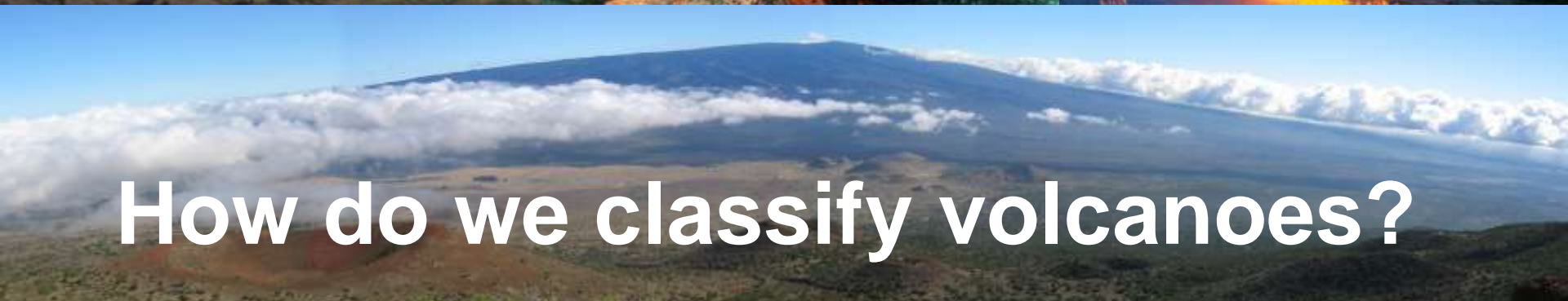


Geology 12
Igneous Rocks:
Part #3-
EXTRUSIVE STRUCTURES

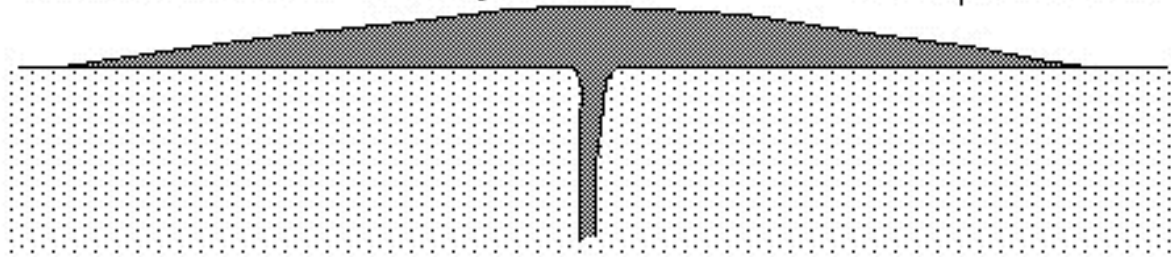
Lecture Notes, Figures, and Images



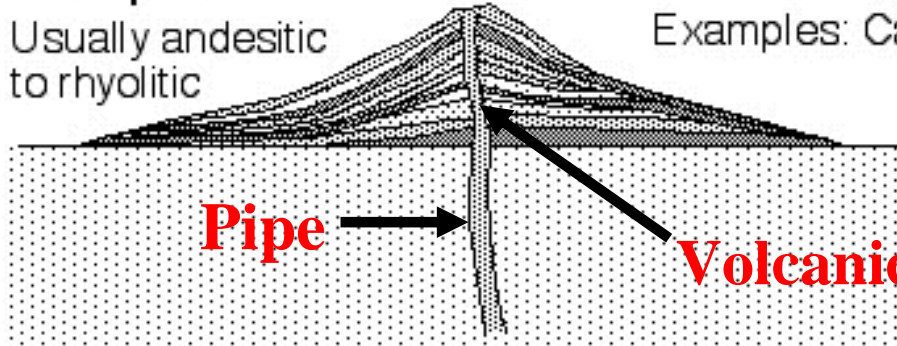
How do we classify volcanoes?

Kinds of Volcanoes

Shield Volcano Usually basaltic Example: Hawaii

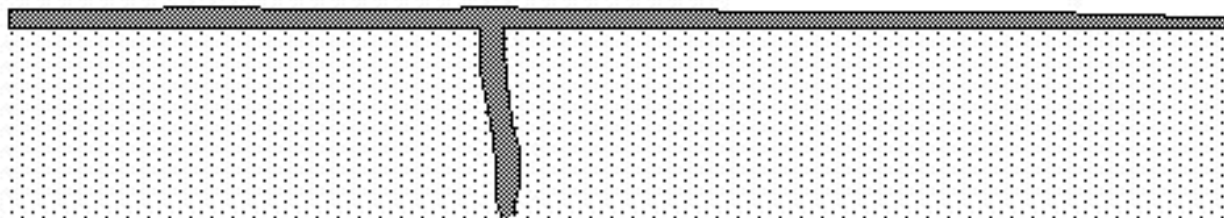


Composite Volcano or Stratovolcano Usually andesitic to rhyolitic Examples: Cascades; Mt. Fuji

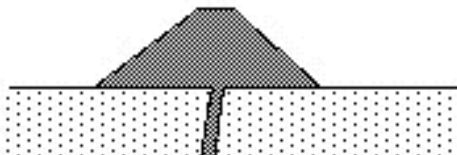


Volcanic Neck

Flood Basalt or Fissure Eruption Example: Columbia Plateau



Cinder Cone



Volcanic Dome Usually rhyolitic



Geol. 12 - Igneous Rocks - Part #2:

- 1. Volcanic / Igneous Extrusive Structures**
- 2. Volcanic Lava / Eject types**

Volcanic / Igneous Extrusive Structures :

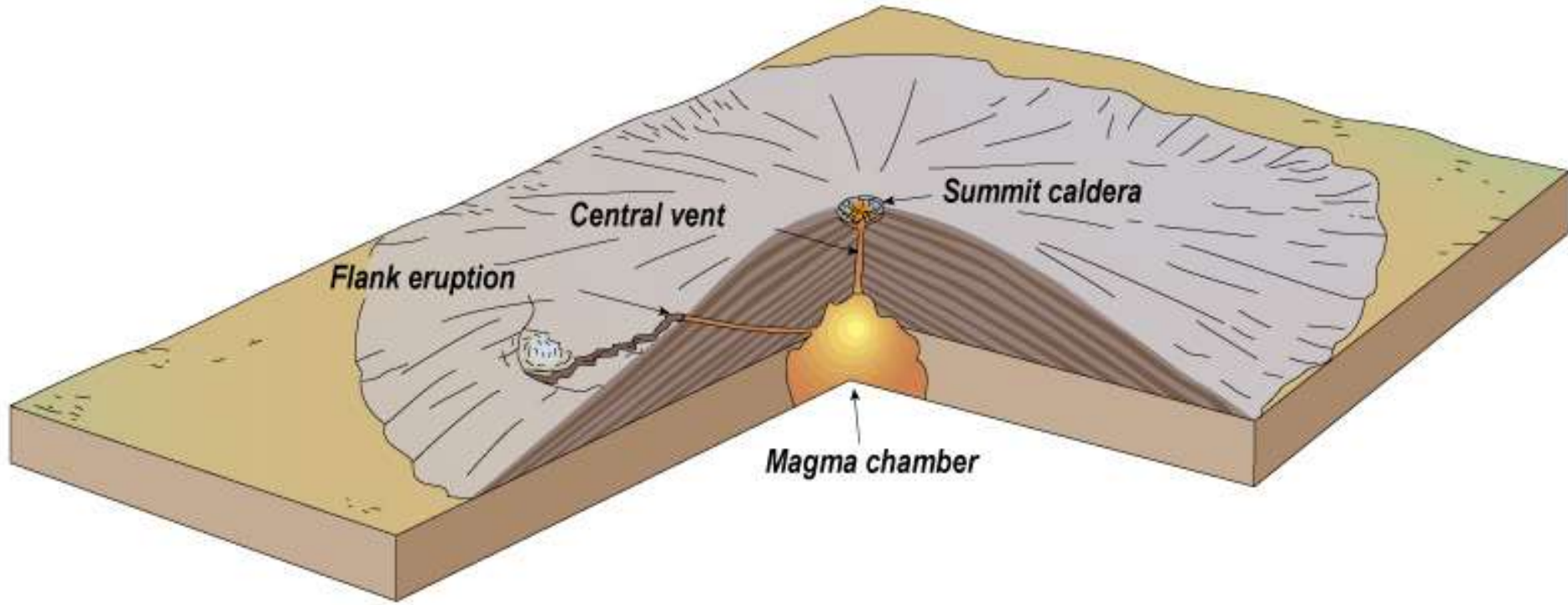
- 1. Shield Volcanoes**
- 2. Cinder Cones**
- 3. Composite Cones**
- 4. Columnar Jointing**
- 5. Volcanic (Lava) Domes**
- 6. Lava Plateaus**

Shield volcano



Note the low profile...Why is this so?

Built up of many thin layers of **mafic** lava flows



(b) Shield volcano

Low viscosity!!!

Shield volcano





Shield volcano

CINDER CONE

Built of pyroclastic ejected lava

What's this?

Steeper sides!





Cinder cone



Cinder cone



Cinder cone



Cinder cone

COMPOSITE CONE



Mt. Fuji - A Famous Composite Cone



**Composite cone
(= stratovolcano)**

Mt Fuji, Japan





Mount Rainier





Mount Baker - seen from Vancouver



Mount St Helens



Mount St Helens - 2014





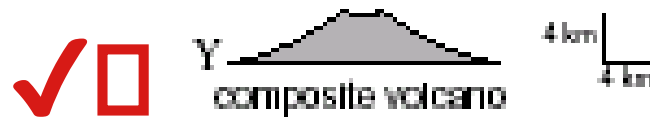


LAVA DOME





A Summary of Basic Volcanic Rock Structures - Cone Types:



Volcanic feature	Height in km	Width in km	Angle of slope
W	1.5	100	1–2 degrees
X	10	100	5–10 degrees
Y	5	20	20–30 degrees
Z	0.3	1	30–40 degrees

Volcanic (LAVA) Dome

Found at a felsic volcanic vent



DISTANT VIEW OF A LAVA DOME!



USGS Photo by Lyn Topinka, May 19, 1982

Mount St Helens, Washington

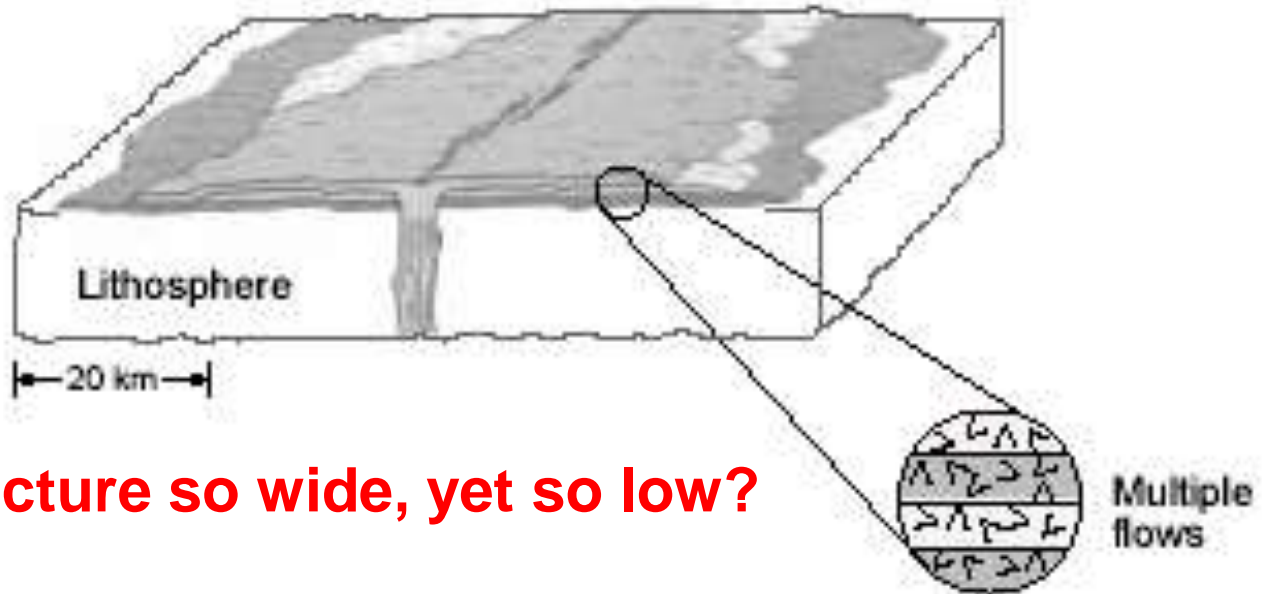
Same Dome...Close Up!





Photo by Lyn Topinka

Lava Flow / Plateau:



Why is the structure so wide, yet so low?

**What Type of Magma would Produce this Structure?
Explain How You Know...**

Rift Zone

A “rift” or rip in the Earth’s surface through which lava flows onto the surface...

Lava Plateaus arise from them!



**A close up of One Branch of A "Rift Zone"
Also Known As A "Fissure" –**

**Therefore eruption from these are
known as "Fissure Eruptions"**





What is this?

Sill

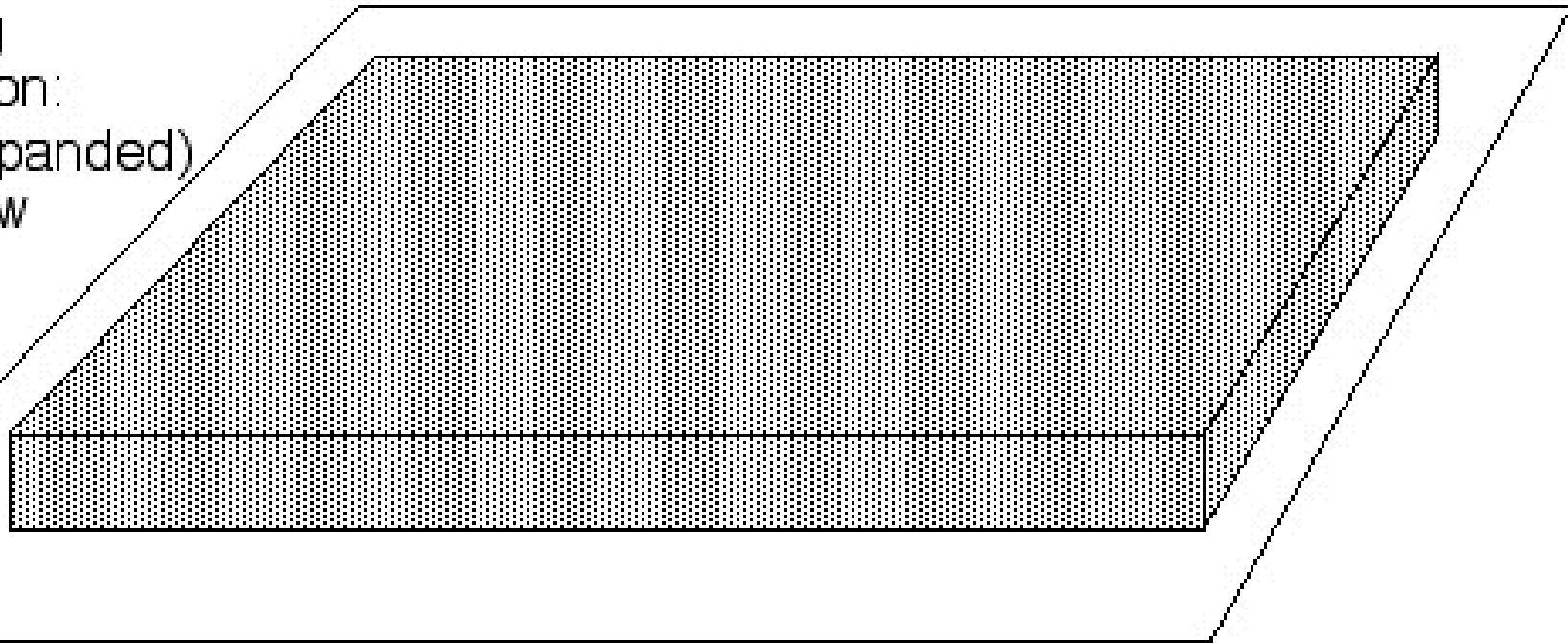
Columnar Jointing:



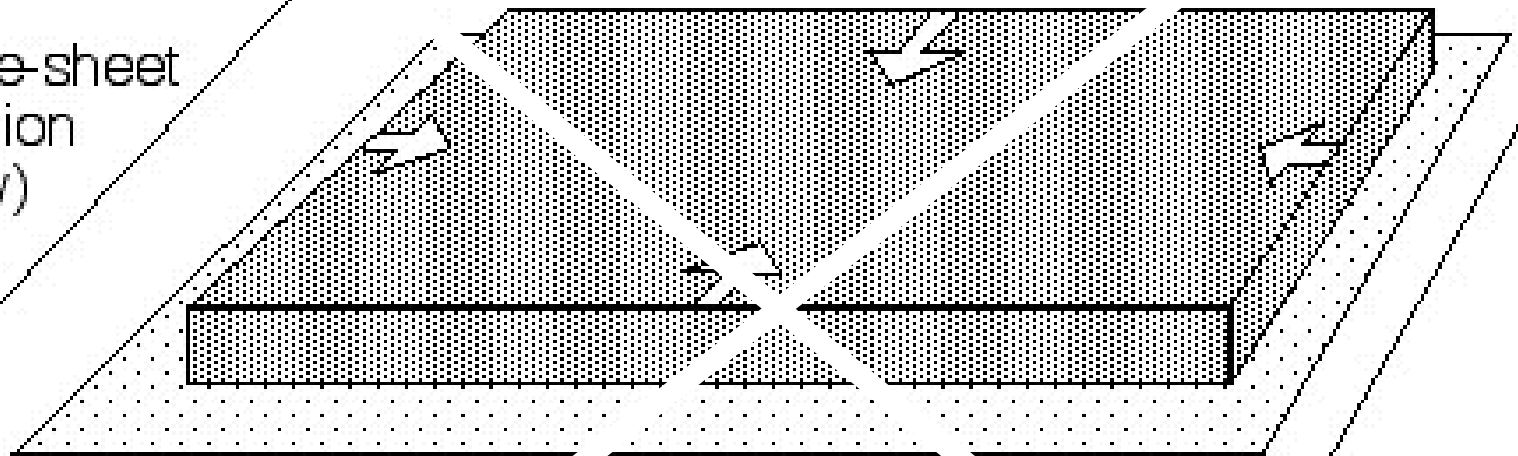
**Results From Rapid-Cooling Basalt
Contracting & Cracking!**

Two imaginable modes of contraction for a hot lava flow

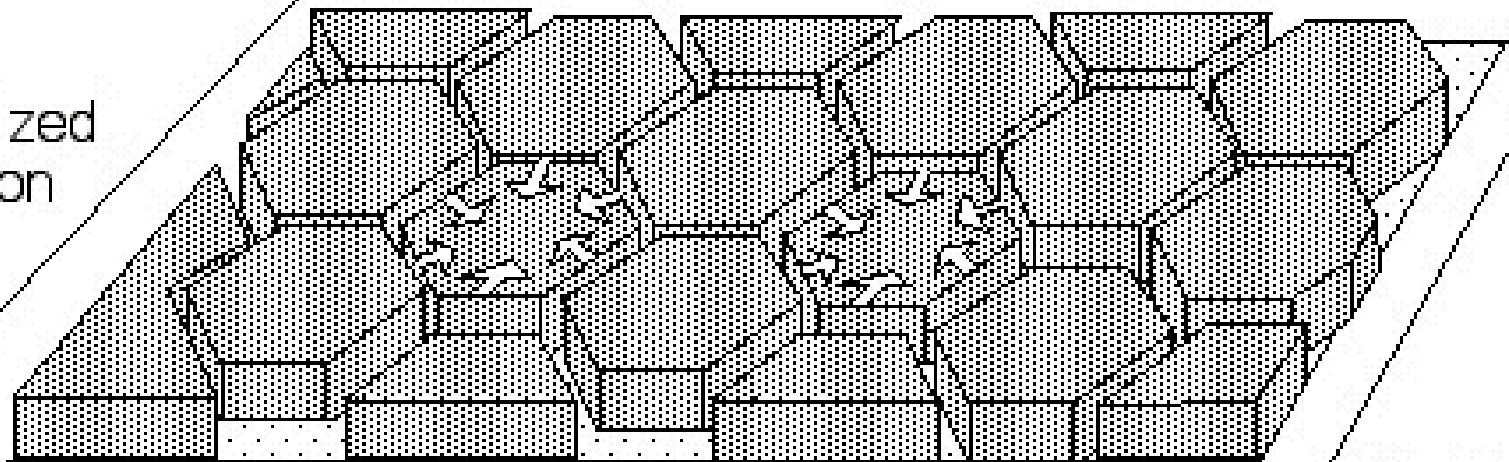
Starting
Condition:
Hot (expanded)
lava flow



1. Whole-sheet
contraction
(unlikely)

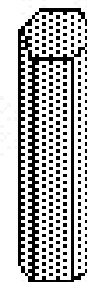


2. Localized contraction



Vertical columnar joints

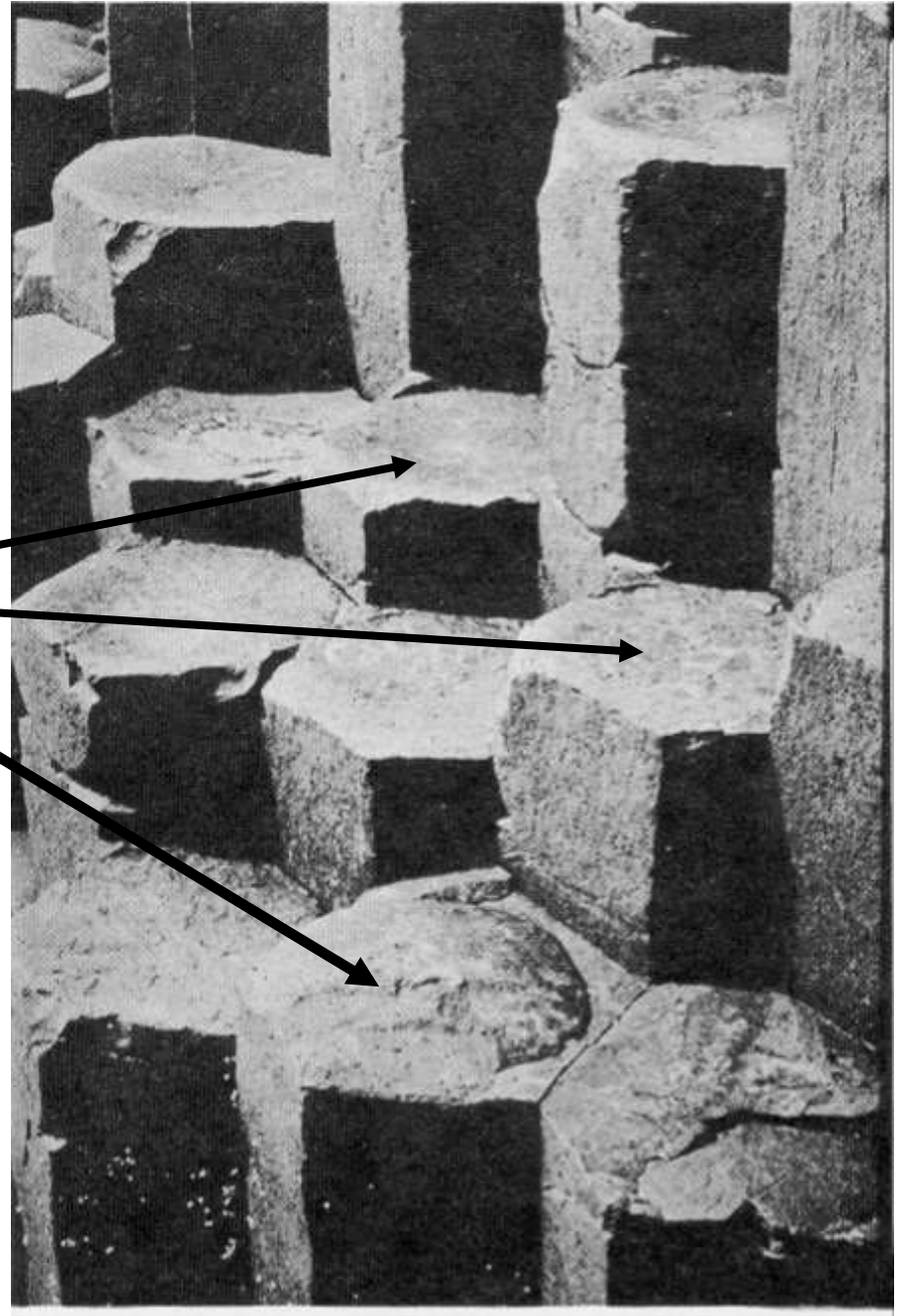
Actual columns of basalt are more elongate:



LBR 1/2002

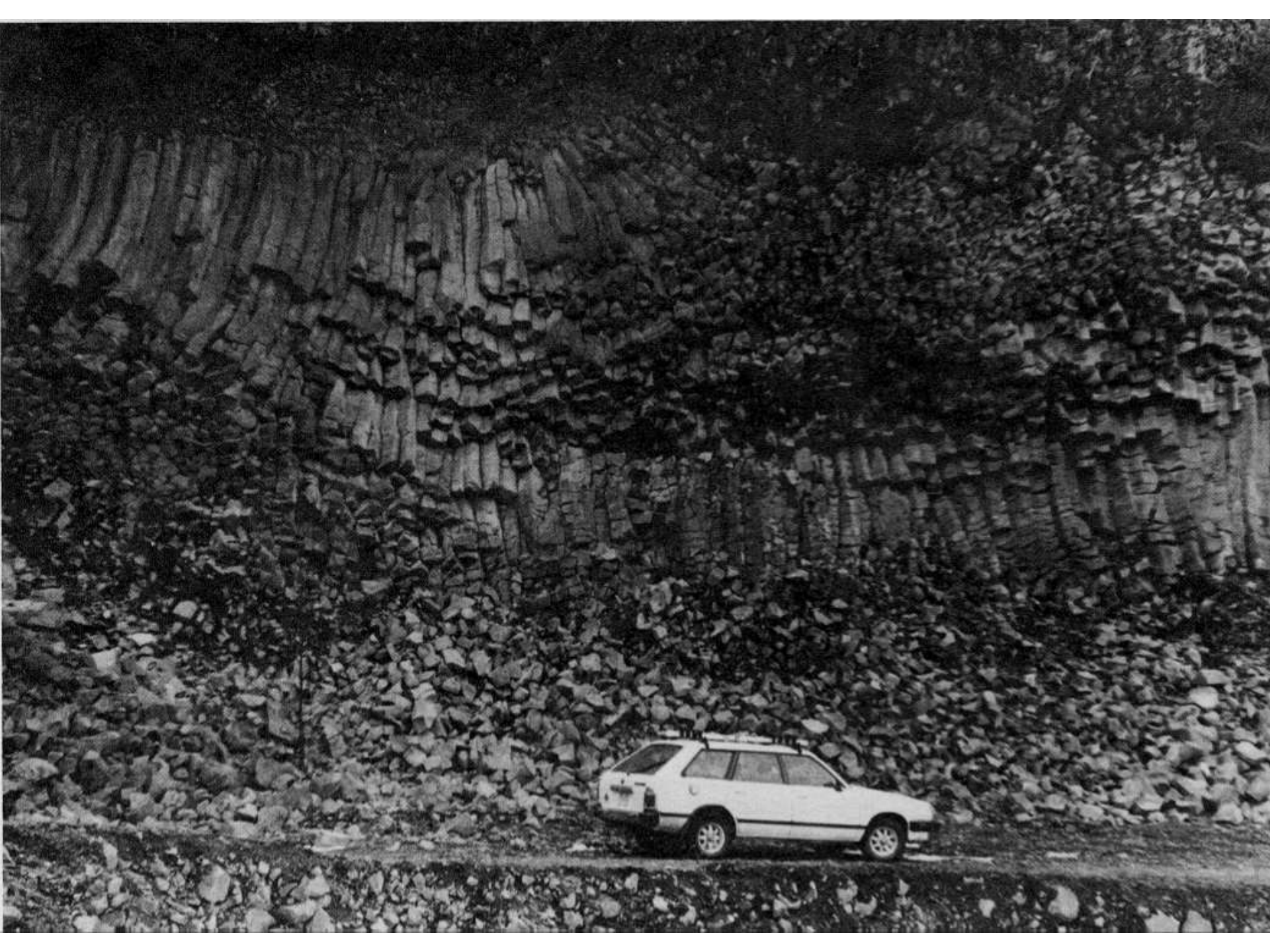
A Close Up!

Individual Columns.



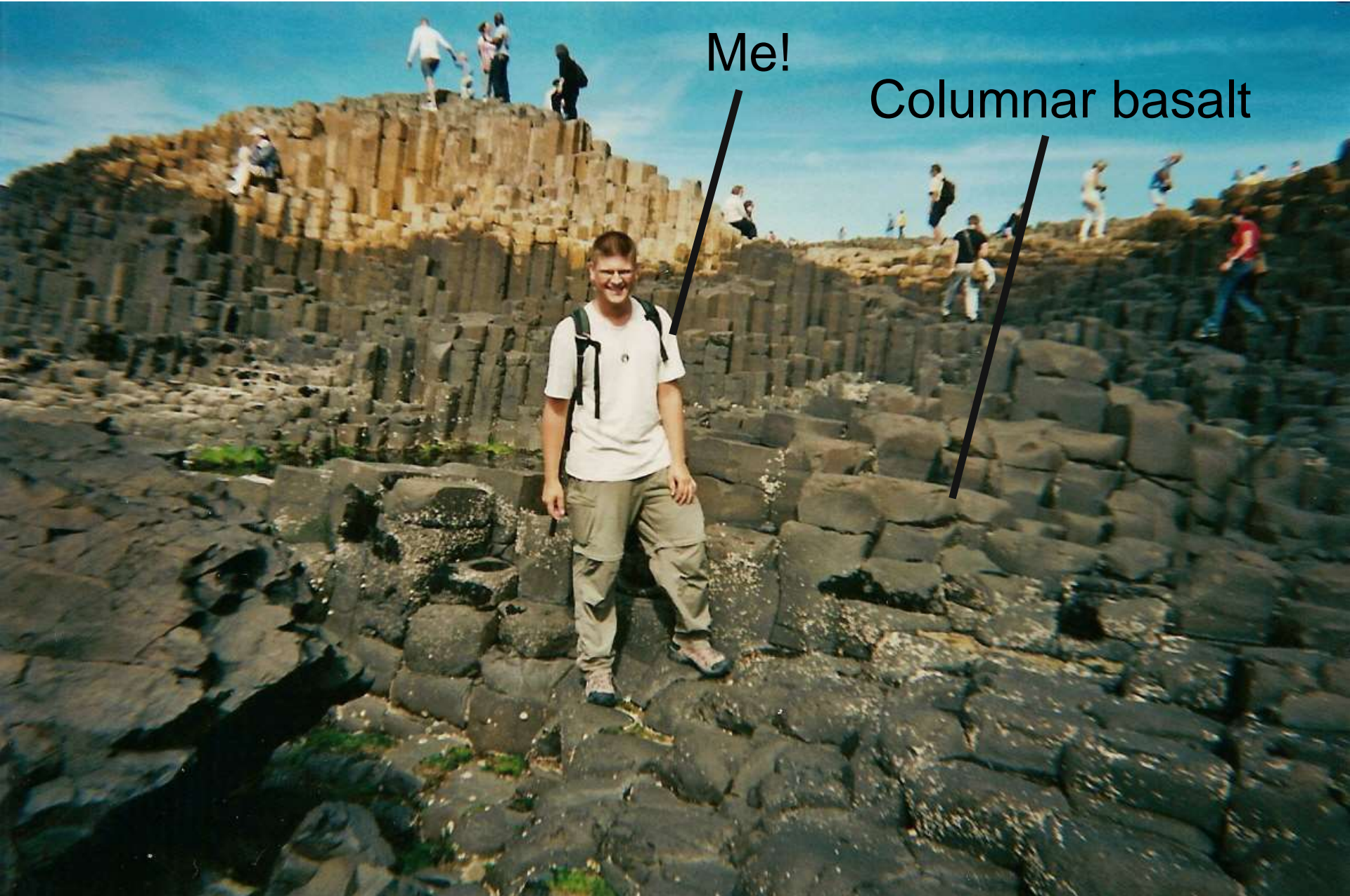
As Seen From Above...







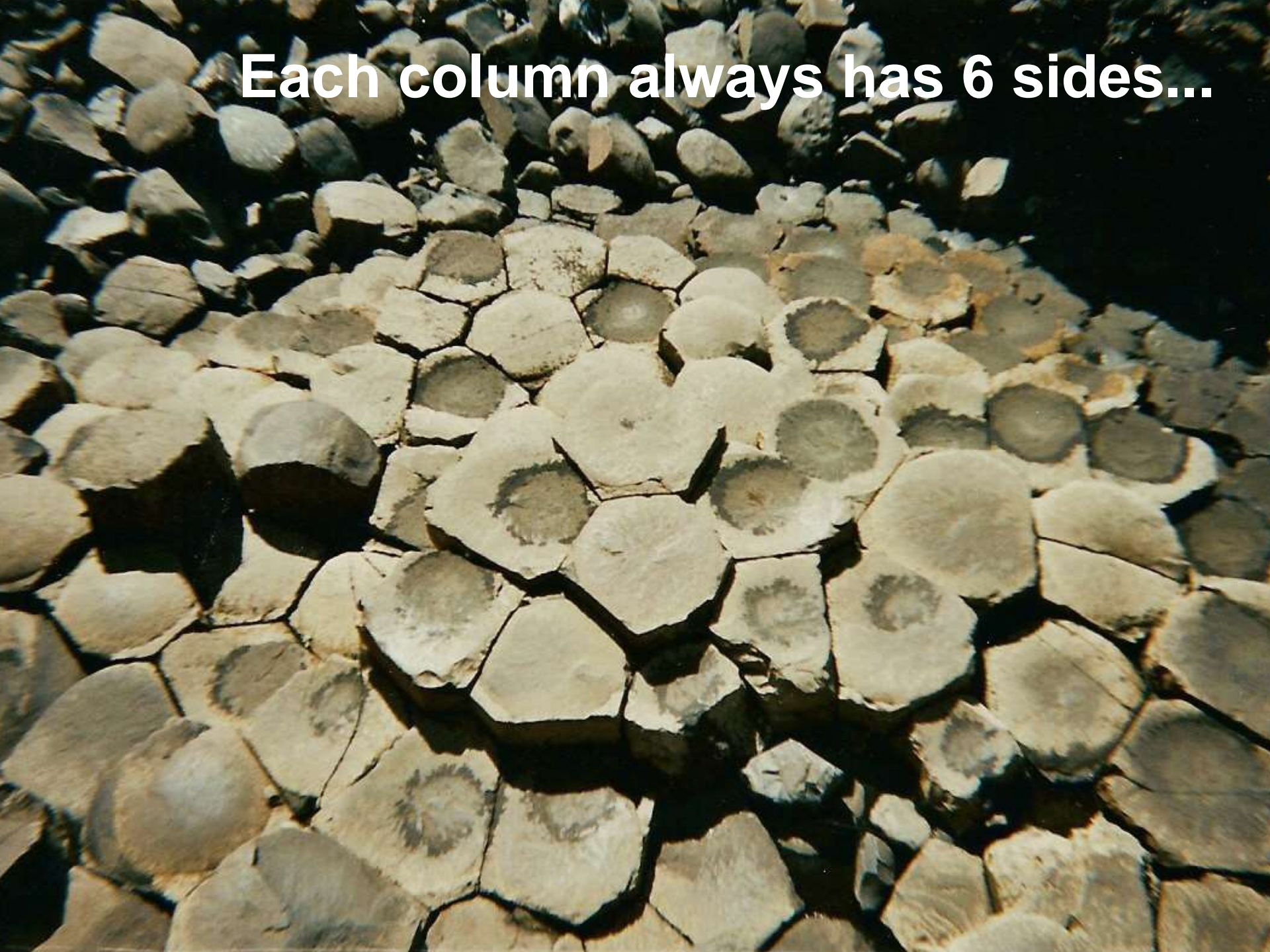
Giant's Causeway - Northern Ireland (2002)



Me!

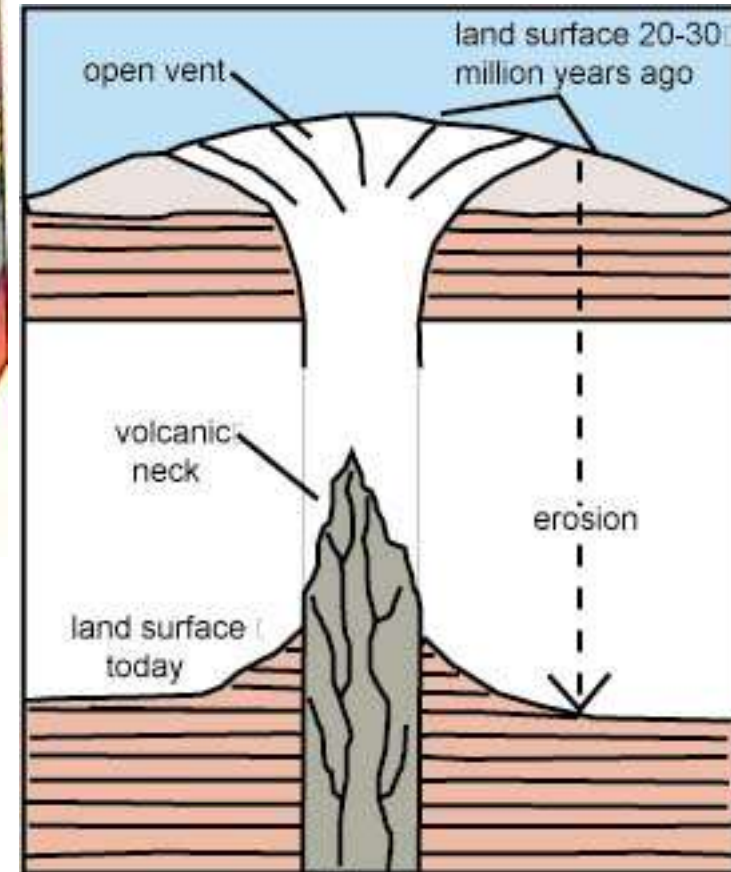
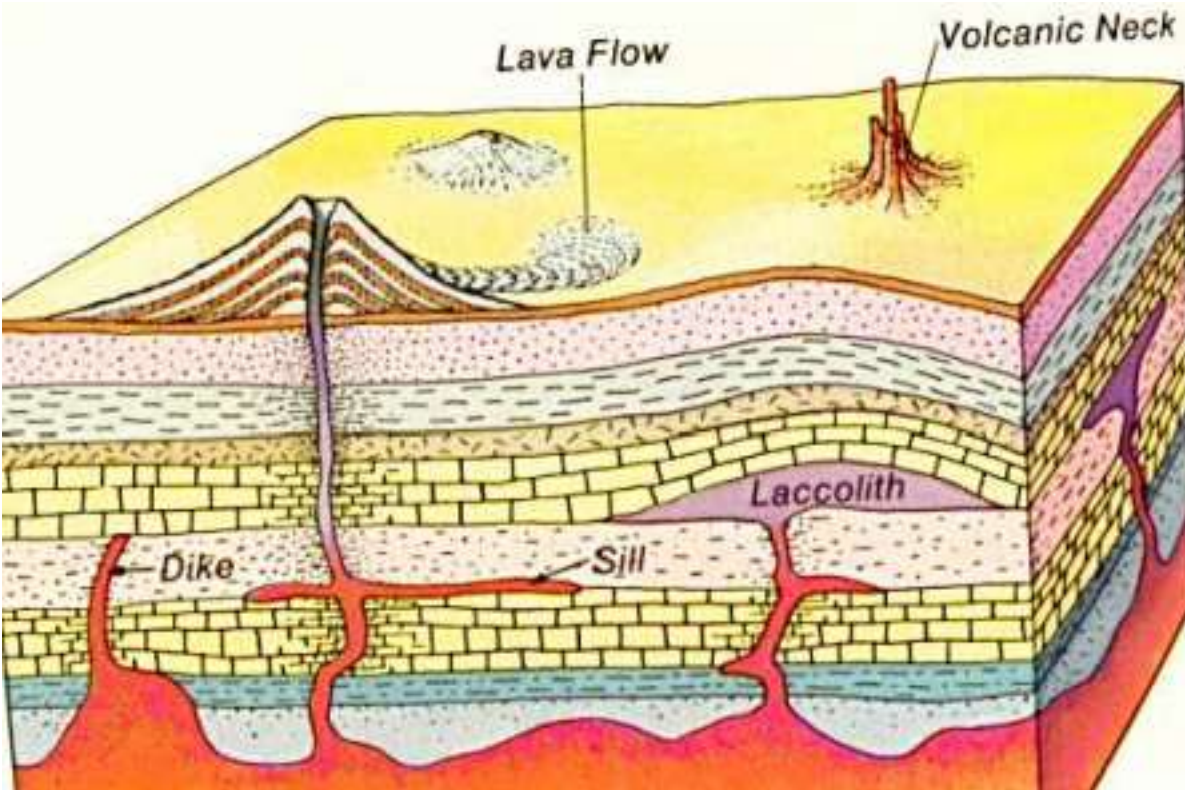
Columnar basalt

Each column always has 6 sides...





Volcanic neck - column of solidified lava inside a volcano vent, exposed by erosion



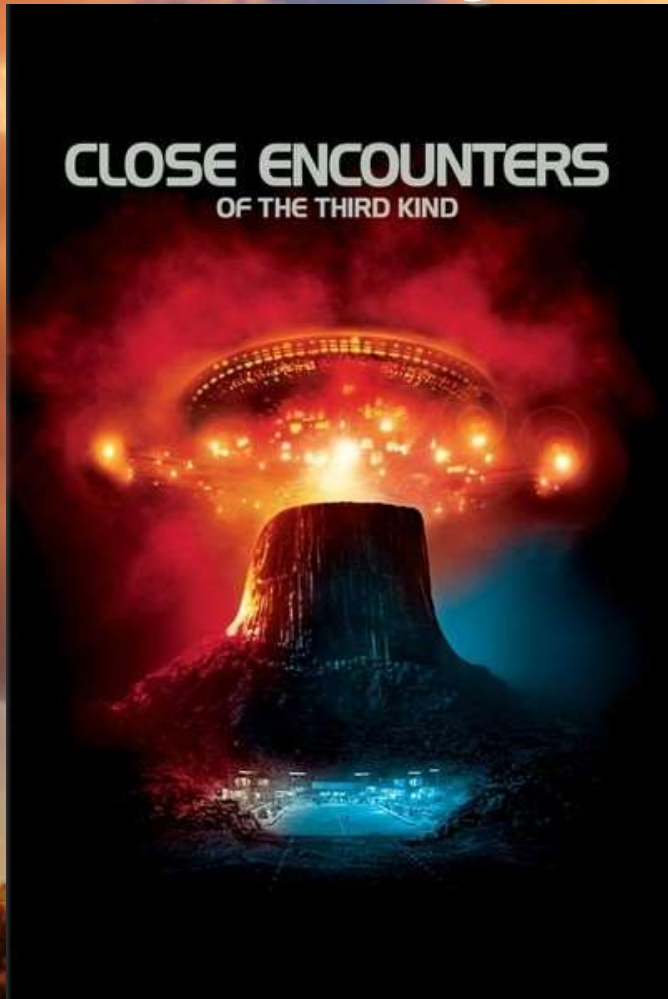
Shiprock - New Mexico...

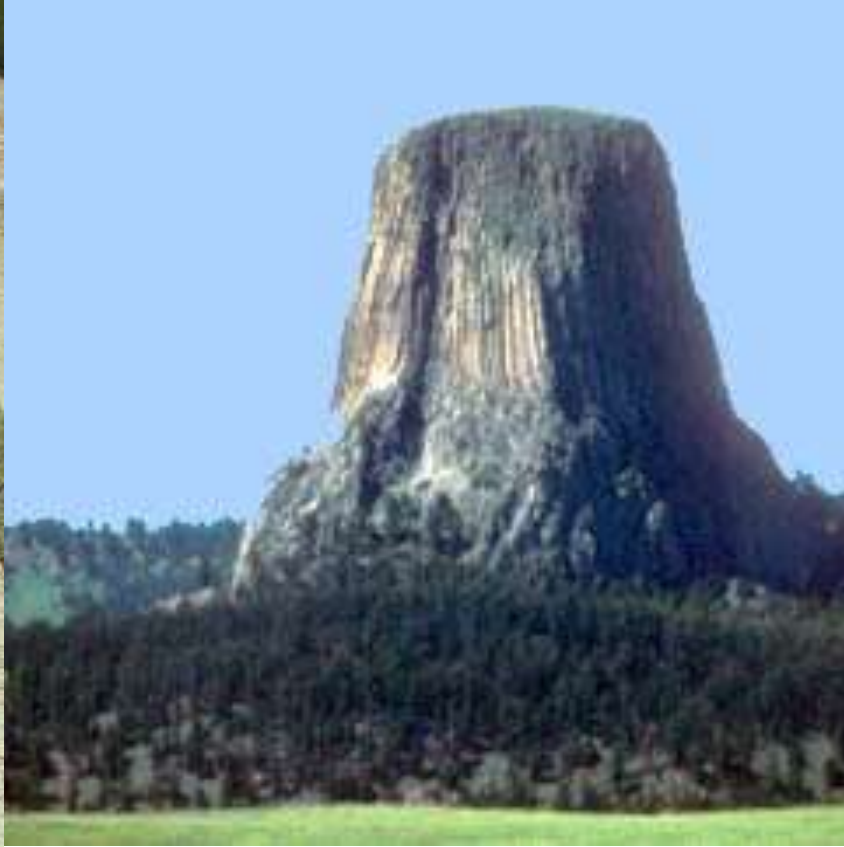




Devil's Tower - Wyoming...

A classic volcanic neck demonstrating columnar jointing!





Drawing Review Assignment

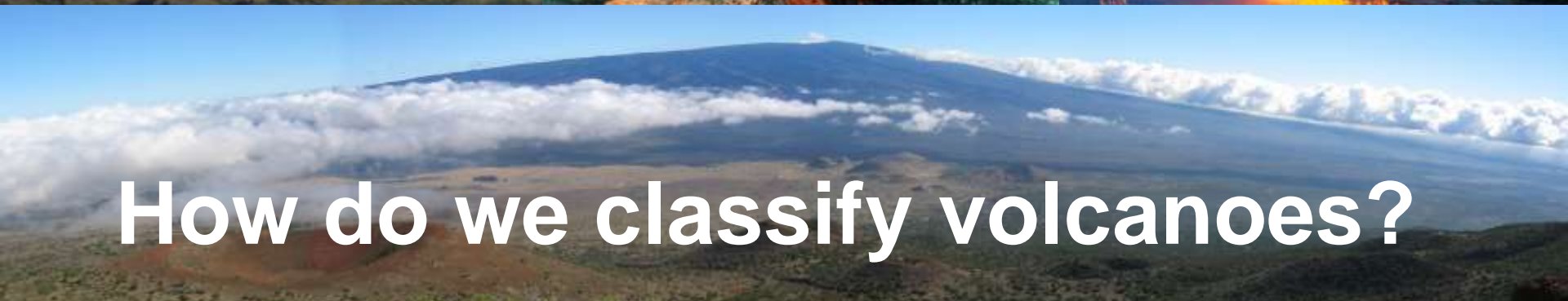
Part 2

Draw all igneous extrusive structures to top half of page

(Shield Volcano, Cinder Cone, Composite Volcano,
Columnar Jointing, Volcanic Dome, Volcanic Neck,
Lava Plateau)

+

Definitions on back of sheet



How do we classify volcanoes?

Volcanic Lava / Eject types:

- Formed From Lava
- **Lava** = magma that reaches the surface!
- You need to know Four main Types of materials ejected from volcanoes:

Ash Flows

Pillow Lava

Pahoehoe

AA

Ash Flows

- Not really lava, rather a dense cloud of fine, hot, **airborne ash mixed with gasses**
- . **a.k.a....Nuee Ardente.**

ASH FLOW

a.k.a. “Nuee Ardente”
or “Pyroclastic Clouds”



Ash Flow - Mt. St. Helen's



**Ash flows are
deadly...they travel at
speeds up to 700 km/h
and incinerate/asphyxiate
everything in their path...**

You can't outrun them!

Ash Flows are the most devastating part of volcanic eruptions!

What type of Volcanic cones would create this phenomena?

What would the composition of the erupting material be?

How can you tell?

Ash Flows Create Thick Layers Of Ash!!

Theses Layers are from successive eruptions of Kilauea Volcano in Hawaii in 1790



Pillow Lava

- Formed when lava is extruded **underwater**.
- Results in bulbous **pillow shaped deposits**.



PILLOW LAVA!



Diver



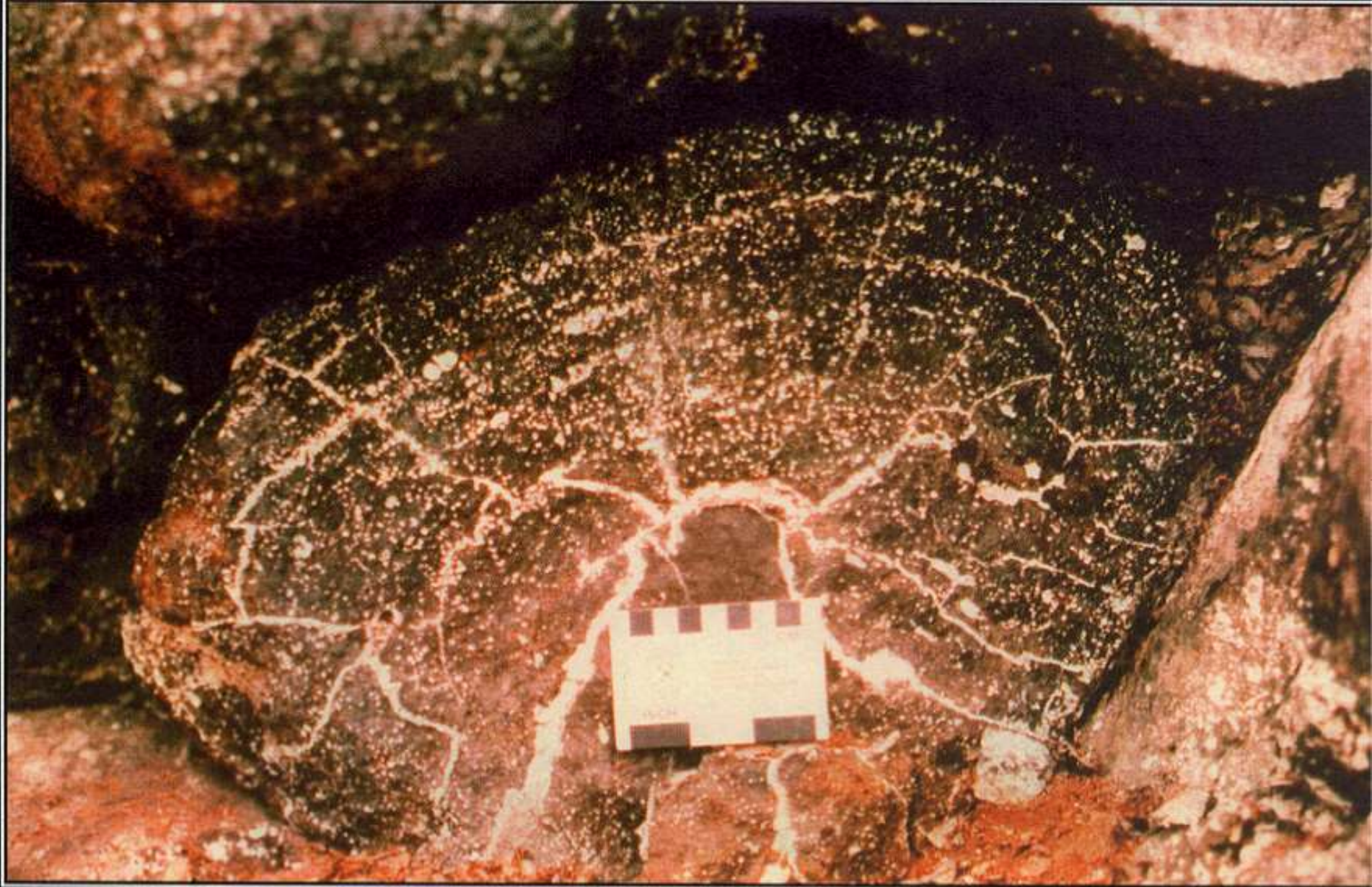
More Pillow Lava - Note Roundness in Cross-Section!



Hammer intended to provide a size scale

Pillow lava





Photograph 4

Pillow lava

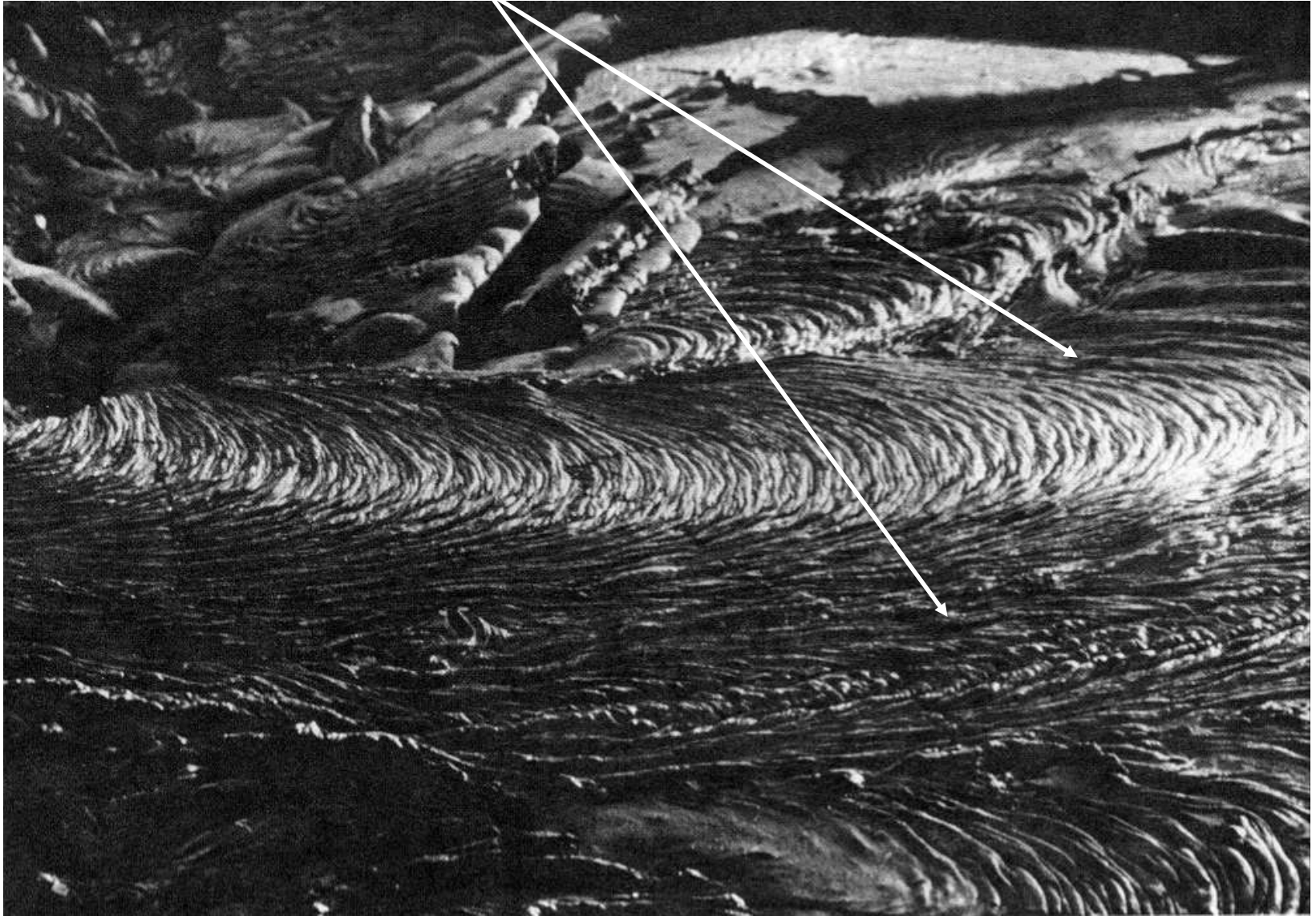


Pillow lava

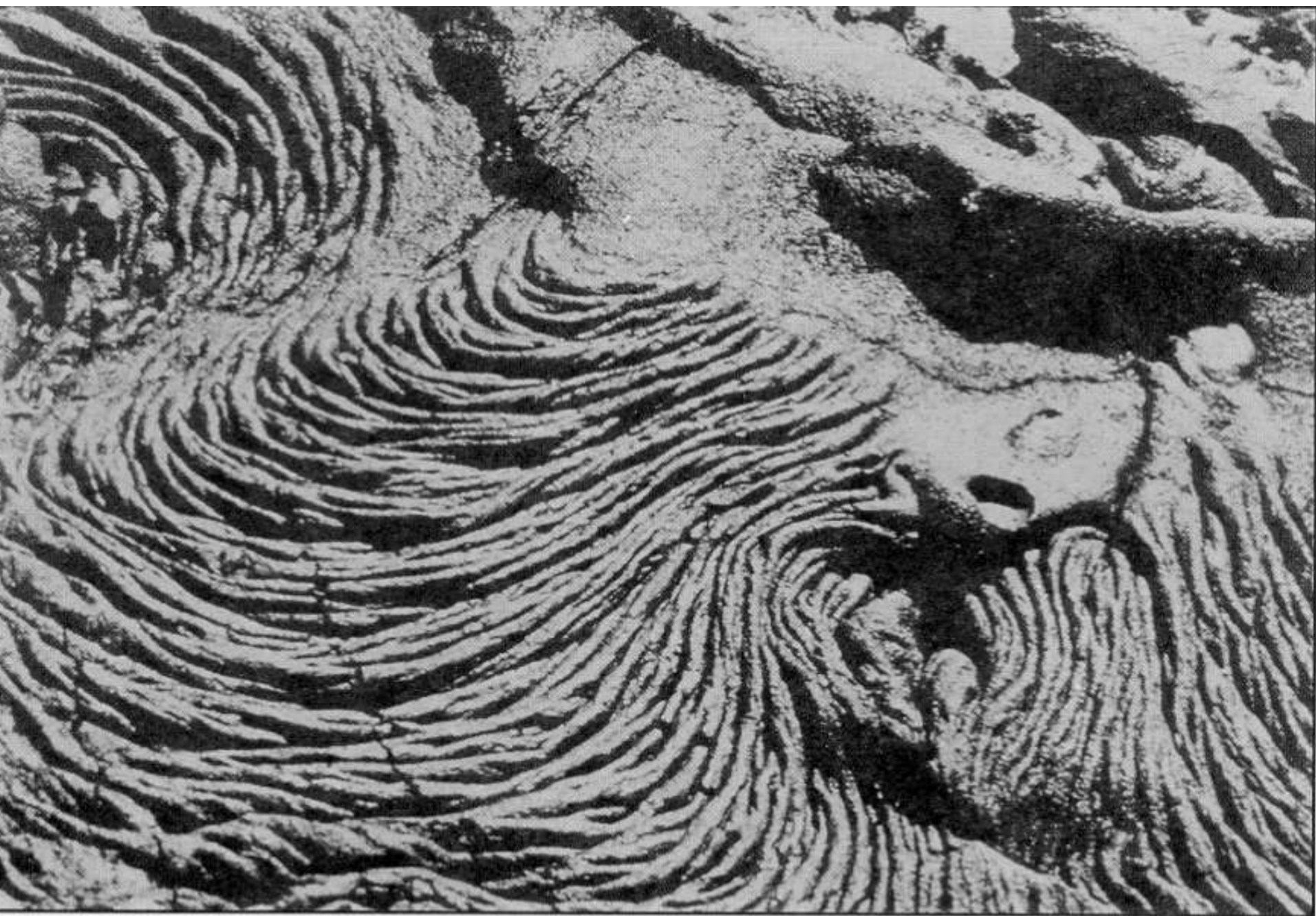
Pahoehoe

- Very “Runny” Fluid lava.
- Cools with a smooth ropy surface.

Notice The ropy Texture!!



Pahoehoe lava



Hot Lava - Cooling to form Pahoehoe...



Pahoehoe lava





Pahoehoe lava

pahoehoe texture



Guess what!?



Aa

- Very **Thick** lava.
- Produces **rough, blocky** lava flows.

A man named Jeff is climbing a dark, jagged volcanic rock formation. He is wearing a white t-shirt, blue shorts, a white cap, sunglasses, and tan shoes. The background shows a vast, flat landscape under a clear sky.

Jeff

a-a texture

Lava Cooling To Form "Aa"



Blocky, Rough "Aa"



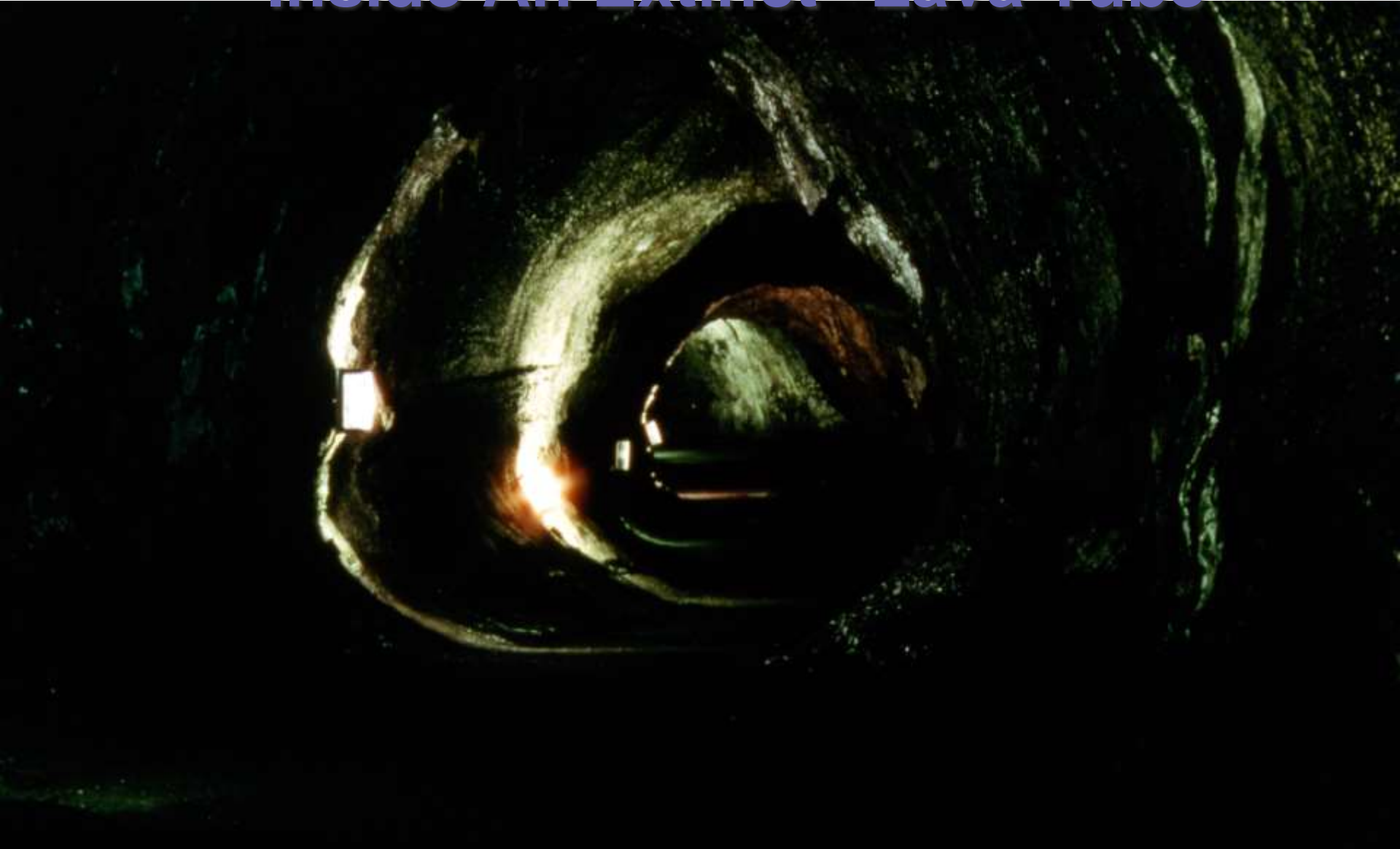
Lava River - Forms Lava Tubes!

Aa

Pahoehoe



Inside An Extinct "Lava Tube"





Lava can be destructive, but rarely kills people because it moves slowly and we outrun it...it tends to damage property that gets in its way!

Ash Flows - a.k.a. “Nuee Ardente” or “Pyroclastic Clouds” are the real danger to human life!



See the person watching the "Show"