

## *Comprehending "Deep Time" Using Common Analogies*

Empathy, the ability to "see and feel" from a perspective that is not one's own, is one of the most difficult of all processes. Man's natural perception of time, is not that of Queen Earth, who has been around for a much greater interval than even the first appearance of bacteria we find housed in rock over 3.5 BILLION years old. Just how do we reconcile this seemingly bridgeless chasm?

The following exercises are designed to use common analogies to show just how long Earth has been developing to the stage where we now contemplate her existence—past, present, and future.

1) The average woman's head has approximately 125,000 hairs. Using the conversion factor of one hair = one year, how many heads would be equivalent to the following intervals of time?

TIME INTERVAL	# OF HEADS	TIME INTERVAL	# OF HEADS
Archaean		Proterozoic	
Paleozoic		Mesozoic	
Cenozoic		Pleistocene	

2a) The average hominid fingernail is replaced by growth every six months and is 1/2 inch long. How long would "Lucy's" (*Australopithecus afarensis*) fingernails be if she had never died and they never broke or were manicured? The specimens of Lucy are about 4 million years old. The measurements must be converted to both FEET and MILES, or you will not receive credit, and you must show your work.

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2b) The average rate of seafloor-spreading is about the same as hominid fingernail growth. Approximately how far (in FEET and MILES) did North America move away from western Africa and Great Britain since the first dinosaurs (*Herrerasaurus* and *Staurikosaurus*) appeared in South America about 235 million years ago?

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2c) Compare your calculations with a modern map of the world. How does your calculation compare with the distance from London to Washington D.C?

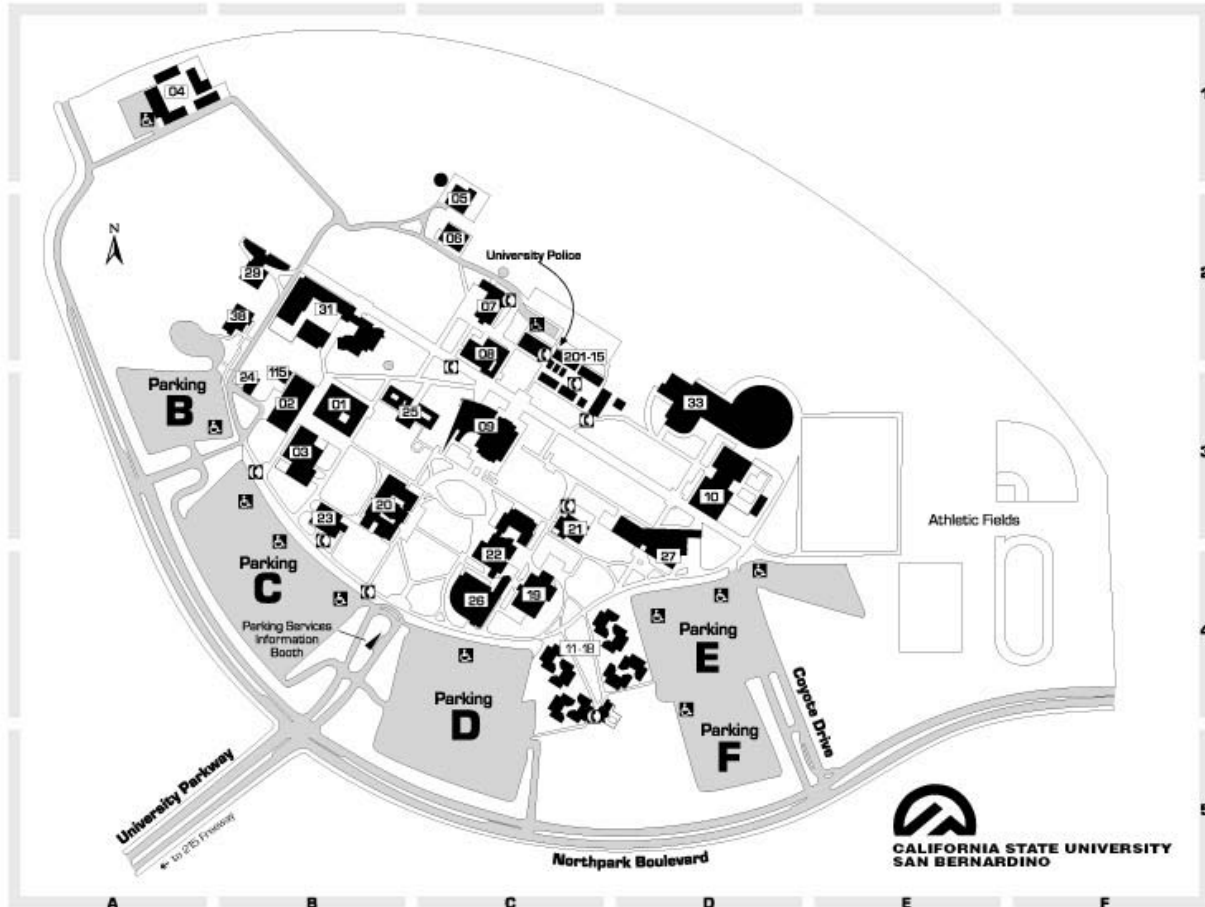
2d) If you could travel back to the Mesozoic in a time machine and observe the entire duration of that era from start to finish, just because you really want to see the entire history of the dinosaurs, how long would your fingernails be at the end of the show? Your answers must be in FEET and MILES (YES, MILES!!)

3) Toilet paper in the US usually comes in rolls. The average household roll has about 280 sheets. Assume that each sheet represents a thousand years, and calculate the number of rolls equivalent to the the time intervals listed below.

TIME INTERVAL	# OF TOILET PAPER ROLLS	TIME INTERVAL	# OF TOILET PAPER ROLLS
Paleozoic Era		Cambrian Period	
Mesozoic Era		entire range of dinosaurs through time	
Cenozoic Era		from Lucy (see above) to the present	
Paleocene Epoch		Eocene Epoch	
Oligocene Epoch		Miocene Epoch	
Pliocene Epoch		Pleistocene Epoch or Ice Age	

4) The conversion factor, 0.1 inch = 4167 years, relates distance to time. Determine the length of your stride by pacing a 100 foot distance measured with a tape. Count the number of normal steps you take in that 100 foot interval, then determine the average length of a single step. Then use your steps as a measuring tool for even greater distances. At CSUSB, you may use the 100 foot measured interval between the two orange lines on the concrete sidewalk just outside the outside entrance to JB-102. Please calculate, BEFORE you begin your journey, the amount of time in each step, and how many steps you need to step off each geological time interval. Beginning at Jack Brown Hall, step-off the Eons and Eras of a full Terra of time and record your travels on a sketch map. Record your journey on the sketch map page provided for this exercise and color code your time/distance intervals for each Era. You may not double back on your path and you must stay on the sidewalks.

## *Deep Time: Sketch Map of a Terra of Time*



EON	ERA	PERIOD	Boundary Age in Ma			
Phanerozoic 570	Cenozoic 65	Quaternary 1.65	Holocene	0.01 -		
			Pleistocene	1.6 -		
		Tertiary 63.36	Neogene 21.86	Pliocene	5.2 -	
				Miocene	23.5 -	
				Oligocene	35.5 -	
			Paleogene 41.5	Eocene	56.5 -	
				Paleocene	65 -	
				Cretaceous 81	Late	97 -
					Early	146 -
				Jurassic 62	Malm	157 -
	Dogger	178 -				
	Lias	208 -				
	Triassic 37	Tr3	235 -			
		Tr2	241 -			
		Scythian	245 -			
	Paleozoic 325	Permian 45	Lopingian	250 -		
			Guadalupian	256 -		
			Rotliegendes	290 -		
		Carboniferous 73	Pennsylvanian 28	Gzelian	295 -	
				Kasimovian	303 -	
				Moscovian	311 -	
			Mississippian 40	Bashkirian	323 -	
				Serpukhovian	333 -	
				Visean	350 -	
		Devonian 46	Tournaisian	363 -		
			D3	377 -		
			D2	386 -		
		Silurian 30	D1	409 -		
			Pridoli	411 -		
			Ludlow	424 -		
Wenlock	430 -					
Llandovery	439 -					
Ordovician 71	Ashgill	443 -				
	Caradoc	464 -				
	Llandeilo	469 -				
	Llanvirn	476 -				
	Arenig	493 -				
	Tremadoc	510 -				
	Cambrian 60	Merioneth	517 -			
St. Davids		536 -				
Caerfai		570 -				
Ediacaran		590 -				
Proterozoic 1930	Neoproterozoic 430	Vendian	Varangian	610 -		
			Sturtian	650 -		
	Mesoproterozoic	Riphean	1000 -			
		Animikean	1650 -			
	Palaeoproterozoic	Huronian	2200 -			
		Randian	2500 -			
		Swazian	2800 -			
Archaean 1500	Isuan	3500 -				
	Early Imbrian	3800 -				
	Nectarian	3850 -				
	Hadean 560	Basin Groups	3950 -			
Cryptic		4150 -				
		Priscoan	4560 -			