President's Message

The February 2014 issue of *Optics & Photonics News* takes us from the origins of quantum mechanics in the universities of Europe in the 1920s, to sophisticated new methods used to compress and digitize massive volumes of signal information in our modern era of "Big Data." The issue also illustrates to me once again that many different fields of science are closely related to fundamental concepts in optics. Let me show you what I mean.

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Two well-known concepts of classical light propagation are the diffraction limit and the time-bandwidth product limit. The former teaches that all finite-aperture light beams must diverge—in fact, the minimum divergence angle is roughly the wavelength divided by the aperture size. The time-bandwidth product, on the other hand, forces finite-length light pulses to have finite frequency spread, and the minimum fractional bandwidth is, once again, just the wavelength divided by the pulse length.

I recall learning as a physics student how quantum mechanics extends these simple wave properties to matter. An electron beam cannot be perfectly aimed, nor its energy perfectly determined; the uncertainty principle forbids it, just as wave mechanics forbids these properties for a light pulse. In this month's OPN, Barry Masters views this natural connection from the point of view of the founder of the quantum wave equation, Erwin Schrödinger himself. As you will read, Schrödinger was intent on finding a wavelike description of matter, and was deeply influenced by the connections between optics and mechanics in classical physics.

The time-bandwidth limit also motivates the Nyquist theorem, which states that if you want to digitize a high-frequency wave, you had better sample it at least twice per cycle. This means that the large-bandwidth signals produced by todays cameras and smartphones need high sampling rates and therefore generate massive digital records. Bahram Jalali and Mohammad Asghari show us in their article how modern signal compression methods are overcoming this limitation.

Finally, all of us at OSA are extremely pleased to present in this issue the new class of OSA Fellows for 2014. Fellows are members of OSA who have distinguished themselves in the advancement of optics, and can be nominated by existing Fellows. Only 10% of the membership of OSA may achieve this distinction. I remember my own election to OSA Fellow nearly 20 years ago. This recognition by my community for my contributions to our field was one of the proudest moments of my career.

I invite you to take a moment to peruse the list and read the citations. This year's Fellows come from around the world and across a broad spectrum of optics and photonics activities, and they confirm the vibrant state of our field. Please join me in congratulating this year's Fellows.

—Phil Bucksbaum
OSA President