

Gordon R. England



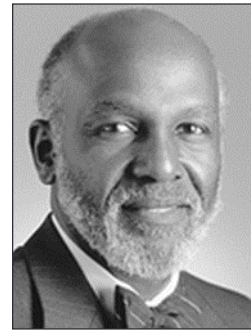
Corale L. Brierley



John L. Anderson



Nadine Aubry



Wesley L. Harris



Edward D. Lazowska



Wanda M. Austin



Anita K. Jones



Richard H. Truly

bylaws; and **Wanda M. Austin**, retired president and chief executive officer of the Aerospace Cor-

poration, will complete four years as councillor. They were recognized in May for their distinguished ser-

vice and other contributions to the NAE.

## NAE Honors 2018 Draper Prize Winner

Each year the NAE celebrates outstanding individuals for significant innovation, leadership, and advances in engineering. The winner of the 2018 Charles Stark Draper Prize for Engineering was honored at a black-tie dinner on February 20 at the National Academy of Sciences Building in Washington. The recipient, **Bjarne Stroustrup**, accepted his award before an audience of more than 90 guests, with NAE president **C. D. Mote, Jr.** at the podium. Assisting in the presentation was Dr. Kaigham (Ken) M. Gabriel, president and CEO of Draper Laboratory.

### Charles Stark Draper Prize for Engineering

*Bjarne Stroustrup was awarded the 2018 Charles Stark Draper Prize for Engineering “for conceptualizing and developing the C++ programming language.”*

Dr. Stroustrup is the designer and original implementer of C++, one of the most widely used and influential programming languages in the history of computing. After its official release in 1985, he guided its evolution through his research, involvement in the C++ ISO standards effort, books, and many academic and popular papers.

C++, based on C and originally inspired by Simula, provides general and flexible abstraction mechanisms that can be mapped directly and efficiently onto computer hardware. It revolutionized the software industry by enabling a variety of software development techniques, including object-oriented programming, generic programming, and general resource management, to be deployed at industrial scale. C++ remains among the most widely used programming languages, with applications in general systems programming, communications, computer graphics, games,



Ken M. Gabriel, Bjarne Stroustrup, and C. D. Mote, Jr.

user interfaces, embedded systems, financial systems, medical systems, avionics, scientific computation, and many other areas. Its influence and the ideas it pioneered and popularized are clearly visible far beyond the C++ community.

Dr. Stroustrup began his career at AT&T Bell Labs' Computer Science Research Center in Murray Hill, New Jersey, where he designed and implemented C++. He was head of AT&T's Large-scale Programming Research Department from its inception in 1996 until 2002. After that, he taught and did research at Texas A&M University, reaching the rank of University Distinguished Professor. Since 2014 he has been a managing director in the technology division of Morgan Stanley in New York City and a visiting professor at Columbia University. His research interests include design, programming techniques, distributed systems, performance, reliability, and maintainability.

His honors include ACM's Grace Murray Hopper Award (1993), election to the NAE (2004), Sigma Xi's William Procter Prize for Scientific Achievement (2005), Aarhus University's Rigmor og Carl Holst-Knudsens Videnskabspris (2010), and the Faraday Medal from the Institute of Engineering Technology (2017). He is a fellow of IEEE, ACM, and the Computer History Museum, and an honorary fellow of Churchill College, Cambridge.

Bjarne Stroustrup was born in Aarhus, Denmark, in 1950. He received a master's degree in mathematics and computer science from Aarhus University in 1975 and a PhD in computer science from Cambridge University in 1979.

#### **Acceptance Remarks by Bjarne Stroustrup**

When I heard that I was to receive the Draper Prize, I naturally looked up who had received it over the years and almost panicked. That's intimidating and extraordinary company!

Those guys made the world we live in! I am truly honored to join this extraordinary group.

Receiving a high honor like the Draper makes you reflect. I want to say "thank you" to all who helped me get here and who made me what I am. To do that, I have to tell my story.

I come from a solid working-class background. My father and all of my uncles left school after 7th grade to work with their hands. So, toward the end of high school when I had to choose, I had no clue what to do next, and no one to ask. History? Architecture? Sociology? Engineering? Get a job like everybody else? I felt a strong need to build something concrete like my father and uncles did.

Engineering appealed to me: Engineers build things! I decided to go to the Technical University in Copenhagen; that's the best place for engineering in Denmark. But then I got cold feet! Copenhagen seemed a big scary city, and I'd have to pay for my living, so I'd have to take out significant loans. In Denmark education is free, of course, but you have to live. And what if I failed? There were no resources in my family to back me up. So I bicycled up to the University of Aarhus, my hometown university, and signed up for "Mathematics with Datalogy." I thought I was signing up for some form of applied math. Fortunately, I was wrong! I wasn't as good at math as I had thought I was, and "datalogy" is Danish for "computer science." After my first encounter with programming and machine architecture, I never looked back. That was great!

Aarhus gave me a solid grounding in math and computer science; I go back there as often as I can. It's a

beautiful city! Denmark is a society that supports you when you follow your dreams. It's one of the nicest places on earth.

From there, I went to Cambridge. It's a magical place, it can inspire you. You look at the accomplishments of the people who came before you and think 'Oh! I have to do better, much better, or I don't belong here!' Also, it can give you the confidence to do something that really matters. My daughter was born in Cambridge and I'm still associated with the university as a fellow of Churchill College.

Bell Labs in New Jersey was another one of those magical places. Like Cambridge, it could inspire people and raise their ambition level to build great things. My colleagues there were scarily smart and accomplished. Many were also true gentlemen and patient teachers. I spent 24 years working at "the Labs." That's where I designed and implemented C++. My children grew up near the Labs.

Much of the credit for C++'s success goes to the C++ community. Nobody can do something like that just on their own. More than 4 million strong today, this community provides me with inspiration and a constant need to innovate. To help support and grow the community, I have spent more than 25 years working on the C++ standards committee, improving C++ as a stable, practical tool.

They say that you are what you eat. But really, you are who you eat with, learn with, work with, and have fun with. So thanks to the many people I met through my work and to my teachers, colleagues, and

friends in Aarhus and Cambridge, and at Texas A&M, Morgan Stanley, Princeton, and Columbia. They made me what I am today and contributed to my work in so many ways. I am very happy to see some of you here tonight.

Also, a heartfelt "thank you" to the Draper family and Draper Labs, who made this event possible, and to the great National Academy of Engineering. And again, thank you to my family, who in so many ways made it all possible and worthwhile.

I was designing, implementing, and evolving C++, but I always saw it as a tool for building interesting things. The amazing applications of C++ are what keep me going! Whatever field you are interested in, software can get you there! "Distributed systems" was my PhD topic and is still much of what I do for Morgan Stanley today. After all, everybody has to get information from A to B, whether across a tiny chip or half-way around the world or beyond! I have always been interested in reliability, speed, maintainability, and affordability.

It is somewhat ironic that my determination to build "something concrete" led me to spend 40 years working on something you can't touch and that's completely invisible.

You can't just build things, though. For a tool to become useful, you must explain its proper use. For an invention to become pervasive, its principles must be articulated and popularized. A favorite Danish author of mine, who came from farming stock, wrote "He who does not plough must write." So along the way, out of necessity, I became an author and a teacher.



Bjarne Stroustrup

We must educate the community about what engineers do and why it matters. Engineering is not just applied science and not just tinkering with gadgets. We innovate, but we also build things to be useful, dependable, and affordable. We need to attract students and inspire them to work hard. The challenges of the future are daunting! We must show the young that they can have a good life, with good friends and a good work-life balance, while working hard to build a better world. We need to foster professionalism. We must show that there can be more to life than ruthlessly chasing money, climbing a career ladder, or becoming a politician. We have to inspire people to do great things! To do better than they imagined they could! To make a difference! Our civilization depends critically on good engineers and good engineering! And, of course, good software.

Again, thank you, all of you! Thank you!