

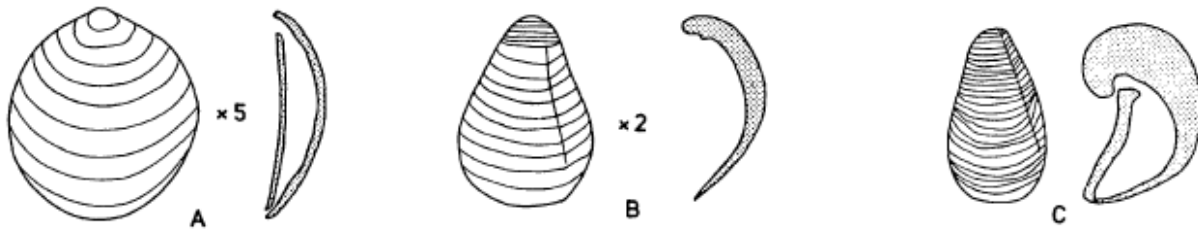
Earth 101: Heterochrony Assignment

Name _____

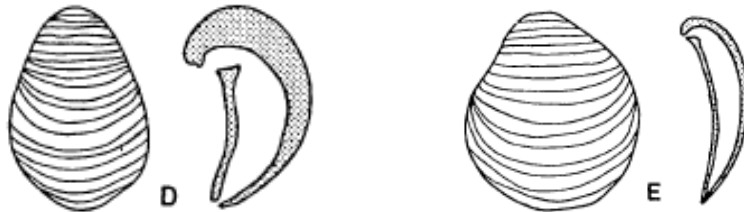
For this assignment, you should identify one of the six specific cases of heterochrony, not just paedomorphosis or peramorphosis.

Question 1

The following figure shows the pattern of shape change during ontogeny of the bivalve *Gryphaea arcuata*, from the early juvenile (A) to late juvenile (B) to adult (C). Note the magnification factors of the juvenile stages.



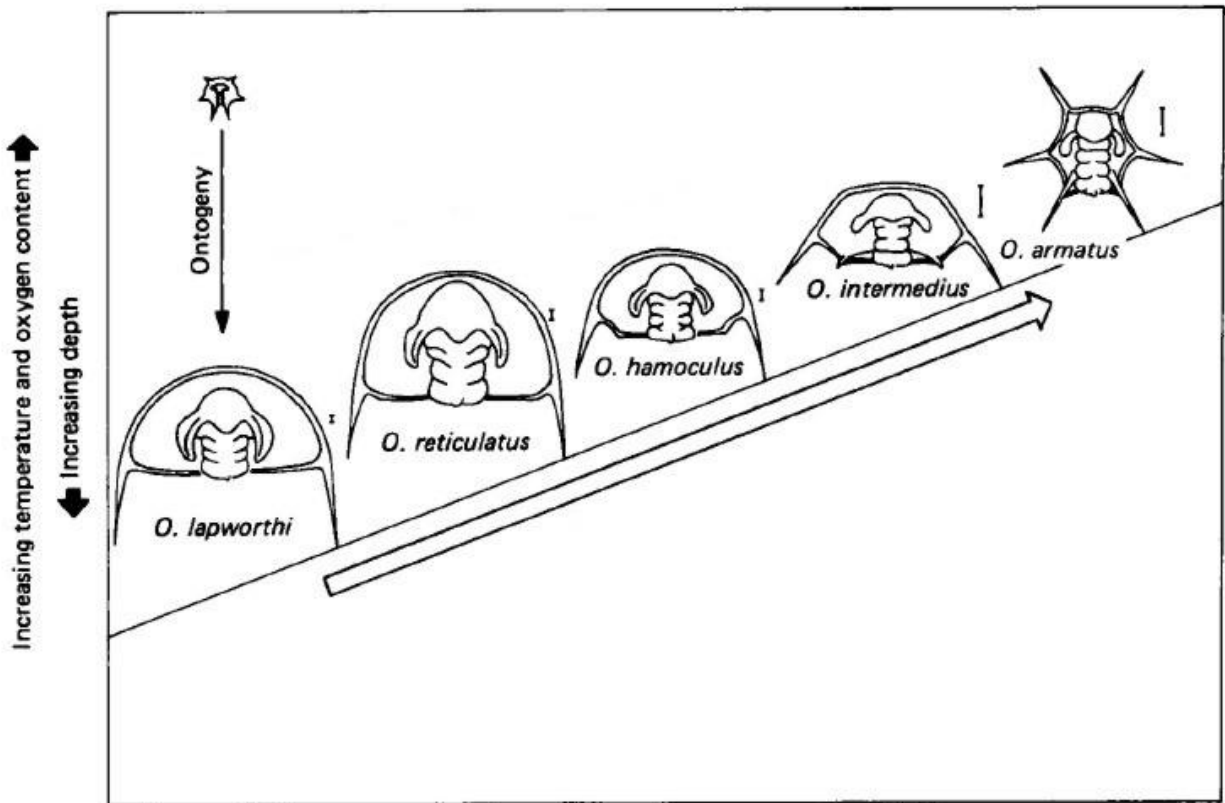
Here are adults of *Gryphaea mccullochi* (D) and *Gryphaea gigantea* (E). They are shown at x1.



Assuming that *Gryphaea arcuata* represents the ancestor, what type of heterochrony is most likely responsible for evolution of these two species? Which species has undergone a greater degree of heterochrony?

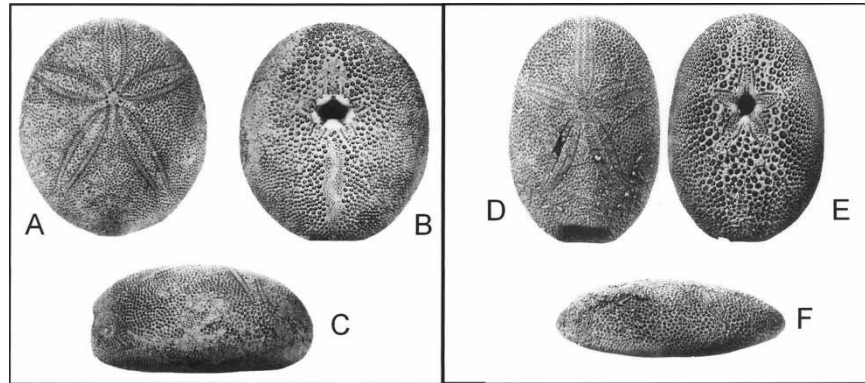
Question 2

The following figure shows the ontogeny of the trilobite *Olenellus lapworthi* (thin vertical arrow on left) and the evolutionary relationship of five species of *Olenellus* (large diagonal arrow). What type of heterochrony is represented?

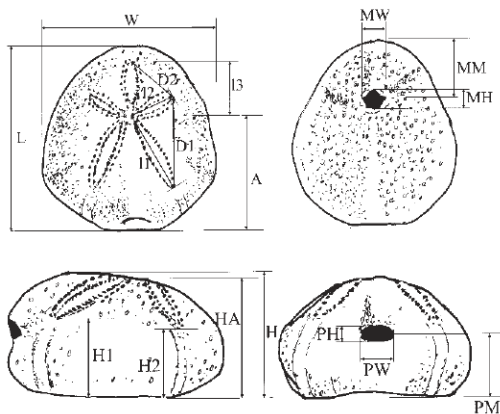


Question 3

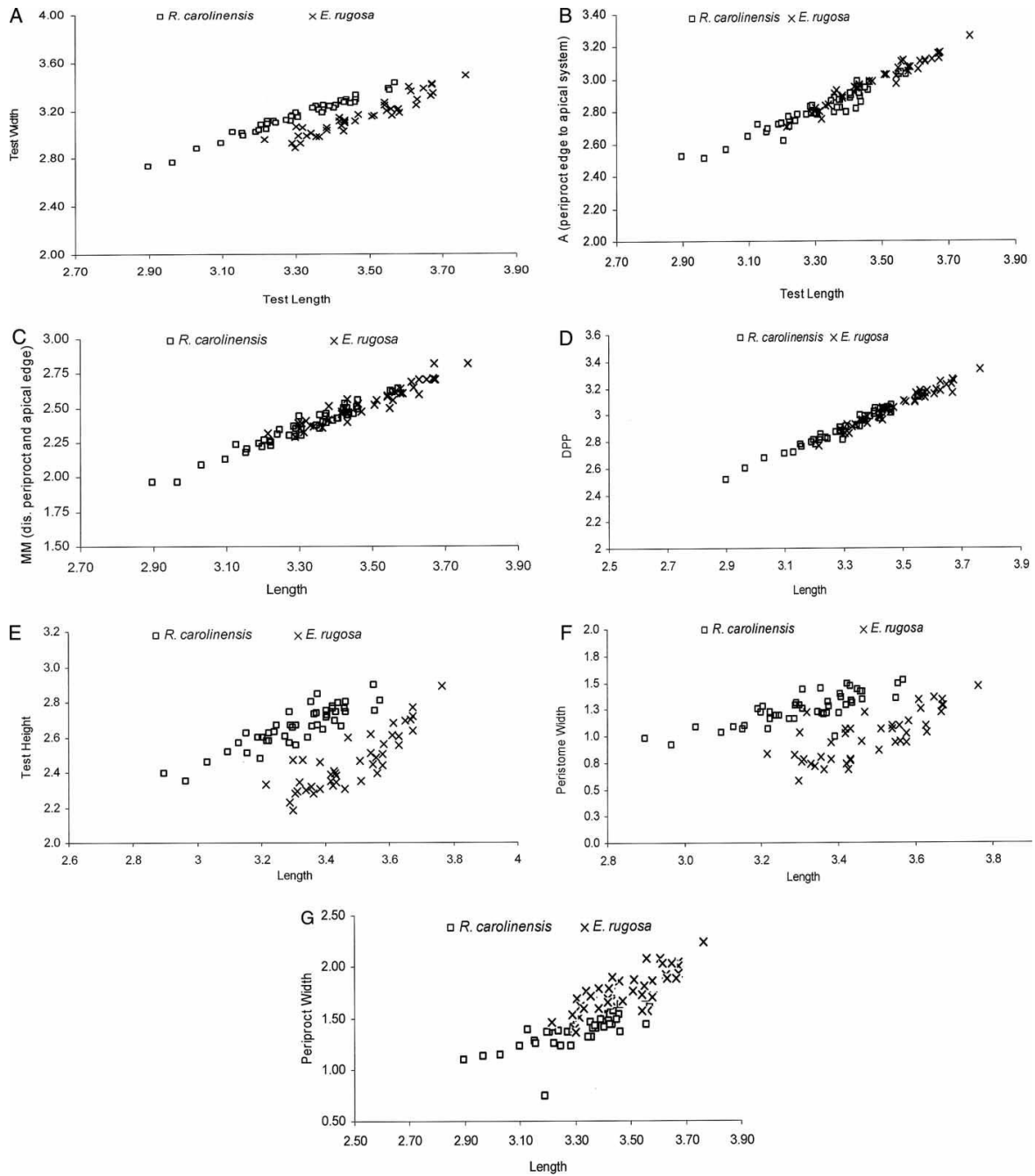
This question centers on the evolution of the irregular echinoid *Eurhodia rugosa* (D-F) from *Rhyncholampas carolinensis* (A-C). Both are middle Eocene in age.



In previous examples, we have considered whether an entire organism is paedomorphic or peramorphic; however, it is actually characters that undergo heterochrony. Organisms have multiple characters, which can evolve independently via different heterochronic mechanisms. Some of the characters and their abbreviations are illustrated below. You do not need to know the details of the characters.



Test Measurements	
Abbreviation	Length Measurement
L	Length of test (apical—posterior axis)
A	Distance from posterior end of test to center of apical system
W	Maximum width of specimen
d1	Straight line distance between the ends of ambulacrum 1 and 2
d2	Straight line distance between the ends of ambulacrum 2 and 3
Dpp	Straight line distance between periproct and peristome
H	Maximum height of test
HA	Height of apical system
H1	Height from oral surface to edge of ambulacrum 1
H2	Height from oral surface to edge of ambulacrum 2
PM	Height of center of periproct from oral surface
PH	Height of the periproct opening
PW	Width of periproct opening
MH	Length of peristome opening measured along the anterior-posterior axis
MW	Width of peristome opening
MM	Length from center of peristome to anterior edge
I1	Length of 1 st ambulacrum from center of apical system
I2	Length of 2 nd ambulacrum from center of apical system
I3	Length of 3 rd ambulacrum from center of apical system



Using the data in graphs A-G, determine the type of heterochrony in each character.

Body Part	Type of Heterochrony
Test width (W)	
A	
MM	
Dpp	
Test height (H)	
Peristome width (MW)	
Periproct width (PW)	