

# CONNECTING THE DOTS

*Industry insights a light bulb moment*

**A SEM WARDAK'S RECENT VACATION RESEARCH SCHOLARSHIP (VRS) PLACEMENT WAS SOMETHING OF A LIGHT BULB MOMENT. THE PROGRAM, INCLUDING PRESENTING AT AMSI CONNECT, WAS THE FIRST TIME THE UNIVERSITY OF SYDNEY MATHS AND PHYSICS STUDENT HAD ENCOUNTERED INDUSTRY RESEARCH.**

"Linking industry and maths research allowed me to develop a clearer picture of the multi-discipline opportunities available within mathematics."

Now completing Honours in Physics, Asem spent six weeks from December to February exploring negatively curved structures in dimensions three and four via discrete geometry. These higher-dimensional versions of making a saddle out of triangles have angle sums greater than 360 degrees around a point, meaning they are negatively curved.

"Negatively curved structures are extremely important in natural sciences such as general relativity and molecular structure in chemistry," Asem says.

As well as general relativity – a branch of physics focused on understanding the nature of gravity in the universe – these structures are also used in knot theory. Inspired by knots in everyday life such as in a rope or a shoelace, this field of research enables prediction of molecule properties.

Having completed a Bachelor's degree in Pure Mathematics and Physics, the VRS project was a chance to bring together two subjects of passion.

"This project looked at metric spaces and differential geometry. This type of research greatly interests me and I hope to pursue it in the future," Asem says.

During 2017, however, Asem will focus on his Honours in Physics and a project at the bridge of neuroscience and artificial intelligence.

He hopes to apply some of the skills developed during VRS to these studies.

"I realised how vital communication is to

the production of research. With effective communication, existing ideas may be improved in subtle ways, which end up making significant contributions."

For Asem the biggest drawcard for completing the intense six-week VRS program was the opportunity to tackle real-world research challenges alongside field leaders. The program's beauty being the opportunity to see your work have impact and propel yourself forward as a researcher.

"My main aim, which I achieved, was to participate in current research in pure mathematics and produce real scientific outcomes," he says.

A program highlight, AMSI Connect, acts as a punctuation mark for the experience giving VRS participants a platform to both to both present their work and hear from industry and research experts. The two-day conference allows students to connect the dots between research and commercial application and the many opportunities beyond their studies.

"The various events expounding this connection between industry and research were enormously valuable. It allowed me to develop a clearer picture of the opportunities available in a range of disciplines within mathematics," says Asem.

With PhD and postgraduate research on the horizon, as Asem discovered at VRS, anything is possible. □

*Asem Wardak was a recipient of an AMSI Vacation Research Scholarship in 2016-17. AMSI Vacation Scholars undertake a 6-week research project, presenting their results to peers and supervisors at AMSI's student conference (AMSIConnect) at the end of the summer.*

**LINKING INDUSTRY & MATHS RESEARCH ALLOWED ME TO DEVELOP A CLEARER PICTURE OF THE MULTI-DISCIPLINE OPPORTUNITIES AVAILABLE WITHIN MATHEMATICS**

