

Astronomy on the High Seas

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Key Words

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Summary

This article describes the development and launching of a stargazing activity on two cruise ships, *Pacific Dawn* and *Pacific Sun*, which sail from Australian ports. The session included a presentation entitled “Voyage to the Stars” that gave passengers an overview of the life cycle of stars from star-birth nebulae to white dwarfs and black holes. In the presentation it was noted that ancient mariners used the celestial sphere to navigate. The presentation was followed by on-deck observing sessions in which objects shown in the presentation were viewed with the naked eye, binoculars and a small telescope. The activity seemed to be well received and resulted in numerous questions to the presenter of the activity. Many people said that the activity had kindled or rekindled their interest in astronomy.

Introduction

This paper describes the development of an astronomy activity for the P&O cruise ships *Pacific Dawn* and *Pacific Sun*, which sail out of Sydney and Brisbane, Australia respectively. The *Pacific Dawn* has a capacity of 2100 passengers. The *Pacific Dawn* has a capacity of 2100 passengers and the *Pacific Sun* 1900 passengers¹.

A major challenge on cruise ships is to provide activities for passengers while the ship is at sea sailing to and from the islands. Many activities are provided — e.g., productions in the main show lounge, art auctions, ceramic painting and many activities for children of different age

groups. The rationale for developing an astronomy activity was the clear skies afforded from the ocean. Air flow across the oceans is very steady, producing good seeing — hence many of the major observatories are located on mountains close to the sea where the wind direction is from the ocean, e.g., Mauna Kea in Hawaii, ESO in Chile etc.

Over the period May to September 2008 a training manual was developed for the activity. The activity was branded as Voyage to the Stars. The activity was to include an astronomy talk and at least two on-deck star-viewing sessions. Two SkyWatcher 102 (SW102) telescopes were bought, one for each ship. The reasons for

choosing this particular type of telescope were as follows. Refractors are in general more robust than reflectors. In this case the telescopes are taken from a storage facility out onto the deck and then back again. There is plenty of scope for knocking telescopes and there can be significant movement and vibration during storms.

The SW102 has a short focal length and therefore has a wide field of view so that objects will be in the field of view for longer as the ship moves. Celestial objects are easier and therefore quicker to locate with a wide field, which is an important consideration at a public astronomy event as it reduces the amount of time people have to wait to look through the telescope.

Another reason for choosing the SW102 is that it has an altazimuth mount which is easier and simpler to use compared to an equatorial mount, which would be difficult to set up and of limited benefit in view of the motion of the ship. With a short focal length tube and aluminium tripod the telescope was small and light enough to be easily carried from the storeroom to the deck. Although the telescope will only be used for a few hours a week at most, a closed tube telescope will be less susceptible to the corrosive influence of sea air. A catadioptric telescope would also be suitable, but would be more expensive than a SW102. The SW102 comes with a laser finderscope. On the *Pacific Sun*, the finderscope was set up in one of the ships corridors using an exit sign hanging from the ceiling as a pointing target. In principle it would be possible to construct a robotic telescope with a gyroscope able to track a celestial object by compensating the motion of the ship, however the cost of such a telescope would be much greater than the price paid for SW102s. There would also be safety issues with people being near a telescope that could move quickly with respect to the deck.

Thirty-five pairs of 10 x 50 binoculars were purchased — 20 for the *Pacific Dawn* and 15 for the *Pacific Sun*. The 50 mm diameter objective lens gathers a reasonable amount of light without being too heavy and unwieldy for most people to use. Two Celestron SkyScouts were bought for each ship.

Pacific Dawn

The Voyage to the Stars activity was launched on the *Pacific Dawn* cruise W825 (Sunshine Melodies) Friday 29 August to Sunday 7 September. The Voyage to the Stars PowerPoint presentation was given in the International Show Lounge (ISL) from 2–3 pm on Sunday 31 August. This was attended by a few hundred passengers. The presentation was delivered using PowerPoint on a Mac Book Pro plugged into the AV system of the ISL.

In the presentation a connection was made between sea voyages of earlier times when the stars were used for navigation. The presentation began with a photo taken from the front deck of the *Pacific Dawn* and was followed by a screenshot from the desktop planetarium Stellarium showing the view of the southern sky that would be seen from the rear of the *Pacific Dawn* as it headed in a north-easterly direction towards the South Pacific island nation of Vanuatu. It was pointed out that many of the constellations of the southern sky have names which relate to navigation and the



Figure 1. The *Pacific Dawn* about 1.6 km off the island of Ouvea, New Caledonia. This distance compared to the circumference of the Earth (40,000 km) is equivalent to the distance between the Earth and Alpha Centauri and the diameter of the Milky Way.

building of the new world, e.g., Octans — a navigational instrument that was a precursor to the sextant, Horologium, the Clock — an essential tool in celestial navigation. Some of the constellations relate to building — i.e. Norma (Set Square) Circinus (the Compass — the sort used for drawing circles and arcs), Triangulum Australe (Southern Triangle). There are also Carina (the Keel) and Volans (Flying Fish).

The topics covered in the PowerPoint presentation covered galaxies, globular clusters, a comparison between the number of stars in the observable universe and grains of sand on a beach, star formation in nebulae, star clusters, the Sun, red giants, planetary nebulae, white dwarfs, supernovae, pulsars and black holes. At the end of the presentation there were ten minutes for questions. Many people asked questions, e.g., what is the difference between a star and a planet, what is a black hole, etc.

On the Sunday evening a session was held in one of the lounges for people to sign up for the first on-deck stargazing session. The first stargazing session was held on deck 10 at the rear of the ship 8:30–9:30 pm the next day. About 40 people turned up. Before the start of the session, the Stellarium and a compass were used to see what would be visible. This section of the ship has a fairly large clear area where people can assemble and is reasonably dark (Figure 2). However, most areas of the ship are light throughout the night to provide illumination for security cameras. It was necessary to have the lights at the rear of Deck 10 switched off to afford a good view of the sky. The view of the sky was about from the horizon to just over the

vertical towards the front of the ship and about 180 degrees horizontally. Binoculars were signed out to passengers and then security staff switched off the lights on Deck 10, which dramatically improved the view of the heavens. P&O staff were present to learn how to conduct stargazing sessions.

In general the seeing was very good with the Lagoon Nebula being visible to the naked eye, for example. Alpha and Beta Centauri were visible intermittently between a few clouds. Topics covered in the presentation were Alpha Centauri, the closest star to the Sun at a distance of about four light-years (and so it would take four million years to get there travelling at 1000 km/h — i.e. as fast as a jet). It was pointed out that looking at Alpha Centauri was exciting, as we were in effect looking at a mirror image of the Sun since Alpha Centauri is the same colour, brightness and size as our Sun — although there are important differences — Alpha Centauri is in fact a trinary system with two stars like our Sun orbiting at a distance about equal to the distance between the sun and Saturn. A third star, a red dwarf orbits at a distance of about a tenth of a light-year away from the central stars. The Alpha Centauri red dwarf is the closest red dwarf to the Earth.

Jupiter was high overhead, close to the handle of the Sagittarian teapot. This helped with the identification of the teapot, although some people had some difficulty in trying to identify the shape of the teapot. The globular cluster Messier 22 and the Lagoon and Trifid Nebulae in Sagittarius could be seen together in the field of view of the 10 x 50 binoculars).



Figure 2. SW102 telescope and computer set up on the Oasis deck of the Pacific Sun.

The red giant star, Antares, was close to overhead. It was explained that elements such as sulphur, magnesium, silicon and iron (e.g., the iron in the ship) are manufactured in the cores of large stars and that heavier elements such as gold, silver, mercury, tin and lead are made in supernovae explosions.

Side-to-side motion of the ship was not a problem. Some passengers elected to lie on the deck to use their binoculars. (Someone suggested that P&O provide yoga mats especially for the stargazing session). The SkyScout seemed to work well if care was taken to keep at least a metre away from the metal structure of the ship. The SW102 telescope was not used on this occasion.

A second stargazing session was held on the voyage home at 8:30 pm on the Thursday. About 20 people were present. However only a very few stars were visible and conditions were getting quite rough — a message was relayed from the captain to keep the stargazing group away from the ship's railings. Most of the session was spent fielding questions from the passengers with an occasional look at various stars through gaps in the clouds. Binoculars were handed out and some people managed to have a look at Jupiter. The telescope was also not used due to the worsening conditions.

Pacific Sun

The stargazing activity was launched on the *Pacific Sun* in November 2008. This followed the same format as the activity on the *Pacific Dawn*, i.e. a presentation in

the show lounge followed by two on-deck sessions later in the voyage. The experience gained from launching the activity on the *Pacific Dawn* were used to improve the stargazing activity. For example, photos taken on the *Pacific Dawn* cruise was used in the Voyage to the Stars presentation to make a stronger connection between a sea voyage and the celestial sphere.

For example, the photo shown in Figure 2 was used give people some idea of the scale of the galaxy, with the ratio of the distance of the *Pacific Dawn* from the shore of Uvea to the circumference of the Earth being about the same as the ratio of the distance between the Sun and Alpha Centauri and the diameter of the Milky Way. On the *Pacific Sun*, the stargazing sessions were held in a secluded section of the top deck called the Oasis (figure 3). This was a better location for observing the night sky than the rear of Deck 10 on the *Pacific Dawn*. The telescope was used on both stargazing sessions. The first session was held while the *Pacific Sun* was in the port of Noumea as it had to stay there an extra 12 hours for mechanical repairs, and so the view of the night sky was not as good as out on the ocean due to the city lights.

The second session was held on the voyage back to Brisbane. Viewing conditions were extremely good. Passengers were afforded excellent views of the Pleiades and Hyades clusters, Orion, 47 Tucanae and the Andromeda Nebula in Pegasus. The Moon and Jupiter were viewed through the SW102 telescope. The rocking motion of the ship was slow enough so that detail could be observed as the object passed through the field of view. On the *Pacific Sun* cruise two private stargazing sessions

were also held for training two of the P&O staff scheduled to conduct the session after the launch. During both the public and private on-deck sessions Stellarium was used. The computer was placed on the covers of a jacuzzi conveniently placed in the centre of the deck. Stellarium was also very useful during the public sessions for showing passengers what to look for in the sky. They were able to look at the computer screen and then look up at the sky and effectively see the same thing. A large plasma screen or data projector would be very useful for enabling a larger numbers of passengers to view the Stellarium output at the same time.

Conclusion

There was a lot of interest in this kind of activity with many positive comments. Some people said that the stargazing sessions had kindled an interest in astronomy and they would be getting out into the backyard a bit more when they got home. One person said that they wished they had paid more attention at school. The main issues to contend with for a nautical astronomy activity are lights, wind and motion of the ship. In the case of the *Pacific Dawn* there was also some screw vibration. Warm clothing might be required for protection from the wind. Stellarium was an essential for planning sessions enabling the view of the sky to be displayed for any time and place on the surface of the Earth.

Notes

¹ For more details of these and other ships in the P&O fleet go to www.pocrises.com.au.

Biographies

Stephen Hughes is senior lecturer in Physics in the Queensland University of Technology, Australia and chair of the Education and Public Outreach Committee of the Astronomical Society of Australia

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