face charge. With poorly cuticularized leaves, and where a film of moisture is present, there should be no need for coating, particularly if salt concentration is high. Such conditions are met in insectivorous plants of the genus *Pinguicula,* and I found that natural images of leaves of this genus can be obtained with no preparation whatever.

Observations were made on freshly expanded leaves of *P. grandiflora* Lamck. Fragments about 2 by 3 mm were cut from the lamina and attached immediately to the specimen stub with a thin film of slow-drying animal glue. Examinations were made with a Cambridge Instruments Stereoscan Mk IIa microscope. The stub was introduced into the specimen chamber oriented suitably before evacuation. No observable changes occurred in the central region of the leaf fragments during the first 4 or 5 minutes after the operational vacuum had been attained. Thereafter there was a progressive desiccation and change of surface features, but even after 15 minutes useful information could still be obtained. There was no evidence of serious charging effects with an accelerating voltage of 5 kv.

The leaf of *Pinguicula* bears two classes of glands, stalked and sessile (*3*). The stalked glands are responsible for insect capture, secreting an apical globule of adhesive mucilage. The sessile glands are enzyme-secreting, producing phosphatases, ribonuclease, proteases, and other hydrolytic enzymes (*4*). Before desiccation begins, the globule of mucilage on the stalked gland shows no surface features (Fig. 1A). As drying proceeds, a skin is formed and this falls into folds (Fig. 1B). The sessile glands are sunken in a slight pit. On first observation their cellular structure is not apparent, but with drying the eight or so radiating cells of the head are brought into relief (Fig. 1C).

On contact with an insect (Fig. 1D), the mucilage becomes affixed tenaciously, and the movements of the insect draw the adhesive out into cables (*5*). The glands lose turgor on stimulation, quickly collapsing against the epidermis. The leaf in the vicinity becomes slightly depressed (*6*), probably because of the loss of turgor of epidermal cells. Later, the sessile glands secrete a pool of enzyme-containing fluid in which digestion takes place. Note that the captured insect shows no evidence of surface charging; studies of living insects without conductive coatings have been made (*7*).

The fact that certain leaves can be examined without preparation opens up numerous possibilities in the high-resolution study of surface features. Apart from observations of glands and other appendages, it should be feasible to extend the study of the submicroscopic morphology of stomata (Fig. 1C) and transpiration control devices, taking advantage of the appreciable interval available for operation before substantial changes in the epidermes occur in the vacuum of the instrument.

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Mixed Permian-Triassic Fauna, Guryul Ravine, Kashmir

Abstract. *At Guryul Ravine near Srinagar, Kashmir, a varied fauna of productid brachiopods, including* Spinomarginifera, *is associated in approximately 15 feet (about 4 meters) of strata with the typical Scythian (Lower Triassic) pelecypod* Claraia. *These faunas are interpreted as true associations of surviving "Permian" and Lower Triassic faunal elements. Similar mixed associations have previously been identified in the lowest Triassic strata of the Salt Range and Surghar Range of West Pakistan.*

The exposures of Permian and Triassic formations in Guryul Ravine near Srinagar, Kashmir (34°6'N, 75°0'E), are justly famous in the annals of Himalayan stratigraphy. This sequence, first reported on by Hayden (*1*), was later given detailed attention by Middlemiss (*2*), who divided the sedimentary sequence above the Panjal volcanics into lithological units to which he did not give formal names (Fig. 1A). Middlemiss placed the boundary between the Permian and Triassic systems at the top of his "Black Shales" unit, from which he reported the bivalve *Pseudomonotis.* The Paleozoic rocks above the Panjal volcanics were named Zewan Series by Goodwin-Austin (*3*), and the top of this unit was extended by Wadia (*4*) to include the rocks of the "Limestone cliff" in Middlemiss's section (Fig. 1A).

During June 1968, we had the opportunity to study this section in the field. In the "Black Shales" unit of Middlemiss (Fig. 1), who considered this unit to be of Permian age, we discovered fossiliferous beds in which *Spinomarginifera* and other productid brachiopods, typically Permian in aspect, are in association with *Claraia,* a bivalve typical of the lower half of the Scythian Stage (Lower Triassic). The position of these beds is shown in Fig. 1B. The mixed faunas are found in approximately 15 feet (about 4 m) of strata. The "Sandy Shales" unit of Middlemiss, which, according to our observations, is essentially a calcerous sandstone, is overlain with a sharp contact by a few centimeters of coquinoid limestone composed of fragmented bivalve shells. About 1.1 m above this contact, we found a bed containing *Claraia* and unidentified productid brachiopods. At about 1.75 m above the contact, *Spinomarginifera* and other Permian-type brachiopods occur. The lowermost 12 feet (3.6 m) are best described as argillaceous limestone with some shaly interbeds. These are followed by a shale unit in which a bed with poorly preserved *Spinomarginifera* is overlain by a bed containing *Claraia.* Additional occurrences of *Claraia,* but not more Permian-type

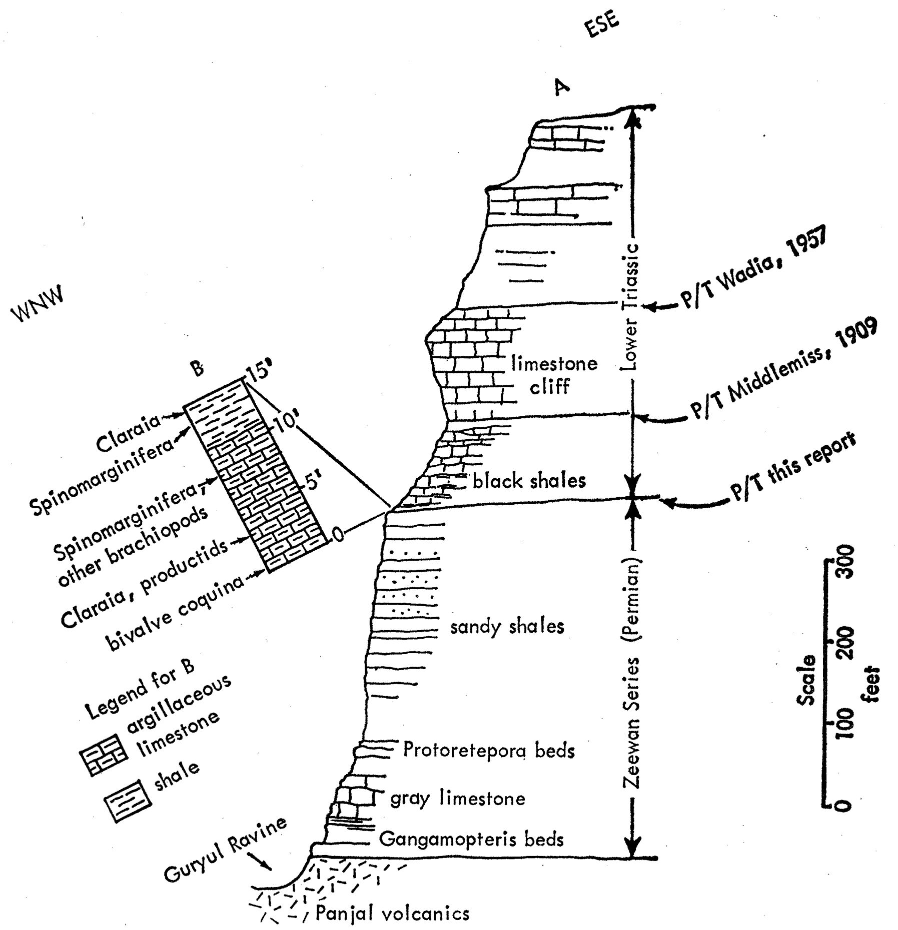

Fig. 1. Southeast side of Guryul Ravine. (A) Stratigraphic section after Middlemiss (1909) [adapted from Wadia (*4*)]; *P/T*, Permian-Triassic boundary. (B) Basal part of Middlemiss's "Black Shale" unit according to our own traverse. (Scale in feet used for compatibility with earlier publications.)

brachiopods, were found higher up in parts of the section not shown in Fig. 1B.

These observations have an important bearing on the problem of biological extinctions at the Permian-Triassic boundary. It has long been known that there is an abrupt change in marine invertebrate faunas at this stratigraphic boundary. Explanations for the mass extinctions of Permian life are legion, but the final answer is still evasive. In recent years a few other occurrences of "mixed" Permian and Triassic faunas have been reported. In most cases, however, this interpretation has been questioned.

The lowest Triassic strata of the Kap Stosch area of East Greenland contain *Otoceras* and *Glyptophiceras*, marking the earliest Triassic ammonoid zone, along with a Permian benthonic fauna including productids, fenestellids, and others. Trümpy (*5*) has interpreted this assemblage as a survival of Permian benthonic elements into earliest Triassic time. A new investigation of these strata and their faunas has been made by Teichert, Kummel, and Trümpy (*6*). Ruzhentsev and Sarycheva (*7*) have thoroughly documented the fossil contents of the Late Permian and Early Triassic strata of Dzhulfa, Armenian SSR. Here the beds regarded as earliest Triassic by these authors contain, aside from ceratitic ammonoids, a variety of productids, tetracorals, and goniatites. Their assignment to the Early Triassic has been questioned by Chao (*8*). These same strata crop out on the Iranian side of the Aras River and were investigated by Teichert and Kummel in July 1968. In outcrops of the Salt Range and Surghar Range of West Pakistan the lowermost 5 to 6 feet of Triassic strata contain a small varied "Permian" brachiopod fauna including productids and *Crurithyris*, along with *Ophiceras connectens*. In a preliminary report Kummel and Teichert (*9*) admitted the possibility of reworking as an explanation for this faunal assemblage, but in their final report (*10*), reworking is not considered as the most probable explanation. Finally, Bion (*11*) reported the presence of productids with *Otoceras* in the vicinity of Pahlgam, Kashmir, about 28 miles (40 km) east of Srinagar. During a visit to this area in June 1968, we were unsuccessful in finding Bion's locality.

We find it difficult to interpret the Guryul Ravine mixed fauna as anything but a true association of surviving "Permian" brachiopods with a typical Lower Triassic pelecypod, *Claraia*. The assignment of an exclusively Early Triassic age to *Claraia* may be open to questions, but Newell (*12*) has examined the specimens and writes, "The fact remains that shells of this kind are not at all characteristic of Permian faunas, whereas they tend to be highly characteristic of a portion of the Lower Triassic." Thus for the moment, it appears highly probable that true mixed Permian-Triassic faunas are present at Guryul Ravine, Kashmir, and in the Salt Range and Surghar Range of West Pakistan.

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