the phenomenon described as doming by Jenike[6]. He defined two flow failure mechanisms; the other was piping. The two types are shown in Fig. 2; it was found that 'flow and stick' flow stoppages were due to piping and free flow stoppages due to doming. Fig. 2a shows piping in a small head of powder; in a larger head the pipe may be closed at the upper end.

The ball-milled particles were produced from particles of 800μ diameter and larger in order that there should be a sufficient range of particles of similar surface condition to define the flow-stick transition at about 200μ. In Fig. 1 the ranges of particle size are indicated for the results with ball-milled sand. Gregory mentioned the pronounced tendency to stick of particles less than 80μ and this was observed with the sand tested, particularly if there was a delay in testing. He also noted that materials with a narrow size range flow best; wider size ranges exhibit an increasing tendency to stick. This was also observed: the 150–170 fraction flowed fairly easily but the complete pass 150 fraction did not flow at all.

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Curve Fitting using a Digital Computer

IN the course of some recent investigations in experimental physics we have processed a great deal of data with a digital computer using a variety of weighted least-squares fitting programmes. All these programmes, regardless of the specific problem, have the following feature in common. After the best values of the fitted parameters have been obtained a test of each data point is made. If the data point lies more than a specified interval from the best curve, the experimental and fitted values of the ordinate, and the associated uncertainty in the experimental value are punched out. We would like to emphasize the great value of this feature. As a criterion for punch-out a deviation equal to three standard errors was chosen. This corresponds to the well-known 99·3 per cent confidence limit, and eliminates nearly all statistical fluctuations from being punched. Within two months of adopting this procedure we had already experienced several resulting benefits.

(*a*) The programme reveals when the theoretical fit is not appropriate, and also just when and where it is not.

(*b*) If the theory is appropriate, but only over a limited range, and too extreme experimental points have been included, these are often detectable after a careful scrutiny of the punched-out information.

(*c*) Previously unsuspected faults in the functioning of the apparatus may be revealed; for example, if the fault caused an intermittent and spurious lowering of readings.

(*d*) Numerical errors in the preparation of data for the computation are often revealed.

(*e*) Inappropriate weighting of the data points can be apparent. In this last category, inappropriate relative weights are revealed and so also is an overall underestimate of experimental uncertainty, which results in consistently high weighting of all points.

(*f*) Our procedure frequently obviates the need for a detailed graphical plot.

We consider that the test could be made to yield more information on the borderline of statistical significance by changing the criterion for punch-out, say, to two standard errors.

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GEOLOGY

Fossils from the Ellsworth Mountains, Antarctica

THE Ellsworth Mountains are centred at 79° S., 85° W. in West Antarctica south of the eastern Pacific Ocean (see Fig. 1). They extend about 220 miles in a north-northwest direction and are divided into a northern Sentinel Range and a southern Heritage Range. Widespread rock exposure and critical location make these mountains important in seeking an understanding of the structural evolution of West Antarctica. One of us (C. C.) visited the Ellsworth Mountains briefly in 1959 during an airborne traverse, and University of Minnesota expeditions worked there during the 1961–62 and 1962–63 summer seasons. Few fossils were found by the first expedition[1], and none has proved identifiable even to genus. Significant palæontological discoveries were made, however, during the 1962–63 season when one of us (G. F. W.) led a party in the Heritage Range and the other a party in the Sentinel Range. Although the new material was only briefly examined and the field work is continuing, it seems desirable to make available a summary of the fossil discoveries so far.

Outlines of the geology of the Ellsworth Mountains have been presented by Anderson *et al.*[1] and Craddock *et al.*[2]. Bedrock consists almost exclusively of intensively deformed and slightly metamorphosed sedimentary rocks with a minimum thickness, based on measured sections and field estimates, of 40,000 ft. No definite unconformities have been established, and this entire sequence may prove to be conformable. The stratigraphic units recognized at present are in ascending order: (1) a poorly known lower group; (2) the Crashite Quartzite; (3) the Whiteout Conglomerate; (4) the Polarstar Formation.

The lower group consists mainly of clastic sedimentary rocks ranging from pelite to boulder conglomerate. Total

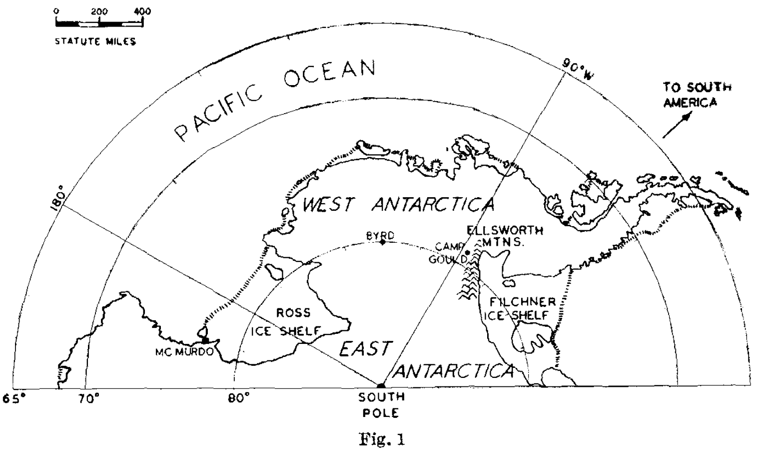

Fig. 1