

CHAPTER 4: IGNEOUS ROCKS

Most rocks in the Fells are igneous rocks. This chapter will introduce you to specific types of igneous rocks and how they form. For more detail on the formation of igneous rocks I suggest Winter (2010) and Jerram (2021).

(Note: Terms in red and italics appear as entries in the companion glossary.)

Igneous rocks have several important characteristics that give us clues about where, when, and how they have formed. Knowing the chemical constituents of the rock, i.e., what minerals are in it, and whether it is intrusive or extrusive tells us about how and where magma was generated, the magma's flow as a liquid, and the conditions (temperature, pressure, water content, depth, etc.) under which the magma crystallized. Another important consideration about igneous rocks in the Fells is how the different units might be related to each other. For example, were they from the same magma chamber or formed at about the same time? We will have to make observations about mineral types, composition, and **textures** (grain size and grain arrangement) to get meaningful information about igneous rocks.

4.1 IS IT IGNEOUS?

One thing that distinguishes most igneous rocks from other rock types is that they are made of silicate and aluminosilicate minerals (see section 3.3.1) that form **interlocking crystals**. It is unusual for other types of minerals to be abundant, except for some secondary oxides and sulfides. The **interlocking texture** means that the mineral grains grow against each other and at least partly surround each other, fitting together like the pieces of a jigsaw puzzle (Fig. 4.1). Many times, we can see flat boundaries on some of the mineral grains where they are in contact with each other. These are crystal faces, and they represent the shape of the mineral grains as they grew in the magma (see Fig. 2.5). These relationships may be difficult to see in an outcrop or in hand specimens unless the mineral grains are coarse, but it becomes much clearer in sawed rock slabs or in microscope views (see Figs. 2.2-2.4). A hand lens is very helpful in this regard. Although igneous rock recognition is not difficult, it takes a little practice, especially in the Fells, where igneous rocks can be hard to identify in the field. To get useful information, we will have to go beyond simply identifying a rock as igneous and learn some specific igneous rock types.

Figure 4.1 – Thin section view with crossed polarizers showing interlocking crystals of pyroxene (colorful grains), biotite (dark brown) and plagioclase feldspar (white to black striped grains) in a coarse-grained igneous rock. See also Figure 2.5.



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