Nadine Collaert—My Wonderful Journey in Science and Engineering

First, let me tell you a bit about myself and my career. I am currently a program director at Inter-university Microelectronics Centre (imec), a R&D centre in nanoelectronics in Belgium. My research is focused on technologies and solutions for the next generation of wireless communication. But in my career, I have had the privilege to work on a diversity of topics going all the way from CMOS scaling to life-science, working as an integration engineer, working in the area of modeling, simulation and characterization. Next to that, in the last ten years, I had the opportunity to lead teams in my role as program manager and later program director, setting the strategy, interacting with industrial partners and academia.

I started my career as a researcher looking into the feasibility of vertical devices and hetero-junction engineering for CMOS scaling beyond 100 nm, and the use of SiGe for buried channel

pMOS devices. In the early 2000's, imec quite early defined a program looking into FinFET devices, which were eventually adopted in 2011 by Intel for the 22 nm technology node and are currently the mainstream device architecture in advanced CMOS. Main highlights of my research lie in the demonstration of high-k/metal gate and the investigation of strain engineering for scaled FinFET devices. I then used my experience in Silicon-On-Insulator (SOI) technologies to work on floating body 1T-DRAM applications. My research in life-science allowed me to expand my knowledge in material science looking at biocompatible materials for lab-on-chip and neuro-probe applications. It was refreshing to step into a new application area, learn new things and at the same time apply my knowledge in CMOS processing and integration to this field. After that, it was time to nurture and broaden my other skills and I stepped into management, that besides technical and operational management also entailed the guiding of cross-disciplinary teams. In my role as program manager of the beyond Si program, we were the first to demonstrate Ge and III-V FinFET and Gate-All-Around devices on 300 mm Si substrates. In 2018, I started the analog/RF program looking at compound semiconductor devices like GaN and InP to tackle the challenges in speed, power and efficiency for the RF Front-End-Module (FEM) in 5G applications and beyond. The expertise we had built up in the area of compound semiconductor materials for logic applications, gave us the confidence that we could really make a difference in the area of wireless communications, where the higher data rates and lower latencies are required for ultra-broadband applications and new use cases like XR and holography. Specifically, the possibility to co-integrate these materials with advanced CMOS is beneficial for form-factor restricted use cases like handsets.

I have been interested in science and mathematics from a very young age. Understanding how things work, being part of enabling new ideas and creating innovations has always fascinated me. As such, studying engineering was a natural next step, and I have been blessed that my parents have always been very supportive about my choices. They have encouraged me and pushed me to always strive for the best. For them, it was only normal that women could excel in science and engineering jobs just like men.

It was during my Ph.D. that I realized I wanted to be in research, doing the groundwork, being at the basis of the innovations that are later taken up by industry. Realizing what you want to do and what you are good at is often a long process, but the road leading up to that realization is as worthwhile as the journey that comes afterwards. I could say that I have been lucky to be able to work in a diversity of topics and roles, but it has not just been luck. I saw the opportunities and grabbed them, and in a few cases I created the opportunities myself. That led me to believe one can achieve more than often thought and anticipated. And that is especially true for women.

The next generation of powerful women in science and engineering has lined up and is eager to do even better than the previous generations. But women in engineering are still underrepresented. And not only are they underrepresented, but many of them also leave the field after a few years. Women are often their own worst enemy. We don't believe enough in ourselves. We need to be brave and step outside of our comfort zones, always look for opportunities where you can try and develop new skills, where you can learn. Continuous learning is the key. Always strive for the best. It takes professional courage, but it is ultimately so rewarding. Know your strengths and weaknesses and be honest. Think about what to do with this knowledge. Strengthen your weaknesses or realize they are there and exploit your strengths.

In general, mentoring is a crucial part of attracting and retaining women in STEM. Having a community to share experiences, hear the inspiring stories of women who dedicated their lives to science and engineering, bounce off ideas, and getting the support to pursue a career is important. Therefore, having this community of Women in Engineering provided by IEEE, is so valuable. The seminars, workshops and events are tailored to connecting engineers from all over the world and providing a platform of mentorship.

In conclusion, I believe we have made progress in attracting more women in engineering, but it's not enough and in fact, we need to accelerate and make sure that future generations of women will be inspired even more to start a career in science and engineering.

Dr. Nadine Collaert is program director at imec. She is currently responsible for the advanced RF program looking at heterogeneous integration of III-V/III-N devices with advanced CMOS to tackle the challenges of next generation mobile communication. Before that she was program director of the LOGIC Beyond Si program focused on the research on novel CMOS devices and new material-enabled device and system approaches to increase functionality. She has been involved in the theory, design, and technology of FinFET devices, emerging memories, transducers for biomedical applications and the integration and characterization of biocompatible materials. She has a Ph.D in electrical engineering from the KU Leuven and she holds more than 400 publications and more than 10 patents in the field of device design and process technology.