**Wed. Jan. 25**

Quiz 1- first 20 minutes

Students have some preparation to do for Group Activity 1 before class Friday; You can find what group you are in (and the instructions for the research that you need to do prior to class) under D2L content (“Group Activities”) and on links in the course homepage (accessible from D2L).

Plate tectonics and types of plate boundaries (plates colliding = “convergent” boundary; plates moving apart = “divergent” boundary; plates sliding past each other = “transform” boundary). Caused by convection (flow) in upper mantle. Contributes to lateral heterogeneous distribution of chemicals across the Earth’s surface. Boundaries associated with earthquakes and volcanoes.

Plate tectonics is directly related to location of natural resources, the extraction and processing of which can affect atmospheric chemistry, hydrologic cycle, etc, natural emission of gases.

Chemicals are heterogeneously distributed across the Earth’s surface. In many cases, besides earthquakes and volcanoes, the location of ore deposits of specific metals/elements is related to plate tectonic and plate boundaries. The richness of metal resources of a country is dictated by their current and past position with respect to plate tectonics ore-forming processes, and other ore-forming processes such as related to climate. Ore deposits of some elements may be more much related to climate as plate tectonics. [Table of important elements, their uses, and sources](http://www.economywatch.com/files/economyw_favicon_0.gif)- Note the USA is only a primary source for a few of the elements.

**Mon. Jan. 23**

[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[The quiz Wed will be given in the **first 20 minutes of class,** with lecture to follow as will be customary. Sample quiz 1 is on D2L with answers also posted.](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://tfc-charts.com/chart/CO/M)](http://www.enviroliteracy.org/article.php/1275.html)](http://www.economywatch.com/mineral/mineral-reserves-world.html)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.fossilmuseum.net/Tree_of_Life/Stromatolites.htm)](http://www.youtube.com/watch?v=Or-TyPACK-g)](http://www.grandchallengescholars.org/)](http://www.ltrr.arizona.edu/nats101/Homework%204-2010.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2010.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2010.htm)](http://earthobservatory.nasa.gov/IOTD/view.php?id=703)](http://earthobservatory.nasa.gov/IOTD/view.php?id=703)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.woodrow.org/teachers/esi/1998/p/phenomena/learnmoreabout.htm)](http://www.woodrow.org/teachers/esi/1998/p/phenomena/learnmoreabout.htm)](http://www.woodrow.org/teachers/esi/1998/p/phenomena/graphicalreps.htm)](http://www.woodrow.org/teachers/esi/1998/p/phenomena/graphicalreps.htm)](http://www.woodrow.org/teachers/esi/1998/p/phenomena/graphicalreps.htm)](http://www.woodrow.org/teachers/esi/1998/p/phenomena/graphicalreps.htm)](http://www.woodrow.org/teachers/esi/1998/p/phenomena/graphicalreps.htm)

[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[We will have **Group Activity 1** on Friday- preparation instructions for everybody are on D2L under “Group Activities”. Instructions for Group Leaders were sent by e-mail. Group lists are also on D2L and the course webpage- see what group you are in and what device you need to research.](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://tfc-charts.com/chart/CO/M)](http://www.enviroliteracy.org/article.php/1275.html)](http://www.economywatch.com/mineral/mineral-reserves-world.html)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.fossilmuseum.net/Tree_of_Life/Stromatolites.htm)](http://www.youtube.com/watch?v=Or-TyPACK-g)](http://www.grandchallengescholars.org/)](http://www.ltrr.arizona.edu/nats101/Homework%204-2010.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2010.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2010.htm)](http://earthobservatory.nasa.gov/IOTD/view.php?id=703)](http://earthobservatory.nasa.gov/IOTD/view.php?id=703)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.woodrow.org/teachers/esi/1998/p/phenomena/learnmoreabout.htm)](http://www.woodrow.org/teachers/esi/1998/p/phenomena/learnmoreabout.htm)](http://www.woodrow.org/teachers/esi/1998/p/phenomena/graphicalreps.htm)](http://www.woodrow.org/teachers/esi/1998/p/phenomena/graphicalreps.htm)](http://www.woodrow.org/teachers/esi/1998/p/phenomena/graphicalreps.htm)](http://www.woodrow.org/teachers/esi/1998/p/phenomena/graphicalreps.htm)

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 [[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[1st- Every object persists in a state of rest or in uniform motion in a straight line](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://tfc-charts.com/chart/CO/M)](http://www.enviroliteracy.org/article.php/1275.html)](http://www.economywatch.com/mineral/mineral-reserves-world.html)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.fossilmuseum.net/Tree_of_Life/Stromatolites.htm)](http://www.youtube.com/watch?v=Or-TyPACK-g)](http://www.grandchallengescholars.org/)](http://www.ltrr.arizona.edu/nats101/Homework%204-2010.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2010.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2010.htm)](http://earthobservatory.nasa.gov/IOTD/view.php?id=703)](http://earthobservatory.nasa.gov/IOTD/view.php?id=703)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.woodrow.org/teachers/esi/1998/p/phenomena/learnmoreabout.htm)](http://www.woodrow.org/teachers/esi/1998/p/phenomena/learnmoreabout.htm)

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 [[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[2nd- The change in velocity (= acceleration) with which an object moves is](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://tfc-charts.com/chart/CO/M)](http://www.enviroliteracy.org/article.php/1275.html)](http://www.economywatch.com/mineral/mineral-reserves-world.html)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.fossilmuseum.net/Tree_of_Life/Stromatolites.htm)](http://www.youtube.com/watch?v=Or-TyPACK-g)](http://www.grandchallengescholars.org/)](http://www.ltrr.arizona.edu/nats101/Homework%204-2010.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2010.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2010.htm)](http://earthobservatory.nasa.gov/IOTD/view.php?id=703)](http://earthobservatory.nasa.gov/IOTD/view.php?id=703)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)

 [[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[directly proportional to force applied and inversely proportional to the](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://tfc-charts.com/chart/CO/M)](http://www.enviroliteracy.org/article.php/1275.html)](http://www.economywatch.com/mineral/mineral-reserves-world.html)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.fossilmuseum.net/Tree_of_Life/Stromatolites.htm)](http://www.youtube.com/watch?v=Or-TyPACK-g)](http://www.grandchallengescholars.org/)](http://www.ltrr.arizona.edu/nats101/Homework%204-2010.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2010.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2010.htm)](http://earthobservatory.nasa.gov/IOTD/view.php?id=703)](http://earthobservatory.nasa.gov/IOTD/view.php?id=703)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)

 [[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[mass of the object (a=F/m)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://tfc-charts.com/chart/CO/M)](http://www.enviroliteracy.org/article.php/1275.html)](http://www.economywatch.com/mineral/mineral-reserves-world.html)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.fossilmuseum.net/Tree_of_Life/Stromatolites.htm)](http://www.youtube.com/watch?v=Or-TyPACK-g)](http://www.grandchallengescholars.org/)](http://www.ltrr.arizona.edu/nats101/Homework%204-2010.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2010.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2010.htm)](http://earthobservatory.nasa.gov/IOTD/view.php?id=703)](http://earthobservatory.nasa.gov/IOTD/view.php?id=703)

[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[3rd- [Every action has an equal and opposite reaction](http://www-istp.gsfc.nasa.gov/stargaze/Snewton3.htm) (conservation of momentum)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://tfc-charts.com/chart/CO/M)](http://www.enviroliteracy.org/article.php/1275.html)](http://www.economywatch.com/mineral/mineral-reserves-world.html)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.fossilmuseum.net/Tree_of_Life/Stromatolites.htm)](http://www.youtube.com/watch?v=Or-TyPACK-g)](http://www.grandchallengescholars.org/)](http://www.ltrr.arizona.edu/nats101/Homework%204-2010.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2010.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2010.htm)](http://earthobservatory.nasa.gov/IOTD/view.php?id=703)

[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[Law of Universal Gravitation- any and all objects exert a force of attraction between them proportional to the product of their masses and inversely to the distance between them squared. (F= G x (m1 x m2)/r2) (also see [Family Guy clip](http://www.hulu.com/watch/50385/family-guy-gravitational-pull) for humorous example)](http://www-istp.gsfc.nasa.gov/stargaze/Snewton3.htm)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://tfc-charts.com/chart/CO/M)](http://www.enviroliteracy.org/article.php/1275.html)](http://www.economywatch.com/mineral/mineral-reserves-world.html)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.fossilmuseum.net/Tree_of_Life/Stromatolites.htm)](http://www.youtube.com/watch?v=Or-TyPACK-g)](http://www.grandchallengescholars.org/)](http://www.ltrr.arizona.edu/nats101/Homework%204-2010.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2010.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2010.htm)

[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[Newton’s Law of Universal Gravitation further explored with astrological examples of gravitational force exerted on you at birth (by closest star other than sun, and doctor).](http://www.hulu.com/watch/50385/family-guy-gravitational-pull)](http://www-istp.gsfc.nasa.gov/stargaze/Snewton3.htm)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://tfc-charts.com/chart/CO/M)](http://www.enviroliteracy.org/article.php/1275.html)](http://www.economywatch.com/mineral/mineral-reserves-world.html)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.fossilmuseum.net/Tree_of_Life/Stromatolites.htm)](http://www.youtube.com/watch?v=Or-TyPACK-g)](http://www.grandchallengescholars.org/)](http://www.ltrr.arizona.edu/nats101/Homework%204-2010.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2010.htm)

[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[Structure of the Earth](http://pubs.usgs.gov/gip/dynamic/inside.html) (heterogeneous distribution of chemicals with depth=layers)](http://www.hulu.com/watch/50385/family-guy-gravitational-pull)](http://www.hulu.com/watch/50385/family-guy-gravitational-pull)](http://www-istp.gsfc.nasa.gov/stargaze/Snewton3.htm)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://tfc-charts.com/chart/CO/M)](http://www.enviroliteracy.org/article.php/1275.html)](http://www.economywatch.com/mineral/mineral-reserves-world.html)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.fossilmuseum.net/Tree_of_Life/Stromatolites.htm)](http://www.youtube.com/watch?v=Or-TyPACK-g)](http://www.grandchallengescholars.org/)](http://www.ltrr.arizona.edu/nats101/Homework%204-2010.htm)

[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[Earth’s **core** is made predominantly of iron and nickel (like some meteorites). The **mantle** layer above the core is primarily magnesium (Mg) and iron (Fe) silicate (Si and O) rock, and the **crust** on the surface is composed of silicate rock with less Fe and Mg and more K, Na and Al.](http://pubs.usgs.gov/gip/dynamic/inside.html)](http://www.hulu.com/watch/50385/family-guy-gravitational-pull)](http://www.hulu.com/watch/50385/family-guy-gravitational-pull)](http://www-istp.gsfc.nasa.gov/stargaze/Snewton3.htm)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://tfc-charts.com/chart/CO/M)](http://www.enviroliteracy.org/article.php/1275.html)](http://www.economywatch.com/mineral/mineral-reserves-world.html)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.fossilmuseum.net/Tree_of_Life/Stromatolites.htm)](http://www.youtube.com/watch?v=Or-TyPACK-g)](http://www.grandchallengescholars.org/)

[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[During early stages of Earth history, our planet was at least partly molten resulting from heat of collisions and gravitational potential energy converted to heat energy (decay of radioactive elements was also important source of heat over all of Earth’s history)](http://pubs.usgs.gov/gip/dynamic/inside.html)](http://pubs.usgs.gov/gip/dynamic/inside.html)](http://www.hulu.com/watch/50385/family-guy-gravitational-pull)](http://www.hulu.com/watch/50385/family-guy-gravitational-pull)](http://www-istp.gsfc.nasa.gov/stargaze/Snewton3.htm)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://tfc-charts.com/chart/CO/M)](http://www.enviroliteracy.org/article.php/1275.html)](http://www.economywatch.com/mineral/mineral-reserves-world.html)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.fossilmuseum.net/Tree_of_Life/Stromatolites.htm)](http://www.youtube.com/watch?v=Or-TyPACK-g)

[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[During this early period, Earth began to “***differentiate***” into layers with heavier material “sinking” to interior and lighter material “rising” to surface. Consequently Earth’s **core** is made predominantly of iron and nickel (like some meteorites). The **mantle** layer above the core is primarily magnesium (Mg) and iron (Fe) silicate (Si and O) rock, and the **crust** on the surface is composed of silicate rock with less Fe and Mg and more K, Na and Al.](http://pubs.usgs.gov/gip/dynamic/inside.html)](http://pubs.usgs.gov/gip/dynamic/inside.html)](http://pubs.usgs.gov/gip/dynamic/inside.html)](http://www.hulu.com/watch/50385/family-guy-gravitational-pull)](http://www.hulu.com/watch/50385/family-guy-gravitational-pull)](http://www-istp.gsfc.nasa.gov/stargaze/Snewton3.htm)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://tfc-charts.com/chart/CO/M)](http://www.enviroliteracy.org/article.php/1275.html)](http://www.economywatch.com/mineral/mineral-reserves-world.html)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.fossilmuseum.net/Tree_of_Life/Stromatolites.htm)

 [[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[Differences in chemistry among layers (for example low SiO2 in mantle and higher in](http://pubs.usgs.gov/gip/dynamic/inside.html)](http://pubs.usgs.gov/gip/dynamic/inside.html)](http://pubs.usgs.gov/gip/dynamic/inside.html)](http://pubs.usgs.gov/gip/dynamic/inside.html)](http://www.hulu.com/watch/50385/family-guy-gravitational-pull)](http://www.hulu.com/watch/50385/family-guy-gravitational-pull)](http://www-istp.gsfc.nasa.gov/stargaze/Snewton3.htm)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://tfc-charts.com/chart/CO/M)](http://www.enviroliteracy.org/article.php/1275.html)](http://www.economywatch.com/mineral/mineral-reserves-world.html)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)

 [[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[continental crust, and more Fe in mantle and less in crust) is consistent with Earth’s “differentiation” into the layers early in its history. Continental crust is referred to as having a granitic composition (K,Na,Fe,Al,Si,O); oceanic crust a basaltic composition (Mg,Ca,Fe,Al,Si,O). The ocean crust is also called “mafic” (dominated by Mg and Fe), whereas the mantle is ultramafic in composition.](http://pubs.usgs.gov/gip/dynamic/inside.html)](http://pubs.usgs.gov/gip/dynamic/inside.html)](http://pubs.usgs.gov/gip/dynamic/inside.html)](http://pubs.usgs.gov/gip/dynamic/inside.html)](http://pubs.usgs.gov/gip/dynamic/inside.html)](http://www.hulu.com/watch/50385/family-guy-gravitational-pull)](http://www.hulu.com/watch/50385/family-guy-gravitational-pull)](http://www-istp.gsfc.nasa.gov/stargaze/Snewton3.htm)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://tfc-charts.com/chart/CO/M)](http://www.enviroliteracy.org/article.php/1275.html)](http://www.economywatch.com/mineral/mineral-reserves-world.html)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ask.com/wiki/Banded_iron_formation)](http://www.ask.com/wiki/Banded_iron_formation)

[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[Crust and rigid upper mantle constitute the “lithosphere”. The lithosphere rides over the portion of the upper mantle (asthenosphere) that flows (heat from Earth’s interior leads to convection processes in the asthenosphere). The plates move (cm per year) and interact with each other in a dynamic system known as “plate tectonics”.](http://pubs.usgs.gov/gip/dynamic/inside.html)](http://pubs.usgs.gov/gip/dynamic/inside.html)](http://pubs.usgs.gov/gip/dynamic/inside.html)](http://pubs.usgs.gov/gip/dynamic/inside.html)](http://pubs.usgs.gov/gip/dynamic/inside.html)](http://pubs.usgs.gov/gip/dynamic/inside.html)](http://www.hulu.com/watch/50385/family-guy-gravitational-pull)](http://www.hulu.com/watch/50385/family-guy-gravitational-pull)](http://www-istp.gsfc.nasa.gov/stargaze/Snewton3.htm)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://www.youtube.com/watch?v=ry_HDlHJPXs)](http://tfc-charts.com/chart/CO/M)](http://www.enviroliteracy.org/article.php/1275.html)](http://www.economywatch.com/mineral/mineral-reserves-world.html)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ltrr.arizona.edu/nats101/Homework%204-2011.htm)](http://www.ask.com/wiki/Banded_iron_formation)

**Fri. Jan. 20**

First **Quiz** next Wed. Jan. 25; I’ll put up a sample quiz on D2L this weekend

First **Group Activity** next Fri. Jan. 27; preparation instructions to follow in a few days

**Grading Rubric** will be posted shortly for the **first writing assignment**

The first 9 students have been selected to **sit in the front row** next Monday Jan 23 and the following Mon. Jan 30.

**Lemonick** “Climate Heretic” article in Scientific American was briefly considered (some concepts include Groupthink, uncertainty, translating climate science into climate policy, black sheep syndrome), but only a few people contributed- question about this article will appear on Quiz 1

More Grand story of epic proportions:

⮚Elements from lithium (Li) to iron (Fe) (also He) produced in the interior of normal stars by “[fusion](http://fusioned.gat.com/what_is_fusion.html)” processes, i.e., lighter elements being combined to manufacture heavier elements. For example, in our Sun, fusion takes place converting 4 hydrogen atoms (1 proton in each nucleus = 4 nuclear particles) to one helium atom (2 protons and 2 neutrons in nucleus= 4 nuclear particles); the mass of the helium atom is less than the 4 hydrogens, so the difference in mass is what was converted to energy that contributes to the internal heat of the Sun (E=mc2); The energy from such nuclear reactions (involving nuclei of atoms) >> energy from chemical reactions (involving electrons of atoms); The fusion taking place in the Sun and other stars represents a tremendous energy source, and research has been directed at trying to promote controlled fusion reactions on Earth as a limitless source of energy (The world already has many fission reactors in which large radioactive elements such as uranium, decay and release energy)

⮚Elements up to Iron can be produced by fusion because energy is released; Elements beyond (heavier than) iron cannot be produced by fusion, but can be produced by high fluxes of neutrons that are captured in the nuclei of existing atoms; such neutron fluxes occur in interior of massive stars and when stars explode ([supernova](http://hubblesite.org/newscenter/newsdesk/archive/releases/2005/21/image/a)). Our sun has all of the elements of the Periodic Table, but it is only making He through fusion- Why?

The fusion taking place in the Sun and other stars represents a tremendous energy source, and research has been directed at trying to promote controlled fusion reactions on Earth as a limitless source of energy (The world already has many fission reactors in which large radioactive elements such as uranium, decay and release energy)

Laws of Thermodynamics

First Law- Energy cannot be created or destroyed, but it can be converted from one form to another (examples of energy- heat, like, kinetic energy, electrical energy, potential energy of petroleum, food and gravity)

Second Law- No energy transformation is 100% efficient ***or*** Energy can be converted from one form to another but in all conversions there is formation of some ‘low quality’, ‘non-usable’ heat ***or*** Heat cannot be completely converted to work ***or*** Universe runs down as energy is dispersed to low-quality heat energy ***or*** All systems tend to become random (or dispersed) on their own (**or** all energy is not “equal”). Entropy is a measure of randomness, or dispersion or disorder

The water behind a dam represents potential energy (that can be used to generate electricity renewably), whose ultimate source is solar energy

Origin of Solar System

Our solar system is made of all the elements of the Periodic Table but only He is being produced in our solar system currently (in the Sun); therefore all of the elements had to have been produced in the 10 billion years before the solar system was formed. (our system is from the remnants of other stars) [Solar Nebula Hypothesis](http://www.daviddarling.info/encyclopedia/N/nebhypoth.html) has solar system forming from a rotating ball of dust and gases that flattened to a disk shape. Most of the mass was in the center and the pressure and temperature in that environment ignited hydrogen “burning” (fusion). Planets formed when dust and gases were swept into the formation of planets at various distances from the proto-sun

**Wed. Jan. 18**

First Quiz next Wednesday (Jan. 25)

We went over some answers to [Homework #2](http://www.ltrr.arizona.edu/nats101/Homework2.htm) that had been handed out in class on Jan. 14. You will be quizzed on these skills in the first Quiz next Wed.

Class provided main points from the ‘August’ opinion piece in the Tucson Weekly, in regard to “old ways”, sustainability, locavores, and flourishing or collapse of societies, as related to food, water and energy in Tucson.

We considered figure from Mackenzie about the degree of our concern about matters related to time and space, and a page from Mann/Kump about the “global cooling” hubbub that took place in the 1970s in comparison with the “global warming” clamor of today.

Grand story of epic proportions:

⮚Only H and He (the most abundant elements in the Universe) were formed in the "Big Bang" 13-15 billion years ago; evidence of the Big Bang event is seen in the galaxies moving away from us at high speeds; [Hubble Deep Field](http://hubblesite.org/newscenter/archive/releases/1996/01) observations; the more distant the galaxy, the faster it is moving from away from us; Wavelengths are characteristic of electromagnetic radiation such as visible light (short wavelengths correspond to low pitch for sound waves, and red color for visible light waves; long wavelengths correspond to high pitch for sound waves, and purple color for visible light waves; see "[electromagnetic radiation](http://science.hq.nasa.gov/kids/imagers/ems/index.html)"); The “[Red Shift](http://www.arachnoid.com/sky/redshift.html)” of visible light is associated with the “Doppler Effect” indicates galaxies are moving away from us at high speed to shift light toward longer wavelengths (red). Video of eye-popping, jaw-dropping, awesome reenactment of the Big Bang using a balloon with some marks on it, in full special effects mode with Dolby® Surround-sound®, and 3-D glasses, which illustrates how the galaxies farthest away could be moving at the greatest speeds.

**Fri. Jan. 13**

**Note:** **Office hours in room 330 Space Sciences** are available immediately before (11-12 MonWed TA Laura and Fri TA Alex) and immediately after (1-2 MonWed with Prof. Leavitt) our class.

**Short Writing Exercise 1 (essay style) announced,** due by class time Wednesday, Feb. 8:

 Write at least 1 page (but not more than 2 pages) double-spaced paper on one (only 1) of the following 2 topics described in Mann/Kump

What is the best course for the country (p. 144-5)

Keeping the power turned on (p. 160-1)

Your essay will contain 2 elements

 1. Summary; boil it down; explain what is being said.

 2. What do you think should be done? Why? You can express personal, US, world viewpoint(s)

 (in-text citations and references not necessary, but all words should be your own).

**Students should work out question in Homework 2 (which is attached to Syllabus, and also linked in D2L and course webpage (accessed through D2L)**

The 535AD global catastrophe was mentioned; [Cerceo](http://www.ltrr.arizona.edu/nats101/CerceoTempting%20Fate.pdf) article linked on syllabus and “readings”, whose thesis is that some catastrophes we are helpless to prevent, but others (global warming related to use of fossil fuels) we can.

Class should be reading [August](http://www.tucsonweekly.com/gbase/Opinion/Content?oid=119710) opinion piece in the Tucson Weekly, in regard to “old ways”, sustainability, locavores, and flourishing or collapse of societies

Characteristics of matter

 All matter is made of small particles (atoms and their constituents)

 Atoms of the same element have similar chemical properties

 Atoms are not divided by chemical reactions

 Chemical reactions involve electrons; nuclear reactions involve protons/neutrons

 (in a column of period table different elements may behave similarly in chemical rxns)

Periodic Table

 Elements arranged according to increasing **Atomic Number** (number of **protons**).

 (This arrangement is also related to filling of **electrons** in discrete electron “shells”)

 Each element has name and 1- or 2-letter shorthand notation.

 When an atom is “neutral”, it will have an equal number of protons (+) in nucleus and

 electrons (-) orbiting nucleus. **Neutrons** (no charge) also can reside in nucleus at the

 center of atoms.

Scientific notation- a shorthand way of compactly writing very large or very small numbers; the power to which “10” is raised in scientific notation tells us how many decimal places to move to the left or right to write a number in expanded notation.; Conversion of units; Moles (number of atoms in the atomic weight [in g] of an element= 6.02x1023 atoms for any element)

Intro to “grand story” of epic proportions regarding time, space, power, fire and ice, attraction and repulsion, collisions and explosions (sort of like Lord of the Rings, Star Wars, Bible, etc). The “Epic Story” told in the [Periodic Table of Elements](http://ic.ltrr.arizona.edu/ic/nats/images/I-periodic-color.gif), which establishes a context of time and space in which our world exists (and allows us to explore required Tier 1 topics of structure of atom, electromagnetic radiation, Newton’s Laws, Laws of thermodynamics)

**Wed. Jan. 11**

Syllabus handed out and key points reviewed; course web site is accessible through D2L containing many links for syllabus, website, homework, readings, skills, etc.

Daily readings from Mann/Kump and Mackenzie textbooks are listed in syllabus, but additional readings will be announced and made available through course web site;

**You are responsible for knowing** **what is in the syllabus, particularly related to instructors contact information, policies, deadlines, grading, etc**……at least 2 questions on first quiz will come from list of questions at end of syllabus.

Course content involves Earth’s systems, natural and human-induced mechanisms of global change, and nature of global changes.

Student can earn up to 6 Extra Credit points that will be added directly on to their final cumulative course grade (a number between 0 and 100%)!

Note: Office hours in room 330 [Kuiper Space Sciences](http://www.arizona.edu/buildings/gerard-p-kuiper-space-sciences) are available immediately before our class (11-12 with TA Laura on Mon. and Wed, and with TA Alex on Fri.) and immediately after (1-2 with Prof. Leavitt on Mon. and Wed).

Cheating/plagiarism is dangerous in this class- it can get you a recommendation for grade of “E” and referral to Dean

**Don’t distract instructor or students** with ringing cellphones, newspaper readings, sleeping, extended conversations, etc! Laptops for class-related purposes, use in lower section only.

Attached to syllabus was also Homework 2 (atom size [diameter, mass], moles, speed of light, conversions, etc) containing problems for students to work and [Periodic Table](http://ic.ltrr.arizona.edu/ic/nats/images/I-periodic-color.gif); Homework 2 will not be graded. If anything is not clear, Homework 1 has lots of explanation about scientific notation, graphs, conversions, etc (likewise, it is not to be turned in or graded). Both homeworks are available on the course homepage as well.