Bell Ringer

1. How does new rock form on Earth's surface?
2. What is the difference between oceanic crust and continental crust?
3. Name a gem

How did these mineral crystals grow to be so large?

http://www.youtube.com/watch?v=HeiMfLmJtzk

Mineral Lab – Part 1

Minerals

A. What is a mineral?

Mineral Characteristics shared by all minerals:

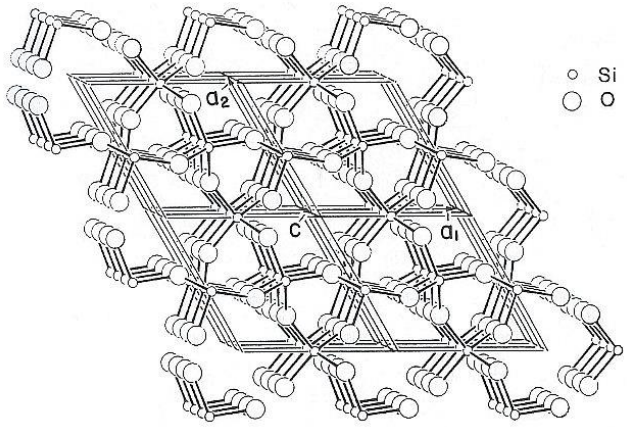
- 1. Natural
  - – occurs **naturally**
  - – NOT manmade

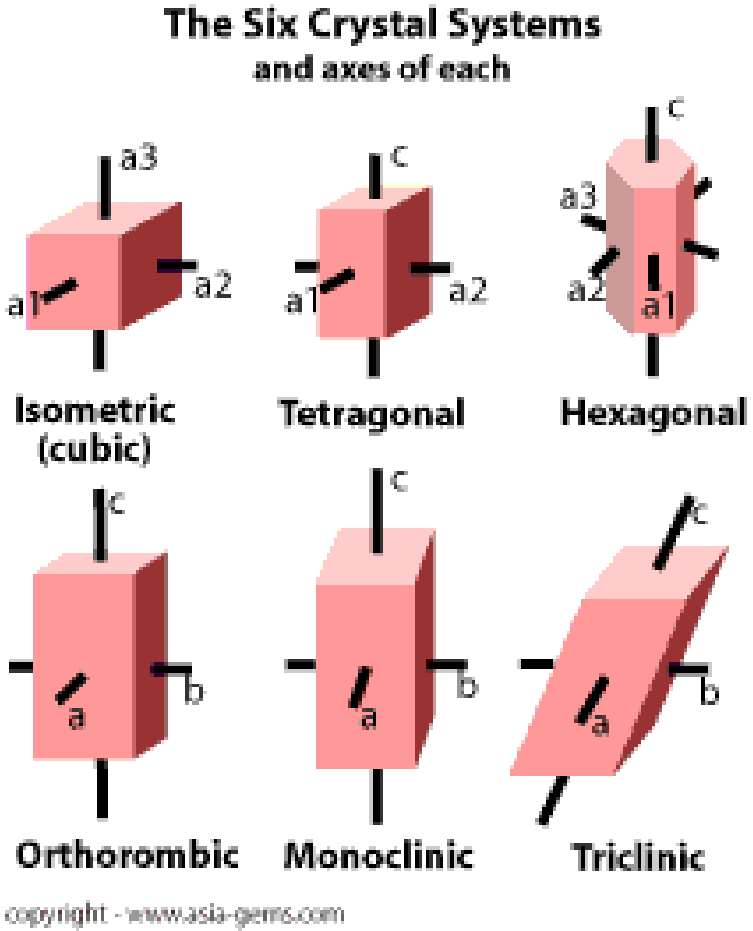
What is a mineral?

- 1. Natural
- **2. Inorganic**
  - Is not alive
  - Was never alive

What is a mineral?

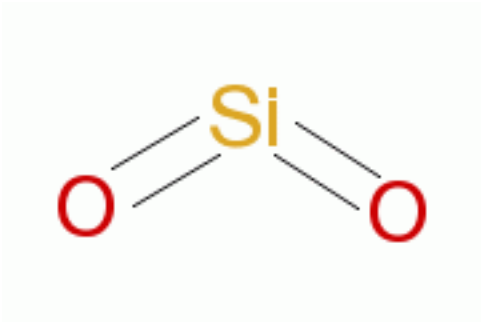
- 1. Natural
- 2. Inorganic
- **3. Crystalline**
  - Atoms are arranged in an orderly pattern





What is a mineral?

- 1. Natural
- 2. Inorganic
- 3. Crystalline
- 4. Definite chemical composition
  - **Chemical formula**
  - **SiO_2 is Quartz**



What is a mineral?

- 1. Natural
- 2. Inorganic
- 3. Crystalline
- 4. Definite chemical composition
- **5. Solid**
  - Not a gas, not a liquid

How will we remember this?

- Natural
- Inorganic
- Crystalline
- Definite chemical composition
- Solid

Mineral Characteristics shared by all minerals:

Now I Can Define minerals!

- Natural
- Inorganic
- Crystalline
- Definite chemical composition
- Solid

Is this a mineral?

- No! Why?
- Not inorganic (it was once living).

Is this a mineral?

- Yes! Why?
- Solid, found in nature, inorganic, has

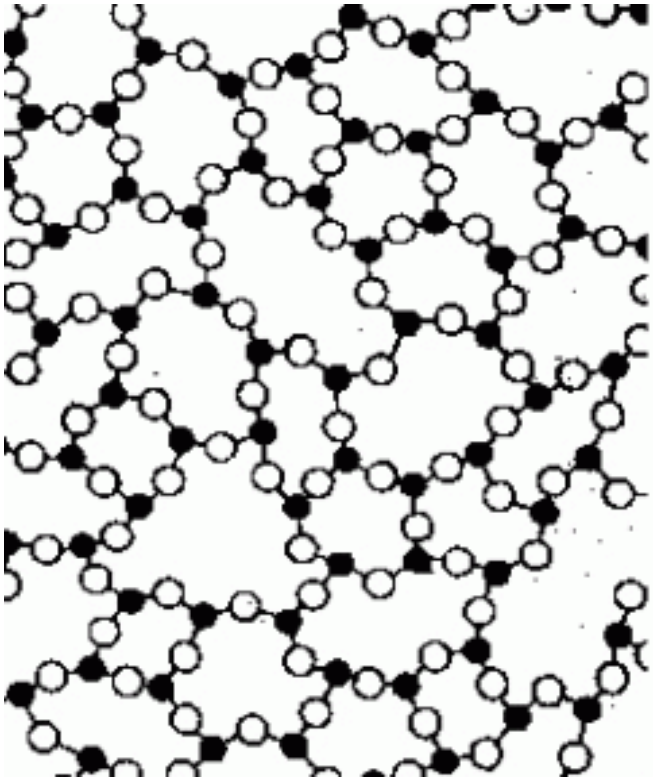
Is this a mineral?

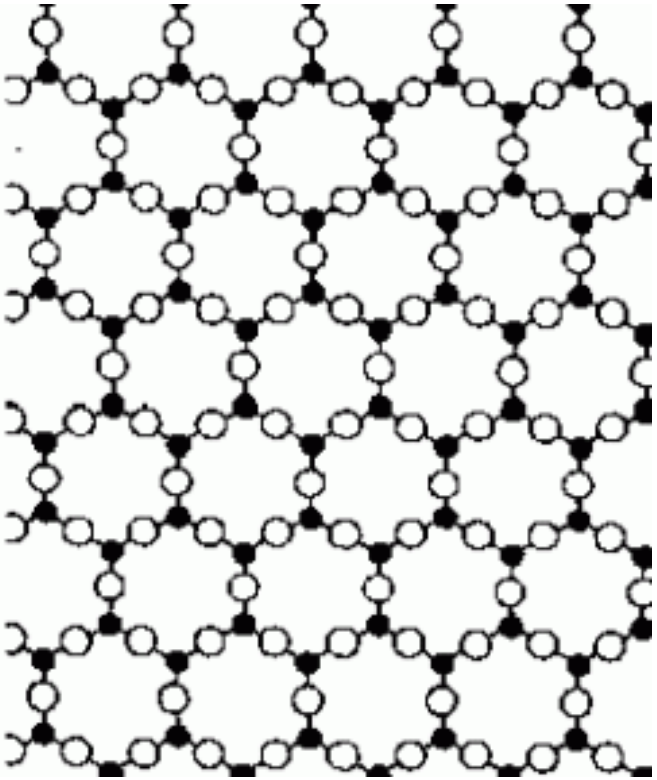
- Solid
- Inorganic
- Naturally occurring

Is this a mineral?

- Solid
- Inorganic
- Naturally occurring
- Chemical composition (SiO_2)
- NOT crystalline (No internal structure)

Glass structure vs. crystalline structure.





Is this a mineral?

- No! Why?
- Not a solid

Is this a mineral?

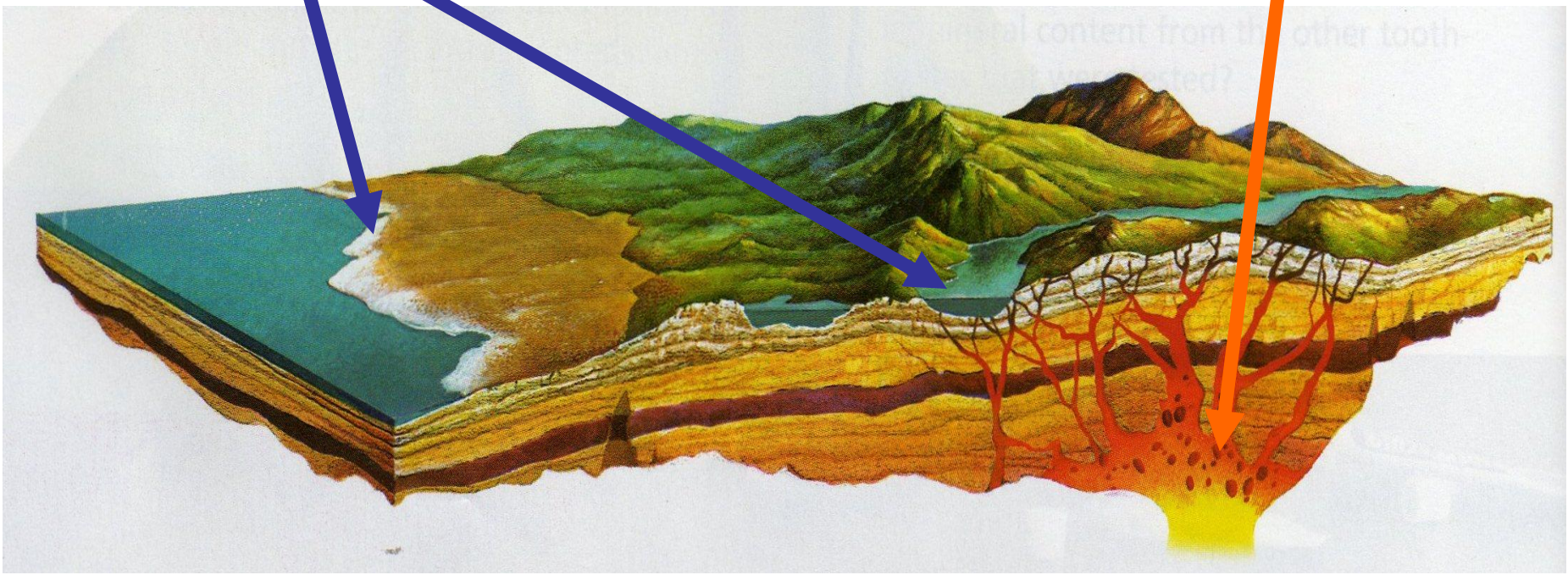
- Solid
- Inorganic
- Crystalline
- Chemical composition (H2O)
- Naturally occurring
- YES!

Where do minerals come from?

- Mineral crystals can form in two main ways:

From stuff
dissolved in liquids
(Evaporation & Hot Water)

From Cooling
molten material

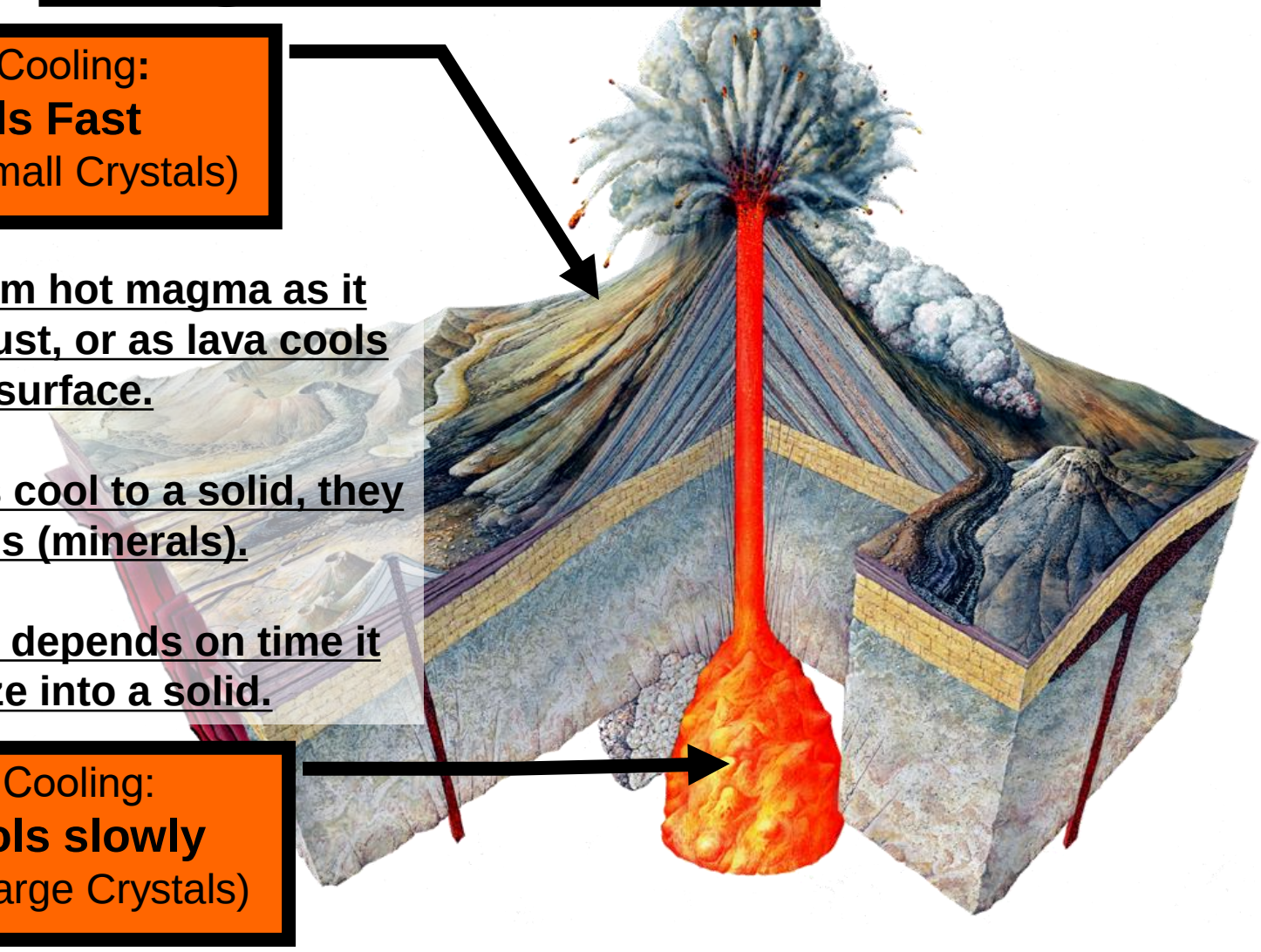


Minerals & Crystals from **Magma & Lava**

"Extrusive" Cooling:
Lava cools Fast
(Short Time = Small Crystals)

- **Minerals form from hot magma as it cools inside the crust, or as lava cools on the surface.**
- **When these liquids cool to a solid, they form crystals (minerals).**
- **Size of the crystal depends on time it takes to freeze into a solid.**

"Intrusive" Cooling:
Magma cools slowly
(Long Time = Large Crystals)



Minerals Crystal Size

When the hot material cools fast, it has smaller crystal size. When it cools slowly, it has large crystals.

Granite

You can see individual crystals in Granite = cooled slowly

Rhyolite

You can't see many individual crystals in Rhyolite = cooled very fast

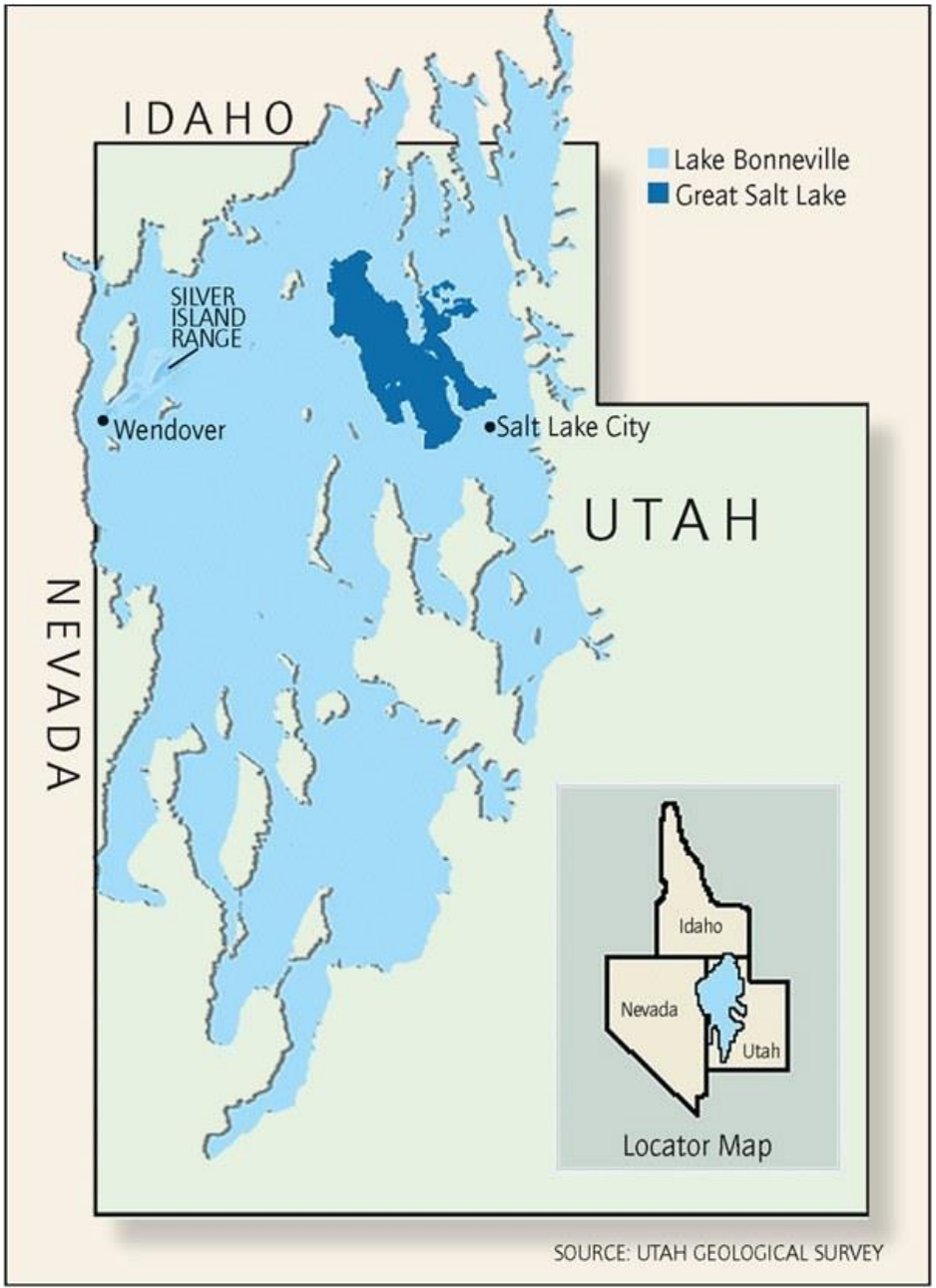
Minerals formed by Evaporation

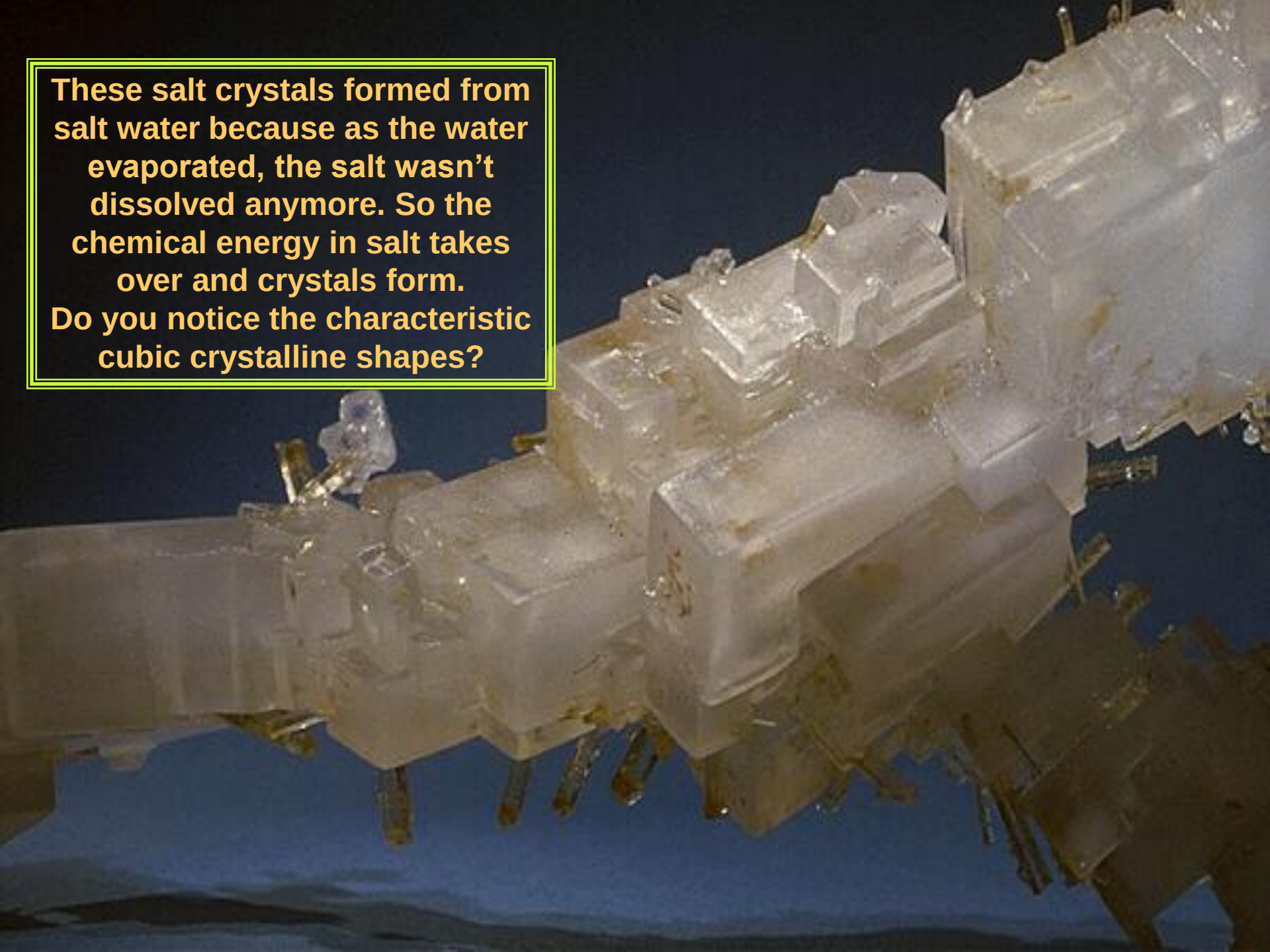
- Some minerals form when solutions/mixtures evaporate:
  - When water evaporates, it leaves behind the stuff that's dissolved in it.
    - The longer it takes to evaporate, the larger the crystal.
    - i.e. salt & water = ocean,
      - Halite, Gypsum, Calcite.

***All the white stuff = salt mineral crystals that formed when the water of this lake evaporated. The mineral material was left behind

Bonneville Salt Flats

Lake Bonneville

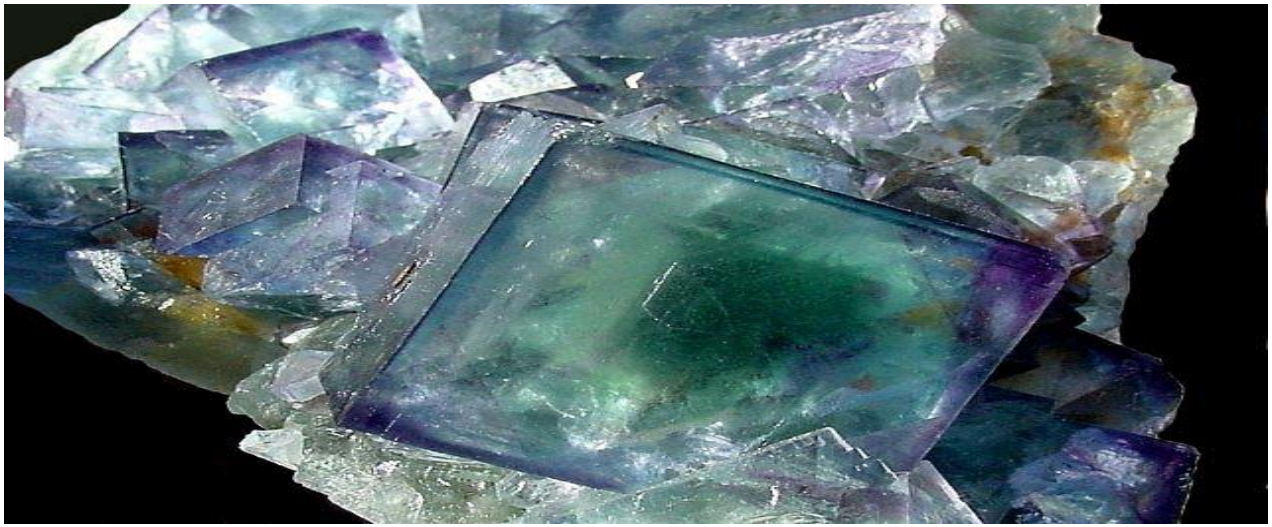



These salt crystals formed from salt water because as the water evaporated, the salt wasn't dissolved anymore. So the chemical energy in salt takes over and crystals form.
Do you notice the characteristic cubic crystalline shapes?

Mineral Lab – Part 2

B. Physical Properties of Minerals

- **1. Color**
  - First impression
  - Not very reliable because **lots of minerals can occur in many different colors**



Quartz

- Purple Amethyst

Fluorite

- White
- Blue
- Green
- Purple

Physical Properties of Minerals

- 1. Color
- **2. Streak**
  - The **TRUE** color of a mineral
  - **Color of a mineral's powder**

The red-brown streak of the mineral hematite.

Streak

Not necessarily the color of the rock.

Physical Properties of Minerals

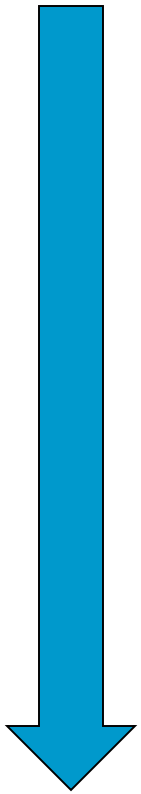
- 1. Color
- 2. Streak
- **3. Hardness**
  - A mineral's **resistance** to being **scratched**
  - **Mohs Hardness Scale from 1-10**

Hardness depends on how **"tightly packed"** the atoms are

Mohs Hardness Scale

1. Talc
2. Gypsum
3. Calcite (Chalk)
4. Fluorite
5. Apatite
6. Potassium feldspar
7. Quartz
8. Topaz
9. Corundum
10. Diamond

Softest



Hardest

Mohs Hardness Scale

How do we make diamonds?

Photos of Diamond Before and After Cutting

Gem quality diamond rough before cutting.

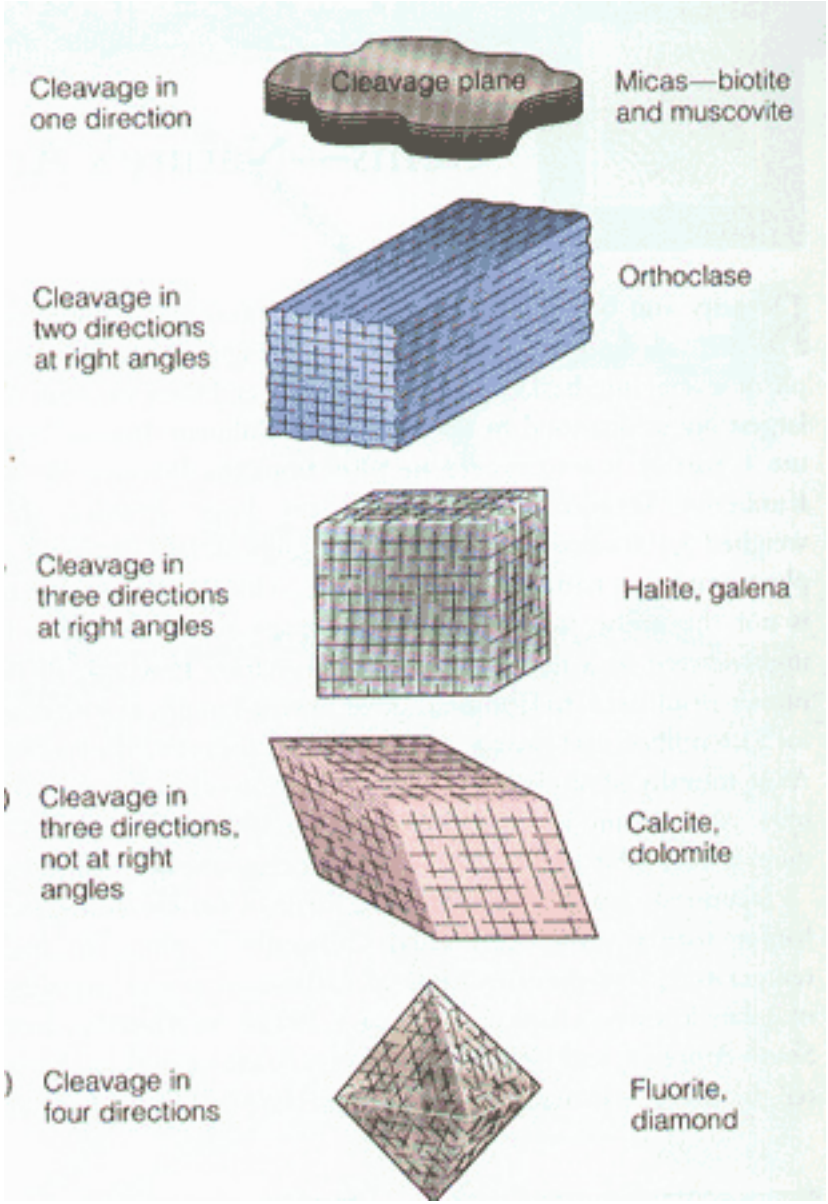
Diamond after cutting with SI2 clarity.

Diamond: 10 Steel: 4-4.5 Tungsten carbide: 9

- https://www.youtube.com/watch?v=8lk8p0re8Eg

Physical Properties of Minerals

- 1. Color
- 2. Streak
- 3. Hardness
- 4. **Cleavage**
  - **How it splits along definite planes**

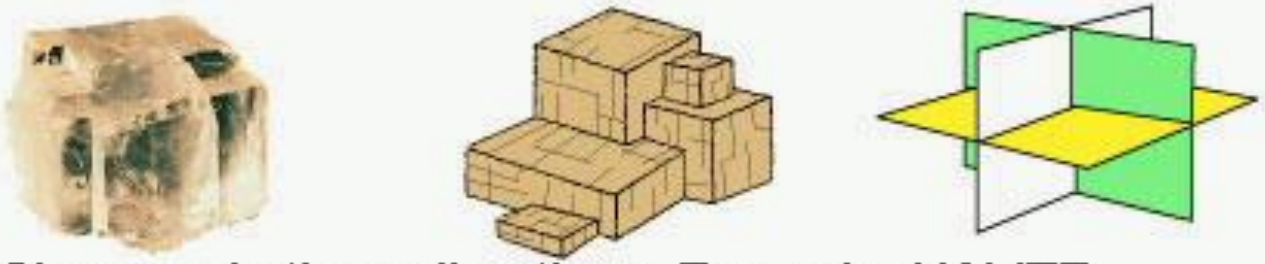


“Cleav” = to split

Cleaver

Cleavage in one direction. Example: MUSCOVITE

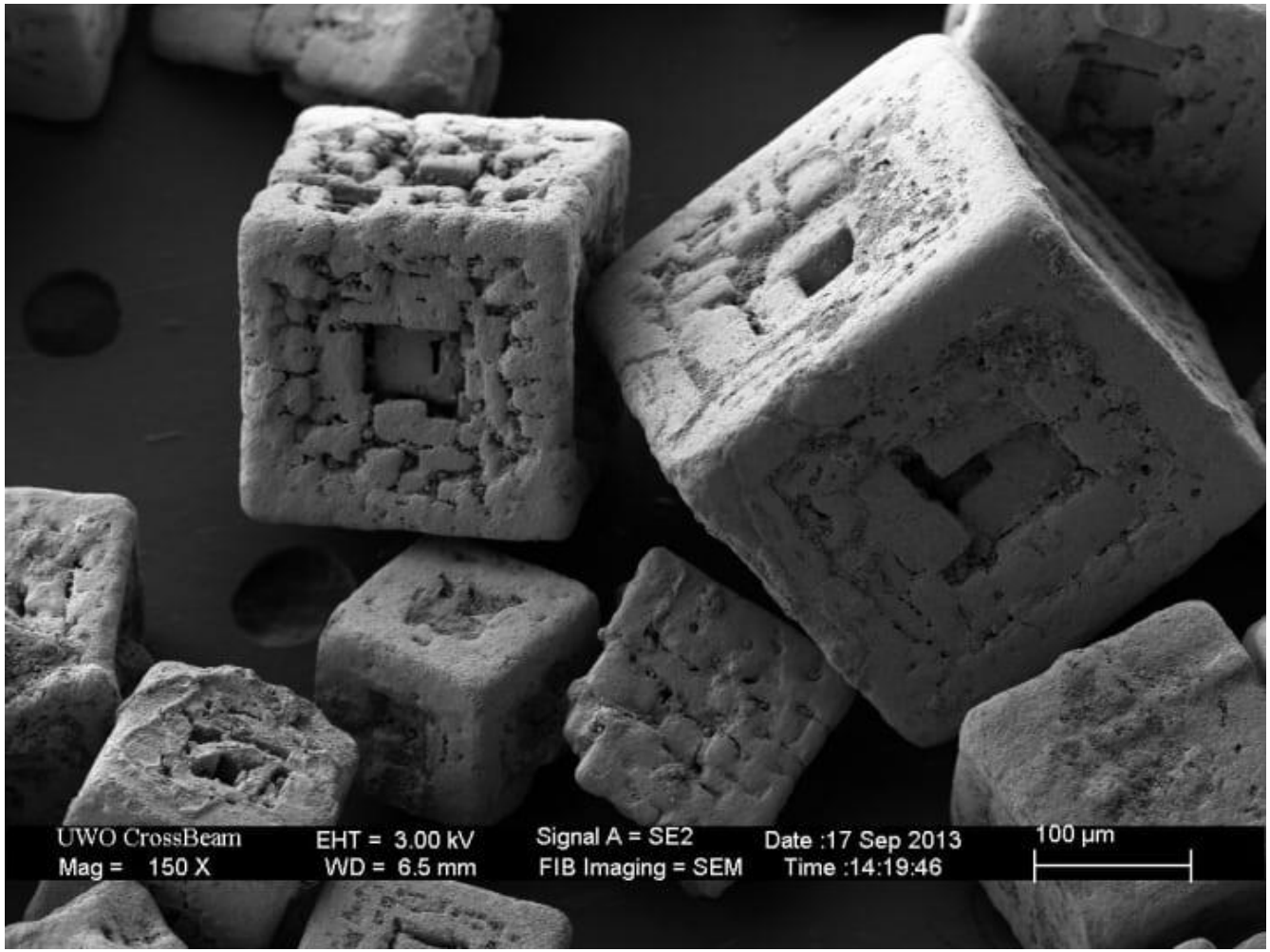
Cleavage in two directions. Example: FELDSPAR



Cleavage in three directions. Example: HALITE

Cleavage in two directions. Example: CALCITE

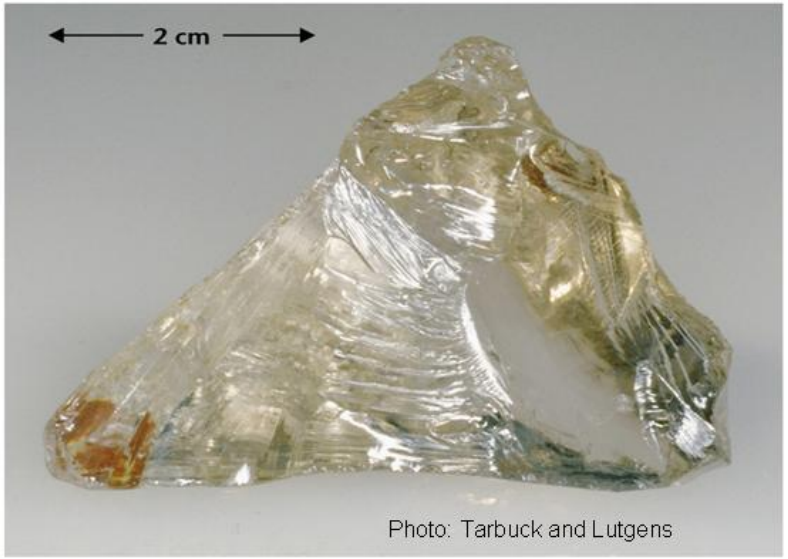
Salt under a microscope – width of human hair.



Physical Properties of Minerals

- 1. Color
- 2. Streak
- 3. Hardness
- 4. Cleavage
- **5. Fracture**
  - **Breaks irregularly, jagged edges**

Conchoidal fracture



Fracture

Difference between fracture and cleavage: Cleavage – how the whole rock splits. Fracture – how the rock chips.

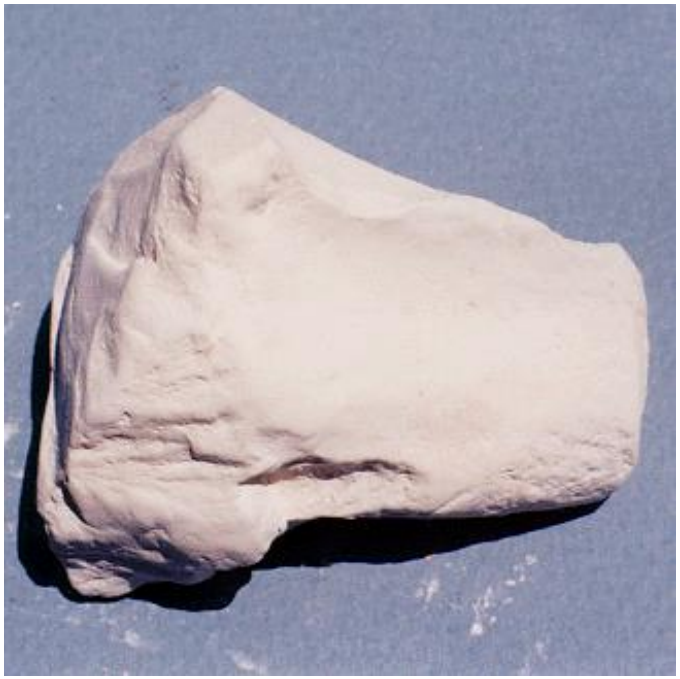
Physical Properties of Minerals

- 1. Color
- 2. Streak
- 3. Hardness
- 4. Cleavage
- 5. Fracture
- **6. Luster**
  - **How light shines off a mineral**
  - **Metallic or Nonmetallic or Vitreous**

Luster

- Metallic

- Nonmetallic



Luster

- Vitreous = shiny!

Physical Properties of Minerals: Used for Identification (I.D.)

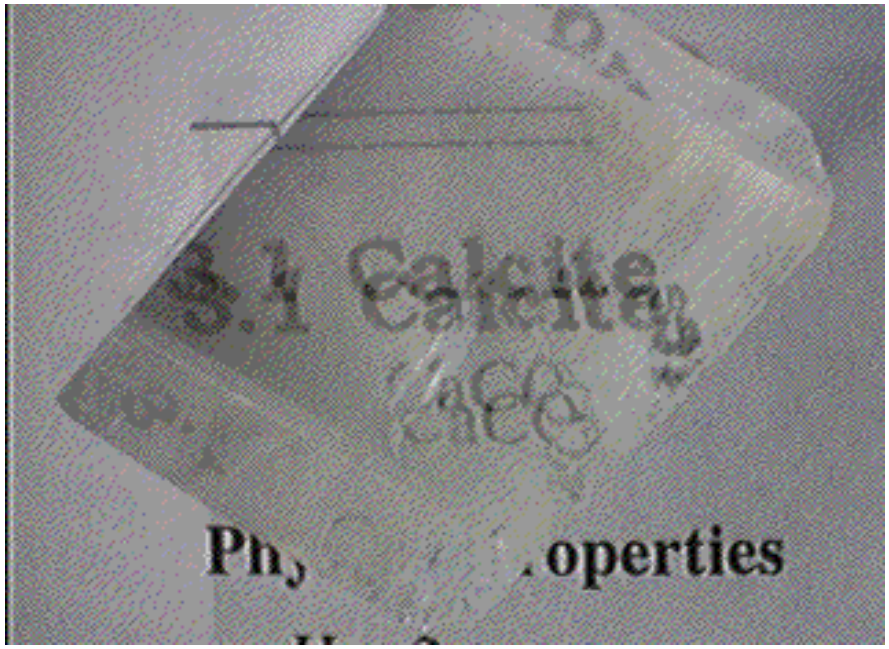
- Color
- Streak
- Hardness
- Cleavage
- Fracture
- Luster

C. Special Properties

- **1. Magnetism**
  - **Attracted to a magnet**
  - Contains **IRON, cobalt, or nickel**

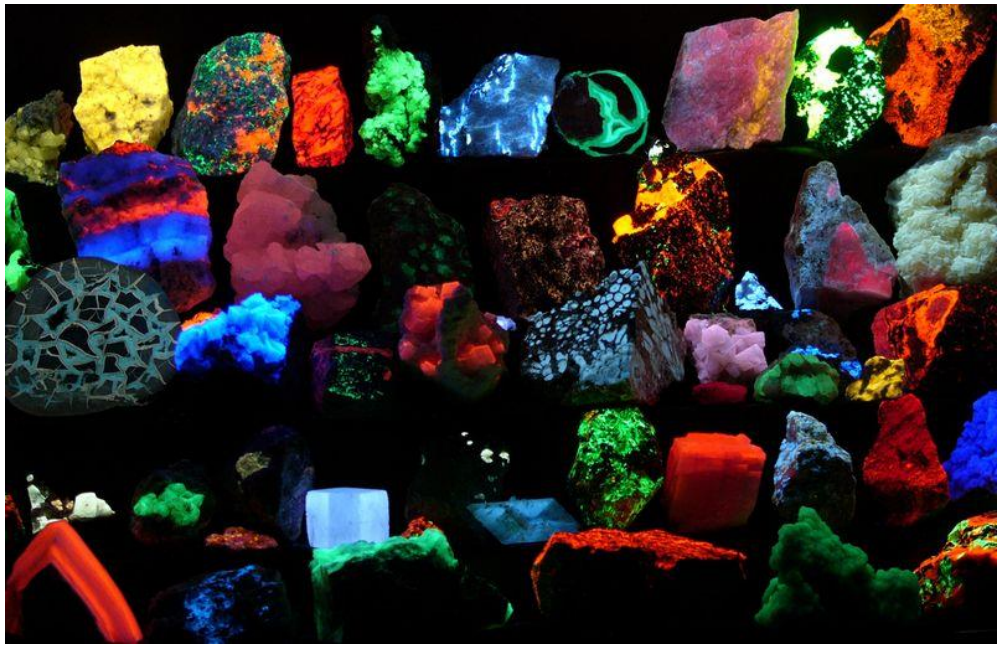
Special Properties

- 1. Magnetism
- **2. Double refraction**
  - Looking through it, you **see "double"**
  - **Ex. Calcite**

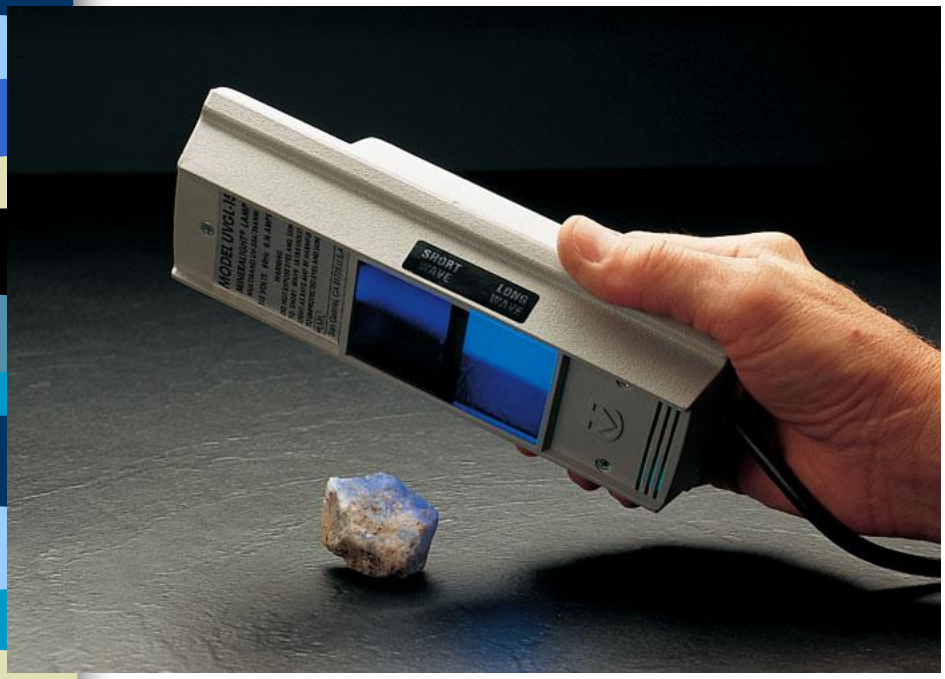


Special Properties

- 1. Magnetism
- 2. Double refraction
- **3. Fluorescence**
  - **Glows** under ultraviolet (**UV**) light



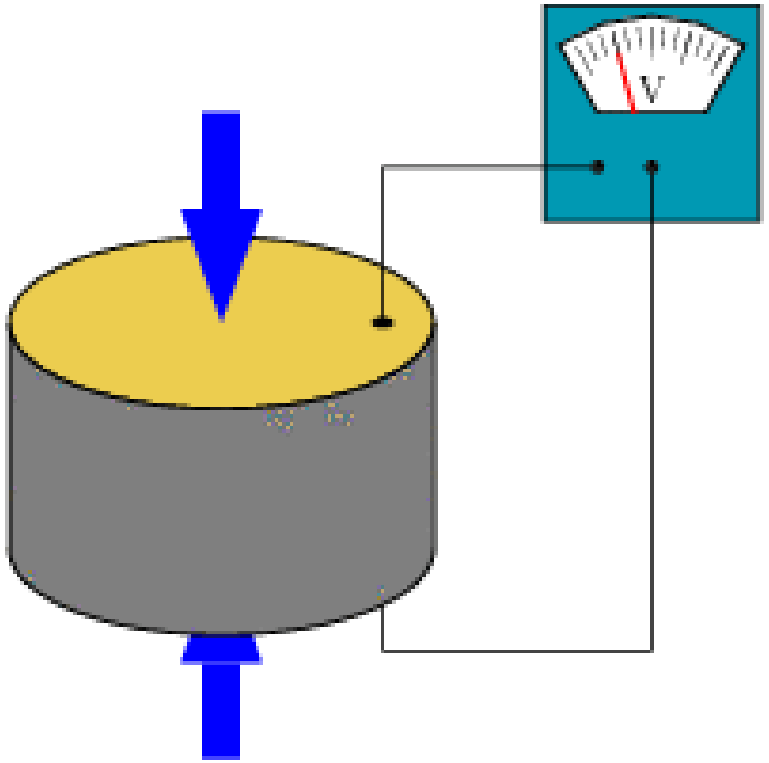
Fluorescence under ultraviolet, UV light



Special Properties

- 1. Magnetism
- 2. Double refraction
- 3. Fluorescence
- **4. Piezoelectric**
  - **Electricity is generated from Pressure**
  - Example: Quartz

Piezoelectric (Pressure=Electricity)



https://www.youtube.com/watch?v=LnlSSWv4qTQ

Special Properties

- Magnetism
- Double refraction
- Fluorescence
- Piezoelectric

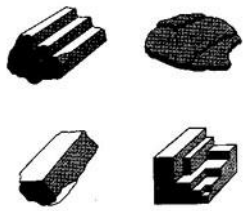
D. Identification Tests

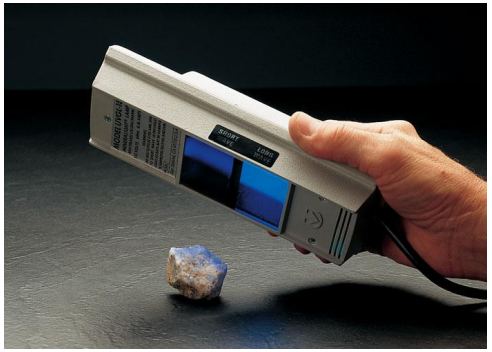
- 1. **Hardness**
- 2. **Streak** (True Color)
- 3. **Acid Test**
  - Use hydrochloric acid
  - Tests for **carbonate** (**calcite**)

Caves can form in rocks with calcite, like here in Harrisonburg!

Acid in groundwater dissolves the calcite

https://www.youtube.com/watch?v=nXme1YICtyo






(1 Molar)
dilute
HCl
(acid)


© geology.com