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MERCURY

Ken Tapping, 14th November, 2017

Mercury is the closest known planet to the Sun. It orbits only about 58 million kilometres from our star, compared with our 150 million. Consequently, the intensity of the solar energy falling on Mercury's surface is about seven times higher than the amount arriving here at the Earth.

Although it shines quite brightly in our skies, it is hard to spot. Many people have never seen it. The problem is that for us it can never be more than 23 degrees away from the Sun. Never rising more than 1.5 hours before the Sun or setting 1.5 hours after, we always see it against a bright sky. Mercury is one of the planets known from ancient times, well before the invention of the telescope.

At an average distance of 58 million kilometres, Mercury orbits the Sun much more quickly than we do, taking only 88 days to complete each trip. Its rapidly changing position in the sky, together with its elusiveness, led to the planet being named Mercury, after the Roman messenger of the gods.

Mercury is an interesting world. It is small, only 4800 km in diameter, compared with our Earth's 12,800 km. It is not much bigger than the Moon, which has a diameter is 3500 km. The Moon is mainly a ball of basalt rock with a small iron core. However, Mercury is so massive it must be mostly a big ball of iron with a layer of rock on top. It could be that forming so close to the Sun, blasted by heat and the intense solar wind from a young star, most of the light stuff was seared away, leaving iron. However, at this point we are still guessing.

Mercury is so close to the Sun that the gravitational attraction on the side facing the Sun is stronger than it is on the far side. This pulls the planet a little out of shape. As the planet rotates it undergoes a gravitational "kneading", which is gradually slowing Mercury's rotation, so that eventually the same side of Mercury will be facing the Sun all the time, and its day will be as long as its year. That is the situation with our Moon. The Earth's gravity has stopped the Moon's rotation with respect to the Earth, so that it turns once for

each orbit. This means we see only one side of it. This has not yet quite happened on Mercury, but with a day now lengthened to 59 of our days, 67% of a Mercurian year, it is well on the way to becoming "locked".

Mercury does not have much of an atmosphere, and its surface reflects only about 10% of the solar energy hitting it. The lack of an atmosphere means heat can be rapidly absorbed by the surface, and then, during the long, 29.5-day nights, there is plenty of time to radiate that energy back to space and for the surface to cool off. The result is the biggest range of daily temperatures in the Solar System. During the day, temperatures on the surface of Mercury can reach 430 Celsius, and then dive to -173 Celsius during the night.

Mercury's axis is hardly tilted at all, so there are no seasons. This also means that near the Poles there are craters where the Sun never, ever shines. Those locations are the coldest places in the Solar System, on the closest planet to the Sun.

Despite being so interesting, Mercury has not attracted a lot of space missions. So far one spacecraft flew past and one other orbited the planet. One of the reasons for this is that being so close to the Sun, Mercury is difficult to get to. Getting into a transfer orbit to Mercury requires a really large launcher or alternatively a complex set of fly-bys of other planets to achieve the required velocity. This approach reduces the size of the launcher but makes the trip take much longer – several years. There are plans for future orbiting missions, but currently there are no plans to put a spacecraft on the surface of the planet.

Saturn lies low in the southwest, getting lost in the twilight. Mars lies in the dawn glow, with brilliant Venus below and Jupiter below Venus. The Moon will be New on the 17th.

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