

EIPEN Lifetime Achievement Award Presentation

Stephen Chou, June 1, 2023

Ladies and Gentlemen, Esteemed colleagues, and Distinguished guests,

On behalf of the EIPBN Conference, it is my great honor to present the inaugural EIPBN Lifetime Achievement Award to two exceptional individuals, who have made pioneering and seminal contributions to the field of nanotechnology over the past six decades: Prof. Fabian Pease and Prof. Henry Smith.

These two esteemed scholars, often referred to as giants and pioneers in their field, have dedicated their lives to the advancement of nanotechnology. Their innovative research has led to the creation of various new nanofabrication methods, novel devices and materials, and new applications. Their groundbreaking work has significantly impacted the field of nanotechnology and profoundly influenced a broad range of disciplines such as electronics, optoelectronics, optics, materials science, energy, biotechnology, and medicine, among others. Their teaching has greatly influenced the careers of many others. They have paved the way for the next generation of researchers and innovators.

The key contributions and inventions made by Prof. Pease include:

In 1963, as part of his PhD thesis, Prof. Pease designed, built, and demonstrated the first SEM with 10nm resolution.

In 1966, Prof. Pease demonstrated electron microscopy of living samples, including insects and plants.

In 1970s, at Bell Labs, Prof. Pease spearheaded the development of materials and processes for Electron Beam Lithography and demonstrated the first LSI circuit (1-kb RAM) made with electron beam lithography.

1978-2010, at Stanford University, Prof. Pease has developed processes used for manufacturing photomasks; new microchannel heat sink, which is 50x better than conventional approach; the first writing with STM in 1985, which won the Feynman Nanowriting Prize; the fabrication of the first silicon nanopillars of 2 nm diameter, a method now is used for making FINFETs; DNA microarray development; and the new methods for eliminating fourfold distortion in photomask generation and for controlling local distortion across a silicon wafer with sub-nm precision.

Prof. Pease's seminal contributions to nanotechnology extend far beyond research and development. Served as a DARPA Program Manager from 1996-98, based on his understanding and deep insights into two technological breakthroughs at the time—the demonstration of single electron transistor at room temperature and the invention of nanoimprint, Prof. Pease initiated

two unique national research programs with a funding approaching \$100M in today's dollars, that have significantly impacted not only research, but also industry and economy. One program is "Advanced Electronics," that led to the industrial development of FINFET, and the other is "Molecular-Level Printing," that resulted in the industrial development of nanoimprinting. Today, FINFET is a 100's billion dollar business, nanoimprint is multi-billion dollar business, and both industries are still expanding rapidly.

Prof. Hank Smith, an equally distinguished figure in the field, has made seminal contributions in many areas, including:

- Conformal photomask lithography
- X-ray lithography
- Spatial frequency doubling
- Phase-shift mask and attenuating phase-shift mask
- Phase-locked interference lithography
- Achromatic interference lithography
- Coherent diffraction lithography
- Spatial-phase-locked e-beam lithography
- Immersion photolithography
- Zone-plate-array lithography
- Interferometric alignment
- Graphoepitaxy
- Grain boundary entrainment
- Templated self-assembly
- A variety of quantum-effect, short-channel, single-electron, nanomagnetic, photonic-crystal, and nanophotonic devices

Both Prof Pease and Prof. Smith have been a faculty for about six decades. Many of us, including many attendees of this EIPBN conference, are either Prof. Pease and Prof. Smith's students; grand students; grand, grand students; and grand, grand, grand students.

I was very fortunate to have both Prof. Smith and Prof. Pease as my advisors, one for my PhD and the other for my post-doc, and I was very fortunate to continue their mentorship and

friendship throughout my career. Like many others, my success has benefited from their teachings, guidance, and friendship, and from the fact that we stand on the shoulders of these two giants.

Both Prof. Pease and Prof. Smith have attended the EIPBN for about six decades. They made invaluable contributions to the EIPBN Conference, ranging from presenting top quality work and helping the organization and the direction of the conference, to enhancing the quality of presentations. I believe that many of you can still recall the direct and penetrating questions that Prof. Pease and Prof. Smith have posed to the presenters. A well-known saying to help presenters prepare their talk is, "Be prepared - Prof. Pease and Prof. Smith will ask you questions!"

Ladies and Gentlemen:

Together, Prof. Pease and Prof. Smith have shaped the landscape of nanotechnology and inspired countless researchers to push the boundaries of what is possible. Their unwavering dedication and exceptional achievements make them more than deserving of the prestigious EIPBN Lifetime Achievement Award.

Please join me in congratulating Prof. Fabian Pease and Prof. Hank Smith on this well-deserved recognition, and let us express our gratitude for their invaluable contributions to the world of nanotechnology and to the EIPBN Conference.