slowly in the hole of their own weight. A core of melt was then taken by cutting off circulation, allowing the silver solder to soften and the teeth on the bit to close inward. Circulation was restored and about 2 in. of melt was trapped in the bit. Sulphur from the outgassing melt was also deposited on the bit.

Gas samples were afterwards collected by John Naughton of the University of Hawaii, Wayne Ault of the U.S. Geological Survey, and me. It was also found that melt samples could be obtained by attaching a 'shoe', a tapered cylinder, to the drill rods and driving this into the melt by hand. The core melt thus obtained could then be tapped out of the shoe. At 20.4 ft. further removal of melt by sampling did not deepen the hole. In less than two days the lava had risen from 20.4 ft. to 18.7 ft. deep in the hole. The hole was then sealed with a capped stainless steel pipe. A platinum-platinum 90 per cent rhodium 10 per cent thermocouple package was installed in the pipe to study the cooling history at three points in the lava lake crust.

Difficulties were encountered in obtaining temperature data as the hole was drilled. Fig. 1 is a plot of the most reliable measurements. These measurements are preliminary and require further evaluation. The peak temperature of 1,064°C. was obtained with an optical pyrometer and is probably a little low due to some gas in the hole.

Fig. 1. Measured temperature as a function of depth of the hole. ●, Chromel-alumel thermocouple; △, platinum-platinum 90 per cent rhodium 10 per cent thermocouple; □, optical pyrometer; ▲, platinum-platinum 90 per cent rhodium 10 per cent 18 days after completion of hole

It is planned to run complete chemical and petrographic analyses on the core and melt samples. The gas samples will be analysed, oxygen-16 : oxygen-18 ratios will be determined on the water and carbon dioxide gases, and the deuterium and tritium content of the water will be measured. These will be compared with local rain and ocean water to determine whether they are primary gases or not. The hydrogen-water ratio of the gases and the ferrous oxide : ferric oxide ratio of the melt and crust samples will also be determined. Thermal conductivity will be measured on the crust samples, making possible a calculation of thermal conductivity of the crust material as a function of temperature and a calculation of heat-flow through the crust.

This work was conducted as part of the Plowshare Program supported by the U.S. Atomic Energy Commission. Details of the experiment, the results of the forthcoming analyses, and their implications will be published elsewhere.

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GEOLOGY

Occurrence of Hydromagnesite in Sediments in South Australia

A PROMINENT feature of the South Eastern Province of South Australia is the system of lagoons associated with a long narrow arm of the sea, the Coorong, formed by a receding and partly resubmerged coastline. In some of these lagoons, as well as in the shallow waters at the closed end of the Coorong, dolomite-calcite sediment is forming, apparently by direct precipitation from saline waters^{1,2}.

Recently, C. von der Borch examined the sediment in a lagoon which lies within a few hundred yards of the eastern edge of the Coorong from which it is separated by a belt of low sand dunes. Macroscopically the sediment closely resembles other fine-grained carbonate sediments of the region but was found in its surface layers to consist essentially of aragonite and hydromagnesite in approximately equal amounts. The proportion of hydromagnesite decreases with depth and has not been detected below about 9 in., at which level the sediment is essentially aragonite. Calcite then appears, and the proportion of aragonite diminishes to zero, after which dolomite makes its appearance. At a depth of 2 ft. the sediment consists essentially of calcite and dolomite.

This mode of occurrence of hydromagnesite appears to be unusual, and is of particular interest in South Australia where the origin of sedimentary magnesite associated with dolomite of Proterozoic age has presented a problem. These rocks occur mainly in the Flinders Ranges and have recently been described by B. G. Forbes³. They show sun-cracks and ripple marks, and may have been formed by sedimentary processes similar to those in progress in the shallow lagoon in the South Eastern Province to-day.

Work on the geochemistry and mineralogy of the hydromagnesite sediment is proceeding.

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