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THE MOON'S OTHER FACE

Ken Tapping, 25th February, 2014

The face on the "Man in the Moon" is something most of us have known all our lives. Our ancestors were familiar with him too. We now know the face is due to our brains concocting patterns in the ancient lava flows covering much of the Moon's surface. What is the other side of the Moon like?

Over billions of years, the flexing of the Moon by the Earth's gravity – because we pull at the near side of the Moon more than the far side – slowed the Moon's rotation so that it now presents the same face to us all the time. From the surface of the Earth there is almost half the Moon's surface we never see. Astronomers assumed that the other side would be much like the side we can see and have mapped in great detail. This how the situation rested until 1959, when the Soviet spacecraft Luna 3 passed behind the Moon and sent back pictures. By modern standards the pictures were not very good. However they were certainly good enough to show that the other side of the Moon is very different from the familiar side we see in our night skies. Whereas our side of the Moon is dominated by huge lava flows, craters and mountains dominate the other side. Why is that?

Let's look at the Earth first. Viewed from one side, we see a lot of land. However, we can spin the globe to a position where we see almost nothing but the Pacific Ocean; we see a few islands, with the Hawaiian Islands close to the centre, and land peeking at us around the edges. If we were to take the oceans away we would still see a big difference. The ocean beds are mainly basalt, which is a volcanic rock from deep down. The landmasses are patches of a floating scum of light volcanic rocks like granite and sedimentary rocks such as limestone. Granite is formed from slowly cooking ocean floor sediments and basalt and water that have been taken down in subduction zones, where one tectonic plate is being jammed into and under another. Sedimentary rocks are made from debris from the weathering of other rocks. Over millions of years, the arrangement of these scummy patches changes as the plate motions rearrange them. However, if the Moon ever had any plate motions, they ceased billions of years ago, and there is no evidence the Moon ever had oceans, the other key ingredient in moulding the Earth. What made the two sides of the Moon so different had to be something else entirely.

Today, thanks to a number of spacecraft that orbited the Moon and made detailed surveys, we now know the far side almost as well as the side we are familiar with, and those images give some clues. On the far side of the Moon there is a huge structure called the Mare Orientale, the Oriental Sea. It consists of a 900-km diameter ring of mountains, with two more concentric rings within it and a lava flow in the middle. It is believed to be a crater caused by the impact of something large, such as a small asteroid. One theory is that huge impacts on the far side triggered some of the lava flows on the near side. Another is that tidal heating resulted in there being more lava available on the near side. There are many other suggestions. There is a theory that something big hit the embryo Earth, which resulted in a mass of material being blasted off, which eventually became the Moon. However, that too is just another theory. It is interesting that we do not have to look into the distant reaches of the universe to find puzzles.

Another puzzle is how the other side of the Moon came to be called the "Dark Side". It is actually no darker than our side. When the Moon is Full, the Sun is shining on our side, and the far side is indeed dark. However, when the Moon is New, the Sun is shining on the far side, and our side is dark. There is no side of the Moon that is always dark.

Venus rises about 5am. Jupiter, second only to Venus in brightness, still dominates the sky for much of the night. Mars rises around 10pm and Saturn at 1am. The Moon will be New on the 1st.

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