arise in astrophysics, plasma physics, and elsewhere calling for a relativistically satisfactory description of high-velocity interactions.

OROGENESIS

## State of Relative Tension

from our Structural Geology Correspondent

A RECENT account of a suite of basaltic dykes emplaced while the host rocks were undergoing deformation and metamorphism will be viewed by structural geologists with considerable interest (D. M. Ramsay and B. A. Sturt, *Amer. J. Sci.*, **268**, 264; 1970). For many years the intrusion of a swarm of basaltic dykes has been used as a firm indication of a period of extension in the host rocks. This assumption has been fundamental to the analysis of the sequence of deformation in the Earth's crust.

Basaltic dykes have been used to separate chronologically two principal periods of orogenesis (mountain building) on the understanding that the dykes were intruded into the deformed and metamorphic rocks after the compressive stresses responsible for the deformation had relaxed into a state of tension. The subsequent deformation and metamorphism of the dykes themselves is the evidence of the later orogenic episode. Sutton and Watson (*Quart. J. Geol. Soc.*, **106**, 241; 1951), in their classical account of the Pre-Cambrian chronology of the Lewisian rocks of north-west Scotland, demonstrated that the Scourie dyke swarm was emplaced into the Lewisian gneisses during an inter-orogenic period. The fact that later works have shown that the Scourie dykes represent a series of dyke intrusions emplaced within a waning metamorphic environment does not detract from their principal argument.

Many other workers have used the presence of dolerite dykes within a deformed sequence of rocks to argue the existence of distinct phases of compression within a principal orogenic episode. In these cases the compressional phases are thought to be separated by periods of relaxation of stresses while the dykes were intruded although the rocks remained deeply buried in the Earth's crust.

The dyke suite described by Ramsay and Sturt was observed within mine workings in a nepheline syenite body on the island of Stjernøy off the north-west coast of Norway. The dykes were intruded in conditions of upper greenschist facies of metamorphism during the waning stages of Caledonian orogenic deformation. The well preserved intrusion features indicate a dilatational mode of emplacement rather than replacement and suggest that magmatic pressures were primarily responsible for the dyke intrusion.

The conclusion to be drawn from this account is that in itself the presence of a suite of basaltic dykes does not confirm a period of tension in the host rocks, but merely that the compression at depth on the magma reservoir was greater than the compression of the rocks into which the dykes were intruded.

SUPERCONDUCTIVITY

## Forcing out the Ohms

by our Solid State Physics Correspondent

THE discovery last year that supercurrents may be induced in lanthanum under pressure has awakened interest in what may be accomplished with other metals in this corner of the periodic table. J. Wittig (*Phys. Rev. Lett.*, **24**, 812; 1970) has now demonstrated that both caesium and yttrium also lose their electrical resistance when large enough pressures are applied, and that the transition temperatures, although still modest, are higher than had been anticipated.

In caesium, the change is attributed to a transformation of the crystal structure under pressure. Wittig points out that this is in line with the idea of a pressure induced electronic transition in caesium, in which the concentration of the d-electrons is raised to give something like an artificial transition metal. The same argument would apply to caesium and lanthanum.

One mystery in lanthanum has been the part played by the 4f electrons in the superconducting mechanism. Wittig maintains that the existence of pressure induced superconductivity in yttrium destroys the notion that the 4f electrons are necessary for superconductivity to occur. He suggests that it may be just a change of lattice constant which causes yttrium to become superconducting, and he surmises that the related element lutetium may also show pressure induced superconductivity on the same basis.

One interesting suggestion is that by alloying metals with yttrium it may be possible to produce some new superconducting materials. The highest transition temperature in this group of metals is 12 K for lanthanum, where, it seems, the transition temperature is enhanced by the peculiar shape of the core potential. There may then be some chance of finding a superconducting phase at higher temperatures by the right choice of pressure and alloy.

Another instance of supercurrents being induced in what might seem to be uncongenial surroundings has been suggested by B. Hillenbrand and M. Wilhelm (*Phys. Lett.*, **31**, 448; 1970). They suggest that a mixed crystal of cerium, terbium and rubidium may be able to harbour both a supercurrent and ferromagnetism at the same time, at first sight an extraordinary proposition, for magnetic fields are normally held to destroy superconductivity. They have taken measurements of susceptibility and resistance and come to the conclusion that there ought to be a region at about 4 K where the two states can exist simultaneously.

They see the explanation as different from that of type 2 superconductivity, in which the magnetic field may penetrate some way inside the solid. The terbium atoms act as a sort of shield, they believe, allowing the supercurrent to wend its way through the minefield of little magnets which are ordered in some systematic way. Although it is hazardous to speculate, the possible coexistence of ferromagnetism and supercurrents may help to explain why certain materials can withstand surprisingly large external magnetic fields without losing their superconductivity, a property which is still something of a puzzle.

CORAL REEFS

## Plague Still Rages

IN the best possible conditions it would take twenty years for the Great Barrier Reef to recover from the ravages of the crown of thorns starfish. This conclusion of a committee of the Australian Academy of Science (*Rep. Austral. Acad. Sci.*, No. 11; 1970) is made gloomier by the frank admission that there is no evid-

© 1970 Nature Publishing Group