

Gas seepage

Shrines, curiosities and hazards

by Nigel Smith, *Keyworth*



© BGS archives, NERC

The gases emitted from seeps and springs are methane (CH₄), nitrogen (N₂), hydrogen sulphide (H₂S) and carbon dioxide (CO₂). Hydrogen (H₂) is associated with ultrabasic and gypsum rocks. The sources of the gases are bacterial, thermal (burial of sediments) and volcanic (e.g. the CO₂ disaster at Lake Nyos, Cameroon) and a mixture is often present (e.g. Lake Kivu, Zaire).

Methane (also known as marsh gas), carbon dioxide and nitrogen are produced by bacterial action, most commonly manifested by will o' the wisp from stagnant lakes and swamps, with accumulation rates of 75–100 cubic feet per day (cfd) per acre attained in the tropics. Exceptionally, if trapping conditions are right, sufficient quantities form gasfields (e.g. Kanto region of Japan). Seeps from landfills have similar compositions.

Gas caps to oilfields, known as associated gas, often leak to the surface, guiding explorers to fields; larger amounts of non-associated gas are produced by burial of gas-prone sediments (e.g. the Coal Measures of Europe). In some places (Poota Valley, Baku; Yenang Daung, Burma; Lizard Spring, Trinidad and Turner's Hall, Barbados) gas has escaped for years and even millennia. Fire worship has taken place at temples near Baku for 2500 years and the Hindus erected a shrine over a gas seep at Chittagong, Bangladesh. Many of these examples are associated with mud volcanoes, which erupt periodically, ejecting rocks, mud, gas, oil and water. The Dashgil mud volcano, Azerbaijan emitted about 4000 cfd of gas from its 45 active cones.

British examples, in comparison, are small and short-lived. Gases are most often encountered in mines, particularly

coal mines, where coals contain Coalbed Methane. Methane (also known as firedamp) in coal mines has caused many fatal explosions. Base metal mines have also encountered gas, for example in the Carboniferous Limestone reservoir (Derbyshire lead mines), overlain by hydrocarbon source rocks (Edale Shales). In 1984 in Lancashire at the Abbeystead valve house of the Lune–Wyre water tunnel, a fatal explosion was caused by methane migrating from Millstone Grit strata.

A methane gas seep, which reached the surface near Broseley in Shropshire, woke residents in 1711. It was developed as a tourist attraction and, when it ceased, exploration was conducted for a replacement, eventually proving successful in 1745. From descriptions, the observers were unsure of the cause of these 'burning (or boiling) wells'. The occurrences may have been natural surface emanations or perhaps were triggered by early coal explo-

Passage from Philosophical Transactions of the Royal Society 1711, volume 28, 475–476 on the Broseley well.

ration; mining operations have disturbed natural migration pathways and methane is sometimes deliberately drained (e.g. Cardowan, and Wolstanton collieries) to prevent accidents. Closure of collieries will initiate further changes to these pathways.

Carbon dioxide has caused deaths, including that of a Geological Survey officer in 1945, who descended a newly-sunk, fifty-foot shaft at Seaton, Cumbria. At a time of low barometric pressure carbon dioxide accumulated at the bottom of the shaft, but no gas occurred in the shaft before or after the accident. In parts of East Anglia, a number of shallow wells drilled in the 19th century encountered carbon dioxide in Tertiary strata. This caused inconvenience, putting out workers' candles, requiring bellows to be deployed and sometimes reached the surface, killing workers and chickens.

Many hydrogen sulphide springs were once fashionable medicinal spas. There are two main areas in the UK: springs issue along faults, anticlines and the margins of the Dinantian sub-basins of the Pennine Basin (e.g. at Craven and Widmerpool) and hydrogen sulphide is found in wells drilled in the Lower Lias of central England.

Dashgil mud volcano eruption.

The photograph of Dashgil Mud Volcano is reproduced from figure 269, page 134 of 'Mud Volcanoes of the Azerbaijan SSR: an Atlas' Jakubov, A. A., Ali-Zade, A. A. & Zeinalov, M. M. Publishing House of the Academy of Sciences of the Azerbaijan SSR. Baku, 1971.

