

The Kampong Sena Formation of the mainland is clearly equivalent, in part at least, to the Singa Formation of Langkawi, and like the latter includes granite detritus and fragments of metamorphosed argillites.

The succeeding Permian Chuping Limestone of Malaya and Rat Buri Limestone of Thailand appear to represent the early, platform, facies of a new sedimentary cycle or sub-cycle.

It is therefore contended that the "Langkawi folding phase" is most probably of Middle to Upper Carboniferous date and constitutes the culmination of a clearly defined Upper Cambrian to Lower Carboniferous cycle of sedimentation.

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DI-BELAKANG RUMAH 338  
JALAN KUALA KRAI,  
MACHANG, KELANKAN,  
MALAYA.

## NOTE ON ASSOCIATION OF PENTACRINUS WITH LIGNITE

SIR,—It has been remarked from the days of the Rev. Prof. Buckland onwards that the splendid groups of *Pentacrinus briareus* for which Lyme Regis is famous, and which adorn most museum collections of Lias fossils, are usually so closely associated with masses of lignite (resembling a friable jet), that there can be no reasonable doubt that the crinoids grew attached to driftwood floating in the Liassic sea. Collectors, however, seem not to have recorded whether the lignite occurs above or below the crinoid remains, and as the clusters of *Pentacrinus* are rarely observable *in situ*, opportunities for observation do not often present themselves.

In the course of the year 1957 I had the good fortune, on two occasions, to see specimens, *in situ*, and in both cases, the lignite lay above the crinoids. In the first instance, a long slice of the "Pentacrinite Bed" with associated strata above and below, to a thickness of some 8 or 9 feet, had slipped from the face of Stonebarrow Cliff without turning over in its descent to the beach, and in this mass was visible the edge of a thin group of crinoids, about 2 feet across, capped by a layer of lignite. Another and thinner seam of the characteristic white crinoidal limestone occurred in another part of the great slumped block, but at least 18 inches lower. No lignite was visible, but this specimen may have shown only the fringe of a group extending beyond the limits of any lignite to which it may have been attached. The difference in horizon of the two specimens is interesting, as indicating that the crinoids may range through an appreciable thickness of strata, and certainly are not confined to one bedding-plane.

In the second case, three small groups, in friable condition and considerably damaged by wave action, were visible in plan, several yards apart, near low-water mark, on the shore-platform below Stonebarrow Cliff, a short distance east of the spot where the Flatstones Nodules are faulted down to beach-level. In each instance a small crust of lignite still clung to the upper surface of the groups. This is the only place where the "Pentacrinite Bed" comes down to the shore; but, unfortunately, the whole area is almost always

covered with a thin sheet of sand ; indeed, I had not seen more than small patches laid bare during the past six years. The bed, when not covered by the shingle beach, can be traced into the foot of the cliff, and here a large group was broken up by the sea before it could be removed, and several beautiful crowns were destroyed. In my experience, *Pentacrinus* seems to be about as common—or as rare—in Stonebarrow Cliff as at Black Ven ; I imagine that some specimens in old collections labelled “ Black Ven ” or “ Lyme Regis ” may have been obtained from Stonebarrow by the local fossil dealers who supplied visitors with specimens in the Anningian Epoch, and afterwards.

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9th May, 1966.

#### FAULT SCARP OR FAULT-LINE SCARP ?

SIR,—Nothing could be more obvious than the distinction between a fault scarp, formed directly by fault movement, and a fault-line scarp, due to differential erosion. Its importance is stressed in all the textbooks and, one gathers, in all elementary teaching. Yet this radical distinction, as regards origin and history, is not always observed, even in high places. The chief error (as it seems to the writer) is in calling a scarp, occurring along a fault, a fault scarp before its claim as a fault-line scarp has been properly considered. Where along a fault a more resistant kind of rock on one side stands higher than a less resistant kind on the other, the scarp must be provisionally taken to be a fault-line scarp in the absence of reliable evidence to the contrary, because the universal and perpetual process of erosion will in any case tend to produce that effect.

An example of what appears to be lack of care in this connexion is shown on opening any edition of the *British Regional Geology* handbook on *The Pennines and Adjacent Areas*. Here we see, as frontispiece, a fine photograph of “ Giggleswick Scar : A prominent fault scarp ”. The additional very brief description seems to imply that this is not merely a loose use of terms but that a fault scarp is indeed meant. There is no discussion about it. The writer is convinced that all the evidence points to its being simply a fault-line scarp.

May one suggest that geomorphology is specially liable to suffer if the processes of reasoning are not strictly watched ?

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