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Introduction

On 10 – 13 August, 2015, we gathered in San Diego, California, once again to assess the status of the instruments, missions and technology in support of remote sensing and radiation detection. Forty-five presentations were delivered by authors from many countries: China, France, Germany, Italy, Japan, Mexico, Russian Federation, Taiwan, Ukraine, and United States. At the time of this writing, there have been 33 manuscripts submitted. Some authors were not able to obtain permission to publish within the publication period, others have found that their current commitments did not allow them to record the work, while others still plan to publish their achievements in refereed publications. One of the pleasures of being a chair is to recommend outstanding papers presented at this conference for publication in the SPIE refereed journals. We recommended a number of papers to be included in the *Optical Engineering* and the *Journal of Nanophotonics*.

The first session, Planetary and Comet Exploration, incorporated nine presentations. It was organized and chaired by Dr. Gabriele E. Arnold from Deutsches Zentrum für Luft- und Raumfahrt e.V. in Germany. These manuscripts report on the major projects led by the European Space Agency in collaboration with Russian and American scientists. Among the 10 projects, probably the most significant achievement is the landing on a comet, despite difficulties with anchoring the instruments on its hard surface. The VIRTIS on Rosetta mission offered a unique opportunity to observe comet 67P/Churyumov Gerasimenko. The results include potential distribution of material as well as its emissivity and temperature. When the SPIE proceedings go to print, the asteroid will be its closest approach to the Sun and acquiring its highest heat load. We are hoping that next year the Europeans will agree to deliver a plenary presentation on this unique achievement during the annual meeting. Another very important update on the European missions include the details from the optical system on the MERTIS mission.

The second session, Probing Extra-terrestrial World: from Asteroids to Cosmos, addresses such fundamental issues as landing on an asteroid and measuring the speed of light from moving sources. It included a description of an IR spectrometer to measure wind and greenhouse gases. The great interest the audience expressed in the SOFIA instrument might lead to a dedicated session on this highly acclaimed instrument next year. Credit for running the session goes to Dr. John T. Woodward from the National Institute of Standards and Technology in the United States.

Dr. Wellesley Pereira, from the Air Force Research Laboratory in the United States, organized Session 3—Advanced Techniques in Remote Sensing. Six presentations covered a wide range subject matter, including such traditional themes as dim object detection in cluttered scenes and loss due to compression algorithms. Then

the optical subtleties were introduced by identifying potential correlations between radiative and acoustic signals and, more broadly, vibrations.

Session 4 dealt with Calibration and Data Processing for IR Feature Extraction. We were indeed fortunate that this session was chaired by life-distinguished professor Dr. Jing-Shown Wu from National Taiwan University We included a paper from an earlier session here that describes scattered radiance in multispectral imagery simulation. This session also incorporated such diverse papers as remote sensing in extreme environments (in particular, magnetic fusion experiments), payload system optimization of a thermal infrared Earth resource-monitoring instrument, and two calibration demonstrations. Speakers described experiments for employing gallium as a thermal calibration reference in space and observatory demonstrations of absolute calibration of standard stars. Over the last few years, infrared cameras have been installed in many public locations to assess potential temperature fluctuations for health monitoring and control. Human temperature changes may be monitored with IR or microwaves.

Mr. Sean Kilcoyne organized the session on Advanced VIS-IR Focal Plane Development. Four presentations were delivered, but only three manuscripts were submitted at the time of this writing. The Raytheon researchers reported on modern multispectral ground, airborne and space digital focal plane technology; lifetime evaluation of large format CMOS infrared devices; and focal plane precision alignment and metrology.

The last two sessions concentrated on materials and technology development. The first among these sessions concentrated on the development of novel IR-responsive materials. Dr. Peter Bermel from Purdue University in the United States capably introduced four presenters, even though the time constrains allowed only three manuscripts to be included in proceedings. They report on cavity-enhanced AlGaAs/GaAs resonant tunneling photodetectors at 1.3 μm, colloidal quantum dot materials for infrared optoelectronics, and the measurement of the modulation transfer function of IR FPA.

The second session on materials and technology development included papers on radiation-to-current transducers. The objective of detector technology has always been to generate an increased amount of current upon a small amount of incident radiation. Dr. Ralph G. Nuzzo from the University of Illinois at Urbana-Champaign was the moderator for the last session.

There are two techniques that increase the production of current upon the incidence and absorption of incident radiation. The first one is to increase the absorption of the incident radiation, and the second increases the generation of carriers for each absorbed photon. Among the former, the paper on enhancing selectivity of infrared absorbers and emitters through quality factor matching is of great interest. In solar energy harvesting, we are aware that more than 50% of the Sun's radiation falls within the IR spectral intervals. Significant resources are

dedicated to engineering materials that increase current response. Among a number of outstanding presentations, we point to the development of nano-membranes and soft fabrication methods for high performance technologies, the development of hot electron detectors for energy conversion, and the development of 2D materials for photon conversion with nanophotonics.

We wish to express our sincerest appreciation to our chairs for introducing the speakers and guiding discussions after the presentations were delivered. The presenters are the most-important contributors to the conference, followed closely by the audience whose informative questions led to lively discussions. The chairs were additionally tasked with the important assignment of reading the papers for the talks delivered in their sessions. They provided feedback formally through the SPIE review website and informally through e-mail. The chairs reviewed a few late papers. We are pleased that the SPIE conference presentations and proceedings incorporate this additional feature because it results in higher-quality proceedings.

We are most grateful to the SPIE staff for making this book happen. Thank you for making this conference and proceedings book a success.

Marija Strojnik Scholl
Gonzalo Páez