2020 GEOLOGIC MAPPING I AND II: Summer I 2020
2 Research in Geology Courses (GEOL 4391, 6 hours total)

June 1 – July 6, 2020

GEOL 4391 Geologic Mapping I and II (6 hours total) – Revised field camp course on geologic mapping and hydrogeology. Techniques emphasized: measuring stratigraphic sections, collecting and plotting joints and paleocurrent data, drafting geologic maps, drafting different scaled correlations of units utilizing collected data and well-log data, preparing geologic reports, and utilizing Google Earth and ArcGIS to complement geologic and hydrologic exercises.

Phone: 325-245-8692 (Dr. Joe’s cell)
248-990-4735 (Mr. Shields’ cell)
325-942-2242 (Department office)

Professors: Dr. J.I. "Joe" Satterfield, ASU, joseph.satterfield@angelo.edu
Mr. Stephen Shields, ASU, stephen.shields@angelo.edu

Texts:
• Geology in the Field, by Robert R. Compton (new paperback edition available)
• Your GIS, Structural Geology, Sedimentology, and Mineralogy-Petrology notes and texts

Grading:
• Project 1: San Angelo Geology Literature Review and GIS Base maps (5%): Satterfield (literature review), Shields (base maps)

• Project 2: San Angelo State Park Mapping, San Angelo, TX (25%): Shields, Satterfield
  Project 2 grades include field map, field notes, stereonets, cross-sections, fracture study, stratigraphic columns, final report (which will include hydrology section)

• Project 3: Great White Throne Area, Zion National Park, Utah, Fracture Analysis (5%): Satterfield

• Project 4: San Angelo Area Measured Sections (10%): Shields

• Project 5: Contucting Grid of Cross-sections in Cordilleran Hinterland, Sand Springs Pass, Nevada (5%): Satterfield

• Project 6: Mapping with Satellite Images in Colorado Plateau, San Ysidro, New Mexico (10%): Shields, Satterfield

• Project 7: San Angelo State Park Hydrologic Mapping (15%): Shields

• Project 8: Subsurface mapping with Geophysical Logs: Susan Peak Oil Field, Tom Green County, Texas (10%), Satterfield, Steve Shaw

• Summary of Field Camp Faculty Presentations on Careers, (5%)

Late Cenozoic faults in and near the Sand Springs Range and Fairview Peak, Nevada. The Fairview fault (Ff) ruptured in 1954. In Project 5, you will make a grid of cross-sections across the Sand Springs Range.
Hand-sample identification and description Quiz over Minerals, Sedimentary Rocks, Igneous Rocks, and Metamorphic Rocks (10%): Shields, Satterfield

Permits:
1. We have a permit to conduct research in San Angelo State Park from Texas Parks and Wildlife Department. Students enrolled in this course will be added to permit.
2. You will need to purchase a Limited Public Use Permit from Texas Parks and Wildlife in order to access Spillway Hill. The permit can be purchased online and costs $12

Student health requirements

All participants must be screened for COVID-19 and identified as not needing further testing prior to participating.

Many days of this course will require strenuous hiking and climbing. Each student must have a general health physical from their health professional prior to attending the field school to assure student’s overall health prior the field school. This is a precaution to assure each student’s safety during the trip as we will be working in very difficult terrain. Complete the form used by ASU athletes: https://www.angelo.edu/content/files/17866-physicalmedical-questionnaire-form

Student Learning Outcomes (slightly modified from 2013, 2016, and 2018 ASU Field Camps)

1) To explore in rugged ridges and draws in the San Angelo area. To practice making detailed geologic maps of sedimentary, intrusive igneous, volcanic, and metamorphic rocks. Field geology skills applied: locating yourself in the field, taking complete field notes, drawing cross-sections, describing rocks, measuring sections, and using stereo aerial photographs.

2) To apply specialized skills of structural geology and environmental geology, including interpreting kinematic indicators on fault surfaces, plotting fault and fold data on stereonets, describing and correlating outcrop-scale folds, applying sense of shear indicators in mylonites, and calculating strike-and-dip from map patterns.

3) To have fun while learning much and working hard physically. This Geologic mapping course will be a once-in-a-lifetime experience. You will probably be in the best physical shape of your life at the end of field camp. You will probably do many things that you have not imagined doing before.

4) To practice preparing, outlining, and writing scientific reports for industry and for graduate school. All of you will write many scientific and technical reports in graduate school and in your career. Most of you will write a Master’s Thesis.

5) To learn about the geology of the North American Cordillera and to address unsolved problems that are subjects of current research. Problems include: timing of mountain building, pluton emplacement mechanisms, significance of strike-slip faulting, and whether unconformities are present at some formation contacts.
6) **To learn about careers in field geology from professionals** in environmental geology, mining geology, petroleum geology, and the US Geological Survey (USGS).

Your and our overall goal will be to gain experience in how to solve diverse problems with map-based data in the field and with geophysical data; not just collect data in the field and think about it later. This means you will gain experience in how to devise and test multiple hypotheses when it is hot or cold, when your legs are sore and punctured by lechuguilla, when you are distracted by pretty scenery, when the rocks look confusing, and when you have deadlines looming.

Also look at [http://fieldcamp.missouri.edu/](http://fieldcamp.missouri.edu/) and [http://specialpapers.gsapubs.org/content/461/25.abstract](http://specialpapers.gsapubs.org/content/461/25.abstract)

**FACULTY BIOGRAPHICAL SKETCHES**

Joe Satterfield (BA, PhD, Rice University; MA University of Missouri). Professor of Geology, Angelo State University. Joe has mapped and described complex structures in the Big Bend of West Texas, the Sierra Rica caldera complex in Chihuahua (current big project, collaborating with Sul Ross, University of Chihuahua), the Ouachita Mountains in Arkansas, and in the Great Basin of western Nevada (next publication). He considers stereonets and cross-sections of field data to be beautiful and profound. ASU Field Camp 2020 will be his fifth ASU field camp. To him, field camp is the most intense, the most fun, and the most rewarding teaching experience ever!

Stephen Shields (BS Grand Valley State, MS Missouri State). Instructor, Angelo State University. Stephen’s thesis analyzed a sandstone in Missouri for carbon sequestration potential by petrographically analyzing thin sections. Stephen is most passionate about geologic hazards, hydrogeology, contamination and remediation, igneous and sedimentary petrography, GIS, and technical writing. Stephen worked as a geologist, well engineer, environmental planner and consultant for 5 years (2014 – 2019).

**ASU Field Camp Faculty making guest remote appearances:**

Josué Rodriguez (BS Angelo State, MS University of Arkansas), Environmental Geologist, consulting firm, Midland Texas

Dillon Hughes (BS Angelo State, MS Midwestern State University), Mining Geologist intern, Lhoist North America

Ryan Sonntag (BS Texas Tech, MS Utah State). Geologist, Chesapeake Energy

Travis Sparks (BS Angelo State, MS Texas Tech). Geologist, Concho Resources

Jon Dyess (BS Angelo State University, MS Sul Ross State, Ph.D. University of Minnesota Duluth)

Phil Frederick (BA Illinois State University, MS Sul Ross State, Ph.D. Texas Tech). Paleontologist and publications editor, USGS, Menlo Park California.
# Tentative Itinerary: ASU Geologic Mapping Research Course, June – July 2020

<table>
<thead>
<tr>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
</tr>
</thead>
<tbody>
<tr>
<td>31 May</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6 June</td>
</tr>
<tr>
<td>Before course: Assign Lit Review Material on Eastern Shelf of Permian Basin Geology/Stratigraphy (6 papers)</td>
<td>1 June 9:00 – 11:00</td>
<td>2 June 9:00 – 11:00</td>
<td>3 June 9:00 – 11:00</td>
<td>4 June 9:00 – 11:00</td>
<td>5 June 7:00 – 11:30</td>
<td>6 June BASE MAPS PRINTED</td>
</tr>
<tr>
<td></td>
<td>Meet in Collaborate Classroom</td>
<td>PROJECT 1</td>
<td>PROJECT 1</td>
<td>PROJECT 1</td>
<td>PROJECT 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GIS assignment for creation of base map used in mapping (N area vs S area)</td>
<td>Review basics of GIS (Shields)</td>
<td>Review elements of a Lit Review</td>
<td>Review requirements of scientific writing (Shields, Satterfield)</td>
<td>Josué Rodriguez speaks on his enviro scientist career</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discuss course objectives</td>
<td>ONLINE DELIVERY</td>
<td>ONLINE DELIVERY</td>
<td>ONLINE DELIVERY</td>
<td>ONLINE DELIVERY</td>
<td></td>
</tr>
<tr>
<td>7 June</td>
<td>8 June 7:00 – 11:30</td>
<td>9 June 7:00 – 11:30</td>
<td>10 June 7:00 – 11:30</td>
<td>11 June 7:00 – 11:30</td>
<td>12 June 9:00 – 11:00</td>
<td>13 June</td>
</tr>
<tr>
<td></td>
<td>PROJECT 2 FIELD DAY 1</td>
<td>PROJECT 2 FIELD DAY 2</td>
<td>PROJECT 2 FIELD DAY 3</td>
<td>PROJECT 2 FIELD DAY 4</td>
<td>PROJECT 2 OFFICE DAY</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LIT REVIEW DUE</td>
<td>SAN ANGELO SP</td>
<td>SAN ANGELO SP</td>
<td>SAN ANGELO SP</td>
<td>REVIEW igneous rocks in hand sample</td>
<td>Dillon Hughes speaks on Mining Geology careers</td>
</tr>
<tr>
<td></td>
<td>SAN ANGELO SP</td>
<td>SAN ANGELO SP</td>
<td>SAN ANGELO SP</td>
<td>SAN ANGELO SP</td>
<td>FIELD MAPS DUE</td>
<td>ONLINE DELIVERY</td>
</tr>
<tr>
<td>14 June</td>
<td>15 June 7:00 – 11:30</td>
<td>16 June 7:00 – 11:30</td>
<td>17 June 7:00 – 11:30</td>
<td>18 June 7:00 – 11:30</td>
<td>19 June 9:00 – 11:00</td>
<td>20 June</td>
</tr>
<tr>
<td></td>
<td>PROJECT 4 FIELD DAY 1 SPILLWAY HILL</td>
<td>PROJECT 2 FIELD DAY 5</td>
<td>PROJECT 2 FIELD DAY 6</td>
<td>PROJECT 4 FIELD DAY 2 MT MARGARET SECTION</td>
<td>PROJECT 4 OFFICE DAY</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BEGIN PROJECT 5: SANDS SPRINGS PASS, NV C-X GRID PROJECT</td>
<td>PROJECT 3 FRACTURE ANALYSIS DUE TWIN BUTTES TPWD</td>
<td>SAN ANGELO SP</td>
<td>SAN ANGELO SP</td>
<td>Dr. Phil Frederick speaks on Paleontology, USGS careers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PROJECT 5 SAND SPRS PASS C-X GRID DUE</td>
<td>N SAN ANGELO</td>
<td>ONLINE DELIVERY</td>
<td>ONLINE DELIVERY</td>
<td>Review metamorphic rocks in hand sample</td>
<td></td>
</tr>
<tr>
<td>Sunday</td>
<td>Monday</td>
<td>Tuesday</td>
<td>Wednesday</td>
<td>Thursday</td>
<td>Friday</td>
<td>Saturday</td>
</tr>
<tr>
<td>--------</td>
<td>--------</td>
<td>---------</td>
<td>-----------</td>
<td>----------</td>
<td>--------</td>
<td>----------</td>
</tr>
<tr>
<td>21 June</td>
<td>22 June 9:00 – 11:00</td>
<td>23 June 9:00 – 11:00</td>
<td>24 June 7:00 – 11:30</td>
<td>25 June 7:00 – 11:30</td>
<td>26 June 9:00 – 11:00</td>
<td>27 June</td>
</tr>
<tr>
<td>PROJECT 4 MEASURED SECTIONS DUE</td>
<td>PROJECT 6 SAN YSIDRO, NM SATELLITE IMAGE MAPPING DAY 1</td>
<td>ONLINE DELIVERY</td>
<td>ONLINE DELIVERY</td>
<td>PROJECT 7 STATE PARK HYDRO DAY 1</td>
<td>ONLINE DELIVERY</td>
<td>ONLINE DELIVERY</td>
</tr>
<tr>
<td>28 June</td>
<td>29 June 9:00 – 11:00</td>
<td>30 June 9:00 – 11:00</td>
<td>1 July 9:00 – 11:00</td>
<td>2 July 7:00 – 11:30</td>
<td>3 July</td>
<td>4 July</td>
</tr>
<tr>
<td>PROJECT 7 STATE PARK HYDRO REPORT DUE</td>
<td>PROJECT 8 SUSAN PEAK OIL FIELD SUBSURFACE MAPPING DAY 1</td>
<td>ONLINE DELIVERY</td>
<td>ONLINE DELIVERY</td>
<td>HAND SAMPLE QUIZ</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Discuss requirements for Final Map and Report</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 July</td>
<td>6 July SUMMER II BEGINS</td>
<td>7 July</td>
<td>8 July</td>
<td>9 July</td>
<td>10 July</td>
<td>11 July</td>
</tr>
<tr>
<td>PROJECT 2 DRAFTED MAP AND FINAL REPORT DUE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8/15: WTGS FALL SYMPOSIUM ABSTRACT DEADLINE: Let's submit 2 abstracts for poster presentations!</td>
<td></td>
</tr>
</tbody>
</table>