

In support of space-related research

In this hasty submission, I concentrate on the science/technology aspect because the knowledge and experience gained leads to economic and cultural developments. Science as parent to technology and economic value. The Australian Antarctic program through the Australian National Antarctic Research Expeditions (ANARE) has been a major contributor.

The long term

Humanity is inherently an exploring species; thus we live in Australia, once unknown but discovered. Over the last few decades exploration has been in the Antarctic and more recently the deep sea with an early and as yet tentative few ventures into space. We are interested in anything discovered in these realms as evidenced recently with the spectacular images from the Antarctic seafloor and of HMAS *Sydney*.

We will venture as people into space in the next few decades as perceived needs arise. Current and evolving technology will suffice for a while but it has limitations and humans will need to go to see for themselves as we have done ever since we left our caves.

Exploring the earth's surface by land or ship was relatively simple and hindered only by our concerns with the unknown. That 'unknown' turned out to be within limits that were already well-known if not realised.

Space is going to be a bit different.

Whereas exploration to date had included understood or experienced weather and surface conditions, this is not true of space. A key concern in moving into space is what is space weather. What are the extremes to be encountered and what impact will they have on people? They certainly will be very different from those of normal everyday experience on the earth's surface in exploration to date.

We have had too short an interval of gathering basic data on cycles in space. We do know and have a basic understanding of some – solar cycles at 11 (actually 22), 20 000, 41 000 and approximately 100 000 years. And what about radiation variation and any cyclicity there? James Michener's book *Space* (my copy is Corgi Book, 1982) contains, on p. 639, a realistic comment on the sort of danger that individuals in space could have to contend with. The content was basically written by the well-known and respected Australian space scientist Dr Ken McCracken of CSIRO.

The polar regions are the best areas to study space cycles because of the role of the Polar Cusp, a conical zone allowing space radiation to reach the earth's surface; no other region allows this to happen. **This study requires commitment to long-term data sets, say for the 100 year timescale, starting now.**

The movement of people into space will also require a high level of understanding of health risks and needs to protect that health in an extremely isolated environment for long periods of time in small community groups. I will leave others more qualified in this area to comment further.

Immediate needs

Australia led the Antarctic world in the development and application of Light Detection And Ranging (LIDAR) techniques in the Antarctic through the installation of a dedicated facility at Davis Station. Like so many other elements of Antarctic science, this is part of an internationally coordinated program to study a series of critical aspects of the Antarctic atmosphere which are of global significance. The LIDAR aims a laser beam high into the atmosphere including that well above the region where our normal weather systems operate. The system monitors atmospheric composition at a series of elevations and records wind speed and direction. The study includes recording temperature variation over time at a series of heights and also the features of the so-called 'ozone layer' at a particularly valuable site. While this program is conducted in the Antarctic, the results are of global value as this sort of information can be best gained in the polar regions.

The global significance comes from early detection of climate change and its influence at a variety of heights, often where no other technique applicable can do so, and the state of the 'ozone layer' (is it re-building, getting better or worse?).

The value to Australia from involvement early in space research comes from a series of directions.

Firstly, we take a place in the international space community. Australia is a technologically and economically advanced nation with other advantages because of our low population density, vast open spaces, clear skies, and value as a site for space launches (with the economic advantages emanating from developments in this area) and research. Being in the game at the beginning has great advantages over trying to catch up later.

Secondly, young Australian scientists will be able to be part of the international community in their discipline with values that spring from being in the community rather than out of it. This has long-term values. Australia, because of its isolated position, can easily suffer from this isolation, not only in this sphere, but also in other areas of science and technology.

Thirdly, being in the community allows the chance to be involved in developing new technology which will have flow-on effects into other areas of society. Already, our lifestyle has advanced because of technological developments arising from the space program; unfortunately, Australia has not done so well out of these developments, other than as a user. This will have economic value.

The potential is great but Australian science is commonly perceived as concentrating on short term outcomes, influenced by special interest groups or short-term government policy aimed at being seen immediately, rather than taking a long-term strategic approach. Space research has to take a long-term strategic view.

Australia has been a leader in some aspects space science, particularly in optical and radio-astronomy and in upper atmosphere and cosmic ray physics. We have produced leaders in both these fields who often have gone on to do very well in other countries; in contrast, we have also attracted specialists from other countries.

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