

# Carolina Backyard Naturalist

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



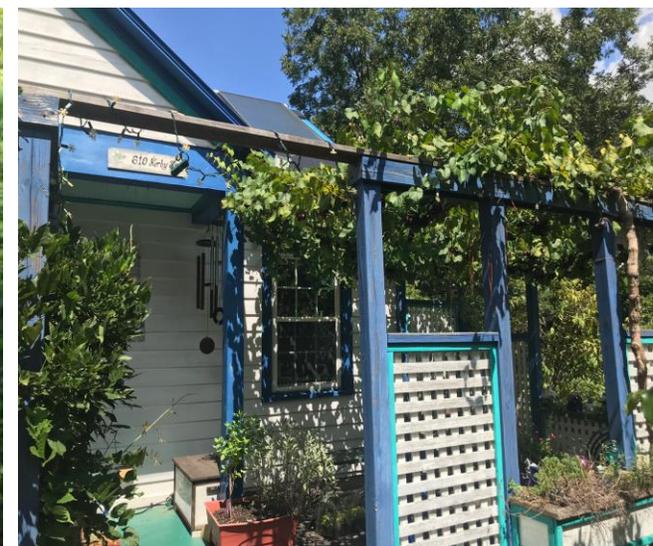
**Jeana Myers, PhD Soil Science  
NC Extension Horticulture, Wake County**



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











**Soil Scientist**

**Horticulture  
Agent**

**GARDENER!**





## Creatures...



**I LOVE ROCKS!**



**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?**

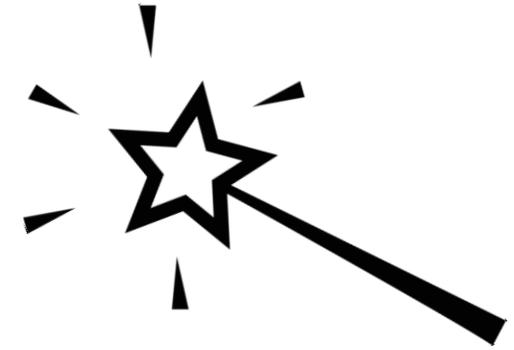
# **Outline**

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

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

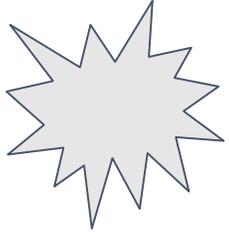
**Our very own soils - understanding and protecting them, for all life!**

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

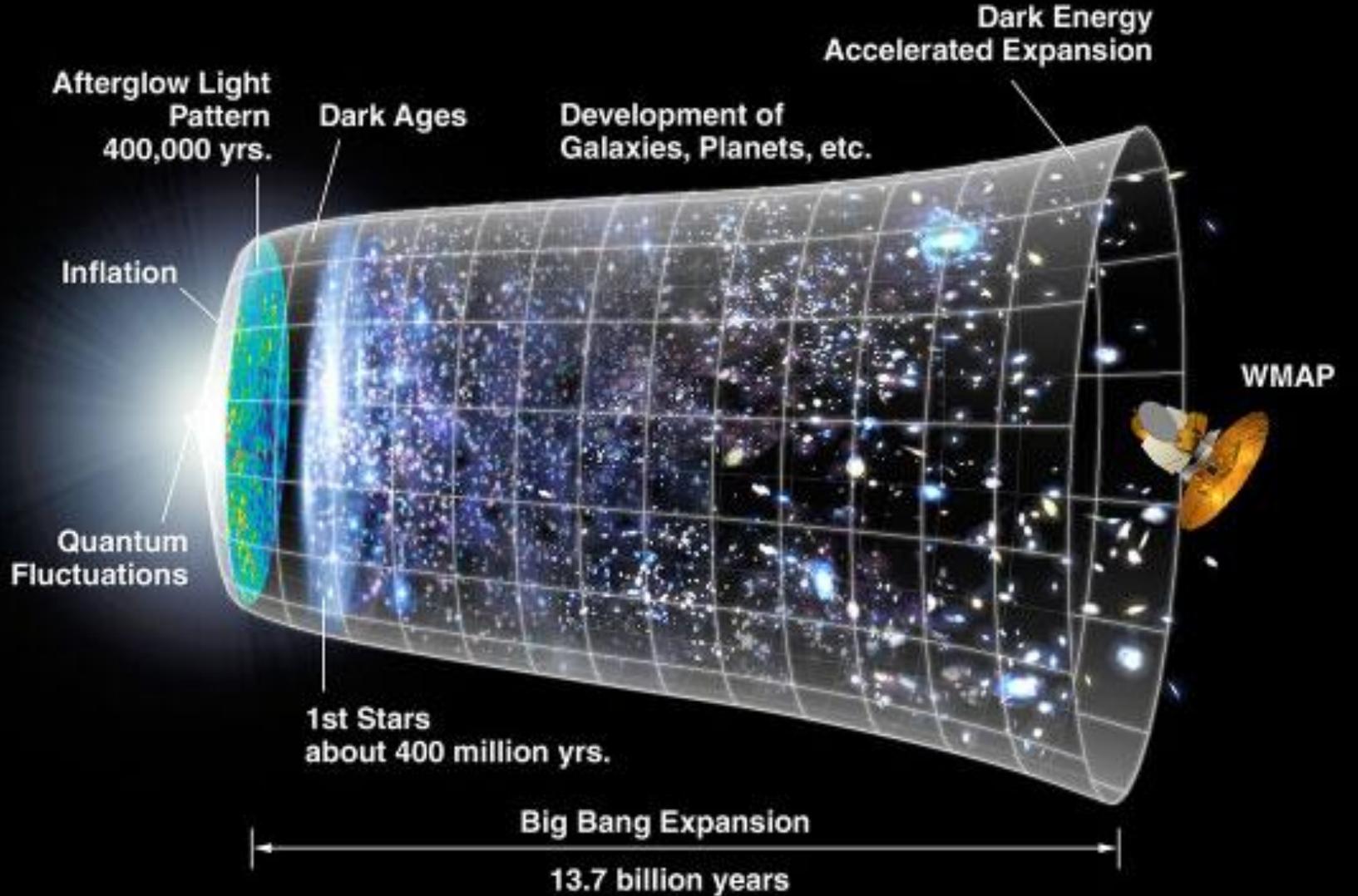




# The Big Bang



# OUR UNIVERSE



**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 our 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**

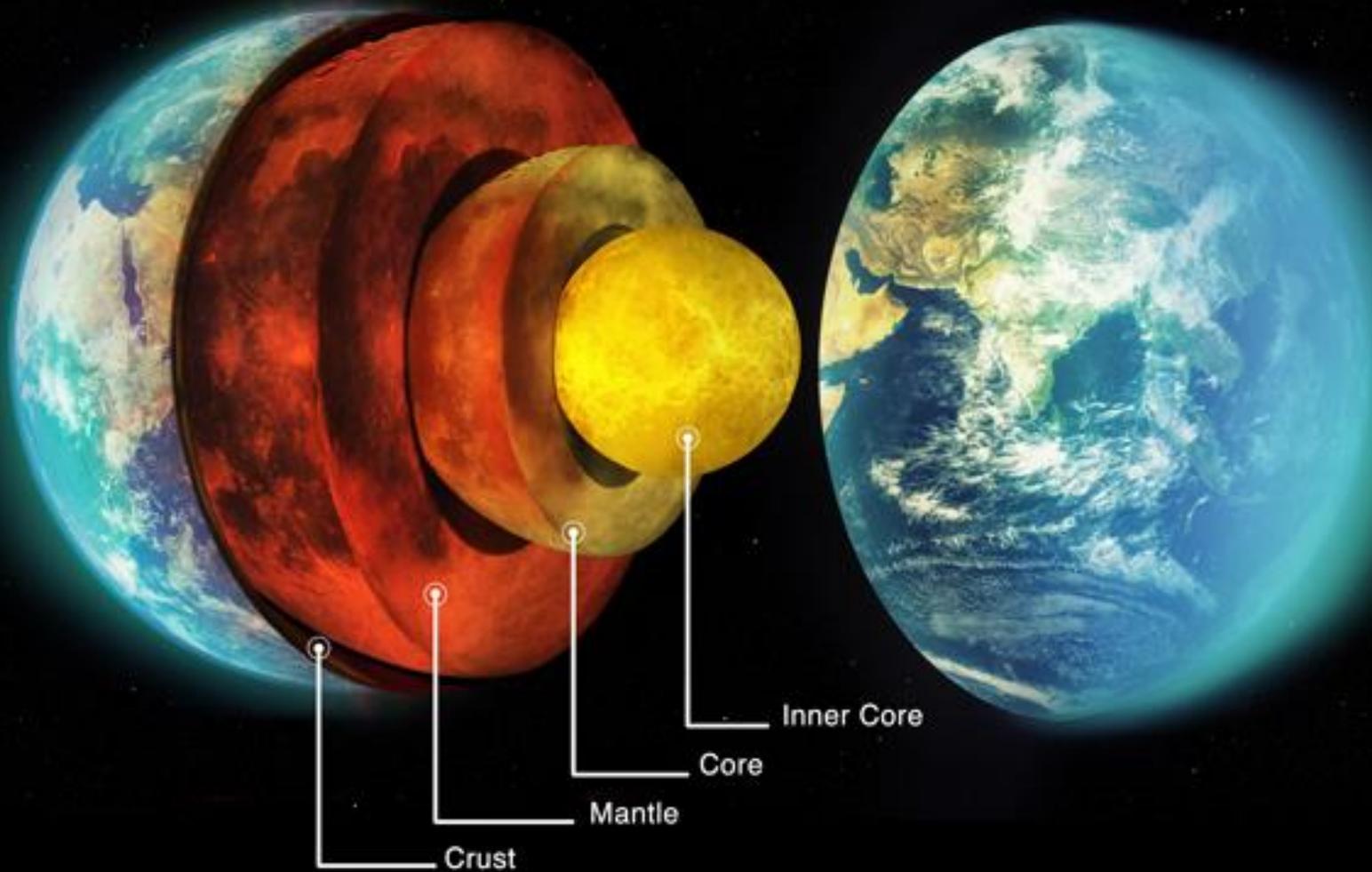


# Rocky, and gaseous planets...

**EARTH...**  
**“Just right”**



# Anatomy of the earth



Planet covered with water

Rained for 1-2 million years!

End of heavy bombardment  
First cyanobacteria

Photosynthetic life

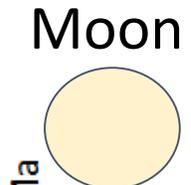
Oxygen

Multicellular life

Cambrian  
Explosion!

Ice  
ages

Eons



4570 Ma

3850 Ma

2500 Ma

540 Ma



Precambrian -----

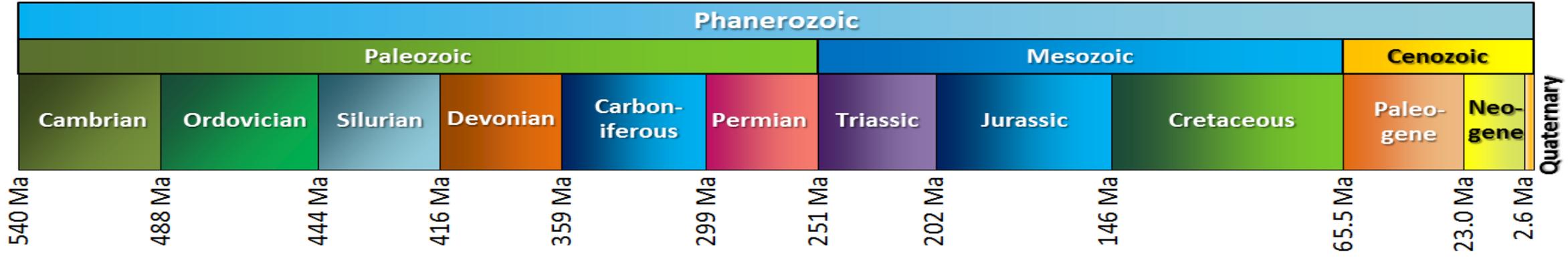
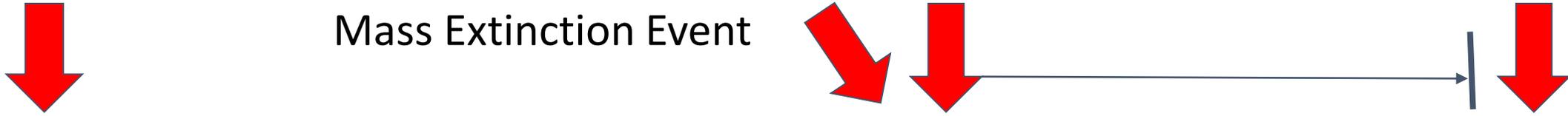
Eras  
Periods



Cambrian Explosion

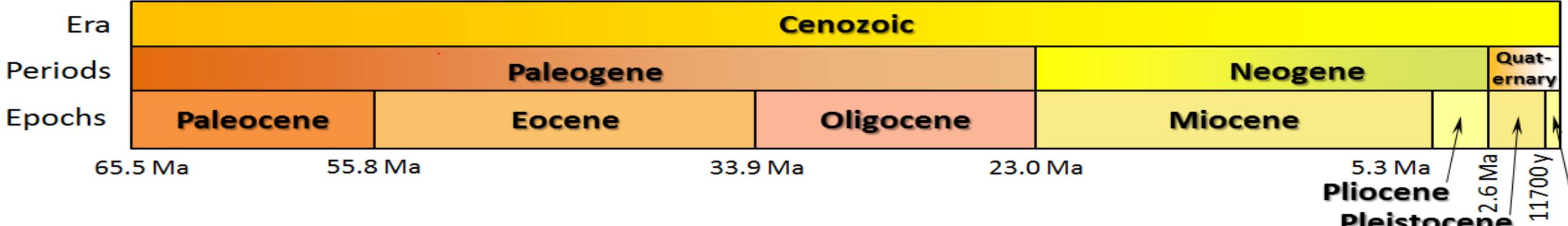
Dinosaurs evolved

Mass Extinction Event



Ice ages

Evolution of Humans





# 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  
 Number of electrons in each shell → 2, 4  
 Chemical symbol → C  
 Element name → Carbon  
 Atomic weight ( ) indicates atomic weight of the most stable isotope → 12.011

1																	2						
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 Ununtrium (289)	114 Uuq Ununquadium (289)	115 Uup Ununpentium (289)	116 Uuh Ununhexium (289)	117 Uus Ununseptium (289)								

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

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

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.

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)

# Most abundant elements in our physical environment

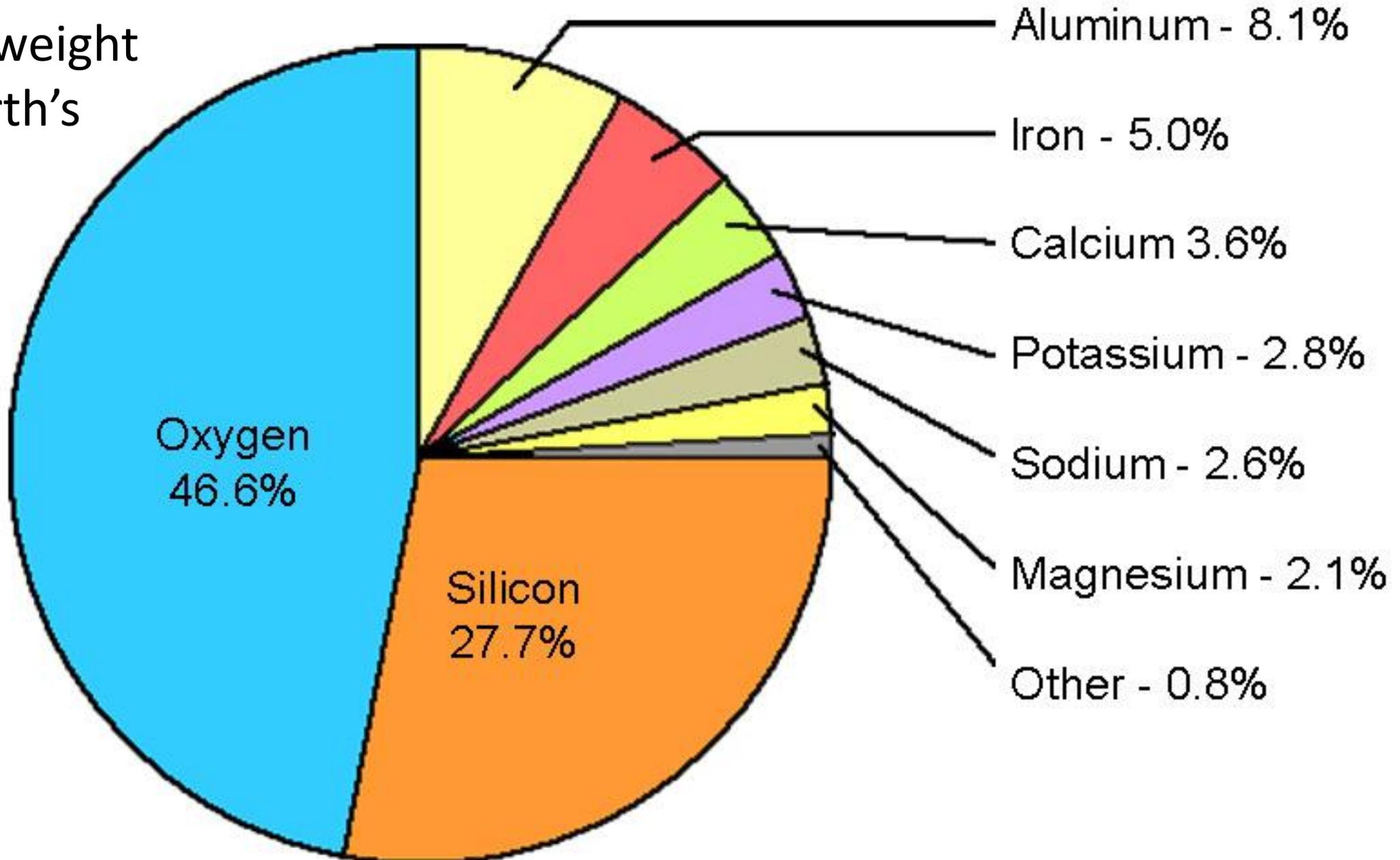
- \* ingredients of common rocks
- \* components of seawater and air
- \* essential nutrients for life

1 1.01 <b>H</b> Hydrogen																	2 4.003 <b>He</b> Helium						
3 6.94 <b>Li</b> Lithium	4 9.01 <b>Be</b> Beryllium																	5 10.81 <b>B</b> Boron	6 12.01 <b>C</b> Carbon	7 14.01 <b>N</b> Nitrogen	8 15.999 <b>O</b> Oxygen	9 18.998 <b>F</b> Fluorine	10 20.18 <b>Ne</b> Neon
11 22.99 <b>Na</b> Sodium	12 24.31 <b>Mg</b> Magnesium																	13 26.98 <b>Al</b> Aluminum	14 28.09 <b>Si</b> Silicon	15 30.97 <b>P</b> Phosphorus	16 32.06 <b>S</b> Sulfur	17 35.45 <b>Cl</b> Chlorine	18 39.95 <b>Ar</b> Argon
19 39.10 <b>K</b> Potassium	20 40.08 <b>Ca</b> Calcium	21 44.96 <b>Sc</b> Scandium	22 47.90 <b>Ti</b> Titanium	23 50.94 <b>V</b> Vanadium	24 51.996 <b>Cr</b> Chromium	25 54.94 <b>Mn</b> Manganese	26 55.85 <b>Fe</b> Iron	27 58.93 <b>Co</b> Cobalt	28 58.70 <b>Ni</b> Nickel	29 63.55 <b>Cu</b> Copper	30 65.37 <b>Zn</b> Zinc	31 69.72 <b>Ga</b> Gallium	32 72.59 <b>Ge</b> Germanium	33 74.92 <b>As</b> Arsenic	34 78.96 <b>Se</b> Selenium	35 79.90 <b>Br</b> Bromine	36 83.80 <b>Kr</b> Krypton						
37 85.47 <b>Rb</b> Rubidium	38 87.62 <b>Sr</b> Strontium	39 88.91 <b>Y</b> Yttrium	40 91.22 <b>Zr</b> Zirconium	41 92.91 <b>Nb</b> Niobium	42 95.94 <b>Mo</b> Molybdenum	43 (98) <b>Tc</b> Technetium	44 101.07 <b>Ru</b> Ruthenium	45 102.91 <b>Rh</b> Rhodium	46 106.40 <b>Pd</b> Palladium	47 107.87 <b>Ag</b> Silver	48 112.41 <b>Cd</b> Cadmium	49 114.82 <b>In</b> Indium	50 118.69 <b>Sn</b> Tin	51 121.75 <b>Sb</b> Antimony	52 127.60 <b>Te</b> Tellurium	53 126.90 <b>I</b> Iodine	54 131.30 <b>Xe</b> Xenon						
55 132.91 <b>Cs</b> Cesium	56 137.33 <b>Ba</b> Barium	57 138.91 <b>La</b> ▶ Lanthanum	72 178.49 <b>Hf</b> Hafnium	73 180.95 <b>Ta</b> Tantalum	74 183.85 <b>W</b> Tungsten	75 186.21 <b>Re</b> Rhenium	76 190.20 <b>Os</b> Osmium	77 192.22 <b>Ir</b> Iridium	78 195.09 <b>Pt</b> Platinum	79 196.97 <b>Au</b> Gold	80 200.59 <b>Hg</b> Mercury	81 204.37 <b>Tl</b> Thallium	82 207.19 <b>Pb</b> Lead	83 208.98 <b>Bi</b> Bismuth	84 (209) <b>Po</b> Polonium	85 (210) <b>At</b> Astatine	86 (222) <b>Rn</b> Radon						
87 (223) <b>Fr</b> Francium	88 226.03 <b>Ra</b> Radium	89 227.03 <b>Ac</b> ▶ Actinium	104 (261) <b>Rf</b> Rutherfordium	105 (262) <b>Ha</b> Hahnium	106 (266) <b>Sg</b> Seaborgium	107 (262) <b>Bh</b> Bohrium	108 (265) <b>Hs</b> Hassium	109 (266) <b>Mt</b> Meitnerium	110 (271) <b></b>	111 (272) <b></b>	112 (277) <b></b>	(113)	(114) (285)	(115) (288)	(116) (289)	(117) (293)	(118) (293)						

Lanthanide series ▶	58 140.12 <b>Ce</b> Cerium	59 140.91 <b>Pr</b> Praseodymium	60 144.24 <b>Nd</b> Neodymium	61 (145) <b>Pm</b> Promethium	62 150.40 <b>Sm</b> Samarium	63 151.96 <b>Eu</b> Europium	64 157.25 <b>Gd</b> Gadolinium	65 158.93 <b>Tb</b> Terbium	66 162.50 <b>Dy</b> Dysprosium	67 164.93 <b>Ho</b> Holmium	68 167.26 <b>Er</b> Erbium	69 168.93 <b>Tm</b> Thulium	70 173.04 <b>Yb</b> Ytterbium	71 174.97 <b>Lu</b> Lutetium
Actinide series ▶	90 232.04 <b>Th</b> Thorium	91 231.04 <b>Pa</b> Protactinium	92 238.03 <b>U</b> Uranium	93 237.05 <b>Np</b> Neptunium	94 (244) <b>Pu</b> Plutonium	95 (243) <b>Am</b> Americium	96 (247) <b>Cm</b> Curium	97 (247) <b>Bk</b> Berkelium	98 (251) <b>Cf</b> Californium	99 (252) <b>Es</b> Einsteinium	100 (257) <b>Fm</b> Fermium	101 (260) <b>Md</b> Mendelevium	102 (259) <b>No</b> Nobelium	103 (262) <b>Lr</b> Lawrencium

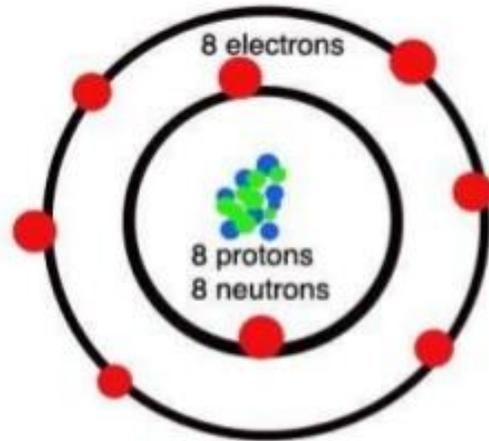
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% by weight  
of earth's  
crust!



# Difference between elements and minerals and rocks

## Elements



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

## Minerals



<http://www.pitt.edu/~7Ecejones/GeolImages/1Minerals/1IgneousMineralz/Quartz/QuartzCrystal.jpg>

## Rocks

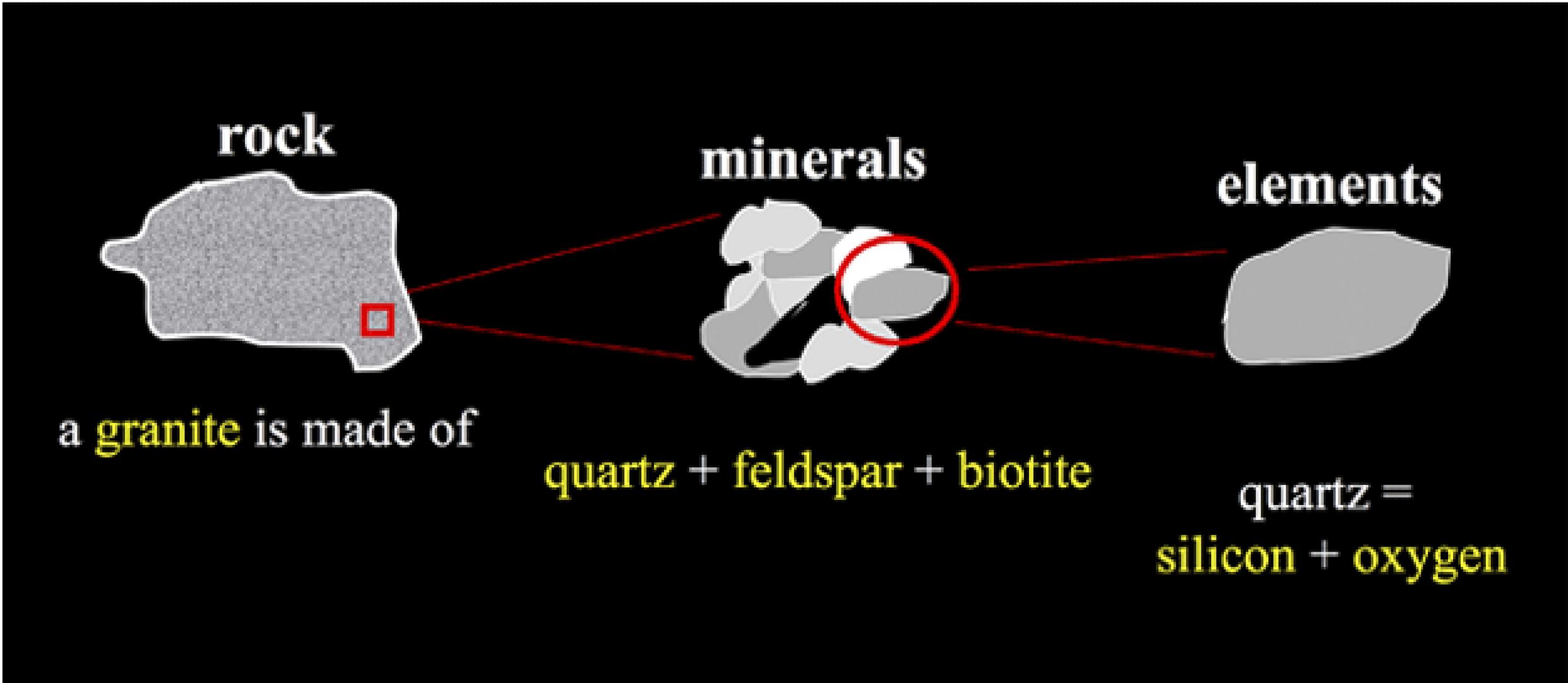


<http://www.geol.umd.edu/~7Ejmerck/gal04/GEOL388/images/02/granite.jpg>

**Elements combine to form Minerals**

**Minerals combine to form Rocks**

# Difference between elements and minerals and rocks



# Common minerals



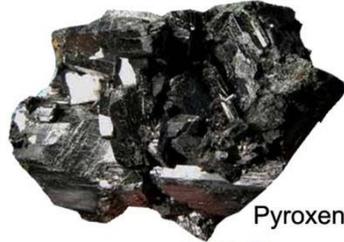
Olivine



Ca-Plagioclase Feldspar



Halite



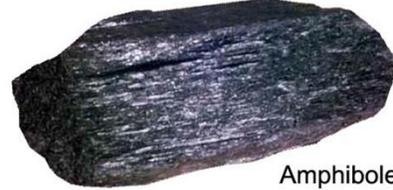
Pyroxene



Na-Plagioclase feldspar



Gypsum



Amphibole



Orthoclase feldspar



Limonite



Biotite



Quartz



Hematite



Muscavite



Calcite

# Native Elements

Native elements are minerals composed of only one element.



**Sulfur (S)**



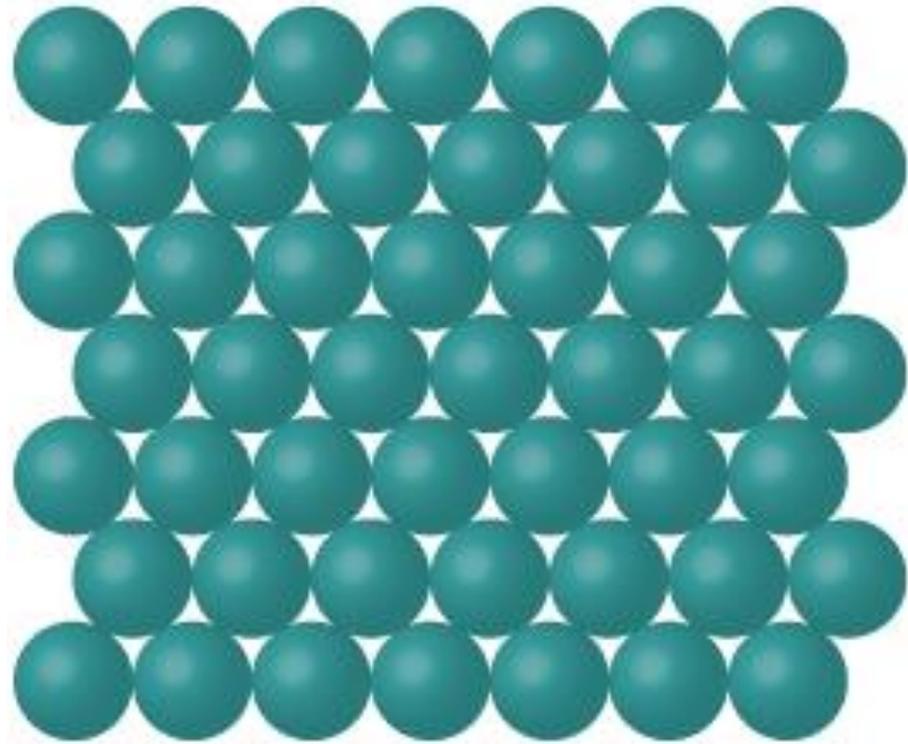
**Diamond (C) Graphite (C) Gold (Au)**



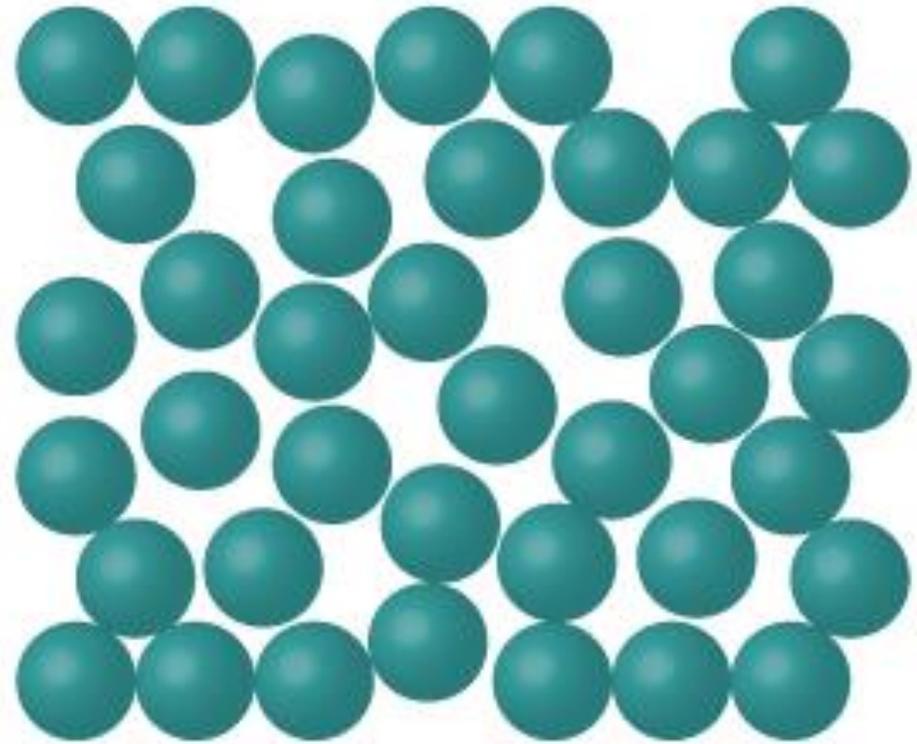
**Silver (Ag)**

**Copper (Cu)**

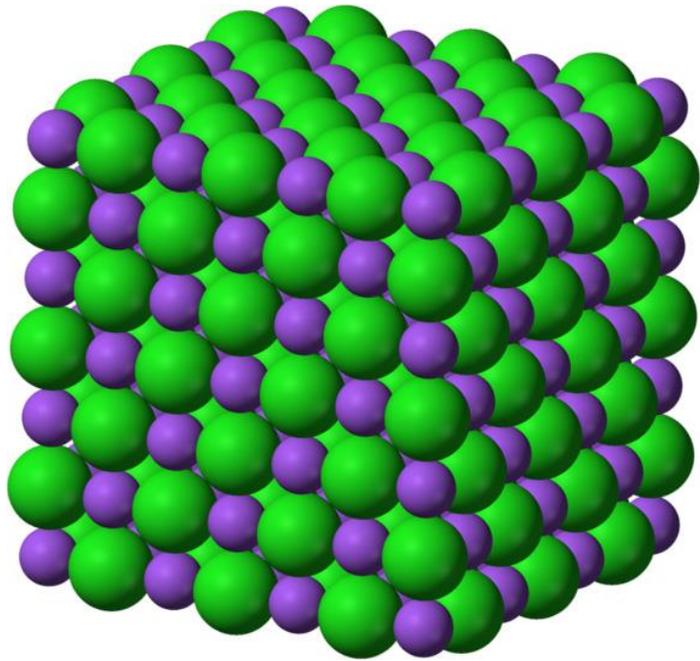
**Platinum (Pt)**



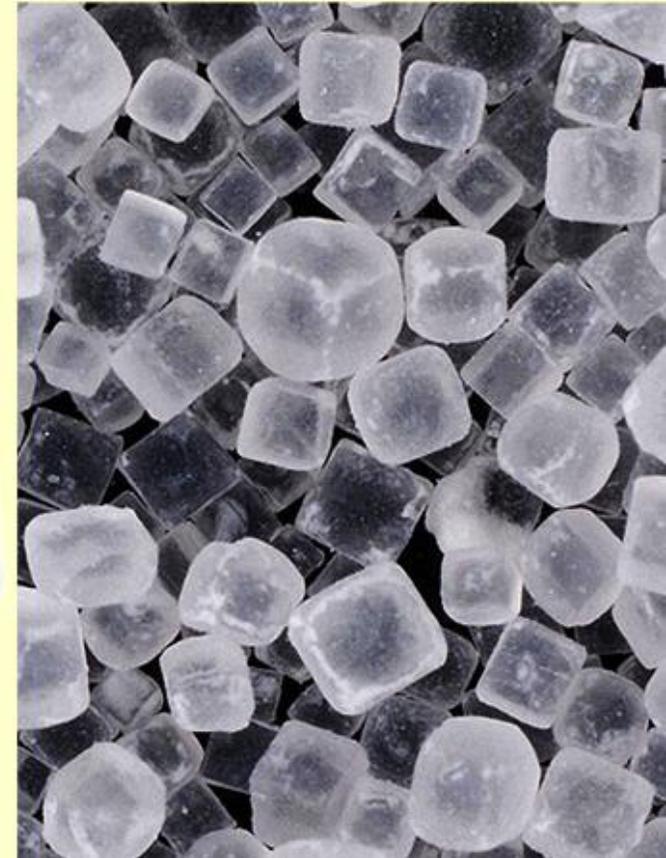
Crystalline



Amorphous

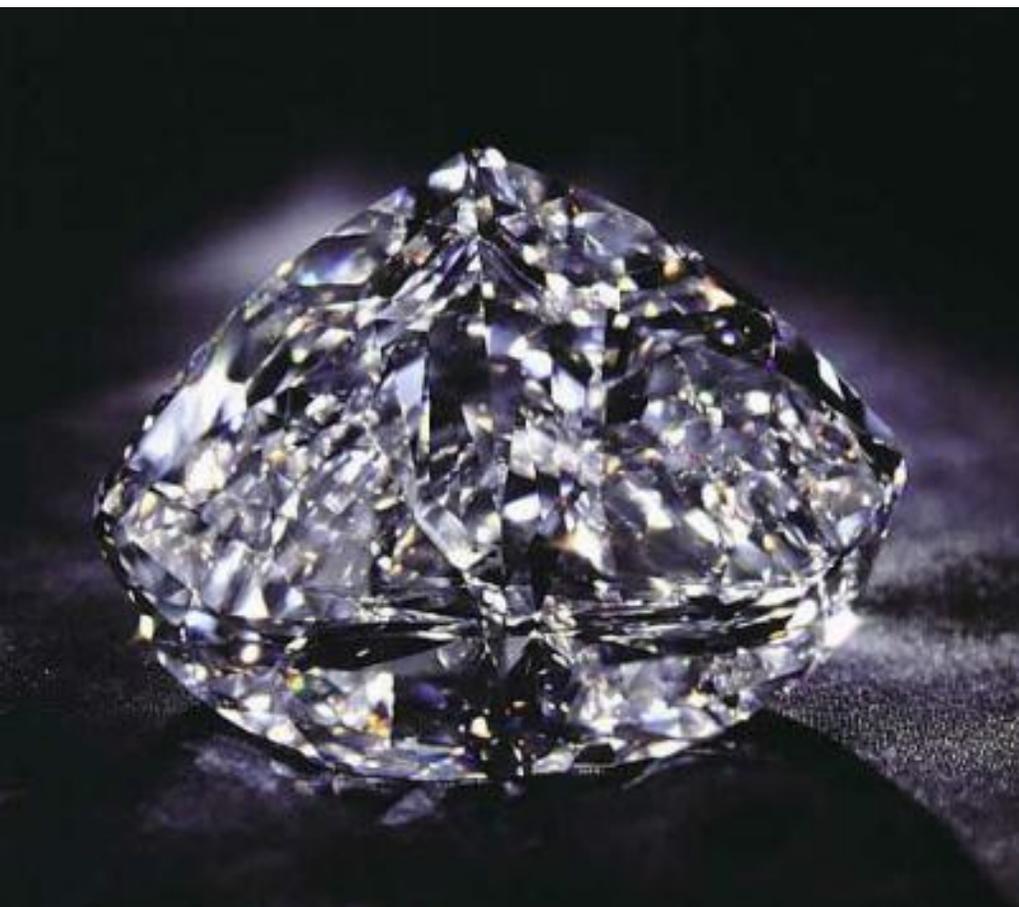


A crystal of halite (rock salt) has the same repeating crystal structure whether it is fist-sized chunk (left) or near microscopic crystals as shown in this magnified sample of commercial table salt (right).

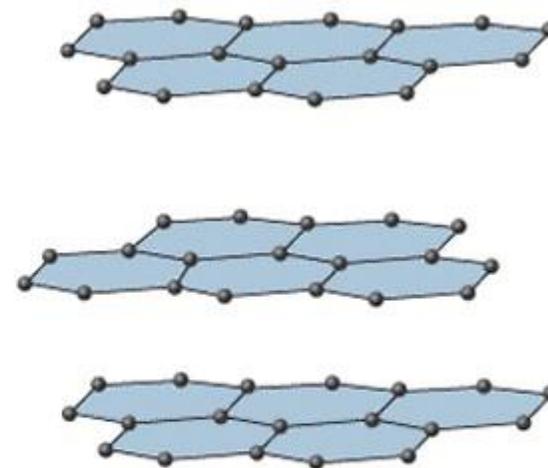


[https://gotbooks.miracosta.edu/earth\\_science/images/salt.jpg](https://gotbooks.miracosta.edu/earth_science/images/salt.jpg)

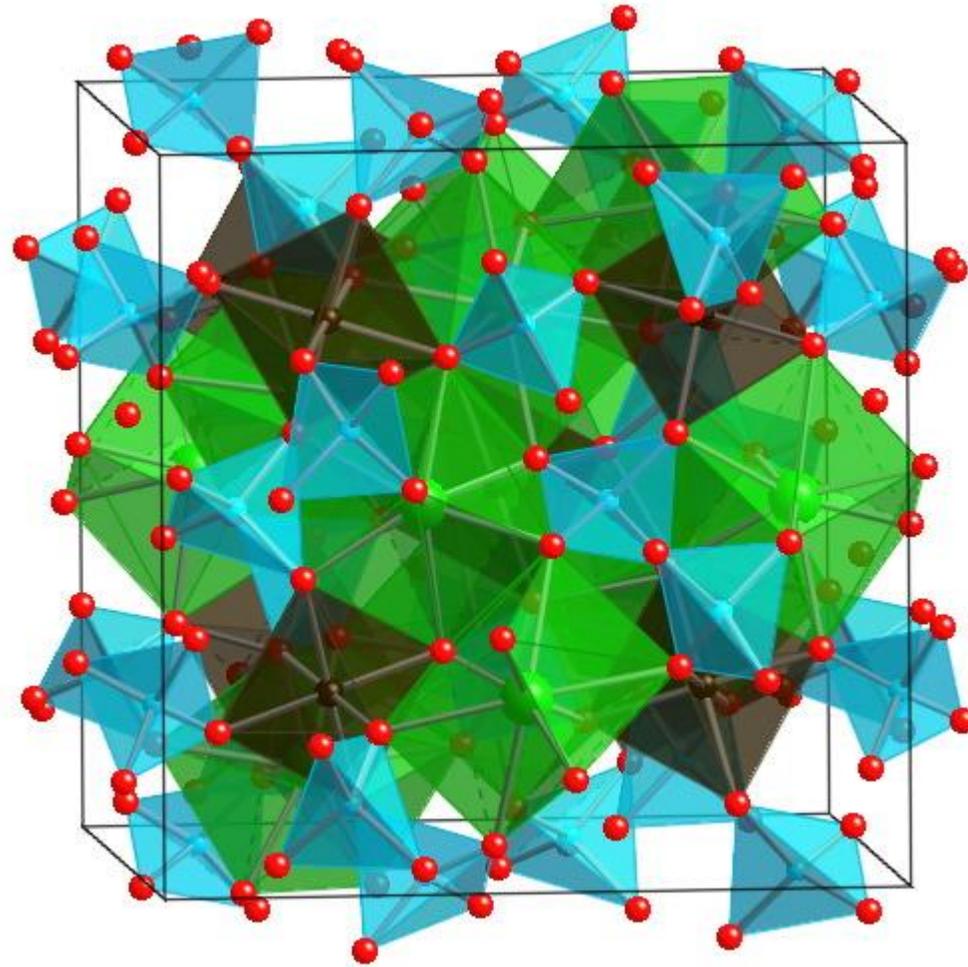




(a) Diamond



(b) Graphite



**Structure Type 087: Ca<sub>3</sub>Fe<sub>2</sub>Si<sub>3</sub>O<sub>12</sub> (Garnet)**

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