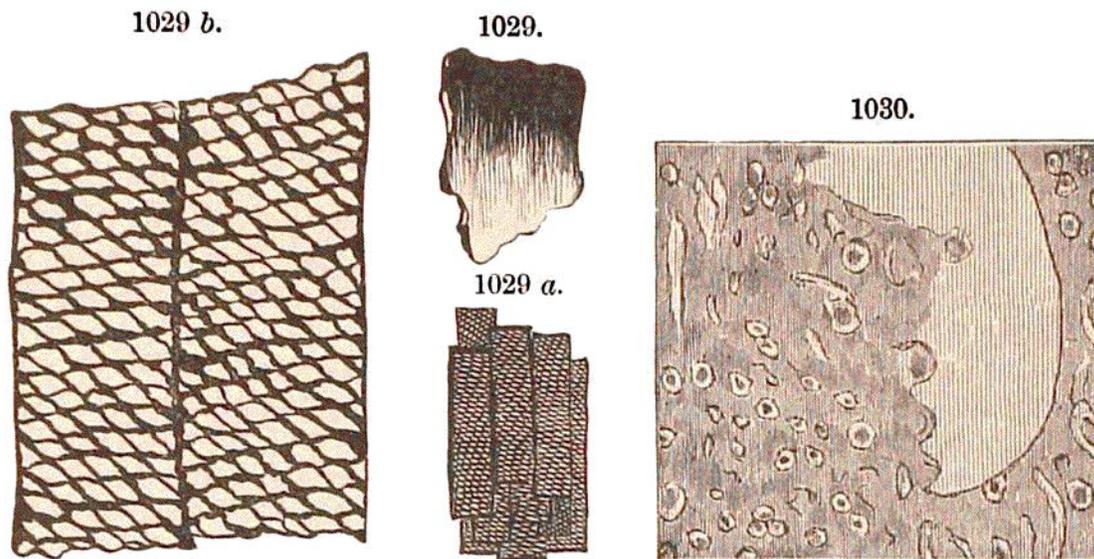


cite has been found to contain vegetable tissues. On examining a piece partly burnt, J. W. Bailey found that it was made up of carbonized vegetable fibers. Figs. 1029, *a*, *b* are from his paper on this subject. He selected specimens which were imperfectly burnt (like Fig. 1029), and examined the surface just on the borders of the black portion. Fig. 1029 *a* represents a number of ducts, thus brought to light, as they appeared when moderately magnified; and Fig 1029 *b*, two of the ducts, more enlarged; the



Figs. 1029, *a*, *b*, Vegetable tissues in anthracite; 1030, Spores and part of a Sporangium, in bituminous coal of Ohio ( $\times 70$ ). Figs. 1029, Bailey; 1030, Dawson.

black lines being the coal that remained after the partial burning, and the light spaces *silica*. The ducts were one tenth of a millimeter (about four thousandths of an inch) broad. Dawson reports like results from bituminous coal.

The spores and sporangites, or spore-cases, of the Lycopods (*Lepidodendrids*) and other Acrogens, abound in the coal to such an extent in some places, that it has been suggested that mineral coal was made mainly out of them. While, as Dawson has shown, this inference is not sustained by facts, such spore-cases are very common in most coal. Fig. 1030 represents, much magnified, the surface of a piece of Ohio bituminous coal, showing a fragment of a spore-case and many of the spores. The spore-cases vary in size, from a tenth to a hundredth of an inch, and in the coal they often have an amber-yellow color. Dr. Dawson states that he has a specimen of Pennsylvania anthracite full of spore-cases, but that the Pictou coal is remarkably free from them.

Animal materials have also contributed to the coal, though sparingly. For animal decomposition also yields carbonaceous material; and animal life was so abundant in the waters that the contributions in some places may have been important. The great number of fossil fishes in some very carbonaceous or bituminous shales has led to the suggestion that fish-oil may have been the sole source of the oil or gas yielded by the shales. It is not