

Minerals

What are minerals and how do we classify them?

Minerals

- ♦ Rock - any naturally formed solid that is part of Earth or any other celestial object
 - ♦ Minerals are the ingredients needed to form the different types of rocks

Minerals

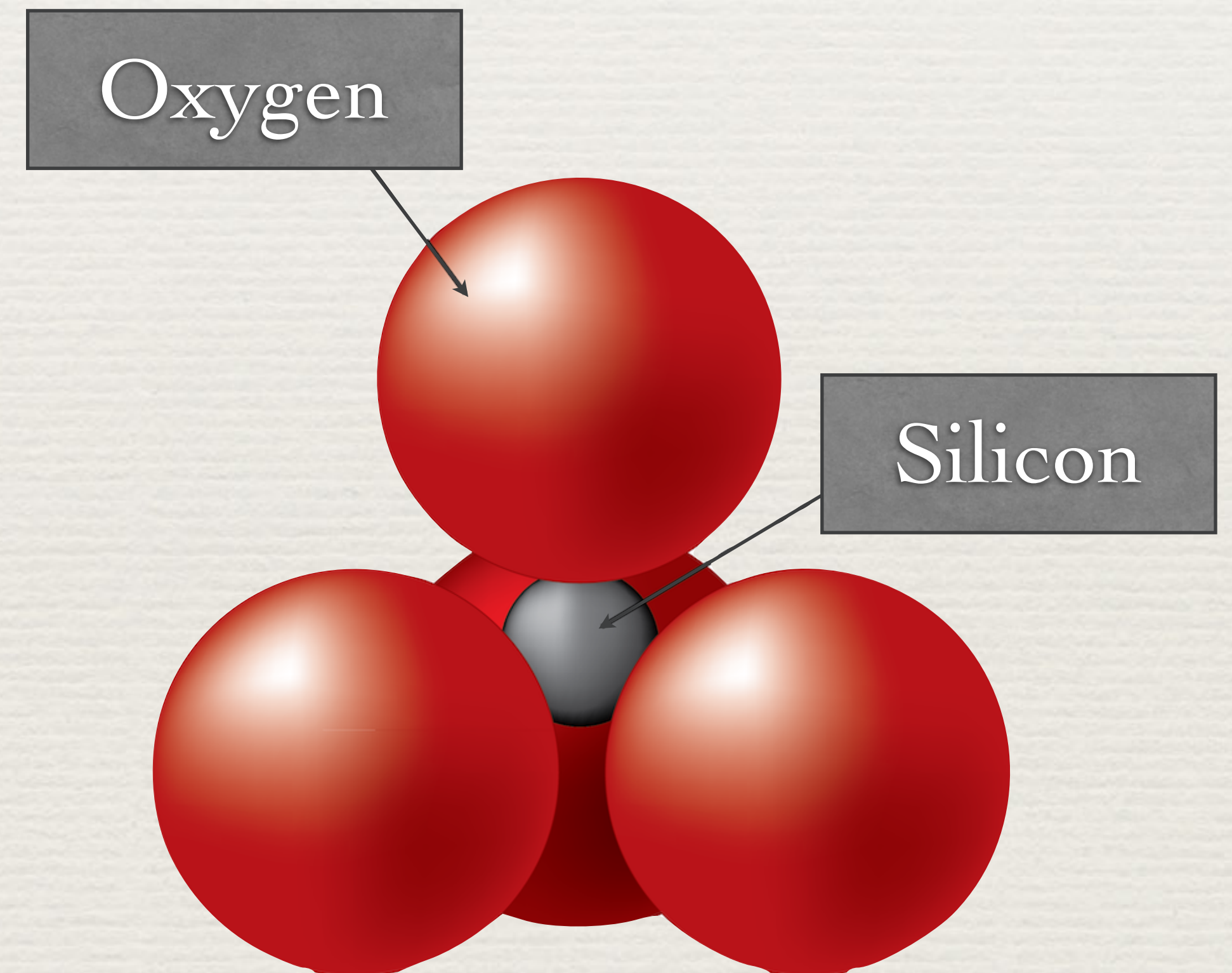
- ♦ Mineral - most geologists define a "mineral" as:
 1. Naturally occurring
 2. Inorganic
 3. Solid
 4. Definite chemical composition
 5. Ordered internal structure

Minerals

- ♦ Minerals form in the following manners:
 1. Precipitation from evaporating seawater
 2. Crystallization around cooling magma
 3. Under extreme heat and pressure [recrystallization]
 4. From hydrothermal solutions flowing through ground cracks

Minerals

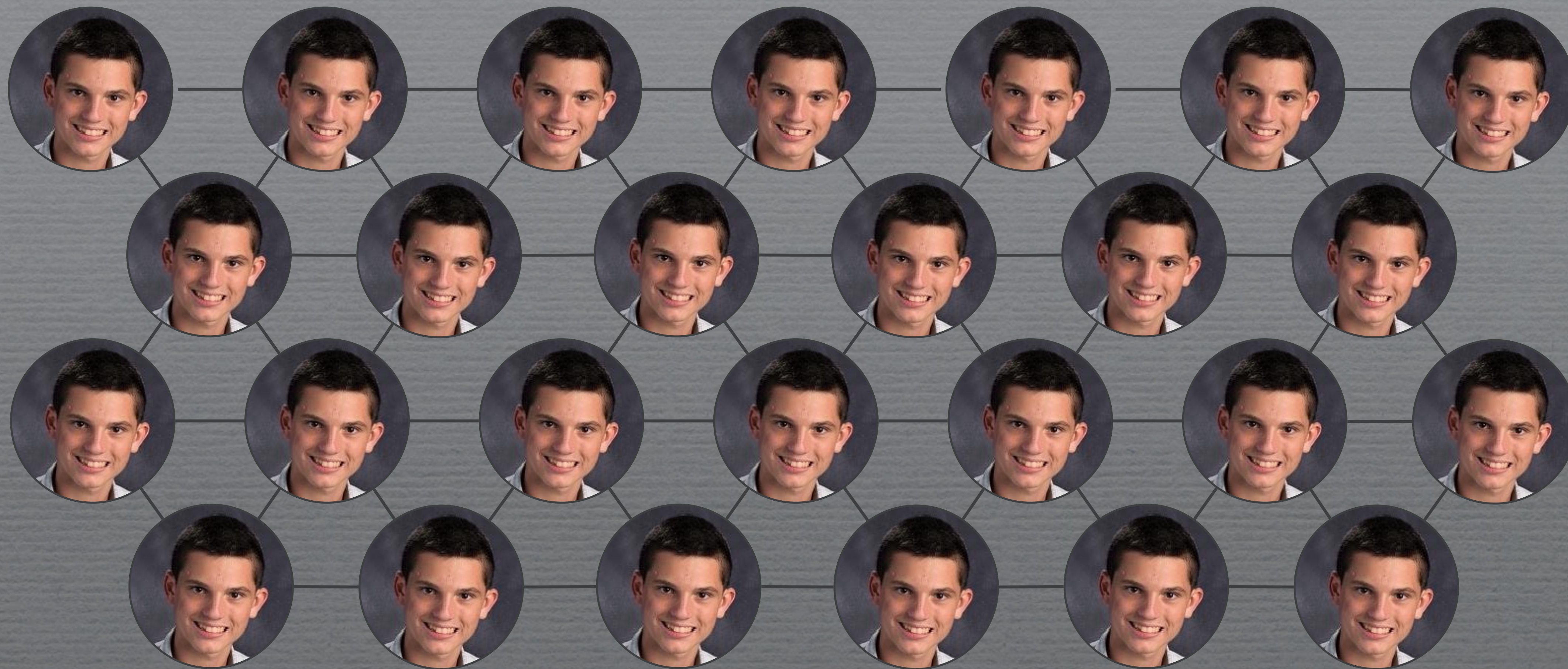
- ♦ Most rock forming minerals are silicates that result in a tetrahedron shape
 - ♦ Four-sided units of 4 oxygens and 1 silicon



Minerals

- ♦ Physical and chemical properties of a minerals are determined by the:

**INTERNAL
ARRANGEMENT
OF ATOMS**



Internal Arrangement of "Adams"



Minerals

Minerals

- ♦ Each mineral has a set of physical and chemical properties that can be used to identify the sample
- ♦ The following methods are used to classify minerals:

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1. Color - a visual attribute of an object based on perception
 - ♦ One of the most obvious, but not the most reliable
 - ♦ Many of the 4000 known minerals share similar colors



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Smokey Quartz



Quartz



Rose Quartz

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2. Streak - the color of finely crushed powder when a mineral is dragged across a streak plate
 - ♦ Weathering changes the outside color, but streak gives the true color



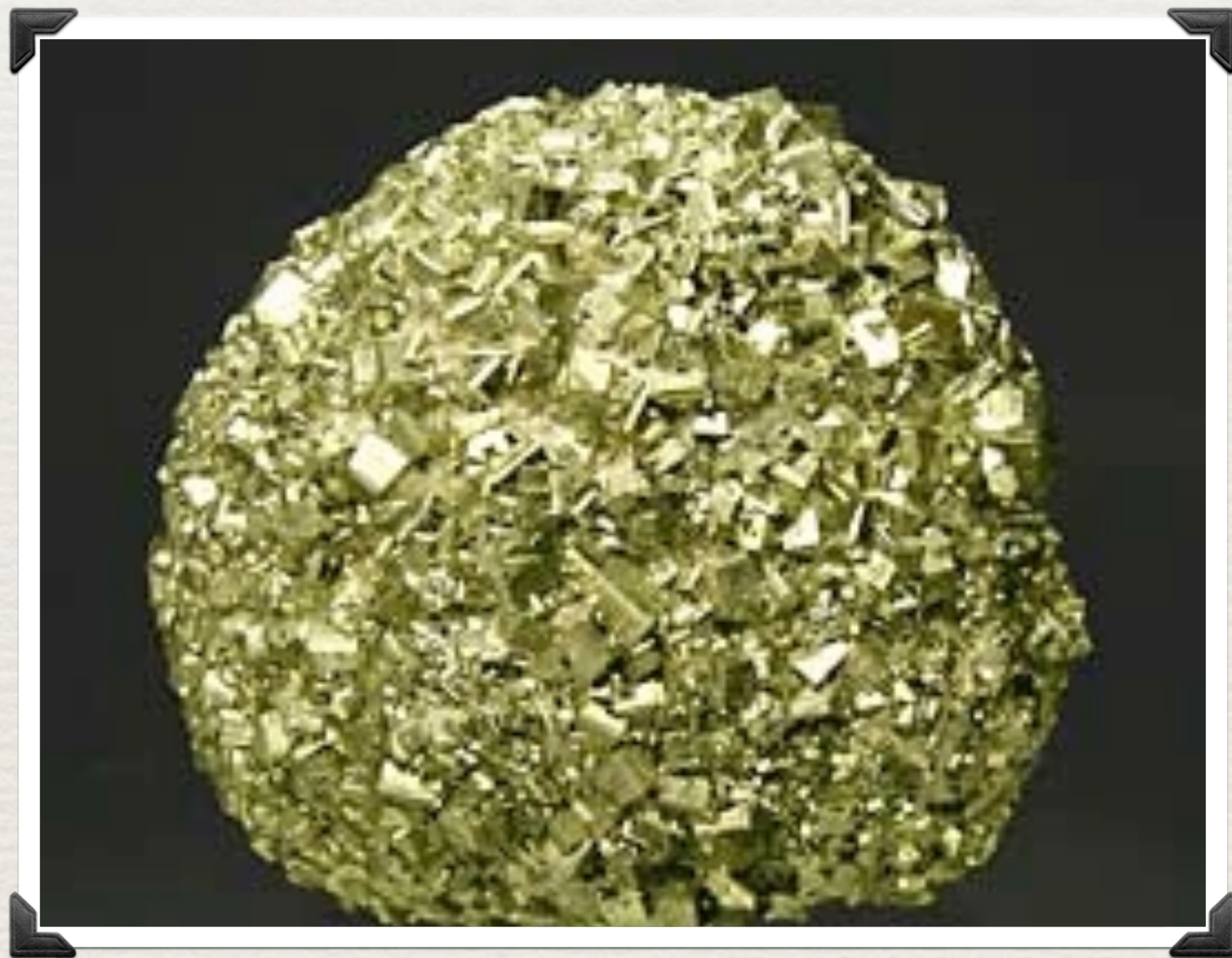
Minerals

3. Luster - the shine of an unweathered mineral or the way it looks in reflected light

♦ Two types of luster:

1. *Metallic Luster* - shines like stainless steel
2. *Nonmetallic Luster* - earthy or dull shine

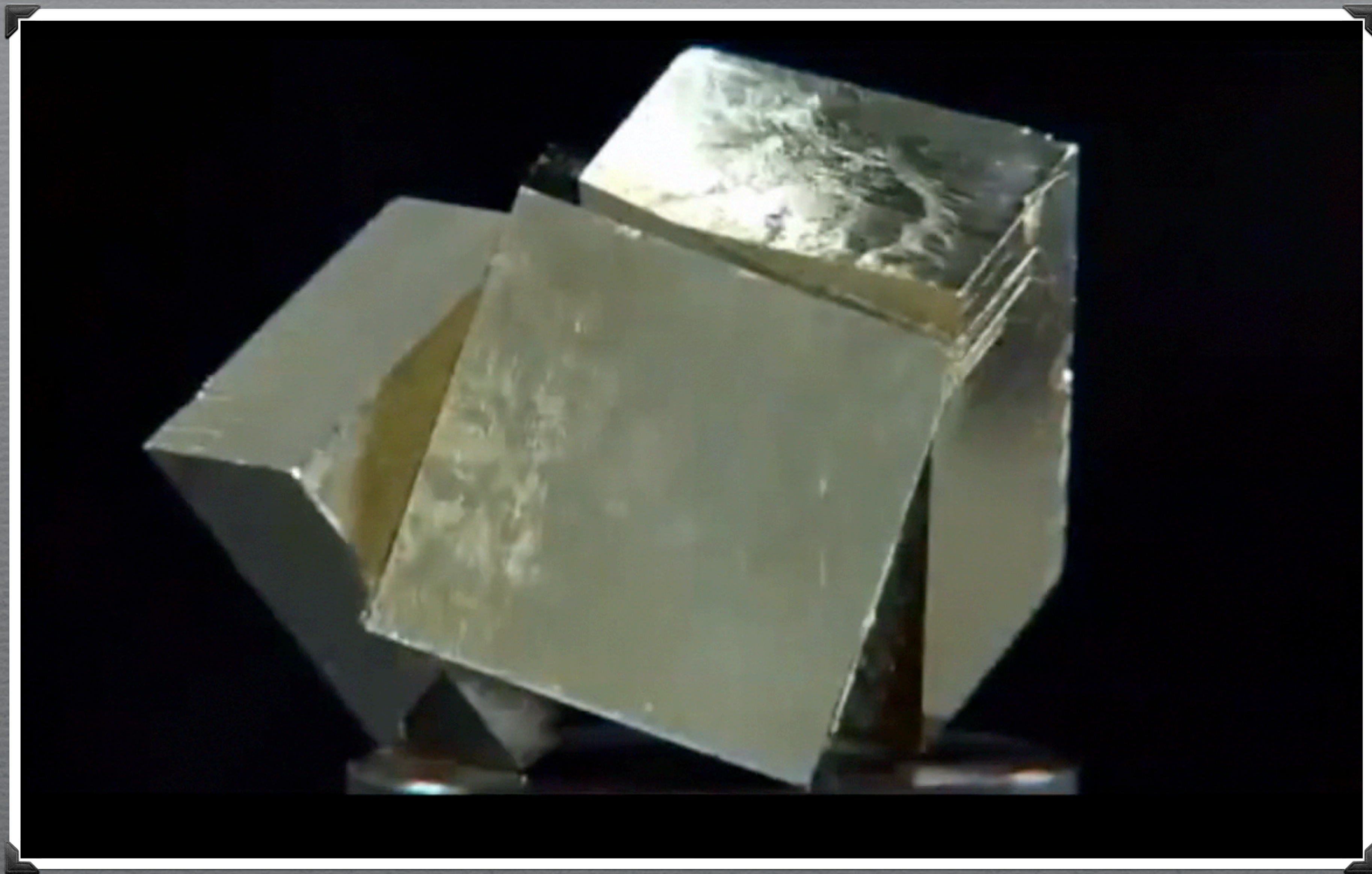
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Metallic Luster



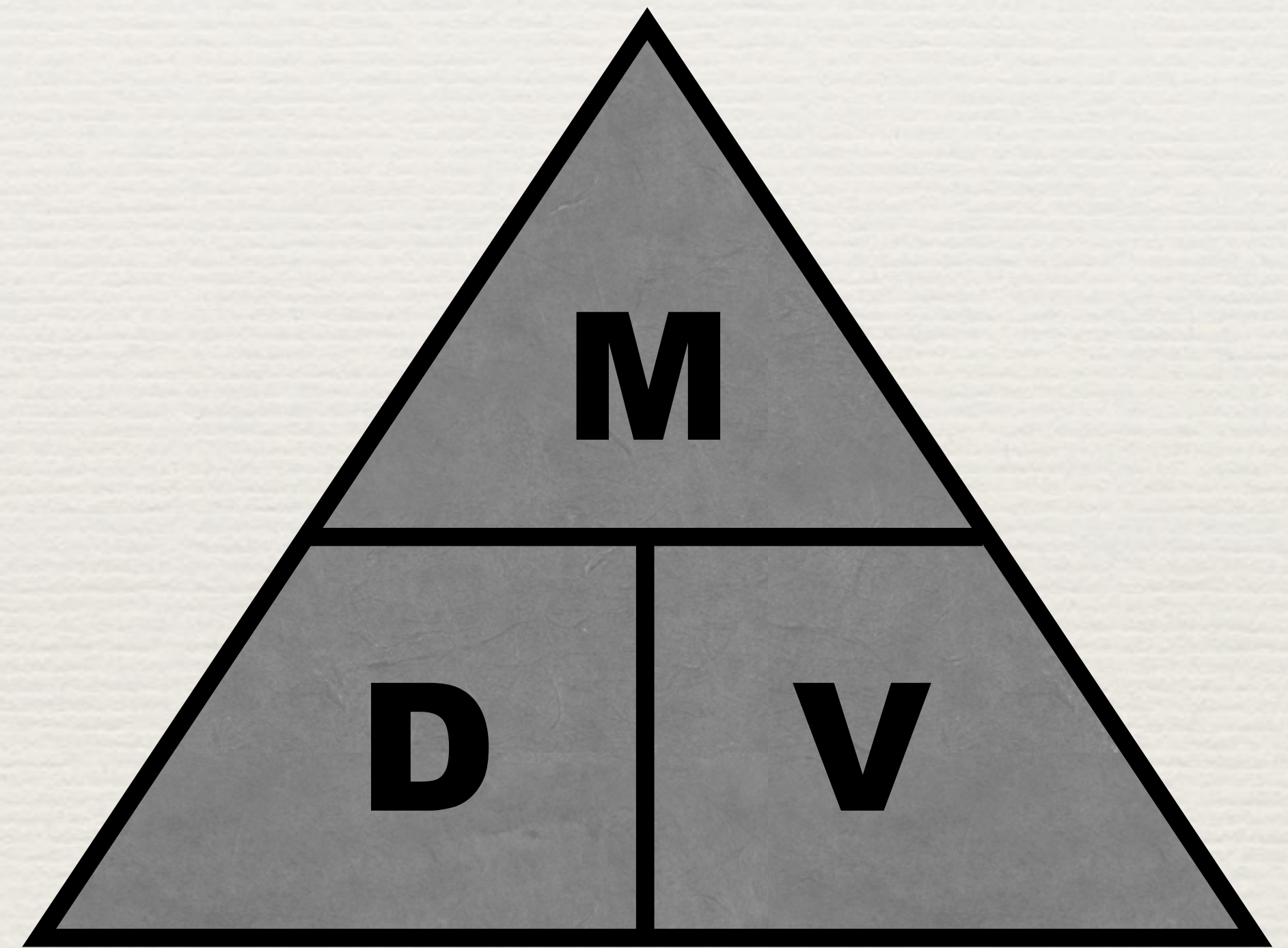
Nonmetallic Luster



Metallic Luster

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4. Density - the ratio of mass and volume of an object



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5. Hardness - resistance of a mineral to be scratched
- ♦ Mohs Hardness Scale is used to classify hardness



Hardness	Mineral	Test
1	Talc	Finger nail scratches easily
2	Gypsum	Finger nail scratches
3	Calcite	Copper penny scratches
4	Fluorite	Steel knife scratches easily
5	Apatite	Steel knife scratches
6	Feldspar	Steel knife will not scratch
7	Quartz	Will scratch glass and steel
8	Topaz	Harder than any common mineral
9	Corundum	Scratches topaz
10	Diamond	Hardest mineral

Mohs Hardness Scale

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6. Cleavage - the tendency of a mineral to break along zones of weakness and form semi-smooth or parallel surfaces

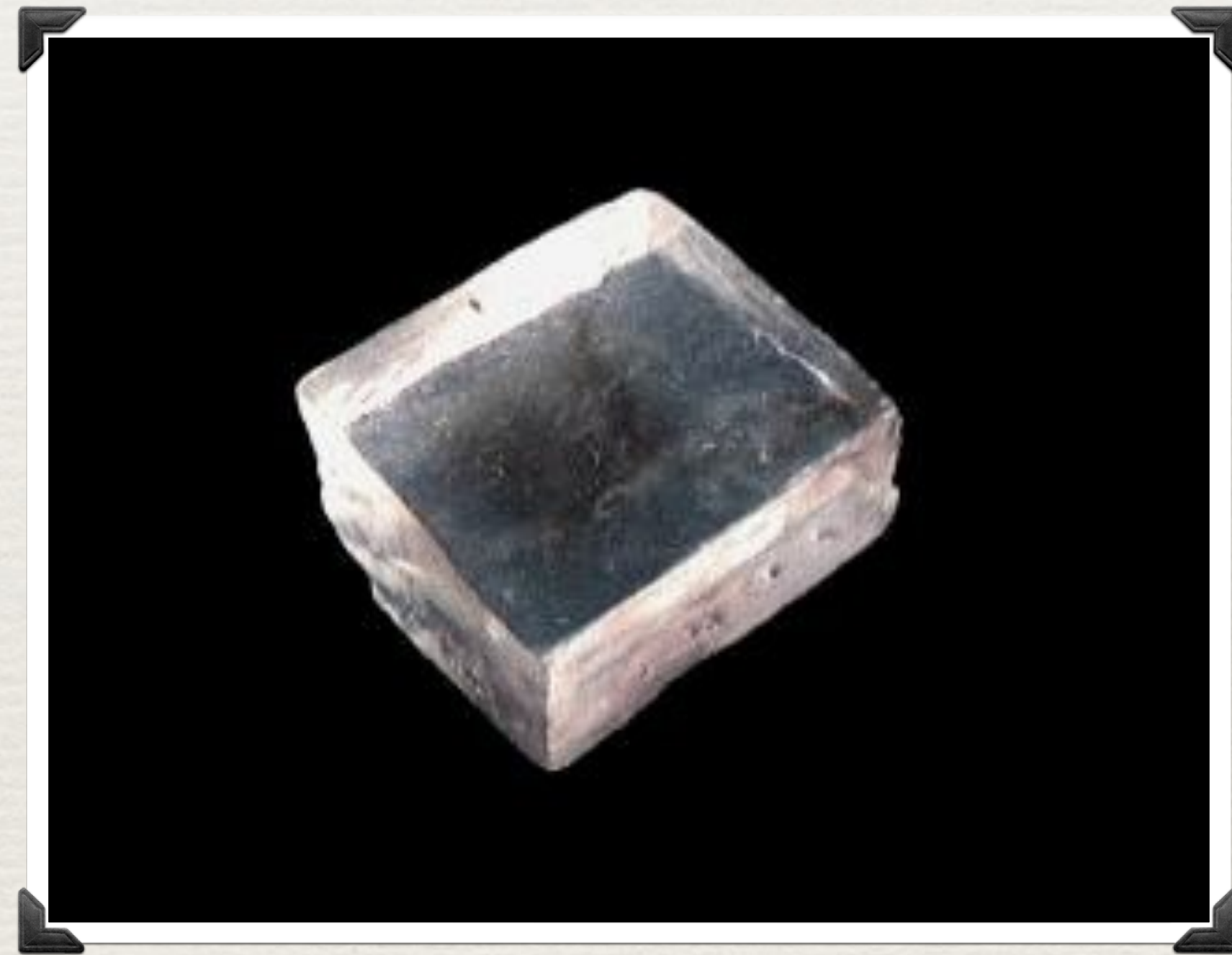
♦ Example: Halite



Minerals



Mica

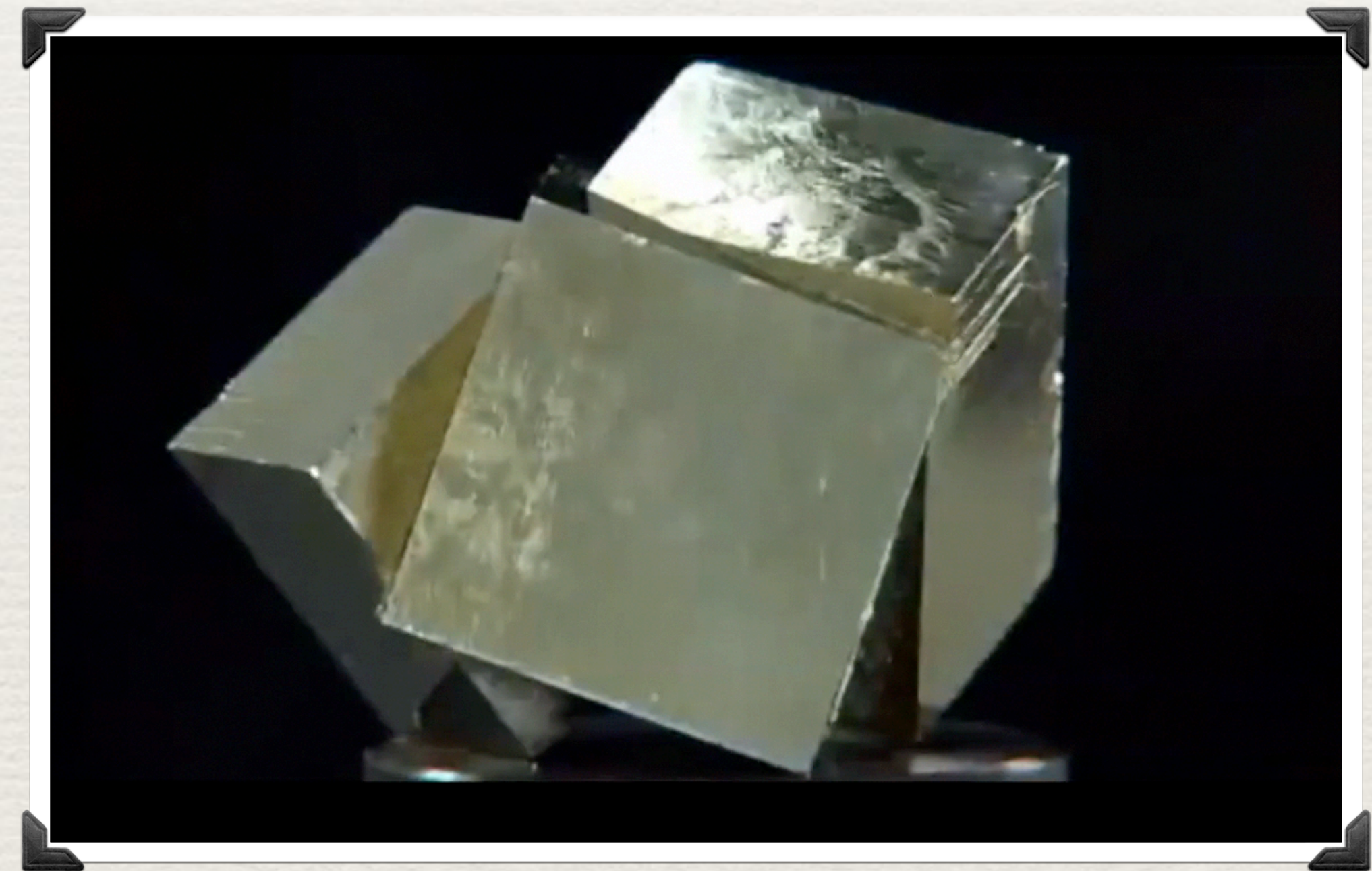


Halite

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One direction



Three directions at 90°

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7. Fracture - an irregular or uneven break

♦ Example: Olivine



Minerals



Fibrous



Conchoidal

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8. Acid Test - when dilute acid [HCl] is placed on a mineral it can effervesce [bubble]

♦ Example: Calcite





Reaction to Acid

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9. Magnetism - when a minerals attracted to a magnet

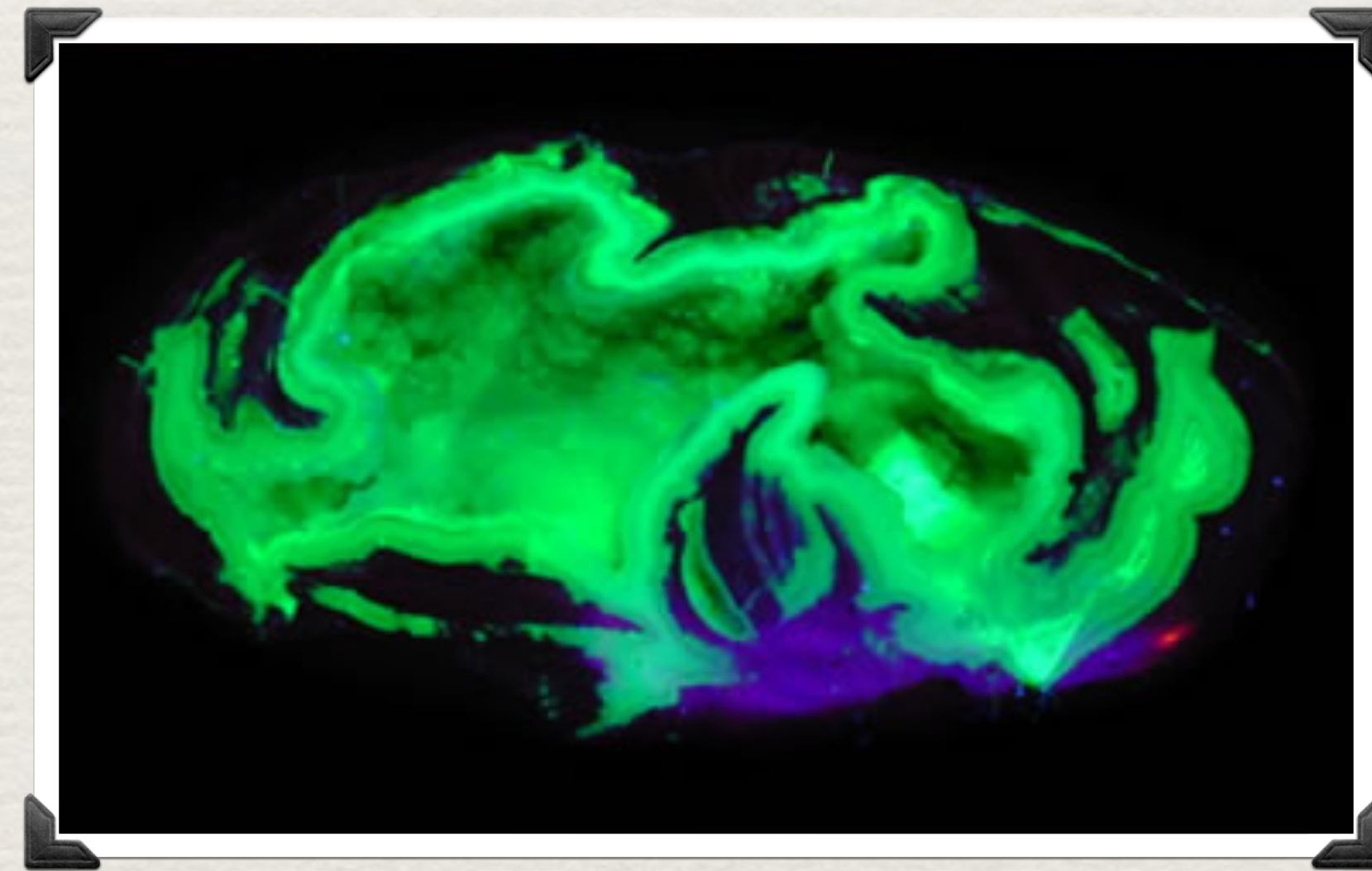
♦ Example: Magnetite



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10. Fluorescence - when a mineral glows under ultraviolet light

♦ Example: Agate





Fluorescence Minerals

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11. Taste - when a mineral tastes salty

- ♦ Example: Halite



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12. Smell - when a mineral exhibits a distinctive smell

♦ Example: Sulfur



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13. Radioactivity - when a mineral gives off radiation that can be measured with a Geiger counter

- ♦ Example: Uraninite

