

Local High School Students Named As Authors On Manuscript Resulting From UA Bioinformatics Study

Summer internships in University of Arizona bioinformatics lab lead to the realization of prestigious scientific goal for three students.

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For some scientists, authoring a manuscript resulting from novel research can be the accomplishment of their career. Students cited as co-authors are typically graduate students or post-docs. Being cited as an author on a scientific paper before graduating high school is virtually unheard of. But, due to a unique internship opportunity, three students in a [University of Arizona BIO5 Institute](#) lab will leave high school as published scientific authors.

Liam Wilson, Wesley Chiu, and Minsu Pumarejo each completed data science summer internships in Dr. Yves Lussier's bioinformatics lab and the [Center for Biomedical Informatics and Biostatistics \(CB2\)](#)—but, this was clearly not the ordinary, coffee-delivering, trivial tasked internship. Within 48 hours on the job, the students were being mentored on how to analyze the results of medical studies, curate information through extensive literature reviews, and cross-reference their findings.

Once that initial training was complete, they were put to work validating the findings of a new bioinformatics study utilizing non-coding areas of DNA which have unveiled a variety of previously unidentified disease comorbidities. Their validations were based on collecting data from existing research studies and analyzing anecdotal evidence from physicians.

The study was the culmination of a four-year computational biology project led by [Dr. Yves Lussier](#), Professor of Medicine, Associate Vice President for [UA Health Sciences](#), Associate Director of Informatics at the BIO5 Institute, and Director for the Center for Biomedical Informatics and Biostatistics. There have been no previous wide-scale, comorbidity curation studies looking into ‘junk DNA’ or the area of the DNA that does not code for proteins. These areas encompass about 97% of our genome, however scientists still understand very little about these regions.

Dr. Lussier and [Dr. Haiquan Li](#), Assistant Professor, Biosystems Informatics in the [Department of Agricultural & Biosystems Engineering](#) in the [College of Agriculture and Life Sciences](#), collaborated together to pursue the study, driven by the hypothesis that analyzing these shared molecular mechanisms between diseases would provide previously unknown comorbidity links. They were right. Among the ~16,000 potential combinations, 398 new links were found.

The work they’ve done on this particular study is aimed at tackling large-scale health problems. Helping to identify new comorbid diseases, which is the presence of one or more additional diseases occurring alongside the primarily diagnosed disease, not only aids doctors in implementing prevention and treatment plans, but can also inform drug discovery efforts. With 42% of patients currently experiencing disease comorbidity, this contribution of knowledge has the potential to lower mortality rates and overall healthcare costs.

Dr. Li, who has been working on research projects of this nature for 10 years, said he was surprised at the capabilities of the students. “They had never been exposed to medical studies. They had to be trained rapidly and had a tight deadline—three weeks.”

Despite the challenges the interns rose to the occasion, according to Li, completing computational analysis usually only conducted by experienced informaticians.

Liam Wilson, from Westwood High School in Mesa, was part of the prestigious [KEYS Research Internship program](#), a seven-week opportunity for Arizona high school students to work in BIO5 Institute labs alongside top faculty like Dr. Li and Dr. Lussier. Wilson said he feels lucky to have been placed in this bioinformatics lab, given his background in programming and the caliber of those he’s able to learn from.

“Dr. Lussier is an absolutely brilliant person,” said Wilson. “Being around someone with such a brilliant mind leaves you awestruck, and is very inspiring.”

Dr. Lussier has contributed to and is serving on about thirty boards of directors, as well as scientific and editorial boards inclusive of pharmaceuticals, journals, information technology startups and large corporations. He has mentored or co-mentored 22 PhD candidates and 21 post-doctoral fellows, two are

now Directors for Biomedical Informatics Departments and/or Institutes in their respective institutions. It goes without saying that Dr. Lussier takes his role as “mentor” very seriously, in this case, taking the initiative to map out a project for his interns where they would have the chance to make a meaningful contribution. And despite his many other obligations, he took time to personally train each of the high school students when they began in his lab.

Wilson said that although he has the grades to get into virtually any university of his choosing, this opportunity has swayed him toward staying at UA to pursue a degree in computer science. The appeal lies in the possibility of continuing to work under Dr. Lussier in this lab throughout his undergraduate program, something that many previous KEYS interns have done in their respective labs.

“The sense of community is very nice. I have definitely felt lost, but there’s always been someone there to help us understand,” said Wilson. “Even in our downtime we are conversing and progressing our knowledge.”

Wesley Chiu, who is now a senior at Basis Tucson North, is also keen on continuing his work with Dr. Lussier. He says always knew he was interested in biology, but it wasn’t until his internship that he began to understand how what he was learning in the classroom could translate to what he wanted to do after graduation.

“I’ve learned more about databases, querying, and their connection to real-world application,” said Chiu. “We have done a lot of programming in class, but this has really opened my eyes to the possibility of integrating programming to solving problems affecting humanity right now.”

About the University of Arizona BIO5 Institute

The BIO5 Institute at the University of Arizona mobilizes top researchers in agriculture, engineering, medicine, pharmacy, and science to find creative solutions to humanity’s most pressing health and environmental challenges. Since 2001, this interdisciplinary approach has been an international model of how to conduct collaborative research, and has resulted in improved food crops, innovative diagnostics, devices, and promising new therapies. Learn more at BIO5.org.