Copernicus is a recent crater. Since it is located in one of the mare, it is an excellent example of the results of a large meteoric impact. Figure 2: The crater itself is about 57 miles in diameter. It is polygonal rather than circular in outline. The interior wall reveals a characteristic terraced formation. The floor is relatively flat with some central mountains. The crater rim is 12,000 feet above the floor. There are numerous rays extending as far as 400 miles and hundreds of small craters scattered throughout the area around the crater. These appear to be secondary craters, resulting from rocks falling back from the primary impact.

It is interesting to compare Copernicus with a crater produced by a nuclear explosion on the earth. Figure 3: Note the characteristic shape and the large number of small secondary craters.

The earth, like the moon, has suffered meteoric bombardment during relatively recent geological times. However, erosion has quickly wiped out most of the evidence. An exception is the meteor crater near Winslow, Arizona. Figure 4: This is believed to have been formed about 10,000 years ago. It is 4,000 feet in diameter. A number of craters of this type have been found on earth, as well as evidence of older craters having diameters of the order of 50 miles.

The maria, the smooth, dark areas, are another prominent feature of the lunar surface. Figure 5: This illustrates a portion of the Mare Imbrium. Many of these maria have roughly circular boundaries and are also believed to be the results of very large impacts. The smooth surface is believed to be lava produced either at the time of impact, or welling up from the interior following the impact. Although the surface appears to be quite smooth on the scale of terrestrial photographs, it could actually be very rough, like terrestrial lava, on a scale of a few feet. Photographs of maria taken close to sunrise or sunset reveal low ridges running for many miles. They are typical of flow patterns or pressure ridges formed in viscous material.

The mountainous areas of the moon are perhaps not as rugged as they appear to be in the usual lunar photographs which accentuate the shadows with the sun near the horizon. Careful measurements reveal very few slopes greater than 15°. However, it is obvious that these mountainous areas would, for the most part, be very difficult to explore on foot.

Among the finer details of lunar photographs, it is worth noting that there is almost no evidence of faults or large rock movements of any kind. Here on earth, rocks are typically folded and broken due to movements along faults, and many faults can be found where horizontal displacements of tens of miles are apparent. On the moon this does not appear to be the case.

Lunar observations with infra-red and with radio waves give us information about the thermal and electrical properties of the surface. For example, some recent data show that the surface does not heat or cool uniformly. During an eclipse of the moon, some areas such as the interior of the crater Tycho, remain as much as 40° C. warmer than the surrounding area. Such differences could be indicative of differences in the thermal conductivity of the rock, or could reflect heat transferred from the interior due to a mass of hot magma near the surface.

Both radio and infra-red data indicate that the actual surface has a very low thermal conductivity and a low dielectric constant. A spongy surface for at least a few centimeters is indicated. Possibly a pumice-like material will be found.

Radar data confirm the fact that average slopes on the moon are of the order of 15°. Observations at short wavelengths indicate an increasing roughness as the wavelength decreases. For dimensions of the order of inches, a rough surface is implied.

It should be noted that, in the visible, the full moon appears uniformly bright across the disc. Hence, the moon is a diffuse scatterer at these wavelengths and therefore there are no optically smooth surfaces.