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Editors

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1 Miniature, Portable and Handheld Instruments
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2 New Instruments and Techniques
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Introduction

The past twenty-five years have seen a massive investment in photonics, electronics, and MEMS, aimed at developing new telecommunications capabilities and innovative consumer products. This has led to advances in miniature optics, light sources, tunable filters, array detectors, fiber optic sensors, and a range of other photonic devices, across the whole electromagnetic spectrum, along with technologies for their mass production. Similarly, in recent years, there have been remarkable developments in handheld consumer electronics, especially cell phones ("smartphones"). Today's devices contain advances in RF technology, processors, displays, operating systems, user interfaces, memory, Bluetooth, WiFi, GPS, cameras, accelerometers, etc. These technologies are increasingly being exploited in new spectroscopic instruments, and are now poised to be the basis of next-generation handheld scientific instruments.

Advances in array detectors (CCD, CID, InGaAs, InSb, MCT, CMOS, etc.) are enabling a new generation of faster imaging spectrometers, with both laboratory and field applications. Lower-cost infrared arrays have been developed, employing MEMS techniques. New laser sources, particularly in the mid-infrared, are being used in combination with advances in detector technology to create new spectroscopic platforms. The concurrent improvements in analytical theory, data analysis methods, algorithms and the power of portable processors enable instrument designers to 'put a PhD scientist in the box', and empower field spectroscopic devices to give specific actionable answers.

Portable and handheld instruments tend to be more targeted at specific applications than their laboratory predecessors. They may have performance (measured as resolution, spectroscopic range, signal-to-noise, etc.) that is 'good enough' for field screening applications. However, they are often more selective, smaller, cheaper, more robust, and designed to give these actionable answers to non-scientist operators in the field. Spectroscopy-based systems are now making critical judgments in environments and applications that were unreachable twenty years ago, from hazardous materials to the operating theater, and from field geologists to customs and border personnel.

The emphasis in this conference is on advanced technologies for spectroscopic instrumentation, particularly the uv-visible, infrared, near-infrared, and Raman molecular techniques, but also including advances enabling miniature and portable spectrometers across the electromagnetic spectrum, including x-ray fluorescence, laser induced fluorescence, laser induced breakdown spectroscopy (LIBS), Terahertz, nuclear magnetic resonance and mass

spectrometry. The conference also includes papers describing breakthrough and novel, recently-introduced, commercial instrumentation, and demonstrations using cell phones for diagnostic purposes and the collection of analytical data for distributed point sensing.

This conference premiered at Optics East 2007 in Boston, MA and is now part of the Sensing Technology and Applications Symposium. For 2015, an existing SPIE conference (Spectral Imaging Sensor Technologies: Innovation Driving Advanced Application Capabilities) was merged into Next-Generation Spectroscopic Technologies. With that merger, the 2015 Conference spanned three days, and was divided into sessions focusing on: Miniature, Portable and Handheld Instruments; New Instruments and Techniques; Smartphone Spectroscopy; Novel Infrared and Raman Applications; Hyperspectral Imaging; Chemometrics and Hyperspectral Imaging. The Conference Chairs believe that this is the first SPIE session devoted to "Smartphone Spectroscopy" and anticipate that this will be a continuing and growing part of this Conference. In all, 48 papers were presented, and we present 40 in this volume.

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