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Mark A. Druy
Richard A. Crocombe
Editors

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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 mobile devices ("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.

This conference focused on advanced technologies for spectroscopic instrumentation, particularly the uv-visible, infrared, near-infrared, and Raman

molecular techniques, but also included 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 included papers describing breakthrough and novel projects, recently-introduced content, commercial instrumentation, and demonstrations using mobile devices for diagnostic purposes and the collection of analytical data for distributed point sensing.

This conference premiered at Optics East 2007 in Boston, MA (United States) and it is now part of the Sensing Technology and Applications Symposium. The 2016 Conference spanned two days and was divided into sessions focusing on: Smartphone Spectroscopy, Novel Spectrometers and Applications, and Tunable Laser Spectroscopy.

The Conference Chairs believe that this Conference in 2015 had the first SPIE session devoted to "Smartphone Spectroscopy", and we anticipate that this will be a continuing and growing part of this Conference. In all, 25 papers were presented, and 18 of which are included in this volume.

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