Virtual Field Trip to Central Texas

Physical Geology - Summer 2023

Name:

myUH ID number:

Professor’s Name:

Class Time:

**Email your completed documents to** [**easglc@central.uh.edu**](mailto:easglc@central.uh.edu) **with the subject “Central TX VFT”**

# Academic Honesty (Acknowledgement Required)

The Virtual Field Trip to Central Texas is to be completed by yourself; you should not work with a partner or group. Do not search for answers on the internet because 1) it is cheating; 2) answers that are posted are incorrect, and we’ll know where you got them from, and; 3) the questions change every semester. Be careful if you watch the videos with closed captioning because the spelling of geologic terms is often incorrect or misinterpreted by the captioning software, so you may end up with a wrong answer. If you are unfamiliar with a word or geologic concept, it is okay to look it up online to find the correct spelling and definition. If you find yourself needing help, physical geology teaching assistants staff the [Geoscience Learning Center](https://uh.edu/nsm/earth-atmospheric/undergraduate/learning-center/index).

By submitting this work, I, Type Your Name Here attest that I have not violated the UH Academic Honesty code. I completed this assignment by myself and did not copy any portion of my answers from another student, a website, or any other source.

# Instructions

The virtual field trip to Central TX is a Google Earth tour that will require you to watch videos of our field trip stops, answer questions, and make interpretations on GigaPan images (very large, high quality). **In addition to this document, you will need the accompanying PowerPoint file for image interpretations.** Head back to the field trip page if you still need the PowerPoint file. All written answer should be in this document.

## Accessing the Trip

This virtual field trip has been built in Google Earth. [Click here to access the trip](https://earth.google.com/earth/rpc/cc/drive?state=%7B%22ids%22%3A%5B%2214xN2ZEHdNStkryosrg35_Wv46ZRC-GgO%22%5D%2C%22action%22%3A%22open%22%2C%22userId%22%3A%22111044525520816793780%22%7D&usp=sharing). The first thing you will see is an overview of Texas, and the field trip stops. In the menu on the left side, click on “Present” to begin the tour. At each location a box will appear on the right side of the screen with information about each stop, the videos you need to watch, and links to the GigaPan images. Use the menu on the bottom left to move between stops.

## Written Answers

**All answers need to be written in complete sentences to receive credit** and typed in the supplied boxes. Your responses will appear in a green-colored font, do not change this. Any answers not written in complete sentences will be marked as incorrect and will not receive credit.

## Taking Snapshots/Screen Captures

You’ll need to take snapshots of high-resolution images from the field trip stops. Follow the directions below according to your operating system. Paste the images into the PowerPoint answer file on their appropriate slide. Image questions will ask you to make annotations on your snapshots to highlight items of geologic interest. Common annotations include drawing circles and lines. Use Microsoft PowerPoint for making these annotations.

[PC Directions](https://support.microsoft.com/en-us/help/13776/windows-10-use-snipping-tool-to-capture-screenshots) for taking snapshots (Windows 10)

[Mac Directions](https://support.apple.com/en-us/HT201361) for taking snapshots (MacOS)

## Assignment Submission

Save your completed word document as “yourlastname\_firstname\_CentralTXVFT”you’re your PowerPoint document as “yourlastname\_firstname\_CentralTXsnapshots” **Email your completed documents to** [**easglc@central.uh.edu**](mailto:easglc@central.uh.edu) **with the subject “Central TX VFT”**. Teaching Assistants will begin grading submissions after the deadline. After your work is graded, you will receive a confirmation email from a TA. Submissions are graded as pass/fail. If your assignment requires resubmission because of too many incorrect questions or missing answers, you will have 48 hours to do so.

# Stop 1: Observations for the Edwards Formation

Head to Stop 1 of the virtual field trip. Watch the video at Bee Cave Road and view the GigaPan image.

## Video Questions for Stop 1

1. Describe how and why sediments change in age as you go from Houston to Austin.

1. Describe what separates the Edwards Plateau from the city of Austin.

1. Use full sentences describe the Edwards limestone, including information such as minerals present, texture, grain size, color, weathering, size of bedding, etc.

1. What are some of the fossils found in the Edwards Limestone?

1. There is a small fault at this outcrop that is part of the Balcones fault system.
   1. What type of fault is this?

* 1. Describe the plate tectonic setting that created this fault.

1. What is the importance of the faults as it relates to the Edwards aquifer?

## GigaPan Questions for Stop 1

1. Take a screenshot that highlights your description from question 3 above. Paste it onto the PowerPoint slide.
2. Take a new screenshot and trace three contacts between sedimentary beds.
   1. Using your observations of these contacts, how thick are the individual limestone beds? (Hint: trees/shrubs are 5-10 ft tall).

* 1. Are all the beds in the Edwards formation the same thickness? Describe what you see. You may want to zoom out and relook at the entire GigaPan image.

1. The Edwards formation has been affected by chemical weathering, both at the surface and underground. Search the GigaPan image for any evidence that chemical weathering affected this outcrop.
   1. What type of chemical weathering is prominent?

* 1. Include a screenshot with annotations that supports your answer (on the PowerPoint slide).
  2. Do these chemical weathering features enhance or reduce the ability of the Edwards formation to be an aquifer?

# Stop 2: Observations for Slaughter Gap

This field trip stop has two different rock types: an igneous rock that students are standing on and a sedimentary rock behind them.

## Video Questions for Stop 2

1. Describe the igneous rock the students are standing on. Include information such as color, minerals present, texture, grain size, name of the rock, and its age.

1. Describe the sedimentary rock located behind the students. Include information such as the type of sedimentary rock, grain size, grain shape, minerals present, color, bedding thickness, age, and any other features.

1. There are no fossils at this location, but elsewhere there are reports of trilobite trackways for this rock. What do you think was the depositional environment for this sedimentary rock?

1. The igneous rock formed within the Earth. How did it come to be exposed at the surface?

## GigaPan Questions for Stop 2

The first image was taken at the location where the students were standing, shown at the red arrow’s tip on the topographic map of Slaughter Gap (Figure 1). The second image is the view across the gap from the first location, as shown by the red line on the topographic map. The base of the second GigaPan image is parallel to the red line shown below.

Diagram

Description automatically generated

Figure 1 - Topographic map of the Slaughter Gap region provided by Dr. Leon Long, University of Texas at Austin

1. On the first GigaPan image, locate the contact between the igneous rock and the sedimentary rock. You may have to zoom in and move around the image to look at the rock textures to help.
   1. Is the contact flat or steep?

* 1. Take a snapshot and draw a line that shows the contact between these two rocks (on the PowerPoint file).

1. Locate this same contact on the second GigaPan image from this stop. You can zoom in to see the rock types within the trees and look for layered rock above the break in slope. Some of these are large boulders that have fallen down the cliff. Take a snapshot and draw a line that shows the contact between the two rock types. The angle of the contact relative to the Earth’s surface should be similar on both sides of Slaughter Gap.

## Geochronology for Stop 2:

The Sauk marine transgression occurred during a period from the 600 to 500 million years ago when sea level rose across North America leaving behind zircon, commonly found in sand, that contain trace amounts of uranium and thorium within sedimentary units enabling researchers to date the sediments.

Detrital zircon geochronology is the science of analyzing the age of zircon deposited within a specific sedimentary unit by examining their uranium–lead (U-Pb) ratios. Researchers tested detrital zircon samples utilizing the U-Pb dating method, which can be used to date rocks that formed and crystallized, were then eroded, transported, and deposited. So, these ages may reflect different sources for zircon as well as its age.

At this location and elsewhere throughout the Llano Uplift, a team of geologists led by J. Richard Kyle collected samples of the Hickory Sandstone and measured the ages of detrital zircon grains (zircon found in sedimentary rocks). Sample 13-5 is from this field trip stop location, and 13-10 is about 20 km to the southwest. Remember, radiometric dating of minerals in sedimentary rocks gives you the age of the igneous or metamorphic parent rock the minerals originally formed in and not the age the sediment was deposited.

This data table shows the percentage of zircon grains for different age ranges.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Sample  Number | 480-550 Ma | 600-900 Ma | 1000-1300 Ma | 1300-1550 Ma | 1600-1800 Ma | >1800 Ma |
| 13-05 | 0 % | 0 | 89 | 9 | 1 | 1 |
| 13-10 | 5 % | 2 | 48 | 44 | 0 | 1 |

Figure 2. Geologic map showing locations of various basement provinces as well as the rifted margin of the Laurentian supercontinent. The colored areas show where different belts of rock are located. The red box shows the location of the Slaughter Gap stop on the UH Virtual field trip. The ages for different basement provinces are summarized for each area. Modified after Kyle and others (2022).

1. What is the age range for each of sample?

1. How much of Earth’s history is recorded by zircon grains in each sample? Hint: compare the age of Earth (~4600 Ma) to the age range recorded by the zircon grains.

1. The Great Unconformity at this location spans from the intrusion of granite at ~1070 Ma to the deposition of the Hickory Sandstone at ~ 500 Ma. How much of Earth’s history is missing at this location?

1. For sample 13-05, describe the relationship between the detrital zircon grains compared to ages in Figure 2.

1. For sample 13-10, describe the relationship between the detrital zircon grains compared to ages in Figure 2.

1. How far from the sample location was the source area for the oldest zircon grains?

1. How far from the sample location was the source area for the youngest zircon grains for each sample?

1. On Figure 2, draw an approximate location of a river that may have brought zircon grains from their source area to the red box.

# Stop 3: Observations for Inks Lake State Park

This stop has two different rock types as well, metamorphic and igneous. The students are standing on one type, and the other is across the stream in the GigaPan images.

## Video Questions for Stop 3

1. Describe, in detail, why the rocks here are different from most others in Texas.

1. Describe the metamorphic rock that students are standing on. Include observations on its color, grain size, minerals, age, and texture (terms such as granoblastic, foliated, or layered).

1. Based on the minerals present, what is the metamorphic grade?

1. Describe the cross-cutting relationships between the igneous and metamorphic rocks and which rock came first.

1. What was the tectonic environment of this region?

## GigaPan Questions for Stop 3

1. In the first image, locate a dike, take a snapshot, and then draw a polygon around it.
2. In the first image, locate a sill, take a snapshot, and then draw a polygon around it.
3. In the second GigaPan image, locate a fold, take a snapshot, and draw a box around it.

# Stop 4: Observations for Enchanted Rock

Enchanted Rock State Natural Area has two exfoliation domes formed by erosion of the Grenville age Town Mountain granite (about 1.1 billion years old), similar to what you heard about at Slaughter Gap. See [this video](https://youtu.be/rT-iPv9Q1fI?t=296) for an explanation of exfoliation domes and [watch exfoliation in action](https://geotripper.blogspot.com/2014/08/exfoliation-in-action-in-twain-harte.html).

The Town Mountain Granite intruded into the Packsaddle Schist (the schist is not visible in the GigaPan image). The two granite domes are part of the second-largest batholith in the Llano Uplift. The tallest dome is 425 ft above ground level.

There are no video questions from our Enchanted Rock stop, only observations made from images.

## GigaPan Questions for Stop 4

1. Locate the first GigaPan image for this stop.
   1. Take a screenshot and draw a polygon around the granite block on the dome to show the exfoliation process.
   2. Do you think these blocks are hazardous to anyone who walks near them?

* 1. Which of the following do you think is most likely to happen? Will the granite blocks 1) undergo further mechanical weathering, break into smaller pieces, slide down the side of the dome, and be added to the granite rubble pile at the bottom or 2) will the granite blocks be chemically eroded by rain? Be sure to explain your answer.

1. Locate the second GigaPan image for this stop.
   1. Take a snapshot and use a pen tool to trace the path of a black stripe running down the slope of the dome.
   2. What type of weathering causes these stripes?