A recent example of spontaneous combustion of oil-shale

SIR – The first documented occurrence since the Holworth 'Burning Cliff', 1829 (Damon, 1884), of spontaneous combustion of oil-shale in Dorset, is reported here.

A bed of bituminous shale, 0.9 m in thickness, referred to as the Blackstone (Strahan, 1898; Arkell, 1947), which outcrops in a cliff-section of Kimmeridgian shales at Clavell's Hard, Dorset [s.y. 920777], was apparently in a state of combustion between November 1973 and February 1974. The actual site of the Blackstone that is undergoing combustion is obscured by scree material. However, the effects of the combustion could be clearly observed, with areas of the cliff above the scree showing evidence of baking, and several fumaroles being present in joints and cracks in the cliff-section and also in fissures, which resulted from landslipping, at the top of the cliff. A temperature of 350 °C was recorded in the scree material, and the absence of kaolinite in baked shales compared with unbaked shales in the same horizon suggested that temperatures at the time of baking exceeded 550 °C. (Brown, 1961). Deposits of fibrous sulphur crystals and a black tarry oil, which were observed at the fumaroles, provide evidence to suggest a derivation from the Blackstone since it contains 6–9 % sulphur (Arkell, 1947; Teichmuller, in Cosgrove, 1970) and, by volume, up to 25 % oil (Schlatter, 1969).

Since no evidence of combustion was found in August 1973, the combustion was probably initiated sometime between August and November 1973. Observations made between 18 November 1973 and 2 February 1974 indicate a gradual increase in both fumarole activity and size of cliff-area that shows the effects of baking.

The origin of the Holworth 'Burning Cliff' in 1826 was attributed to pyrite oxidation producing sufficient heat to start combustion of the Blackstone at this locality (Buckland & De la Beche, 1835). It is possible that the example described above is a result of the same process, which is also thought to be a frequent cause of spontaneous combustion in coal (Moore, 1940). In coal the sulphuric acid resulting from pyrite oxidation facilitates oxidation of the coal itself, which is probably the fundamental cause of the heating (Moore, 1940), and this may also apply to the Blackstone. The presence of pyrite in the Blackstone was confirmed from X-ray diffraction analysis (Brown, 1961). The landslipping noted above, which was not present in January 1972, may be connected with the combustion, since it would result in only a partial supply of air, which is apparently conducive for the retention of heat from the oxidation process in coal (Moore, 1940). With increasing temperature the rate of direct oxidation accelerates, resulting in a cumulative action progressing towards the temperature of combustion (Moore, 1940). Landslipping was also noted prior to combustion of the Blackstone at Holworth in 1826 (Damon, 1884).

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