From the Editor

Multiple Beams

When I began working in the fields of electron microscopy and microanalysis some 40 years ago, these analysis techniques appeared to be maturing. I thought that I might have to move to some other field within a few years. Later I noticed that every four or five years some technology breakthrough energizes these methods, making them more useful for various research disciplines. Spectrum imaging in electron energy loss spectrometry and X-ray emission spectrometry, electron backscatter diffraction (EBSD), silicon drift detectors (SDDs) for X-ray analysis, and aberration-corrected STEM and TEM each provided new excitement by allowing information to be obtained from our specimens faster, better, and with increased ease. Atomic force microscopy, fluorescence microscopy, and super-resolution techniques in light microscopy also fall into this category of significant developments. Many of us could watch these methods evolve from early concept proposal to practical demonstration to commercial instrument. It may have taken a decade or so, but people active in the field could see these advances coming.

The multiple-beam SEM described in this issue's feature article, however, took me by surprise. I must admit I did not see it coming. Of course, I was well aware of the problem it solves. In any scanning microscopy, a separate image needs to be taken at each required magnification because, unlike the photographic film we used in flooding-beam instruments, the image cannot be enlarged more than two or three times because of the limited number of pixels in a single scanned image. While taking images of the same specimen area at multiple magnifications was a boon to the Polaroid Corporation for many years, this procedure was not efficient for closely examining large—read statistically significant—regions of the specimen. Moreover, this situation made the reconstruction of three-dimensional specimen volumes at high resolution a difficult and time-consuming task.

When I was first told about how this long-standing imaging problem could be overcome by acquiring 61 montaged SEM images simultaneously, it seemed like science fiction. Not only is a low-magnification image obtained, but this same image can be interrogated in detail at the top end of magnification at the best available resolution. The more I learned about the multiple-beam SEM and its applications, the more clearly I could see that this development was one of those technological advances that re-energize our field every few years.

Charles Lyman
Editor-in-Chief

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