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Interferometry XVII: Techniques and Analysis

**Katherine Creath
Jan Burke
Joanna Schmit**
Editors

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Introduction

Let us begin with a heartfelt thank-you to SPIE, the program committee, the authors, and everyone attending this seventeenth Interferometry conference. Metrology never goes out of style—quite the opposite: The demands for less uncertainty *and* faster measurements reach back to the early roots of interferometric techniques. Today, it is becoming increasingly apparent that metrology is required on many levels to help maintain automated production within tight tolerances and to reduce the rate of wasted production time and materials. Also, there are many new innovative uses beyond the realm of testing optics and process control. We are happy that SPIE continues to provide this forum for us to exchange ideas and share our latest research in interferometry and related fields.

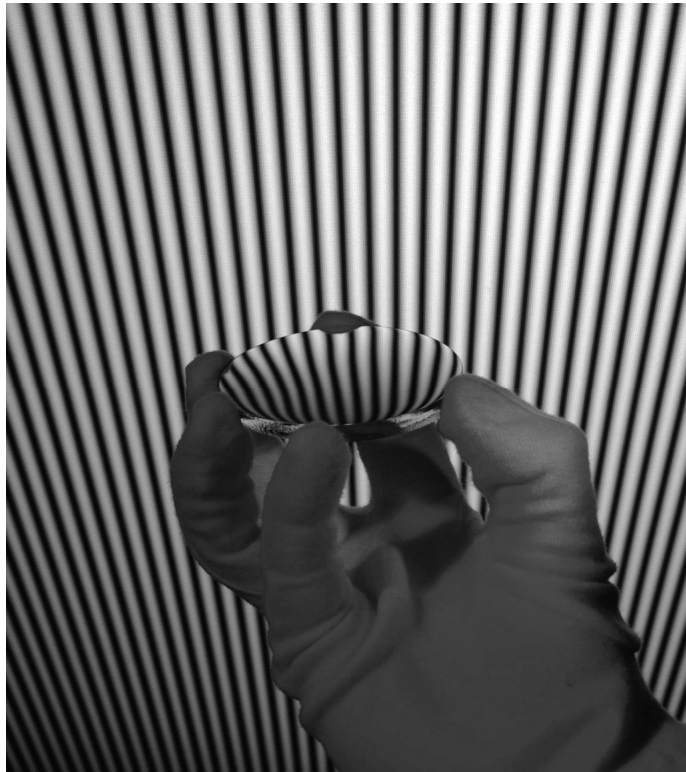
In light of the recent discussions about what is original research, what papers should go to a conference and what should be prepared for a journal—and most importantly, whether you can still publish in a reviewed journal what you have already presented at a conference, we would like to state our view here, which also coincides with a new SPIE publication policy—It is perfectly acceptable, even expected, to bring first results, preliminary findings, and work-in-progress to this conference. Usually, the work will be extended and polished later for submission to a journal so long as progress is recognizable. Even with the preliminary nature of the contributions in this Proceedings volume, each contribution has been reviewed and revised where necessary to ensure a high scientific standard.

The flipside of the sometimes preliminary nature of results presented here is, of course, the real excitement and inspiration of live science—from brilliant feats of optical engineering, enabling new and better implementations of known techniques, to combinations of ideas generating new techniques, to breakthroughs where things widely accepted to be impossible suddenly no longer are, we see here the forefront of optical metrology what it looks like in 2014. Even in this age of teleconferences and instant messaging, it is beneficial to come together in person, to present, discuss, and socialize. Many collaborations are germinated when those involved in this conference have the opportunity to eat at (or at least put their coffee on) the same table for a few days in a row.

Optics is being recognized more and more as being not only one of the major research disciplines of the future, but also an enabling technology for a large number of manufacturing and testing techniques, and this conference series covers this wide range by a dual approach. Interferometry XVII is a part of the “Advanced Metrology” program and consists of two complementary conferences, one dedicated to Techniques and Analysis and the other to Applications. The proceedings of these two conferences are published in two separate volumes as Interferometry XVII: Techniques and Analysis (SPIE

Proceedings 9203) and Interferometry XVII: Advanced Applications (SPIE Proceedings 9204). The present volume contains the new research presented at the first conference: recent developments mostly in fringe analysis, interferometric or otherwise, for measurements of various natural and man-made objects and materials and their parameters. The second volume presents the application of such techniques to a wide range of tasks and systems.

Besides the traditional core topics of interferometry and analysis of fringe patterns, irrespective of their origin, this "Techniques and Analysis" part highlights developments in digital holographic and speckle metrology, Fabry-Perot and fiber sensors and other high-precision techniques, gradient methods such as deflectometry and shearography, calibration and self-calibration methods, microscopy, and fringe projection. From general topics of optical physics to custom solutions for very specific problems, once again the multitude of contributions reflects the versatility of the photon.



The authors, from 17 countries, have brought inspiring papers to this forum, which we are very pleased to present in this book. It contains 44 papers presented at the SPIE's 59th Annual Meeting in San Diego, 17–21 August, 2014. Thirty-five of these papers were presented orally.

During our last conference in 2012, we had a very lively and fun Fringe Art competition with several rounds of voting, choosing our favorite fringe patterns from those brought along by attendees. The image ultimately selected as the favorite was a display of fringes reflected by the surface of a progressive power eyeglass submitted by Christian Faber from the University of Erlangen, Germany.

The origin of phenomena submitted to the Fringe Art Competition spanned the range from reflection and refraction to diffraction and scattering, coherence and dispersion, as well as numerical simulation and architectural art.

Once you put your mind to fringe patterns, suddenly you discover the world is full of them. Beautiful, interesting, and sometimes puzzling images appeal to our inquisitiveness and our sense of wonder. During the Interferometry XVII conference, we have continued this tradition of celebrating beauty in science, and the favorite fringe pattern will be presented in the Interferometry XVIII proceedings.

Until then, may the Fringe be with you.

**Katherine Creath
Jan Burke
Joanna Schmit
Catherine E. Towers**