



the Art OF THE HACK

Threat researcher Ismael Valenzuela (standing) teaches McAfee's Malware Research Analysis class to Cal Poly cybersecurity students.

New Initiative Turns Undergrads into Cybersecurity Warriors of Tomorrow

BY JO ANN LLOYD PHOTOGRAPHY BY BRITTANY APP

It made international news days before Christmas last year: Millions of Target customers' credit card information was breached while they did business at the nation's No. 2 discounter, and according to reports, the biggest retail hack in U.S. history could have been prevented.

In the not-too-distant future, Cal Poly computer science and computer engineering students will be equipped to spot, stop and prevent these types of attacks. The university's new cybersecurity education initiative — which includes the Cybersecurity Center, Cal Poly Northrop Grumman Cyber Lab, cybersecurity curriculum, and a Cybersecurity Council — is preparing students to tackle the ever-increasing challenge of protecting peoples' and organizations' online privacy.

Cal Poly's momentum in cybersecurity education

builds upon an already-established interest, initiated through a cybersecurity projects lab for students established with funding from Raytheon. The Cal Poly White Hat club uses the lab to make the Internet a safer place by protecting personal computers, private data and information systems.

Spearheaded by the College of Engineering, the unique initiative seeks to educate all Cal Poly students in issues of cybersecurity.

The new cyber lab, the first of its kind in the nation, enables students to study real-world computer security technologies, in a safe and controlled environment. Funded by the Northrop Grumman Foundation in a partnership, the cutting-edge lab features a direct connection to Northrop Grumman's Virtual Cyber Lab, allowing students to work directly with the company's cybersecurity experts and experience emerging challenges in real time.

"This initiative is giving our students virtual access to some of the best resources in the world," said Cal Poly President Jeffrey D. Armstrong. "It's yet one more way in which Cal Poly is producing graduates uniquely prepared to meet the challenges of our complex society

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— in this case, for a quickly developing profession that truly needs the best and brightest minds right away.”

The umbrella organization that is the Cal Poly Cybersecurity Center will create connections and partnerships between disciplines, said computer science Professor Zachary Peterson, the first person hired specifically to teach in the area of cybersecurity.

“I’m a believer in cybersecurity not being a specialization,” he said. “I would go so far as to say it’s a principle every computer science student needs to see.” And he wants them to see it during their very first quarter on campus.

Part of Peterson’s vision is to expand course offerings and rethink how students who have never studied computer science are introduced to the discipline. “Let’s avoid highly constrained, low-level programming exercises, which lack context and relevance; instead, let’s go build something fun,” he said.

The newly revamped Intro to Computing course lets them do just that. “The course has always been offered in a variety of ‘flavors,’” Peterson said. “Students can choose to explore computer science through computational art, music, video games, or mobile apps. Now, we’re offering security as a flavor.”

Students in Peterson’s section of Intro to Computing will explore computer security concepts through a quarter-long Capture the Flag-style game, in which students will work together to try to break into computers Peterson has setup, in order to steal a digital “flag.”

“This course will get students excited about comput-

er security while communicating core computer science principles,” Peterson said. “Other sections of the class have been shown to help reduce attrition, increase performance, and maintain women and other under-represented populations in CS. I hope to do the same.”

Peterson, an expert in secure storage systems and applied cryptography, said he’s not aware of any university offering a course dedicated to security to students in their first quarter.

In the new Cryptography Engineering course, students learn how to build secure systems using cryptography, the science of coding and decoding secret messages. A third class, Malware Research Analysis, was taught in the spring with the help of engineers from McAfee Corp. “They have been extremely generous with their time and resources, sending 10 world-class experts over the course of the quarter to lecture each week,” Peterson said.

Cybersecurity is uniquely suited to tap the exponential powers of a polytechnic institution, said Debra Larson, dean of Cal Poly’s College of Engineering.

“Learn by Doing in a cyber world is as real-world as it gets,” Larson said. “Cybersecurity isn’t just a technical discipline, and it’s not just computer science. It involves business, economics, ethics, philosophy and psychology. It asks all of us to apply diverse knowledge in new ways.

“Similarly, our collaborations reflect the truly polytechnic nature of this initiative. Our relationships span a spectrum of industries, interests and disciplines, which contributes to the relevance of the curriculum we design.”

“The Internet is everywhere, which makes our cybersecurity graduates immediately valuable to employers wherever they are,” Peterson said. “Whether they work specifically for a security company like McAfee or become an engineer with software giant Google, having a working knowledge of security will make more them valuable to that company,” he said.

“Internet connectivity is all around us — in cars, refrigerators, electrical systems. Things we thought were safe today can become totally broken and insecure tomorrow.”

But should that day come, Cal Poly’s students will now be there to help.

The entrance to the new Cal Poly Northrop Grumman Cyber Lab





On hand for the dedication of the Cal Poly-Northrop Grumman Cyber Lab were (left to right) Dale Griffiths, chief scientist in the Northrop Grumman Intelligence System Division; Cal Poly Computer Science Chair Ignatios Vakalis; cyber student Christina Formaini; Professor Zachary Peterson; Northrop Grumman Vice President Michael Papay; Northrop Grumman Studies and Special Program Manager Rich Shelton; Northrop Grumman CEO Wes Bush; Cal Poly President Jeffrey D. Armstrong; Dean Debra Larson; student Jessie Pease; Northrop Grumman Vice President Ron Smith (B.S., Electrical Engineering, 1983).

CAL POLY AND NORTHROP GRUMMAN DEDICATE CYBER LAB

When it comes to training young, work-ready engineers in the critical field of cybersecurity, Northrop Grumman CEO Wes Bush believes Cal Poly “gets it.”

Bush was on campus in January for the dedication of the Cal Poly-Northrop Grumman Cyber Lab, a 32-workstation facility that is the centerpiece of the new Cal Poly Cybersecurity Center. Bush said programs like Cal Poly’s are crucial in meeting the growing challenges in modern life.

“Cybersecurity isn’t just about national security, it’s about economic security,” he said.

Cal Poly students will now be able to receive intensive training in malware, encryption, cyber attacks and cryptography in the new lab, which was built with the support of a \$150,000 grant from the Northrop Grumman Foundation and is connected to the defense company’s Virtual Cyber Lab in Virginia. Dale Griffiths, chief scientist at Northrop Grumman’s Intelligence System Division, helped configure the lab, which is equipped with specialized software, hardware and television monitors that rotate 360 degrees.

“Cyber threats evolve faster than textbooks,” noted Cal Poly President Jeffrey D. Armstrong. “This opportunity is unprecedented in higher education and particularly unheard-of at the undergraduate level. This is much more than a state-of-the-art lab. Cal Poly students will be able to enter the workforce equipped and ready to handle the challenges they’ll face.”

Computer science student Jessie Pease, president of the university’s White Hat cybersecurity club, said the lab would help the club fight hacking and “make the Internet a safer place.” Pease, a junior who said her interest in cybersecurity drew her to Cal Poly, said the lab should make her major more popular. “It’s really exciting to see this dream become a reality,” she said. “I’m glad I will be able to take advantage of the new lab.”

Bush, who joked he would “love to hire every one of the students,” said he knows Northrop Grumman will have to compete for them, adding “this is going to be the place where people come to look for talent.” —Amy Hewes

INDUSTRY PARTNERS WITH CAL POLY ON CYBERSECURITY

The Cal Poly-Northrop Grumman Cyber Lab represents one part of Cal Poly’s initiative in cybersecurity education. The Cal Poly Cybersecurity Center serves as the nexus for a wide range of activities that involve faculty and students collaborating with experts from other universities, private companies, government agencies and research labs. Programmatic and strategic direction is provided by the Cybersecurity Council.

The Cybersecurity Council consists of individuals at the highest levels of cyber leadership in companies that include:

- Boeing
- McAfee
- Pacific Gas & Electric (PG&E)
- Parsons
- QL+
- Good Technology
- Northrop Grumman
- Raytheon

Both Raytheon and Boeing have been key supporters of Cal Poly’s initial efforts in cybersecurity; PG&E, Parsons and McAfee have provided recent major gifts to launch the Cybersecurity Council and develop curriculum.

Cal Poly Computer Science Chair Ignatios Vakalis and Russ Bik (B.S., Industrial Technology, 1970), a member of the President’s Cabinet and Sun Microsystems’s original vice president of operations, serve as council co-chairs.