Nomenclature for Rock-destroying Organisms

ROCK-DESTROYING organisms have interesting problems of adaptation[1] and are important agents in coastal erosion[2]. The geologic significance of fossil rock-boring animals was recorded at an early stage[3]. Advances have been made in understanding the biochemical and biophysical mechanisms of rock erosion by some species[4,5] and micro-morphological results of these processes have been described for a number of species[6,7]. No universally accepted nomenclature has developed, however, which (1) separates all rock-destroying organisms from non rock-destroying organisms, (2) distinguishes those parts of the rock (surface or sub-surface) where the greatest modification takes place as a result of biological activity. Here I suggest a nomenclature.

Terms such as rock grazing, browsing, rasping, burrowing and boring are used to describe plants or animals that erode rocks, but no single term is applied to all rock-destroying organisms. Such a term should include reference to both "rock" as distinct from "sediment", and to "destruction" or "erosion" to distinguish those species that actually erode rock from those that nestle or take refuge in already formed "reliefs", but do not contribute any erosion themselves. These two criteria are satisfied by the term lithophagic used by Craig[8] to refer to a freshwater snail responsible for erosion of limestone in southern British Honduras. It is now suggested that lithophagic (Greek: *lithos*, stone, rock; *phagos*, eating) be adopted and applied generally to any organism that erodes rock. Earlier terms such as lithodomous, lithotomous and lithophagous are by definition[9] limited to burrowing and boring animals and exclude rock-grazing animals and rock-destroying plants (algae, fungi, mosses). The ecological term "cryptofauna" used by Evans[10] is too broad and includes non-lithophagic as well as lithophagic species; some species may be lithophagic in some localities but non-lithophagic in others[11].

The nature and extent of rock destruction and the depth to which rocks are eroded by lithophagic organisms varies greatly and is partly determined by rock hardness[12] and other lithologic characteristics[13]. Three "vertical" zones are frequently distinguished in rock substrates which equate with the epifaunal, semi-infaunal and infaunal habitats normally used in reference to species located on or in sediments or soft substrates. Ginsburg[14] defined three lithophagic forms on intertidal limestones in Florida: (*a*) grazing forms; (*b*) forms which have exposed, generally shallow burrows; (*c*) forms which penetrate the rock. Kühnelt[15] introduced the following nomenclature for the same forms, (*a*) animals living on the rock surface occupy the *epilithion*, (*b*) those partially embedded the *mesolithion*, (*c*) those wholly embedded the *endolithion*. These terms have been used by Evans[16] with reference to the lithophagic species *Penitella penita*, and their adoption is recommended. Using this nomenclature for communities it is clear that they include non-lithophagic as well as lithophagic species, that is those who occupy space created by lithophagic organisms but who do not contribute to rock erosion. This is also true of the recently introduced term "cryptobion" which refers to communities enclosed within living or dead coral which are revealed only by cracking the substratum open[17]. It is therefore necessary to distinguish between those organisms which have an active role from those which have a passive role.

I suggest the following nomenclature: (*a*) epilithophagic, (*b*) mesolithophagic, (*c*) endolithophagic. Epilithophagic species are lithophagic species inhabiting the epilithion; mesolithophagic species are lithophagic species inhabiting the mesolithion; and endolithophagic species are lithophagic species inhabiting the endolithion. Names for non-lithophagic species inhabiting the epilithion, mesolithion and endolithion are not proposed here. The precise boundaries in depth between the epi-, meso- and endolithion cannot be given at this stage.

A large number of terms are applied to the erosional results of lithophagic species, such as pipes, perforations, galleries, tunnels, cavities, burrows and boreholes. In the absence of an all-embracing term it is suggested that biolithophagic "reliefs" should be used to cover all such forms developed in rock, following the terminology applied to biogenic sedimentary structures and trace fossils in sediments by Seilacher[18,19]. Biolithophagic epireliefs, mesoreliefs and endoreliefs may be appropriate names for those reliefs identified in the epilithion, mesolithion and endolithion respectively. Further refinement of terms descriptive of the precise details of biolithophagic reliefs, such as their depths, widths, orientations, inclinations, shapes, sinuosities and geometries, is clearly required, but I do not attempt that here. Palaeontologists and paleoecologists in particular are put in a taxonomically difficult position because empty biolithophagic reliefs are often the only indications of the former presence of lithophagic organisms, and because modern taxonomy is based on soft-part anatomy of the organisms. I agree with Boekschoten's suggestion[20] that the best solution would be the creation of new names for either the holes or the organisms. There is merit in the former approach, but much more work on the description of biolithophagic reliefs needs to be done before this can be put into effect.

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Hormones and Blood Chemistry

LAST year we had a unique opportunity to study the reprint request behaviour of scientists, as we published two papers almost simultaneously dealing with biochemical changes in human blood induced by synthetic steroid hormones. The first paper appeared in *Nature* as a single-page letter[1], while the second was a six-page contribution to a specialist journal[2]. For one year we have collected and analysed reprint requests for these papers.

A total of 70 requests were received for paper 1 and 133 for paper 2 (writers asking for more than one reprint were classified as single requests). Despite the similarity of content between