

# Atlas of Igneous Rocks and Their Textures

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**ELBS**

**LOW-PRICED EDITION**

# Part 1: Crystallinity

- Igneous rock range in crystallinity from entirely glass. Adjectives used to describe these states are shown on the following scale:

100 % crystals

100 % glass

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holocrystalline

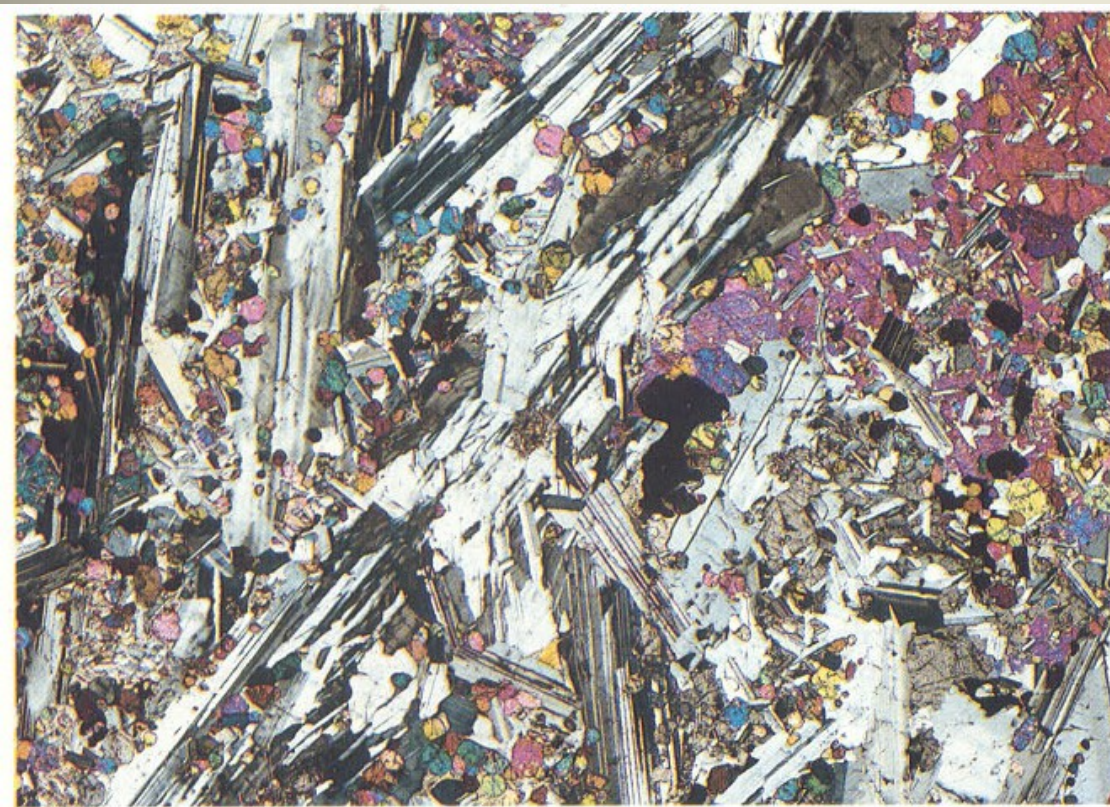
hypocrystalline<sup>1</sup>  
or hypohyaline

holohyaline

The adjectives *glassy*, *vitreous* and *hyaline* all indicate that a rock is more or less completely glass.

<sup>1</sup> Hypocrystalline rocks can be described more precisely by stating the relative proportions of crystals to glass.

## Holocrystalline anorthositic gabbro

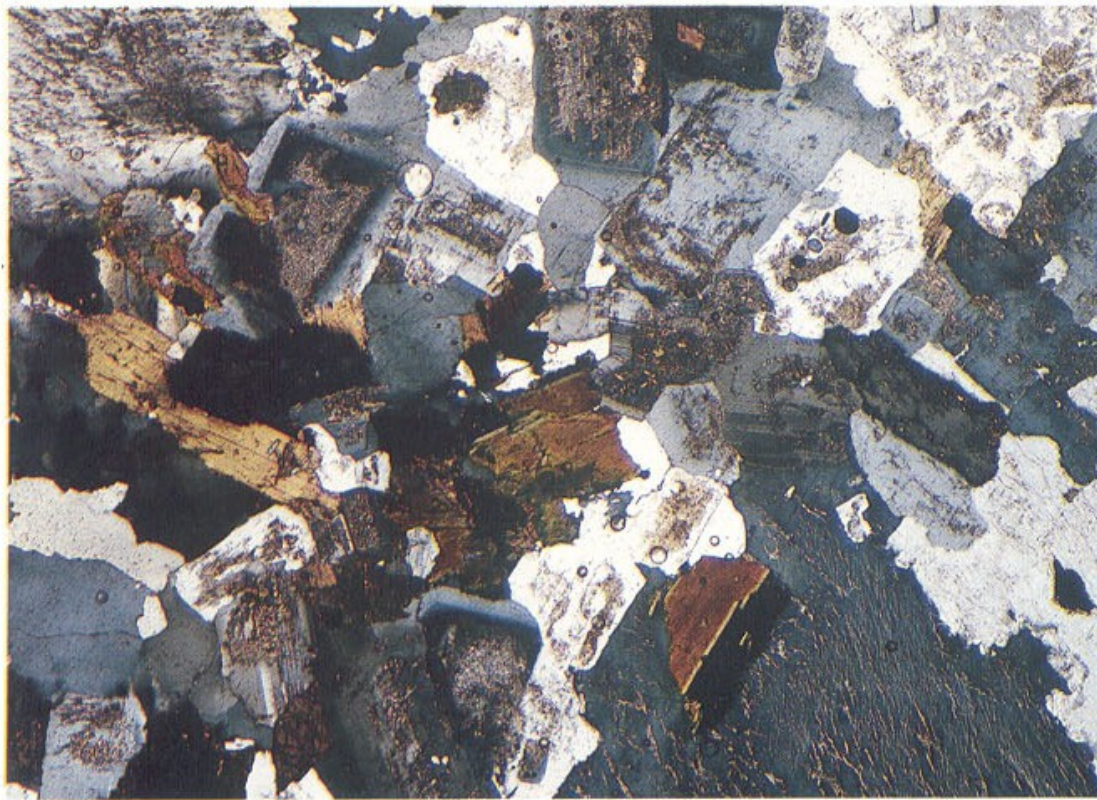


### 1 Holocrystalline anorthositic gabbro

Elongate crystals of plagioclase feldspar, some wrapped round olivine crystals, form a framework in this rock, the interstices of which are filled with smaller plagioclase, olivine and augite crystals. The purplish-blue area at the top right of this photograph is an augite crystal which includes a number of small plagioclase and olivine crystals.

*Perpendicular Feldspar gabbro from Middle Border Group of the Skaergaard intrusion, East Greenland; magnification  $\times 7$ , XPL.*

## Holocrystalline granite



### 2 Holocrystalline granite

Crystals of biotite, quartz, 'perthitic' potassium-rich feldspar (large crystal bottom right) and zoned sodium-rich feldspar makes up this granite. The speckled appearance in the cores of the plagioclase feldspars is caused by fine inclusions of mica.

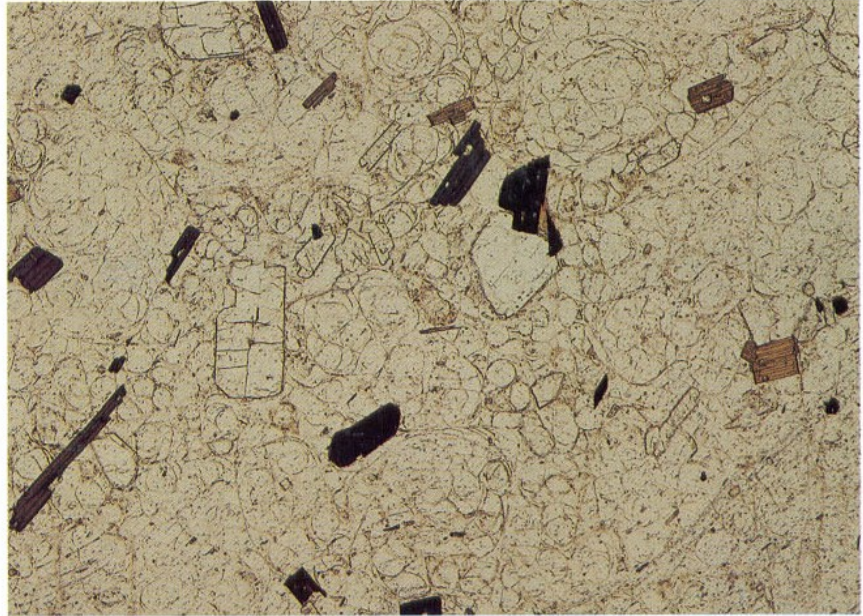
*Granite from Ross of Mull, Scotland; magnification  $\times 14$ , XPL.*

# Hypocrystalline pitchstone with perlitic cracks

## 3 Hypocrystalline pitchstone with perlitic cracks

Crystals of plagioclase, biotite and magnetite in this rock are set in glass (black in XPL) which has spherical fractures known as *perlitic cracks*: these appear as circles in thin section.

*Dacite from Chemnitz, East Germany; magnification  $\times 20$ , PPL and XPL.*

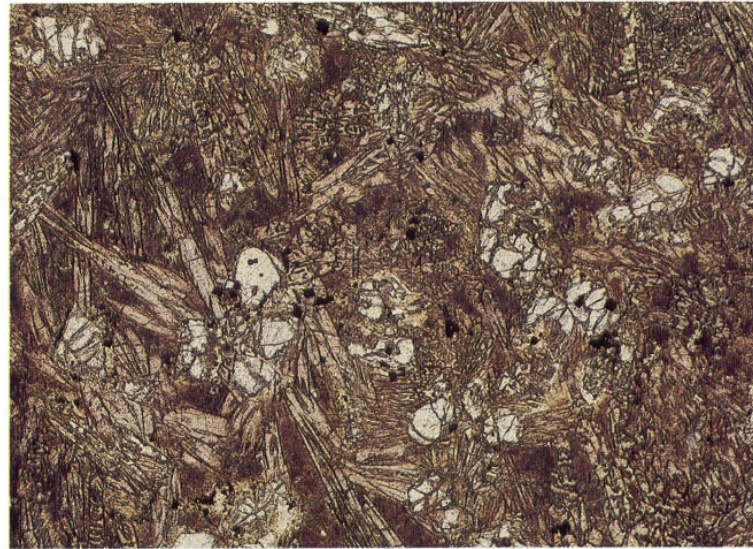


# Hypocrystalline basalt

## 4 Hypocrystalline basalt

Small olivine phenocrysts (colourless in PPL) and columnar, skeletal titanite crystals (pinkish-beige colour in PPL) are enclosed by murky brown glass. No plagioclase has crystallized in this rock. The deeper pink colour around the margin of some of the titanites is a narrow mantle of Ti-rich amphibole.

*Basalt from Quarsut, West Greenland; magnification  $\times 35$ , PPL and XPL.*



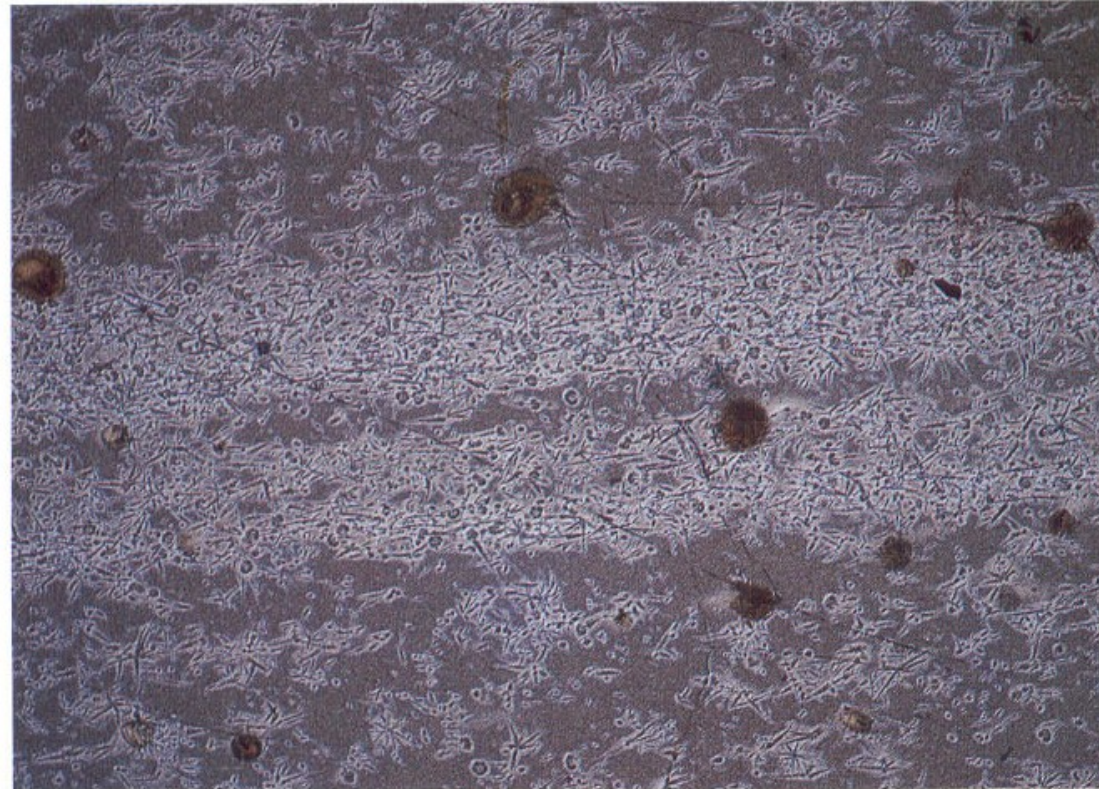
Hypocrystalline basalt (continued)

## Glassy rock

### 5 Glassy rock

The photograph shows abundant, very small crystals (probably quartz or feldspar) enclosed by glass. Note the banding caused by (a) differences in abundance of crystallites, (b) crystallites in the lighter bands having a slight preferred alignment and (c) differences in colour of the glass. The small brown, isolated round objects are known as 'spherulites' (see *Spherulitic texture*, p. 54). (See also 14.)

*Pitchstone from Arran, Scotland; magnification  $\times 12$ , PPL.*



## Glassy basalt threads - Pele's hair



### **6 Glassy basalt threads – Pele's hair**

These filaments of basalt glass form when particles in a molten lava spray are caught by the wind and drawn out. Pele is a mythical lady, believed by native Hawaiians to reside within the volcano Kilauea. (Contrast 7.)

*Specimen from Erta Alé volcano, Ethiopia; magnification  $\times 8$ , PPL.*

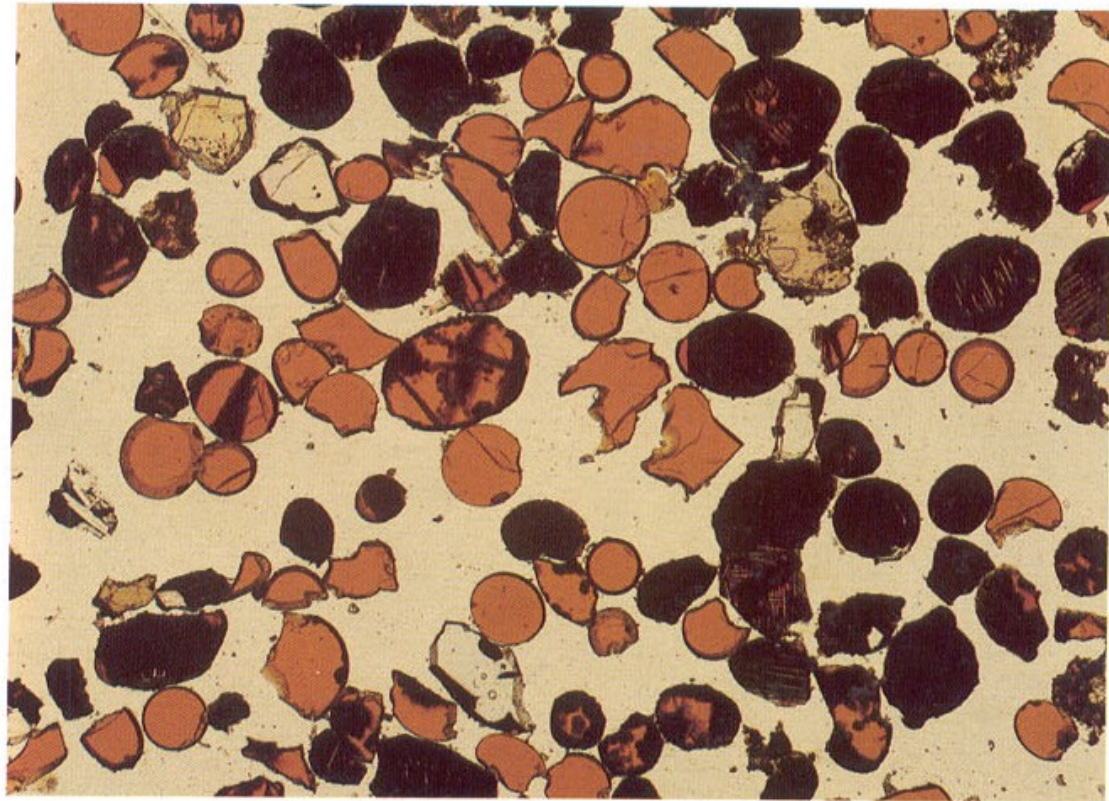


## Glassy particles of mare basalt in lunar soil

### 7 Glassy particles of mare basalt in lunar soil

Pieces of glass, many of them spherical, are orange-brown or black in colour. Some of the darker ones are partially crystalline. These particles were formed by rapid cooling of droplets of basalt melt; it has been suggested that the droplets formed either in a fire-fountaining lava eruption, or by meteorite impact into a lava lake or into a molten or solid lava flow. (Contrast 6.) The scarce, irregularly shaped fragments are pyroxene (pale brown) and feldspar (colourless).

*Lunar basalt 74220 from Taurus Littrow Valley collected by Apollo 17 astronauts; magnification  $\times 43$ , PPL.*

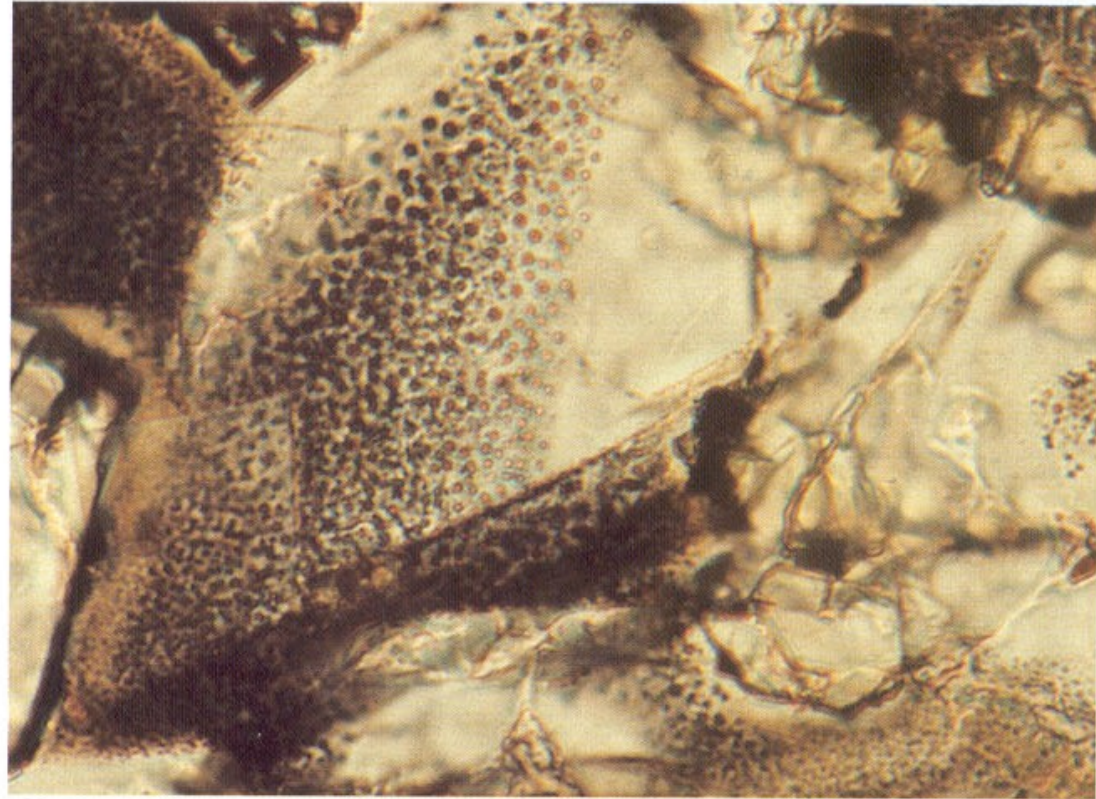


# Liquid Immiscibility

## 7a Liquid Immiscibility

Globules of one glass in another are found in some rocks and these are attributed to immiscibility of the two liquids. In this rock they can only be seen at very high power in thin films of glass between laths of plagioclase.

*Specimen from basalt lava, Lava beds National Monument California, U.S.A.: magnification  $\times 600$ , PPL.*



## Glassy unwelded rhyolite tuff



### 8a Glassy unwelded rhyolite tuff

The glassy fragments in this rock, some of which are banded and slightly flattened, are not welded to one another. They and the crystals of quartz and feldspar are embedded in fine glassy particles (ash).

*Recent ignimbrite, from Whakatane, North Island, New Zealand; magnification  $\times 46$ , PPL*

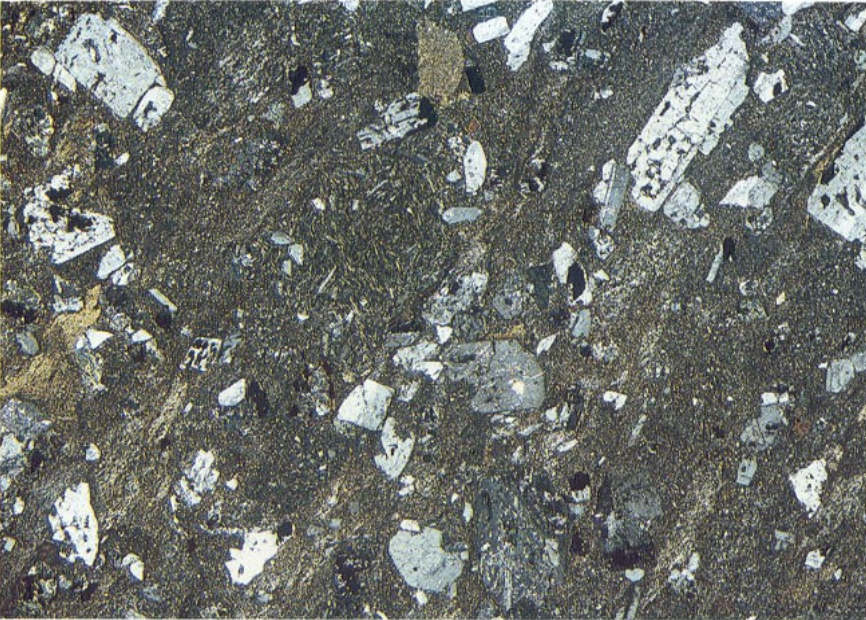
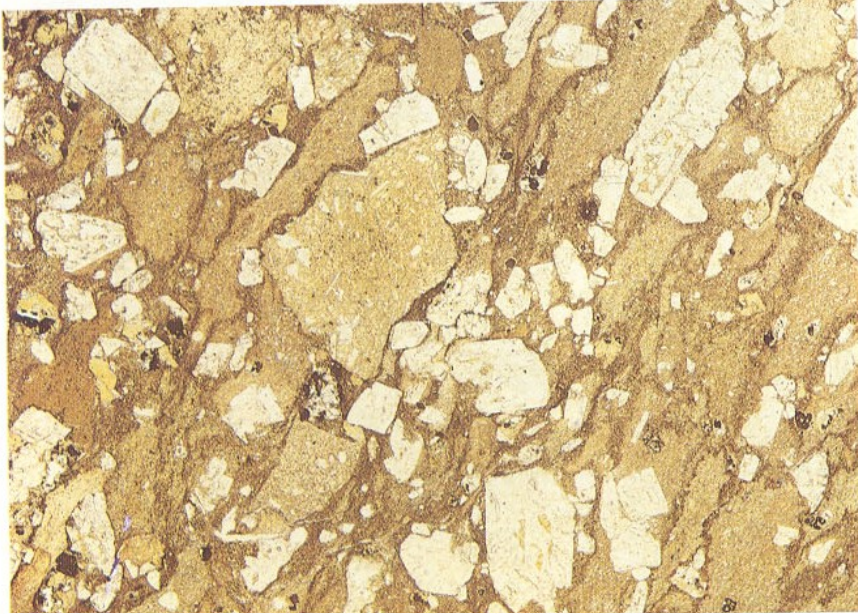
- Glass, or devitrified glass, is often an important constituent of the pyroclastic rocks known as *ash-flow tuffs* ( or *ignimbrites*). Such rocks typically have *fragmental textures*. They comprise mixture of fragments of rocks of rocks, crystals and glass, predominantly less than a millimetre in size.

# Tuff

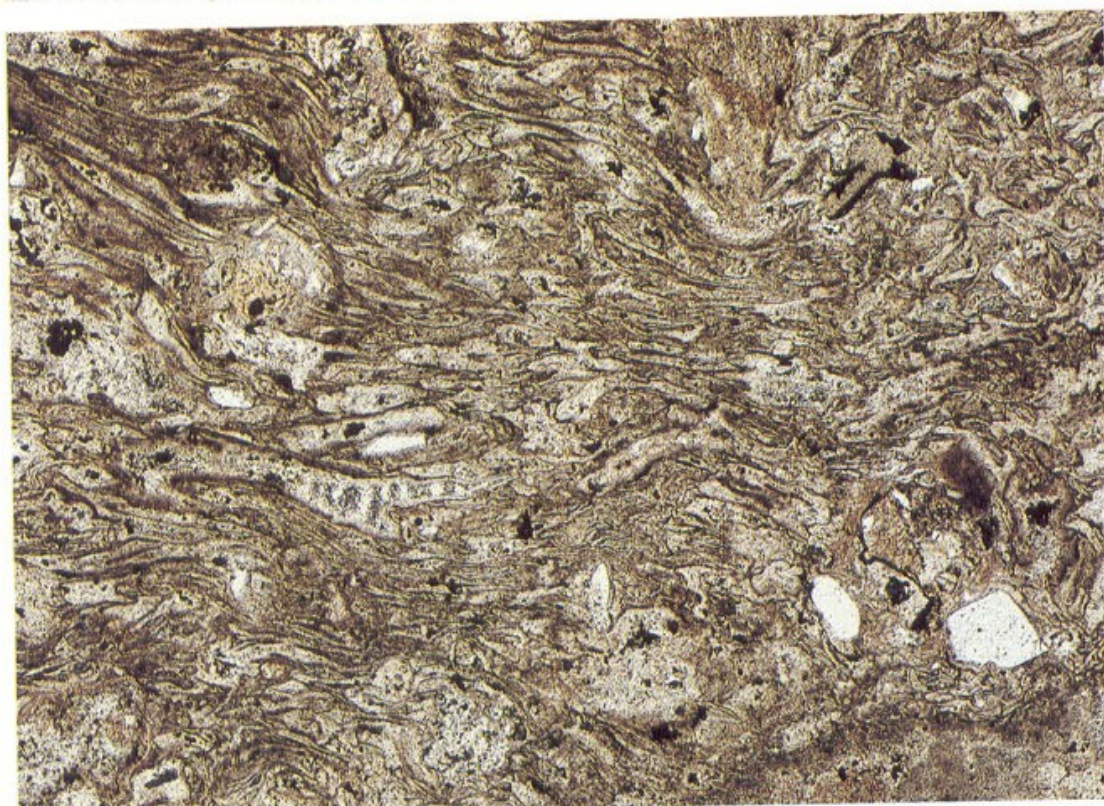
## 9 Tuff

This fragmental rock consists of crystals of quartz, alkali feldspar and plagioclase of various sizes and shapes, pieces of glassy rhyolite (e.g. centre) and pieces of fine-grained tuff, all enclosed in a fine-grained banded ash matrix which originally may have been glassy. (See also 13.)

*Tuff from Llanellwedd, Wales; magnification  $\times 10$ , PPL and XPL.*



## Glassy welded crystal tuff



### 8b Glassy welded crystal tuff

The glassy matrix in this rock has an apparent discontinuous lamination caused by extreme compaction and welding of original pumice fragments. The regular alignment of the flattened fragments is known as *eutaxitic texture*.

*Welded tuff from Tibchi granite ring-complex, Nigeria; magnification  $\times 36$ , PPL.*

- In an Ash-flow deposit the glass fragments may initially be plastic enough to be partly or wholly welded together as the weight of overlying material causes compaction of the constituent fragments; such a rock is known as a *welded tuff*. If sufficient heat is available, glassy fragments devitrify.