

■ **BY LIN ZHAOWEI**

MATHEMATICS whizz Alan Aw, 18, was working through questions in a graduate-level textbook last year when he discovered a new way of solving a classic maths problem.

Realising the elegance of his solution, the Raffles Institution (RI) alumnus wrote a paper and submitted it to the *American Mathematical Monthly*, an international peer-reviewed journal. To his delight, it was accepted for publication.

Mr Aw is among an elite group of students in the Integrated Programme in top schools who are producing papers worthy of publication in international journals. Leading the charge is the NUS High School of Mathematics, with 16 student publications since 2007 – including seven published last year.

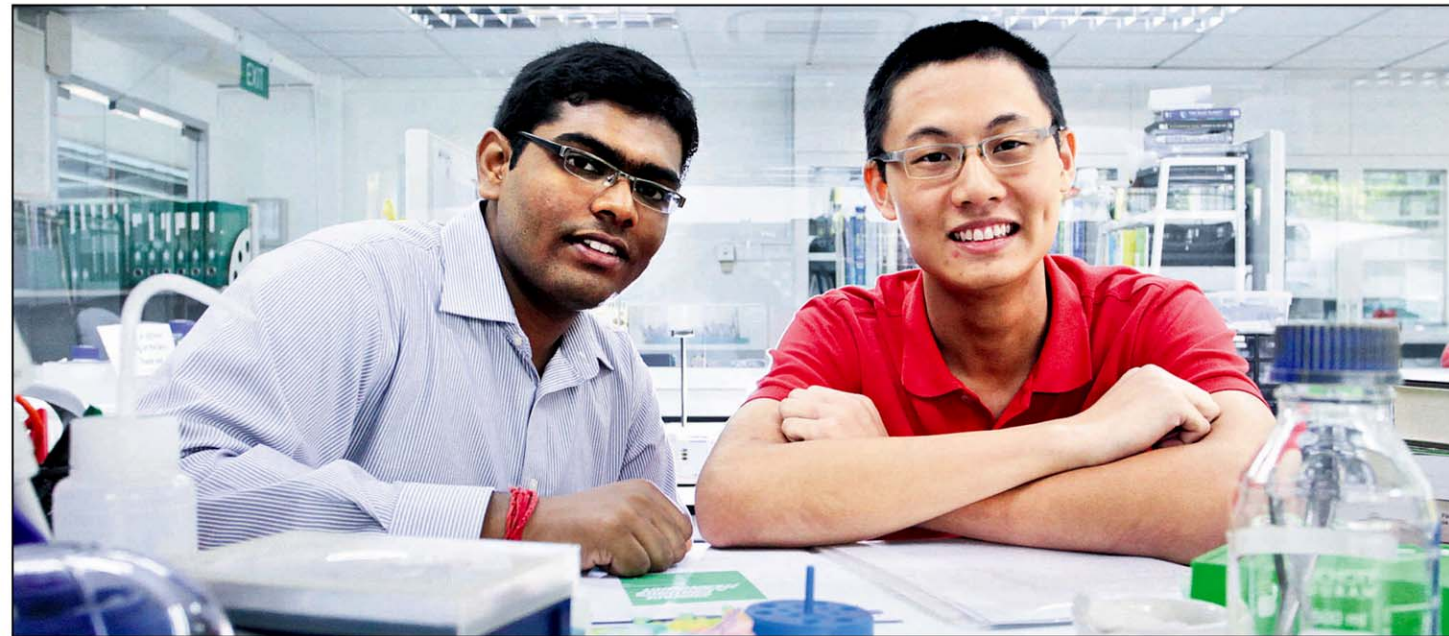
RI has had five papers written by students published in the last two years, and Hwa Chong Institution (HCI) has had five so far. The schools help their students by giving them guidance through mentors – some of whom hold PhDs – and even setting up research facilities on campus.

Dr Adrian Loo, who heads RI's Raffles Science Institute, said the students who have published papers are mostly self-driven: "I was a post-doctoral researcher before, and for universities it's publish or perish. But for these students, it's purely out of passion for their respective fields."

Dr Loo said there are no key performance indicators for RI's student researchers, as it is more important for students to learn and explore their interest. "We want students to experience science as a real scientist would. We let them be first-hand inquirers, so they construct their own knowledge of science."

The Raffles Science Institute was set up in 2009 to encourage and facilitate research by its students. It started with a biology laboratory, and RI is now setting up labs for research in physics and chemistry. There are four scientists-in-residence who help students identify research topics and guide them through their projects, sometimes with the help of external collaborators.

Similarly, both NUS High and HCI have high-tech laboratory facilities that students may use for their research, as



(From left) Raffles Institution alumni Murali Adithyavairavan and Alan Aw, both 18, have put Singapore schools on the world map. Mr Murali co-wrote a paper with a Nanyang Technological University professor that appeared in *Surface And Coatings Technology* last year, while Mr Aw's paper will be published in the *American Mathematical Monthly* this year. ST PHOTO: DESMOND LUI

# Students shine in scientific research

Papers by Integrated Programme students published in international journals

well as staff members with PhDs who mentor students.

Mr Aw said his uncle, a trained mathematician, had nurtured his interest by introducing him to pure maths when he was in lower secondary school. Driven by his interest, Mr Aw approached Dr Ku Cheng Yeaw, a maths lecturer at the National University of Singapore, for a possible research collaboration after meeting him at a science conference when he was

in Secondary 4. A paper co-authored by him and Dr Ku is almost completed.

"I enjoy the intellectual stimulation from doing maths... I even take the opportunity to visit maths professors when I travel overseas on family vacations," he said.

Mr Looi Qin En, 18, says it was his interest in computer games that got him started on research in computer science.

The HCI and Catholic High alumnus

has produced a total of five papers in peer-reviewed journals to date.

"What really drives me is the excitement of finding out new things people have not found out before," he said.

"When I go overseas to present research, other researchers are very surprised to see a high school student presenting papers.

"But many of them have offered me useful feedback and encouragement."

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## Some papers by students

**The Turan Number And Probabilistic Combinatorics, to be published in the *American Mathematical Monthly* this year**

■ Written by Raffles Institution (RI) alumnus Alan Aw, 18, who plans to study mathematics at the California Institute of Technology (Caltech) or the Massachusetts Institute of Technology (MIT).

■ He used a mathematical tool called the probabilistic method to prove a classic theorem about the Turan number, which is simpler than the previous known approach.

**A Morphological Study On Direct Polymer Cast Micro-Textured Hydrophobic Surfaces, published in *Surface And Coatings Technology* last year**

■ Written by RI alumnus Murali Adithyavairavan, 18, and a professor from Nanyang Technological University. The teenager plans to study engineering at Caltech, MIT or Cambridge University.

■ The pair re-created the water-repellent properties of lotus leaves on engineered surfaces. Their methods can potentially be used on ships' hulls, vehicle windshields and buildings.

**Modularising Scratch Code To Develop Interactive Media Content, published in *Lecture Notes In Engineering And Computer Science* last year**

■ Written by Hwa Chong Institution alumnus Looi Qin En, 18, who plans to read computer science at Stanford University.

■ He created a simple framework for educators to develop relevant teaching tools, such as animations and games.