

EDITORIAL

Bite the bullet



Sue Bowler,
Editor

Times are tough, internationally, nationally and locally, in UK science no less than in other areas of life. We now have to make a case for continued funding that stands up against the needs of wider society – schools, healthcare, police, defence – as well as other research fields. We do have a strong case for the wider benefits of astronomy and geophysics, as beacon subjects that draw young people into the STEM subjects that the government recognizes as going hand in hand with national prosperity: science, technology, engineering and medicine.

But that case is a tricky one to make; the research councils assess the “impact” of research in the wider, economically significant, arena. Many feel this emphasis may damage the prospects of “blue skies” research for which practical applications cannot be anticipated. It does happen, as John O’Sullivan’s wi-fi discovery demonstrates (right). And of course, it is even more difficult to assess the impact of, for example, viewing the Moon through a telescope or seeing the effects of an earthquake, on people’s choice of science as a career. But neither of these processes happens reliably and quantifiably, nor can they be predicted. The timescale is another problem. IYA2009 counts inspiration among its goals, with a view to boosting the scientific base in developing countries particularly. The results may be strikingly obvious in 50 years, as they have become for the 1957–1958 International Geophysical Year, but that’s not going to help any government get re-elected.

There aren’t going to be any good outcomes, and we have to bear in mind that seeking the perfect (impossible) solution may stand in the way of getting a satisfactory outcome – or the least worst one. Let us hope that the inspirational and intriguing aspects of science survive this round of stringencies and that they continue to be appreciated in future.

Radio astronomy lurking in your laptop

John O’Sullivan, a radio astronomer, has received the 2009 Australian Prime Minister’s Prize for Science for technology that was devised to improve radio astronomy, but now allows fast and reliable wireless computing for all of us – genuine knowledge transfer in action.

Every time you click through to the net or check your email using wi-fi, you are using technology developed for radio astronomy. In the 1970s O’Sullivan and his colleagues in Australia’s Commonwealth Science and Industrial Research Organisation (CSIRO) were looking for radio waves from exploding black holes, and were faced with the problem of cleaning up the very faint signals. O’Sullivan co-authored a paper describing the use of Fourier transforms to cope with the distortions of light passing through the atmosphere, linking their use at optical and radio wavelengths – techniques now known as adaptive optics. He went on to apply these techniques to the faint radio signals he was seeking, but he and CSIRO colleagues realized that the same techniques could help pick up radio frequency signals to link computers without wires. Problems in wi-fi networking can arise from the complex signals resulting from the many reflections in a typical room or building. O’Sullivan’s method worked here, too, and CSIRO put it into action, refining the method and obtaining patents for the technology now used worldwide.

A multidisciplinary approach also



John O’Sullivan, whose work on radio waves led to wi-fi. (Bearcage Prodn)

paid dividends, as O’Sullivan, who combined expertise in physics and electrical engineering, also designed a computer chip to do the processing, not only for these wider applications, but also for the Australia Telescope at Narrabri, built for Australia’s bicentennial in 1988. O’Sullivan’s career took him into industry to head teams working on wireless technology and satellite television, before returning to astronomy. He is now working on the Australian Square Kilometre Array Pathfinder telescope.

The Prime Minister’s Prizes for Science are Australia’s pre-eminent awards for scientific achievement, given to active researchers in any scientific discipline whose work advances human welfare or benefits society. O’Sullivan receives a medal and lapel pin, plus a cash grant of around £170,000.

<http://www.scienceinpublic.com/blog/prime-ministers-prize/2009-science>
<https://grants.innovation.gov.au/SciencePrize/Pages/Doc.aspx?name=PrizeWinners.htm>

Want to find planets? Track the lithium

A spectrographic survey has found that stars with planets – like our Sun – tend to have a lot less lithium in their make-up than comparable stars without planetary systems. It is not yet clear how this comes about, but it points the way to a shortcut to finding new exoplanetary systems.

For 60 years it has been apparent that the Sun is an odd star: compared to other stars of its type, it has low levels of lithium. Now astronomers led by Garik Israelian of the Astrophysical Institute of the Canaries, Tenerife, Spain, have conducted a census of 500 stars with the HARPS spectrograph at the European Southern Observatory and found that the 70 of them known to have exoplanets also have low levels of lithium. Something in the formation of planets around a star appears to lower its lithium levels.

Lithium would be expected to exist at fairly constant levels in stars like the Sun, as it is one of the light elements mainly produced just after the Big Bang. But there is much less lithium in the surface layers of the Sun than expected, without there being a mechanism to remove it. The convective zone below the surface does not get hot enough for lithium burning, for example. So the low levels of lithium in these stars (1% of that in comparable stars without planetary systems) suggests that some other process destroys this element; the coincidence with planet formation suggests a link.

“Like our Sun, these stars have been very efficient at destroying the lithium they inherited at birth,” says team member Nuno Santos of the University of Porto, Portugal. “Using our unique, large sample, we can also prove that the reason for

this lithium reduction is not related to any other property of the star, such as its age.”

Now the search is on for the physical mechanism. “There are several ways in which a planet can disturb the internal motions of matter in its host star, thereby rearranging the distribution of the various chemical elements and possibly causing the destruction of lithium. It is now up to the theoreticians to figure out which one is the most likely to happen,” concludes Michael Mayor of Geneva Observatory, Switzerland.

It is possible, for example, that the presence of planets may increase mixing in the host star, and deepen the convective zone, leading to more lithium burning during planet formation, perhaps. The international team published their findings in *Nature*.
<http://www.eso.org/public/outreach/press-rel/pr-2009/pr-42-09.html>