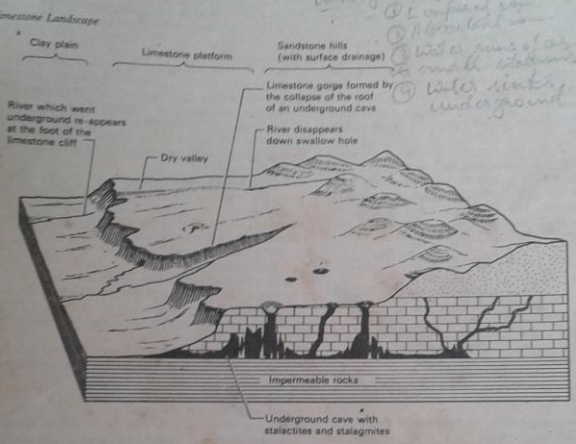
Chapter 6 Limestone and Chalk Features



DRAINAGE FEATURES IN A LIMESTONE REGION

The nature of limestone

Limestone consists chiefly of calcium carbonate which is insoluble. The carbon dioxide, which rain water absorbs from the air, turns the insoluble carbonate into soluble bicarbonate. This is the reason why rain water and rivers are able to remove limestone in solution.

$$\underset{\text{carbonate}}{CaCO_3} + CO_2 + H_2O = \underset{\text{bicarbonate}}{Ca(HCO_3)_2}$$

Limestone is a well-jointed rock and its joints and bedding planes soon become opened up by rain and water, and in time the surface consists of broken and rugged rocks.

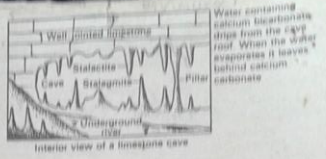
Limestone landscape

One of the most noticeable features of a limestone landscape is the almost complete absence of surface drainage. The permeability of limestone permits rain to soak into it very easily. Joints rapidly become excavated and deepened, with the result that the surface becomes criss-crossed with wide irregular gullies, known as *grikes*. The intervening blocks of limestone surface are called *clints*.

Rivers rising in a non-limestone region sometimes flow into a limestone region. When this happens the rivers disappear into vertical holes in the surface and continue to flow as *underground rivers* inside the limestone. The vertical holes, called *swallow holes* or *sink holes*, are formed by rivers and they are usually widened vertical joints. Gaping Ghyll in Yorkshire, England, is a particularly good example. Swallow holes may join together to give a very large opening, called a *doline*. Likewise, dolines may join up to give even larger openings. These are called *uvala*.

Rivers which flow inside limestone develop underground caves and caverns as they flow along joints and bedding planes. Some caves are of great size, e.g. Carlbad Cave (New Mexico – U.S.A.) is 1200

Gaping Gill near Ingleborough, Yorkshire, England.



Interior view of a limestone cave

Sometimes the roof of an underground cave or cavern collapses and a gorge, with almost vertical sides, then develops. Cheddar Gorge (the U.K.) was formed in this way.

Rivers which disappear underground when entering a limestone region reappear on the surface again where the function of the limestone and the underlying impermeable rocks meet the surface. Dry, gorge-like valleys often mark the former courses of such rivers and these occur between the point of disappearance and the point of emergence (diagram, page 56). The former course over the limestone in European regions was probably made

metres (3900 feet) long, 183 metres (600 feet) wide and 90 metres (295 feet) high. Batu Caves, near Kuala Lumpur and the caves near Ipoh are further examples. *Stalagmites* and *stalactites* develop in these caves and sometimes they join together to form natural columns or pillars.

Interior of Cango Caves (South Africa)

possible by the frozen subsoils in Glacial Times. Dry waterfalls also occur in these valleys, especially where the rivers once crossed limestone escarpments.

The surface of a limestone region is not only broken, it is also stony. Any soil which may occur is usually in small shallow patches which support only a few shrubs, grasses and in some regions sweet-smelling herbs. Larger plants, such as trees, only occur in the bottom of large valleys which have been excavated down to the rocks underlying the limestone. Although the limited plant life in limestone regions varies from region to region, it being dependent upon the nature of the climate, the general appearance of all limestone regions is very much the same. The limestone region around Ipoh, in Perak (West Malaysia), is well-covered with vegetation because of the fairly deep soils which have formed under humid tropical weathering.

Limestone landscapes are called *karst* landscapes and good examples occur in north-west Yugoslavia, the Pennines of the U.K., the Yucatan Peninsula of Mexico, the Kentucky region of the U.S.A. and parts of Perak and Perlis in West Malaysia.

Value of Karst regions to Man

Because of their barren nature karst regions contain few settlements. The dryness of the surface and the limited amounts of poor soils prevent the growth of a continuous plant cover. In some regions there is sufficient grass to support sheep or goats and animal grazing takes place. Occasionally areas of good soils do occur. These are usually confined to basins which have been formed by the collapse of roofs of underground caverns. In Yugoslavia and other parts of the Mediterranean region, these soils are usually red and are called *terra rossa*. They are valuable for farming.

Limestone is quarried as a building stone and for making cement, and usually there are stone and cement works near to limestone regions, e.g. near to Ipoh in West Malaysia.

Features of a chalk landscape

Chalk, like limestone, is made of calcium carbonate but it is much softer than limestone. Its surface is not marked by outcrops of hard rock. Instead it is usually gently undulating with rounded hills, called *downs* in England, and wide open valleys, which are usually without rivers. Chalk is a porous rock and rain falling on its surface rapidly soaks into the ground. There is, therefore, very little surface run-off, that is, there are very few streams. Because the valley are without streams, they are called *dry valleys* or *coombs*.

Good examples of chalk landscapes occur in England in the Chiltern Hills and the Downs, and in these regions dry valleys are very common. These valleys were obviously formed when the water-table was higher than it is at present. Possibly, towards the end of the last glacial period, vast quantities of melt water from the retreating ice sheets were able to flow as rivers across these chalk regions, because the subsoils were frozen, thus presenting an impermeable zone.

EXERCISES

1 Briefly distinguish between the following:
(i) a dry valley and an underground river
(ii) a limestone gorge and a swallow hole.
(iii) a clint and a grike
Name *one* region where these types of features may be seen.

2 Carefully explain why (i) some underground rivers produce varied underground scenery, (ii) most limestone areas have little agriculture and few people, and (iii) there is almost no surface drainage in a limestone region. Illustrate your answer with relevant diagrams.