

# **MIDDLE AND HIGH SCHOOL TEACHER MISCONCEPTIONS OF GEOLOGIC TIME**

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# Previous Work

- + Libarkin et al. (2007): “overall, the majority of college students understand the relative order of major biological events in Earth’s history, while misunderstanding the time span between events” (p. 421)
- + Trend (2001): UK elementary school in-service teachers familiar with the general relative order of biologic events in Earth’s history but not the placement of geologic events through time

## College Student Conceptions of Geological Time and the Disconnect Between Ordering and Scale

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**Journal of Geoscience Education, 55(5): 413-422**  
**November 2007**

## Geologic Time Exercise

The following questions address your ideas about time. Please answer to the best of your ability.

If you had a time machine and were able to travel back to the moment the Earth was formed, what do you think the Earth would look like? How similar or different would it be from today? Explain your answer.

+ Questions 2-6 ask you to place numbers and words on the timeline of the next page. The words can be in any order on the timeline, and you can put more than one word in the same place. In the space beneath each question, *please explain your answers.*

## Geologic Time Exercise

How far back in time would you have traveled? Write the number of years next to **EARTH FORMS** on the timeline on the next page.

How many years ago do you think life first appeared on Earth? On the timeline, write **FIRST LIFE** and the number of years ago when you think life first existed.

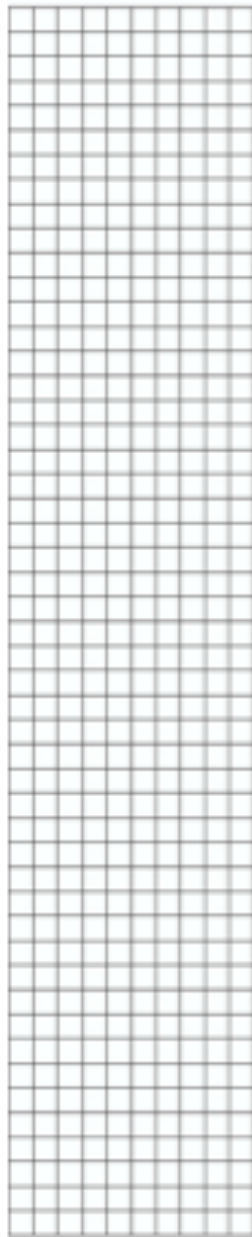
How many years ago did humans appear on Earth? Write **HUMANS** and the number of years ago when you think humans first existed.

How many years ago did dinosaurs appear on Earth? Write **DINO** and the number of years ago when you think dinosaurs first existed.

Do dinosaurs live today? If so, which dinosaurs? If not, when did dinosaurs stop living? Write **NO DINO** and the number of years ago on the timeline when you think dinosaurs stopped living.

If you went back to the time when dinosaurs were still alive, what do you think the Earth would look like? How similar or different would it be from today? How many years back in time would you have traveled?

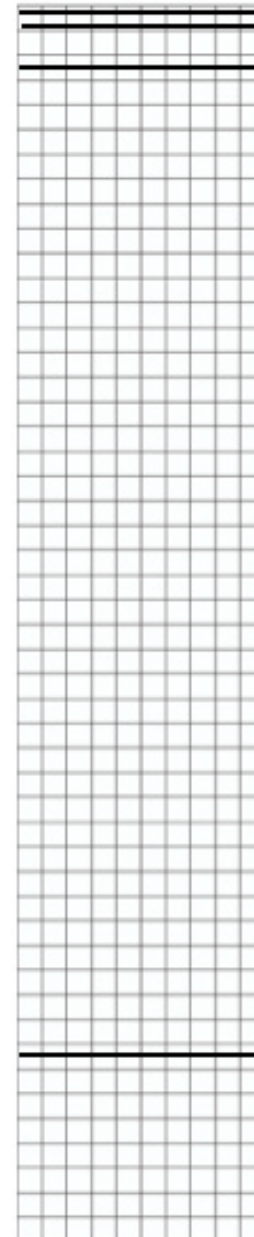
TODAY



EARTH FORMS



TODAY



EARTH FORMS

Humans 2 mya  
No Dino 65 mya  
Dino 230 mya

First Life 3.8 bya

4.6 bya

# Survey Distribution

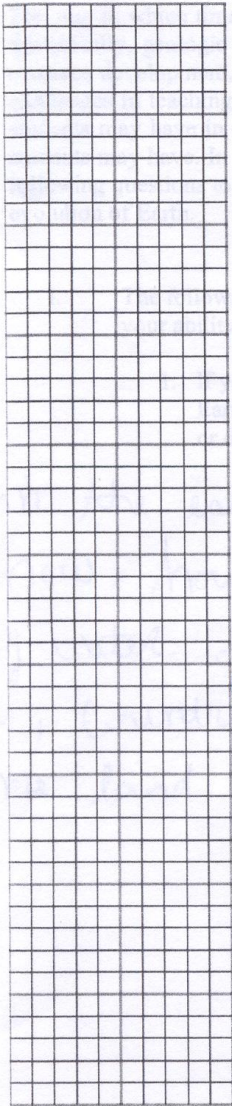
- + First day of week-long summer workshop on Plate Tectonics**
- + 17 Pennsylvania upper elementary, middle and high school teachers**

# Results

- + 16 out of 17 placed the events in the correct order
- + EARTH FORMS: 12 correct
- + FIRST LIFE: 7 correct (btwn 4-3 billion yrs)
- + DINOS APPEAR: 3 correct (btwn 200-150 million yrs)
- + NO DINOS: 1 correct
- + HUMANS APPEAR: 5 correct



TODAY



EARTH FORMS 2,000 years

NO Dino (when there was no water or vegetation left, they were killed or became extinct)

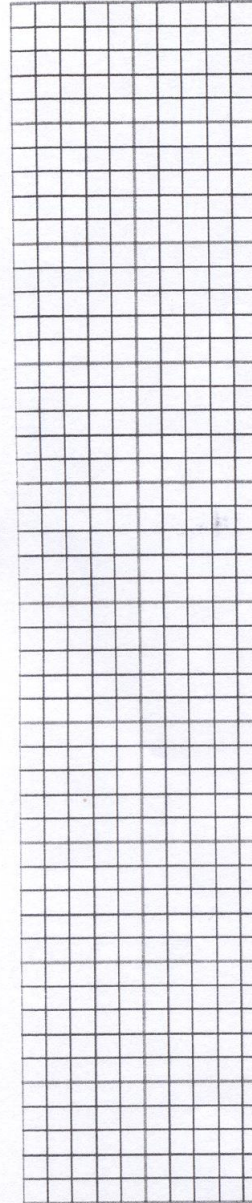
Humans A.D. 1



Dino (millions of years ago ~~no~~ exact date)

first life - millions of years ago (no exact date)

TODAY 2011



EARTH FORMS

Humans @ 30,000 B.C.

~~Humans~~  
~~first life~~

No Dino 500,000

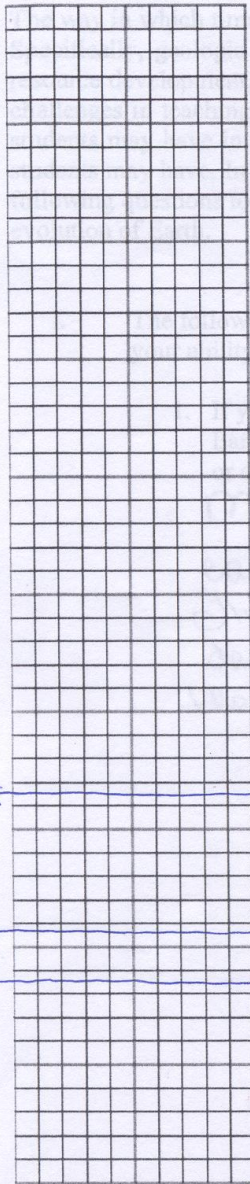
Dino

First Life



@ 360 million

TODAY



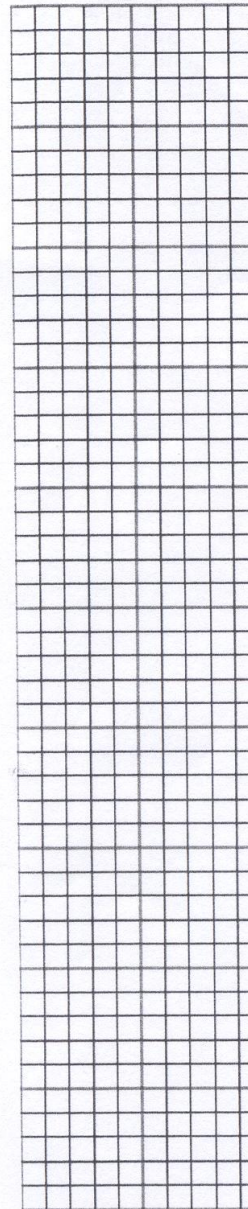
← → HUMANS (10,000 years)

← → DINO (20,000 years)

← → FIRST LIFE (@ little over 20,000 years)

EARTH FORMS (indefinite - perhaps millions)

TODAY



3,900 No Dino  
 4011 Human Life  
 4011 First Life, Dino  
 4011

EARTH FORMS

# If you had a time machine.. back to when Earth formed... look like...?

- + Earth would look like a potatoe form space (shaped like one).*
- + I would see one joined piece of land with water on either side.*
- + I think the Earth would have layers like to does now; however, I think it would have been mostly water. I don't think continents or other land, countries, states, etc., were formed yet. There is more land now then from the start.*
- + ... I base this on things I've read and movies I've seen.*

**If you went back in time... back to when  
dinos were alive... Earth look like...?**

- + *Plants were larger and more oxygen in the atmosphere hence some bigger organisms***
- + *Continents in different places, only one plate***
  - + *Earth was flat with no structures***
- + *Little water, similar climate to today***
- + *No pollution, clean air***

## Dinosaurs live today as...

- + *Alligators, crocodiles, roaches, whales, manatees*
- + 7 said dinosaurs not around today
- + Only three mentioned birds

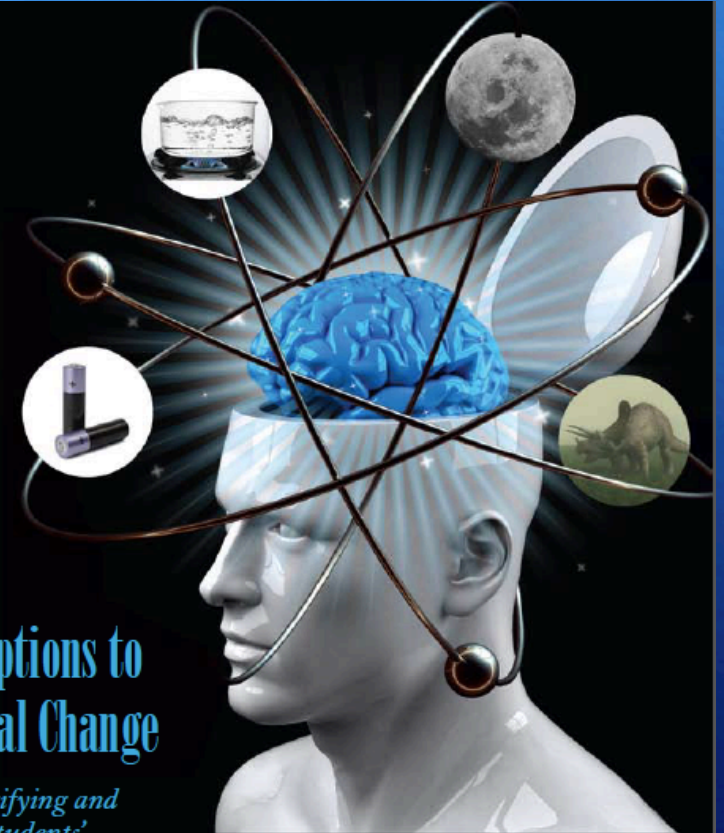
## Not a Simple Fix!



Tips for overcoming student misconceptions (NRC 1997, p. 31)

- 1) Anticipate most common misconceptions, be alert for others
- 2) Encourage students to test conceptual frameworks, discuss/think about evidence and possible tests
- 3) Think about how to address with demonstrations/lab work
- 4) Revisit misconceptions often
- 5) Assess and reassess the validity of student concepts

Gooding and Metz, *The Science Teacher*, April/May 2011, 34-37



### From Misconceptions to Conceptual Change

*Tips for identifying and  
overcoming students'  
misconceptions*

— Julia Gooding and Bill Metz —

**W**e all have misconceptions about the world in which we live—how it works, how we interact with it, how it changes, and the reasons behind those changes. These misunderstandings are personal notions we create to make meaning of our surroundings. Often, these misunderstandings go unchallenged for a lifetime. This article addresses how these inaccuracies can occur, what historic missteps may contribute, and which strategies teachers can use to help students move toward conceptual change.

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## Misconceptions Discussion

By [Laura Guertin](#) on July 7, 2011

Read The Science Teacher article, “From Misconceptions to Conceptual Change” (available at [this link](#) — Note you will need to create a free account and add to your library to download).

**Think about a misconception you have witnessed in your Earth Science classroom. Guided by the article (especially Figure 2), describe how you might address this misconception the next time you teach the topic.**

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Do you have a current topic you teach and assess that you think would benefit from deconstruction?-- [Add to the Discussion](#)

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