WEYMOUTH ASTRONOMY

Sky Watcher

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Trips / Events

Ideas for trips and events always welcome!

events@weymouthastronomy.co.uk

- 21 Feb CADAS—Early misconceptions in astronomy - Bill Read
- 6 Mar WAS—Radiation Protection: How to survive a journey to Mars—Dr Elizabeth Cunningham
- 21 Mar CADAS—The International Space Station—Bill Combes
- 3 Apr WAS—Globular clusters: galactic fossils—Callum Potter
- 18 Apr CADAS—T'aint Rocket… - Bud Budzynski
- 1 May WAS—Debunking the Moon landing myth—Graham Bryant
- 16 May CADAS—Light pollution FAQ - Bob Mizon

Programmes for many local Societies will be available in the near future.

Check their websites for more details.

WAC Upcoming Events:

9 Mar—Paul Spurr - Celestial Mechanics #Pt 2

13 Apr—David Whitehouse - T BC

11 May—AGM + James Fradgely - Birth of the Solar System

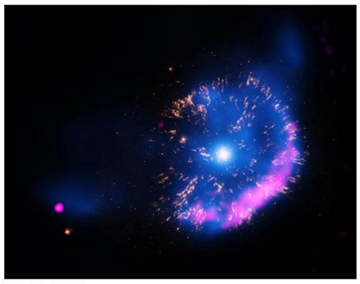
8 June—Ask the Panel

13 July—Geoff Kirby - Quirky Astronomy

10 Aug—Summer Social

Please see the reverse of this issue of the Sky Watcher for the full programme listing for 2018!

WAC News—


Credit: NASA

The latest 'hot off the press' article I've come across is one describing the asteroseismic analysis that reveals the remains of a white dwarf's helium-burning phase is unexpectedly rich in oxygen. The exciting field of asteroseismology analyses stars' intrinsic pulsations to tease out the physical properties of stellar interiors. Such studies have yielded precise estimates of stellar masses, temperatures, and internal rotation speeds. This is analogous to seismic waves passing through the Earth allowing us to understand the interior composition and structure. The research involved studying two years of *Kepler* data on the white dwarf KIC 08626021 to find out how carbon and oxygen, biproducts of the star's helium-burning phase, mixed and settled in the core. Using sophisticated mathematical techniques, the team deduced that the ratio of oxygen to carbon at the star's core is roughly six to one, far higher than the two-to-one ratio predicted by conventional stellar evolution theory. The result suggests that the theory underestimates the star's internal mixing during the helium-burning phase, underestimates certain nuclear reaction rates, or both. The high oxygen–carbon ratio could have implications for how astronomers interpret the spectra of type 1a supernovae, which occur whenever a matter-accreting white dwarf grows beyond a critical mass. (N. Giammichele et al., *Nature* **554**, 73, 2018.) Until next month! ~SK

Sixty Years of Observing the Earth by Teagan Wall

Satellites are a part of our everyday life. We use global positioning system (GPS) satellites to help us find directions. Satellite television and telephones bring us entertainment, and they connect people all over the world. Weather satellites help us create forecasts, and if there's a disaster—such as a hurricane or a large fire—they can help track what's happening. Then, communication satellites can help us warn people in harm's way.

There are many different types of satellites. Some are smaller than a shoebox, while others are bigger than a school bus. In all, there are more than 1,000 satellites orbiting Earth. With that many always around, it can be easy to take them for granted. However, we haven't always had these helpful eyes in the sky.

The United States launched its first satellite on Jan. 31, 1958. It was called Explorer 1, and it weighed in at only about 30 pounds. This little satellite carried America's first scientific instruments into space: temperature sensors, a microphone, radiation detectors and more.

Explorer 1 sent back data for four months, but remained in orbit for more than 10 years. This small, relatively simple satellite kicked off the American space age. Now, just 60 years later, we depend on satellites every day. Through these satellites, scientists have learned all sorts of things about our planet.

For example, we can now use satellites to measure the height of the land and sea with instruments called altimeters. Altimeters bounce a microwave or laser pulse off Earth and measure how long it takes to come back. Since the speed of light is known very accurately, scientists can use that measurement to calculate the height of a mountain, for example, or the changing levels of Earth's seas.


This photo shows the launch of Explorer 1 from Cape Canaveral, Fla., on Jan. 31, 1958. Explorer 1 is the small section on top of the large Jupiter-C rocket that blasted it into orbit. With the launch of Explorer 1, the United States officially entered the space age. Image credit: NASA

Sixty Years (more!)

Satellites also help us to study Earth's atmosphere. The atmosphere is made up of layers of gases that surround Earth. Before satellites, we had very little information about these layers. However, with satellites' view from space, NASA scientists can study how the atmosphere's layers interact with light. This tells us which gases are in the air and how much of each gas can be found in the atmosphere. Satellites also help us learn about the clouds and small particles in the atmosphere, too.

When there's an earthquake, we can use radar in satellites to figure out how much Earth has moved during a quake. In fact, satellites allow NASA scientists to observe all kinds of changes in Earth over months, years or even decades. Satellites have also allowed us—for the first time in civilization—to have pictures of our home planet from space. Earth is big, so to take a picture of the whole thing, you need to be far away. Apollo 17 astronauts took the first photo of the whole Earth in 1972. Today, we're able to capture new pictures of our planet many times every day.

Today, many satellites are buzzing around Earth, and each one plays an important part in how we understand our planet and live life here. These satellite explorers are possible because of what we learned from our first voyage into space with Explorer 1—and the decades of hard work and scientific advances since then. To learn more about satellites, including where they go when they die, check out NASA Space Place: https://spaceplace.nasa.gov/spacecraft-graveyard

The demise of the Google Lunar X Prize By Ashley G. Smart

PHYSICS TODAY

XPrize founder Peter Diamandis announces the lunar challenge in 2007. The contest has come to an end without a winner. Credit: XPRIZE

The Google Lunar X Prize has come to an unceremonious end. On 23 January, XPrize founder Peter Diamandis and CEO Marcus Shingles announced that the contest's $20 million grand prize—which was to be awarded to the first privately funded team to land a spacecraft on the Moon, navigate 500 m across the lunar surface, and beam back high-definition images—will go unclaimed. None of the five teams remaining in the competition will be able to reach the Moon by the 31 March contest deadline, the prize organizers concluded.

The announcement came just days after reports surfaced that financial woes led one of the X Prize hopefuls, India-based Team Indus, to scuttle an agreement to launch its lunar lander aboard an Indian Space Research Organization rocket. That development effectively knocked two teams out of prize contention, since the Japan-based team, Hakuto, had previously arranged to send its rover to the Moon aboard Team Indus's lunar lander. The remaining teams vying for the X Prize—the US's Moon Express, Israel's SpaceIL, and the international team Synergy Moon—were already facing delays that rendered a March launch improbable. Some teams had indicated they would lobby for a few additional months of time to complete the lunar mission. XPrize had previously granted several such extensions, in all prolonging the contest more than three years beyond the 2014 deadline that was set when the prize was announced in 2007. "However, a collective decision was made last year that we would not extend this competition," the prize's senior director, Chanda Gonzales-Mowrer, told *Physics Today* in an email. "The official end date was going to remain March 31, 2018."

XPrize has administered more than a dozen of its signature incentive contests over the past two decades, including competitions to develop fuel-efficient cars, improve understanding of ocean acidification, and teach artificially intelligent machines to deliver TED talks. But the Lunar X Prize was arguably the most ambitious of them all. The only country since the Cold War to soft-land a spacecraft on the Moon is China, and its *Yutu* rover malfunctioned after wheeling less than 120 m in 2013. The prize's $20 million grand prize was, and remains, the largest bounty the foundation has ever offered.

In addition to the grand prize, XPrize offered $10 million in consolation prizes, including milestone awards to be given for demonstrating landing, imaging, and roving capabilities and other mission-related technological achievements. The foundation doled out $6 million in milestone prizes over the course of the competition, but the grand prize remained beyond the contestants' grasp. XPrize officials attribute the teams' difficulties to technological, fundraising, and regulatory challenges. As of last week, two teams, Moon Express and Synergy Moon, were still awaiting development of the rockets that would carry their lunar landers into space. At least two contestants, Team Indus and SpaceIL, had yet to raise the more than $50 million they needed to cover the costs of their respective lunar missions. Only one team, Moon Express, had publicly received approval from its government to send a payload to the Moon.

The impending expiration of the Lunar X Prize hasn't derailed the competitors' lunar ambitions. But contest organizers are also okay with the possibility that the Lunar X Prize will go unclaimed. "It's incredibly difficult to land on the Moon," the foundation's Diamandis and Shingles said in the 23 January announcement. "If every XPrize competition we launch has a winner, we are not being audacious enough."