quartz and felspar, which under ordinary conditions form more equidimensional crystals, would assume lenticular forms. In the necessary co-operation of these three causes, viz. flattening of particles by compression, orientation of particles by flow and formation of laminar crystals, the fundamental explanation of slaty cleavage is found. The planes of cleavage will be approxi­mately perpendicular to the earth pressures which acted in the district; hence the strike of the cleavage (*i.e.* its trend when followed across the country) will be persistent over considerable areas.

Where the rock masses are not homogeneous *(e.g.* slates alter­nating with gritty bands), the cleavage is most perfect in the finest grained rocks. In passing from a slate to a grit the direction of the cleavage changes so that it tends to be more nearly per­pendicular to the bedding planes. A structure akin to cleavage, often exemplified by slates especially when they have been some­what contorted or gnarled, is the *Ausweichungsclivage* of Albert Heim. It is produced by minute crumplings on the cleavage faces all arranged so that they lie along definite planes crossing the cleavage. These slight inflections of the cleavage may be sharp-sided, and may pass into small faults or steps along which dislocation has taken place. A secondary or false cleavage, less perfect than the true cleavage, may thus be produced (see Petrology, Pl. IV. fig. 7). The faces of slates have usually a slightly silky lustre due to the abundance of minute scales of mica all lying parallel and reflecting light simultaneously from their pearly basal planes. In microscopic section the best slates show much colourless mica in small, thin, irregular scales. Green chlorite is usually also abundant in flakes like those of the mica. The principal additional ingredient is quartz in minute lens-shaped grains. The size of the individual particles may be approximately one-five-hundredth of an inch. Minute rods or needles of rutile are also common in slates, and well-formed cubes of pyrites are often visible on. the splitting faces. The brownish colour of some slates is due to limonite and haematite, but magnetite occurs in the darker coloured varieties. Other minerals which occur in the rocks of this group are calcite, garnet, biotite, chloritoid, epidote, tourmaline and graphite or dark carbonaceous materials.

By advancing crystallization and increased size of their com­ponents, slates pass gradually into phyllites, which consist also of quartz, muscovite and chlorite. In the neighbourhood of intrusive granites and similar plutonic igneous rocks, slates undergo “ contact alteration,” and great changes ensue in their appearance, structure and mineral composition. They lose their facile cleavage and become hard, dark-coloured, slightly lustrous rocks, which have a splintery character or break into small cuboidal fragments. These are known as “hornfelses ” (*q.v.*). Farther away from the granite the slates are not so much altered, but generally show small rounded or ovoid spots, which may be darker or lighter in colour than the matrix. The spots contain a variety of minerals, sometimes mainly white mica or chlorite. In these spotted slates andalusite, chiastolite, garnet and cordierite often occur; chiastolite is especially characteristic; cordierite occurs only where the alteration is intense. The chiastolite-slates show elongated, straight-sided crystals with black cores (see Petrology, Pl. IV. fig. 9), which, on transverse section, have the form of a cross constituting the two diagonals of the rhombic or squarish pattern of the mineral. These crystals may be half an inch to several inches in length; they are usually more or less completely weathered to white mica and kaolin. In other cases, especially near mineral veins, slates are filled with black needles of tourmaline or are bleached to pale grey and white colours, or are silicified and impregnated with mineral ores. Frequently in districts where slates are much crumpled they are traversed by numerous quartz veins, which have a thickness varying from several inches up to many feet, and may occasionally be auriferous. (J. S. F.)

Slates are widely used for roofing houses and buildings of every description, and for such purposes they are unequalled, the better sorts possessing all the qualities necessary for protection against wind, rain and storm. The finer varieties are made into writing slates, and in districts where cross cleavage exists slate pencils are made. Slabs are also manufactured, and, being readily cut, planed, dressed and enamelled, are used for chimney pieces, billiard tables, wall linings, cisterns, paving, tomb-stones, ridge rolls, electrical switch-boards and various other architectural and industrial purposes.

Slate rocks are quarried both above ground and below ground, according as they lie near to or distant from the surface. When they are near the surface, and their dip corresponds with the slope of the ground, they are in the most favourable position, and are worked in terraces or galleries formed along the strike of the beds and having a height of about 50 ft. The galleries are generally carried on in sections of 10 yds., worked across the beds, and may rise to any height or be sunk below the surrounding level by excavations. When the rock is much removed from the surface, or inconveniently situated for open workings, it is quarried in underground chambers reached by levels driven through the intervening mass and across or along the beds. Or it may be necessary to sink shafts as in coal-pits before the rock is arrived at, but the cost of doing so forms a serious drawback. The material is sometimes won by the aid of channelling machines which make a series of cuts at right angles to each other in the face of the rock; a block is then broken off at its base by wedges forced into the cuts, and its removal permits access to other blocks. When blasting is resorted to, advantage is taken of the natural cuts or joints, as the rock is readily thrown or worked off these. The explosive used should be of such a character as to throw out or detach masses of rock without much splintering, which would destroy the blocks for slate-making. From the mass thrown out by the blast, or loosened so as readily to come away by the use of crowbars, the men select and sort all good blocks and send them in waggons to the slate huts to be split and dressed into slates. Two men are employed at this operation—One splitting and the other dressing, performing their work in a sitting posture. The splitter places a block on end between his knees, and with chisel and mallet splits it into as many plates as possible of the usual thickness for roofing purposes—namely, a quarter of an inch more or less according to the size and strength required. These plates are then placed horizontally by the dresser on a vertical iron “stand,” and cut with a sharp knife into slates of various sizes suitable for the market. For an enumeration of these sizes, see Roofs, where also will be found an account of the different varieties of slates and of the ways in which they are fixed.

**SLATE ISLANDS,** a group belonging to the parish of Kilbrandon and Kilchattan off the coast of Lome, Argyllshire, Scotland. They comprise Seil, Easdale, Torsay, Luing and Shuna, and owe their name to the fact that they are composed mainly of meta­morphic rocks, Easdale, Torsay and Luing being entirely slate, Seil mostly slate with some porphyrite in the north, and Shuna gneissose. The quarries provide occupation for most of the inhabitants. The steamers to and from Oban usually call at Luing and Easdale. Seil (pop. 424), the most northerly, is con­nected with the mainland by means of Clachan bridge on its north-east side, near Rue. It measures 4 m. N. and S. by 2 m. E. and W. at its widest, and contains Kilbrandon church. Off a promontory on its west coast, divided only by a narrow strait, is the comparatively flat island of Easdale (pop. 284), measuring roughly ½ m. each way. The quarries have been worked since 1630 and yield some eight million slates every year. The experi­ment of leasing them to the workers on co-operative lines has been tried unsuccessfully. Luing (pop. 620) is situated S. of Seil, is 6 m. long and 1½ m. broad. Torsay (pop. 7), 1 m. long by ½ m. broad, lies off its north-east, and Shuna (pop. 8), 2½ m. long by 1 1/5 m. broad, off its south-east, shore.

**SLATER, JOHN FOX** (1815-1884), American philanthropist, son of John Slater (Samuel Slater’s brother and partner), was born in Slatersville, Rhode Island, on the 4th of March 1815. He was educated in academies at Plainfield, Connecticut, and Wrentham and Wilbraham, Massachusetts. At seventeen he entered his father’s woollen mill in Hopeville, Conn., of which he took charge in 1836. This and other mills he owned in partner­ship with his brother, William S. Slater, until 1873, when his brother took over the Slatersville Mills and he assumed sole ownership of the mills at Jewett City, Conn. In 1842 he re­moved from Jewett City to Norwich; there he helped to endow the Norwich Free Academy, to which his son presented the Slater Memorial Hall; and there he died on the 7th of May 1884. In 1882 he had made over to a board of ten trustees, incorporated in New York state, $1,000,000 for “ the uplifting of the lately emancipated population of the Southern states,