WEYMOUTH ASTRONOMY

Sky Watcher

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13 July 2018

Trips / Events

Ideas for trips and events always welcome!

events@weymouthastronomy.co.uk

- 7 Aug WAS—Gravitational waves by Mark Gibbons
- 15 Aug CADAS—Gadgets and Gizmos evening.
- 4 Sept WAS—Lunar geology from the safety of your own home by Barry Fitzgerald
- 19 Sept CADAS— – Orbital oddities by James Fradgley
- 22 Sept WAS—Astro Open Day — with Space Detectives Astronomy Workshop
- 2 Oct WAS—AGM & Zero gravity by John Ives
- 17 Oct CADAS Ask the panel.

Programmes for many local Societies will be available in the near future. Check their websites for more details.

If you are interested in giving a talk or workshop, let the organisers know. They like to offer new titles in their programme line-up.

WAC Upcoming Events:

10 Aug—Summer Social

14 Sept—Open Evening / Viewing Evening

12 Oct—Barry FitzGerald - Lunar Geology from the safety of your own home

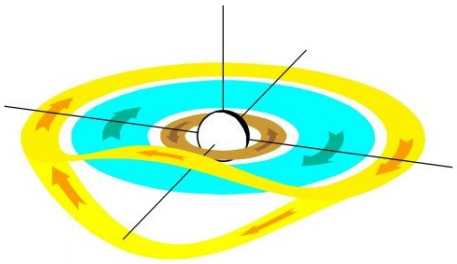
9 Nov—Sheri Karl - Gravity Waves

14 Dec—Christmas Quiz / Social Evening

More to come!!

WAC News—

Going with the flow from outer space…'**What electric currents flow in near-Earth space?** *There are various different types of electric current flowing around the Earth. Geospace, the region of near-Earth controlled by Earth's internally-generated magnetic field, is a fairly hard vacuum compared to the air we breathe. It still has some particles in it, though; specifically, it contains plasma, a rarified electrically charged gas. Plasma distribution is by no means uniform and there are sharp boundaries separating types of plasmas with totally different characteristics. Electric currents tend to form at these boundaries, and our review summaries the typical structure and motion of the major current systems. The Sun constantly emits charged particles called solar wind. The Earth, with its magnetic field, is an obstacle in the flow of the solar wind. The kinetic pressure of the solar wind compresses the terrestrial magnetic field on the dayside, in front of the Earth, and a current flows across the magnetopause, a surface boundary separating Earth's field and the interplanetary magnetic field (IMF). On the nightside, behind Earth, the magnetic field is stretched and this is where the magnetotail current exists.*



Because of the structure of the magnetic field in the dayside region of near-Earth space, a special current system called the cut ring current (yellow) exists, where the current flow splits open for a portion of its path around the planet. Eastward (light brown) and westward (light blue) parts of the ring current flow closer to Earth. Credit: Ganushkina et al., 2018, Figure 5

This extract was taken from a fascinating article. If you would like to read more, visit https://eos.org/editors-vox/going-with-the-flow-in-outer-space Until next month! ~SK

A Close-up View of Mars by Jane Houston Jones and Jessica Stoller-Conrad

In July 2018, skywatchers can get an up close view of Mars—even without a telescope! In fact, on July 31, Mars will be closer to Earth than it has been in 15 years. Why is that?

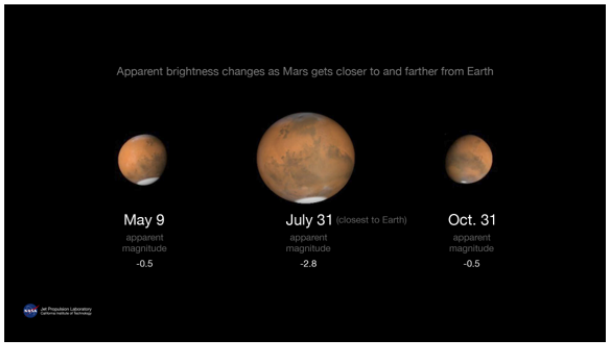
Like all the planets in our solar system, Earth and Mars orbit the Sun. Earth is closer to the Sun, and therefore it races along its orbit more quickly. Earth makes two trips around the Sun in about the same amount of time that Mars takes to make one trip.

Sometimes the two planets are on opposite sides of the Sun and are very far apart. Other times, Earth catches up with its neighbor and passes relatively close to it. This is called Mars's closest approach to Earth, and it's happening this year on July 31. The Moon will be near Mars on that night, too!

Keep in mind that even during its closest approach, Mars is still more than 35 million miles away from Earth. That's really far. So, Mars won't appear as big as the Moon in the sky, but it will appear bigger than it usually does.

July and August will be a great time to check out Mars. Through a telescope, you should normally be able to make out some of the light and dark features of the Red Planet—and sometimes even polar ice. However, a huge Martian dust storm is obscuring these features right now, so less planetary detail is visible.

There is another important Mars date in July: Mars opposition. Mars opposition is when Mars, Earth and the Sun all line up, with Earth directly in the middle. This event is happening



Caption: In 2018, Mars will appear brightest from July 27 to July 30. Its closest approach to Earth is July 31. That is the point in Mars' orbit when it comes closest to Earth. Mars will be at a distance of 35.8 million miles (57.6 million kilometers). Credit: NASA/JPL-Caltech

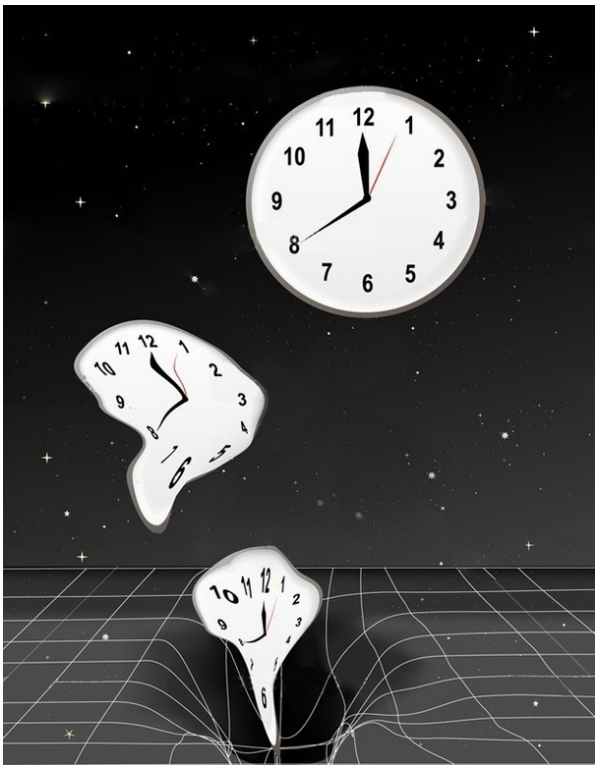
Mars (more!)

on July 27 this year. Although you may see news focusing on one of these two dates, Mars will be visible for many months. For about three weeks before and three weeks after opposition and closest approach, the planet will appear the same size to a skywatcher.

From July 7 through September 7 Mars will be the third brightest object in the sky (after the Moon and Venus), shining even brighter than Jupiter. The best time to view Mars during this time is several hours after sunset, when Mars will appear higher in the sky. Mars will still be visible after July and August, but each month it will shrink in size as it travels farther from Earth in its orbit around the Sun.

In other sky news, there will be a partial solar eclipse on July 13, but it will only be visible from Northern Antarctica and southern Australia. On July 27 (beginning at 20:21 UTC), a total lunar eclipse will be visible in Australia, Asia, Africa, Europe and South America. For those viewers, Mars will be right next to the eclipsing Moon!

The Effect of Gravity on Time by Paul Masham FIMA



From Newton's inverse square law of gravity it follows that the acceleration due to gravity at the Earth's surface is $g = - G.M/R^2$ where $R = 6.4.10^6$ is the radius of the Earth in metres, G, Newton's gravitational constant is $6.67*10^{-11}$ and $M = 6.10^{24}$ is the Earth's mass in kg. Plugging these numbers into the above formula for g, $g = - 9.8\ ms^{-2}$.

A relatively simple calculation in general relativity predicts that a clock speeds up when raised above the Earth's surface according to the following formula: $(dt/t)/h = g/c^2$. h is the height of the clock above the surface, $c = 3.10^8 m/s$ is the speed of light so g/c^2 is 10^{-16}, $(dt/t)/h$ is the **rate of speeding up of the clock per second per metre raised.** So for a clock raised one metre above another clock we would have to wait 290 million years for it to gain one second with respect to the lower clock! (290 million years = 10^{16} seconds).

There is another way of looking at the formula: $(dt/t)/h = g/c^2$ and that is that the force due to gravity is a direct consequence of the slowing down of time as we move towards the centre of the Earth. For a black hole for instance, clocks slow to a standstill as they approach the event horizon at a distance $2GM/c^2$ from the centre of the black hole, from above. In essence the force due to gravity is an affect of the rate of speeding up of clocks with respect to increasing distance measured form the centre of the gravitating body (and nothing else).

Another piece of related wisdom I have come across is that objects tend to accumulate in the universe so as to minimise the duration of the time they experience - which follows from the above considerations of clocks in gravity. Also if they are allowed to move freely in space i.e. fall freely in gravity like the planets round the Sun or stars in a globular cluster, the objects choose paths so that the time they experience going from say event A to event B in space-time is a maximum with respect to all the possible paths the objects could have taken.

So it appears that time is of the essence when trying to understand the nature of the universe.

Christchurch Weekend Meeting

WESSEX ASTRONOMICAL SOCIETY

Friday 7th – Sunday 9th September 2018

Christchurch Junior School, Clarendon Road, Christchurch, BH23 2AA

'Theories and observations of the Universe'

The Wessex Astronomical Society are our hosts for this weekend

To book and for more information visit www.britastro.org/Christchurch2018

Retailers attending will be the BAA Sales and W&W Astro