

Dear Sir/Madam,

Daniel Comber-Todd of Mona Vale has been selected by the National Youth Science Forum to represent Australia at the forthcoming Research Science Institute (RSI), held in Boston in June this year.

The RSI is an extremely prestigious event hosted over 6 weeks by MIT in Boston and organised by the Centre for Excellence in Education (CEE). The CEE is an organisation whose aims are similar to those of the National Youth Science Forum in Australia and it attracts fifty of America's top ranked students plus a few overseas representatives by special invitation. Daniel is one of 30 international students selected to attend the program this year. Students are, generally, in their last year at High School and are tipped to become key figures in the future of international Science. Further information can be found at <http://www.cee.org/>

Daniel was chosen by Rotary as one of 432 students from around Australia to attend the National Youth Science Forum in January 2010.

Of course, like all things in life, the experience comes at a cost. Daniel needs some financial assistance. While he has succeeded in obtaining some support he needs at least another \$7,000 to enable him to attend the RSI in Boston.

Daniel is in Year 12 at Mater Maria Catholic College. He was selected by the local Rotary Club as a most outstanding student in science. We believe that he will make an excellent ambassador for Australia at this very prestigious event.

Daniel has suggested to us that you might be willing to help him. We would be grateful if you would consider giving some financial support, no matter how small, to help Daniel travel. For further details please contact Sandra Meek at the NYSF office on (02) 6125 7158, alternatively you may find an email request to <sandra.meek@nysf.edu.au> will find her quicker. Daniel can be contacted on 043287 1456.

Donations to Daniel over \$2 are tax deductible. Cheques should be made payable to the "**National Youth Science Forum**" and forwarded to the NYSF office in Canberra. Receipts for tax purposes will be issued on request.

Alternatively, you might contact Daniel's "mentor" Dr. Vicky Mogahey. Dr. Mogahey can give you a much better picture of Daniel and his needs and can be contacted on 04231 62238.

I trust you will be able to help us and Daniel in particular.

Yours sincerely

Mr Geoffrey Burchfield
Director, NYSF



National
Youth
Science
Forum

Inspiring Futures

Research Science Institute 2010, Massachusetts Institute of Technology Daniel Comber-Todd

- I am a Year 12 student at Mater Maria Catholic College, Warriewood. My main interest is science. I was accelerated into senior Chemistry and Mathematics, completing my HSC in these subjects last year. After school I want to study Physics at the Australian National University. I then hope to do a Ph.D. in Physics and work in research.
- I attended the National Youth Science Forum (NYSF) in January. The NYSF is a 12 day residential program held in Canberra and Perth for Year 12 students who are interested in science. The program includes laboratory visits, lectures and debates. It is run with the help of Rotary.
- Through the NYSF I was given the opportunity to apply for similar overseas programs. Just before Easter I was offered a place at the 2010 Research Science Institute (RSI).
- The RSI is a 6 week research program held for Year 12s at the Massachusetts Institute of Technology in Boston between June and August. Students attend university-level lectures and classes in science. Under the guidance of an academic mentor they undertake original research on a problem in their chosen field, eventually producing an academic paper which is presented to the other students.
- I have not yet been paired with a mentor, but in my application I indicated interest in Physics, particularly a phenomenon called sonoluminescence. When sound is passed through a liquid, bubbles form and then collapse. Under certain conditions the collapsing bubbles produce light. This process is called sonoluminescence. Currently the exact mechanism of light production is of great interest.
- To attend the RSI I must raise the money to cover my attendance and travel. This is about AU \$12 000. I have already received around \$3 200 from Government bodies (the Australian Nuclear Science and Technology Organisation and the NSW Office of Scientific and Medical Research). Donations are tax-deductible and a receipt can be provided.
- The RSI is an amazing opportunity. It provides aspiring scientists with first-hand experience in research. This provides a firm foundation for applications to distinguished university programs.

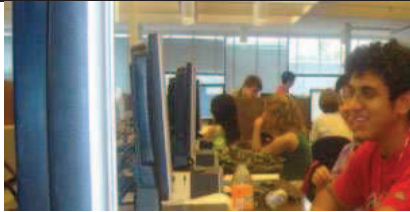
Links to further information:

- The 2009 RSI Brochure: <http://tinyurl.com/RSIbrochure>
- Information about the RSI: <http://tinyurl.com/RSIinformationDOD>
- Information from the organisation that runs the RSI: <http://tinyurl.com/RSIinformationCEE>
- A reports from Australians who attended: <http://tinyurl.com/RSIreport1>
<http://tinyurl.com/RSIreport2>
- A page that showcases exemplary papers produced at the RSI: <http://tinyurl.com/RSIpapers>

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Research Science Institute (RSI)

Each summer, 80 of the world's most accomplished high school students gather at the Massachusetts Institute of Technology for the Research Science Institute (RSI). Invited students enjoy a six-week, cost-free program designed to kick-start their careers of leadership in science, mathematics, engineering, and technology.

Participants experience the entire research cycle from start to finish. They read the most current literature in their field, draft and execute a detailed research plan, and deliver conference-style oral and written reports on their findings.

RSI projects are open-ended and relevant, fitting into the larger work of the host laboratory. The experience gives many their first taste of work at the creative edge of science.



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April 20, 2010

Dear Sir/Madam

It is my pleasure to introduce Daniel Comber-Todd. Daniel is currently a student at Mater Maria Catholic College, Warriewood, completing his HSC in 2010. He is an exceptional student who has achieved outstanding scholastic results. In 2009 he was an accelerated HSC candidate in Chemistry, Mathematics and Mathematics Extension 1. He performed at the highest level in each of these courses.

Daniel is an exceptional young man and his natural academic ability and commitment to his studies have led to the honour of being chosen to attend the Research Science Institute 2010 Program at the Massachusetts Institute of Technology. This placement is offered to only two Australian students who have participated in the National Youth Science Forum here in Australia and involves a rigorous application and selection process. This scholarship involves Daniel participating in a research project of his choice, as well as having the opportunity to attend lectures presented by Nobel Laureates.

In order for Daniel to participate in this program he has to raise over \$10000AU to cover his attendance, travel and accommodation expenses. Any contribution that you can make to enable this promising young scientist to fulfil this dream would be most appreciated.

I thank you for your time in consideration of this proposal.

Yours faithfully

Mr Ray Werren
Principal



Rob Stokes

Pittwater MP



7 April 2010

TO WHOM IT MAY CONCERN

I am honoured and delighted to write in support of Daniel Comber-Todd and his upcoming research project at the Massachusetts Institute of Technology (MIT) Boston, USA from June 19, 2010.

Daniel is currently is a Year 12 student at Mater Maria Catholic College and was accelerated to Year 11 Chemistry and Extension Mathematics. In 2009 he gained a place in the National Youth Science Forum held at Australian National University in Canberra.

From this he went on to apply for the 2010 Research Science Institute program was highly competitive and only two Australians were offered a position out of over 500 Year 12 students.

Daniel is very mature young man and I admire his enthusiasm and determination to excel in the field of Sciences. He is admired and respected by his school teachers and fellow students at his college.

I understand that for Daniel to attend this vital program in Massachusetts he will need to raise over \$ 12,000, which is a very large amount to raise before he leaves in June this year.

It gives me great pleasure to write this letter and highly commend Daniel to you. I wish him all the best for his future and his fundraising to enable him to travel to the USA to attend the program.

Yours faithfully

A handwritten signature in blue ink, appearing to read 'Rob Stokes'.

ROB STOKES MP
MEMBER FOR PITTWATER

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National Youth Science Forum

Reports: 2007 — Research Science Institute

Note that prior to 2010 the International Program was part of the Staff Training program, hence these reports reflect a number of other activities not present in the current Program.

Fern McAllan

I was fortunate to win a place at the National Youth Science Forum (NYSF) in January 2007. Subsequently I entered a selection process and was granted a place at the Research Science Institute (RSI) 2007. This allowed me to pursue a research project of my own.

After applying in February, I was notified of my success in April. The program was based at the Massachusetts Institute of Technology (MIT) and ran for six weeks from late June to early August. We were accommodated at Simmons Hall on the MIT campus, in the centre of Cambridge, across the river from Boston.

The program began with an introduction to Mrs. Joann DiGennaro, cofounder of the Rickover Foundation and an overview of the program which we were about to undertake. Mrs. DiGennaro also spoke at the Closing Convocation which outlined the various ways in which we could support the RSI family as alumni in the future. Mr. Cliff Bowman, director of RSI, played an active role in the program attending lectures and talking to students.

The academic program began with a week of introductory lectures. All students attended the humanities lectures, and two of biology, physics, chemistry and mathematics, according to their preferences. The biology lectures were given by Katherine Olsson-Carter, covering topics such as the function of DNA in the non-coding region, apoptosis and ageing. Professor Evan Scannapieco's physics lectures on astrophysics were also extremely interesting. Lance Rhoades' humanities lectures discussed American history through Fenimore Cooper's Last of

the Mohicans and Terrence Malick's film rendition *The New World*.

Three nights a week were spent in academic lectures and each of the astounding speakers were highly knowledgeable in their specialty. The topics ranged from the physics of super-cooled atoms, the mathematics behind investment, biostatistics, RNA interference for cancer research, education, and the senses of other animals. These lectures exposed us to some of the many interesting topics in science, expanding our knowledge and horizons. I was amazed by the calibre of the lecturers attracted by RSI which included Nobel laureates.

Two of the evening activities varied from the lecture format. One of these was college night, which saw about fourteen American Universities each give a five minute presentation on their science courses and university life. This provided useful insights into the applications required and the differences in culture and courses. MIT took advantage of our presence and organised a separate evening where specific information about their courses could be obtained.

Another stand-out evening was 'International Night', where students from each of the different countries present gave a short presentation about their home country. Rarely staying within the time limit, these presentations showed some of the different cultures and highlighted aspects which we may take for granted.

The core of the academic program was the research mentorships, beginning late in the first week with Meet Your Mentor night and concluding throughout the final week with presentations given to peers and mentors. Meet Your Mentor night was, for many students, an introduction not only to their mentor but to their project. Here I was first introduced to my project which developed over the course of the project to be entitled "Determination of Different Sensitivities within Gram Positive and Gram Negative Bacteria to Various Antibiotics and Natural Product Extracts".

This work was undertaken at Cubist Pharmaceuticals, Inc., at Lexington. My official mentor, Dr. Dwight Baker, was the Senior Director of the Natural Product Discovery group, although most of my work was conducted under the guidance of Dr. Uma Oza, Senior Scientist in Natural Product Screening, with Cathy Hartland, also in Natural Product Screening, more than willing to provide advice. The atmosphere in the lab was wonderful, providing a supportive environment and the friends and contacts I have made within the pharmaceutical business will assist me into the future.

My project was triggered by results obtained by Uma and Cathy in their initial screen of some natural products which identified compounds active against an *E. coli* strain engineered not to respond to known classes of antibiotics, but the same compounds were inactive against a commonly used more sensitive wild type strain. These results intrigued Cubist, so my project was designed to investigate whether similar sensitivities were demonstrated between other

strains. I found that different sensitivities were evident between the different gram positive and gram negative strains for a range of known antibiotics, however the intriguing initial screening results were not repeatable.

My work suggests that multiple gram positive or gram negative strains should be used in natural product screening to increase the likelihood of finding an active compound as a possible antibiotic.

I gained an incredible amount from my mentorship at RSI. I became comfortable working in the laboratory and was able to trust the results I obtained as correct. The techniques I learnt will be readily applicable in any future work I undertake. I also acquired an understanding of the complexities of the process involved in the development of novel antibiotics and the work which must be done to maintain existing products on the market.

As well as this biologically based knowledge, I also wrote a scientific paper and presented this paper to a group of my peers. Across two days every student presented their work to their peers, providing an amazing opportunity to learn about other people's work.

To complement the academic program, we were able to see parts of Boston and the surrounding area. A weekend trip to the White Mountains in New Hampshire saw us hiking, swimming in freezing waterfalls and caving in a beautifully picturesque area, staying the night in a motel. We camped out on the Esplanade to watch the fireworks on July the Fourth, with the heartfelt reflections of Rawan, from Lebanon, putting the celebration of independence into perspective.

Numerous dinner trips were organised to places like Quincy Market, Little Italy and many smaller restaurants. The opportunity to see some of the local area was wonderful, however the most memorable parts of these adventures are the times spent with friends. At RSI I met an amazingly diverse group of people and have come away with a stunning group of friends.

Attending RSI was a wonderful experience and I would like to thank some of the people who made this possible; the Rotary Club of Yarram for the opportunity to attend NYSF, both Yarram Secondary College and the Distance Education Centre of Victoria for their support with my continuation of year twelve studies and the National Youth Science Forum for their help and support.

The Research Science Institute program provided me with an awesome experience to undertake my own research project. This gave me a valuable insight into the nature of research within a company setting, as well as the diverse group of academics I can expect to meet at university. The RSI family of which I am now a part will also continue to support me into the future, with a rich tradition of community.