

PROCEEDINGS OF SPIE

***Chemical, Biological, Radiological,  
Nuclear, and Explosives (CBRNE)  
Sensing XIX***

**Jason A. Guicheteau  
Augustus Way Fountain III  
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*Editors*

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## Introduction

The 19th meeting of the CBRNE Sensing Conference met as part of the 2018 SPIE Defense and Commercial Sensing (DCS) Symposium in Orlando, Florida. The Conference extended over the course of three days and 10 sessions. Session co-chair Dr. Jason Guicheteau of the U.S. Army Edgewood Chemical Biological Center (ECBC) opened this year's conference by noting the program has continued to grow over its 19 years, from just over a dozen papers discussing chemical and biological (CB) sensing only, to more than 50 presentations and posters in 2018 spanning each element of the CBRNE spectrum, and with representation from the United States, Canada, and Europe.

This year marked the introduction of a new, and we hope permanent, session on photonic integrated circuit (PIC) technologies specifically for CBRNE sensing. Six presentations across two sessions described recent advancements in gas, aerosol, and biological sensing applications of integrated photonics technology. This field is rapidly advancing, leveraging developments from the telecommunications industry for the unique challenges of CBRNE sensing with the aim of developing accurate, miniaturized single particle detectors in an affordable way.

This year we also had the reemergence of a session specifically on algorithms and modeling for CBRNE sensors after a hiatus for several years. The session on "Threat Signature Modeling and Algorithm Advancements" highlighted recent advances in CBRNE detection. Half of the presentations in this session presented work funded by the Intelligence Advanced Research Projects Activity (IARPA) through the Standoff Illuminator for Measuring Absorbance and Reflectance Infrared Light Signatures (SILMARILS) program. A major focus of these efforts is modeling the radiative transfer of contaminated rough surfaces towards improving the stand-off detection of threat materials.

Key papers you may want to take notice of:

**Judith Su** from the University of Arizona and **Lan Yang** from Washington University in St. Louis, MO each presented papers on their own recent developments to further enhance the sensitivity of whispering gallery mode (WGM) optical resonators.

**Lars Landström** of the Swedish Defence Research Agency presented a novel approach to ultraviolet (UV) Raman imaging of surface contaminants using tunable laser and narrow bandpass filters. In this method, UV Raman hyperspectral data cubes were acquired by filtered imaging of a tunable laser-illuminated field of view to obtain Raman spectra at each pixel.

**Nathaniel Cady** from the State University of New York Polytechnic Institute presented work to develop a grating-coupled surface plasmon resonance and grating-coupled fluorescent plasmonics (GC-SPR/GC-FP) biosensor for the rapid, multiplexed detection of *Borrelia burgdorferi* infection.

**Diana Cruz** from the Air Force Institute of Technology presented early work aimed at determining whether defects in ytterbium doped fibers (YDF) exposed to radiation was the result of neutron emissions or some other cause.

**Michael R. Papantonakis** from NRL discussed the persistence of explosive particles in various environmental conditions, particularly those left within a fingerprint.

**Joshua P. Herron** from Utah State University discussed the development of an eye-safe elastic backscatter LiDAR for CB aerosol tracking.

**Tanya L. Myers** of PNNL presented work on determining index of refraction ( $n$ ) and extinction coefficient ( $k$ ) optical constants for modeling optical phenomena in media and at interfaces.

Once again we want to thank the committee who really makes this conference happen. This year marks the last year for one of us (AWF) as a Conference Co-chair. Dr. Fountain has been part of the Conference for the past 17 years and Chair or Co-chair the past 14 years. He will remain active with the Conference, but will be turning over the Chairmanship to Drs. Guicheteau and Howle. Next year the 20<sup>th</sup> meeting of the CBRNE Sensing Conference will be held in Baltimore, Maryland. The conference plans to have several invited talks to review the advances over the past two decades in CBRNE sensing. Selected proceedings papers will be invited to submitted as peer reviewed articles in the SPIE Journal "Optical Engineering" after the Conference. Mark your calendars now and please plan on attending this historic event.

**Jason A. Guicheteau**  
**Augustus Way Fountain III**  
**Chris R. Howle**