The Big Picture

Gazing at the full Moon, you can tell a lot about its origins.

Several amateur astronomers have told me that they’re beginning to observe the Moon because the nebulae and galaxies that they used to seek have become obscured by light pollution. I say welcome to the most fascinating object in the sky!

In a telescope, the Moon is much richer and more complex than any distant gas cloud or collection of stars. Thousands of details are identifiable with even a small scope. And through thoughtful observing you can read the story of lunar evolution.

The best way to begin to understand the Moon is to look up at it when it’s full. The naked-eye Moon reveals more features than any telescopic view of a distant galaxy or even any planet. The first glance shows one obvious aspect: the lunar surface is two-toned, with bright regions and scattered splotches of darker gray. This duality is one of the most fundamental pieces of evidence about the Moon’s history.

Looking through binoculars, you’ll see that most of the bright material is in the Moon’s central and southern parts. The bright areas are also flecked with many brighter glints. The dark material tends to occur in roughly circular patches and it has fewer flecks. Did you notice that not all of the dark areas are exactly the same? They come in slightly different shades.

Now switch to the telescope. The view can be overwhelming: you can see more than 10,000 craters from your backyard, not to mention thousands of hills and valleys. The gray splotches, called maria, or seas, are the basic landmarks that allow you to navigate. Within the maria you’ll find a few round craters. The brightest ones are the youngest and sometimes have streamers, called rays, spreading outward. The bright white regions have far more craters, and these are typically larger than those in the maria.

Although craters seem to have a bewildering variety of shapes, they really only come in a couple of types. The smallest craters you can discern through a good telescope are 1 to 2 miles in diameter. These and all the others up to about 10 miles wide are simple pits, sometimes with a tiny flat floor. Uninterrupted shadows curve across their interiors, revealing that they’re simple bowls.

Larger craters have more complex interiors, often with a cluster of mountains near the middle of a broad, flat floor. Their walls aren’t smooth but instead have mounds of debris that have slid down the sides.

These two kinds of craters are called simple and complex. Both form by the same process: the impact of an asteroid or comet nucleus. Smaller projectiles make simple bowl-shaped craters; larger ones blast such gaping holes that the surrounding rocks are deeply fractured, causing the walls to slump. Large impacts push down so forcefully that ground zero bounces upward to form central peaks, or in really big cases, central rings.

Impact cratering is almost all you need to know to understand the face of the Moon. Remember the round maria? The dark material is lava that filled deep basins caused by the largest impacts. Notice that remnants of the rims encircle some maria.

The bright terrain is the oldest, dating from the...