

**M.Sc. Remote Sensing and GIS**

**RT-203**

# **Remote Sensing in Geosciences**

## **Unit-III**

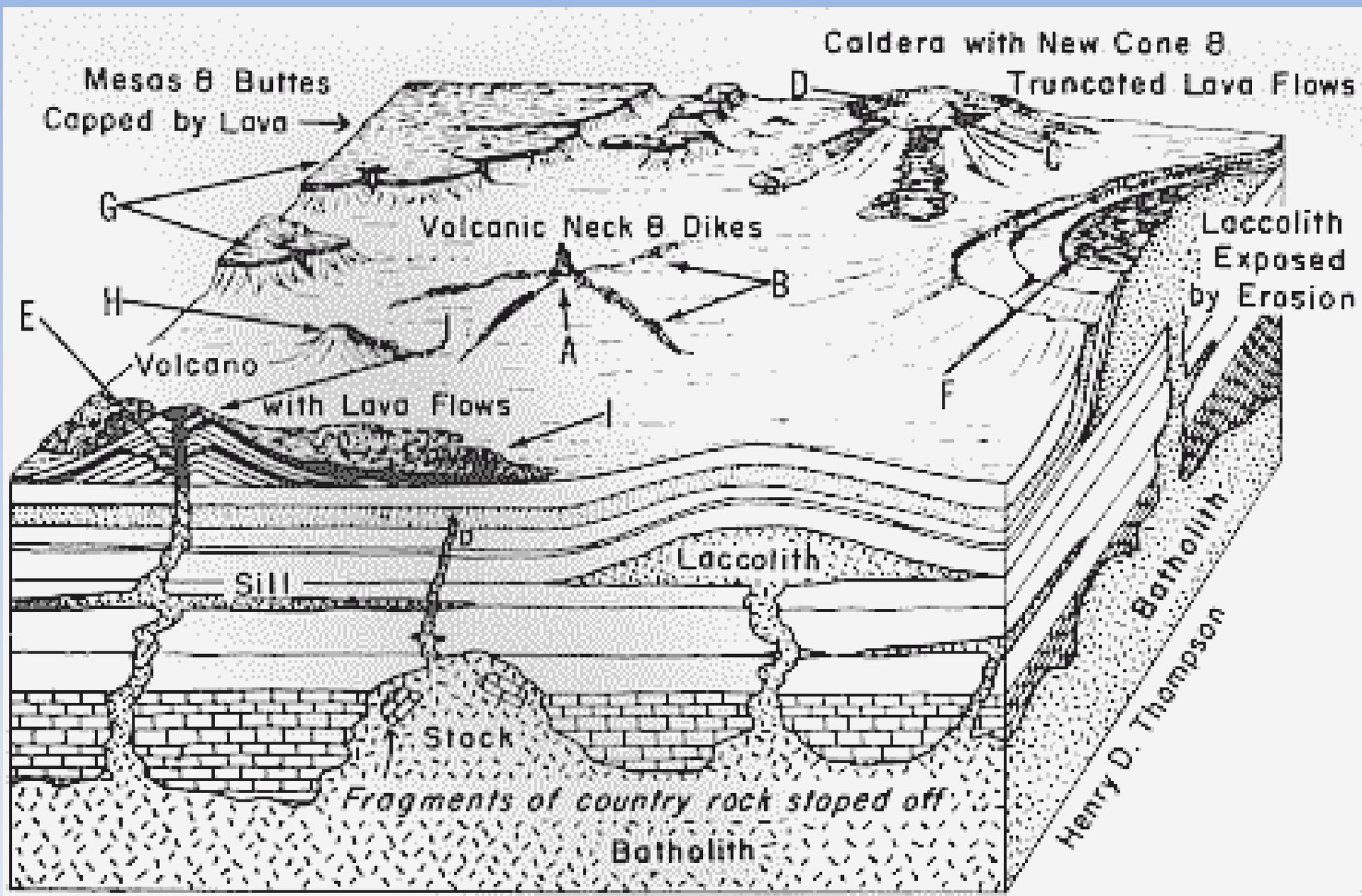
### **3.3 Interpretation of Landforms related to Igneous rocks**

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# Igneous Land Forms

- Igneous landforms can usually be placed in one of two camps: Intrusive and Extrusive.
  - **Intrusive** forms result from magma solidifying *beneath* the earth's crust, then later exposed by earthquake, erosion, glacial activity, etc.
  - **Extrusive** landforms result when hot magma reaches the earth's surface in a liquid form, then solidifies.
- Rock resulting from intrusive activity includes obsidian, fine grained basalt, etc. and other batholithic rock.
- Rock resulting from extrusive activity such as pumice, "lava rock" etc. frequently shows evidence of the outgassing that occurs as the magma cools.

- Includes Dikes, Necks, Calderas, Cinder Cones, Lava Domes, Composites, Lacolithic domes, Lava flows, stock.
- Much of the igneous landforms described here can be best understood by referring to the following illustration-



# Arches, Bridges

- Some natural arch and bridge formations are the result of lava tubes, in which the majority of the tube has subsequently collapsed and a small section remains. If the length of the tube or tunnel is greater than the width, it is not technically an arch.



# Batholiths

- Large areas of intrusive igneous and/or metamorphosed rock exist on every continent. When these are exposed, usually by erosion or glacial activity, they are known as Precambrian shields.
- Well known hunks of exposed batholithic formation, called "Monadnocks" or "Stocks" include Enchanted Rock in Fredericksburg, TX and Stone Mountain, GA.

# Enchanted Rock in Fredericksburg, TX



Stone Mountain, GA



# Buttes

- Most buttes are not igneous forms. Sometimes volcanic necks are locally referred to as a butte. More often, buttes are a combination of erosion forms and igneous forms.
- For example, some would call Devil's Tower a "butte," when it is actually a neck.

# Devil's Tower



# Canyons

- Igneous forms seen in are usually intrusives; the magma crystallized beneath the earth's crust but has since been exposed by whatever formed the canyon. Some igneous forms in canyons are extrusive, such as the lava flow in the western portion of Grand Canyon NP; the lava flowed after the canyon had been formed.

# Grand Canyon, NP



# Cinder Cone

- Volcanic formations, sometimes called craters, sometimes buttes, sometimes cones...characterized by the presence of black volcanic sand. One of the best places to view this phenomenon is Craters of the Moon, an area in Idaho administered by the National Park Service. Another prime location is near Flagstaff Arizona, where dozens of black cinder cones can be explored.

# Black Cinder Cone, Flagstaff Arizona



# Crater

- Unfortunately this word is frequently used to describe two similar looking phenomena that couldn't possibly be more different in origin. One is the result of something blasting *out* of the earth -- while the other is the result of something blasting into the earth. Both are called **craters**.
- Turn to northern Arizona, where Sunset Crater  
Sunset "Crater" is actually an inactive volcano.

# Sunset Crater, North Arizona



# Dendritic Wash

- When drainage channels create patterns across a relatively flat plain of old, metamorphosed batholiths. Eventually the channels narrow, and leave a checkerboard type pattern across the area. One of the most accessible and visible examples of dendritic drainage can be seen at Petrified Forest National Park in Arizona.

**Dendritic Drainage, Petrified Forest National Park, Arizona.**



# Dikes

- Dikes indicate volcanic activity. Appear frequently as "veins," but not necessarily. Intrusion in weaker or older cracked rock.

