analysis, which simply divides the component under study into elementary shapes (triangles, rectangles and so on) and solves the equations of equilibrium and compatibility by matrix methods. Any conference intended to cover the whole of stress analysis, such as the Institute of Physics Stress Analysis Group annual conference at the University of Surrey on September 23–25, must include this topic to an increasing degree. This certainly happened, but it seemed rather reluctantly done, and reflected the ostrich attitudes of many experimental stress analysts, for whom the Institute of Physics has provided a useful debating ground for many years (the majority of physicists interested in stress analysis are concerned with experimental techniques).

Dr T. K. Hellen (Central Electricity Generating Board) emphasized the success of computer methods for elastic problems, and was supported by Dr J. McEwen (Weir Group Ltd), who had used these programs to solve the centrifugal stressing of impeller blades, and compared the results with other methods. Dr K. Kedward (Rolls Royce) demonstrated the successful application to anisotropic carbon fibre reinforced beams, describing some very convincing comparisons with photoelastic coating fringe patterns. In this type of application, with anisotropic and non-linear material behaviour, finite element analysis is most promising, for experimental methods bring considerable difficulty in both modelling and analysing this behaviour.

Dr G. C. Mitchell (NCRE, Dunfermline) described some uses of finite elements in ships' structures, showing that it is still necessary to test actual prototypes (or large scale models, at least) to destruction, for practical assessment of failure. Accurate calculation of stresses is only one step in the safe design of large structures.

Several contributors commented on the difficulty of preparing data, and the problem of the vast computer output, which often frightened designers used to decisions based on limited data. The simplification of output for design purposes is an important task.

There were several descriptions of the application of standard experimental techniques to various design and material testing problems, but there were also some interesting developments of instrumentation for high temperature work. Dr V. M. Hickson (Royal Aircraft Establishment, Farnborough) described an ingenious but rather expensive gas gauge, which used the variation of pressure at an orifice to determine small displacements. Stabilization at working temperatures seemed to be difficult, but this did seem a problem with the capacitance gauge, described by Dr B. E. Noltingk (Central Electricity Research Laboratories, Leatherhead), which depended on the change of capacitance between two curved wires, placed side by side, as they were stretched. Preliminary results from this instrument suggested that it is very reliable up to 600° C, and associated instrumentation, described by Dr P. C. F. Walfendale (Automatic Systems Laboratories) could satisfy all practical requirements. For temperatures greater than 600° C, optical techniques seem still to be the only practical, though far from perfect, methods. Dr A. R. Luxmoore (University of Wales, Swansea) described an application of the moiré effect to creep measurements of stainless steel tubes at 800° C.

There was only one description of the application of holography (an elementary study on plates) from Dr K. G. Miles (University of Nottingham). This was surprising, in view of the impact of holography on interferometric measurement of deformation, but perhaps it was attributable to the wide scope of the contributions.

PALAEOMAGNETISM

Can Sediments be Used?

from our Geomagnetism Correspondent

PALAEOMAGNETISM is apparently based on a preposterous premise. Although it is no surprise that rocks which contain small quantities of magnetic minerals can acquire a magnetization, no one had a right to expect that such magnetization could remain stable for hundreds, or even thousands, of millions of years. The reason for the stability is, of course, that some of the magnetic minerals concerned have high coercive forces; and nowhere is this characteristic better illustrated than in haematite-bearing sediments. Very often the natural remanent magnetization (NRM) of red sediments is hardly affected by demagnetizing fields of 2,000–3,000 oersteds.

As far as sediments are concerned, the validity of the palaeomagnetic method is confirmed by consistency of data, as exemplified by close internal grouping of palaeomagnetic directions and comparability of directions with those derived from other types of rock. Nevertheless, a minor stir was created when Smith (R. W.) and Fuller (*Science*, **156**, 1130; 1967) showed that in single crystals of haematite the magnetic moment produced by the interaction of antiferromagnetism with lattice defects and impurities (the so-called defect moment) was much more stable magnetically than the moment produced by the canting of spin sub-lattices (the intrinsic moment). In other words, it seemed that the structure sensitive moment, which can easily be altered by stress or heating to give spurious palaeomagnetic data, was much more stable magnetically than the spin moment, which is less influenced by extraneous phenomena. If this were so, partial demagnetization of the NRM would first remove the very moment which records the true palaeomagnetic direction.

Palaeomagnetists can now breathe freely again, for Dunlop (*Science*, **169**, 858; 1970) has shown that what applies to single haematite crystals does not apply to fine-grain haematite nor to the form of haematite found in sediments. In a long series of magnetic experiments on synthetic haematite powders and natural red sediments in various states of annealing (which removes the defects and so the defect moment), Dunlop has shown that it is the spin-canted moment which is the harder magnetically—and thus that palaeomagnetic directions obtained from sediments partially demagnetized in the laboratory are valid in theory as well as in practice. It turns out that thermal demagnetization should be particularly suitable for the magnetic cleaning of sediments because not only is the average coercivity of the defect moment lower than that of the intrinsic moment, but the process of heating tends to anneal the sample, thereby reducing the number of defects which produce the structure-sensitive moment in the first place.