

Lab 6, part one: Structural geology (data sheet)

Structural geology is the study of the orientation and relationship of rock units. A rock **unit** is a lithologically similar layer or body of rock, and different rock units are given names referred to as **formations**.

In this part of the lab, you will measure and obtain data about the rocks of Cougar Mountain Regional Park in east King County. From the data you will plot it on a map, and make some inferences about the structural geology of that area.

Objective: To describe the geologic structures of Cougar Mountain Regional Park

Skills: • Data collection (rock identification, attitude measurement, GPS measurement)
• Data analysis (plotting data on a map)
• Conclusion inference (describing the structural geology and some geologic history of this area)

How geologists measure geological structures

Clearly, a horizontally-bedded set of rocks will tell a different geological story than a tilted set of rocks. To convey the data that would allow geologists to formulate an interpretation, a set of standard symbols and measurements was developed.

The two principal measurements of any geological structure (for instance, a fault or a layer of rocks) is the **strike** and the **dip** of a layer of bedded rocks. Both measurements can be made with a Brunton compass; both measurements have a compass orientation (i.e., such as N 30 W (or NW 30) which means "30 degrees west of due north"). In addition, the dip requires the measurement of an angle (reported in degrees off of horizontal). But what are they?

The strike of a structure is the compass orientation of any horizontal line on a planar surface. The dip is the angle of slope at right angles to the strike. Note that the strike orientation will always be 90° (perpendicular) off of the dip orientation.

A way to think about strike and dip is to consider how water behaves. Imagine a boat ramp sloping toward a lake. The water dripping off the ramp into the lake will be going in the direction of the dip; the slope angle of the boat ramp is the magnitude of the dip. The water level of the lake, which makes a horizontal line across the planar surface of the boat ramp, is the strike (once you measure its direction).

"**Attitude**" is the term used to describe a feature's strike and dip at a particular point. An attitude symbol looks like a short-legged "T" with the arms of the T representing the direction of the strike and the short leg of the T pointing in the direction of the dip (towards lower elevation). A number is written next to the short leg of the T, which represents the magnitude of the dip in degrees.

*Head south on I-5 and go east on I-90 to exit 17 (Newport Way). At the foot of the off-ramp, turn right, then an almost-immediate right onto Newport Way. Continue for about 0.4 miles, to the point where the right shoulder parking strip widens. Park there; the outcrop is across the road. The speed limit on the road is 45 miles/hour; **be careful crossing the road.***

Stop 1 — Blakeley Formation

Examine the outcrop to find any sort of bedding.

What type of rock is this? What rock name(s) are appropriate for the rock?

Are there any interesting features about this rock, such as fossils or unusual clasts?

Measure the GPS coordinates (latitude/longitude — don't forget we're in the northern hemisphere as well as the western hemisphere) and altitude.

Using the Brunton (or similar) compass, measure the strike and dip of the beds in this formation at this locality.

Make a U-turn and head east on Newport Way until the intersection with State Route 900 (a little over two miles). Turn right onto SR 900 south. After a little over two miles, the road will crest (about where the entrance to Pacific Topsoils is); look briefly at the layered rocks on the left (west) side of the road.

Drive-by "stop" 2 — Renton Formation

There is no parking here, so we'll slow down and cruise by. The road at this point is oriented southwest (the direction we're going)/northeast.

Estimate the direction of the dip of the beds here.

Continue southbound on SR 900. After two miles, turn right at the intersection with 164th Ave. SE (north), then after 0.1 miles, make another right at SE May Valley Road. After another tenth-mile, continue straight onto SE 112th St. The road will curve around for a bit. At the intersection with SE Licorice Way, park by the side of the road.

Stop 3 — Tukwila Formation

Examine the outcrop to find any sort of bedding.

What type of rock is this? What rock name(s) are appropriate for the rock?

Are there any interesting features about this rock, such as fossils or unusual clasts?

Measure the GPS coordinates (latitude/longitude — don't forget we're in the northern hemisphere as well as the western hemisphere) and altitude.

Using the Brunton (or similar) compass, measure the strike and dip of the beds in this formation at this locality.

Make a U-turn and head back to 164th Ave. SE; head north (turn right) on this road, which will now be named SE May Valley Road. Continue for about a mile and a half and turn right (north) onto 136th Ave. SE, which will be renamed Coal Creek Parkway SE. Just over a mile later, there will be a rock outcrop on the right (Lake Boren is to the left). Turn into the first driveway on the right past the rock outcrop; it's a service road for a park. Park and walk back to the outcrop; you will need to slip past the chain link fence to examine the rocks.

Stop 4 — Tukwila Formation

The formation name is the same as the previous stop; what similarities does this rock have to stop 3's rock?

What differences do you notice?

On the whole, do these two stops satisfy the definition of a geological formation: “A mappable body of rock identified by distinctive characteristics, some degree of internal homogeneity, and stratigraphic position”?

Measure the GPS coordinates (latitude/longitude — don't forget we're in the northern hemisphere as well as the western hemisphere) and altitude.

Using the Brunton (or similar) compass, measure the strike and dip of the beds in this formation at this locality.

Back carefully out of the driveway and resume heading north on Coal Creek Parkway SE. Almost immediately, turn right onto Newcastle Coal Creek Road (north). Follow this road for two miles and turn right into a gravel parking lot (the Red Town trailhead for Cougar Mountain Regional Park). Park and cross the road, carefully, and follow the trail for about 0.2 miles to the first bridge. Cross the bridge and follow the trail. Across the small stream (Coal Creek), there should be a stream-cut outcrop with clearly-defined bedding.

Stop 5 — Renton Formation

What type of rock is this? What rock name(s) are appropriate for the rock?

Are there any interesting features about this rock, such as fossils or unusual clasts?

Measure the GPS coordinates (latitude/longitude — don't forget we're in the northern hemisphere as well as the western hemisphere) and altitude.

Using the Brunton (or similar) compass, measure the strike and dip of the beds in this formation at this locality.

Turn right out of the parking lot and continue north on Coal Creek Parkway SE, which will turn into Lakemont Blvd. SE, which will take you back to I-90. Get on I-90 westbound; return home.