3.37 for the garnet and pyroxene, respectively. This implies a density of 3.63 for the total rock. The addition of 1 percent metallic iron, if present, would raise the density to 3.67. Above 30 kb, the quartz-coesite transformation may raise the density by an additional 0.05. The effects of compression and thermal expansion are opposite and will approximately cancel each other. For a rock with such a high ratio of Fe to Mg, and such a low Na_2O content, data of Ringwood and Green (*4*) indicate that garnet will appear at about 10 kb at 1100°C, and that the transition to the high-pressure mineral assemblage will be complete by 15 kb.

A model of the moon with a "core" of density of 3.65, a radius of 1388 km, and a "mantle" of eucritic density (3.25) will have a pressure of 15.9 kb at the core-mantle boundary and a central pressure of 69 kb. As discussed above, this core-mantle pressure is sufficient for the transition to the high-pressure mineral assemblage under consideration. The mean density of the moon will then be 3.47 when a radius of 1735 km is used (*7*). This is distinctly higher than the value 3.36 found when a recent value for the lunar mass of 7.3505×10^{25} g (*8*) is used.

As long as the temperature is below the melting point, assumption of higher temperatures in the lunar interior should not greatly affect the result, because dT/dP for the basalt-eclogite transformation is 50° to 100°C kb^{-1} (*4*), whereas the melting point gradient is only 10°C kb^{-1} (*3*). The assumed temperature at the core-mantle boundary of 1100°C is within about 100°C of the melting point, and consequently raising the temperature to the melting point would increase the pressure at the core-mantle boundary only 1 or 2 kb. Of course, if the temperature exceeds the melting point, the density will be lower. Such partial melting of the lunar interior might be expected in this model, since the radioactivity of eucrites (*9*) is sufficiently high. However if such partial melting occurs, it may be expected to have produced a differentiated lunar crust, and again, a lack of correspondence between the surface composition and the mean composition. A lower temperature in the lunar interior will result in an even greater mean density. It therefore appears that it is difficult to obtain a consistent model of a solid moon with a homogeneous eucritic composition, and that correspondences between eucritic densities, the surface density, and the mean density are not necessarily significant.

It is not my purpose to discuss in detail possible lunar models. However, there are possible homogeneous lunar compositions which are consistent with the Surveyor analyses, and which do not become too dense at the pressure of the lunar interior. Lower density is favored by lower FeO content and SiO_2 saturation. A low FeO content results in a less dense garnet and a higher proportion of pyroxene, whereas SiO_2 saturation results in the occurrence of significant quantities of quartz in the high-pressure modification. For example, a quartz tholeiite with about 8 percent FeO would have a high-pressure density of about 3.4 (*4*), and the resulting mean density would be less than that of the moon. Basalts intermediate between this composition and that of the eucrites could match the lunar density. The lunar density could also be matched by the composition of some howardites, but the high ratios of Mg to Ca and Mg to Al of these achondrites have not been found in presently available analyses of lunar surface rocks. Also, a peridotitic moon consisting of magnesium-rich pyroxene and olivine and with a thin basaltic crust would not undergo any significant phase changes at lunar pressures. The basaltic models would be characterized by a large increase in seismic velocity at a depth of about 350 km, whereas the peridotitic models would not. Both types of model could be in agreement with the observational data discussed here, and they indicate that these compositional constraints are not extremely restrictive, but that they nevertheless must be considered in constructing models of the lunar interior.

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Urocanic Acid in Sweat: An Artifact of Elution from the Epidermis

Urocanic acid, a product of the reaction of histidine in the presence of histidase, is reported to be a normal constituent of human sweat (*1*), except in patients with histidase deficiency (*2*).

In view of the fact that urocanic acid is present in high concentrations in human stratum corneum (*3*) and that the histidase reaction occurs in animal skin not containing sweat glands (*4*), we examined the hypothesis that urocanic acid is not a true constituent of sweat but is eluted into sweat from the epidermis across a sweat epidermis interface.

Use of the anaerobic technique for collecting sweat minimizes or perhaps eliminates the effects of a sweat epidermis interface. This technique allows sweat to be secreted under mineral oil as discrete droplets emerging from single glands rather than to be layered on the skin.

The concentration of urocanic acid in human sweat (collected by the anaerobic technique) (*4*) from the anterior surface of one arm was compared to its concentration in sweat (collected on filter paper) from the contralateral limb. In this process, both sites were stimulated by pilocarpine iontophoresis, and, after a secretory period of 30 minutes, sweat was collected almost simultaneously from both sites. The urocanic acid was measured spectrophotometrically at 277 nm after sweat was diluted (1:10) in a phosphate buffer, *p*H 7.4.

Figure 1 shows the absorption spectra of the sweat obtained by the two techniques. The spectra are qualitatively similar, but the peak at 277 nm due to sweat collected under oil has only 10 percent of the optical density of sweat collected by conventional means.

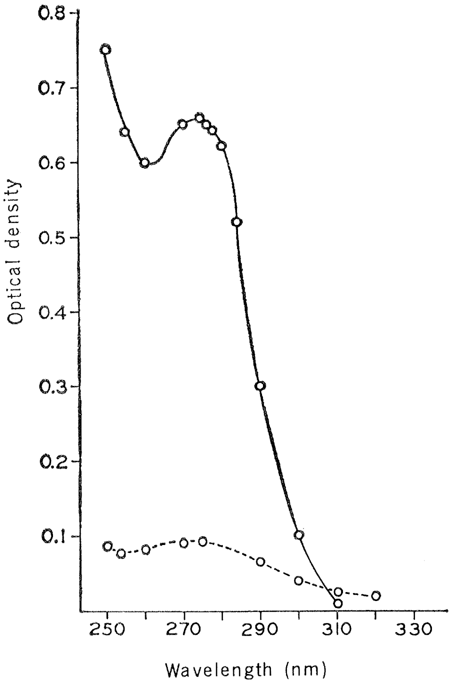

Fig. 1. Absorption spectra of sweat diluted 1:10 in phosphate buffer (*p*H 7.4). Solid line, sweat collected on filter paper; dotted line, sweat collected under mineral oil.

The mean concentrations of urocanic acid in sweat collected under oil and by filter paper are, respectively (milligrams per 100 ml of sweat): 0.76 (range < 0.2 to 1.8) and 5.4 (range 2.7 to 9.6). Secretory rates were comparable. In all cases, sweat collected under oil had much less urocanic acid than sweat which had been in contact with skin.

In an attempt to recover urocanic acid from nonsweating skin, further studies were performed with filter paper (saturated with phosphate buffer) applied to the skin surface. In these studies, amounts of urocanic acid similar to those found in sweat collected on filter paper were eluted both from the skin of volunteers who had been exposed to low ambient temperatures ($< 5°C$) and from cadaver skin.

These results show that urocanic acid, hitherto thought to be a constituent of sweat, is not a true constituent of sweat, but is a consequence of elution of urocanic acid from the epidermis by sweat. These findings suggest that this phenomenon may account for the presence of other organic compounds reported to be in sweat (*6*).

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Lunar Soil: Should This Term Be Used?

In past months the authors of several reports which appeared in *Science* (*1*) have used the term lunar soil as a surrogate for a term for the blanket of material that covers the lunar surface. On behalf of all earthbound investigators engaged in research on soils and in geomorphic studies, I feel compelled to remind selenologists (and martianologists, venusologists) that usage of the term soil other than in reference to that of the earth is not in keeping with past and present conventions and is in fact incorrect. Misapplication of the term soil could lead to confusion and may endanger the present usefulness of the term. The practice should be discontinued.

I have recently reviewed three definitions of soil taken from three important reference books on soils. One of the books is old and time-honored (*2*), another is new and in wide use as a college text (*3*), and the third is recognized in North America as the standard reference on pedology (*4*). An examination of these definitions brings to light certain characteristics of soil that, in our present state of knowledge, sets it unequivocally apart from the material which blankets the moon. The characteristics are (i) that soil is a natural body which supports and sustains plants; and (ii) that soil contains —and in part consists of—organic matter, air, and water in variable proportions (*5*).

Thus, until it is satisfactorily shown that the debris blanket on the lunar surface is indeed a natural body which consists in part of organic matter, air, and water and which supports and sustains plants, selenologists should defer using the term lunar soil. Perhaps the term *epilith* (compare with regolith), analogous to epidermis, would be a satisfactory word to mean all loose lunar debris. We would then speak of the lunar epilith, much as we now refer to the earth's regolith, but remembering that regolith includes soil whereas the epilith does not.

The admonition presented here is directed to all investigators of the solar system who borrow earth-conceived terms for soils or geomorphology and apply them when not referring to the earth. In short, space researchers should either use existing terminology properly or begin coining their own terms, as the circumstances demand.

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1 March 1968

Photographic Sky Coverage for the Detection of UFO's

The following estimates were made in connection with my course on "Flying Saucers" (*1*). Over a period of 20 years, during which there have been at least 11,000 visual sightings of unidentified flying objects (UFO's) in the United States, no astronomical photograph has recorded one (*1a*), even though artificial satellites, meteors, and asteroids are frequently noted. In nighttime sightings, UFO's are usually quite luminous; the question is, what frequency of random UFO tracks could be missed by astronomical telescopes now in use.

Each telescope used photographically covers a solid angle ω for an average exposure time t and obtains an average of N photos per year. The photos are usually taken with-