsible for the use of that computing resource and for the use of his or her computer account. Persons misusing the University's computing resources in violation of federal and state laws, Board of Regents and University policies, or these Policies are subject to disciplinary actions by the University and/or forfeiture of their computer privileges. In the event such misuse of computer resources threatens to compromise the integrity or jeopardize the security of University computer resources or harm authorized users of those resources, the University's Chief Information Officer or his/her designee is authorized to take any and all necessary actions, including the immediate confiscation and/or disabling of a University computer resource or the temporary or permanent

termination of a computer account, to protect, investigate, and ensure the security and proper use of the computer resources.

- Use of any University computing resource is restricted to those having proper authorization to use that particular resource. It is a violation of the law and University policy to assist in, encourage, or conceal from authorities any unauthorized use, or attempt an unauthorized use, of any of the University's computers or network facilities.

- No one shall knowingly endanger the security of any University computing resource, nor willfully interfere with authorized computer usage by circumventing or attempting to circumvent normal resource limits, logon procedures, or security regulations. Furthermore, use of all University computing resources shall be subject to all provisions of the Georgia Southern University Information Technology Security Standards and Guidelines, which are incorporated by reference as part of these Computer Use Policies.

- No technologies shall be connected to the University's computing resources that interfere with authorized usage of those resources. The University reserves the right to restrict the use of any technologies that may endanger the security and/or integrity of its computingresources. See the Information Technology Security Standards and Guidelines.

- The University's computing resources shall not be used to attempt unauthorized use, nor to interfere with another person's legitimate use, of any computer or network facility anywhere. All users shall share computing resources in accordance with policies set for the computers involved, giving priority to more important work and cooperating fully with the other users of the same equipment. Encroaching on or disrupting another person's use of University computers is prohibited. Examples of such acts include but are not limited to: excessive game playing; sending excessive messages either locally or offcampus [including but not limited to electronic chain letters]; initiating denial of service attacks; printing excessive copies of documents, files, data, or programs; modifying system facilities, operating systems, or disk partitions; attempting to crash or tie up a University computer; damaging or vandalizing University computing facilities, equipment, software, or computer files; causing an inordinately large number of requests for files; spamming; sniffing; running scans; reconfiguring; or using an inordinately high percentage of bandwidth.

- University computing resources and network facilities shall not be used for commercial purposes without specific authorization from the Vice President for Business and Finance or his or her duly authorized designee. All computer usage shall be in full compliance with all provisions of the Campus Advertising, Sales and Solicitation Policy and the Web-based Financial Transaction Policy.

- Passwords to any computing resource shall only be issued to authorized users. Password recipients are responsible for the integrity of their password and shall not distribute it to unauthorized users.

- Misrepresenting a person's identity or relationship to the University when obtaining or using University computer or network privileges is prohibited.

- Accessing, reading, altering, or deleting any other person's computer files or electronic mail without specific authorization is prohibited.

- Copying, installing, distributing, infringing, or otherwise using any software, data files, images, text, or other materials in violation of copyrights, trademarks, service marks, patents, other intellectual property rights, contracts, or license agreements is prohibited. All usage of computing resources shall be in compliance with federal and state copyright laws and in full conformance with the Regents Guide to Understanding Copyright and Fair Use.

- Creating, installing, or knowingly distributing a computer virus, "Trojan horse," or other surreptitiously destructive program on any University computer or network facility, regardless of whether any demonstrable harm results, is prohibited.

- Only those persons with proper authorization shall modify or reconfigure any University computing resource or network facility.

- Users of University computing resources shall have no expectation of privacy of materials stored on those resources. The University reserves the right to access any of its computer resources when federal or state laws or University policies may have been violated or where University contractual obligations or University operations may be impeded. Computer users should not place confidential information in computers without protecting it appropriately. The University cannot and will not guarantee the privacy or confidentiality of computer files, electronic mail, or other information stored or transmitted by its computers. All computer usage on Georgia

Southern University computing resources and network facilities is subject to the provisions of the Georgia Open Records Act, O.C.G.A. §50-18-70 et seq.

- Authorized computer users shall take full responsibility for messages that they transmit through the University's computing resources. The University's computing resources shall not be used to transmit any communications prohibited by law, including but not limited to fraudulent, harassing, obscene, or threatening messages.

- System administrators shall perform their duties fairly, in cooperation with the Georgia Southern community, their administrative supervisors, University policies, and funding sources. System administrators shall respect the privacy of others to the extent allowed by law and shall refer all disciplinary matters to appropriate authorities.

Responsible Office:

This Computer Use Policy shall be administered and enforced by the University's Chief Information Officer or his or her duly authorized designee.

Definitions:

Computing Resource

Computing resources comprise all computers and electronic data storage, transmission, and manipulation devices owned and/or controlled by any part of Georgia Southern University or connected to the University's communications facilities, including departmental computers and the University's computing network facilities accessed by anyone from anywhere.

Authorized Use

Authorized use of Georgia Southern University computing resources is use of computer resources that is consistent with the education, research, and service mission of the University and consistent with this Computer Use Policy.

Authorized User

Authorized users are as follows:

1. current faculty, staff, and students of Georgia Southern University;
2. any person connecting to a public information service housed on a computing resource; and
3. others whose access furthers the mission of the University and whose usage does not interfere with other users' access to computing resources.

Each user of a computing resource must be specifically authorized to use that particular computing resource by the University unit responsible for maintaining and operating the resource.

Source: http://academics.gasou.edu/provost/policies/computeruse.html.
Last updated 9/10/02.

Appendix B

Geology and Geography Program Checklists

See Department of Geology and Geography web site at

<http://cost.georgiasouthern.edu/geo> for program checklists

Appendix C

Honors Requirements

HONORS IN GEOLOGY

Students majoring in Geology (BS or BA) may pursue an Honors in Geology program. Students are required to have a minimum GPA of 3.2 after 45 hours of coursework and approval of Geology and Geography faculty to commence the Honors program.

To graduate with Honors in Geology a student must:

- Maintain a minimum GPA of 3.5 in the major, and 3.2 in a minor.
- Complete a senior thesis (BA or BS degree) with a minimum grade of B in GEOL 4610. The thesis will be supervised by a Geology/Geography faculty member.
- Complete GEOL 4120, 4820, and 4610 (3-semester research sequence) for a total of 4 credit hours. A minimum grade of B is required in GEOL 4120 to continue the research sequence.
- Present a departmental seminar on the thesis research.

HONORS IN GEOGRAPHY

Students majoring in Geography (BS or BA) may pursue an Honors in Geography program. Students are required to have a minimum GPA of 3.2 after 45 hours of coursework and approval of Geology and Geography faculty to commence the Honors program.

To graduate with Honors in Geography a student must:

- Maintain a minimum GPA of 3.5 in the major, and 3.2 in a minor.
- Complete a senior thesis (BA or BS degree) with a minimum grade of B in GEOG 4610. The thesis will be supervised by a Geology/Geography faculty member.
- Complete GEOG 4120, 4820, and 4610 (3-semester research sequence) for a total of 4 credit hours. A minimum grade of B is required in GEOG 4120 to continue the research sequence.
- Present a departmental seminar on the thesis research.

Appendix D

Course Offering Sequence

The Department of Geology and Geography offers courses that fulfill core curriculum requirements as frequently as possible, ususally every semester. Introductory level courses which do not fulfill core requirements are commonly offered once each year. Courses required for the geology and geography majors are usually offered every other year. Enrichment courses in the major are offered irregularly.

GEOGRAPHY	**Last Offered**	**Anticipated Next**
Offered Every Semester		
GEOG 1111 - Climate and Landscape	Fall 2003	Fall 2004
GEOG 1130 - World Regional Geography		
GEOG 3330 - Weather and Climate		
GEOG 3430 - Introduction to GIS	Fall 2003	Fall 2004
GEOG 4543 - Advanced GIS	Spring 2003	Spring 2004
GEOG 4820 - Senior Thesis Research		
Offered Once per Year		
GEOG 1110 - Climate and Landscape Lab	Fall 2003	
GEOG 3230 - Economic Geography	Fall 2003	Fall 2004
GEOG 4120 - Intro to Research Methods	Spring 2003	Spring 2004
GEOG 4610 - Senior Thesis Seminar	Spring 2003	Spring 2004
GEOG 5090/G - Selected Topics - GIS		Spring 2004
Offered During Academic Years Beginning with Even-Numbered Years (2000-01, 2002-03,		
GEOG 3530 - Advanced Cultural Geography	Spring 2003	Spring 2005
GEOG 4541 - Cartography	Fall 2002	Fall 2004
GEOG 4232 - Geography of Latin America	Spring 2003	Spring 2005
GEOG 4330 - Geography of Africa South of Sahara	Fall 2002	Fall 2004
GEOG 5130/G - Geography of North America	Spring 2003	Spring 2005
Offered During Academic Years Beginning with Odd-Numbered Years (2001-02, 2003-04,		
GEOG 1101 - Human Geography	Spring 2002	Spring 2004
GEOG 3130 - Conservation	Fall 2003	Fall 2005
GEOG 3741 - Remote Sensing	Fall 2003	Fall 2005
GEOG 4233 - Geography of Asia	Fall 2001	Spring 2004
GEOG 4430 - Geography of Europe	Fall 2003	Fall 2005
GEOG 5230/G - Urban Geography	Spring 2002	Spring 2004
Offered Irregularly		
GEOG 4130 - Biogeography	Fall 2001	
GEOG 4131 - Geography of the American South		
GEOG 4632 - Advanced Cartography		
GEOG 4742 - Advanced Remote Sensing		
GEOG 5030/G - Selected Topics - Regional Geog		
GEOG 5031/G - Selected Topics - Human Geog		
GEOG 5590/G - Field Studies in Geography		
GEOG 5620/G - Research Seminar		

GEOLOGY

Offered Every Semester	Last Offered	Anticipated Next
GEOL 1110 - Earth Laboratory		
GEOL 1121 - Introduction to the Earth		
GEOL 1310 - Environmental Geology Laboratory		
GEOL 1330 - Principles of Environmental Geology		
GEOL 1430 - Dinosaurs (History of Life)		
GEOL 1530 - Principles of Oceanography		
GEOL 3790 - Teaching Internship in Geology		
GEOL 4820 - Senior Thesis Research		
Offered Once per Year		
GEOL 1122 - Historical Geology (Spring)	Spring 2003	Spring 2004
GEOL 4120 - Introduction to Research (Spring)	Spring 2003	Spring 2004
GEOL 4610 - Senior Seminar (Spring)	Spring 2003	Spring 2004
GEOL 5230/G - Earth Science (Spring)	Spring 2003	Spring 2004
GEOL 5741/G - Sea Turtle Conservation (Spring)	Spring 2003	Spring 2004
Offered During Academic Years Beginning with Even-Numbered Years (2000-0		
GEOL 3520 - Field Methods (Spring)	Spring 2003	Spring 2005
GEOL 5141 - Invertebrate Paleontology (Fall)	Fall 2002	Fall 2004
GEOL 5142 - Stratigraphy and Sedimentation (Spring)	Spring 2003	Spring 2005
GEOL 5440 - Structural Geology (Fall)	Fall 2002	Fall 2004
GEOL 5530 - Geomorphology (Fall)	Fall 2002	Fall 2004
Offered During Academic Years Beginning with Odd-Numbered Years (2001-02		
GEOL 3541 - Mineralogy (Fall)	Fall 2003	Fall 2005
GEOL 3542 - Petrology and Petrography (Spring)	Spring 2004	Spring 2006
GEOL 5541 - Hydrogeology (Fall)	Fall 2003	Fall 2005
Offered Irregularly		
GEOL 4530 - Tectonics	Fall 1999	
GEOL 5090 - Selected Topics	Spring 2003	
GEOL 5130 - Geochemistry		
GEOL 5131 - Economic Mineralogy	Spring 2003	
GEOL 5132 - Regional Field Geology		
GEOL 5540 - General Oceanography	Fall 2002	
GEOL 5542/G - Hydrogeochemistry	Spring 2002	
GEOL 5870 - Research Methods		
GEOL 5890/G - Directed Study		
GEOL 6440/G - Environmental Geology		

Latest Revision January 2000

Appendix E

Style Manual for Writing in Geology and Geography

Style Manual

For Writing in Geology and Geography

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We do much of our thinking with words, and if I have trouble understanding what a geologist writes, I wonder whether he or she THINKS clearly and logically. That is, if he writes badly, does he think badly? Of course it may not matter; I know geologists who are good scientists but poor writers --- but the bad cancels the good. Clumsy wording can mean you won't get the job, the company won't drill the well, or your boss will delay your promotion.

Wendell Cochran

Geological editor, former editor of *Geotimes*
and *Earth Science*,
and co-author of *Geowriting* and *Into Print*

INTRODUCTION

Geology cannot be used if it cannot be understood. In addition to being good scientists, geologists have a responsibility to present information clearly and concisely. Whether the information is in a field-trip report, master's thesis, or a paper for publication, the object is the same: to communicate information. Only the type of information and its complexity vary. Clear writing is important not only for academic papers, but also in professional settings. Employers stress communications skills when considering potential employees. A typical newsletter of the southern California chapter of the Association of Engineering Geologists includes a list of job openings - and all the available jobs require "demonstrated writing and oral communications skills." Writing ability is not only a useful talent; it has become necessary in finding and keeping a job.

No writing guide can answer all the questions about how to write a paper. This manual is intended to add to other, more general, information and to help organize and present scientific material according to generally accepted practice. The guidelines are not iron-clad rules; logic and consistency will indicate where and when exceptions should be made. Not all this information may be relevant to a particular assignment. For example, a term paper is unlikely to need a discussion of "research methods." This manual does not address the general problem of clear writing either. Two of the best references for this are the classic book by Strunk and White (*The Elements of Style*) and one by Zinsser (*On Writing Well*). The reference list at the end of this manual gives full citations for these books and some other worthwhile sources.

The catalyst for compiling this manual was a similar booklet by Daniel F. Merriam of Wichita State University. William Wadsworth, formerly of Whittier College, contributed to various drafts of this manual, and useful feedback came from students in Whittier College's Geology Department, their January Field Geology course, and the Geological Sciences Department of the California State Polytechnic University, Pomona. The content of the manual profited greatly from a short course on "Geowriting for Results," sponsored by the Geological Society of America, in November 1979. Conversations with and advice from members of the *Geotimes* Advisory Committee and the Publications Advisory Committee of the American Geological Institute have also been helpful. Any comments, corrections, or suggestions for this manual are welcome.

ORGANIZATION

Style and Mechanics

Most organizations (universities, businesses, and publications) have adopted a uniform style. For a paper to be accepted by the organization, it must be presented in their style. (If you don't believe this, try getting a master's thesis past a graduate school review board sometime.) To follow a particular style, you must be aware of the elements of a style, such as the organization of the report, the use of headings, and proper referencing and citation. The main reason you should follow this style manual is to make you sensitive to these elements of form. The style presented here is almost exactly the same as that used by most major American geological publications, so following it is also good practice. Remember, however that style is just that--style. No single style is absolutely correct. You must adapt your writing to the requirements of the organization or publication that will receive it.

In addition to a specific style of presentation, certain mechanical aspects of written work are also commonly specified. These mechanical considerations include such things as the font type and size, the

width of the margins, and the proper place for page numbers. For papers written for geology courses, the following "mechanics" should be observed.

Final manuscripts must in black ink on standard white 8.5 x 11 inch white paper.

Avoid the temptation to use all the tricks available in word processors. A formal manuscript should use a standard type face, preferably 12-point Times, Geneva, or Courier font. If the printer you use has more than one printing mode, always use the one that produces the "best" quality printing. Laser printers are preferable to ink-jet printing because the "ink" is fused to the page and, therefore, less likely to smudge or run.

Everything, including the abstract, references, and figure captions, should be double spaced. Except for the title page, all pages of the manuscript must be numbered. Use only 1 side of the paper, and leave 1-inch margins at the top, bottom, and on both sides of the page. Avoid all gimmicks, including italic or script type styles and colored paper or ink. Making a photocopy for yourself is an excellent idea, but be sure to hand in the original.

Outline

Having an outline is important to clear writing. If you do not have a clear idea of the organization of your paper, you are likely to create a muddled mixture of data, inferences, and conclusions. An outline can help you keep your thoughts straight and your writing succinct.

Begin with a general outline and then expand it into a complete one. Some editors believe you must have all the work done and conclusions drawn before you can even begin to think about writing, but most people continue to organize and reorganize their thoughts as they write. Thinking about the report you expect to produce cannot begin too early. Whatever order you follow in completing your research and organizing your report, you will probably find that your outline follows the general format shown below.

Title
Abstract (sometimes omitted in library-research papers)
Introduction
Body of the paper
    Heading A
        Subhead 1
        Subhead 2
    Heading B

Summary or Conclusions
Acknowledgments (if appropriate)
References cited
Appendices (if necessary)

Title and Abstract

More people will read your title than any other part of the paper. Titles should be both interesting and informative; its purpose is to catch the attention of readers and tell them what the paper is about. Commercial indexing and bibliographic services rely on "key" words in titles, and so you should compose

your title with that in mind. Be as brief and descriptive as possible. Try to avoid using colons. They are becoming an academic affectation, and some journals, notably the *Journal of Geological Education*, are unwilling to accept a manuscript whose title includes a colon.

After the title, the abstract is the next most important part of a paper. For every person who reads an entire published paper, between 10 and 500 people are likely to read the abstract. If you are writing an abstract for a talk you plan to give at a professional meeting the quality of the abstract will influence whether the paper is chosen for presentation - and whether anyone will come to hear you talk if it is selected.

An abstract should tell briefly what the paper is about: why it is important, what the data are, and what the conclusions are. Except in rare circumstances, never cite a reference in an abstract. Be as concise as possible; for most papers, 250 words should be a maximum length.

You should beware of passive verbs in all writing, but especially in abstracts. They weaken the sentences and are usually less informative than active verb forms. Consider these two examples:

Passive: Further limitations on this statistical analysis are seen by examining the fossil records of the Pleistocene mammals of Europe.

Active: Fossil records of the Pleistocene mammals reveal further limits on this statistical analysis.

Note that this results in a net savings of 6 words in just one sentence, too. When your abstract must fit within a defined space, saving a few words may be essential.

Body of the Text

The main body of a paper should include an introduction, a complete statement of the problem and hypotheses, an explanation of the methods used (if the paper involves any data collection beyond library research), the data, and an interpretation and discussion of the results.

The introduction should establish the context for the paper: when, where, how, and why the work was done. Historical perspective (previous work) should be given here, unless it is sufficiently important to deserve a section of its own. The subject of the study should be stated clearly. Is it a literature review? A discussion of one theory about a geologic problem? A report of experimental results or preliminary mapping? Your readers deserve to know what the paper is about.

Observations should be carefully separated from interpretations in any paper. Testing each statement as you write it can help you avoid mixing the two. As you write each sentence, ask "Is this a measurement or observation (fact), or have I inferred this from the data (interpretation)?" The difference may only be in how you arrange your sentence. For example:

Observation: The frequency of bankfull stage on Buffalo Creek is 2.3 times per year.

Interpretation: Buffalo Creek is likely to overflow its banks in the next few years.

The structure of the text should reflect its organization. The best way to do this is by using headings of different weights, showing the importance of the section. A standard format is shown below. A first-order heading would indicate the most important groups, including the abstract, introduction, main points in the body, summary, and references. Note that this manual follows the same system for headings.

FIRST-ORDER HEADING - CENTERED, ALL CAPITALS

Second order - Centered, upper and lower case

Third-order headings - left side of page, upper and lower case, underlined

Fourth order heading. Beginning of paragraph

Summary or Conclusions

A summary is a condensed version of the paper, usually with more detail than an abstract. Reports that involve compiling information from a variety of sources, but with little or no collection of new data, usually end with a summary.

Conclusions reemphasize the results of the paper, and they are most often used when original research is involved or the paper deals with a critical analysis of several theories or groups of data. Conclusions are sometimes numbered in a list or within a paragraph.

A summary is not the same as a conclusion, and you should consider your purpose when you are writing your paper. If you want to review the entire paper, use a summary. If you want to emphasize your results, write a conclusion.

After the title and abstract, your conclusions are the most important part of your paper. Many readers will turn to the concluding section after they read the abstract and before they read the body of the paper. A good practice is to try writing your conclusions before any other part of the paper. If you cannot do it, you may not have a clear enough idea of what you want to say.

Acknowledgments

People who have contributed directly to the paper--or the work it discusses--should be acknowledged briefly. This includes people who supplied their data for your use, suggested ideas, helped with field or lab work, read or typed the manuscript, or supplied equipment or financial assistance. Generally, this section is only needed in research papers; reports based on library research seldom require acknowledgments.

Writing acknowledgments may seem awkward at first, but it is a professional courtesy; a formal acknowledgment is sometimes required with research funded by a government agency or a scholarship. It is not professional to acknowledge your dog, even if she did help with the field work. Acknowledging your parents is acceptable, if they helped in the field or provided assistance beyond the normal call of duty.

If your paper is controversial, be sure to show your paper and acknowledgments to everyone you mention, especially if you are submitting it for publication. Some uncomfortable situations have developed when acknowledgments in a paper have implied the approval of the people mentioned. Some authors avoid

such misunderstandings by adding a statement saying, “The conclusions expressed here are entirely my own.”

Acknowledgments often provide the only personal touch in a scientific paper. They can range from terse to exhaustive to humorous, as illustrated by these examples:

This research was funded in part by NASA grant NSG-7568.

Example from Kochel and Baker (1982, p. 361):

We thank H. Mills, R.J. Everett, G.C. Marshall, C. Hunt, T.M. White, T. Hayre, J. Martin, H. Hunt, L. Billings, Jr., J. Skiles, M. Rose, W. King, D. Rowland, W.J. Thompson, A.O. Baker, T.J. Jarrett, D. Duncan, F. Ingram, and the E. Hinojosa family for hospitality and access to land along the Pecos and Devils rivers. P.C. Patton and B.L. Kochel assisted in the field work. D.S. Dibble and P.C. Patton provided discussions and data for the Arenosa Shelter. S. Valastro, Jr., offered advice on interpreting radiocarbon dates. We are grateful to P.E. Smith for the loan of a field vehicle and to B.L., D.E., and the late R.I. Kochel for assistance. L.R. Beard, P.C. Patton, A.J. Scott, and E.L. Lundelius provided useful reviews of this manuscript. This work was supported by grant EAR 77-23025 from the National Science Foundation Support for manuscript preparation was provided by the Geology Foundation, University of Texas at Austin.

Example from Blatt and Brown (1974, p. 261):

During the course of this work we benefited greatly from the comments of our colleagues in the School of Geology and Geophysics of the University of Oklahoma. The insights they provided sustained us through the hours of tedium during data collection and analysis. They gave new meaning to the concept of a community of scholars.

This research was not supported by grants from either the National Science Foundation, National Aeronautics and Space Administration, or Petroleum Research Fund of The American Chemical Society. We do wish, however, to acknowledge the important contribution to our research made by the Cleveland County Health Department.

Documentation

References

References are cited in the text of the paper by the author’s last name(s) and the publication date, and then the complete reference is listed at the end of the paper. Any fact, figure, or idea that cannot be considered “obviously common knowledge” should have a citation showing the source of information. Thus, in a report on the geomorphology of Swedish Lapland, you would need to cite the source of your information on the Arvidsjaur granite as an important type of bedrock in the region; you would not need to indicate the source of information on the fact that the Arctic Circle begins at a latitude of 66° 30' North latitude.

Where a reference is cited in the text of a paper, it should be enclosed in parentheses. The examples given below are from Rhodes (1977). Note the two different formats depending on whether the author’s name is part of the sentence.

At-a-station hydraulic geometry describes the manner in which the channel characteristics of width, depth, and velocity adjust to changes in discharge (Leopold and Maddock, 1953).

Lewis (1966) showed that hydraulic geometry relationships obtained for intermediate to high discharges . . .

References to sources with 3 authors should include all names (e.g., Leopold, Wolman, and Miller, 1964), but those with 4 or more authors can be referred to in the text more briefly (for example, Smith et al., 1982). All the authors should be listed in the reference list at the end of the paper.

Before submitting a paper, always double-check that (1) all sources cited in the text are included in your "References Cited" list and (2) every entry in your citation list is mentioned in the body of the paper. Do not list publications you consulted but did not cite in your paper.

Quotations

Direct quotes should be used sparingly, and only when the original version expresses the idea so much more clearly than you could ever hope to, that it is impossible to paraphrase without losing information. Your paper will usually be much stronger if you restate what you have read in your own words. If you find an important passage that you simply can not improve, or if you need to show exactly what someone else has stated, then use and acknowledge the quote. *Never* use another author's words without giving full credit. Plagiarism is a serious offense, academically, morally, and legally. One rule of thumb is that if you are using more than 5 consecutive words from another author, put them between quotation marks.

Despite what you may have learned in other disciplines, footnotes are almost never used in scientific papers. They interrupt the flow of the writing (and reading) and should be avoided. Show the source of your information by the methods described above.

If you do use a direct quotation, cite it parenthetically, with author, date, and exact page(s) on which the quote occurred. For example:

The evolution of our geologic understanding of the San Andreas fault has been "highlighted by a few revelations which resulted in conceptual revolutions" (Hill, 1981, p. 127).

If you omit part of the material you are quoting, use ellipses (". . .") for the omitted words. A quote that is longer than 5 or 6 lines should be indented as a block, with no quotation marks, and the reference should be given before the body of the quotation, as in this example from Hill (1981, p. 127).

This history of understanding of the San Andreas fault is highlighted by a few revelations which resulted in conceptual revolutions. Obviously, the first revelation was the 320-km zone of ground rupture accompanying the 1906 San Francisco earthquake; this led to the recognition of strike-slip faulting and the elastic-rebound theory of earthquakes. Noble's (1926) suggestion of 38 km of right-slip constituted a new interpretation, partially aborted, that was reintroduced and augmented by Hill and Dibblee (1953). Finally, plate tectonics and Wilson's (1965) introduction of the transform fault gave the first, although partial, explanation for strike-slip displacements of hundreds of miles.

References Cited

At the end of a manuscript, all the references cited in the paper (including those in the text, tables, and figure captions) should appear in one list, titled "References Cited." They should be arranged alphabetically by the author's last name; if an author has more than one publication, the sources should be further organized by year, from oldest to most recent. For a journal or magazine article, the complete reference should include the author(s)' name, date of publication, title, journal name (spelled out - no abbreviations) with volume (and number, if needed), and pages (starting and ending pages of article). For example:

Hulbert, R. C., Jr., Petkewich, R. M., Bishop, G.A., Burkey, D., and Alshire, D.P., 1998, A Middle Eocene protocetid whale (Mammalia: Cetacea: Archaeoceti) and associated biota from Georgia: Journal of Paleontology, v. 72, no. 5, p. 907-927.

Thorn, C.E. and Welford, M.R., 1994, The equilibrium concept in geomorphology: Annals of the Association of American Geographers, v. 84, p. 666-696.

For a book, the reference should include the author(s), date, title, location of publisher, name of the publisher, and number of pages.

Judson, S., Bonini, W.E., Rhodes, D.D., and Rossbacher, L.A., 2000, The lab book: problem solving in geology [2nd edition]: Upper Saddle River, New Jersey, Prentice Hall, 250 p.

If you only used part of the book, then list those pages instead, using the following style.

Hulbert, R. C., 1998, Postcranial osteology of the North American middle Eocene protocetid *Georgiacetus*; *in* Thewissen, J.G.M. (editor), New York, The emergence of whales, Plenum Press, p. 235-267.

Rich, F. J., and Pirkle, F.L., 1998, Steinkerns as pollen traps; *in* Bryant, V.M., Jr., and Wrenn, J.H., (editors), New developments in palynomorph sampling, extraction, and analysis, American Association of Stratigraphic Palynologists Contributions Series No. 33, p. 87-94.

References to published maps follow the form given above but also include the map scale.

Diblee, T.W., Jr., 1973, Regional geologic map of San Andreas and related faults in Carrizo Plain, Temblor, Caliente, and La Panza Ranges and vicinity, California: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-757, scale 1:125,000.

If you are writing for publication, you should follow that journal's format for references. The Geological Society of American/U.S. Geological Survey style is commonly accepted. These references and those at the end of this manual follow that style; refer to them for specific examples of how to list the references.

The World Wide Web and other Internet sources of data provide a new class of information. Because the material contained in Web-based data sources is subject to instant modification and revision,

and because its location (the URL) may change, the American Geophysical Union, for one, has decided to treat electronically delivered information as unpublished material. AGU's editorial policy states: "If such data are essential to the paper, authors may cite them like a personal communication in the body of the paper" (American Geophysical Union, References in AGU Publications, (located in December 1999 at: http://earth.agu.org/pubs/references.html)). This Web site gives two other examples of citation:

Gross, R. S., SPACE94, Crustal Dynamics Data Information Center, NASA Goddard Space Flight Center, Greenbelt, Md., 1994 (located in 1994 subdirectory of JPL directory, accessible via anonymous FTP from CDDIS.gsfc.nasa.gov (128.183.10.141)).

(Magellan data are available from the World Wide Web server for the Planetary Data System Geosciences Node at http://www/pds/wustl.edu)

Never cite a reference that you have not looked at yourself; it is lazy and you cannot trust other authors to have understood the original reference. If you absolutely must use a reference that you cannot locate, then show the source that you used. For example, if writing about the interpretation of the San Andreas fault as a transform fault, you could show your source of information as Wilson (1965, in Hill, 1981, p. 127). Do not cite Wilson (1965) directly if you did not read the original paper.

Occasionally, you may want to include other sources of information on a subject which you did not cite in the text of a paper. This can be done by adding a list of "Other References," following and separate from the "References Cited." Generally, this will only be useful when you are writing the definitive work on a topic and want to show other major references; do not be tempted to list uncited books and articles just to expand your references. Every reference listed should be there for a good reason.

An annotated bibliography includes, besides the standard citation, a few sentences about the source material. Annotations may mention important data, unusual or innovative methods, unique illustrations, pertinent results, or whether the references are particularly useful. This type of reference can be extremely helpful while you are doing research, writing a paper, or preparing a seminar presentation, but they are seldom included in manuscripts for publication.

Appendices

Any supporting material that you want to include with your paper but which does not fit into the text should go into an appendix (note that two of them are appendices). Long tables of untreated data belong in an appendix, as do lengthy calculations. The appendix can be cited in the body of the paper, and it should follow the references.

Figures and Tables

A picture may be worth a thousand words, but a poorly executed one may only be a waste of space. Only use illustrations that add to the text. Figures increase the work involved in manuscript preparation, and if the paper is published, illustrations can increase printing costs dramatically.

Illustrations come in three forms. Figures are either black-and-white photographs or line drawings, including graphs, maps, and charts. Figures should be freshly drafted for the paper, never photocopied from another publication. Tables are columns of numbers or other information that take the

place of text. Plates are either photographs or drawings that are so large they must be put into a pocket at the back of the paper.

As with information used anywhere in the paper, the sources of information should be shown clearly in the figures and tables (unless you collected the data yourself). This includes figures you have almost copied from other papers; at the very least, you should acknowledge this, "(Redrawn from Rhodes, 1977)." This simple acknowledgment is usually acceptable for a paper written for a course. For publication, you must show that you have received written permission to use any copied or redrafted figures.

Illustrations are referred to in the order in which they are mentioned in the text. For example, Figure 1 comes before Figure 2, Table 1 comes before Table 2, and Plate 1 comes before Plate 2. [The same rules are true for equations, if you are including them in your paper.] If any of the illustrations have several parts, they should be labeled 1a, 1b, and so on. References to illustrations in the text should be spelled out, but they are abbreviated if they are cited in parentheses. The example shown below is from Wadsworth (1975, p. 272); this passage appears near the end of the paper, and therefore, both figures referenced here have already been introduced in their proper numerical order in the paper.

> Figure 1 can be reoriented to show the geologic features in their prefaulting attitudes, and Figure 11 has been prepared to aid this procedure. Restoration requires that the map (Fig. 11) be tilted toward the observer . . . .

Figures and plates should have captions that explain them, including explanations (*not legends*) for symbols and unusual abbreviations. Maps should include a north arrow, scale (metric), contour interval (if appropriate), and latitude and longitude. An index map of the locations should also be included, if needed.

Limit the illustrations to one per page. Figures and plates have captions below them (or on the preceding page); titles for tables go at the top of the table. Concentrate on a few good illustrations, instead of graphs and tables showing large quantities of data. For a lengthy paper, a list of figures, tables, and plates should follow the table of contents, as an aid to the reader.

HELPFUL HINTS

> "English is the most valuable tool we have. Use it with precision."
> Dr. Sigfried Muessig, Getty Minerals

Capitalization

All proper names are capitalized, including geographic names:

Puente Hills	San Joaquin Valley
Mount St. Helens	Coast Ranges
Appalachian Mountains	Cumberland Island

Structural names are capitalized, as illustrated below:

San Andreas fault
Newport-Inglewood zone of deformation

Stratigraphic names:

Upper Cretaceous Series
Late Cretaceous Epoch
Artists Drive Formation
Eureka Valley Tuff

Check Lists

A check list is an excellent means of assuring that everything required in a writing assignment is included and is prepared in the required form. Do not think that formal check lists are used only in academic assignments. The National Science Foundation (NSF), for example, includes a long and detailed check list in its grant-application instructions. In a sense, the various "Instructions to Authors" used by many publications are check lists of what to include in a manuscript and how to prepare it. Preparing a check list for any formal written work is an excellent idea, because it will help you avoid oversights that may cause the manuscript to be returned to you. Appendix 1 may serve as a model for how to prepare your own check lists.

Compass Directions

North, south, east, west, and northwest are all directions and treated as nouns. Northeastern, southwestern, and southern are all adjectives. None of them is capitalized, unless they are the first word in a sentence.

Trends of lines can be described with only one direction; north-south and east-west are redundant. For example:

a south-trending fracture trace
beds dipping to the northwest
the southern California climate

Gender

Using the masculine pronoun to cover both genders is technically, but not politically, correct. A number of solutions have been proposed, including he/she, he or she, (s)he, and alternating use of the masculine and feminine pronouns. The simplest solution is to use plural pronouns: "Geologists can avoid gender-specific pronouns in *their* writing when *they* utilize plural pronouns."

Geologic Time

Time-stratigraphic and rock-stratigraphic units are distinctly different. Note the correlations - and differences - in the table below:

CHRONOSTRATIGRAPHIC	LITHOSTRATIGRAPHIC
Era	---
Period	System
Epoch	Series
Age	Stage
---	Zone

Beware of having "late" rocks or "upper" time. Keep your rock units and their ages separate (see Cluff, 1961). For a detailed explanation of proper usage, consult the "North American Stratigraphic Code" (The North American Commission on Stratigraphic Nomenclature, 1961).

Hyphens

Compound adjectives are hyphenated; for example, you could describe an iron-bearing member or coarse-grained sandstone. Placement of the hyphen can change the meaning of sentence completely: would you rather carry 10 gallon jugs or 10-gallon jugs? Only compound adjectives that come before a noun have hyphens; note the use of the hyphen in these two examples:

The coarse-grained sandstone was deposited.
The sandstone is well sorted.

Adverbs modifying adjectives, including most words that end in -ly are not hyphenated. Thus, the phrases "poorly sorted sandstone" or "steeply plunging anticline" have no hyphens.

Italics

Italics are commonly used for titles of completed creative works, including books (Principles of Geology), magazines (*Geotimes*), and newspapers (Los Angeles *Times*). Note, however that the titles of

unpublished manuscripts are given in quotation marks ("Student Writing Style Manual"). Words from other languages that are not incorporated into English are also italicized. The names of individual vessels, including aircraft, spacecraft, and ships, appear in italics (*Glomar Challenger*). The formal names of genera, species, and subspecies are given italics (Bulimina elongata subulata). Family and higher order biologic names are rendered in standard type (Phylum Brachiopoda).

Because most typewriters and many computer printers did not have *italic characters*, words that would have appeared in *italics* in type-set print were underlined. Remember, *italics* and underlining mean the same thing. Neither is necessarily correct, but it is important to be consistent. Use one or the *other*, not *both*.

Numbers and Units of Measurement

Use metric units for all measurements. Metric units may feel awkward and unfamiliar, but their use conforms to international standards. If you are quoting data from an older publication (before the use of metric units became common), you should give the data in their original units and then give the metric equivalent. For example, you would write "Smith and Jones (1895) found this unit to be 10 ft (3 m) thick." When converting from English to metric units, pay attention to the appropriateness and accuracy of significant figures. For example, convert 3 ft to 1 m, not 0.9144 m.

A number should always be given in numeric form, unless it is the first word in a sentence, and reorganizing a sentence will usually avoid the problem of beginning with a number. Generally, any number larger than 1,000 can be given in scientific notation. Units are abbreviated with no periods, according to international agreement.

2 sec	8.9 m/sec	2.1415 m	76.98 m^2
65.5 km	354 kg	42.3 g	2.65 g/cm^3
98 cm/sec	32 lb	16 ft	3 x 10^8 ergs

Plurals

Use the singular as much as possible. When in doubt about the plural form of a word, check a dictionary. Common usage can be misleading, so look it up for yourself. For example, Sierra Nevada is already a plural. Newscasters, reporters, and others who refer to the "Sierras" are incorrect. English incorporates many words that come from other languages. These borrowed words, especially technical, geological terms, often have unusual plural forms. Note the few examples listed below:

SINGULAR	PLURAL
colloquium	colloquia
criterion	criteria
datum	data
formula	formulae

phenomenon	phenomena
palsa	palsen
pingo	pingos
symposium	symposia
tsunami	tsunami

Unnecessary Words

Eliminating unnecessary words can sharpen your writing. An effective way to improve your writing is to avoid beginning a sentence with "It is . . ." or any similar weak construction such as "Some were . . ." or "They are . . ." Sometimes the decision is a judgment call between conciseness and active versus passive voice. Note the two versions below:

It is possible to improve almost any sentence beginning with "It is . . ." by rewording it.

Almost any sentence beginning with "It is . . ." can be improved by rewording.

Other words that take more space than they deserve include:

along these lines (omit)
and/or (a legal term; use "and," "or," or "or both" to convey your precise meaning)
as follows (omit)
due to the fact that (= because)
hopefully (see separate section in "Word usage")
in the case of (if)
it is interesting to note that (omit)
located or situated at (at)
needless to say (omit)
of distinctive character (distinctive)
on the order of (about or approximately)
thing (be specific)
were engaged in the study of (studied)
whether or not (whether)

These words can usually be deleted to improve a sentence:

certainly
merely
quite
rather

simply
undoubtedly
unquestionably
very

Word Usage

Many pairs of words differ only in a shade of meaning, and that slight variation can change the entire meaning of a sentence. Your time and effort will be well spent choosing the right word. Some often-confused words are listed in this section. You will probably want to add some of your own candidates to this list.

AERIAL vs. AREAL - *Aerial* photographs are taken from airplanes; *areal* refers to surface area (as in a square meter).

AFFECT vs. EFFECT - The moon *affects* (verb, meaning influences) the Earth by producing an important *effect* (noun, meaning result): tides.

AMONG vs. BETWEEN - You divide something *between* two people, but *among* three or more.

AS and BECAUSE vs. SINCE - "As" refers to a similar or relative characteristic shared by several things; "because" gives a direct reason; "since" only refers to time.

COMPARE vs. CONTRAST - Two items are *compared* with each other when their similarities are pointed out. They are *contrasted* when their differences are stressed.

COMPOSE vs. COMPRISE - This granite *comprises* (includes) feldspar, but quartz, feldspar, and biotite *compose* (make up) the rock.

FARTHER vs. FURTHER - *Farther* refers to distance. *Further* is abstract and cannot be measured. Example: "We will need to hike farther today if we are going to pursue our theory any further."

FORWARD vs. FOREWORD - *Forward* is a direction you can move in; a *foreword* is an introductory comment, usually at the beginning of a book.

GEOLOGIC vs. GEOLOGICAL - *Geologic* refers to a natural feature or phenomenon; *geological* refers to something made by man. Thus, you can have a geological map depicting geologic features.

HARD vs. DIFFICULT - *Hardness* can be measured on Moh's scale, but if you can not do it easily, then it is *difficult*.

HOPEFULLY - Do not confuse this word with "I hope." Properly speaking, "hopefully" means that some action is being done with hope. Saying "Hopefully, we will be finished mapping soon," is wrong (unless you have great expectations of the mapping process). One of the few ways in which the word is used

correctly is saying, “Hopefully, she opened the fat envelope from the college of her choice (or the Irish Sweepstakes or her long-lost uncle).”

IMPLY vs. INFER - Do you mean to *imply* (suggest) that you can *infer* (conclude or deduce) the origin of ophiolites?

IT’S vs. ITS - It’s incredible that so many people still don’t know the difference between *it’s*, the contraction for “it is” and *its*, a possessive pronoun meaning “belonging to.”

LIE vs. LAY - During the spring floods, the river will *lay* (actively deposit) new sediments on the flood plain, but right now the older materials just *lie* (passively rest) there.

PRESENTLY vs. CURRENTLY - *Presently* means “in the near future.” *Currently* means now. They should not be used interchangeably.

PRINCIPAL vs. PRINCIPLE - The *principal* (main or primary) concept to remember is the *principle* (law or generalization) of cross-cutting relationships.

STILL vs. YET - *Still* is quiet. *Yet* refers to time. Example: Is the water still yet?

SURFICIAL vs. SUPERFICIAL - *Surficial* features occur on the Earth’s surface; *superficial* features are trivial.

UNIQUE vs. VERY (OR QUITE) UNIQUE - Something either is or is not unique. No modifiers apply.

VARY vs. RANGE - A rock can *range* in color from white to black, but it can only *vary* (change) if it’s a chameleon (or pleochroic). Range implies a continuum of values. Your data may range, but they should not vary.

WHICH vs. THAT - *That* begins a restrictive clause; *which* is nonrestrictive and refers to a less important trait. Thus, “the sediment that fills the basin” means that specific sediment. “The sediment, which fills the basin,” suggests that some other aspect of the sediment is a more important characteristic. The most useful test for the which/that question is to see if the sentence means the same thing without the phrase. If so, use a “which.” If the phrase needs to be there, use “that.”

SUMMARY

With the availability of computer software to check grammar and spelling, writers have no excuse for those errors. However, eliminating mistakes in spelling and basic grammar places even more emphasis on the quality of reasoning and the clarity of the writing. This manual was written to help students avoid some of the most common mistakes that cannot be recognized word processing software. Practice may not actually make perfect, but experience will certainly improve your writing. American poet John Ciardi once said there are six rules for improving your writing. They are: “Read, read, read. Write, write, write.”

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Appendix 1

SAMPLE CHECK LIST OF DEADLY ERRORS

_____ The paper is typed double-spaced, on white paper.

_____ The report has a cover page with:

____ title

____ author's name and address

____ date

_____ The pages are numbered sequentially.

_____ The paper is organized by headings and subheadings as specified in this manual.

_____ All the measurements are in metric units and properly abbreviated, as specified in this manual.

_____ All sources cited are listed in the reference section and every source in the list of references is cited in the narrative.

_____ All the reference citations and listings are in the style described in the manual.

_____ The spelling and grammar in this paper have been checked using computer software.

_____ All the pages are in correct order and paper-clipped together. (Do not submit report in any type of binder or cover.)

IF ANY OF THESE THINGS ARE NOT DONE OR ARE DONE INCORRECTLY, THE PAPER WILL BE RETURNED IMMEDIATELY. PENALTIES FOR LATENESS WILL ACCUMULATE UNTIL THE PAPER IS SUBMITTED IN THE PROPER FORM.

I certify that I have checked all these items for completeness before submitting the paper. I understand that signing this Check List without actually checking the items is an act of academic dishonesty and, therefore, subject to severe penalties.

Signed: _____

Appendix 2

TECHNICAL WRITING RULES

All technical writers in this department will use the following rules when preparing their documents.

1. Each pronoun must agree with their antecedent.
2. Just between you and I, case is important.
3. Verbs has to agree with their subjects.
4. Watch out for irregular verbs which have crept into our language.
5. Don't use no double negatives.
6. A writer mustn't shift your point of view.
7. When dangling, don't use participles.
8. Join clauses good, like a conjunction should.
9. Don't write a run-on sentence you have to punctuate it.
10. About sentence fragments.
11. In letters reports articles and other writing we use commas to separate items.
12. Don't use commas, which aren't necessary.
13. Use the apostrophe in it's proper place and omit it when its not needed.
14. Don't abbrev
15. Check to see if you any words out.
16. As far as incomplete constructions, they are wrong.
17. Never use a preposition to end a sentence with.
18. It is important to never under any circumstances split an infinitive.
19. Last but not least, avoid clichés like the plague.
20. Don't use a foreign term when there is an adequate English quid pro quo.
21. If you must use a foreign term, it is *de rigor* to spell it correctly.
22. It behooves the writer to avoid archaic expressions.
23. Do not use hyperbole; not one writer in a million can use it effectively.
24. Mixed metaphors are a pain in the ass and ought to be thrown out the window.
25. Placing a comma between subject and predicate, isn't correct.
26. Parenthetical words however should be enclosed in commas.
27. Consult the dictionary frequently to avoid mispelling.
28. Don't use tautological, repetitive, or redundant statements.
29. Puns are for children--not for readers who are groan.
30. The passive voice should not be used.
31. Hopefully, you will use words correctly irregardless of how others use them.
32. Never use a long word when a diminutive one will do.
33. Avoid colloquial stuff.
34. Remember to finish what you

The source of this set of rules is unknown. Like "Murphy's Laws" this insightful look at technical writing has probably existed in a variety of forms for some time.
organization of your paper, you are likely to create a muddled mixture of data, inferences, and conclusions. An outline can help you keep your thoughts straight and your writing succinct.