

My Life as a Microscopist; Two Dual Beams and an Atom Probe

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"The doctrine that the world is made up of objects whose existence is independent of human consciousness turns out to be in conflict with quantum mechanics and facts established by experiment". Bernard d'Espagnat French physicist, philosopher, and winner of the 2009 Templeton prize.

In kindergarten, on the cover of the "Weekly Reader," I encountered my first electron micrograph of a fly (Fig. 1). My brain, not yet fully conditioned to accept the current reality of the five senses, locked this picture into my imagination. With an English degree and a dead end job, I saw an ad for the Madison Area Technical College (MATC) Electron Microscopy program and remembered the fly on the cover of that "Weekly Reader." What if? What if the microanalytical world is a path to understanding how we create the world we live in? What if this understanding leads to technology beyond cell phones, microwaves and blowing things up?

During an internship with Dr. Thomas Kelly at the University of Wisconsin-Madison, we collaborated with Dr. David Larson (Seagate) on innovative ways to prepare atom probe tomography (APT) specimens (Fig. 2). Our focus, multilayered thin films. In 2000, I presented our work at the Microscopy and Microanalysis (M&M) annual conference [1]. It was one of five APT papers presented and was featured as the (M&M) cover [2] (Fig 3). The resulting data was the catalyst for founding Imago Scientific Instruments and the subsequent development of the first commercial Local Electrode Atom Probe (LEAP) microscope. The number of APT papers has increased dramatically related to increased data yields enabled by the LEAP microscope. Today, symposiums, workshops, and tutorials on APT are a regular occurrence (Fig. 4).

Through the M&M annual conference, I met Dr. Gregory Thompson, a new collaborator, and a future employer. Dr. Thompson began laying the groundwork for APT research at The University of Alabama's Central Analytical Facility (CAF)[3]. The CAF maintains major research instrumentation. It is a "hands-on" facility that teaches and educates students, faculty, and staff to use research instrumentation. The addition of LEAP, made the CAF a premiere microanalytical and microstructural characterization facility in the Southeast.

Seeing how technology permits new avenues of analysis and data collection while operating within the confinement of the technology itself is challenging. It begs the question, what if? The microscopy and microanalysis field grows with new techniques and procedures every day and more waiting for discovery. It challenges the imagination, curiosity and the courage to see differently in the mind of a five-year-old boy. I am grateful to those who paved the way and in return pay it forward. Our future is built on materials we study today.

References

- [1] R.L. Martens, D.J. Larson, T.F. Kelly, A. Cerezo, P.H Clifton, N. Tabat, N (2000). "Preparation of 3D Atom Probe Samples of Multilayered Film Structures using a Focused Ion Beam" *Microscopy Microanalysis* 6(suppl 2): 522-3. (2000)
- [2] D.J Larson, B.D. Wissman, R.L Martens, R.J. Viellieux, T.F Kelly, T.T. Gribb, H.F. Erskine, N. Tabat (2001). "Advances in Atom Probe Specimen Fabrication from Planer Multilayer Thin Film Structures" *Microscopy Microanalysis* 7: 24-31. (2000)
- [3] <http://caf.ua.edu/>

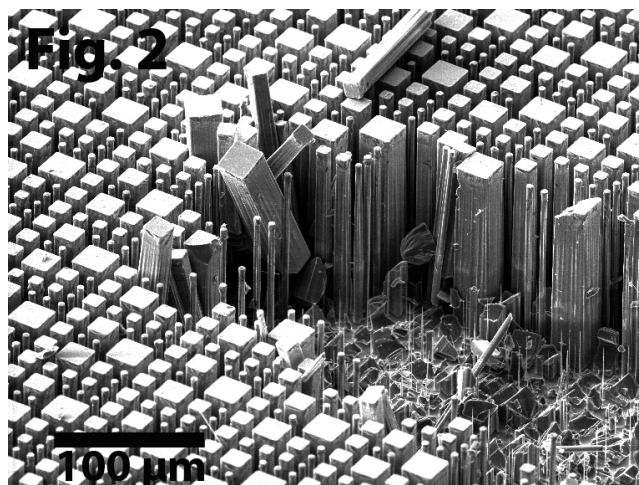
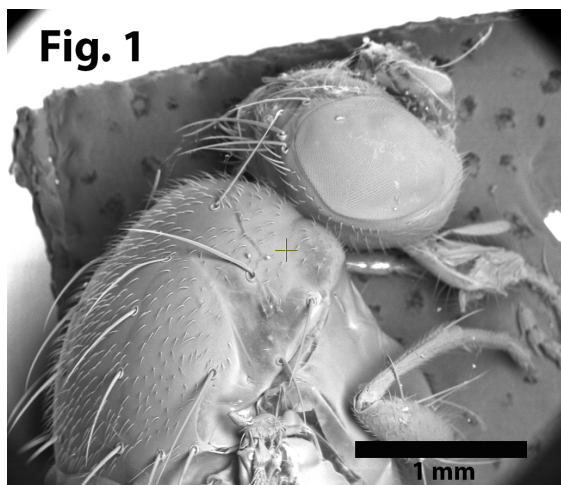


Figure 1. Micrograph of a fly similar to the one first viewed on the Weekly Reader.

Figure 2. Micrograph of a Bosch etched silicon wafer prepared for multilayered thin film atom probe specimen preparation.

Figure 3. Atom Probe Tomography data of a multilayered thin film sample showcased on the cover of the *Microscopy Microanalysis Journal* 7: 24-31. (2000)

Figure 4. The 53rd International Field Emission Symposium (IFES) held at The University of Alabama in 2012, with a pre-meeting workshop on atom probe and high field nanosciences.

