Very large and cavernous spherulites have been called *litho­physae;* they are found in obsidians at Lipari, the Yellowstone Park, &c. The characteristic radiate fibrous structure is usually conspicuous, but the fibres are interrupted by cavities which are often arranged as to give the spherulite a resemblance to a rose- bud with folded petals separated by arching interspaces. Some of these lithophysae are an inch or more in diameter. In the crystallization of a glass there must be contraction, and it is supposed that thus the concentric cavities arise. The steam and other vapours in the magma would fill these empty spaces and exert a powerful mineralizing action on the warm rock. The presence of garnet, tridymite, fayalite and other minerals, very abnormal in rhyolites in these cavities, in the lithophysae is accounted for in this way. The fibres of these coarse spherulites are often broad and seem to belong to alkali felspar (sanidine or anorthoclase) embedded in tridymite and glass; by analogy it is often inferred that the extremely tenuous fibres of ordinary spherulites have the same composition.

Artificial glass which has not the right composition, or is retained for too long a time in a furnace, sometimes crystallizes, and contains spherulites which may be as large as a marble. As the glass has little similarity in chemical composition to volcanic obsidians these spherulites when analysed throw little light on the mineral nature of spherulites in rocks. They show, however that in viscous semi-solid glasses near their fusion point crystallization tends to originate at certain centres and to spread outwards, producing spherulitic structures. Many salts and organic substances exhibit the same tendency, yielding beautiful spherulite crystallizations when melted and cooled rapidly on a microscopic slide.

There are many structures in rocks which are allied to spherulites and usually grouped with them, though probably they are not exactly of the same nature. Some are more vitreous, while others are more perfectly crystalline than the true spherulites. Of the former we mention the doubly refracting glassy spheroids common in rhyolites and obsidians. They differ in no respect from the surrounding hyaline base in ordinary light, but between crossed nicols appear as rounded bodies faintly lighted, with a black cross like that of the spherulites. They are portions of the glass which are in a state of compression or strain and hence no longer isotropic. In gelatin, celluloid and artificial glasses similar appearances are occasionally seen. Opal, especially the variety known as hyalite, exhibits the same phenomenon.

In the group of porphyries known as granophyres crystals of quartz and felspar occur surrounded by a ground-mass which has a radiate fibrous or spherulitic structure. The fibres consist of quartz and felspar, usually in graphic intergrowth over considerable areas, and often sufficiently coarse to be easily distinguishable by means of the microscope. Often the quartz or the felspar of the spherulite extinguishes simultaneously with a crystal of either of these minerals lying in the centre of the aggregate. Exactly what the relationships of the spherulites are to those of the obsidians has never been cleared up; they are probably analogous growths but not identical. The name granospheres has been given to these bodies. Another group of radiate fibrous growths resembling spherulites in many respects consists of minute feathery crystals spreading outwards through a fine grained or glassy rock. In the variolites there are straight or feathery felspar crystals (usually oligoclase) forming pale coloured spherulites, a quarter to half an inch in diameter. The same rocks often contain similar aggregates of plumose skeleton crystals of augite. Many volcanic rocks have small lath-shaped crystals of felspar or augite diverging from a common centre. To distinguish these radiate crystal groups from the cryptocrystalline spherulites they have been called sphaerocrystals. They are commonest in those rocks which contain a fine ground-mass and have been rapidly consolidated. Stellate groupings are frequent also in secondary minerals, being very characteristic of natrolite, chlorite and chalcedony; often the component prisms are very narrow and regularly arranged so that in microscopic sections they give a black cross exactly like that of the spherulites. (J. S. F.)

SPHINX (Gr. *σφlyyeιv,* to draw tight, squeeze), the Greek name for a compound creature with lion’s body and human head. The Greek sphinx had wings and female bust, and the male sphinx of Egypt (wingless) is distinguished as “ andro- sphinx ” by Herodotus. The type perhaps originated in Egypt, where figures of gods with human bodies and animal heads, and compound animal forms like the gryphon were numerous from very early times. The sphinx, however, is a perfectly clear and well-defined type there, and is usually recumbent. The most celebrated example is the Great Sphinx of Giza, 189 ft. long, a rock carved into this shape, and from its situation likely to be a work of the IVth Dynasty. The pattern of the wig-lappets has been quoted to prove that it dates from the XIIth Dynasty, but it is said that the peculiar disposition of the uraeus on its forehead agrees with that in the earliest sculptures. The face looks out due eastward from the pyramid field over the Nile valley, and, according to the inscriptions of the XVIIIth Dynasty in the shrine between the paws, it represented the sun- god Harmachis. Sphinxes of granite, &c., occur of the XIIth Dynasty and later. A pair from Tanis are attributed by Flinders Petrie to Pepi I. of the VIth Dynasty. The heads of the sphinxes are royal portraits, and apparently they are intended to represent the power of the reigning Pharaoh. The king as a sphinx, in certain religious scenes, makes offerings to deities; and elsewhere he tears his enemies in pieces. In the Saite period accordingly the figure of the sphinx was used as a hieroglyph for *neb,* “ master,” “lord.” Recumbent sphinxes were especially used in pairs to guard the approach to a temple, and it may be conjectured that the Great Sphinx was sculptured at Giza to guard the entrance of the Nile valley. The name of the sphinx in Egyptian was Hu.

The great temple avenues at Thebes are lined with recumbent rams, true sphinxes (a few late instances), and with the so-called criosphinxes or ram-sphinxes, having lion bodies and heads of the sacred animal of Ammon. A falcon-headed sphinx was dedicated to Harmachis in the temple of Abu Simbel, and is occasionally found in sculptures representing the king as Horus, or Mont, the war-god. It is distinguishable from the gryphon only by the absence of wings.

W. M. F. Petrie, *History of Egypt from the Earliest Times to the XVIth Dynasty,* p. 51, &c.; L. Borchardt, “ Das Alter der grossen Sphinx,” in *Sitzungsberichte* of the Berlin Academy (1897), p. 752. Baedeker’s *Egypt',* Prisse d’Avennes, *Histoire de l'art égyptien* (Paris, 1878), vol. ii. pl. 26, 35, text, pp. 405, 410. (F. Ll. G.)

From Egypt the figure of the sphinx passed to Assyria, where it appears with a bearded male head on cylinders; the female sphinx, lying down and furnished with wings, is first found in the palace of Esar-haddon (7th cent. B.c.). Sphinxes have been found in Phoenicia, one at least being winged and another bearded. They are copies of the Egyptian, both in form and posture, wearing the pshent and the uraeus, but distinguished by having the Assyrian wings. The sphinx is common on Persian gems, and the representations are finely executed. On a Persian intaglio are two sphinxes face to face, each wearing a tiara and guarding a sacred plant which is seen between them; but the sphinx, whether of the Egyptian or the Assyrian type, is not found in Persian sculptures (Perrot and Chipiez, *History of Art in Persia,* Eng. trans., London, 1892). In Asia Minor the oldest examples are the “ Hittite ” sphinxes of Euyuk. They are Egyptian sphinxes treated in the Assyrian style. They are not recumbent, and the hair falling from the head is curled, not straight, as in the true Egyptian sphinx. An ancient female sphinx, but wingless, stands on the sacred road near Miletus. Sphinxes of the usual Greek type are represented seated on each side of two doorways in an ancient frieze found by Sir Charles Fellowes at Xanthus in Lycia, and now in the British Museum. The same type appears on the early sculptures of the half-Greek, half-Oriental temple at Assus. In the early art of Cyprus—the half-way house between Asia and Greece—sphinxes of this type are not uncommon. On the other hand, on a gem of Phoenician style found at Curium in Cyprus there appear two male (bearded) sphinxes, with the tree of life between them. With regard to Greece proper, in the third tomb on the acropolis of Mycenae were found six small golden sphinxes; they are beardless, but the sex is doubtful. The bust is not that of a woman, though the head and face are distinctly feminine. A shallow cap covers the head, and from the middle of it there is always a sort of tail or plume, blown back by the wind. It is curious that, though the sphinx (as also the gryphon) were thus common in the Mycenaean period, the words *σφιyζ* and *yρbψ* do not occur in Homer. Helbig suggested that the word *κbωv* (dog), which is