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#### **Publisher's version / Version de l'éditeur:**

<https://doi.org/10.4224/23000224>

*Skygazing: Astronomy through the seasons, 2015-03-24*

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## VENUS AND JUPITER

**Ken Tapping, 24<sup>th</sup> March, 2015**

At the moment we have two really bright planets in the sky. Dominating the southern sky overnight we have Jupiter, and low in the west after sunset we have Venus, shining like an escaped aircraft landing light. Venus looks brighter, and whiter; Jupiter is more yellowish. However, although they look similar in the sky, they are dramatically different from each other, and also both very different from our world.

Venus is the second planet out from the Sun; we live on the third, and Jupiter is the fifth. Since Venus is closer to the Sun, its orbit is smaller, so it never gets very far from the Sun in the sky. It never rises more than roughly three hours before the Sun or sets more than about three hours after. It is so bright that when in the east before dawn we have for centuries referred to it as the “Morning Star”, and when in the west after sunset the “Evening Star”. The Greeks called it “Phosphoros” and “Hesperos” respectively. However, ancient Greek astronomers also worked out that the morning and evening stars are the same object. Jupiter is further from the Sun than we are, therefore on occasion the Earth passes between it and the Sun, so we can see Jupiter in the sky at midnight, which can never happen with Venus. Because we get to see Venus from the back and sides, as well as the front, telescopes may show it to be a crescent or a disc. We never get alongside or behind Jupiter, so we only see it as a disc.

Venus is just a little bit smaller than the Earth, with a diameter of 12,104 km, and orbits around 108 million kilometres from the Sun. Our world’s diameter is 12,756 km, and we orbit about 150 million kilometres from the Sun. The Solar System formed about 4.5 billion years ago; back then Venus and Earth would probably have been identical twins, with atmospheres containing water vapour, methane and carbon dioxide. At that time the Sun was about 30% fainter than it is now. However, methane and carbon dioxide are greenhouse gases, and made both worlds warm

enough for liquid water and possibly life. We know life got going on Earth. Plants absorbed the carbon dioxide, liberating oxygen, which got rid of the methane. The greenhouse effect was drastically reduced, which compensated for the brightening Sun. It’s believed that being closer to the Sun sealed Venus’ fate. If life got started there, it did not remove greenhouse gases fast enough, and as the Sun brightened, the greenhouse effect ran away and the planet fried. Today it is hot enough on Venus’s surface to melt lead and tin.

Jupiter has a diameter of 143,000km and lies about 780 million kilometres from the Sun. Its volume is over 1400 times that of the Earth, so we would expect its mass to be roughly that much larger. However, Jupiter’s mass is only 318 times larger than Earth’s. It cannot be a rock ball with a thin atmosphere, like our planet. It must be mostly atmosphere. That’s why we call such planets “gas giants”. It is a big ball of hydrogen, methane, ammonia and various organic compounds, with a ball of rock somewhere in the middle. Saturn, the next planet out from Jupiter is also a gas giant. In fact this world has so much gas and so little rock that if we could find a big enough pond to put it in, it would float. Even the Sun is denser than that.

The thing Jupiter and Venus have in common, which makes them so spectacular in our skies, is that they are both covered with thick layers of clouds. Venus reflects 65% of the sunlight falling on it; Jupiter reflects 52%. The Moon, with no atmosphere and no clouds, reflects 12%. Jupiter is immensely further away than Venus; however, it is larger and scatters more light back towards us, which compensates for the greater distance. The result is two brilliant planets to enjoy in the sky.

At 18:45 EDT/15:45 PDT the Sun crosses the celestial equator, heading north, marking the Vernal (Spring) Equinox. Saturn rises about 1 am. The Moon will reach First Quarter on the 26<sup>th</sup>.

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