Seismology and Magnetics; fall 2002: Final Hurrah Who?_________________________________

ANSWER 4 of the 5 questions – skip one page of your choice

1.A. What causes a magnetic anomaly?

B. Why are most magnetic anomalies dependent on latitude?

C. How and why does changing the depth of the causative source affect a magnetic anomaly?

D. What minerals are most important for generating magnetic anomalies and how are they different?

E. Write the main equation for Earth's dipole field and explain the variables:

2. A. What, in the context of plate tectonics, is an Euler pole and why is it significant?

B. List and accurately (yet briefly) explain four different ways to determine the position of an Euler pole from geologic observations.

3. Suppose a vast area, like the southern Californian deserts, was covered by a 1200^{o}C ash flow tuff in the mid-Miocene, and that tuff cooled below the Curie temperature in a few weeks. The whole region is later chopped up by faults. Now imagine you want to do a paleomagnetic project in the area to learn about post-tuff tectonics.

a. Describe and justify a paleomagnetic field program (e.g., how are your sampling sites distributed) that would let you determine if any (or all) fault blocks were rotated around a vertical axis during faulting?

b. How is your experiment dependent on the tuff's covering a large area and cooling rapidly?

c. What lab work would you have to do, and why, to recover reliable paleomagnetic directions?

d. suppose some blocks were rotated clockwise, some rotated counterclockwise, and some not rotated – how would you tell them apart?

4. Sketch and label a map of two normal faults in the area with a connecting strike-slip (transform) fault and,

- show which way the normal faults dip
- show the nature of strike slip on the connecting fault (e.g., right or left lateral)

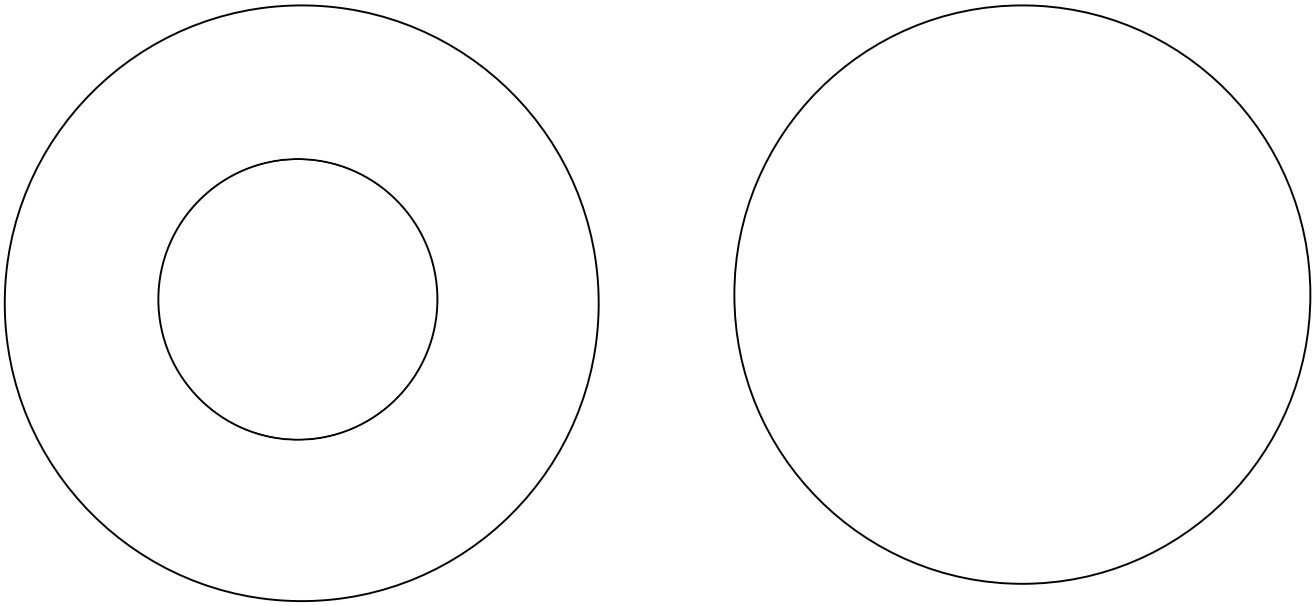
B. Explain how the normal and strike slip faults fit into Anderson's theory of faulting (sketches might help you clarify this).

C. now explain the slip vector for faults and describe how it differs for the two different faults.

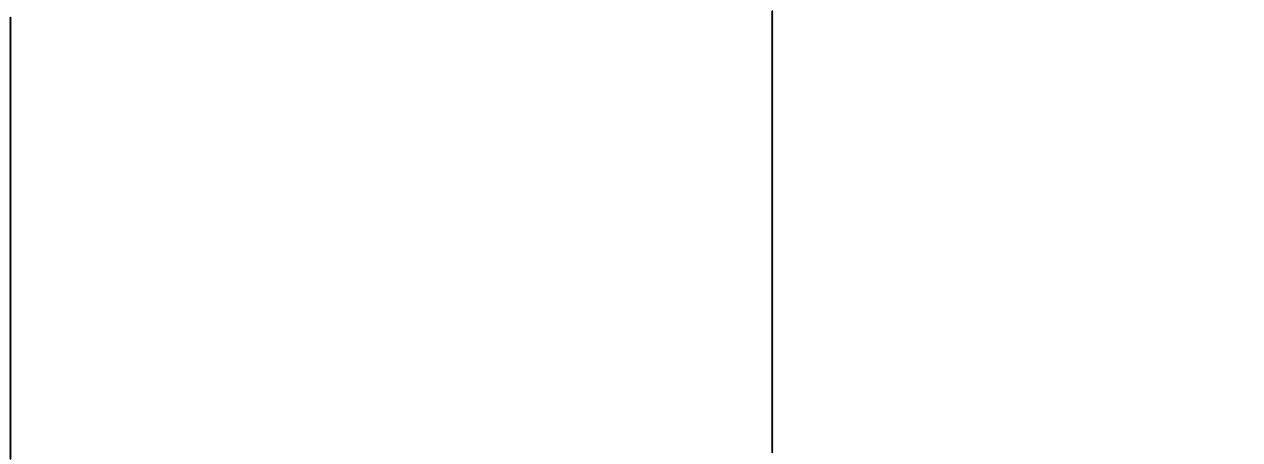
D. and finally draw first motion results (beach ball diagrams) for the two types of faults (and draw an arrow linking them to the map above so I can tell what's which?

5. A colleague suggests the two models below for the moon. The model on the left has a core whose P-wave velocity is significantly **higher** than that of the mantle. The model on the right has no core. Both models have the same P-wave velocities in their mantles. The mantle and core velocities are constant, they **DO NOT** change with depth.

a. Neatly and accurately sketch and label the P and PkP travel paths as appropriate



b. Neatly and **accurately** sketch and label the T-delta curve for P and PkP for each model.



C. Explain which critical zone of delta values you would observe (and why) during a one-time whole-moon seismology experiment designed to differentiate between the two models.