# IRRADIATION, TEXTURE AND HABIT HISTORIES OF THE LUNAR DUST GRAINS

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ABSTRACT

Latent and etched nuclear particle tracks and some habit and texture features have been studied by 100 and 1000 keV transmission electron microscopies and by scanning electron microscopy in grains extracted from 5 different size fractions of lunar dust samples 10084, 12032, 12070 and 12028 (55, 61, 62, 75, 98, 203). Then these characteristics have been compared to those observed in crystals hand picked in lunar rocks 10046, 10047, 12013, 12021, 12063 and in different types of meteorites (Orgueil, Pesyanoe, Shergotty, Angra dos Reis).

In all dust samples the finest and uncrushed crystalline grains generally contain latent nuclear particle tracks only visible by transmission electron microscopy and characterized by their high densities which can exceed $10^{11}$ tracks/cm$^2$, and their complex contrast structure. These grains are also frequently rounded and covered with a thin layer of amorphous material of about 1000 A° in thickness but below this superficial " skin " their lattices are well ordered as shown by electron diffraction. Spectacular transformations produced by heating and chemical etching have also been observed in the finest grains.

In a given dust sample the finest grains appear different from those extracted from the coarser fractions and from lunar and meteoritic rocks. Furthermore their comparison in the various dust samples reveals marked differences between the Apollo 11 and 12 soils but also between the 12028 core tube samples.



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Some evidences from work in progress indicate that the amorphous " skin " observed in the finest regolith grains could result from their exposure in the " ancient " solar wind and that these grains possibly contain tracks produced by a flux of " cosmic " nuclear particles with energies intermediate between those of the solar wind nuclei and those of the more energetic solar flare cosmic rays.

Finally some implications of the present results concerning the study of the past activity of the sun the " fabrics " of the lunar dust grains and breccias, and the mechanical and optical properties of the lunar soil will be briefly discussed.



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