

# MAVENS OF MATHEMATICS

**T**he Center for Communications and Computing has performed fundamental research in support of the National Security Agency's mission in cryptology since the 1950s. Areas of research focus are broad and employ a diversity of mathematical approaches, making recruitment of the best mathematical talent critical. Among former and current staff at the three locations that make up the Center for Communications and Computing are five remarkable women who have made their marks in mathematics.

## Center for Communications Research, Princeton, New Jersey

Helene (Laney) E. Kulsrud was the first woman research staff member at IDA. When Laney retired in February 2019, her career at the Center for [Communications Research in Princeton](#) (CCR-P) had spanned more than 50 years. Laney earned her bachelor's degree in mathematics from Smith College and her master's in astrophysics from the University of Chicago. She joined the center in 1968.

When Laney was an undergraduate at Smith College, a women's college in Massachusetts, she was influenced by alumnae Betty Friedan and Gloria Steinem and professors at Smith who advocated for women's rights at a time when they were often ostracized from certain workplaces and professional spheres. Even in her early years at CCR-P, Laney was met with discrimination from male colleagues who often withheld credit, praise and leadership opportunities on the basis of her gender.

Laney was offered a position at CCR-P for her impressive expertise. The position provided her with an exciting opportunity to work with the



Researchers at the Center for Computing Sciences combine expertise in computer science, computer architecture, electrical engineering, information theory and other branches of mathematics and the sciences.

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largest, newest computers available at the time. At CCR-P, Laney developed important tools supporting scientific computer programming.

"I am most proud of my work leading a team of programmers who created a computer language and compilers, which allowed development of scientific codes with great parallelism and portability," she explains. "I also paved the way to using mathematics to manage massive data sets for data mining." This type of application of math to massive data sets has contributed to the current explosion in, and dependence on, artificial intelligence.



Laney served as a member of the board of the Cray User Group for more than 15 years and led the group for 4 years. According to [its website](#), the group, established in 1978, provides “opportunities to share and discover ideas, solutions and developments in the effective use of computational tools.” At the time, Cray (acquired by Hewlett-Packard Enterprise in 2019) was a leader in the design and manufacturing of high-performance computers, then known as “supercomputers.” The user group was able to influence Cray’s computer designs during Laney’s time there.

While having begun her distinguished career as a lone woman in a male-dominated arena, Laney has been both a trailblazer and catalyst for change at CCR-P, as the center opened its doors to more women over her decades-long career. “I was delighted to be able to mentor several of the highly qualified young women hired by CCR and management became more sure of their equality,” says Laney. In general, her advice to young women entering STEM fields is to plan carefully in order to balance their personal and technical goals, she says, and “keep your standards high.”

### Center for Computing Sciences in Bowie, Maryland

Hailing from academia, **Lindsey-Kay Lauderdale** first heard of career opportunities at IDA while attending the Mathematical Association of America’s MathFest in 2014. She correctly surmised then that IDA would be a perfect place to apply



*Lindsey-Kay Lauderdale is a mathematics professor and adjunct member of the research staff at the Center for Computing Sciences.*

her background in mathematics, while also using new techniques and building up her professional credentials. Lindsey-Kay holds a doctorate in mathematics from the University of Florida. In her work at the [Center for Computing Sciences \(CCS\)](#), she is proud to have used her theoretical knowledge base from academia to solve problems and create state-of-the-art physical models.

Despite having a life-long passion for mathematics, the face of math changed for Lindsey-Kay upon becoming a research staff member at IDA. Whereas she had often found herself surrounded by male mentors and peers in the past, she says: “my perspective and experiences changed when I started working at IDA. There are many strong women leading projects and are well-respected; I have seen many of them engage with girls in STEM, and they are having a positive impact on them.” Lindsey-Kay urges the next generation of women in STEM to

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seek out and surround themselves with people who will accept and support them as they are.

**Julia C. Lipman** explains that “tech-bro culture” — a term sometimes used to describe the wider male-dominated computing world — “was at its apex when I finished grad school.” Julia earned her doctorate in computer science from the University of Michigan in 2007. “I knew I wanted to end up somewhere that was more like a university than a startup.” She found what she was looking for in the culture at IDA, which she believes provides an inclusive equilibrium of opportunities to be collaborative along with plenty of space to be an individual.

Over the course of her career at IDA, she has gone from viewing computers as useful yet mysterious abstractions to confidently “moving closer and closer to the machine,” as she puts it. Her proudest accomplishments thus far have been “reverse engineering embedded firmware, hand-assembling machine code and finding bugs in the deep recesses of software.”

Most of Julia’s role models in STEM have been men. She states, “It never occurred to me growing up that I couldn’t be just like the men I idolized.” One of her major influences was the [legendary mathematician](#) Paul Sally at the University of Chicago. He once told her something that Julia herself would reiterate to the next generation of women in STEM, “It’s persistence that pays off in this game.” Julia explains, “‘This game’ being math. But also, all of STEM, and life.”

### Center for Communications Research, La Jolla, California

**Nida K. Obatake** is the first person hired under IDA’s postdoctoral fellowship program. The program is part of an initiative to recruit and support highly qualified scientists from diverse



*Researcher Karen Ball with Nida Obatake, who was an IDA postdoctoral fellow before becoming a research staff member at the Center for Communications Research, La Jolla.*

backgrounds, experiences and perspectives. Successful candidates are appointed to permanent positions on the research staff following their fellowship.

What initially attracted Nida to IDA was “the promise of hard problems requiring a broad range of scientific tools.” Nida earned her doctorate in mathematics from Texas A&M University in 2021, joining IDA shortly thereafter. “I was excited to apply my skills to a completely different area of mathematics than I had ever worked in throughout my academic career,” Nida says. Having joined the Center for Communications Research in La Jolla (CCR-L) recently, Nida explains, “I am grateful that IDA crafted this initiative to recognize my diversity, both in identity and scientific strengths.”

Nida’s success and professional recognition have not come without some adversity. “The most frustrating obstacle I face is the minimization of my successes to my gender identity.” Nida can recall times in the past when male colleagues would imply that recognitions she received were only due to her being a woman. “I found myself thinking, ‘Would my accomplishments still be as impactful if I were a man?’”



At times, imposter syndrome had even made Nida doubt her place in STEM altogether. “We women often undersell ourselves, chalking up big accomplishments as just ‘doing our job.’ We should, however, allow our professional success to be openly highlighted, so that we will be celebrated as STEM professionals *and* women.”

On the other hand, Nida explains how her short time at IDA has already consisted of research projects with majority-women teams. While she has encountered mixed ratios of genders in various

environments during her STEM career so far, she is inspired by the sense of belonging that she has felt at IDA. “Working with supportive women has powerfully impacted my career,” Nida says. “Together we have contributed important theorems and mathematical tools, all while supporting each other to excel.” To the future generation of women in STEM, Nida stresses the importance of approaching challenges with confidence. “Surround yourself by those who build this confidence and boldly ignore those who get in the way.”

## JULIE B. KERR AWARD

IDA's **corporate awards** are named after past IDA presidents: Andrew J. Goodpaster, Larry D. Welch, W. Y. Smith and David S. C. Chu. IDA broke with that tradition earlier this year by announcing the Julie B. Kerr Award for Excellence in Research. This is the first IDA award named after a researcher and the first to recognize research in support of the mission of the Center for Communications and Computing. The winner of this bi-annual award will be announced later this year.

Julie Kerr was a researcher who is remembered for her many research contributions and for her warmth, kindness and upbeat attitude. Not only was Julie a brilliant mathematician in her own right, she was also a strong collaborator who elevated the contributions of everyone around her.

Her strength as a mathematician was recognized early. As an undergraduate, Julie was selected as runner-up for the 1992 Alice T. Schafer Prize for Excellence by the Association for Women in Mathematics. While she was a Ph.D. student at the University of Michigan, she participated in several SCAMPs at the Center for Communications Research, La Jolla, and



when she graduated in 1997, she joined the research staff full time. She spent a successful 10 years in La Jolla, where she was a key player in six of the mission breakthroughs memorialized there.

Julie had delightfully diverse personal interests, which included “ferrets, Esperanto, cello, origami and miniatures” (as she wrote in her 1996 resume) and being vegan. She pursued all of these and other interests with gusto and passion.

IDA named this award after Julie both as an expression of her coworkers’ fond memories as well as to recognize that, had she lived longer, she would have been a strong contender for this award.

When **Karen T. Ball** was coming out of her second year of graduate school, she was one of the youngest SCAMP participants of her year. SCAMP is an annual summer workshop where some of the most important collaboration at the centers occurs as teams work to solve difficult mathematical problems.

“It was definitely an experience of learning to swim by being dropped into the deep end,” she says. But Karen rose to the challenge, successfully finding a group and making impactful contributions. She participated in SCAMP again the year she finished graduate school, and the rest is history. Karen applied for a permanent position in 2005.

When Karen arrived, only two other women were on the research staff at CCR-L. “I would occasionally look around the room and count the number of women. The numbers have gotten better over the years, though there are still more men than women on our staff.” Karen’s mother was a major influence on that front. As Karen states, “She always pushed me and my sister to do things in male-dominated fields.”

About five years after joining CCR-L, Karen’s team was awarded the National Intelligence Meritorious Unit Citation for a project she had been working on for the majority of her time at the center. Karen cites the best day of her career as the day in April 2009 when the project had its first operational success. She also cites the SCAMP summer program that she co-chaired in 2017 as another one of her proudest accomplishments as the research that the program produced remains integral to her current work and field. “I enjoyed being in on the research from the beginning and advising on how to take things further.”

Meanwhile, to use the language of Laney Kulsrud, you might say that Karen’s personal life has

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been “planned carefully,” to dovetail with her professional goals. Karen’s decision to join CCR-L in 2005 was in part a decision to remain close to her family in San Diego, as opposed to taking a tenure-track position on the East Coast with her husband, a fellow mathematician. They decided to stay on the West Coast, even though it meant Karen would be leaving academia. “I have never regretted my decision to come to CCR-L. I enjoy and admire my colleagues.”

Karen continues, “I have given talks to world-class mathematicians on my work. I had the chance to lead a large research effort without having to give up being a researcher myself. I really appreciate being able to contribute to the larger mission of the sponsor.”

**The talent and versatility of these and other researchers at the Center for Communications and Computing are important to providing cutting-edge research in mathematics and computer science to the National Security Agency.**