Name:_____

GEOL 104 Dinosaurs: A Natural History
Video Assignment

DUE: Tues. Nov. 15 (FC01), Wed. Nov. 16 (0101)

Documentaries represent one of the main media by which scientific information reaches the general public. For this assignment, you'll be looking a series of three different TV documentaries that reflect different approaches and techniques used to uncover the life and death of different dinosaurs. As it happens the three documentaries are all about theropods (carnivorous dinosaurs): I would have liked to have included some herbivorous dinosaurs in this, but there aren't as many good documentaries about them yet!

These videos are available for watching via the ELMS site during the week of Oct. 31-Nov. 4. (Additionally, "Great American Predator" will be available in Dial Access in the NonPrint Media room of Hornbake Library. Dial Access is a program by which the videos are shown on a continuous basis during open hours: see http://www.lib.umd.edu/NPRINT/dialaccess.html for more details.) There will be online access to at least some of these videos, too: more information to come.

The three documentaries are each about one hour long. Each has a particular different emphasis, focusing on different particular dinosaurs and different approaches to paleontology. The documentaries in question are:

- "Arctic Dinosaurs" *Nova* (PBS) 2008 (online at http://video.pbs.org/video/1022686073)
- "The Four-Winged Dinosaur" *Nova* (PBS) 2008 (online at http://www.hulu.com/watch/63729/nova-the-four-winged-dinosaur)
- "Great American Predator", *Monsters Resurrected* (Discovery) 2010 (on ELMS and in NonPrint Media)

For each documentary, watch the video and answer the questions as you go along. You may want to see them more than once if you miss part of the question.

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"Arctic Dinosaurs" *Nova* (PBS) 2008

This documentary suffers from some rather crappy (and in come cases horribly, horribly inaccurate!!) computer dinosaur models. But it does take a different look at dinosaurs than the previous documentaries we've examined. Rather than focusing on a particular species, this one looks at a particular environment: dinosaurs of 70 million years ago (early Maastrichtian Age, Late Cretaceous Epoch) of the North Slope of Alaska.

1) How many different species of dinosaurs are represented in the Colville River fossils?

2) Hans-Dieter Sues discusses the implications of Arctic dinosaurs for dinosaur biology. What is this implication? In particular, what is the significance of the lack of crocodile fossils from the same formations?

3) Tom Rich and colleagues are trying to recover fossils from the Liscomb bone bed. What sort of approach do they need to do in order to get to those bones? What precautions do they need to take?

4) What is the most common dinosaur found in the Liscomb bone bed?

5) How does the diversity of dinosaurs in Tony Fiorillo's bone bed compare to that of the Liscomb bone bed that Tom Rich is working?

6) How does Fiorillo explain the concentration of *Pachyrhinosaurus* bones at his site? That is, what events did he speculate happened to produce this concentration?

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7) Robert Spicer uses fossil plants to estimate the paleoenvironment of 70 Ma Alaska. What property of leaf form does he use to determine if the climate was warm or cold?

8) What match did Spicer find for the climate conditions of 70 Ma North Slope of Alaska?

a. Identical to modern North Slope conditions: tundra, same average annual temperature as today)
b. Close to modern southern Alaskan conditions: temperate, average annual temperature of 42ºF, 30ºF warmer than modern North Slope
c. Close to modern northern California conditions: temperate, average annual temperature of 62ºF, 50ºF warmer than modern North Slope
d. Close to modern Guatemala: subtropical, average annual temperature of 80ºF, 68ºF warmer than modern North Slope
e. Close to southern India: tropical, average annual temperature 85ºF, 73ºF warmer than modern North Slope

9) Steve Hasiotis examines trace fossils in order to reconstruct the ancient environment as well. Using these trace fossils, what time of year and what kind of local environment does Hasiotis reconstruct for this site?

Extra Credit) At 70 Ma, how many months of darkness did the North Slope of Alaska get every year?_____

10) How would the dark time affect the food sources for the herbivores? How would it have affected the food sources for the carnivores?

11) Sues suggests a possible survival strategy for the herbivorous dinosaurs. What is that strategy? And what problems does Tony Fiorillo see with this strategy for some dinosaurs?

12) Anusuya Chinsamy-Turan looks at the bone texture of dinosaurs. What did she find concerning the hadrosaur bone, in particular with year-round activity? That is, did she find that it rested for a long period of time, or did she instead find that it had year-round activity?

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"The Four-Winged Dinosaur" *Nova* (PBS) 2008

While the other two documentaries focused on one of the larger carnivorous dinosaurs of its environment, this one looks at a little one: the aptly-named *Microraptor*.

Extra Credit) What unusual **new** feature was first discovered in *Microraptor*?

13) What was the **paleoenvironment** (that is, the type of habitat that existed in the past) of Liaoning 130 million years ago when *Microraptor* and the other fossils were formed?

14) What sort of material formed the **sediment** that allowed the wonderful preservation of the Liaoning fossils?

The documentary discusses the work of John Ostrom in the 1960s that modernized the study of dinosaurs and connected dinosaurs and birds.

15) Which two fossil genera were the main ones that Ostrom used in connecting birds and dinosaurs? (Circle the two names)

Allosaurus	*Archaeopteryx*	*Deinonychus*	*Hesperornis*
Ichthyornis	*Microraptor*	*Nanotyrannus*	*Velociraptor*

16) As they discuss in the documentary, what very important feature was left off of the raptors of *Jurassic Park*?

17) The documentary mentions that feathers can have important functions other than for flight. Name two of the functions they mention, with extra credit for a third.

18) According to the video, what is the function of **asymmetrical** feathers?

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The video discusses the work of Ken Dial (about which we will see more of in class).

19) True or False: Ken Dial showed that baby birds use powered wing flaps to run up walls, but that their wings were only used as passive parachutes (that is, they were not flapped) when they jumped off of heights?

[True | False] (Circle the correct answer)

The program spends some time examine the creation of two alternative models of *Microraptor*. Paleontologists Mark Norell and Xu Xing and artist Jason Brougham sculpt one model from measurements of many individuals; paleontologists Larry Martin and David Burnham prepared the second one from casts of a single specimen. These models are then evaluated by anatomists and paleontologists Farrish Jenkins and Steve Gatesy.

20) What major flaw did Jenkins and Gatesy find in the Martin & Burnham model?

The latter portion of the video concerns the possible use of long leg feathers in flight. (In class I will discuss my own hypothesis, which is not one of the ones they examined!) Eventually they have a poseable life restoration for use in the MIT wind tunnel. Below is a set of different positions they tried in the order they try them. For each, indicate the type of gliding result they found:

21) Legs relatively straight down:

22) Legs and feet tucked up against the body:

23) Biplane model (with metatarsal feathers sticking out laterally):

24) Biplane model, but with the legs held more forward:

25) Xu Xing's model: legs held backwards:

Extra Credit) of the above five models, which seems to have been the most effective as a mode of gliding?

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"Great American Predator" *Monsters Resurrected* (Discovery) 2010

Monsters Resurrected takes one particular species of ancient predatory animal and looks at how we interpret its anatomy, behavior, and so forth. The animal in question for this episode is *Acrocanthosaurus*, a mid-Cretaceous allosauroid carnosaur.

After some introductory remarks, we begin by looking at footprints found at the Paluxy River near Dallas, Texas.
26) Today this is a river in sparse Texas woodlands. What was the environment of this region at the time the sediment was laid down and the fossils were formed?

27) What does the steep angle of the toes of the *Acrocanthosaurus* tracks indicate?

Jim Farlow examines the distribution of the tracks of *Acrocanthosaurus* and *Paluxysaurus*.
28) How close to each other were the two dinosaurs, based on the physical position of the footprints?

Phil Currie & Tom Holtz compare the predatory powers of *Acrocanthosaurus* and *Tyrannosaurus*.
29) Which of these two (dinosaurs, that is: not paleontologists!) had the more powerful bite?

30) Which of the two had to deal with smarter, better armed prey?

31) Which of these had steak knife-like teeth, used like scissors?

32) What features make the arms of *Acrocanthosaurus* different from *Tyrannosaurus*? List one, with an extra credit for a second difference.

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Phil Senter examines the position and range of motion of the arms of *Acrocanthosaurus*.

33) What does he discover about how useful its arms would have been in catching large-bodied prey (like *Paluxysaurus*)?

Jerry Harris explores the cervical vertebrae of *Acrocanthosaurus*.

34) What unusual feature of the neural spines did Harris find, and how did he think it might have been used?

Jim Farlow again examines the map of the tracks. He points out the missing left footprint in the *Acrocanthosaurus* trackway.

35) How does Farlow explain the missing left footprint?

36) According to Holtz, why do we not have good direct evidence for the reasons for the disappearance of *Acrocanthosaurus* and its kin?

37) According to Currie, why might the disappearance of giant sauropods have been a problem for *Acrocanthosaurus*?