Lab Seven

graphic correlation: *Please use a pencil for these exercises! Also, do not fear the ruler.*

1. Please begin by answering the questions on the graphic correlation warm-up worksheet.

The following exercise was created using information from a paper by Lucy Edwards that appeared in the journal *Palaios* in 1989 [*Palaios* 4(2):127-143]. The article dealt with correlation of upper Paleocene to lower Eocene strata of the Atlantic Coastal Plain in Virginia.

2. Plot the biostratigraphic data (dinoflagellates) from the Lake Jefferson and Carter's Corner cores.
- **a.** Use the data from the Carter's Corner core for the x-axis values, and the data from the Lake Jefferson core for the y-axis values.
- **b.** Retain negative signs when making graph; data are given as depths (feet) in cores.
- **c.** When plotting datums, use "o" for range bottoms, and "+" for range tops.

3. Using "*" for each datum, plot the supplemental data.
- **a.** Electric log peaks: Resistivity (low) and Spontaneous Potential (high).
- **b.** Paleomagnetic field reversal event: reversed to normal polarity = ? C22 chron (~49.3 Ma).
- **c.** Stable isotope peaks: $\delta^{13}C$ (high) and $\delta^{18}O$ (low).
- **d.** Bentonite layer, geochronometry: $^{40}Ar/^{39}Ar$ radiometric date = 57.8 ± 0.6 Ma.

4. Correlate and interpret the Lake Jefferson and Carter's Corner sections.
- **a.** Draw the Line of Correlation (LOC) through the points.
- **b.** Calculate the approximate slope of the LOC.
- **c.** What was the relative rate of rock accumulation in the Lake Jefferson core with respect to the Carter's Corner core?
- **d.** Are there any unconformities present? Any evidence of mass extinctions? If so, where?
- **e.** Does the LOC imply that the rate of rock accumulation was constant during this interval? Explain why or why not.
- **f.** What do you make of the datums that don't fall exactly on the LOC? Suggest three possible reasons for these discrepancies.
- **g.** Should you adjust the LOC? Or, should you adjust some of the FADs / LADs? Explain why, and how you might make adjustments.

5. Generate a Composite Standard (CS).
- **a.** Identify each instance where it would be appropriate to make adjustments to datums.
- **b.** Record the values for all possible datums on your data sheet under the columns for the CS.
- **c.** Note that many of the original values for datums from the Reference Section (the Lake Jefferson core) will be retained, while many values will be new.

6. Correlate and interpret the Haynesville core and the CS.
- **a.** Plot biostratigraphic and supplemental data as in #2 and #3 above, using the data from the Haynesville core for x-axis values, and the data from the new CS for the y-axis values.
- **b.** Draw the LOC through the points.
- **c.** Calculate the approximate slope for each of the three segments of the LOC.
- **d.** What was the relative rate of rock accumulation in the Haynesville core versus the CS?
- **e.** Are there any unconformities present? If so, where? Explain your reasoning.
- **f.** Are there any mass extinctions evident? If so, where? Explain your reasoning.
- **g.** What would you recommend doing with the anomalous range bottom to the right of the LOC? What about the two anomalous range tops? Explain their occurrence.

7. Given the geographic locations of the cores, describe the geologic history of this area during this time interval. Items of consideration might include: relative sea level fluctuations, depositional environments, relative rates of sedimentation (rock accumulation), direction of source area, and any other significant geological and biological events.

GRAPHIC CORRELATION EXERCISE									
		Lake Jefferson		Carter's Corner		Haynesville		Composite Standard	
	dinoflagellate	taxon ranges		taxon ranges		taxon ranges		taxon ranges	
taxon #	species	bottom	top	bottom	top	bottom	top	bottom	top
1	*Fibradinium annetorpense*	-	-214	-	-195	-	-		
2	*Xenikoon australis*	-	-197	-	-166	-	-507		
3	*Deflandrea dartmooria*	-	-196	-	-166	-	-503		
4	*Phelodinium magnificum*	-	-141	-	-116	-	-465		
5	*Caligodinium amiculum*	-	-197	-	-157	-	-		
6	*Fromea fragilis*	-	-141	-	-129	-	-416		
7	*Veryhachium spp.*	-	-156	-	-143	-	-416		
8	*Fibrocysta spp.*	-202	-	-177	-	-537	-		
9	*Cordosphaeridium multispinosum*	-197	-117	-177	-129	-539	-410		
10	*Deflandrea phosphoritica*	-186	-	-163	-	-507	-		
11	*Adnatosphaeridium robustum*	-180	-157	-166	-157	-495	-416		
12	*Impagidinium sp.*	-180	-147	-163	-129	-465	-416		
13	*Cassidium sp.*	-180	-145	-157	-129	-490	-361		
14	*Turbiosphaera magnifica*	-180	-141	-165	-120	-497	-411		
15	*Kallosphaeridium brevibarbatum*	-180	-	-164	-	-469	-		
16	*Apectodinium homomorphum*	-180	-	-167	-	-496	-		
17	*Eocladopyxis peniculuta*	-180	-	-162	-	-503	-		
18	*Andalusiella rhombohedra*	-167	-157	-157	-143	-	-		
19	*Heteraulacacysta spp.*	-157	-	-157	-	-449	-		
20	*Muratodinium fimbriatum*	-136	-	-129	-	-416	-		
21	*Gonyaulacysta sp.*	-136	-	-122	-	-416	-		
22	*Ascostomocystis hydria*	-119	-106	-116	-87	-405	-388		
23	*Catillopsis abdita*	-119	-101	-114	-99	-	-		
24	*Wilsonidium tabulatum*	-117	-	-111	-	-410	-		
25	*Deflandrea heterophlycta*	-101	-	-91	-	-398	-		
26	*Wetzeliella hampdenensis*	-101	-	-99	-	-	-		
27	*Emmetrocysta sp.*	-97	-	-91	-	-400	-		
28	*Phthanoperidinium echinatum*	-87	-	-99	-	-361	-		
29	*Wetzeliella varielongituda*	-80	-	-91	-	-389	-		
30	*Rhombodinium sp.*	-80	-	-90	-	-	-		

supplemental data		Lake Jefferson		Carter's Corner		Haynesville		Composite Standard	
I	e-log: SP peak	-218	x	-192	x	-	x		x
II	bentonite layer	-185	x	-165	x	-500	x		x
III	del O-18 peak	-153	x	-142	x	-416	x		x
IV	e-log: R peak	-113	x	-108	x	-402	x		x
V	del C-13 peak	-100	x	-101	x	-395	x		x
VI	paleomag event	-84	x	-89	x	-390	x		x