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Astronomy for the Masses*

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This talk is about the importance of educating the wider population generally about science, and why astronomy is a suitable vehicle for doing this. As you know, the world is composed of two classes of people. The first class consists of an ever-growing number of people of above-average intelligence, usually strongly motivated, highly competitive, generally well cared-for and given the latest tools to work with. Because they are also hard workers they either get fast results or at least learn a lot about why they can't get results. When they do get results, they soon build on those results to get more results, so their progress is fast. These people share a common goal, which is to acquire knowledge. They are called scientists.

The other, much larger, class consists of people, on average less educated, less organised, less wealthy and in global terms less privileged. Although many of them are highly motivated, these motivations are often turned on each other, causing discord, argument and sometimes bloodshed. Most of these people are too concerned with the daily survival of themselves and their children to be able to devote a lot of effort to acquiring knowledge, unless it helps them in their daily tasks. These people are called citizens or, in this context, taxpayers.

Because of the united efforts and motivations of the first group, and the disorganised, often conflicting activities of the second group, the gap between these two groups is continually widening. Not just widening, but widening faster, as the months go by. But one thing remains constant: The people in the first group depend on those in the second group for the things they need to continue their research. On the other hand, taxpayers can easily forget they derive any benefit from much of the research done with their money—even if they drive cars with computer chips in them and watch real-time sport on the tele.

We are probably united in our belief that society does benefit from scientific research, but if that research is to keep on getting funded by taxpayers, it is important to keep reminding those taxpayers where their money is going and why they are benefitting from it. This probably applies to astronomy more than any other branch of science, with the possible exception of high energy nuclear physics. This is because of the large cost of building and maintaining a telescope on a remote mountain, or putting it into orbit, or sending a probe to Mars. Also, the average taxpayer believes astronomy has little relevance in practical matters. He will argue that astronomers can only observe the Universe, they cannot influence it; that whatever the Universe decides, will be. In practical terms this is a hard argument to defeat In psychological terms I think there may be room for argument, especially if some of the more far-fetched physical theories gain greater acceptance.

Along this line, astronomy can honestly be marketed as the science with the best access to the greatest laboratory that has ever been built; where all the experiments are conducted without bothering the taxpayer at all and where the human species can demonstrate its ingenuity for detection, analysis and inference like nowhere else. Black holes may be out there, uncontrollably gobbling galaxies but by learning about them the time might come when each home has its own black hole down at the bottom of the garden, generating energy where the incinerator used to be!

So, I hope it is clear that it is in your own best interests to keep your fellow citizens informed of what you are doing. This task is made much easier by the fact that, at least since the dawn of humanity, earthlings have been fascinated by what they have seen in the night sky, encouraged no doubt by eclipses, shooting stars, comets, supernovas and other celestial spectacles. Indeed the heavens have exerted such a pull on people that many, if not most, believed their past and their destiny lay in the stars. Our forebears were, of course, right, but not in the ways they believed. Rather than our lives being controlled along the lines that astrologers insist on, we now have a very good idea how our planet and our solar system developed. We also have a plausible argument, except perhaps for the

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first few zillionths of a second, of how the entire Universe developed. And, in my view, the recent developments in astronomy are more fantastic, more fascinating and more inspiring than any cosmological theories dreamed up by the ancients.

This fascination is shared by many people. And the more educated they are, the greater is their curiosity. So there is no shortage of people 'out there' with an interest in what you astronomers have to tell them. The problem is: at what level should you pass on your news to your fellow citizens? A clue may be gained by looking at advertising on the tele. Much of this appears moronic and I have great difficulty believing it would sway the decision of any but the most feeble-minded but, if money is any guide, I am wrong. Apparently hard-headed corporations pay millions for these antics in the belief they get results. Assuming these corporations have done their homework, it is evident that the benefits of underestimating the intelligence of your audience outweigh the benefits of overestimating it. This is why astronomical (and other science) stories have to be kept simple.

You also need to remember that, although you might be talking to a knowledgeable, scientifically aware journalist, he or she has to 'sell' his story to his section editor back at the office. The chances of getting two scientifically aware journalists in a row are not good, yet they all take their turn at prioritising your story. It is also useful to remember that journalists are, reasonably enough, reluctant to publish articles they cannot understand and justify to their superiors. Caution rules. So the rule here is: when in doubt: KISS. This stands for Keep It Simple, Scientist.

Remembering that your journalist is unlikely to know much about, say, redshift, it is a good idea to have clear, illustrative analogies ready, so he or she can get a grasp of the principle involved, and can then pass it on to the reader. You might say analogies are illogical and therefor dangerous. True. But, somewhere, the transition has to be made between what you know and what you want the reader to know. If you produce the analogy or illustration, you have more control over the way your news is presented than if you don't take the risk. Also, a confused journalist is more likely to ditch the story than to struggle with his confusion. In this context, journalists are quite happy to be spoonfed. Give them a few catchy lines, or an identifiable idea to feed off, and you increase the chances they will become productive on your behalf. And if you can inspire them with your enthusiasm, you just about have it made. But, you must remember, you have to inspire them at their level, not yours.

In 1996, astronomers at the University of New South Wales produced an infrared image of an interesting part of the sky. Interesting to astronomers, that is. To anyone else it was nothing to get excited about. Except that the image looked like a kangaroo. So 'the giant kangaroo' was born. For a completely illogical, but equally human, reason it captured the attention of the media. The astronomers were swamped with media inquiries and hundreds of thousands of Australians learned a bit more astronomy. Also, some useful publicity was generated for a neat new infrared instrument that had been designed and built at this University.

Further encouragement comes from a recent national opinion survey comissioned by the CSIRO (dated 15 June 1997). This survey, conducted by AGB McNair, was designed to assess the popularity of science coverage in the media. According to the survey, Australians would rather learn about scientific discoveries from the media than about sport or political news, said the Chief Executive of the CSIRO, Dr Malcolm McIntosh. Science, technology, medical advances and pollution outranked sport, politics, employment and crime as the subjects of greatest interest to readers, viewers and listeners of the media, he said. Medical discoveries had the strongest support, with 54% of respondents saying they were very interested. These were followed by environmental pollution (47%), technology (46%), and science (43%). In comparison 39% said they were very interested in crime, 37% in employment, 33% in sports news, and 22% in politics. And while 16% said they were not at all interested in scientific discoveries, 28% said they were uninterested in sport and 32% in politics. Most of this is good news for science publicists, but there was also a worrying trend showing that older people were more interested in science matters than young people. While this report offers hope, it also shows how far below expectations scientists have performed in getting their message across.

If science stories are as popular as the survey claims, why don't we have ten pages of them every weekend? Because newspapers and journalists have been raised on sports stories, not science stories. Sports writers have a slick product and they have plenty of advertising dollars to support their programs. Also, it's easy. All you have to do is describe it or film it while the sportsmen do the work. If there is a lesson here it is how sports journalists have generated an industry that has become widely accepted and generously financed, with themselves as the main beneficiaries, when more people would prefer to read about science and technology. I know we are hosting the Olympic Games in 2000 but the country would be much better off if our media could generate similar interest in acts of mental gymnastics and intellectual wizardry.

Which brings us back to education. Despite the apparent aim of the present Federal Government to discourage education wherever possible, education is

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obviously the greatest lever to a sane and prosperous society. And of all the forms of education, none is more necessary than education in the wonders and applications of science. Whether this is good or bad, this is where the future of humanity lies. A common response to learning about science, particularly maths, is 'What's the use? I will never use it anyway', but this misses two points. First: people who don't learn about science will be unable to use it if the opportunity—or the necessity—arises. And two: whether used or not, even a small amount of science learning gives some insights into what is happening in the world around us. A person without science can be only a passenger in tomorrow's society.

Most of what I have said relates to why the wider population can and should be taught as much about astronomy and the other sciences as is possible. Now a few ideas on how. When preparing to go to the news media with research results, the first thing to decide is: what are you trying to achieve? Are you trying to enthuse young people with a love for astronomy? You must keep it really simple—but not childish—and give them examples rather than abstractions. If you are on about light-years tell them how far we are from the Sun, e.g. about nine light-minutes. Are you angling for research funding? In this case you can be slightly technical, but you must not lose your interviewer or the eventual audience.

You should try to anticipate the interviewer's line of questioning, especially the curly ones like, 'But what use is it?' Rehearse these answers, making sure you bring out and even repeat the points you want to get across. Acting on the parliamentary precedent, it is not strictly necessary to answer questions. You can respond with: 'That's an interesting question—but first you have to understand that ...' and then get back to your agenda. Sometimes the interviewer will flounder because he is out of his depth. Be prepared for this because here you can take the initiative, leading him to where you want to go. The most important thing is to stimulate and enthuse your interviewer. Try to see the universe through your interviewer's eyes and describe the wonderful events you have been watching there. Literature, poetry, quotes from famous scientists ... all is fair in publicising a good cause.

One day about five years ago, when I knew even less about astronomy than I know now, I wandered around the back of the UNSW astronomers' hut up at Siding Spring. Sitting in the sun was a nearly white-haired man, Dave Aitkin, some of you might know him. Dave said he was an astronomer, from ADFA, and I asked him what he was researching. He took a deep breath, as if to say, 'Gawd, not another one,' then said: 'Well, most people are surprisingly ignorant about the nature of magnetic fields in star-forming regions of other galaxies and I am trying to dispel some of that ignorance.' I was obviously one of the people Dave was referring to.

I asked him how anyone could possibly know anything about magnetic fields in other galaxies, thinking to myself, 'If he can sort out another galaxy's magnetic field from that of Earth, he must be a very clever fellow.' But Dave used a different trick. He explained how the magnetic field tended to line up elongated dust particles along the magnetic force lines and that this alignment then polarised light coming through the dust clouds from bright objects beyond. And from this polarisation, the alignment of the particles could be inferred, to give the direction of the magnetic field. My immediate thought was that if astronomers could tell which way particles of dust were lying in parts of other galaxies, they must be mighty clever.

But that was only the beginning of my education. I later found out that astronomers were so thoroughly into what can truly be called distance learning that they could also tell what these particles were made of, and how hot they were. In some cases I believe you can tell the temperature at which ice crystals formed. The point of this is that astronomers make some very fine instruments, capable of detecting the most subtle physical facts, and then making inferences from those facts which lay people find incredible but which can eventually be shown to be true or false by cross-checking.

But, as I said before, many lay people believe the practical relevance of these discoveries is close to zero. Whether you discover something wonderful or something terrible, there is precious little anyone can do about it, because it's 'out there', light years away. But, back on Earth, there must be great potential for many of these instruments to be adapted to industrial purposes. Even if most of you want to keep working on the stars, I suggest you owe it to your profession, and also to the taxpayer to try to adapt some of your instruments to more everyday uses. This can provide the following advantages: ... contact with industry, which is as important to the CSIRO as it is to universities, and ... it expands understanding of scientific applications. Many of you are teaching physics to people who will never become astronomers. Astronomers should try to show how their work links to other disciplines, e.g. chemists, mass spectroscopists, as well as other physicists. Any links to industry such as new tools developed from astronomical instruments should be stressed.

In fact there is no reason why astronomers should not always be on the lookout for commercial developments that could flow from their work. The University of New South Wales was the first in Australia to set up a wholly owned commercial technology transfer company, Unisearch Limited,

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which has been followed by most other universities. These companies are always happy to talk to their academics and researchers about devices with commercial possibilities and, if government funding continues to decline, I think more attention will be paid to this as a funding source for universities. A provisional patent is quite easy to obtain and gives the inventor, or inventors, a year's protection, during which they have an opportunity to develop their instrument and find someone to commercialise it. For astronomers, the biggest difficulty is that prior publication of details of a potentially patentable process extinguishes any commercial rights as surely as clouds of galactic dust can extinguish even the brightest sources beyond them. (No, shifting to another wavelength will not help you here. Your best hope is to improve the instrument and this time, patent before you publish.) I know you are all impatient to get your instruments pointing at the stars but if you talk to your institution's commercial arm, you might find at least a partial solution to your funding problems.

In conclusion, I would like to reaffirm that it is in your best interests to tell the wider population about your astronomy research and to encourage them, through your astronomical revelations, to reach the highest possible level of education and scientific awareness. If you and other scientists, as well as we journalists, fail in this task, we will be letting down our country in precisely the area where international competitiveness has taken off, with no end in sight. If we fail we can expect few thanks for all the hard work you astronomers are putting into unravelling the great mysteries surrounding us on our little scrap of matter spinning around the Sun. Thank you.

Rory McGuire is a journalist on *Uniken*, the fortnightly newspaper of the University of New South Wales.

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