# Carolina Backyard Naturalist

## From North Africa, to North America, to North Carolina - The Journey of Our Soils, Their Character, and Their Relevance to Life!

**Jeana Myers, PhD Soil Science**
**NC Extension Horticulture, Wake County**

# Which county do you represent?  Place a mark (annotate)


610


TTERFLY
SSING

**Soil Scientist**

**Horticulture Agent**

**GARDENER!**

# Creatures...

# I LOVE ROCKS!

Johannes Stotter

**Where the heck did our rocks and soil come from,**

**and earth for that matter!?**

**Why are there so many different minerals - gems, quartz, iron, clay…how did they form?**

**What IS soil, really, here in my backyard?**
**How does it support life?**

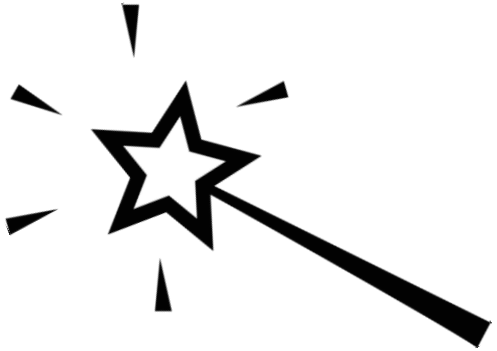
# Outline

**Geologic history of our “earth,” ALL the way back**

**What our homeland NC is made of and what makes it special**

**Our very own soils - understanding and protecting them, for all life!**

# How the Universe,
# Our Planet, Formed...



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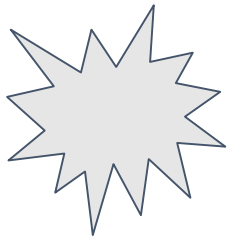
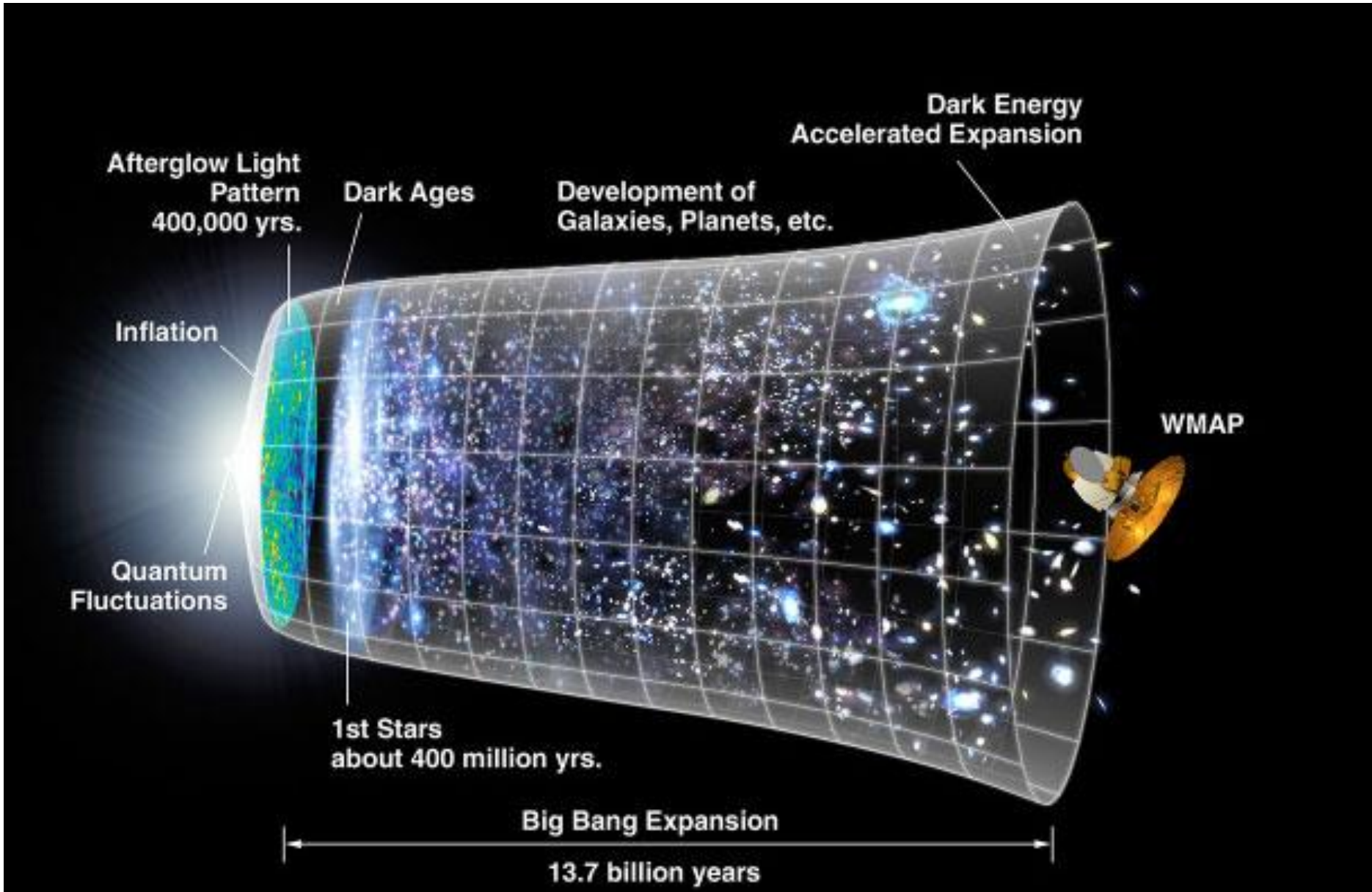
# The Big Bang



# OUR UNIVERSE




observatory.astro.utah.

**Universe - 1?**

**Galaxies - 100-200 billion**

**Each galaxy has stars and solar systems**

"Our" Milky Way Galaxy holds our solar system, and maybe 100 billion other stars! Our solar system orbits our galaxy every 250 million years, at 500 thousand miles per hour:)

# Formation of <u>our</u> solar system 4.6 Billion years ago

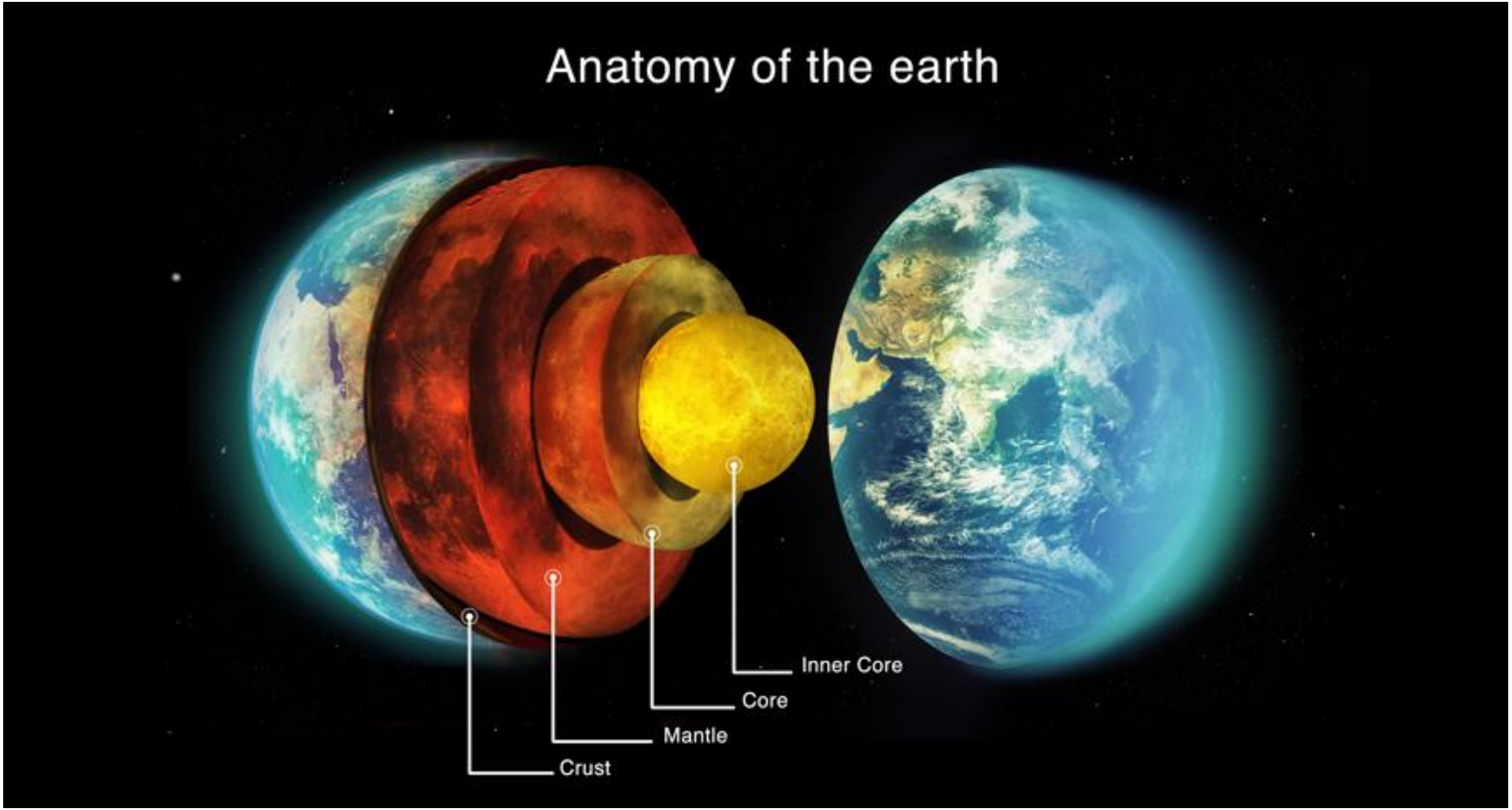
**"The nitrogen in our DNA, the calcium in our teeth, the iron in our blood, the carbon in our apple pies were made in the interiors of collapsing stars. We are made of star stuff." Carl Sagan**

University of Copenhagen/Lars Buchhave

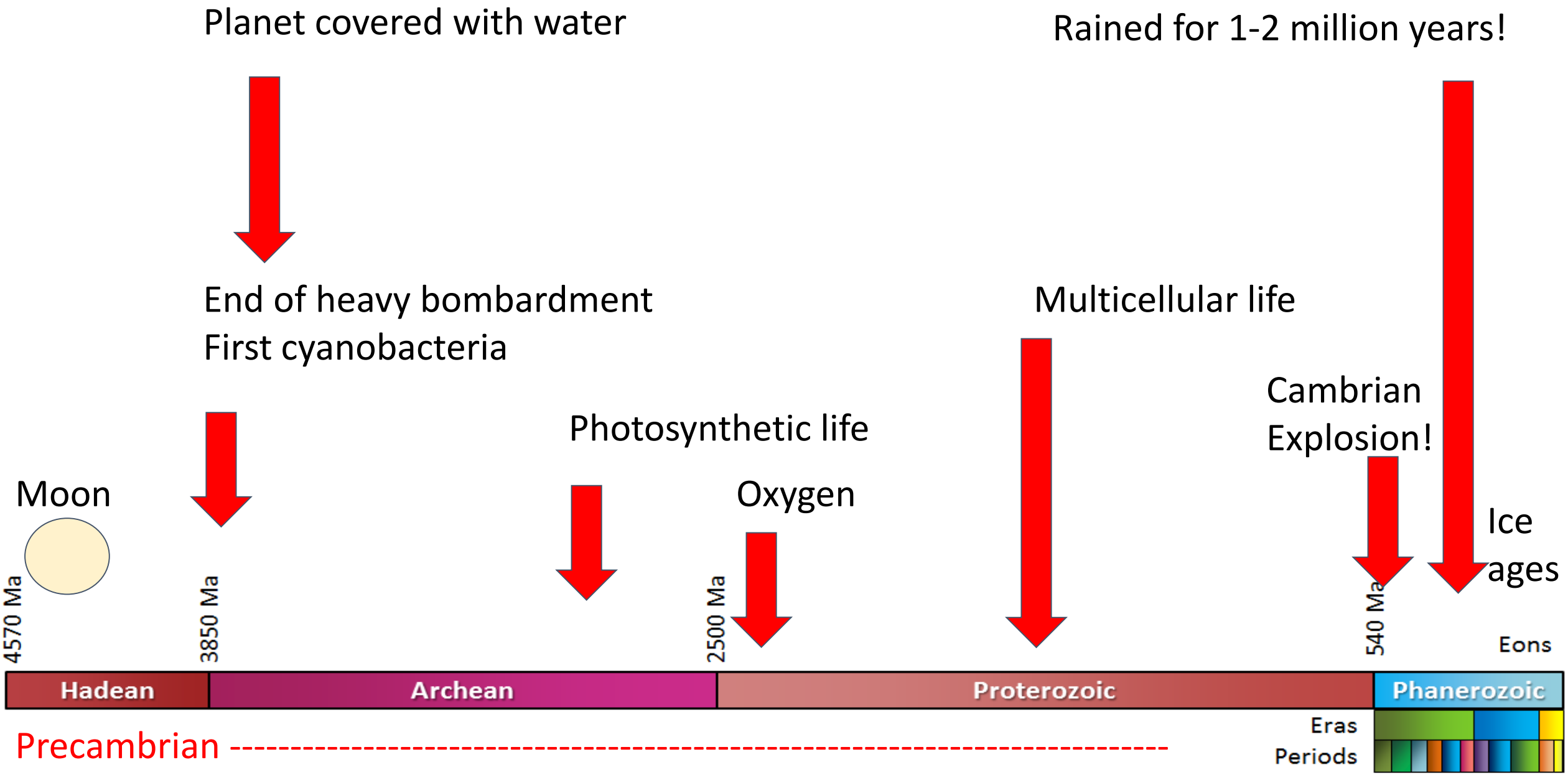
# Rocky, and gaseous planets…

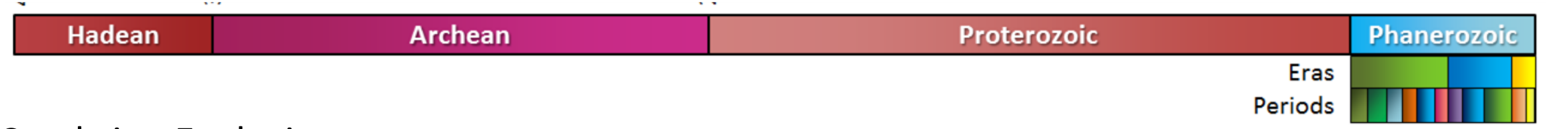
https://www.universetoday.com/72305/order-of-the-planets-from-the-sun/

**EARTH…**
**“Just right”**




https://www.sciencenewsforstudents.org/article/explainer-earth-layer-layer

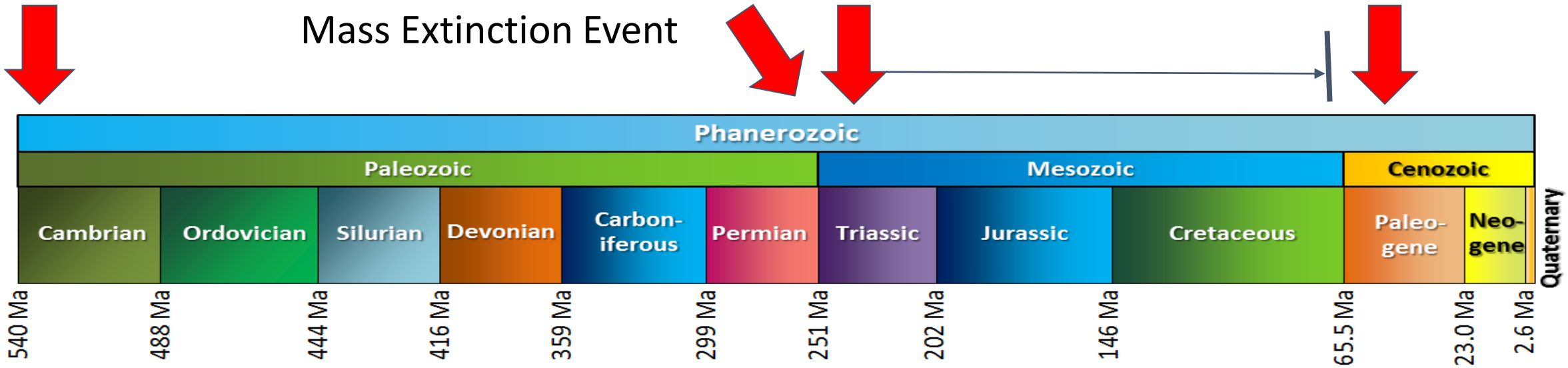

Planet covered with water
Rained for 1-2 million years!
End of heavy bombardment
First cyanobacteria
Multicellular life
Cambrian
Explosion!
Photosynthetic life
Oxygen
Moon
Ice
ages
4570 Ma
3850 Ma
2500 Ma
540 Ma
Eons
Hadean
Archean
Proterozoic
Phanerozoic
Eras
Periods
Precambrian




Cambrian Explosion

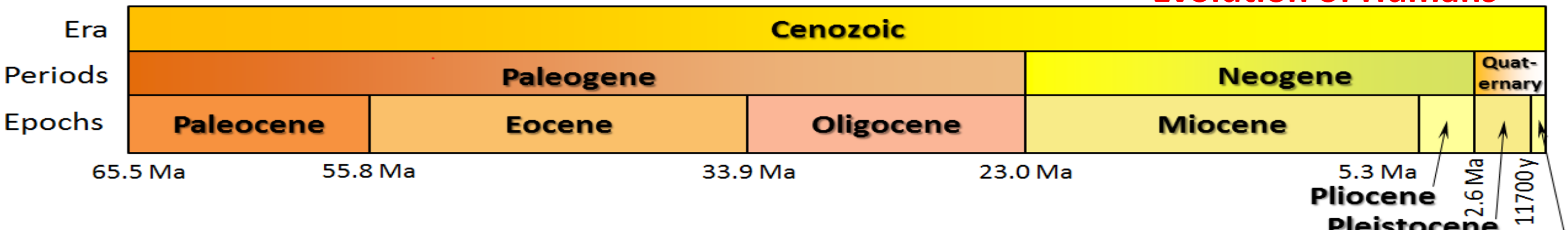
Mass Extinction Event

Dinosaurs evolved

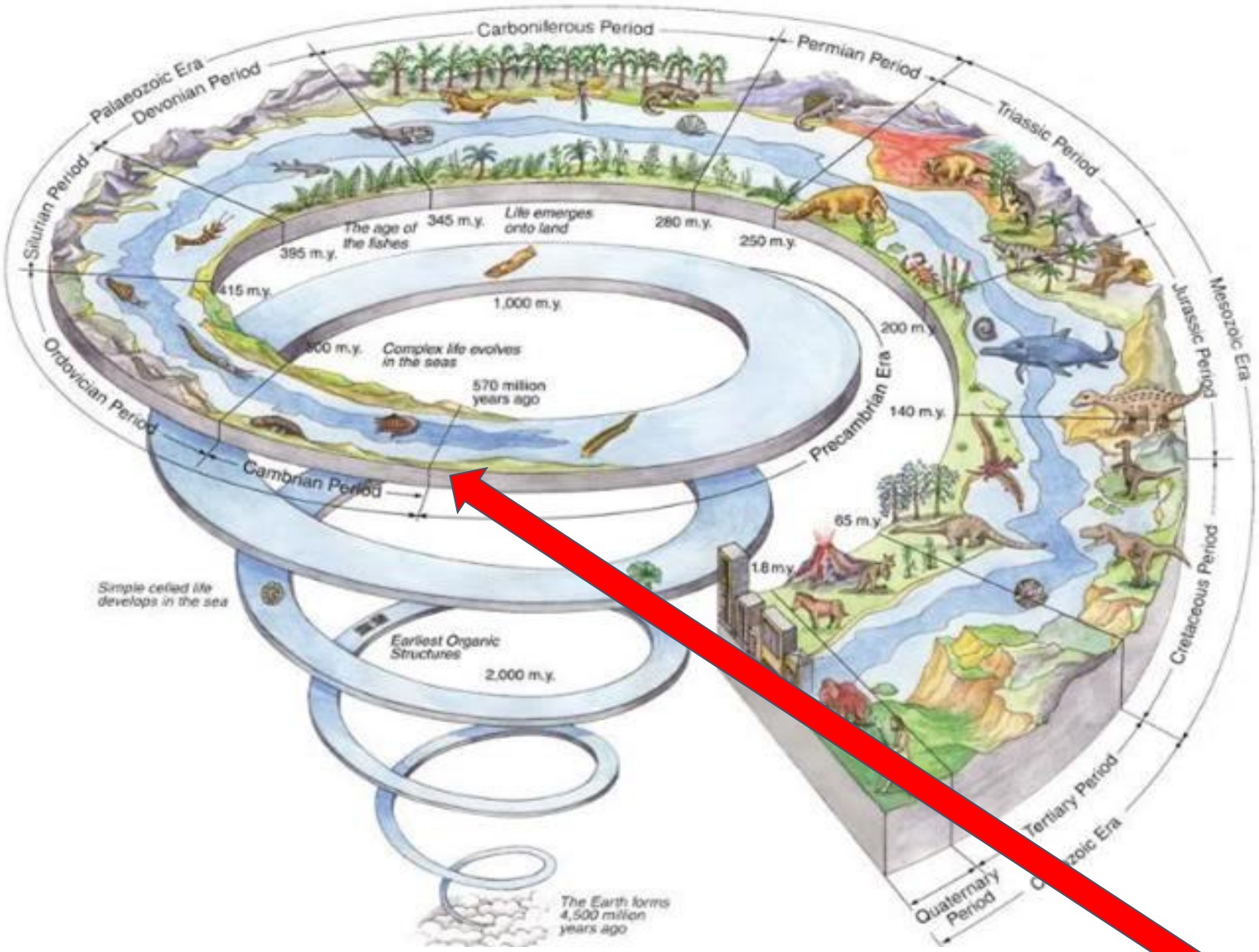


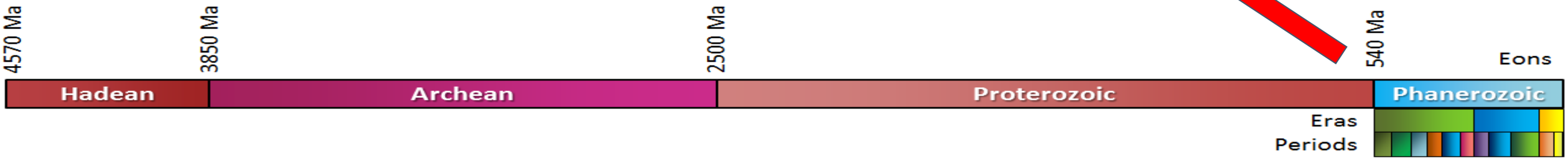

Ice ages

Evolution of Humans



Bruno
Martini



# The Minerals on our Planet

# Periodic Table of the Elements

This table gives information about the chemical elements. Elements are grouped into eight classes according to their properties. Each class is shown in a different color. Hydrogen does not belong to any one class.

Atomic number → 6
Chemical symbol → C
Element name → Carbon
12.011

Number of electrons in each shell: 2, 4

Atomic weight
( ) indicates atomic weight of the most stable isotope

- Alkali metals
- Alkaline earth metals
- Transition metals
- Lanthanide series
- Actinide series
- Other metals
- Nonmetals
- Noble gases

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 H Hydrogen 1.00794 | | | | | | | | | | | | | | | | | 2 He Helium 4.002602 |
| 3 Li Lithium 6.941 | 4 Be Beryllium 9.012182 | | | | | | | | | | | 5 B Boron 10.811 | 6 C Carbon 12.0107 | 7 N Nitrogen 14.00674 | 8 O Oxygen 15.9994 | 9 F Fluorine 18.9984032 | 10 Ne Neon 20.1797 |
| 11 Na Sodium 22.989768 | 12 Mg Magnesium 24.305 | | | | | | | | | | | 13 Al Aluminum 26.981539 | 14 Si Silicon 28.0855 | 15 P Phosphorus 30.973762 | 16 S Sulfur 32.066 | 17 Cl Chlorine 35.4527 | 18 Ar Argon 39.948 |
| 19 K Potassium 39.0983 | 20 Ca Calcium 40.078 | 21 Sc Scandium 44.95591 | 22 Ti Titanium 47.867 | 23 V Vanadium 50.9415 | 24 Cr Chromium 51.9961 | 25 Mn Manganese 54.93805 | 26 Fe Iron 55.845 | 27 Co Cobalt 58.9332 | 28 Ni Nickel 58.6934 | 29 Cu Copper 63.546 | 30 Zn Zinc 65.39 | 31 Ga Gallium 69.723 | 32 Ge Germanium 72.61 | 33 As Arsenic 74.92159 | 34 Se Selenium 78.96 | 35 Br Bromine 79.904 | 36 Kr Krypton 83.80 |
| 37 Rb Rubidium 85.4678 | 38 Sr Strontium 87.62 | 39 Y Yttrium 88.90585 | 40 Zr Zirconium 91.224 | 41 Nb Niobium 92.90638 | 42 Mo Molybdenum 95.94 | 43 Tc Technetium (98) | 44 Ru Ruthenium 101.07 | 45 Rh Rhodium 102.9055 | 46 Pd Palladium 106.42 | 47 Ag Silver 107.8682 | 48 Cd Cadmium 112.411 | 49 In Indium 114.818 | 50 Sn Tin 118.710 | 51 Sb Antimony 121.76 | 52 Te Tellurium 127.60 | 53 I Iodine 126.90447 | 54 Xe Xenon 131.29 |
| 55 Cs Cesium 132.90543 | 56 Ba Barium 137.327 | | 72 Hf Hafnium 178.49 | 73 Ta Tantalum 180.9479 | 74 W Tungsten 183.84 | 75 Re Rhenium 186.207 | 76 Os Osmium 190.23 | 77 Ir Iridium 192.217 | 78 Pt Platinum 195.078 | 79 Au Gold 196.96654 | 80 Hg Mercury 200.59 | 81 Tl Thallium 204.3833 | 82 Pb Lead 207.2 | 83 Bi Bismuth 208.98037 | 84 Po Polonium (209) | 85 At Astatine (210) | 86 Rn Radon (222) |
| 87 Fr Francium (223) | 88 Ra Radium (226) | | 104 Rf Rutherfordium (261) | 105 Db Dubnium (262) | 106 Sg Seaborgium (266) | 107 Bh Bohrium (262) | 108 Hs Hassium (263) | 109 Mt Meitnerium (268) | 110 Ds Darmstadtium (271) | 111 Rg Roentgenium (272) | 112 Uub Ununbium (277) | 113 Uut | 114 Uuq (289) | 115 Uup | 116 Uuh (289) | 117 Uus | |

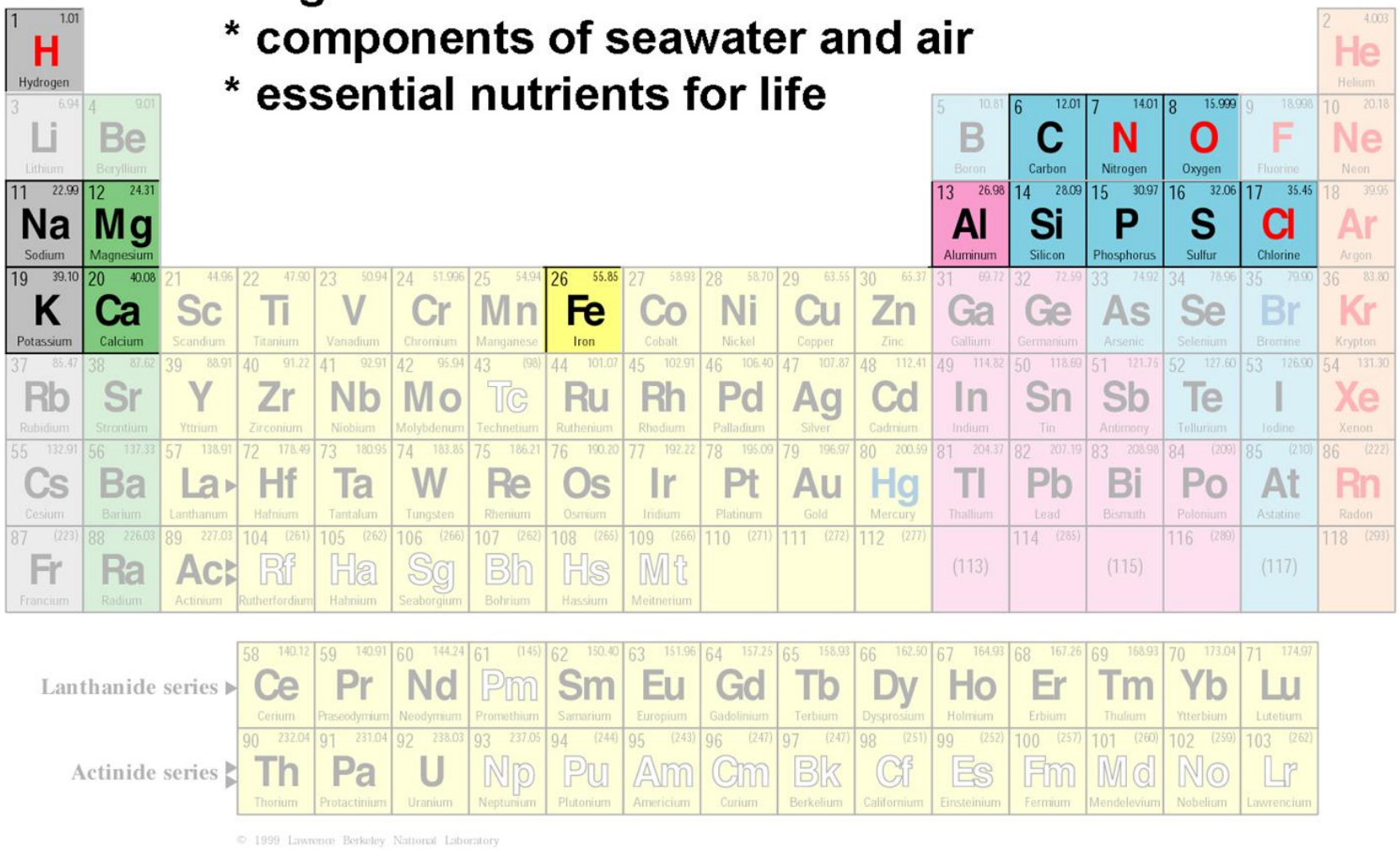
Note: Elements 113, 115, and 117 are not currently known.

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 57 La Lanthanum 138.9055 | 58 Ce Cerium 140.116 | 59 Pr Praseodymium 140.90765 | 60 Nd Neodymium 144.24 | 61 Pm Promethium (145) | 62 Sm Samarium 150.36 | 63 Eu Europium 151.964 | 64 Gd Gadolinium 157.25 | 65 Tb Terbium 158.92534 | 66 Dy Dysprosium 162.50 | 67 Ho Holmium 164.93032 | 68 Er Erbium 167.26 | 69 Tm Thulium 168.93421 | 70 Yb Ytterbium 173.04 | 71 Lu Lutetium 174.967 |
| 89 Ac Actinium (227) | 90 Th Thorium 232.0381 | 91 Pa Protactinium 231.03588 | 92 U Uranium 238.0289 | 93 Np Neptunium (237) | 94 Pu Plutonium (244) | 95 Am Americium (243) | 96 Cm Curium (247) | 97 Bk Berkelium (247) | 98 Cf Californium (251) | 99 Es Einsteinium (252) | 100 Fm Fermium (257) | 101 Md Mendelevium (258) | 102 No Nobelium (259) | 103 Lr Lawrencium (262) |

Note: The subgroup numbers 1–18 were adopted in 1984 by the International Union of Pure and Applied Chemistry (IUPAC). IUPAC is the recognized authority in the field of chemistry. It credits the discovery of elements and assigns names to them.

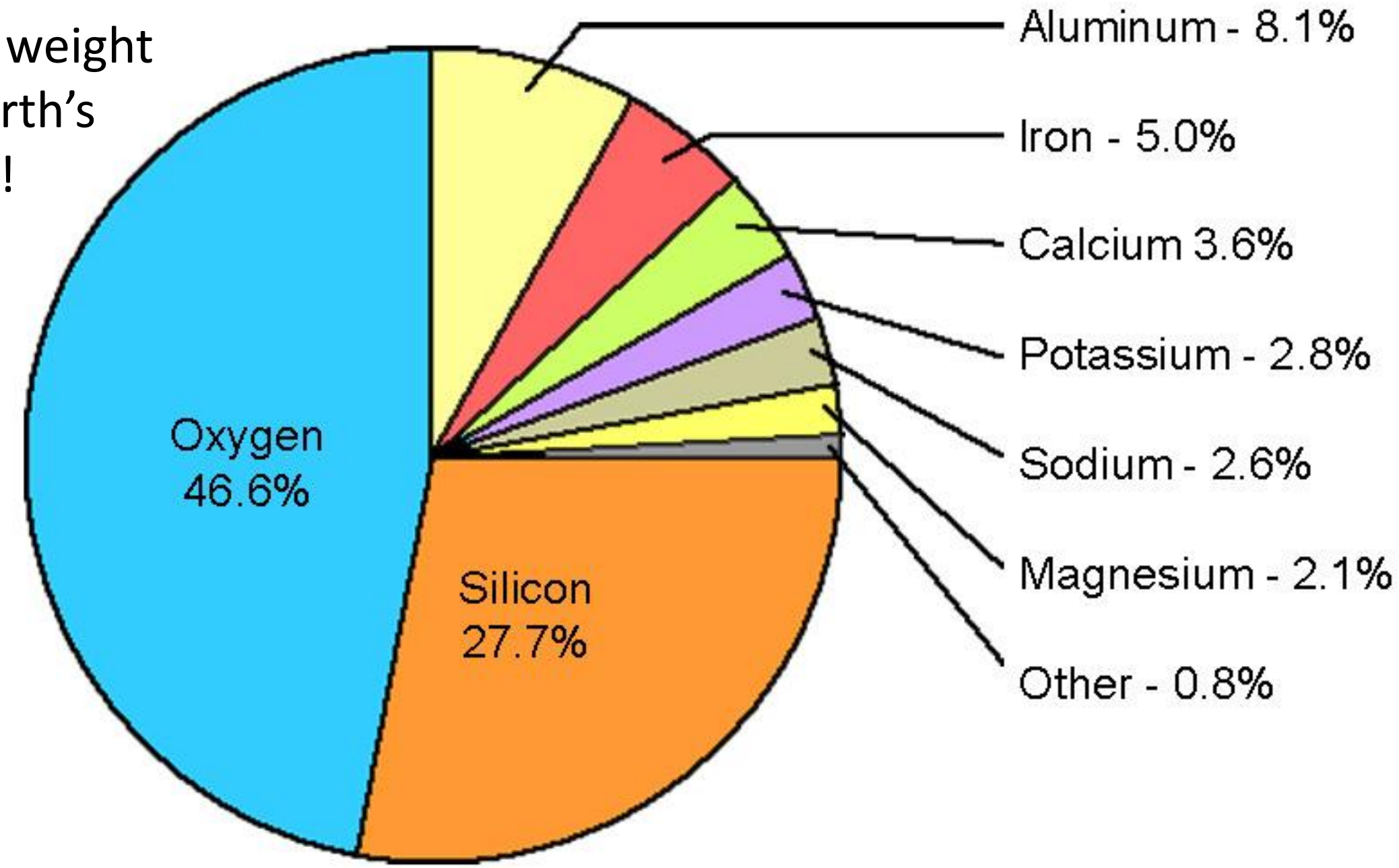
# Most abundant elements in our physical environment

* ingredients of common rocks
* components of seawater and air
* essential nutrients for life




https://gotbooks.miracosta.edu/earth_science/images/periodic_table2.jpg

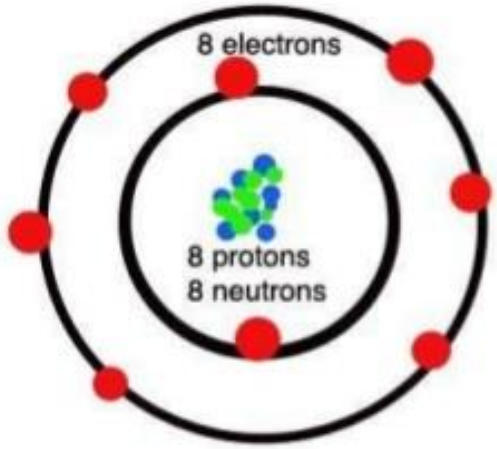
% by weight of earth's crust!




https://gotbooks.miracosta.edu/earth_science/chapter2.html

# Difference between elements and minerals and rocks

**Elements**




http://www.historyforkids.org/scienceforkids/chemistry/atoms/pictures/oxygen.jpg

**Minerals**

http://www.pitt.edu/%7Ecejones/GeoImages/1Minerals/1IgneousMineralz/Quartz/QuartzCrystal.jpg

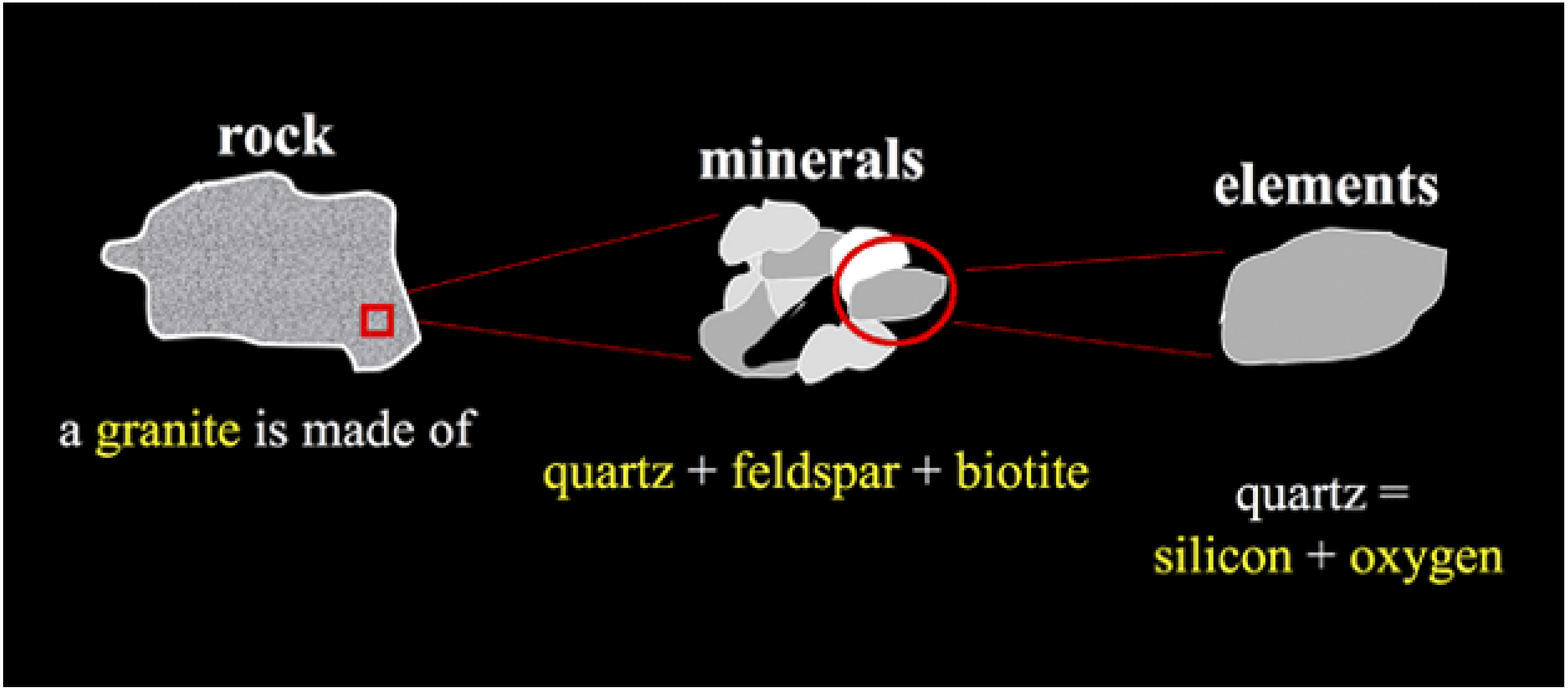
**Rocks**

http://www.geol.umd.edu/%7Ejmerck/gal04/GEOL388/images/02/granite.jpg

**Elements combine to form Minerals**

**Minerals combine to form Rocks**

# Difference between elements and minerals and rocks




http://ratw.asu.edu/aboutrocks_whatarerocks.html

# Common minerals


https://gotbooks.miracosta.edu/earth_science/chapter2.html

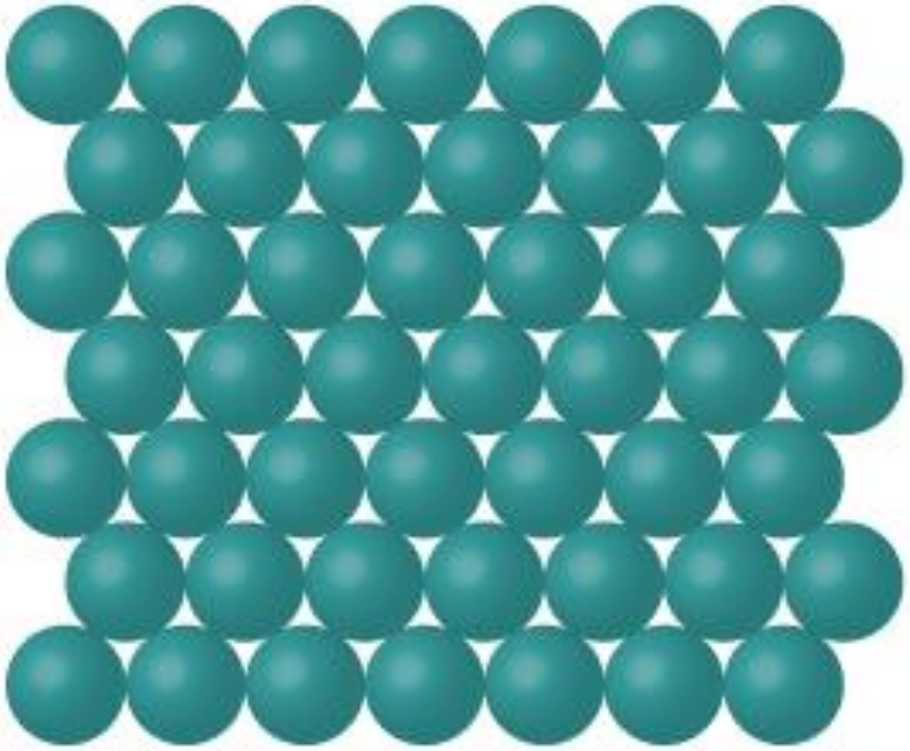
# Native Elements

Native elements are minerals composed of only one element.

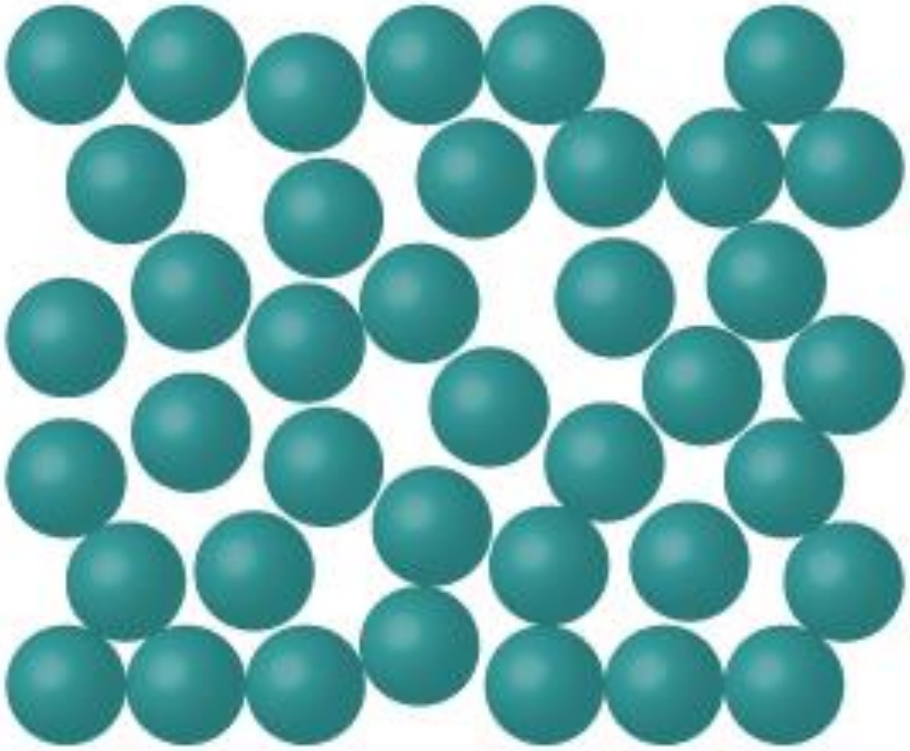
**Sulfur (S)** **Diamond (C)** **Graphite (C)** **Gold(Au)**

**Silver (Ag)** **Copper (Cu)** **Platinum (Pt)**

https://www.pinterest.com/pin/479351954076657289/

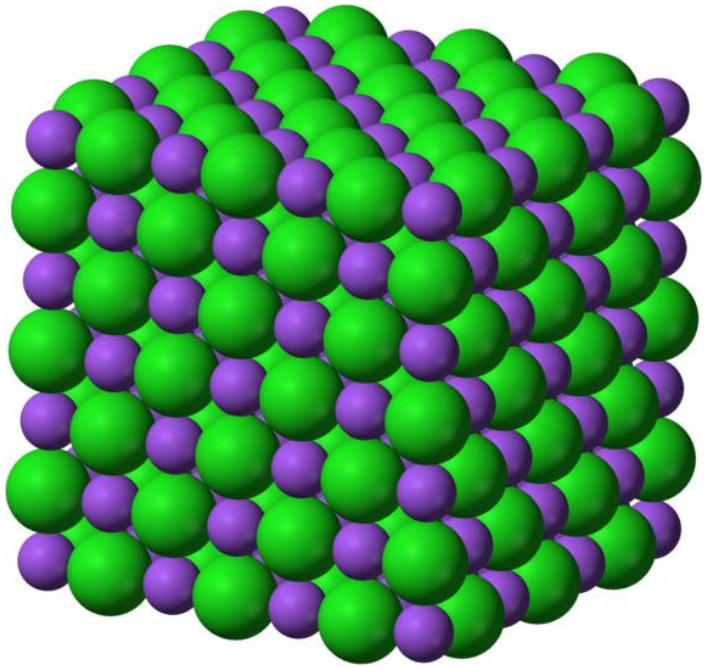


Crystalline



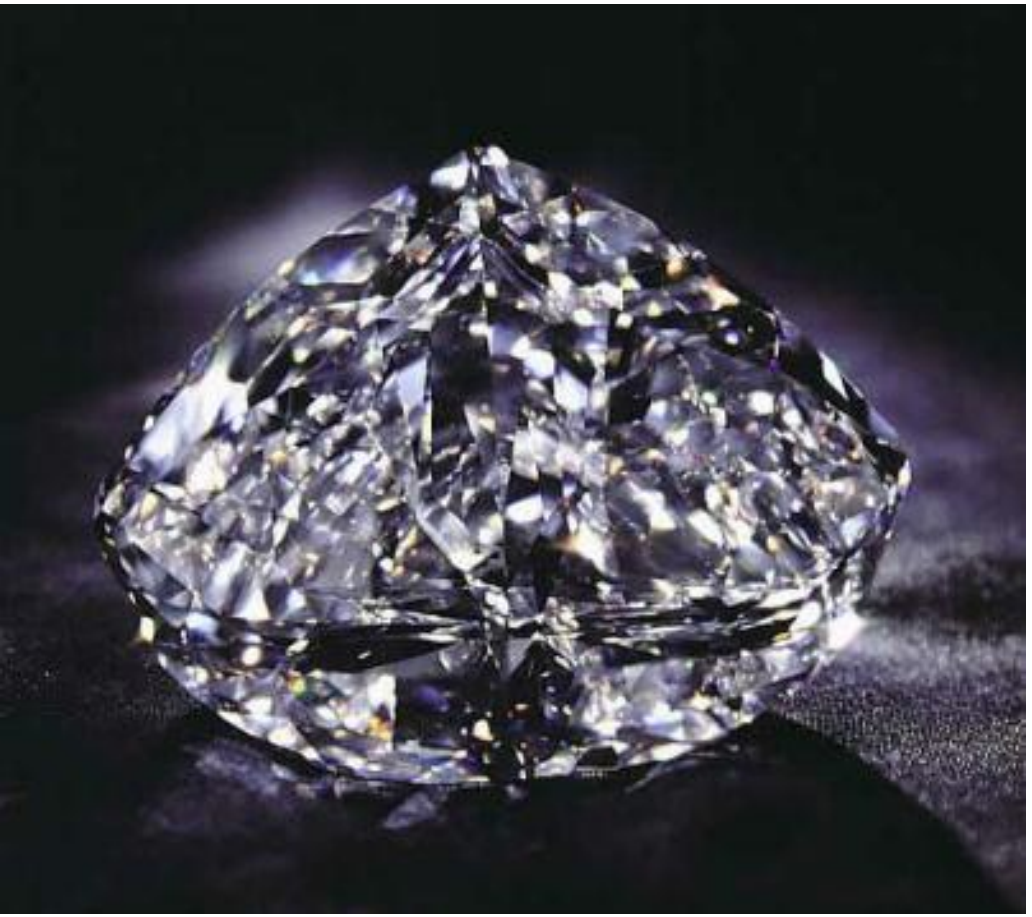
Amorphous

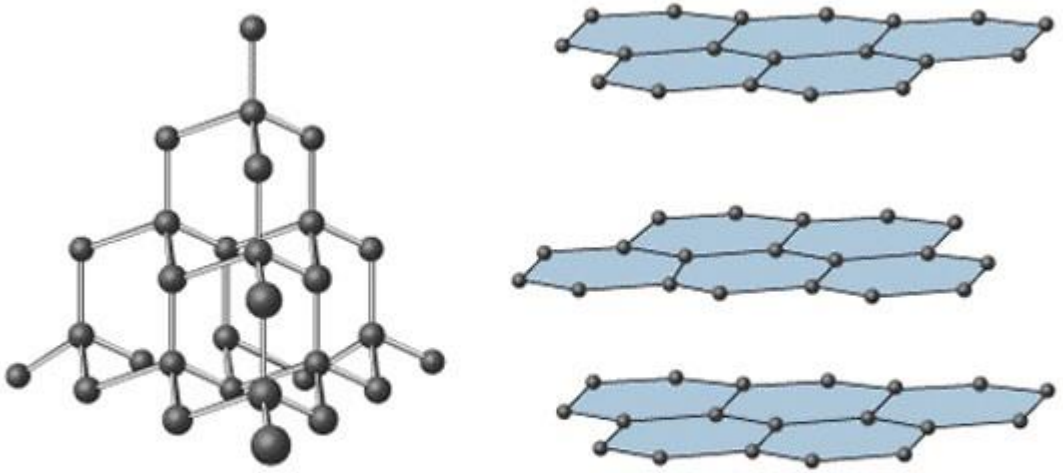
https://pressbooks-dev.oer.hawaii.edu/chemistry/chapter/the-solid-state-of-matter/



A crystal of halite (rock salt) has the same repeating crystal structure whether it is fist-sized chunk (left) or near microscopic crystals as shown in this magnified sample of commercial table salt (right).

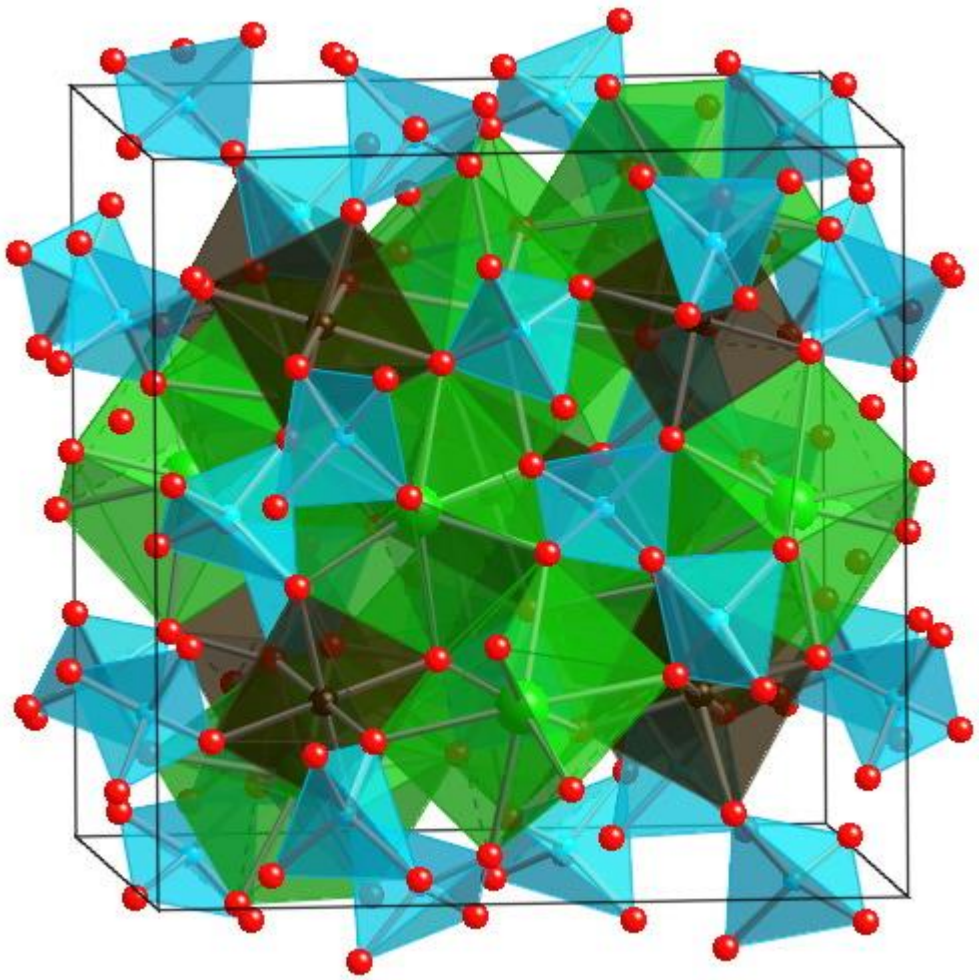
https://gotbooks.miracosta.edu/earth_science/images/salt.jpg





(a) Diamond (b) Graphite

http://www.scienceline.ucsb.edu/images/diamond-graph.jpg



**Structure Type 087: $Ca_3Fe_2Si_3O_{12}$ (Garnet)**

(Si blue, O red, Fe dark gray, Ca green)

http://som.web.cmu.edu/structures/S087-garnet.html