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THE PATH FROM SCIENTIFIC DISCOVERIES TO COMMERCIAL SEMICONDUCTOR PRODUCTS, WITH MAGNETIC TUNNEL JUNCTION (MTJ) DEVICES AS A CASE STUDY

ABSTRACT

Advances in semiconductor technology are built on a foundation of discoveries and innovations in materials and devices that typically go back decades. Important discoveries are sometimes predicted by theory, but often discovered experimentally first and understood later. A constant stream of discoveries and innovations has fueled the semiconductor industry over time, along with huge efforts to develop each innovation from demonstration to production. The development of Magnetic Tunnel Junction (MTJ) Devices for sensors and magnetoresistive random access memory (MRAM) is a wonderful case study in how discoveries move along the path from laboratory research to product development and, sometimes, into commercial production. Fundamental discoveries in the physics of magnetic materials and devices made during 1980s, 90s and 2000s enabled a revolution in commercial product offerings for data storage and nonvolatile memory that continues today. The key phases of this path, illustrated through the physics and the business of MRAM will be discussed, including recent developments, technology outlook, and lessons learned over almost 30 years as a physicist in the semiconductor industry.

BIOGRAPHY

Jon Slaughter received his Ph.D. in physics from MSU in 1988 and has since worked in academia and industry with roles spanning materials, process and device R&D, new product definition, and nine years as VP of Technology R&D for the venture-backed spin-out Everspin Technologies. He was a key contributor to the first commercial MRAM product in 2006 and the first commercial spin-transfer-torque MRAM product in 2013 as well as other discrete and embedded MRAM and magnetic sensor products. He has over 110 issued US patents and over 100 technical publications. Jon is currently a Principal Research Scientist at IBM Semiconductors in Albany, New York.

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