form of anthracite and graphite proves that at the time the rocks were formed organic life must have been represented in the sediments.

Many indications available in the distinctly sedimentary rocks as guides in the determination of the relative age of their ore-deposits are here wanting. The bedding becomes more and more obscure, and is sometimes no longer distinguishable from the cleavage. Many of the ore-deposits in these rocks have also become in whole or part crystalline, adjusting themselves to the prevailing stratification or cleavage, so that most of them present a bed-like structure and form. Whoever believes in the possibility of a contemporaneous formation of the ores with the rocks will not trouble himself here with genetic speculations, but will see in these deposits simply "ore-beds," according to the old classifications.

Taberg, Sweden.—The circumstance that magnetite is a constituent of many eruptive rocks has inclined many geologists to regard masses of magnetite in the neighbourhood of such rocks as immediately belonging to them. This theory originated in connection with the Taberg deposit, in Smaland, Sweden, and was propagated by F. L. Haussman, W. Hissinger, and A. Daubrée; and Taberg has been regarded ever since as an example of the primitive existence of magnetite deposits, those of Kackanar, Visokaya Gora, and Blagodat being classed with it.

The question arises, where the line is to be drawn between an eruptive rock containing magnetite and a magnetite deposit. An eruptive rock, like that of Samakov, in the Pils Mountains in Bulgaria, from the weathered detritus of which magnetite is obtained by ore-dressing, is not properly an ore-deposit; but, on the other hand, that of Taberg, where the ore is not only finely disseminated in large amount, but also occurs in separate, solid veins, may fairly be so called. According to A. Sjögren, the rock consists of olivine, magnetite, and a little plagioclase, with mica and apatite as accessories. In other words, it is an already metamorphosed rock. Considering that at several places in Scandinavia magnetite occurs in the crystalline schists also, it seems unlikely that the magnetite of Taberg belongs to the primitive rock. This is confirmed by the observation of Th. Kjerulf, that all the ore-deposits of Norway follow the courses of eruptive rocks. Taberg will scarcely prove to be an exception, and may, therefore, be regarded as a secondary or xenogenous ore-deposit.

Before proceeding further, mention must be made of the action of the mineral solutions upon the country-rock of some veins, which might be also classed as impregnation. In this respect tin-deposits are most interesting, because they carry ore, not only in the space of discission, *i.e.*, the vein-fissure, but to a large extent in the neighbouring country-rock also. If the veins occur in granite, this is changed for a certain width into greisen—*i.e.*, it is robbed of its feldspar, which is even, in some cases, replaced by cassiterite and associated minerals. Thus are formed the beautiful pseudomorphs of cassiterite after feldspar, which adorn many mineral collections. (See Fig. 91.)

Figs. 91–93 are taken from C. Le Neve Foster. Fig. 91 represents the alteration of the granitic country-rock to greisen on both sides of a fissure, which is here filled with symmetrical quartz-crusts, to the central druse or comb. Often such fissures occur close together; and, since each has its own zone of greisen, the result is a *stockwerk*, constituting a metamorphosis of the granite, and formed by these fissures.

Cornwall.—In the slate or *killas* of the Cornish miners there is often a disturbance of the bedding in the neighbourhood of the fissure (Fig. 92), such as is observed in connection with fault-fissures elsewhere; but in this case the *capel*, or adjacent portion of the slate, is altered chemically also, being impregnated with quartz and traversed by streaks of ore. The fissure itself is filled with quartz, cassiterite, chlorite, pyrite, and fragments of the *capel*. When several fissures come together, the result is somewhat complicated, but can be reduced to the simple case just described.

Still more interesting is the tin-deposit of East Wheal Lovell, described by the same authority. At the side of a narrow quartz vein the ores occur in the granite, from which they are not separated by any definite boundary, so that the ore-body is an almost vertical shoot, confined to the neighbourhood of the fissure, yet lying in the country-rock. It is clear that a mineral water of high solvent power must have ascended under great pressure, in order to bring about such effects in a rock ordinarily regarded as insoluble. Fig. 93 shows the situation of one of these ore-shoots in granite, at the East Wheal Lovell Mine.

The ore-deposits in metamorphous and eruptive rocks occur especially in the great crystalline northern areas, in Scandinavia, Canada, and the north-eastern United States.

Scandinavia.—In Scandinavia, the science of ore-deposits, like that of petrography, has had a comparatively independent development. Although these countries have been often visited by foreign observers, few analogies with European deposits have been noted—chiefly, no doubt, because of the peculiar character of the occurrences examined, but also partly because of the differing standpoints and views of native observers. In recent times a difference of interpretation has developed itself between the Norwegian and the Swedish geologists; and the former, since Kjerulf, have approached more nearly the Continental view.

As already remarked, Kjerulf traces all the ore-deposits of Norway to the filling of spaces of discission, and particularly of a peculiar space, produced by the sliding of the rock along a bedding-plane, and locally called a *lineal*.

With respect to the ore-filling, he points out that the occurrence of the ore-deposits must always be studied on the large scale, and that this method shows the ore-deposits to occupy certain lines, characterized by the presence of eruptive rocks. The ores appear chiefly in the crystalline schists, but also in traces along the contact, and sometimes in the eruptive rocks themselves. In the first case, the different sulphides, mostly accompanied with quartz, lie parallel with the bedding or cleavage of the rock, and thus look like beds; but their secondary origin is indicated by the slickensides, the branching of the deposits, and other signs. Sometimes it is made evident by the course of the ore-masses cutting across the bedding or cleavage. In the Museum at Christiania