# Abergavenny Astronomy Society

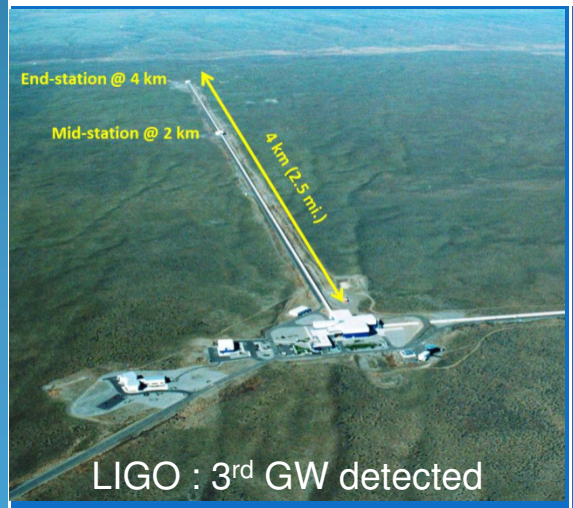
## What's in the news this month?

June - 2017

"Citizen Scientists" discover new brown dwarf


Juno peers below Jupiter's clouds


Where does anti-matter come from?




LIGO : 3rd GW detected

Do stars fall quietly into black holes, or crash into something utterly unknown?

NASA will explore an asteroid worth $10,000 quadrillion 4 years sooner than expected

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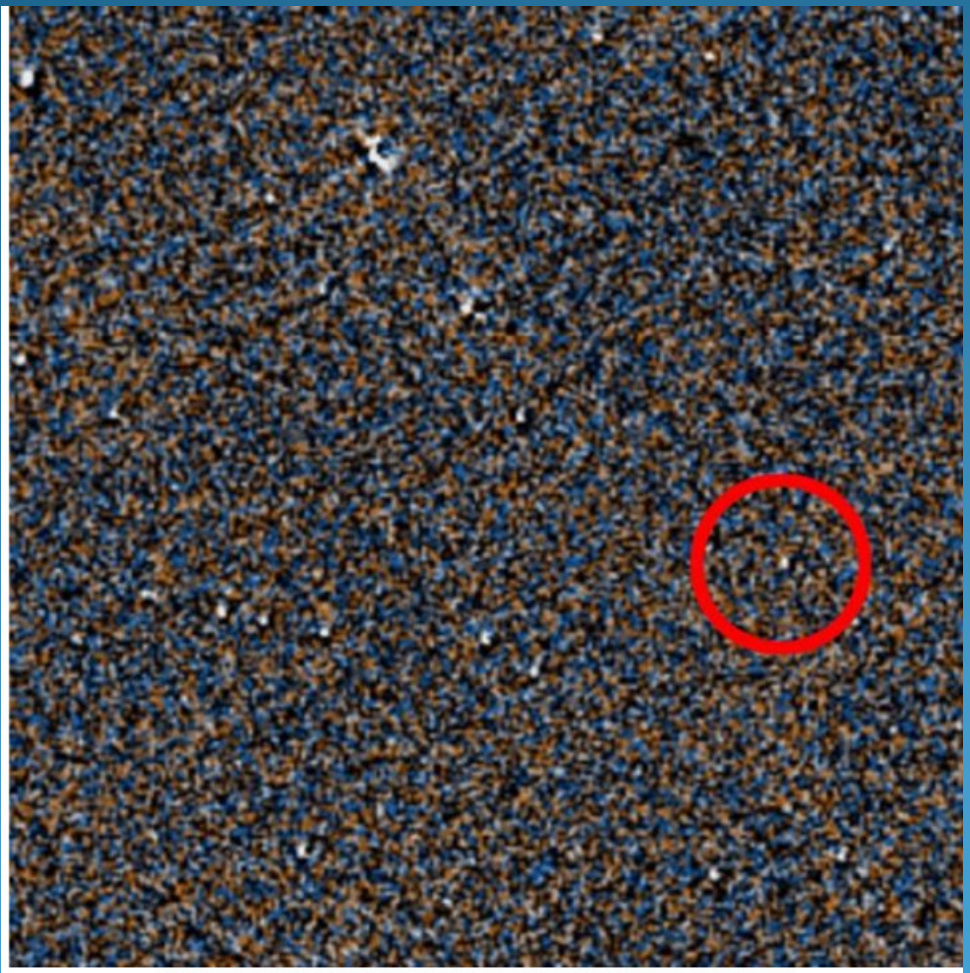
## What's in the news this month?

June - 2017

### 1 - "Citizen Scientists" discover new brown dwarf



The new brown dwarf, circled, discovered by "citizen scientists"
Image credit : NASAClose

*A Brown Dwarf is an object which is larger than a planet but has insufficient mass to trigger stellar fusion and shine.*

*There are 2 main ways that BWs can be detected, 1) visually in the infra red part of the spectrum and 2) by their proper motion as they are "fairly" close.*

*The Backyard worlds-planet 9 website was launched in February using NASAs WISE data.*

*Within 6 days this object, around 100 L.yrs. distant, was found from it's proper motion. It was first reported by Bob Fletcher, a teacher in Tasmania. It was initially given the name "Bob's Dwarf".*

*So, if you have a computer, a bit of spare time and are interested in joining in – no telescope required – have a look at* https://www.zooniverse.org/

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## What's in the news this month?

### 2 - Juno Mission looks deep into Jupiter's atmosphere

***Instruments aboard the Juno spacecraft captured these infrared images that show Jupiter's banded thermal emissions.***

***(J.E.P. Connerney et al., Science 2017).***

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## What's in the news this month?

### 2 - Juno Mission looks deep into Jupiter's atmosphere

The Juno satellite has been in orbit around Jupiter since July, 2016. Orbiting every 53 days it passes within 3,000 miles of the cloud tops.

We are now getting the first science results from the probe and, as usual, there are many surprises in the data. The first papers have been published in Science (http://science.sciencemag.org/content/356/6340/821).

Juno has eight scientific instruments, designed to study Jupiter's interior structure, atmosphere, and magnetosphere.

Researchers have been amazed by the storms seen at the planet's poles, the picture on page 1. "Think of a bunch of hurricanes, every one the size of the Earth, all packed so close together that each hurricane touches the other," said Mike Janssen.

In addition they have found the magnetic field is twice as strong as expected (10x earth), indicative of the nature and density of the core, and also a band of ammonia around the equator which goes down at least 350km.

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## What's in the news this month?

### 3 - Where does Anti-Matter in the Milky Way come from?

Antimatter is the opposite of normal matter. More specifically, the sub-atomic particles of antimatter have properties opposite those of normal matter. For example

electron : negatively charged & positron : positively charged

When matter and antimatter come into contact, they annihilate.

The big bang should have created equal amounts of matter/anti matter.

- Why is there so much matter now? and Where is anti matter generated now?

The answer to the 2nd question has now been found by ANU researcher Dr Roland Crocker and his team.

They ruled out the super-massive black hole and dark matter as being the source.

They found that the antimatter came from a system where two white dwarfs form a binary system and collide with each other. The smaller of the binary stars loses mass to the larger star and ends its life as a helium white dwarf, while the larger star ends as a carbon-oxygen white dwarf.

"The binary system is granted one final moment of extreme drama: as the white dwarfs orbit each other, the system loses energy to gravitational waves causing them to spiral closer and closer to each other," Dr Crocker said.

Once they became too close the carbon-oxygen white dwarf ripped apart the companion star whose helium quickly formed a dense shell covering the bigger star, quickly leading to a thermonuclear supernova that was the source of the antimatter.

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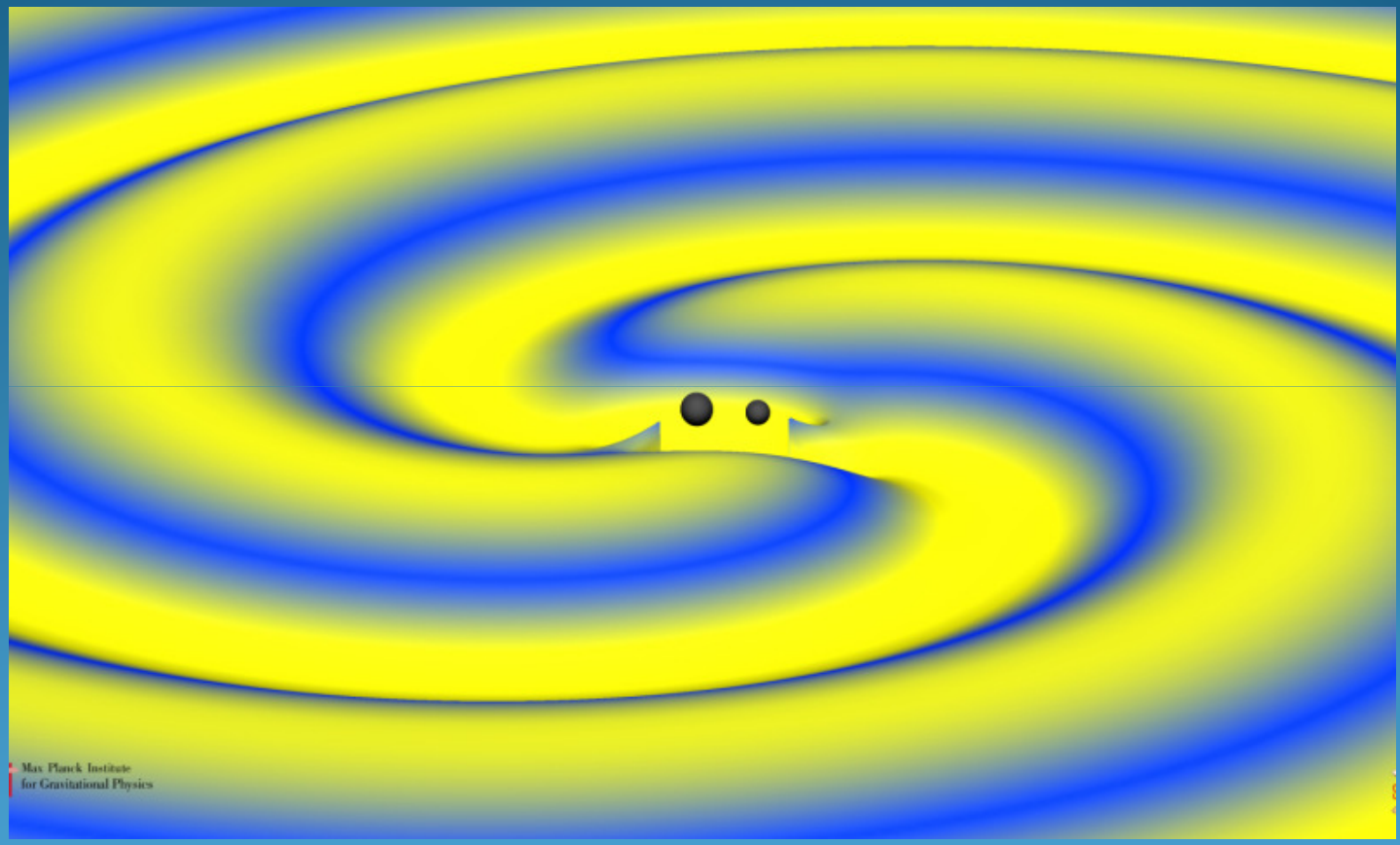
## What's in the news this month?

### 4 - LIGO detects gravitational waves for third time




*This image shows a numerical simulation of a binary black hole merger with masses and spins consistent with the third and most recent LIGO observation. The image is not to scale, as the size of the black holes has been doubled to make them more visible.*
*Image Credit: Max Planck Institute for Gravitational Physics*
http://www.zmescience.com/space/astrophysics-space/gravitational-waves-observed-01062017/

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## What's in the news this month?

### 4 - LIGO detects gravitational waves for third time

The Laser Interferometer Gravitational wave Observatory (LIGO) has made a third detection of ripples in space and time, demonstrating that a new window in astronomy has been firmly opened.
As was the case with the first two detections, the waves were generated when two black holes collided to form a larger black hole.
The newfound black hole, formed by the merger, has a mass about 49 times that of our sun. This fills in a gap between the masses of the two merged black holes detected previously by LIGO, with solar masses of 62 (1st) and 21 (2nd detection).

"We have further confirmation of the existence of stellar mass black holes that are larger than 20 solar masses these are objects we didn't know existed before LIGO detected them," says MIT's David Shoemaker, the spokesperson for the LIGO Scientific Collaboration (LSC), a body of more than 1,000 international scientists who perform LIGO research together with the European based Virgo Collaboration.
"It is remarkable that humans can put together a story, and test it, for such strange and extreme events that took place billions of years ago and billions of light years Distant from us. The entire LIGO and Virgo scientific collaborations worked to put all these pieces together."

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## What's in the news this month?

### 5 - Do stars fall quietly into black holes, or crash into something utterly unknown?

The theory says that if you get close enough to a black hole, if you pass what is called the event horizon, there's no turning back. Nothing, not even light can escape back from the event horizon. Even though the existence of such event horizons is all but certain, and they fit greatly into Einstein's Theory of Relativity, they haven't been proven yet — until now.

When a black hole forms, the event horizon also takes shape. Technically, the event horizon is a boundary in space-time after which events cannot affect an observer, and vice versa. Basically, it's the point of no return: nothing can go past the event horizon and go back.

While a singularity has no surface area, the non-collapsed object would have a hard surface. So material being pulled closer a star, for instance would not actually fall into a black hole, but hit this hard surface and be destroyed.

Kumar, his graduate student Wenbin Lu, and Ramesh Narayan, a theorist from the Harvard Smithsonian Center for Astrophysics, have come up with a test to determine which idea is correct.

The team figured out what a telescope would see when a star hit the hard surface of a supermassive object at the centre of a nearby galaxy: The star's gas would envelope the object, shining for months, perhaps even years.

The researchers, from the University of Texas and Harvard University, have put this principle to test, showing that when matter gets pulled past an event horizon, it simply vanishes.

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## What's in the news this month?

### 6 - NASA will explore an asteroid worth $10,000 quadrillion 4 years sooner than expected

Psyche, NASA's Discovery Mission to a unique metal asteroid (called 16Psyche) was set to reach its target in 2030. However, a better trajectory has been found and the timeline has been shifted significantly. The planned launch is now 2022, reaching the asteroid in 2026.

The idea of mining asteroids is a relatively new one, a few decades ago it was the stuff of SciFi, but no longer.

16 Psyche is one of the ten most massive asteroids in the asteroid belt. It is over 200 km in diameter and contains a little less than 1% of the mass of the entire asteroid belt.

It is thought to be the exposed iron core of a protoplanet. It is the most massive metallic M-type asteroid. Psyche was discovered in 1852 from Naples and named after the Greek mythological figure Psyche.

Radar observations indicate that Psyche has a fairly pure iron–nickel composition, consistent with it having the highest radar albedo of any asteroid in the asteroid belt, with small amounts of pyroxene