



**Rocks
cover the
entire
Earth!**



What happens when rocks break?



Why do we care about the strength of rocks?

Some natural disasters are caused by breaking rocks.



Why do we care about the strength of rocks?

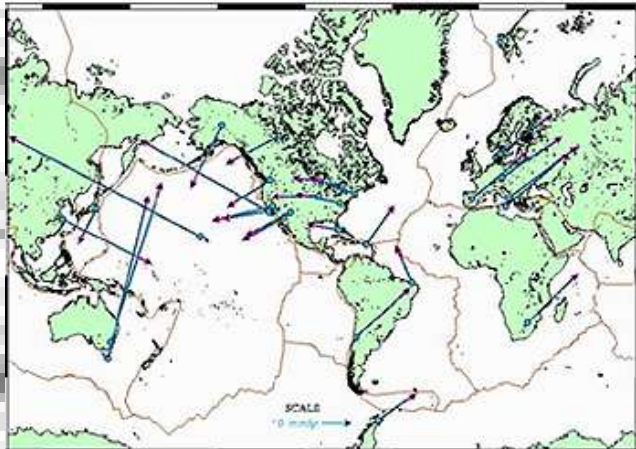
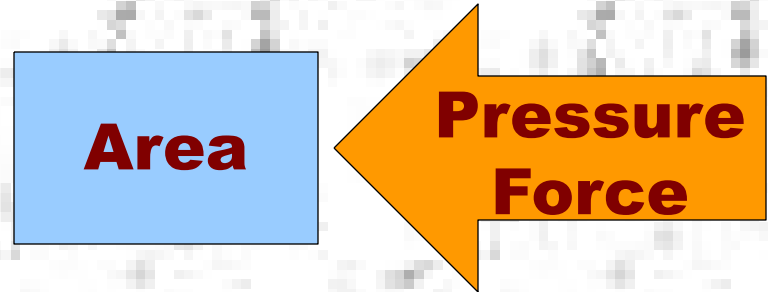


And, sometimes we break rocks on purpose!



What can break rocks? Stress!

**There are many things
in nature that cause
stress.**



**One cause is plate
movements in the earth.**

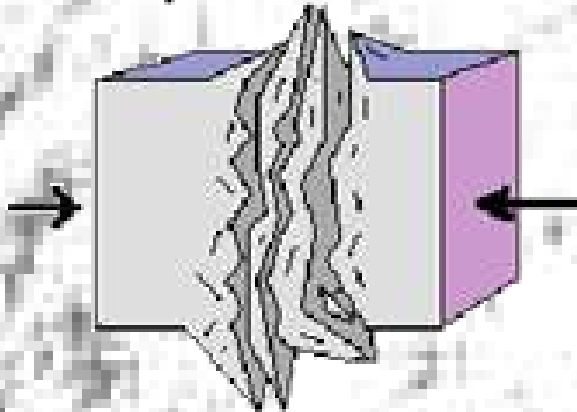
What can break rocks? Stress!

There are 3 types of stresses.

1. Compressional Stress

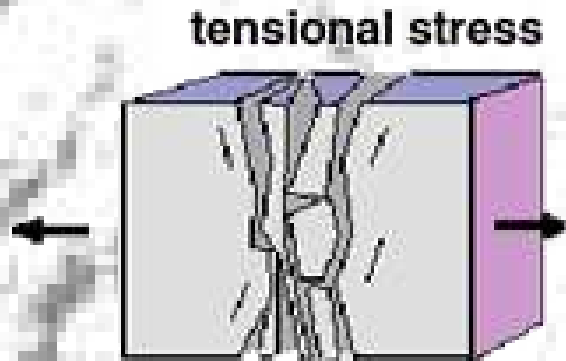


compressional stress



What can break rocks? Stress!

2. Tensional Stress

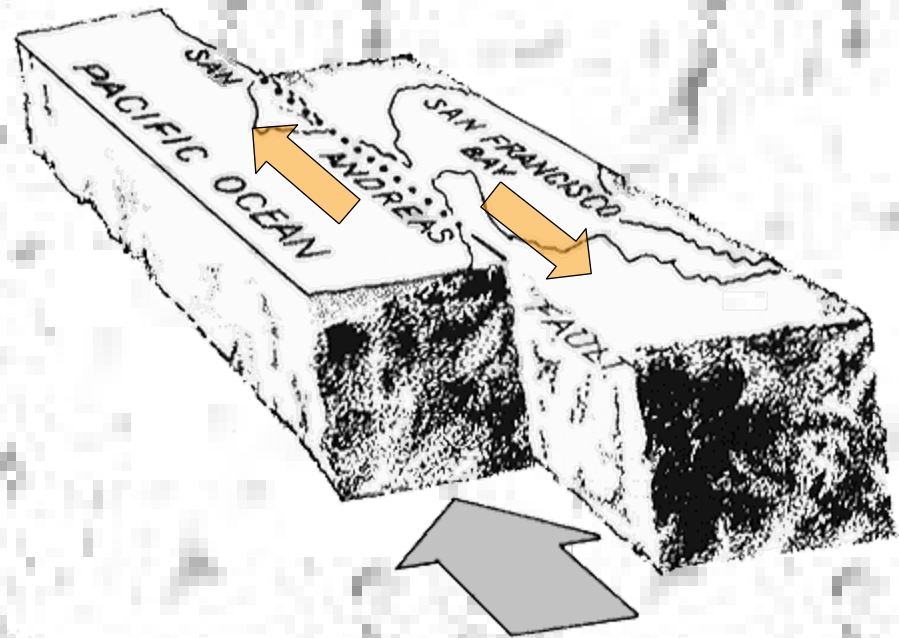
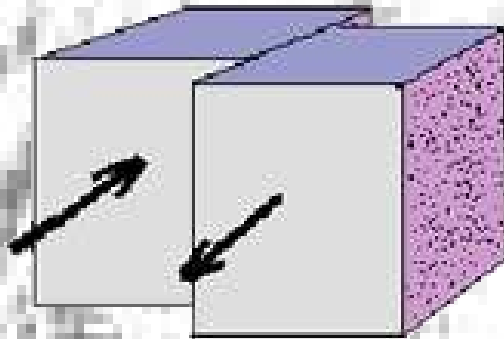


What can break rocks? Stress!

3. Shear Stress



shear stress



What can break rocks? Stress!

Weathering also causes stress in rocks, resulting in rock breakage.

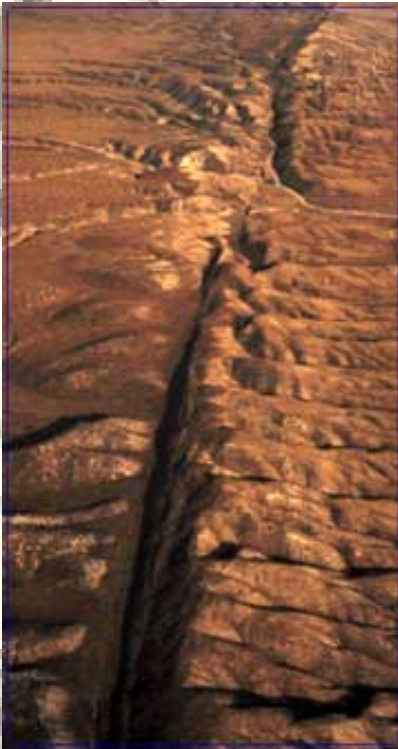


What can break rocks? Stress!

There are 3 types of weathering.

1. **Physical/Mechanical**

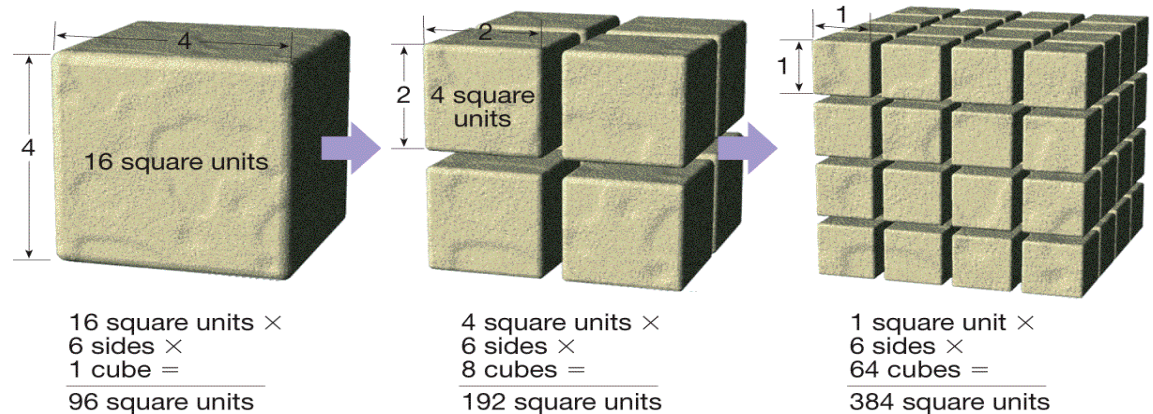
Wind
Water
Freezing
Repeated
wetting & drying



Mechanical Weathering

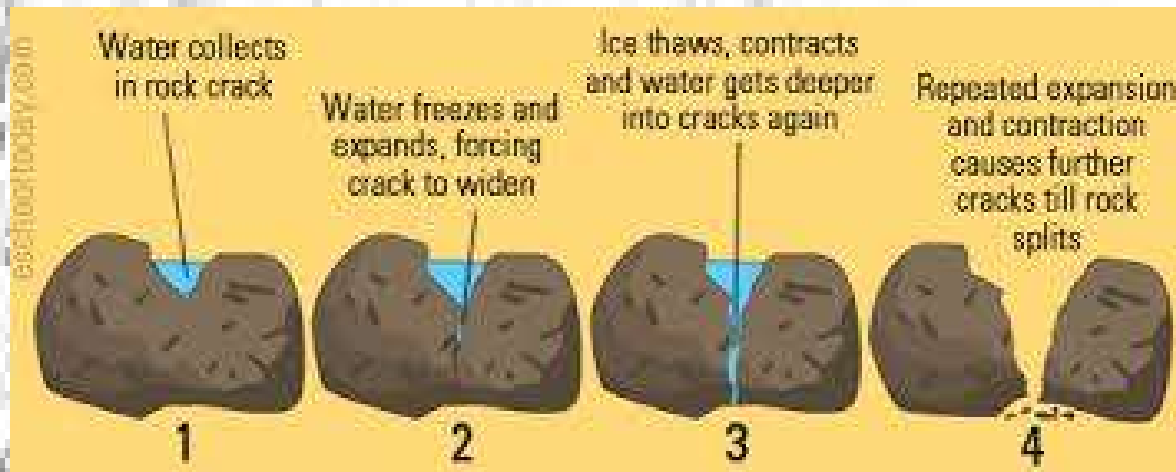
- ◆ This occurs when physical forces break rock into smaller and smaller pieces without changing the rock's mineral composition.

The more surface area exposed, the faster the weathering can occur.



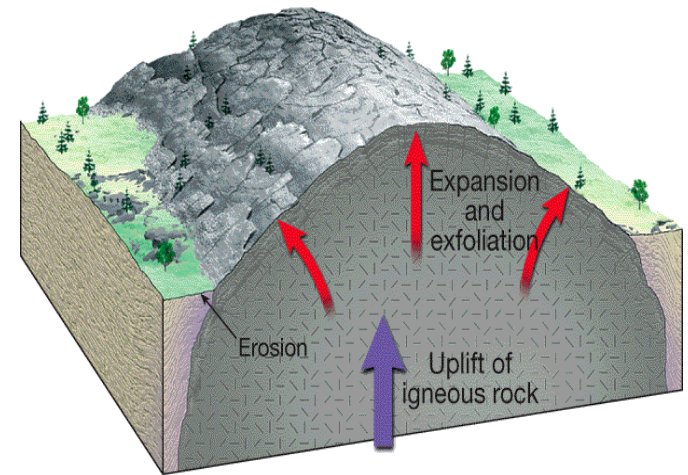
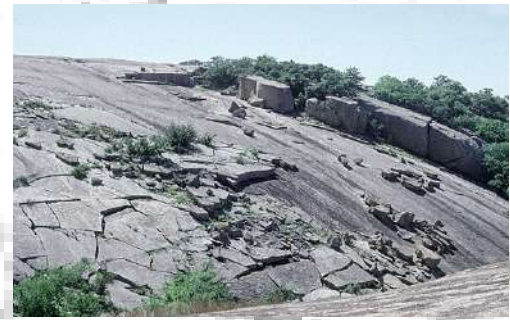
Frost wedging

The mechanical breakup of rock caused by the expansion of freezing water in cracks and crevices



Unloading

Reduced pressure on igneous rock causes it to expand and allows slabs of outer rock to break off in layers in a process called **exfoliation**.

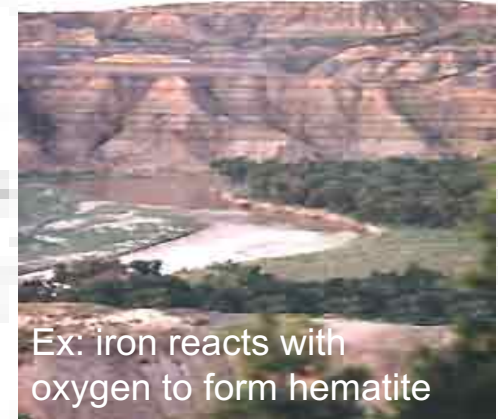


What can break rocks? Stress!

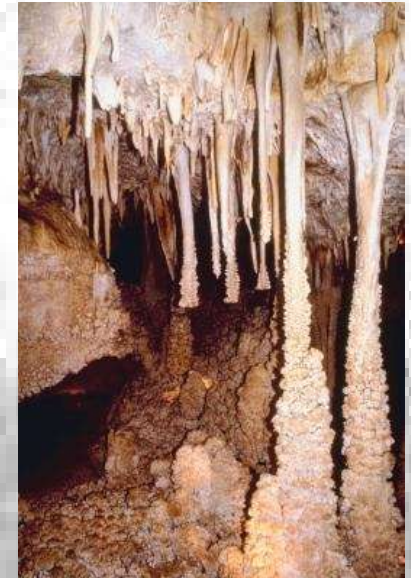


2. Chemical

Acid rain
Rust



Chemical weathering is the transformation of rock into one or more new compounds.



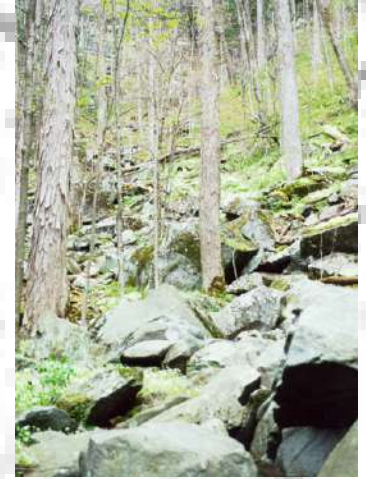
What can break rocks? Stress!

3. **Biological**

Tree roots

Animals

Human activity



What does rock strength depend upon?

Type of rock
Texture of rock
Chemical
composition
Internal
structures
Fluids in rock

◆ Differential Weathering

- Caused by variations in composition in the rock
- Creates unusual and spectacular rock formations and landforms

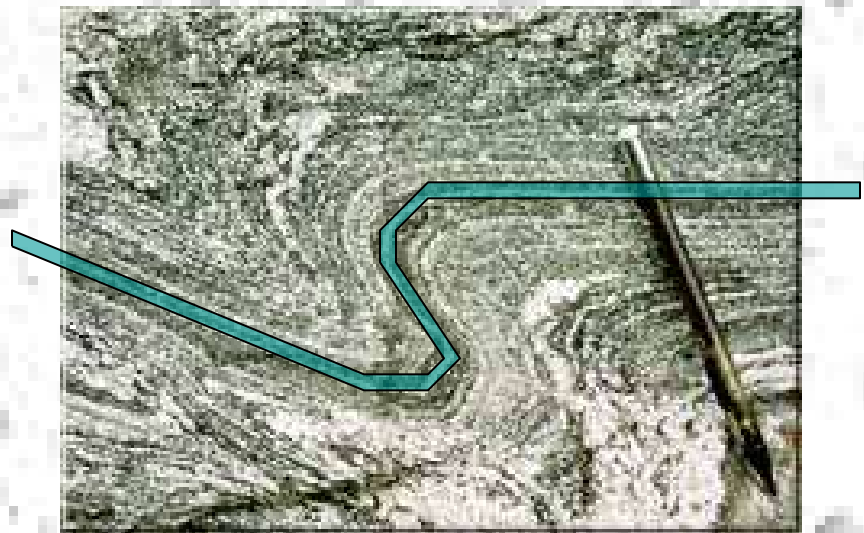


Badlands National Park



What does rock strength depend upon?

Planes of Weaknesses



Rate of Weathering



1. Rock characteristics

- Mineral composition and solubility
- Physical features such as cracks



1908



1969

Ex: acid rain

Rate of Weathering cont...

2. Climate

- Temperature and moisture are the most crucial factors.
- Chemical weathering is most effective in areas with high temperatures and abundant moisture.



Erosion

Erosion is the movement of weathered particles from one place to another

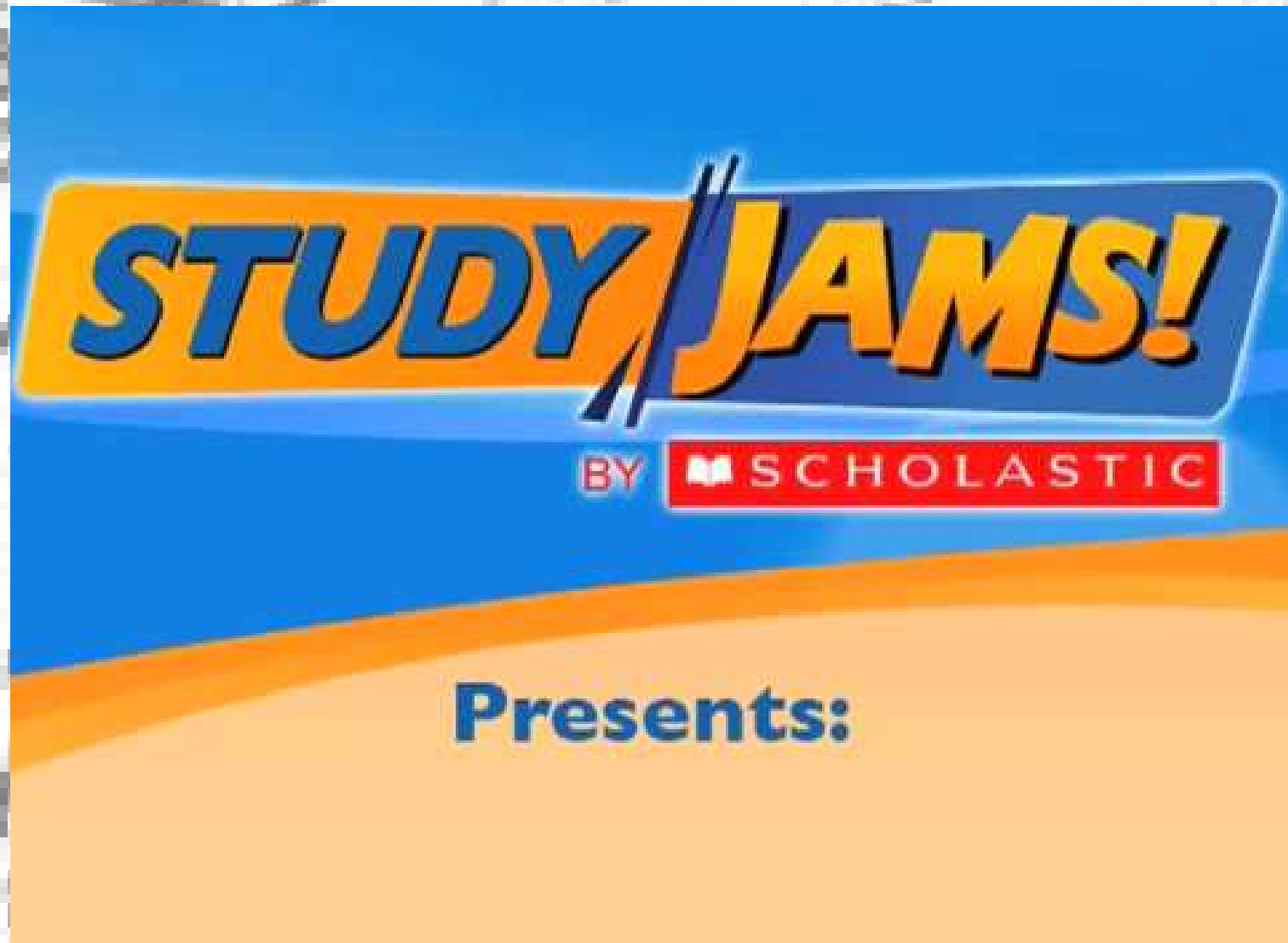


Water is the most effective physical weathering agent

Wind can also carry sediment

Ex. The Grand Canyon has been carved out by the Colorado River.

Weathering & Erosion



How do we determine rock strength?

Take samples



Observe



Use special testing equipment

