UW CSE 2016 Alumni Achievement Awards

CSE honored two extraordinarily accomplished alumni — Albert Greenberg and Stefan Savage — during its June 10th graduation ceremony. UW CSE's Alumni Achievement Awards have two purposes: to celebrate alums such as Albert and Stefan, and to affirm to new graduates that they are joining a community of UW CSE alums who have changed the world.

Albert Greenberg (Ph.D., '83)

Master of Cloud Computing Datacenter Networks

Albert Greenberg has worked on the front lines of grand scale networking and cloud computing for more than two decades, first at Bell Labs/AT&T and since 2007 at Microsoft. Today, he directs development of networking for Azure, Microsoft's global cloud computing infrastructure platform that spans millions of servers around the globe — encompassing analytics, database, storage, and other services — and helped make Seattle a major player in the booming arena of cloud computing.

Winning UW CSE's Alumni Achievement Award is the latest in an impressive string of honors for Greenberg. Earlier this year, he was elected to the National Academy of Engineering, the profession's highest honor. He is one of five UW CSE graduate program alumni who are NAE members (along with Tom Anderson, Jeff Dean, Ed Felten, and Hank Levy).

A native of New Orleans and educated at Dartmouth College in New Hampshire, Greenberg found his way into computer science and to the Pacific Northwest though his love of math and statistics. "I was fascinated with combinatorial algorithms and generating interesting objects and sequences," he says. "I took all the usual computer science classes and thought I could program anything, but that was not true with combinatorial algorithms and so I wanted to dig deeper into everything to do with computer science."

From Dartmouth to UW

A Dartmouth professor was collaborating on a project with Bob Ritchie, then chair of UW CSE, who encouraged Greenberg to apply for admission to the graduate program. Once he arrived in Seattle, Greenberg worked with CSE professors Richard Ladner and Martin Tompa in theoretical computer science, and with Ed Lazowska on a networking project.

"As a research and teaching assistant, I loved the camaraderie in the department and with the faculty, and I picked up really good skills across diverse areas of CS. Their passion for their work also was a great influence," Greenberg says.

After earning his doctorate in 1983, Greenberg headed back east to begin his career at Bell Labs/AT&T in New Jersey, where he rose to division manager for network measurement engineering and research, and then to executive director and an AT&T Fellow. By 2006 his work in cloud computing had caught the attention of Microsoft. The following year, he joined the Redmond company as a Principal Researcher, helping to establish the vision and program direction for the projects that would lead to Azure.

For the past six years, as a Microsoft Distinguished Engineer, he has led the design and development of networking for Azure, overseeing the work of teams in Redmond, Mountain View, Hyderabad, Dublin, and Beijing. His responsibilities extend over physical and virtual datacenter networking design and management, to create and build the public cloud infrastructure to allow customers to bring their own networks to the cloud. Azure is available in 140 countries across 32 announced regions worldwide, providing the platform for services such as Bing, MSN.com, Office 365, Xbox Live, and more.

Greenberg's latest project is Microsoft's SmartNIC, a hardware component to help speed up software-defined networks. "The cloud is growing at an unbelievable pace and more new businesses will be born there. The challenge will be to scale to keep up with the demand, so the cloud is an unbounded space available to everyone," Greenberg says.

Breadth and Depth

"Albert is remarkable in many ways, not the least of which is the extent to which his career has spanned theory and practice, research and engineering," says CSE's Lazowska. "He came to UW as a graduate student in theory. He went to AT&T, and then to Microsoft, as a networking researcher, but his research had tremendous impact on practice. Now he's the Director of Development for Azure Networking. Truly astonishing breadth and depth."

"Software is everything to networking, and everything I've done has been about opening up and virtualizing networks through software — now dubbed Software Defined Networking (SDN)," says Greenberg. "The cloud scenario provided the tools and economic imperative we needed to write the code to virtualize networking,

the counterpart of virtual machines but for networking. Our software lights up large fully functional, secure networks, each private and dedicated to a customer, reliably and on demand in milliseconds. To make this happen at massive scale, there's no book, no precedent, so we got to invent the ideas and write the code as a team — a huge and ongoing thrill."

Greenberg's pioneering work has brought him many accolades from leading organizations in the field in recent years, including the IEEE Koji Kobayashi Computers and Communications Award in 2015 for his "fundamental contributions to large-scale backbone networks and datacenter networks," and the ACM SIGCOMM Award that same year in recognition of his lifetime contributions to the theory and practice of operating carrier and datacenter networks. He also received the ACM SIGCOMM Test of Time Award in 2015, and the ACM SIGMETRICS Test of Time Award in 2013. It all boils down to be being one of the SDN fathers.

"I'm really humbled by the recognition from CSE and being part of the University and the computing scene in the Seattle area," Greenberg says. "It's awesome that Microsoft and UW have such a strong tie, and there is even greater potential for growing closer and collaborating on projects aligned with faculty and student interests."

Stefan Savage (Ph.D., '02)

Cyber Security Sleuth and Trailblazer

As a leader in the Systems & Networking and Computer & Network Security groups at the University of California San Diego, professor Stefan Savage has journeyed across the cyber crime universe, tackling everything from computer worms and online scams, to distributed attacks, insidious global consumer fraud networks, and automobile systems hacking. The stars align for him in June, when he will collect double honors for his outstanding research in network security and innovative efforts to clamp down on cyber crime. On June 10th, Savage will collect CSE's Alumni Achievement Award. The following day, in San Francisco, he will accept the 2015 ACM-Infosys Foundation Award in the Computing Sciences.

Savage's route to a career in computer science academia was unorthodox. His combination of abundant curiosity, enthusiasm and good humor — mixed with the confidence to bend the rules — contributed to an "I'll find my own path" mentality. His father, a sociology professor raised in Renton, and his mother, a native of Yugoslavia, met in Paris when she was organizing student protests against the Vietnam War. They moved to Manhattan when Savage was a toddler, and by third grade he had "extreme independence" to explore the streets of New York as long as he was back by dinnertime. Family legend has it that he caught the computer bug around age 8 or 9: when his father absentmindedly left a Radio Shack store without him, the manager set the younger Savage up at a TRS-80 to keep him occupied until his father returned.

Eclectic Education, Fateful Connections

When he arrived at Carnegie Mellon University as an undergrad, Savage plunged into a double major in physics and cognitive science. He was eager to "learn the truths of the universe and of the human mind — the two biggies." He dropped physics but earned almost enough credits for a cognitive science degree, until a contretemps with a Nobel Laureate professor.

"I was too young and too stupid to stop incessantly arguing with him. We finally agreed I should not be in his class," Savage recalls. The door thus closed on a CogSci degree, he earned his bachelor's in Applied History instead, enjoying the focus on reasoning, analysis, and rhetorical skills.

After receiving thumbs-down in response to his CS grad school applications, Savage remained at CMU for two more years, working in a CS lab and taking over project management after the faculty director left. One fateful day, Savage asked Brian Bershad for a job in his lab.

"Brian said he was leaving for the University of Washington and invited me to come along. I have no idea what he saw in me given my checkered academic record, but we hopped in his car and headed for Seattle," Savage says. A year later he was accepted to the UW CSE doctoral program, focusing on operating systems.

Around the time Bershad took leave from UW CSE to launch a startup, the Internet was taking off and a visiting speaker told students it was a waste of time to work on operating systems. "Game over, we needed to find something new. A few grad students got together, and we taught ourselves networking, then approached Professor Tom Anderson and pressed him into service to start a research group," Savage recounts. Together, Bershad and Anderson, themselves former UW CSE Ph.D. graduates who had swum back home from faculty positions at CMU and UC Berkeley, served as his doctoral advisors.

Continued on page 13

Continued from page 5

Alum Achievement Awards

As he was winding up his doctorate, that new focus brought faculty offers from MIT, Stanford, Berkeley, CMU, Cornell, Princeton, UCSD, and several others. "Choosing San Diego was kind of iconoclastic, but it was the right culture for me, the same as at UW, and people I wanted to spend time with." (UCSD has a large number of UW CSE Ph.D. alums on the faculty, including Stefan's close collaborator and close friend Geoff Voelker.)

Challenging Cyber Crime

After first focusing on business network security at UCSD, the underworld of cyber drug crime sparked Savage's interest. He studied the business models and financial channels, identifying the point most vulnerable to shutdown — credit card transactions through merchant banks. He gained permission for his researchers to pose online as drug buyers, with specially assigned credit cards for tracing transactions. He also worked with Microsoft on a pilot program to curb the sale of counterfeit software by tracking the flow of money. Collaborating banks shut down the entire system in 18 months.

In a 2011 *New York Times* essay, Savage noted that criminal profit-seeking is a major force in transforming the computer security landscape and that new threats will directly reflect technical innovations in how money is used, moved, and stored. He argued that anticipating new threats requires an understanding of human nature and the drive for profit, warning about the potential rise of "social bots" that seek to build trusting relationships to enable manipulation of scam targets. "The threat is not of humans controlling or monitoring our computers, but precisely the converse," he wrote.
Savage also drew attention for work with CSE professor Yoshi Kohno (a UCSD Ph.D. alum) to expose how hackers could remotely break into a car's computer system and take control of critical functions such as engine acceleration and braking. He co-founded the Center for Automotive Embedded Systems Security, a joint effort between UW and UCSD, and also established the Center for Evidence Based Security Research in partnership with the International Computer Science Institute at Berkeley.

Among his honors, Savage emulated his UW mentors Bershad and Anderson in winning the SIGOPS Mark Weiser Award in 2013. The SIGOPS award nomination cited Savage as by far "the most creative person working in the hugely important fields of network security, privacy and reliability. He has the uncanny ability to ask exactly the right question, propose exactly the right solution, and see that solution through to impact."

One reason, Bershad says, is that "Stefan always had spark and a super power ability to take a complex subject and tell a simple and compelling story anyone could relate to. He's brought a lot of weird concepts into the mainstream."

"The alumni achievement award is a big honor," Savage says. "I'm very fond of my time at CSE and stay in close contact with the people who have been so influential in becoming who I am."