

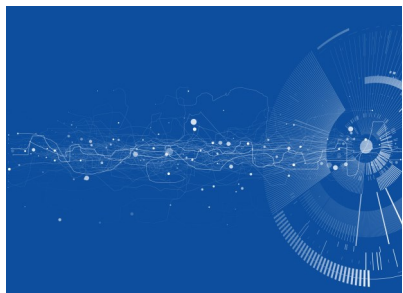


FREE COPY

Published by the Peter Underwood Centre

July 27, 2020

Revealing the science of radio waves:
Page 2



Follow us on Facebook



www.facebook.com/UnderwoodCentre/

Fun word changer puzzle:
Page 2

Word CHANGERS

Change one letter and rearrange them on the next line to make a new word. Use the clues to help you change an emu into a bat and a hyena into a rhinoceros. The solution is below.

	E M U	
A native Australian tree	_____	
An insect	_____	
Something you put things in	_____	
	B A T	H Y E N A



ARTWORK: iStock/ solarseven

DID you know Tasmania is one of the best places in the world for radio astronomy?

In fact many fascinating things about the Universe have been discovered by radio astronomers in Tasmania.

Radio astronomers use giant radio antennas, known as radio telescopes, to detect radio waves from the Sun, the Milky Way, planets and other objects in space.

They sometimes use several connected telescopes, or radio arrays, which work like one very large telescope.

The University of Tasmania is the only university in the world that operates a continent-wide array of telescopes, called the AuScope VLBI Array.

Mt Pleasant observatory, near Hobart, pictured right, has a 26-metre former-NASA telescope and a 12m AuScope

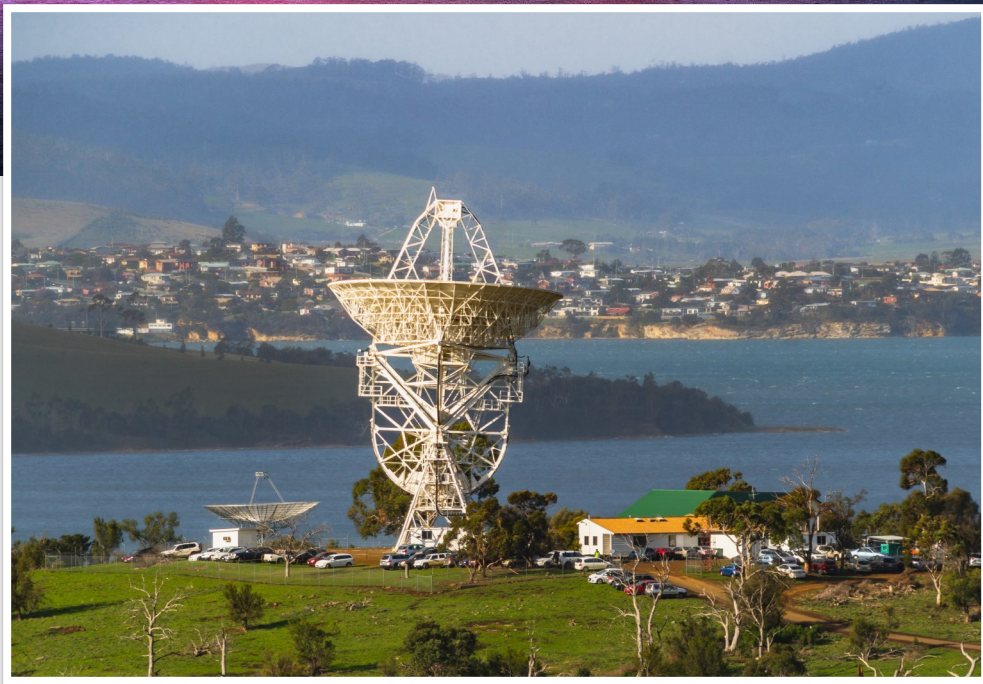
telescope, which is linked to 'dishes' at Katherine in the Northern Territory, Yarragadee in Western Australia, and Ceduna in South Australia.

Professor of Physics and Radio Astronomy at the University of Tasmania, Professor Simon Ellingsen, said these sites were used for many different projects, including supporting a number of space missions.

"We are currently building a new tracking antenna to support space missions at the University's Greenhill observatory at Bisdee Tier in the southern midlands," he said.

"The new tracking antenna is being funded by the Australian Space Agency and will be used to support Australia's research and development activities in space."

The new antenna will also be used to



broadcast signals from the ground, and the Mt Pleasant antenna will detect the signals reflected from spacecraft to identify and track space junk.

"We were a key part of the Japanese HALCA/VSOP and Russian RadioAstron missions, both of which

put a radio telescope into orbit around the Earth and our telescopes were part of an array of ground telescopes they combined to make very high resolution images of materials in the centres of distant galaxies."

Continued Page 2

Secrets revealed by radio waves

From Page 1

Other exciting space missions the University of Tasmania has been involved include monitoring the descent of the Huygen's spacecraft onto Titan, the largest moon of Saturn; and studying the interior of the moon.

Professor Ellingsen said the University's VLBI array is also used to make images of distant objects in space, including the centres of galaxies where gas and dust is being drawn into black holes with masses a million times or more greater than our Sun.

"As the material is pulled towards the black hole, giant rotating disks form, like water going down a plug hole, and some material is ejected... as jets of particles travelling at nearly the speed of light," he said.

"We also study a range of rare and exotic objects such as neutron stars and the formation of the largest stars."

The best observations that have ever been made of a pulsar "glitch" were made at Mt Pleasant.

Pulsars are spinning neutron stars - the dense cores of giant stars - produced when the star runs out of fuel and ends its life.

They are the most accurate clocks in the Universe as they spin at a very predictable rate.

But on December 16, 2016, University of Tasmania astronomers captured the Vela pulsar in a "glitch" - for an unknown reason the pulsar started spinning faster.

"Another exciting piece of work we have recently been involved in was an investigation of the first ever detection of the merger of two neutron stars," Professor Ellingsen said.

"The University of Tasmania's Mt Pleasant and Ceduna radio telescopes were part of a global array which made ultra-high resolution images of the jet of radio waves produced in the resulting explosion."

Radio telescopes don't take photos, but radio signals can be converted into data which make images such as this.

Professor Ellingsen said the AuScope VLBI Array also used to learn very important things about the Earth.

"By looking at astronomical objects called quasars, which are very bright, but a very long way away, we are able to use them as fixed references and investigate the Earth," he said.



Creating a wavelength

VISIBLE LIGHT: The Milky Way, the Magellanic Clouds (in the top right of the photo) and the Aurora Australis captured over Lion Rock, South Cape Bay, Tasmania. Picture: iStock/Konstantinos Ouzounidis

RADIO waves are a type of electromagnetic radiation.

All electromagnetic radiation is light, but we can only see part of this radiation with our eyes - what is called visible light.

Most of the light in the universe is invisible to our eyes.

Objects in the universe radiate many other types of light through space in waves, like the waves of the ocean.

Each wave has a peak and a trough, which is called a cycle.

The distance the wave moves during a cycle is called a wavelength.

Radio waves have wavelengths billions of times longer than those of visible light.

Radio waves can of course be generated artificially by transmitters and received by radio receivers, using antennas.

Your challenge is to make your own radio wave.

You will need is an AM radio, a 9-volt battery and a 20-cent coin.

Tune the radio between stations, so all you can hear is static.

Hold the battery and coin next to the radio's antenna, and touch the edge of the coin to the battery terminals.

You will hear a different noise on the radio.

Children's University Tasmania members can earn a stamp in their passports for this challenge, at the discretion of school coordinators.

"We do experiments several times a week where our radio telescopes are part of a global array and we measure the position of each of the telescopes on the Earth and their separation from all the other telescopes in the array very accurately.

"That allows us to measure continental drift and even how the length of the day changes.

"We need to do that because the accuracy of GPS and other similar satellite navigation systems depends on correcting for all these small dynamic changes in the Earth.

"If we were to stop collecting that data in a matter of only a few months the accuracy of all satellite-based navigation would start getting progressively worse."

The Wonder Weekly will reveal more on Tasmania's important place in the history of radio astronomy, including the involvement of the town of Bothwell, in an upcoming edition.

Word CHANGERS

Change one letter and rearrange them on the next line to make a new word. Use the clues to help you change an emu into a bat and a hyena into a rhinoceros. The solution is below.

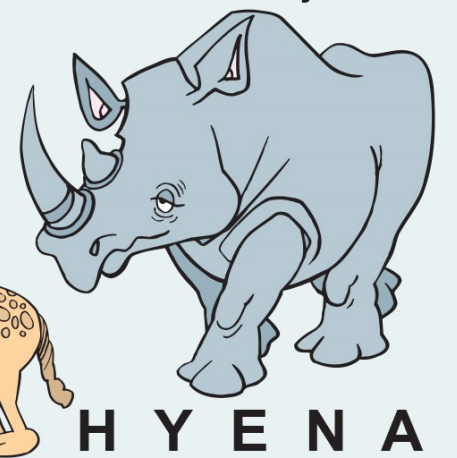
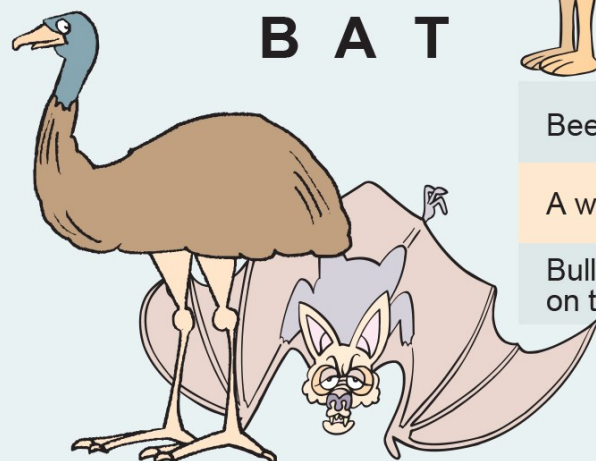
E M U

A native Australian tree _____

An insect _____

Something you put things in _____

B A T



Bees make this _____

A water bird _____

Bulls have these on their heads _____

R H I N O

SOLUTIONS: EMU, gum, bug, bag, BAT, HYENA, honey, heron, horns, RHINO