

The Australian Space Exploration Prize

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Abstract

The NASA Ames Research Center in California and the Victorian Space Science Education Centre (VSSEC) in Melbourne, Victoria have forged a collaboration in order to conduct an Australian nationwide search for the best young researchers studying in space related fields. We report here on the progress and intended path for the 'Australian Space Exploration Prize', which will commence in the second half of 2007. It is intended that prizes be awarded annually to the researcher who is judged the best university Bachelor graduate in each of the fields of 1) space exploration technology, 2) space-related data analysis and information processing, 3) planetary science, 4) space biology and human physiology, and 5) astronomy and astrophysics. An overall winner will be judged from these category winners. The overall winner will attend the NASA Ames Space Exploration Academy in June-August the following year.

Introduction

At the beginning of the 21st century, ties between space-related researchers in Australia and the space and aeronautical community in the United States face many strains, and only exist in a largely ad-hoc fashion between individual researchers and collaborators. The lack of an Australian Space Agency during the tenure of the Howard government and the lack of federal funds for space science and engineering (with the notable exception of astronomy) has helped to bring about a situation where Australian space researchers lack public recognition and are generally isolated from each other at individual universities or small private companies.

This situation has also lead to a decrease in opportunities for potential young Australian researchers to pursue studies related to space science or engineering. Indeed, most gifted and motivated Australian students are likely to be pragmatic about their chances of finding employment in space-related fields, and will not pursue space-related studies as a result. Space educators and potential supervisors are disinclined to orient their research primarily towards space-related topics since they can expect no support from federal funding agencies. As a result, Australian space exploration research withers on the vine.

Into this challenging environment we cast an innovation that we hope will provide a long-lived, stable and reliable source of sustained interest in space research in Australia. The Prize we envisage will provide a bridge between Australian space research and the United States that will not depend on personal contacts between US and Australian researchers, but will be a broad-based avenue down which the most gifted Australian graduates may travel. We see the prize as a natural showcase of Australian talent that will attract favourable public attention and hopefully greater awareness in Australia of the potential of space exploration in the 21st century.

Prize Guidelines

It is anticipated that the guidelines of the Prize will evolve over time. Here we describe the intended guidelines for the first Prize, which will send a winner to the NASA Ames Academy in June-August 2008.

Applications will be sought from 2007 undergraduate final or honours students at all Australian academic institutions. Applications will also be accepted from students who have graduated within the past three years. The requirement for the student to have a Bachelor degree is driven by the requirement of the NASA Visa program, administered by NASA HQ in Washington for the US State Department. The language of visa program requires students to be carrying out a Masters-level 'research program'. This requires a minimum requirement that the student be eligible to commence a Masters program in Australia or the United States.

The applications of respondents will be submitted on CD to the VSSEC, which will forward the submissions to a selected review panel. The members of the review panels are drawn from Australian engineering and scientific associations who have agreed to participate in the conduct of the Prize.

The applications will include a copy of the respondent's undergraduate final or honours thesis, which will detail the space related research they have carried out at their institution. The respondent will nominate the category they wish to compete in (Table 1). This documentation will form the basis for selection of the winning respondent in each category.

Category	Research areas
Exploration Technology	Spacecraft design, orbital dynamics, human-system integration, robotics, thermal protection
Data Analysis and Information Technology	Data manipulation and analysis, artificial intelligent systems, supercomputing and data mining
Planetary Science	Geology, astrobiology, geophysics, geochemistry, geomorphology, atmospheric science
Biology and Human Physiology	Human physiology, exobiology, microbiology, life sciences, gravitational research, bioengineering, cognitive function, radiation medicine
Astronomy and Astrophysics	Astronomy, theoretical physics, space weather, heliophysics, cosmology

Table 1 – A description of the categories for the Space Prize competition. One winner will be selected in each field, and the ultimate winner will be decided from the five category winners.

The category winners will be selected in December-January annually. The category winners will all be asked to assist the VSSEC to present their research to high school students as part of the VSSEC education and outreach program. This assistance may include, but not be limited to, public presentations of their research.

The overall winner will be selected by a cross-discipline board of judges drawn from professional societies associated with each category. The result will be announced in February 2008. If the overall winner accepts the prize, they will have the following responsibilities:

1. Confirm their intention to attend the NASA Ames Academy in June-August 2008
2. Apply for a US J1 visa for this period
3. After they return from the NASA Ames Academy, they will be asked to assist the VSSEC to present their Academy experiences to high school students as part of the VSSEC program.

Future Plans for the Prize

It is hoped that, in future years, the Prize will also include a selection night, where the winners of each category will travel to the VSSEC to present their research, and the overall winner will be chosen on the night by a board of judges. This will provide an opportunity to publicly showcase cutting-edge Australian space exploration research on an annual basis. The extra costs associated with this Prize Night will preclude this from happening for the first year of the prize.

The judging panel will be drawn from prominent Australian space researchers, and a distinguished Australian who has forged a career in space exploration will award the final prize.

The NASA Ames Academy

The NASA Ames Academy (<http://academy.arc.nasa.gov>) (Figure 1) is a unique summer program whose goal is to help guide future leaders of the Space Program from all disciplines by giving them a glimpse of how the whole system works. The program includes guided laboratory research, collaborative group projects, lectures, field trips, interaction with prominent professionals from NASA and its associates, and oral and written presentations.

NASA Ames is one of the United States premier research laboratories in support of NASA missions and the United States “Vision for Space Exploration”. Ames is located in California’s Silicon Valley. It has created partnerships with leading universities and high technology industry leaders, bringing the scientific and corporate communities together in an effort to advance human knowledge and explore the unknown.



Figure 1 – (left) NASA Ames Research Center in Mountain View, California. (right) The NASA Ames Academy logo.

The Ames Academy is held June-August annually. The goal of the Academy is to inspire gifted students to become leaders in the aerospace program. Its primary objectives are to:

1. Provide upper level undergraduate/first year graduate students cutting-edge research opportunities with NASA scientists, engineers, and educators,
2. Provide opportunities for leadership development, teamwork, and relationship building,
3. Connect to communities at different places in the educational pipeline through special projects and outreach efforts, especially to under represented student populations, and
4. Link Academy alumni to future hiring opportunities within NASA and throughout the space program.

The NASA Academy program is committed to providing a strong technical foundation through which leadership potential can develop among an academically strong and diverse student population. Upon graduation, students immediately find themselves within a latticed network of support from the NASA Academy Alumni Association (NAAA). This structure helps place the students in positions of employment within NASA and in related industries.

Previous International Participation in the NASA Academy

The NASA Academy is also conducted at NASA Goddard Spaceflight Center and NASA Marshall Space Center. The students are drawn from a large number outstanding college educated applicants around the United States. US students are sponsored state by state by the US Space Grant and, in the first instance, each state will forward their best applicants to the NASA center of the applicant's choice. The state space grant will pay a stipend and the Academy fees if their students are selected. Typically 12-13 students are selected per year by the NASA Ames Academy staff from those offered by each participating state.

The NASA Academy has accepted students from Canada and France in years past. NASA Ames Academy typically has hosted one Canadian student per Academy since 1999. NASA Ames has signed a letter of agreement to make a space available for the winner of the Australian Space Exploration Prize from 2008.

Victorian Space Science Education Centre

The Victorian Space Science Education Centre (VSSEC) promotes the learning of science by providing engaging, hands-on activities for students and their educators. VSSEC also provides a unique collaborative research and education centre and, as part of a global network of Space Science Centres and Institutions, offers a link between local and international business and industry.

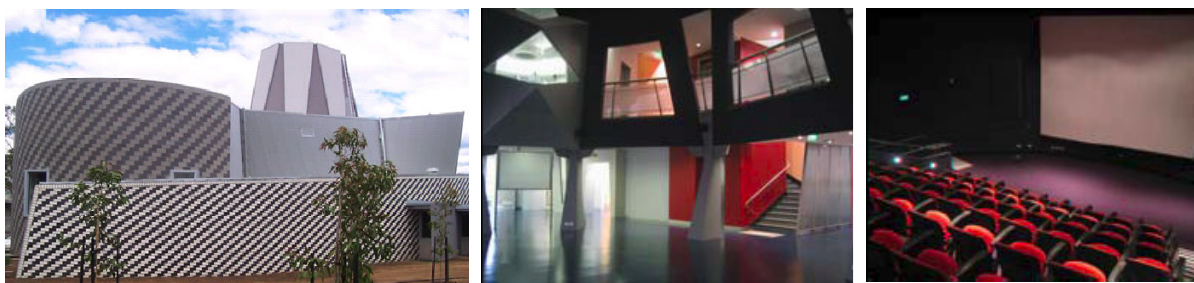


Figure 2 – (left) Victorian Space Science Education Centre in Strathmore, Victoria. (centre) Inside the VSSEC building (right) Theatre facilities inside the VSSEC.

The Centre also houses a Theatre and Conference facilities, as well as a Mission Control Room linked by audiovisual communications with the Space Laboratory and the Planetary Surface Simulation Room (Figure 2).

VSSEC will initially cater for high school students, providing separate programs for year 11-12 Victorian Certificate of Education. Programs have been designed with VCE Physics, Chemistry and Biology units 1-4, and relate to school assessed work. Activities will be undertaken in the laboratory and involve experimental activities, data collection and analysis.

Students in the critical years for science education in years 9 and 10 are offered a scenario-based 'hands-on', space science programs – *“Mission to Mars”*, and *“Mission to the Space Laboratory”*. Both these programs are designed to provide a richness and depth of experience not possible in schools. The environment will enhance students' decision-making skills, teamwork, leadership and problem solving abilities. Students will suit-up for a fieldtrip on a simulated Martian surface, or a flight to a fully equipped Space Laboratory, where they will collect data and conduct experiments under the direction of their ground-based team in Mission Control.

VSSEC also offers on-going teacher professional development programs, and will include professional activities, on-line mentoring, and access to lesson plans. VSSEC is coordinating the Australian side of the Prize and category winners will be asked to present their research as part of the VSSEC education program.

Australian Sponsors for the Prize

It is intended that the prize will have sponsorship by five professional societies throughout Australia with interests in space research. The costs of sending the overall winner to the NASA Ames Academy are being met by this sponsorship. In addition, cash prizes will be awarded to each of the category winners who were not the overall winner.

There may be additional commercial sponsorship for the Space Prize in the future. We are actively pursuing space-related companies with an interest in cultivating outstanding Australian space-related research in order to sponsor the Prize. Commercial sponsorship will allow an expansion of the Prize to conduct a Prize Night at the VSSEC.

Conclusion - Outcomes in the United States Space Program and in Australia

In the coming decades, NASA faces an increasingly large challenge for recruiting the next generation of space explorers. Half of the NASA workforce is aged above 42 and many

Apollo-era scientists and engineers are beyond regular retirement age [1]. NASA is yet to face this challenge head-on, with a hiring freeze being enforced throughout the Agency due to budget challenges.

The Presidential Vision for Space Exploration dictates that the NASA manned space program will send humans back to the Moon by 2020, and NASA is currently orienting its human spaceflight program to meet this goal. The most obvious affect of this is the retirement of the space shuttle program and the development of the Ares I and V heavy lift vehicles, to replicate the Saturn V capability of the Apollo era.

These changes in the NASA manned space program are opening up new opportunities and tasks that might be achieved by international cooperation. NASA is exploring international cooperation in a proposed lunar base around 2020. Australian participation in such a program is possible, and it is hoped that the winners of the Australian space prize will be well placed to participate directly in the Vision for Space Exploration.

The overall aim of the Prize is to achieve a continuing and strengthened dialogue between Australian space researchers and the NASA community. This will have untold benefits and possibilities in the future of both countries – Australians will have an opportunity to participate in manned space exploration, and the US will gain the involvement of a politically important international partner in the biggest challenge for the civilian space program in the first half of the 21st century.

References

- [1]. Space Studies Board, *Building a Better NASA Workforce: Meeting the Workforce Needs for the National Vision for Space Exploration*, National Academies Press, Washing D.C., 2007. p. 17.

About the authors

Dr. Adrian Brown is a research scientist at NASA Ames Research Center and the SETI Institute in Mountain View, CA. He is a graduate from the Australian Centre for Astrobiology at Macquarie University, where he worked on mapping hydrothermal systems in the 3.5 billion year old rocks of the Pilbara in Western Australia. Adrian is currently working on the CRISM infrared Spectrometer mission on Mars Reconnaissance Orbiter, which was built and is run by the Applied Physics Lab in Maryland, MD. Adrian is a private pilot and graduate of the Defense Force Academy in Canberra.

Dr Jennifer Heldmann is a research scientist at the NASA Ames Research Center in Silicon Valley, near San Francisco. She obtained her PhD from University of Colorado Boulder, where she worked on discovering the nature of gully features on Mars. She is currently working on the Lunar CROSS Mission, which will collide with the lunar surface in 2008 in search of water in the Moon's poles. She is a graduate and former staff member of the NASA Ames Academy, the most prestigious graduate level program run by NASA.

Naomi Mathers BEng (Aero) is currently completing a PhD in Engineering at RMIT University. She joined the Victorian Space Science Education Centre (VSSEC) team at the beginning of 2006 as Research Scientist and Curriculum Development Officer. Naomi has

spent many years combining her work in space structures with her passion for education. This included the establishment of the RMIT Space Science Expo, as a member of the Space Education and Awareness Working Group of the Asia Pacific Regional Space Agency Forum (APRSAF), a member of the IAF Space Education and Awareness Committee and as the Education Initiatives Coordinator for the Engineers Australia National Committee on Space Engineering.