STARGAZING LIVE
TEACHERS’ GUIDE

LOOK UP AND TUNE IN TO THE UNIVERSE

ABC iview
About Stargazing Live with Professor Brian Cox

Did you know Australia is the best place in the world to look at the night sky? We can see 100 times more stars than the Northern Hemisphere, because we look directly into the vast heart of the Milky Way.

This April, renowned physicist Professor Brian Cox will inspire the Nation to look up in Stargazing Live. The three-part ABC series will be broadcast from Siding Spring Observatory – Australia’s premier observatory, a UNESCO certified Dark Field site, and a world leading facility in the search for planets orbiting distant stars.

It’s on ABC TV, 4,5,6 April 2017 8.30pm AEST & ABC iview, 8pm SA + NT, 8.30pm AWST and streamed live on both ABC TV Facebook and Youtube channels

[abc.net.au/stargazing](http://abc.net.au/stargazing)

#StargazingABC and #StargazingQuestions
Now is a great time to look up! Here is a taste of what’s happening in the night sky

The Milky Way stretches across the night sky, hundreds of billions of stars crowding together to give a beautiful glow. The middle of the Milky Way appears dark, not because there are no stars there, but because there are clouds in the way. Giant accumulations of gas and dust lying between the stars that block that light. In the dark regions gas can cool and come together, eventually reaching high enough densities to form new stars, these are actually stellar nurseries. Five billion years ago our own Sun would have been born in a cloud just like these.

Before midnight, low on the horizon below the Milky Way to the North-East, is a very bright golden star. This isn’t a star at all and is in fact the King of the Planets, Jupiter. Look closely and it shouldn’t be twinkling (that’s how you tell your stars from your planets) and with a reasonable telescope you can see the Great Red Spot on the surface, a storm raging for centuries that’s bigger than the entire Earth. With even a pair of binoculars you can see that around the planet are four bright points of light in a line, these are the largest moons of Jupiter, first seen by Galileo from which we derive their name; the Galilean moons.

(Source NASA)
It doesn’t have to be night-time for your class to enjoy this astronomy activity - make a pinhole projector & safely view the sun

To get started you will need a large piece of white card, aluminium foil, white paper, scissors and a pin.

Remember never look directly at the Sun! Even with sunglasses on it will damage your eyes, this experiment means you won’t ever be looking at it.

**Step 1** Take the cardboard and cut a square hole, 2 centimetres across, in the middle.

**Step 2** Cover the hole with a single layer of aluminium foil and tape it down taut.

**Step 3** With the pin, pierce a single hole in the centre of the foil. This is now a pinhole projector.

**Step 4** Let sunlight shine through the pinhole projector onto the sheet of white paper which is now the screen.

**Step 5** Experiment! For every metre between pinhole and screen the Sun’s image will appear 1 centimetre wider. It will also appear fainter. So make the pinhole a little wider to let in more light – but the wider you make it the fuzzier the image becomes. Astronomy is a balancing act between these issues!

**Step 6** To make the image of the Sun appear even clearer you can experiment with blocking stray light by surrounding the sides with dark cloth or even building the entire projector within a cardboard box (just remember to cut a small viewing window on the side in that case!)

**Step 7** Instead of the pinhole you can use binoculars or a lens to magnify the Sun’s image. CAUTION Just don’t put your hand or eye near the image as it’s hot, never look directly towards the Sun with this setup and make sure to take binoculars or lens out of the Sun every few minutes to cool down.
Pinhole projector activities

You can use trigonometry to explore the size of the Sun:
Measure the diameter of the Sun’s image in centimetres divided by the distance in centimetres between pinhole and image. This ratio will be the same as the diameter of the Sun divided by the distance from the Earth to the Sun. If you tell them the distance to the Sun (149,600,000km) then they should find the size of the Sun is 1.4 million kilometres in diameter! They can then try to measure the size of the largest sunspots and show that they are as large as the entire Earth.

If you use a lens or binoculars to magnify the image (REMEMBER never look directly at the sun, only the Sun’s image projected onto the card) you should see dark patches on the bright surface. These are sunspots, which can be as large as the Earth itself. Watch NASA’s explanation of a sunspot.

Every couple of days get the class to trace the outline of the Sun and any sunspots they see. Explore the changing size and shape of the sunspots. Can you find it with NASA’s regularly updated Sun monitoring satellite?

If you do this every day, weather permitting, you will see the sunspots move around the Sun eventually going out of view. That’s because the Sun is spinning around, just like Earth, with its middle taking 25 days to fully rotate once.

NASA also has a step-by-step image guide here.
Some of the must-sees in our southern sky

Autumn officially begins on 20th March 2017 with the Vernal Equinox when the Sun rises due East and sets exactly in the West. In the Southern Hemisphere this is also known as the Autumn Equinox, and for the Northern half of Earth it’s the Spring Equinox. In Australia we will now have nights that are longer than the days, perfect for astronomy!

A must-see constellation in the night sky is the hunter Orion, visible in the West low on the horizon after sunset. Three stars in a line form a sword-belt between the brilliantly bright white star Rigel and the red star of Betelgeuse. It’s one of the most recognisable sights in the sky but only really resembles a hunter when seen from Greece, where the story originated. From Australia, the hunter is tilted sideways, and the sword-belt is described as the base of a Saucepan. The Yolngu people in Arnhem Land see a canoe with three brothers fishing, with Betelgeuse the bow of the canoe and Rigel the stern. There’s even a Kingfish still on the line as the delicately shimmering Orion Nebula behind the brothers up and away from the stern!

Now turn around with your back to Orion. Put your arm out in front like you’re giving the horizon a thumbs up. Stretch your little finger down so that it now looks like you’re giving the surfer symbol and with that little finger resting on the horizon your thumb should be touching the top of the Southern Cross. Just to the right should be two bright stars, the Pointers. In your minds eye draw a line along the main length of the cross continuing to the South until you see two faint clouds. These are in fact entire galaxies, caught by the Milky Way’s gravity - the Large and Small Magellanic Clouds.

The Milky Way Near the Southern Cross Credit & Copyright: Yuri Beletsky
How to run a viewing night for schools

One of the problems faced in teaching astronomy is you are discussing objects that generally can’t be seen during a school day. Whilst there are now some schemes that allow you to access telescopes remotely so that your class can view the night sky somewhere else in the world, there is still nothing to beat the impact of a well-run viewing night under clear dark skies to promote an interest in many students.

The CSIRO has produced a great tip sheet on how to hold a successful event which is available here.

Contact your nearest astronomy group

The best and easiest way to get an introduction to astronomy is to contact your local amateur astronomical society, who will be more than willing to guide you on a tour of the night sky. They will most likely know about Stargazing Live and many have Junior sections.

Find your nearest society at The Astronomical Society of Australia.

Top tips from an astronomer

Dr. Alan Duffy has some great tips for you to tune in to the universe. He’s also a professional astrophysicist and knows a thing or two about hot chocolate...

A good pair of binoculars is better than a similarly priced cheap telescope, so borrow some or even head to your local amateur astronomical group and try their equipment.

It might seem obvious but go somewhere dark if you can, the further away from city lights you are the more you’ll see, especially faint objects like the Large and Small Magellanic Clouds.

It takes your eyes 20 minutes to become dark adapted meaning you need to give yourself time away from lights before you can see all that the night sky has to offer.

Take a blanket and some hot chocolate, settle in for a comfortable observing run, no point being cold and hungry when out looking for stars!
Continuing the learning experience at home - what students can do with their families

Please print copies of our take home guide Stargazing Live Family Guide and give them to students to take home.

You can download the guide from the ATOM pack or from here.

Stargazing Live can be viewed across the ABC universe!

BtN’s Stargazing Special is on Wed April 5th @ 10:30am.

BtN looks to the outer reaches of the universe in this Stargazing Special. We start by telling you all about the first spacecraft to travel to Pluto and beyond, before marvelling at some of the awesome pictures taken by the Hubble Telescope. Then it’s back to Earth when we discover that a sacred Aboriginal site could be the oldest astronomical map ever found before amateur astronomer Joe shows us his incredible home-built telescope.

On ABC Splash

To celebrate Stargazing Live, take a look at Splash’s exciting astronomy topic with 22 resources for primary and secondary students. Find videos about why stars twinkle, how much time light takes to travel through space, moon eclipses, the sun’s weather and Earth’s place in the universe.

ABC Splash is the ABC’s education portal, boasting over 4,000 resources matched to the Australian Curriculum, in subject areas including English, maths, history, science, geography, arts and technologies.

The Stargazing Live website

Tutorials, quizzes, beginners guides, indigenous astronomy, portraits of our solar system - there’s everything you need to tune in to the universe on the Stargazing Live website.