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|----------------------|---|-------------------------------|
| Meeting times: | Tuesday, 1:40 - 3:30 | 114 Bretske Hall |
| Instructor: | J. W. Mies, Ph.D. | 105 Bretske Hall |
| | Office phone: 425-4606 | E-mail: Jonathan-Mies@utc.edu |
| | Web page: http://www.utc.edu/Faculty/Jonathan-Mies/ | |
| | Office hours: Monday through Friday, 10:00 – 11:00 | |
| | Monday through Friday, 1:30 – 2:30 | |
| Text: | Selected papers on the geology of the Basin and Range and the Colorado Plateau. | |
| Prerequisites: | Introductory course in natural sciences and approval of instructor | |
| Hours: | 3 credit hours (listed as variable, 1 to 6 hours) | |
| Catalog Description: | GEOL 496 gives students the opportunity to study the geology of a region. The course culminates with a field trip to the region of interest. | |
| Objectives: | The Spring 2010 offering of GEOL 496 will focus on the North American Cordillera, particularly the Basin and Range and the Colorado Plateau of the desert southwest (AZ, CA, NV, and UT). The principle objective of the course is to provide students with an experience that stimulates their interest in geology and contributes to their knowledge of the subject. As a result of this class, students should better appreciate how a multitude of field observations contribute to the interpreted geologic history of the region. | |

TENTATIVE LECTURE SCHEDULE

| Date | Topic |
|--------|--|
| Jan 12 | Introduction to Geology 496, FAQs about the class and the trip |
| 19 | Review/overview of Earth's structure and plate tectonics |
| 26 | Convergent boundaries and orogenic belts (late Paleozoic and Mesozoic Cordillera) |
| Feb 2 | Divergent tectonics and continental rifting (late Precambrian and Cenozoic Cordillera) |
| 9 | Precambrian and Paleozoic history of the southwestern U.S. |
| 16 | Mesozoic and Cenozoic history of the southwestern U.S. |
| 23 | Igneous and metamorphic rocks and related structures of the southwestern U.S. |
| Mar 2 | Sedimentary rocks and depositional environments of the southwestern U.S. |
| 9 | Spring Break, no class |
| 16 | EXAM 1 |
| 23 | Discussion of specific field trip stops and related papers |
| 30 | Discussion of specific field trip stops and related papers |
| Apr 6 | Discussion of specific field trip stops and related papers, review |
| 13 | EXAM 2 , preceded by final logistical meeting |

Apr 24 to May 4 Field trip (see tentative itinerary)

Field-trip details and logistics (expenses, payments, equipment needs, precautions, etc.) will be discussed, as necessary, during the semester.

May 4 Field notebooks due**June 15 Final reports due**

GRADES AND RELATED MATTERS

The *final numerical grade* for the class will be computed as follows.

| | | |
|--|--------------------------------------|-----------------|
| 20 % Exam 1 (Mar 16) | _____ | x 0.20 = _____. |
| 20 % Exam 2 (April 13) | _____ | x 0.20 = _____. |
| 10 % Avg. of 3 to 5 assignments | _____ | x 0.10 = _____. |
| 10 % Student-led discussion (begin March 23) | _____ | x 0.10 = _____. |
| 15 % Field notebook (due May 4) | _____ | x 0.15 = _____. |
| 20 % Final report (due June 15) | _____ | x 0.20 = _____. |
| 5 % Attendance and participation | _____ | x 0.05 = _____. |
| | <i>TOTAL (Final numerical grade)</i> | = _____. |

Because the grade for this class depends in part on the field trip, which will not occur until after the end of the Spring semester, **all students will initially receive an *incomplete***. The incomplete will be replaced with the deserved grade after all course materials have been turned in and are graded, which will have occurred by August 1.

The *final letter-grade* for this class will conform to the following scale, based upon the computed *final numerical grade*.

$$F \leq 59.9, D = 60-69.9, C = 70-79.9, B = 80-89.9, A = 90-100$$

EXAMS

Exam 1 will test a basic understanding of plate tectonics, the geology and geography of the Basin and Range and the Colorado Plateau, geologically significant features of the region, and important logistical aspects of the field trip. Preparation for Exam 1 should also provide a preparation for student-led discussions scheduled for March 23, March 30, and April 6.

Exam 2 will emphasize student-led discussions subsequent to Exam 1, but will also include questions related to material covered prior to Exam 1.

ASSIGNMENTS

There will be three to five assignments related to the geology and geography of the Basin and Range and the Colorado Plateau.

STUDENT-LED DISCUSSIONS

Student-led discussions of specific field-trip stops or topics are scheduled for after Spring Break. Students should be knowledgeable about the subject that they present and should be prepared to engage the class in discussion, but should not compose and read their presentation or memorize it verbatim. Students are encouraged to make use of visual aids (e.g. PowerPoint presentations, etc.).

Discussions begin on March 23. Topics should be decided upon and approved by the instructor by mid February.

Participation in these discussions will weigh heavily on the “attendance and participation” aspect of the final grade.

Potential topics for student-led discussions

Badwater, DV
Bryce Canyon
Colorado River (hydrology, geology, water quality, environmental impact of dams)
Dunes of Death Valley (sand dunes)
Frenchman Mountain
Grand Staircase (Chocolate, Vermilion, White, Gray, Pink cliffs)
Hoover Dam (geology of dam site and construction history)
Lake Manly (Pleistocene climate, Shoreline Butte, relation to Great Basin)
Meteor Crater (impact craters)
Monoclines of the Colorado Plateau (Kaibab, Waterpocket, San Rafael, interpretations)
Resting Springs Pass (geologic history and implications of vitrophyre-bearing outcrop)
San Francisco Volcanic Field and SP Crater
Turtlebacks of Death Valley
Ubehebe Crater (phreatic explosion craters)
Warm Springs (geology, mining history, occurrence of talc)
Zion Canyon

FIELD NOTEBOOK

During the field trip, students are expected to keep field notebooks, in which they should describe each field stop.

Descriptions of field stops should include the date, time of day, a stop number, the location of the stop, an objective description of rocks, geologic structures, or vistas observed, and reference to any photographs taken. Sketches are useful to show relationships among outcrops and features within them and among geologically significant landmarks. While at the stop, students should also record their thoughts as to the significance of their observations.

At the end of each day, students should summarize the activities of the day in their notebooks, including logistical details, and the significance of field trip stops in the context of regional geology.

Field notebooks will be collected at the conclusion of the trip, May 4. They will be graded and will be returned to students within a week.

FINAL REPORT

Each student is expected to submit an independently prepared final report, based largely upon his/her notes and embellished with his/her sketches and photos. The report should (1) summarize the geology of the Basin and Range and the Colorado Plateau **with appropriately documented references** (articles discussed in class, etc.), (2) document the field trip and describe the geologic significance of important field stops, and (3) serve as a lasting memento of the class and the field-trip experience.

The final report is due on June 15. Students are advised to start work on their reports immediately following the field trip, while the experience is still fresh in their minds.

OTHER POLICIES

Students are expected to attend class regularly. Attendance and participation will be considered in the final grade. (See *Grades and related matters*.)

Students are expected to be punctual, prepared for class, attentive, and respectful of others.

Assignments are expected to be completed and turned in on time. Late assignments will be accepted in only the most adverse circumstances (e.g. serious illness or accident). Documentation of the circumstance (e.g. doctor's note or police report) may be required.

All students are expected to follow the UTC honor code.

UTC ONLINE (AKA BLACKBOARD)

Some aspects of this course are available through UTC's online course delivery system (Blackboard), which can be accessed at:

<http://utconline.utc.edu>

Your user name for logging on to the system is your UTCID (mix of letters and numbers), which appears on your Mocs card. Your password for Blackboard is the same as your password for your UTC e-mail and for your access to the Lupton Library databases. If you change your password in Blackboard, you also change your password on both of these other systems. If you forget your password, follow the "Forgot Password" link from the UTC web site (<http://www.utc.edu/>) or the Blackboard login page (<https://bb3.utc.edu/webapps/login/>).

Documentation on student use of Blackboard is available at:

<http://utconline.utc.edu/online/bbtutorials.php>

EMAIL (firstname-lastname@utc.edu)

To enhance student services, the University will use your UTC email address (firstname-lastname@utc.edu) for communications. Please check your UTC email on a regular basis. If you have problems with accessing your email account, contact the Help Desk at 423-425-2676.

It is particularly important for rapid communications related to field-trip logistics that students can be reached at their UTC email address.

ATTENTION: If you are a student with a disability and think that you might need special assistance or special accommodation(s) in this class or any other class, call the Office for Students with Disabilities/College Access Program at 425-4006 or come by the office, 110 Frist Hall.

This syllabus is subject to minor changes.

TRIP TO THE DESERT SOUTHWEST

Tentative dates: April 24 to May 4, 2010 (11 days, 10 nights).

Faculty leaders: J. W. Mies and A. E. Holmes

About the trip:

The group will fly, round trip, to Las Vegas and will travel the field-trip route in rented passenger vans. (See itinerary and map, p. 6.) We will camp for all but the final evening, which will be spent in Las Vegas. Typically, we will arrive at our campsite by dark and will break camp and be on the road by 8:00 am. **Campsites will be PRIMITIVE**; most will be far removed from the nearest facilities; and most will be free of charge. Most meals will be self-prepared at campsites, at field-trip stops, or on the roadside, though there will be opportunity for fast food and the occasional restaurant meal along the route. Campfires are forbidden or impractical at all but one or two campsites; cooking will require some sort of camp stove. There will be frequent opportunity to purchase groceries and other supplies (fuel, ice, batteries, etc.). We should be prepared for very warm (near 100°) and dry conditions with intense sunshine during days spent in the desert (e.g., Death Valley, floor of Grand Canyon, Cathedral Valley) and quite **COLD** (well below freezing) and potentially wet conditions during evenings at higher elevations (e.g. rim of Grand Canyon, Boulder Mountain, Bryce Canyon). Elevations will range from 282 feet below sea level, in Death Valley, to over 8,500 feet, where we camp on Boulder Mountain.

Note that, in 2008, the group experienced overnight temperatures as low as 18°F at Bryce Canyon (<http://www.wunderground.com/history/airport/KBCE/2008/5/3/DailyHistory.html>).

Estimated Expense:

| | | |
|----------------------|----------------|---|
| ¹ Airfare | \$250 to \$450 | Round trip, Chattanooga (CHA), Atlanta (ATL), or Nashville (BNA) to Las Vegas, NV (LAS) |
| Lodging | \$45 to \$54 | 3 nights @ \$5 to \$8 (campgrounds) + 1 night @ \$30 (Las Vegas hotel) |
| Van Rental | \$0 to \$0 | Van rental is normally paid by the University |
| Meals | \$198 to \$275 | 11 days @ \$18 to \$25/day |
| Nat. Park fees | \$0 to \$0 | Fee waivers will be secured for 6 parks (otherwise \$10 to \$20 each) |
| Priv. Park fees | \$10 to \$10 | Meteor Crater normally offers a reduced entrance fee (approx. \$10) |
| ² TOTAL | \$503 to \$789 | plus other personal expenses. |

¹Payment of airfare is generally required early in the semester, at time of ticket purchase.

²With an airfare of \$325, total cost will be approximately \$650, plus other personal expenses.

Principal Field Trip Stops (in approximate order):

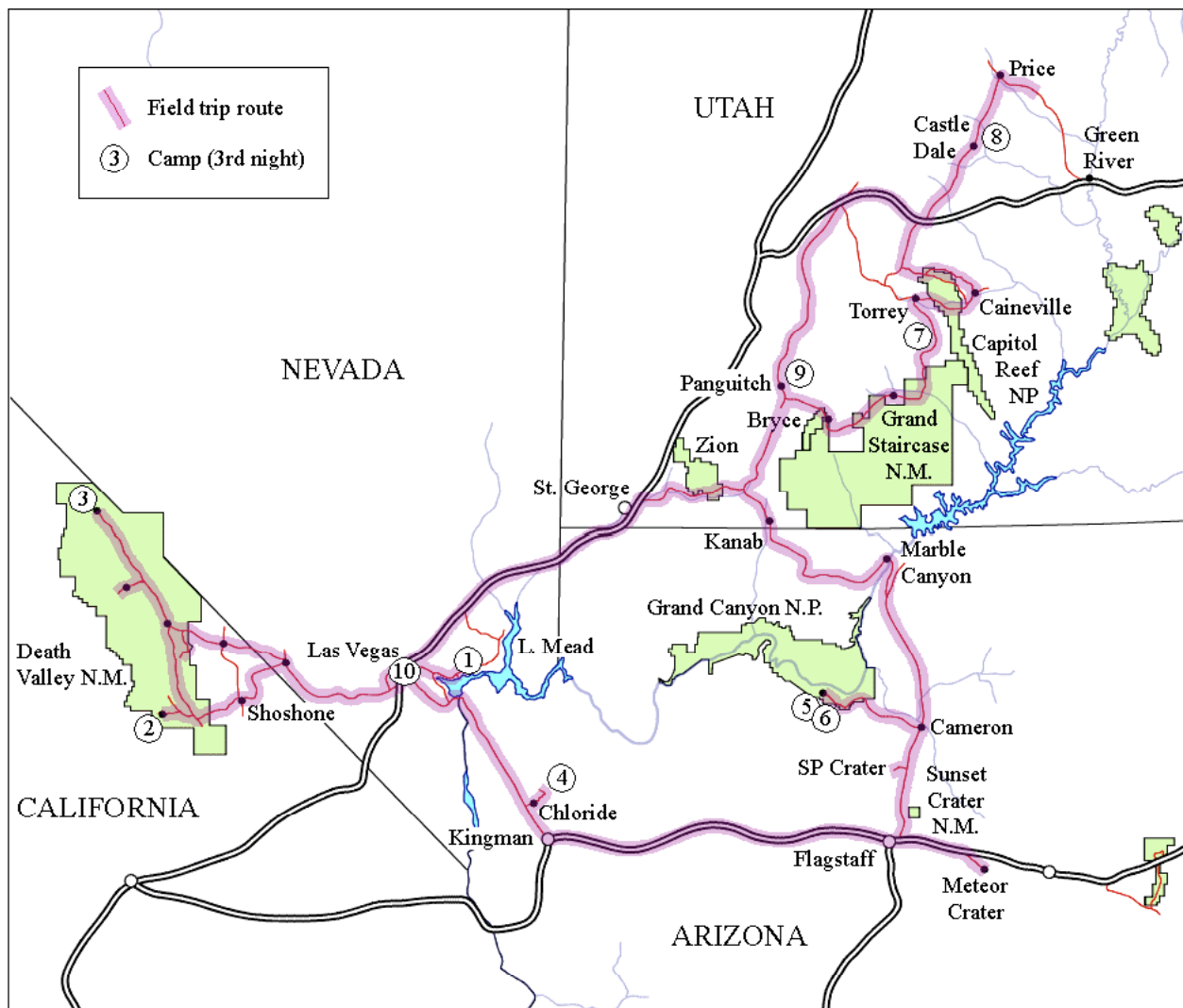
| | |
|---|--|
| Frenchman Mountain (northeast of Las Vegas) | Meteor Crater |
| Valley of Fire State Park (NE of Las Vegas, L. Mead) | San Francisco volcanic field and SP crater |
| Red Rocks Canyon (west of Las Vegas) | Grand Canyon |
| Resting Springs Pass | Echo Cliffs/Paria Plateau/Vermilion Cliffs |
| Warm Springs (Death Valley, talc and prec. metal mines) | Kaibab Monocline |
| Shoreline Butte (remnant of L. Manly), DV | Grand Staircase of the Escalante |
| Turtlebacks, DV | Boulder Mountain (vista of Henry Mountains, etc.) |
| Badwater, DV | Capitol Reef (Waterpocket mono., dikes, sills, etc.) |
| Dunes, DV | <i>San Rafael Swell (monocline)</i> |
| Mosaic Canyon, DV | <i>Book Cliffs (Cretaceous stratigraphy)</i> |
| Ubehebe, DV | Bryce Canyon |
| Dante's View, DV | Zion Canyon |
| Hoover Dam | St. George (volcanics, inverted topography) |

For an aerial preview of the field trip, view the file *sw496tour.kml* as a tour in *Google Earth*. *sw496tour.kml* can be downloaded from Blackboard (<https://bb3.utc.edu/webapps/login/>, [GEOLOGY FIELD EXPERIENCE \(SP10GEO496001\)](#), Course Documents). *Google Earth* can be downloaded from <http://earth.google.com/>.

Tentative Itinerary:

| Date | From | To | Comments/Principal Stops | Camp/Lodging |
|-----------|----------------------------|------------------|---|--------------------------|
| Sa Apr 24 | Chattanooga | Las Vegas | Air travel, supplies, Frenchman Mtn. | Valley of Fire or LMNRA |
| Su Apr 25 | Las Vegas | Death Valley | Red Rocks, Resting Spr. Pass, etc. | Warm Springs, S. DV |
| Mo Apr 26 | S. DV | N. DV | Turtlebacks, alluvial fans, dunes, etc. | Mesquite Springs, N. DV |
| Tu Apr 27 | N. DV | Chloride, AZ | Ubehebe, Hoover Dam, etc. | Packsaddle, Cerbat Mts. |
| We Apr 28 | Chloride | Grand Canyon | Meteor Crater, SF volc., etc. | Mather CG, S. rim |
| Th Apr 29 | Grand Canyon, S. rim, etc. | | Hike, tour canyon, etc. | Mather CG, S. rim |
| Fr Apr 30 | Grand Canyon | Boulder Mt., UT | Marble Canyon, Escalante, etc | Dixie NF, Chriss L. TH |
| Sa May 1 | Boulder Mtn | Castle Dale area | Capitol Reef, Cathedral Valley, etc. | BLM, San Rafael Swell |
| Su May 2 | Castle Dale | Panguitch area | ¹ Book Cliffs, etc. | NF, Valley west of Bryce |
| Mo May 3 | Panguitch | Las Vegas | Bryce, Zion, St. George, LV, etc. | Las Vegas hotel |
| Tu May 4 | Las Vegas | Chattanooga | Air travel | Home |

¹In place of the San Rafael Swell and the Book Cliffs (Price, UT), we may see more of Bryce/Zion area.



Map showing tentative field-trip route.

Some basic rules (that should go without saying) and facts you should know:

- Use good judgment in all circumstances. *We can't afford the mishaps, medical emergencies, etc. that can result from poor judgment.*
- National parks strictly forbid taking samples of rock, mineral, plant, animal, etc. *There will be opportunity to collect samples outside of national parks.*
- Arizona, California, Nevada, and Utah adhere to the national minimum drinking age of 21.
- No open (or opened) alcohol containers are permitted in vehicles under Arizona, California, Nevada, and Utah state laws.
- No consumption of alcohol is permitted during the day.
- No illegal drugs.

Some Useful Websites:

Photos from previous UTC geology trips to the southwest (1994 - 2008)

<http://www.utc.edu/Faculty/Jonathan-Mies/photos/swusa.html>

Maps from the University of Texas Libraries

<http://www.lib.utexas.edu/maps/arizona.html>

<http://www.lib.utexas.edu/maps/california.html>

<http://www.lib.utexas.edu/maps/nevada.html>

<http://www.lib.utexas.edu/maps/utah.html>

http://www.lib.utexas.edu/maps/national_parks.html

National Park Websites (National Park Service)

<http://www.nps.gov/findapark/index.htm>

Geology of the National Parks (USGS, all parks)

<http://3dparks.wr.usgs.gov/>

Arizona gis (DOQ's, DRG's, etc.)

<http://agis.az.gov/>

<http://aria.cals.arizona.edu/>

Arizona geology (geologic maps)

<http://www.azgs.az.gov/>

http://geology.about.com/library/bl/maps/n_statemap_AZ1250.htm

California gis (DOQ's, DRG's, etc.)

<http://www.atlas.ca.gov>

California geology (geologic maps)

<http://www.conservation.ca.gov/cgs/Pages/Index.aspx>

Nevada gis (DOQ's, DRG's, etc.)

<http://keck.library.unr.edu/datawarehouse.html>

Nevada geology (geologic maps)

http://geology.about.com/library/bl/maps/n_statemap_NV800.htm

<http://www.nbmng.unr.edu/dox/e30.pdf>

Utah gis (DOQ's, DRG's, etc.)

<http://agrc.its.state.ut.us/>

Utah geology (geologic maps)

http://geology.about.com/library/bl/maps/n_statemap_UT1600.htm

<http://geology.utah.gov/maps/geomap/index.htm>

Paleogeography of the southwestern United States

<http://jan.ucc.nau.edu/~rcb7/paleogeogwus.html>

Cenozoic volcanism in the desert southwest

<http://www.geosci.unc.edu/page/navdat-and-geoinformatics>

Book Cliffs

<http://strata.geol.sc.edu/BoocliffslustExercise/ClasticlithofaciesBC.html>

http://www.paleocurrents.com/book_cliffs/index.html

http://en.wikipedia.org/wiki/Book_Cliffs

Bryce Canyon

<http://www2.nature.nps.gov/geology/parks/brca/>

www2.nature.nps.gov/geology/education/foos/bryce.pdf

Capitol Reef

<http://www2.nature.nps.gov/geology/parks/care/>

<http://www.nps.gov/archive/care/geology1.htm>

www2.nature.nps.gov/geology/education/foos/capitol.pdf

Colorado Plateau

www2.nature.nps.gov/geology/education/foos/plateau.pdf

Death Valley

<http://www.nature.nps.gov/Geology/usgsnps/deva/devaft.html>

<http://www2.nature.nps.gov/geology/usgsnps/deva/deva1.html>

<http://geomaps.wr.usgs.gov/parks/deva/troxel.pdf>

http://www.exploratorium.edu/learning_studio/news/january98.html

<http://geology.csupomona.edu/drjessey/fieldtrips/kingston/snow.htm>

<http://palomar.edu/geology/DVWeb.htm>

Frenchman Mountain

<http://geoscience.unlv.edu/pub/rowland/Virtual/virtualfm.html>

Grand Canyon

<http://www2.nature.nps.gov/geology/parks/grca/>

http://www.kaibab.org/geology/gc_geol.htm

<http://www.nps.gov/grca/grandcanyon/quicklook/Geologicstory.htm>

www2.nature.nps.gov/geology/education/foos/grand.pdf

Grand Staircase

http://jan.ucc.nau.edu/~rcb7/Grand_Staircase.html

Hoover Dam

http://en.wikipedia.org/wiki/Hoover_Dam

Meteor Crater:

http://www.lpi.usra.edu/science/kring/epo_web/impact_cratering/enviropages/Barringer/barringerstartpage.html

Red Rocks Canyon

<http://www.sunsetcities.com/redrockgeology.html>

San Francisco Volcanic Field

<http://geopubs.wr.usgs.gov/fact-sheet/fs017-01/>

Zion Canyon

<http://www2.nature.nps.gov/geology/parks/zion/>

<http://www.nps.gov/zion/Geology.htm>

www2.nature.nps.gov/geology/education/foos/zion.pdf

Some Useful Files:

At the time of this preparation, 12/27/09, several files are available to students and can be downloaded from Blackboard (Course Documents).

| | |
|--------------------------------|---|
| syl496_sp10.pdf | This syllabus |
| maj equip.pdf | list of major equipment and broad categories of equipment and supplies required for the field trip. |
| sw496tour.kml sw496tour.kmz | <i>Google Earth</i> placemarks for an aerial preview of the field trip featuring selected field trip stops and campsites (<i>Play tour, Tools</i> menu in <i>Google Earth</i>). |
| cord_sw.jpg | Generalized geology of the western Colorado Plateau and Basin and Range in Arizona, southern California (Death Valley), Nevada, and Utah (large poster, 5200 x 2500, 2.2 MB) |
| xs_ariz.jpg | Generalized Geology (Cross Section) of the Western Colorado Plateau in Arizona (part of large poster, 2500 x 800, 380 KB) |
| xs_utah.jpg | Generalized Geology (Cross Section) of the Western Colorado Plateau in Utah (part of large poster, 2800 x 800, 428 KB) |
| stru_geol_time.jpg | Cross Sectional Tectonic Model for the Development of the North American Cordillera with <i>geologic time scale</i> (part of large poster, 1000 x 1700, 288 KB) |
| xs_model_maps.jpg | Cross Sectional Tectonic Model for the Development of the North American Cordillera with <i>maps for selected geologic times</i> (part of large poster, 1600 x 1700, 416 KB) |
| strat_s_nv.jpg | Stratigraphic Relationships in the Cordilleran Miogeocline Through Southern Nevada (part of large poster, 1100 x 1300, 208 KB) |