inary findings in other populations, such as that in Japan, an independent mutation appears to be involved.

Undoubtedly, many more associations will be uncovered. Also, from this example, it appears that disease susceptibility is determined by a locus on the HLA chromosome, but that the locus is closer to the B lymphocyte antigen locus than to the HLA-A, -B, -C, or -D loci. This is inferred from the fact that association with MS is less with the A and B loci and somewhat less with the D locus. The finding that everyone who is DW2 is also group 4 (in this small series), suggests that the antigens could indeed be identical, but that the two different methods may produce different results. It is possible that HLA-D locus testing may not identify all the group 4 positive cells.

An association with DW3 has been found in celiac disease and dermatitis herpetiformes (*12*), which was higher than the earlier reported association with HLA-B8 (*13*). In another study two antiserums that react to a higher frequency with B lymphocytes of such patients were described (*14*). Whether the serums react with DW3 cells was not determined, although the possibility that they detect antigens similar to Ia antigens was postulated. The existence of an IR (immune response) gene for MS susceptibility and the detection of Ia antigens by antibodies to B lymphocytes may be analogous to the system described in mice (*15*).

Since not all MS patients in our study were of the group 4 type, it could be postulated that "pure" MS will prove to be of a specific type when the MS patients are finally accurately diagnosed. The serums defining group 4 may also be changed eventually since, as discussed earlier, the reactions are heterogeneous. It is perhaps more likely that because of crossing-over, the MS susceptibility gene is present on haplotypes other than that with group 4.

The above results indicate that the B group 4 could be utilized as a diagnostic aid, even though the rather high incidence of the antigen group in normal subjects may be a complicating factor. However, if some clinical signs of MS are viewed in combination with B lymphocyte typing, the possibility of accurately identifying MS patients may be magnified considerably.

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30 January 1976; revised 10 May 1976

Endolithic Blue-Green Algae in the Dry Valleys: Primary Producers in the Antarctic Desert Ecosystem

Abstract. *Endolithic unicellular blue-green algae occur under the surface of orthoquartzite rocks in the dry valleys of southern Victoria Land, Antarctica. This report of primary producers in the Antarctic desert ecosystem suggests that, in future efforts to detect life in extraterrestrial (for example, martian) environments, scientists should consider the possible existence of endolithic life forms.*

The ice-free cold desert of the dry valley region in southern Victoria Land, Antarctica (77°30′S, 161°00′E) can be regarded as the most extreme and inhospitable environment on Earth. This area attracted the interest of microbiologists not only because the combination of extreme drought and cold poses utmost demands on the adaptive capacity of microorganisms (*1*), but also because the dry valleys are regarded as the closest terrestrial analog to martian or other extraterrestrial planetary environments (*2*, *3*).

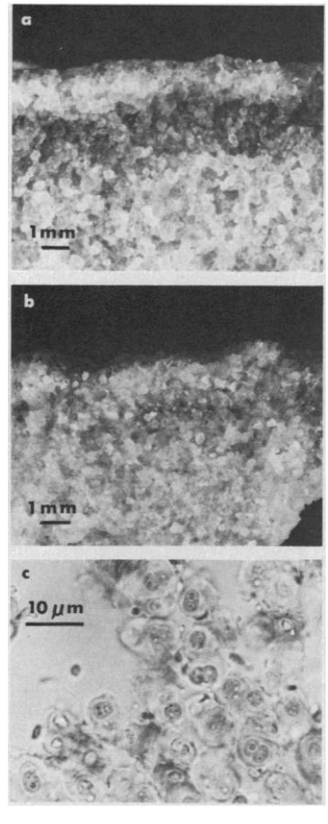

Fig. 1. (a) Vertically fractured orthoquartzite rock from the Mount Baldr–Mount Thor area, Wright Valley, Asgard Range, southern Victoria Land, showing a dark green zone of endolithic algae under the surface. (b) Similar endolithic algal zone in Nubian sandstone, from Wadi Mangan, north of Timna, Negev Desert. (c) Unicellular blue-green algae (*Gloeocapsa* sp.) from rock shown in (a).

Horowitz *et al.* (*2*) summarized the results of soil microbiological research in the dry valleys. They concluded that either (i) dry valley soils are abiotic or (ii) when microorganisms do appear in cultures, they are not indigenous. The authors suggested that the microbial population of dry valley soils represents a steady state in which influx from the atmosphere (carried by wind from more favorable environments) is balanced by mortality on the ground. These findings were challenged by Vishniac and Mainzer (*3*, *4*), who found an indigenous soil microflora by microbiological methods applied in situ. Yeasts recently isolated

from dry valley soils and unlike any previously described (*5*) may also be representatives of an indigenous microflora.

Given the conflicting nature of these claims, the in situ direct visual demonstration of an indigenous microbial flora in the dry valley area is significant. In addition, on the basis of reports published to date, primary producers of organic matter, such as algae, seem to be conspicuously lacking in dry valley soils.

In our earlier studies in hot deserts, we demonstrated the presence of a quantitatively measurable flora of microscopic algae and associated bacteria inside exposed rocks. These endolithic organisms grow a few millimeters below the surface and colonize the microscopic air-space system in certain porous rocks (*6*).

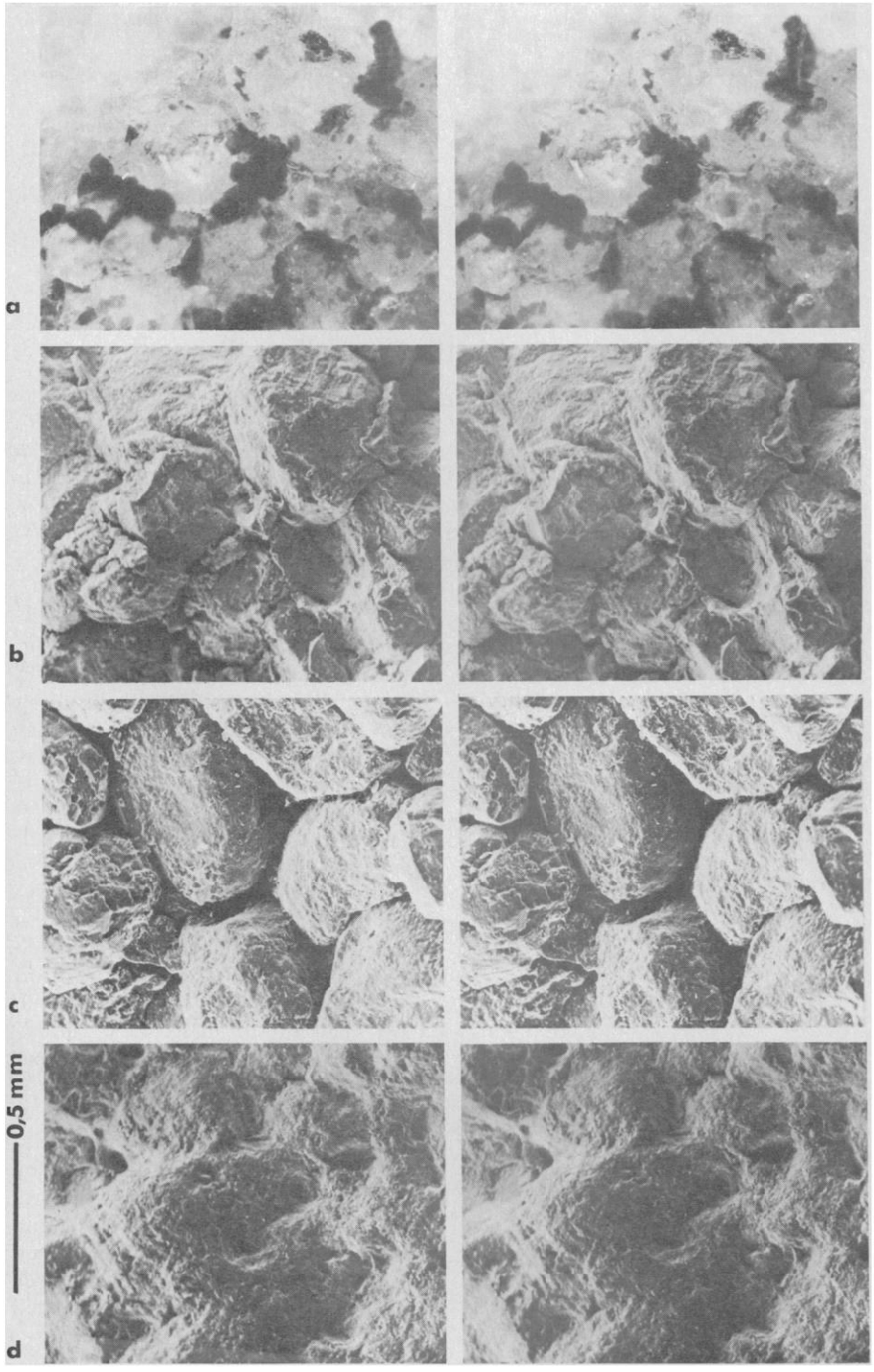

Fig. 2. Structure of orthoquartzite rock from the Antarctic dry valleys illustrated in Fig. 1a. The stereoscopic pairs of micrographs, produced by tilting the specimen stage, should be viewed with a stereoscopic hand viewer. (a) Portion of the algal zone, showing dark colonies of cells growing between rock particles. Several colonies are visible behind the transparent crystalline particles. Light micrograph taken through a Leitz Ultropak incident light objective with water immersion. (b) The same area as shown in (a) after coating with gold-palladium and viewed in the scanning electron microscope. The colonies of algae can be identified by comparison with (a). (c) Structure of rock below the algal zone showing crevices between particles. (d) Surface of the rock, crevices between particles filled with debrislike material.

Examination of exposed orthoquartzite rocks (*7*) from the dry valley area revealed the presence of endolithic algae which form a dark greenish zone approximately 1.5 mm wide parallel to and approximately 1 to 2 mm beneath the rock surface (Fig. 1a). The rock fabric is porous, and the algae grow in the air spaces between the rock particles (Fig. 2). The transparency of the rock allows light to penetrate into the algal zone (Fig. 2a). The crevices between particles form a coherent air-space system in the rock fabric (Fig. 2, b and c). At the surface, the spaces between rock particles are filled with a debrislike material of presumably aeolian origin (Fig. 2d), which shields the inner air-space system from the outside environment. These factors result in a peculiar and protected physical niche, in which favorable conditions for microbial life prevail within the hostile macroenvironment.

There is a high degree of morphological similarity between endolithic algal microorganisms in Antarctica and those found in hot deserts such as the Negev and the Sinai (Fig. 1b) (*8*). The similarity extends to the physical structure of the rocks, the morphology of growth, and the endolithic organisms themselves. Cells growing on the surface of crystals and removed by micromanipulation (Fig. 1c) form a monospecific population of a (probably undescribed) species of *Gloeocapsa* (*9*). Strains of endolithic *Gloeocapsa* morphologically similar to the Antarctic form have been isolated in our laboratory from rocks collected in hot deserts (*10*).

The similarities between endolithic microorganisms from the Antarctic and those from the hot desert are not surprising when ecological conditions of both habitats are compared. During periods of extreme aridity these organisms are probably in a cryptobiotic state, and metabolic activity is resumed when sufficient water becomes available. In hot deserts, the main source of water is dew, absorbed and retained by the porous rock substrate (*8*). Although in the dry valleys snow sublimes without visibly wetting the ground, Vishniac and Mainzer reported that icicles and puddles are occasionally formed after snowfalls and are then absorbed by the soil (*3*) and presumably also by porous rocks. The blue-green algal colonizers of rocks are thus apparently able to undergo rapid changes between active metabolic and cryptobiotic

states, and it may be the adaptation to these conditions that enables organisms to survive in the harsh environments of both of the endolithic desert habitats.

The finding of endolithic blue-green algae in the dry valley region provides direct visual evidence of the presence of indigenous microbial life in this area and, so far as we can determine, also constitutes the first record of primary producers in the Antarctic cold desert ecosystem (*11*). We suggest that, beyond the relevance of our finding to terrestrial biology, scientists making future efforts to detect life in extreme planetary (for example, martian) environments, which have so far centered exclusively on soft soils (*12*), should also consider the interiors of exposed rocks as possible substrates for pioneer life forms.

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22 April 1976; revised 21 June 1976

Placental Localization of Human Pregnancy–Associated Plasma Proteins

Abstract. *Frozen sections of human placenta were examined for the presence of four human pregnancy proteins, pregnancy-associated plasma proteins A and C (PAPP-A and PAPP-C), human chorionic somatomammotropin (hCS), and pregnancy zone protein (PZP), by the indirect immunofluorescence technique. Monospecific rabbit antiserums to PAPP-A, PAPP-C, and hCS all stained the trophoblast cytoplasm equivalently in a continuous layer, suggesting that the same trophoblast cells synthesize all three pregnancy proteins. In contrast, PZP was localized in blood vessel walls, parenchymal structures within the villous, as well as in the trophoblast cytoplasm. Its distribution in the latter was relatively inhomogeneous, tending to be more intense on the basement membrane side.*

Our laboratory has demonstrated that in addition to human chorionic somatomammotropin (hCS) [also called human placental lactogen (hPL)], three other proteins, which are not seen in plasma of nonpregnant women, men, or cord blood, become detectable by immunodiffusion methods in plasma during late pregnancy (*1, 2*). These pregnancy-associated plasma proteins (PAPP-A, -B, and -C) were distinct from each other immunologically and physicochemically (*2, 3*). They were unrelated to numerous other pregancy-associated hormones, enzymes, or antigens (for example, prolactin, human chorionic gonadotropin, placental alkaline phosphatase, oxytocinase, α_1-fetoprotein, and carcinoembryonic antigen), as well as to the pregnancy zone protein (PZP). The latter is a pregnancy-associated protein which has been studied under ten different names (*3–5*). The sharp increase of PAPP-A, -B, -C, and hCS during the latter portion of pregnancy and their rapid disappearance after birth have been documented (*6, 7*), as well as certain differences in their biological behavior from that of PZP (*8*).

In previous studies, analysis of saline extracts of placenta demonstrated that all of the PAPP's are present in placental tissue in amounts significantly greater than the quantities attributable to their maternal blood content (*9*). In sharp contrast, all of the PZP found in the placental extracts was apparently derived from the maternal blood there. Because this evidence suggests that the PAPP's are synthesized in the placenta, we felt that immunofluorescence analyses should help to clarify the cellular localization of each PAPP. As a follow-up of preliminary data (*10*), the present report documents findings on human placental tissue sections when monospecific antiserums to PAPP-A, PAPP-C, hCS (hPL), and PZP were used. Since monospecific antiserum to PAPP-B is not yet available, it could not be investigated at this time.

Five placentas were obtained at the time of term delivery of normal Caucasian and Negro infants at the Jackson Memorial Hospital, Miami, Florida. Venous blood from each of the respective mothers was also obtained, the serum being harvested and stored at −20°C until use. Placental tissues were first rinsed with cold 0.01*M* phosphate-buffered saline (PBS) (*p*H 7.1) to remove blood clots from the surface. Small pieces of each placenta were cut from the villous side and frozen on Dry Ice or in a mixture of isopentane and Dry Ice. These frozen tissue blocks were wrapped in aluminum foil and stored at −50°C. Sections of each block were cut at a thickness of 2 to 4 μm with a cryostat. (They were air dried, since preliminary studies revealed that acetone fixation resulted in blurred patterns.) Sections were sequentially treated at room temperature for 1 hour with monospecific rabbit antiserum to each protein under study, rinsed with PBS twice (each 5 to 10 minutes), stained with fluorescein-labeled goat antibody to rabbit immunoglobulin (1 hour), rinsed with PBS as above, and mounted in a 50 percent solution of glycerine in PBS. Stained sections were examined with a Leitz Ortholux microscope with a dark-field condenser and a 200-watt ultra-high–pressure mercury lamp (HB-200) and were photographed with a Polaroid camera. Controls for specificity of the staining included parallel sections treated with (i) unlabeled goat antibody to rabbit immunoglobulin in place of labeled antibody; (ii) normal rabbit immunoglobulin, as well as rabbit antiserums to human albumin, immunoglobulin M, immunoglobulin A, and transferrin, in place of the monospecific antiserum to the PAPP's and PZP; and (iii) absorption of antiserum to each PAPP with plasma from pregnant or nonpregnant women prior to use.

Monospecific rabbit antiserums to PAPP-A, PAPP-C, hCS (hPL or PAPP-D), and PZP immunoglobulin reagents were prepared as described (*3*). All were rendered monospecific by absorption with plasma from nonpregnant women. They also reacted only with their respective protein in plasma from pregnant women and in placental tissue extracts, and not with plasma from nonpregnant women or extracts of normal human heart, liver, kidney, and pancreas. A pool of preimmunization serums from the rabbits was processed as the control normal rabbit immunoglobulin, in which