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## LOOKING AT THE MOON

Ken Tapping, 23<sup>rd</sup> May, 2017

Many questions we get asked are not about the “fabric of space”, the “Big Bang” or “black holes”, they are often questions like: “How do the phases of the Moon work?”, “If the Moon always keeps the same face towards us, does it rotate?”, and “Why is the Full Moon high in the sky in the winter and low in the sky in summer?” Here goes.

The Moon orbits the Earth, taking about 27 days to complete each revolution. During each trip it goes through its phases of “New”, “First Quarter”, “Full”, “Last Quarter” and then “New” once more. The part of the cycle where the illuminated part of the disc is getting bigger, approaching Full, is traditionally termed “waxing”, and after Full Moon, where the illuminated portion is shrinking, the Moon is “waning”. Through the whole cycle the familiar “Man in the Moon” is always looking in our direction. Try this backyard analogy.

Grab an old tennis ball. With a black felt tip put a happy face on one side, representing the “Man in the Moon”. Go into a dark room or out in the backyard at night. Take an assistant with a bright flashlight. Get him or her to stand a few metres away, shining the light in your direction; ask them to keep their eyes on the ball.

Hold the ball at arm’s length so that you see the side bearing the happy face. Start with the ball being in the same direction as the flashlight. You are looking at the dark side of the ball. If you have a dark background, the ball will be invisible. This is analogous to the New Moon, where the Sun is lighting up the side of the Moon we can’t see.

For us in the Northern Hemisphere, the Moon orbits the Earth in a counter-clockwise direction, that is, leftwards. So, keeping that ball at arm’s length, slowly turn to the left. You will see a thin crescent of the illuminated side of the ball come into view on the right side of the ball, like a letter “D”. As you turn, the crescent will get broader and broader, until when you are holding the ball at right angles to the direction of the flashlight, the side of the ball facing you will be half lit up: the right hand

side lit and the left side dark. This is equivalent to the phase of the Moon called “First Quarter”. Keep moving. When you are facing directly away from the light, you will be seeing the illuminated face of the ball. The “Moon” is now Full. Then, as you continue moving, a dark crescent of the unlit side of the ball will appear on the left-hand side which will broaden until when you are again at right angles to the direction of the light. Once again half the visible side of the ball is lit, except this time it is the left hand side. We are now at “Last Quarter”. As you continue to move, the amount of visible disc you can see will get narrower and narrower, looking like a letter “C”, until once again you are holding the ball in the direction of the light, and you are seeing only the dark side. The “Moon” is New once again. It is always easy to tell if the Moon is waxing or waning because if the crescent is on the right, like a letter “D”, it is waxing; if it is waning the crescent looks like a letter “C”. Remember “DOC”, where the “O” represents the Full Moon.

While you were turning, the “Man in the Moon” faced you all the time. However, if you ask your friend with the light, you will be told that he or she saw all sides of the ball as it moved in its orbit. From the point of the “outside universe” that ball definitely turned – once per orbit. Even though you might not have seen the ball turn, you were turning, and holding the ball, so it was turning too.

When the Moon is Full, the Earth lies between it and the Sun, so we see the Moon from the direction the light is coming from. In our winter, the Northern Hemisphere is leaning away from the Sun, and towards the Full Moon, so it looks higher. In summer, we are leaning towards the Sun and away from the Full Moon, so it’s lower in the sky.

Jupiter lies the south after sunset, setting in the early hours. Saturn around 11pmt. Venus rises about 4am. The Moon will be New on the 25<sup>th</sup>.

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