pairs an angle of 100° about the maximum principal pressure. In cylinders inclined at small angles (less than 25°) to the foliation asymmetrical conjugate sets developed. At angles of 25°–45° only one set of kink-bands appeared and at greater inclinations of the foliation to the cylinder axis, and hence to the maximum principal pressure, the deformation took other forms. No mention is made of any change in orientation of the kink-bands during growth.

These experimental results are in good agreement with the geometrical relationships and mechanisms of formation I outlined, particularly with the statement that kink-bands "may be interpreted as a response to a major principal stress acting in a direction contained in, or close to, the foliation".

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Live and Dead Foraminifera between the Sarns, Cardigan Bay

THE Sarns of Cardigan Bay are submarine ridges of boulders, cobbles and pebbles, running out to sea at right angles to the coast. The longest, Sarn Badrig or St. Patrick's Causeway, is more than 13 miles long. These striking features, and the areas of finer sediment between them, are being investigated. During the summer of 1961 samples were collected from sand areas in shallow, near-shore waters above the five fathom line, off Aberystwyth, off Clarach and off Borth in Cardigan Bay. These samples were surface skims of sediment obtained by use of 'Normalair' aqualung equipment from a rubber boat. Dr. T. D. Adams and Mr. W. Barrett assisted with this work. Analysis of the fauna in these samples by the standard rose bengal staining technique[1] revealed that all the foraminifera were dead, and many of the shells were abraded and worn.

In late 1962 the Department acquired the research vessel, *Antur*, and systematic bottom sampling of the whole area between Sarn Cynfelyn and Sarn Badrig was undertaken. This work was done in co-operation with Dr. H. A. Jones and Mr. J. R. Moore, III, the object being to map recent sediment distribution and its relation to living and dead foraminifera, and to other forms of marine life. Most of the samples were collected with the Holmes vacuum grab, others with the Van Veen grab. Boat operations were continued through the winter of 1962/63 and an area of about 200 square miles was sampled at approximately one-mile intervals. This survey covered the area between the Sarns down to the 10-fathom line and made it possible to compare samples collected at different seasons.

Petrological work by Mr. Moore shows that the predominant sediments in this area are fine sands ($\frac{1}{4}$–$\frac{1}{8}$ mm) with subsidiary patches of coarse sands and sandy gravels. Living specimens of foraminifera are absent from these sediments—not only from samples collected by the Van Veen grab, where it could be argued that surface sediment was swamped by subsurface material, but also in vacuum grab samples of less than 50 ml. where the sediment included a high proportion of surface material.

As was shown by Herdman and Lomas[2] the net current movement, and thus transport of sediment, in the shallow parts of the eastern Irish Sea, is landwards. Admiralty charts show that currents up to 1 knot obtain in the area between the Sarns. These speeds are quite sufficient to transport smaller foraminifera, average size between 0·1 and 0·5 mm (ref. 3). This indication that the dead foraminifera are moving with the sediment is strongly supported by their marked size sorting. In the fine sand areas they fall mainly on the 100 mesh (152 microns) sieve. In the coarse sand and gravel areas the majority are found in the 60 mesh (251 microns) sieve with some well-grown forms on the 30 mesh (500 microns) sieve.

Clues to the origin of at least some of the species found dead in the current-swept sand of the bay are provided by samples from the Sarns themselves. Parts of the Sarns are awash at low spring tides. They are thus shallow banks providing convenient anchorage for many kinds of marine algae and associated life forms. Cobbles and boulders obtained with the Van Veen grab, particularly from Sarn Bwch, carry a rich assemblage of algae, hydroids, tunicates and bryozoans with associated molluscs and foraminifera. Most of the foraminifera are living, and include not only fixed forms, such as *Cibicides*, but also numerous members of the Miliolidae. When they die these forms are undoubtedly swept into the sands. Foraminifera also live on the surface of the relatively small areas of mud deposition in the Bay, such as in the 'trawling grounds' south of Sarn Cynfelyn. It is unlikely that specimens from these quiet areas are worked into the sands (though the muds include specimens which may have been winnowed from the sands). There are, however, many forms in the dead assemblage that occur neither on the Sarns nor, living, on the mud. These include *Bolivina* and *Lagena* as well as *Globigerina*, and are presumably swept in from the deeper parts of St. George's Channel, or beyond.

Carter[4], in his work on the East Anglian crags, has shown that the foraminifera are size-sorted. The sands between the Sarns are likewise the product of a rapidly advancing transgressive sea. Identification of such current-swept microfaunas as occur in these sands may thus assist in the identification of similar sedimentary bodies, above unconformities, in the sub-surface.

The work described here is part of a research project concerning the geological history of Cardigan Bay, directed by Prof. Alan Wood. The diving equipment was supplied by the College and the research vessel financed by the Department of Scientific and Industrial Research.

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M_2 Component at Hyderabad

IN an earlier paper[1] the authors reported the recording and analysis of the gravity variation with time in the month of December, 1961, at Hyderabad (long. 78° 27′ E and lat. 17° 26′ N). The record was continued for another six months in 1962 and the data were analysed only for the main lunar semidiurnal tidal component M_2, as it was found that this was the most consistent and dependable component. It is found desirable to check the calibration of the photographic recording paper (in milligals) frequently. The theoretical amplitude is 0·069 milligals for Hyderabad.

In Table 1 the gravimetric factor G is the ratio of the observed amplitude (A) in milligals to the theoretical amplitude. From this factor the characteristic numbers Love (h, k,) and Shida (l) are calculated.

Table 1

Month	A	G	h	k	l
Jan.	0·0815	1·18	0·64	0·31	0·08
Feb.	0·0807	1·17	0·61	0·29	0·08
Apr.	0·0830	1·20	0·71	0·34	0·09
May	0·0839	1·21	0·75	0·36	0·10
June	0·0812	1·18	0·64	0·31	0·08