Our Passport's Strange Astronomy

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Essay

The Aoteaora/New Zealand passport dedicated to navigation and discovery is very attractive, but some of its astronomy is a little peculiar

It's the International Civil Aviation Organisation, a United Nations agency, that's reponsible for setting the world-wide standards to which passports conform. The previous standard (ICAO, 2006-08) comprised three parts filling more than 650 pages (plus supplements). The current standard (ICAO, 2015) has grown to no less than 12 parts, available in five languages.

The requirement that 'every visa page' should be 'printed with a different security background design' has led countries to produce far more exciting passports than the dingy ones of the past. Finland's sports an elk which gallops if you flick the pages. Norway's has minimalist views of mountainous scenery which under uv light fluoresce with the northern lights. Canada's pages glow with fireworks and shooting stars when similarly illuminated.

The Department of Internal Affairs chose themes of navigation, discovery and destination for our passport (DIA, 2011-16), and very appropriate they are for a country where everyone, on the time-scale of humanity, is a newcomer. The visa pages begin at sea. As you turn them, land appears, particularly Hokianga Harbour, where Kupe is said to have landed, and Young Nick's Head, the first part of New Zealand seen by Cook's expedition. The journey culminates at Aoraki/Mt Cook. Constants across pages are the ever-present oceans, and clouds (Aotearoa!) which of course provided navigational clues in early days. Successive pages show frigate birds, lines of magnetic declination and whales as additional navigational hints. But the 'Māori star wheel... using the universal Māori names' on pages 14 & 15 (Figure 1) is surely a mistake. It looks more like a protractor to me! (Did the early Māori really divide the circle into 360º?) And did anyone coming to New Zealand ever use an astrolabe, unless it was Abel Tasman in 1642? Tasman never landed, but his ships the Heemskerck and Zeehaen feature on a subsequent page, followed by Cook's Endeavour and John Harrison's H1 clock. As has been pointed out (RMG, 2012) H1 has no connexion with New Zealand, but it is more curious and visually engaging than the later (and better) H4, the K1 copy of which Cook did use on subsequent voyages. Sextants, compasses and radar, illustrated on following pages, have most certainly served in navigating to New Zealand.

Our passport has no galloping elk, but it does have Crux, the Southern Cross, on every page (Figure 1). The DIA says that from front to back of the passport 'the Southern Cross travels from right to left' (which it does), 'representing the movement of the constellation through the sky during the calendar year,' which is contentious, to say the least.

Figure 3 is a reminder of the dirurnal and annual motions of the Southern Cross, as seen from Wellington. The constellation

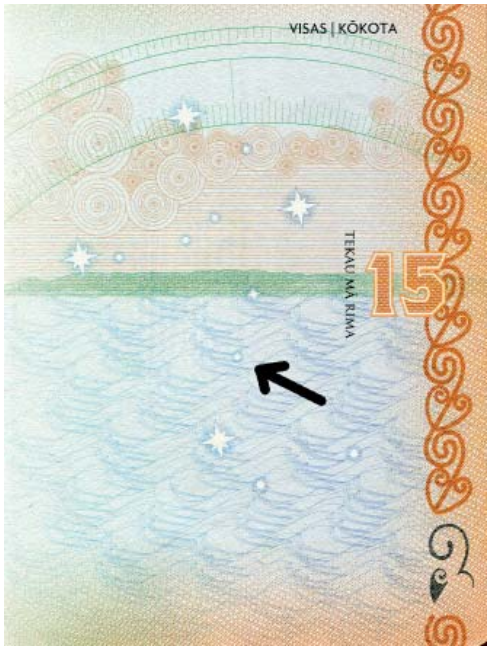


Figure 1: The Southern Cross appears on the visa pages of the New Zealand passport; page 15 is shown here. The land in the background is the approach to Hokianga Harbour. The kōwhaiwhai border at the right symbolises oceans, while the spirals in the sky represent clouds.

is circumpolar, so over the year makes a complete circuit around the celestial pole, half of it from left to right, and half from right to left. But if we restrict ourselves to the DIA's 'right to left' part of the track, the constellation is upside down compared to the representation in the passport. But don't think that turning the passport 180º exonerates the bureaucrats – the Southern Cross then moves left to right. The only way to get the passport to accord with reality, whether held the right way up or upside down, is to turn its pages from back to front.

This is not the end of the Southern Cross's peculiarities. Figure 2 (front cover) shows a photograph of the constellation. What is the interloper in the passport marked with the arrow in Figure 1? It has no obvious bright analogue on the photograph.

Through careful measurement of the passport and least-squares fitting to the coordinates of the other stars, whose identity is evident, I ascertained that the interloper is R Crucis (Figure 4). This 5.8-day Cepheid variable has a V-magnitude range of 6.4–7.2, almost a magnitude fainter at brightest than the next faintest objects in the passport (HR4607, 35 Cru, and the variable BL Cru, all V~5.5). Why is it there?

My former colleague at the Universirty of Canterbury Peter Cottrell has worked on southern Cepheids and was involved

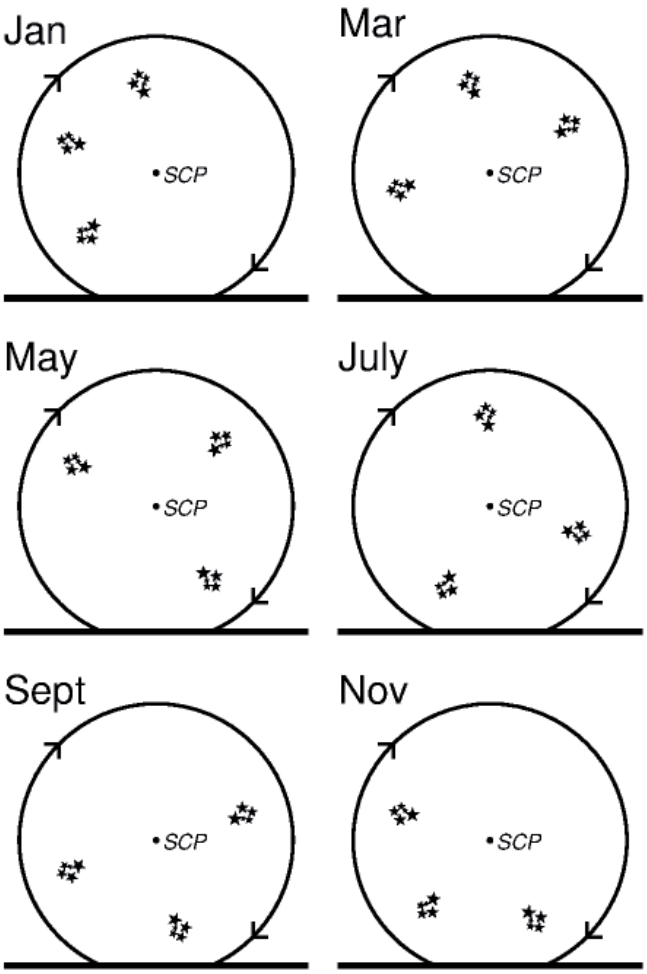


Figure 3: The Southern Cross, as seen mid-month from Wellington over the year. The horizontal line is the horizon. The circle has a 45º radius and is centered on the South Celestial Pole. The arrow heads indicate the nightly motion of the sky. Each panel shows the nightly clockwise progression of the Southern Cross from the dusk end of civil twilight, through solar midnight, to the dawn beginning of civil twlight. The shift of the constellation through the year is also clockwise.

in the 'Southern Skies' astronomy stamps that New Zealand Post issued in 2007. I therefore wondered if he was behind the appearance of R Crucis in the passport. But no.

The ICAO standard specifies that passports should include 'deliberate errors' as an anti-counterfeiting measure, but I don't believe R Crucis is what is intended (rather, something like a spelling error in microprint text). Figure 5 shows Crux in Norton's Star Atlas and I think is the clue to what happened. R Crucis is included as an open circle, indicating a tabulated variable star. These can be as faint at 8th magnitude in Norton's, but whoever put the Southern Cross design together didn't realise this, and assumed that R Crucis was as bright as stars of the same 'size' in whatever atlas was used as a source. But if so, why is nearby T Crucis absent?

One could wish that the Department of Internal Affaris had consulted some astronomers and navigators over its passport design, but these are all relatively minor errors, and the passport is a pretty production. I suggest you look closely at its pages next time you're waiting in a international departure lounge!



Figure 4: Identification of the passport stars. The open cluster NGC 4349 (visible in Figure 2) is near R Crucis in the sky and was a possible candiate for the unidentified object, but its position does not fit. It is unclear whether the passport represents θ^1 or θ^2 Crucis, or an average. θ^1 Cru fits slightly better.

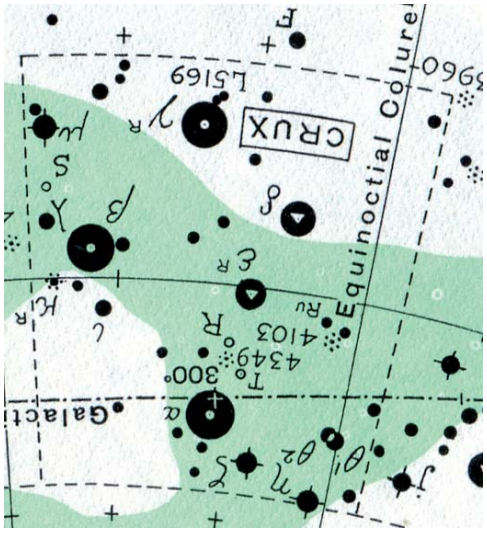


Figure 5: Crux from Norton's Star Atlas (17th edition, 1978). Since 35, 39 & BL Cru, and HR4706 appear on the passport, one can wonder why ι Cru or the two stars slightly to the north of α Cru are omitted.

References

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