Name: _____

Lab #2: Using a geologic compass – TCU Campus Tour

Objectives:

- Understand the Right-hand rule
- Getting familiar with geologic map symbols
- Learn using a Brunton compass
- Plotting data and making maps

Introduction:

Reading and constructing geologic maps is one skill that every geologists has to master. Initially, this means that we have to understand the symbols that are used on geologic maps. Some common symbols are shown on page 3 and we will spend a little time looking at these symbols.

Once we know the general meaning of these symbols, we will have to learn how to measure and plot them. The measuring is generally done using a magnetic compass such as the Brunton compass, which you read about in the pre-lab exercise. Finally, we have to plot the data on a map so that others understand the geology based on our mapping.

Terminology:

Right-hand rule

As I mentioned before, we want to use azimuth notation in this class (since quadrant notation is a little antiquated). However, without any kind of convention, one needs to indicate the dip direction of the plane.

For example, if we give the strike and dip of a plane as 090°/45°, we don't know whether the plane dips to the north or south and would have to say 090°/45°S for a south-dipping plane or 090°/45°N for a north-dipping plane.

In order to avoid giving a dip direction and make the writing even simpler, we will employ the **Right-hand Rule**. To use the Right-hand Rule when measuring Strike with a compass, always keep the Dip Direction to your (the observer's) right, as though you are looking at the right hand, palm side down, and your right thumb was pointing to the strike direction (Figure 1 & 2). Using this method of recording data will consistently record the Dip Direction in a clockwise rotation relative to Strike.

Staying with the above example, 090°/45° would mean an E-W striking plane dipping to the south, whereas 270°/45° would be an E-W striking plane dipping to the north.

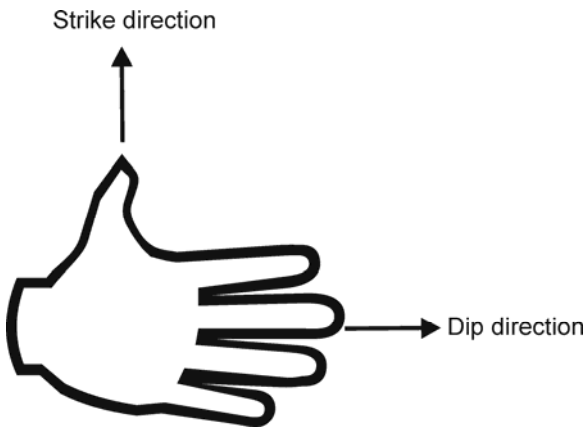


Figure 1: Use of right hand for Right-hand Rule

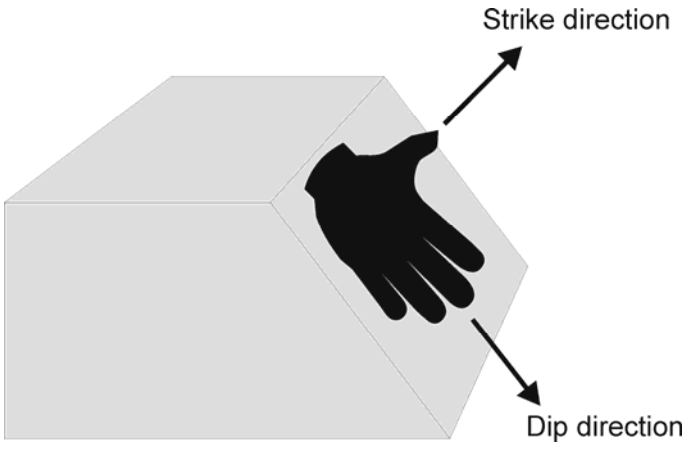


Figure 2: Diagram showing use of Right-hand Rule

Assignments:

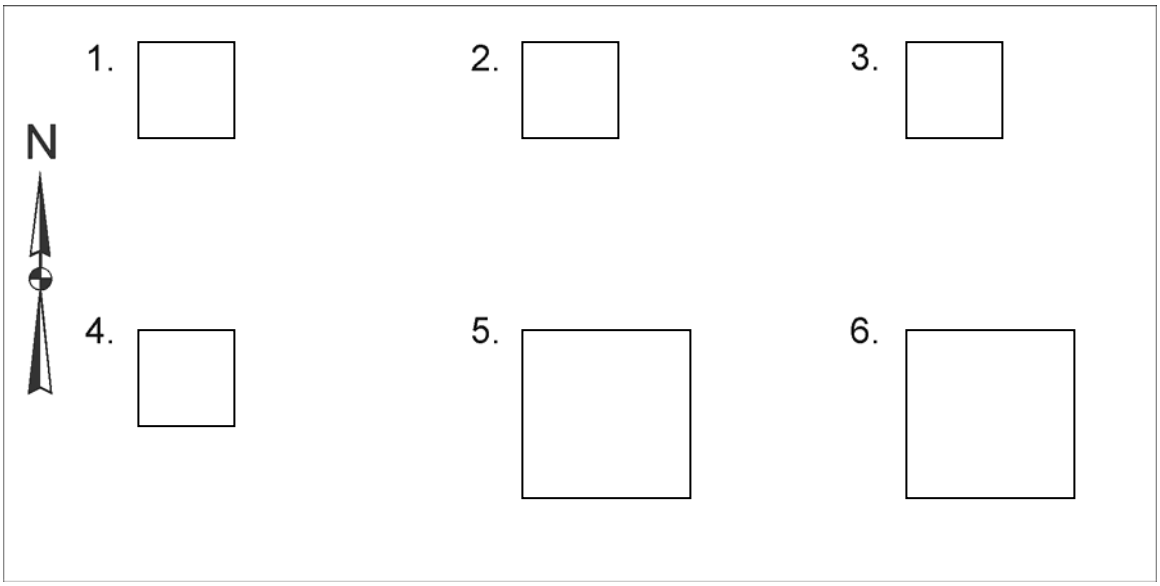
Problem 1: Give the following notations in Right-hand Rule (RHR) azimuth notations.

Orientation	Orientation	Orientation	Orientation
N30°W, 65°NE	S84°W, 37°NW	N62°E, 12°SE	S15°E, 72°NE
Azimuth (RHR)	**Azimuth (RHR)**	**Azimuth (RHR)**	**Azimuth (RHR)**

Problem 2: Use the box below to plot the following features in their correct orientation using the correct symbols (see next page for symbols). All orientations are given using the right-hand rule.

Try to keep the length of the lines you draw for strike of bedding, foliation, and lineation about the same (~1 cm) and the mark for dip direction should be much shorter (~0.2 cm). The line length of faults, folds, and contacts between units is usually variable.

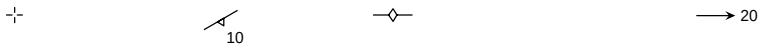
#	Feature	Strike or trend	Dip or plunge
1.	Bedding	120°	44°
2.	Bedding	070°	90°
3.	Lineation	315°	13°
4.	Foliation	174°	82°
5.	Normal fault	000°	33°
6.	Reverse fault	225°	69°



Orientation of strata (bedding) - strike and dip

Horizontal Inclined Vertical Overturned

Orientation of metamorphic or igneous foliation - strike and dip



Horizontal Inclined Vertical Lineations (trend and plunge)

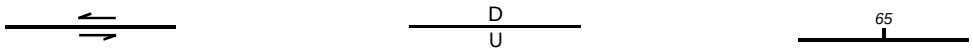
Contacts (depositional, tectonic, intrusive)

Definite location Approximate location Inferred location

Folds (trace of the axial surface and direction (arrow) of plunge (if any)

Anticline (upright and overturned) Syncline (upright and overturned)

Faults (surface trace)



Strike slip fault - apparent sense of horizontal slip

U&D = relative up and down sides of fault

Fault dip direction and amount

Normal fault - ball and bar on downthrown side

Reverse(thrust) fault - teeth on upper side

Figure showing symbols, lines and features commonly seen on geologic maps.

Problem 3: Using a Brunton compass – TCU Campus tour (map is shown on page 8).

Introduction:

I'll introduce you to measuring strike and dip using a Brunton compass at TCU's Froghenge. After the introduction, you will be divided into two groups and walk around east campus using the map on page 6.

East Campus Mapping Project:

Assignment:

- Set your compass to the appropriate magnetic declination for our location.
- There are 10 stations marked on the map. At stations 1 through 6, 9 and 10, you should measure strike and dip of the surface indicated (see pictures) in the special instructions column. Write down the orientation using right-hand rule azimuth notation in the columns provided for each station. Once you get back to the lab plot the orientations on the campus map in the little squares.
- Although you do not have to plot the orientations until you get back to the lab, I encourage you to take mental notes of any changes.
- The rock types at the stations where you actually measure the attitudes are pretty much the same, however, for the sake of this exercise, we'll assume, that
  i. Stations 1 through 6 are a Triassic sandstone unit and you are measuring bedding.
  ii. Stations 9 & 10 are in Precambrian schist and you are measuring a foliation.
  iii. You will have to identify minerals and rock types at stations 7 & 8
- Since you are dealing with different rock types, you will have to put contacts on your map (see page 3 for symbols) and you should color the different lithologies on your map.

Station	Special instructions	Strike	Dip
#1			
#2			

#3			
#4	 Use something flat to get a measurable surface		
#5			
#6	 Use something flat to get a measuable surface.		

After these 6 measurements you should take a moment and think about changes in orientations that you (hopefully) have observed. Do you see an emerging pattern?

What kinds of structures are associated with the kinds of changes in strikes and dips you see?

Answer:

Station	Special instructions
#7	Go to the The Neeley School of Business. The school has slabs of another rock type below its windows. Identify the minerals and rock type. **<u>What minerals are present and what is the rock type?</u>** **Answer:** Assume that the southeastern part of east campus (including the Neeley School of Business, Annie Richardson Bass Building, and everything in between) is this kind of rock and that the rock is Cretaceous in age. What kind of contact is most likely? **Draw the contact on the map**. **<u>What type of contact?</u>** **Answer:**
#8	Identify the minerals and rock type at the Smith Entrepreneurs Building. Assume that the parking lot to the west of the building, the library, and the lawn to the west of the library all the way to University Drive are also made of this rock and that the age of the rock is Precambrian. **<u>What minerals are present and what is the rock type?</u>** **Answer:** 1. The contact between these Precambrian rocks and the Precambrian schist is conformable and you should draw the approximate location of the contact on the map using one of the symbols from page 3. 2. The contact between the Precambrian rocks and the Triassic sandstones is Jurassic in age. **What kind of contact must that be?** **Answer:** **Draw the contact on the map**.

Station	Special instructions	Strike	Dip
#9			
#10			

Lab #2: TCU East Campus Mapping Project