permafrost, seismic refraction profiles were run in lake basins to establish the relief and structure of bedrock and overburden thicknesses, and a regional aeromagnetic survey was made to provide structural control. In addition, environmental monitoring (physical and microbiological) was begun and will be continued throughout the project.

Drilling began during the 1972-1973 season with two holes through the volcanic rocks of Ross Island; and preliminary geological and geochemical results from these sites (boreholes 1 and 2) were described about a year ago (*Antarctic J.*, **8**, 157; 1973). During the 1973-1974 summer, seven more holes were drilled in the Ross Island volcanics (borehole 3 adjacent to hole 2) and in the dry valleys at Lake Vanda (boreholes 4 to 9); and a series of reports on this work has just been published (*Antarctic J.*, **9**, 125; 1974).

According to Kyle and Treves the cores from holes 1, 2 and 3 reveal that the geological history of Hut Point Peninsula (Ross Island) is much more complex than the surface geology suggests, which is itself sufficient vindication of drilling. The oldest unit penetrated by holes 2 and 3 is a 200+ m thick pile of hyaloclastite representing early eruptive events that took place below ice or water; in other words, an early stage of marine volcanism involved the construction of a hyaloclastite pedestal which may have impinged on a thick ice shelf covering the Ross Sea more than 1.2 million years ago. The higher lavas, on the other hand, are apparently subaerial flows and pyroclastic units which represent a single differentiation series starting with olivine–augite basalts, working through augite–kaersutite basalts and ending with kaersutite hawaiites, although the phonolites on an adjacent hill may well be more extreme differentiates of the same magma chamber.

The cores from the dry valleys not unexpectedly comprise glacial and marine sediments, although two of the holes also penetrated the crystalline basement. Both sedimentary and igneous cores are still under laboratory investigation so few geochemical and mineralogical results are available. But Tarii reports that stable isotope studies have already revealed the sources of core ice; in Lake Vanda, for example, most of the present water apparently originates as fresh water whereas deeper sedimentary layers are still under the influence of sea water. Also Gumbley *et al.* have begun to use the upper few metres of sediment from Lake Vanda to trace the lake's Late Quarternary history.

The DVDP can already be credited with the resolution of at least one long-standing disagreement. Over a decade ago, Armitage and House (*Limnol. Oceanog.*, **7**, 36; 1962) discovered that although Lake Vanda lies in a region where the mean air temperature is −18° C, it has a bottom water temperature of +25° C. This led Armitage and House, and later Angino *et al.* (*Sci. Bull.*, **45**, 1097; 1964), to suggest that below the lake there are either high geothermal gradients or hot springs.

Wilson and Wellman (*Nature*, **196**, 1171; 1962) ruled out hot springs on the grounds that the measured isotherms in the lake are nearly horizontal. Not only are hot springs unlikely in Antarctica because the great thickness of frozen ground precludes abundant groundwater; they argued that the entrance of springwater into the lake in conjunction with any possible hot spring would produce a much more complicated thermal pattern. Instead, they developed a theory of solar heating in which solar energy penetrates the lake's ice cover (found to be extremely transparent) and is absorbed in the water below. In support of this view, Wilson and Wellman pointed to the extreme clarity of the water and to the decrease in temperature gradient with depth (which implies a heat 'source' in the water itself). Heat flow measurements in the upper 30 cm of lake sediment also seemed to show that heat is flowing from the water to the sediment. But Ragotzkie and Likens (*Limnol. Oceanog.*, **9**, 412, 1964) produced precisely the opposite result from similar measurements and therefore attributed the high bottom temperature to a combination of solar heating and high geothermal gradient.

Wilson *et al.* have now resolved this question by making thermal measurements in DVDP hole 4 which penetrated the crystalline basement below Lake Vanda. The temperature in the basement 15.5 m below the lake bottom is consistently 0.48° C lower than that in the sediment 0.5 m below the lake bottom. The corresponding temperature gradient (average 0.032° C m^{-1}), combined with estimates of thermal conductivity, shows that Lake Vanda is losing heat downwards at a rate of 0.5–1.0 cal $cm^{-2}s^{-1}$, thus convincingly supporting the view that geothermal heat is not the reason for the lake's high temperature.

Corvine cannibalism

from our Animal Ecology Correspondent

ARGUMENTS have been raised for years about the functions and consequences of territories to animals. Since the ultimate restraint to population increase is availability of food, one might expect the relationship of territory size to food to be both positive and linear. For some species, mostly herbivores, this may be true or nearly so. But often for both carnivores and herbivores territory size is unrelated to food supply (Watson and Moss, in *Animal Populations in Relation to their Food Resources*, 167, Blackwell, Oxford, 1970). Hinde points out that territories have complex functions with consequences both harmful and advantageous to an individual's chance of breeding success (*Ibis*, **98**, 340; 1956). Simple answers cannot be expected to complex questions.

In a well designed series of field experiments on carrion crows in north-east Scotland, Yom-Tov added extra food to the environment to ascertain if there was a direct relationship between territory size, food supply and breeding success (*J. Anim.Ecol.*, **43**, 479; 1974). There was circumstantial evidence that there was no absolute food shortage during the breeding season. Food in the form of hens' eggs and dead hens' chicks was placed near to artificial trees both within and without established crow territories. This treatment failed to increase the breeding density of adults. But one egg and five chicks offered daily to a group of fourteen breeding pairs in the close proximity of their nests resulted in a significantly higher survival rate of nestlings although there was no difference in clutch size. At fledging an average of 2.3 young had survived in the experimental nests compared with 1.1 in the controls.

The other effect of food added daily from the start of the year was to significantly shift the date of the start of laying, bringing it forward by 5 days. Earlier layed clutches were almost twice the size of late clutches, but the

Eltanin bailed out

To oceanographers the name Eltanin probably stands second only to Glomar Challenger. From 1962 to 1972 this vessel carried out geological, geophysical, geochemical, biological and meteorological researches which covered some 80 per cent of the southern ocean between 35° S and Antarctica. Then a $1.5 million budget cut in the US Antarctic Research Program ended its active work.

But now the Eltanin is about to begin a new five-year programme on Antarctic research as a result of an agreement between the United States and Argentina. The ship, renamed Islas Orcadas and operated from Buenos Aires by the Argentine navy, will carry out joint scientific expeditions with support from the National Science Foundation and the Argentine National Antarctic Directorate.