PROCEEDINGS OF SPIE

The Nature of Light: Light in Nature II

Katherine Creath
Editor

10–11 August 2008
San Diego, California, USA

Sponsored and Published by
SPIE

Volume 7057

Proceedings of SPIE, 0277-786X, v. 7057

The papers included in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. The papers published in these proceedings reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from this book:
Author(s), "Title of Paper," in *The Nature of Light: Light in Nature II*, edited by Katherine Creath, Proceedings of SPIE Vol. 7057 (SPIE, Bellingham, WA, 2008) Article CID Number.

ISSN 0277-786X
ISBN 9780819472779

Published by
SPIE
P.O. Box 10, Bellingham, Washington 98227-0010 USA
Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445
SPIE.org

Printed in the United States of America.

Publication of record for individual papers is online in the SPIE Digital Library.

SPIE Digital Library

SPIEDigitalLibrary.org

Paper Numbering: Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print and on CD-ROM. Papers are published as they are submitted and meet publication criteria. A unique, consistent, permanent citation identifier (CID) number is assigned to each article at the time of the first publication. Utilization of CIDs allows articles to be fully citable as soon they are published online, and connects the same identifier to all online, print, and electronic versions of the publication. SPIE uses a six-digit CID article numbering system in which:

- The first four digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B … 0Z, followed by 10-1Z, 20-2Z, etc.

The CID number appears on each page of the manuscript. The complete citation is used on the first page, and an abbreviated version on subsequent pages. Numbers in the index correspond to the last two digits of the six-digit CID number.

Contents

POSTER SESSION

Conference Committee

Conference Chair

Katherine Creath, Optineering (United States) and College of Optical Sciences, The University of Arizona (United States)

Program Committee

Helen Ghiradella, SUNY/University at Albany (United States)
Mitsuo Takeda, The University of Electro-Communications (Japan)
Jean-Pol Vigneron, Facultés Universitaires Notre-Dame de la Paix (Belgium)
Wei Wang, Heriot-Watt University (United Kingdom)

Introduction

In the field of optical science and engineering there are many aspects of light we take for granted; yet, do we truly understand and appreciate the nature of light in the world around us? In the natural world there are many fascinating and beautiful effects involving optics. Most of the time we take these effects for granted. Each day optical scientists and engineers discover more about the natural world when we see how new technologies such as photonic crystals mimic the natural world. Photonic crystal-like structures in peacock feathers give the plumes their color. Similar structures in butterfly wing scales provide their iridescent colors.

Beyond these structures there are effects in the natural world such as the aurora borealis or things as everyday as rainbows and oil slicks. Polarization and color effects brighten up our world. When we look more closely we notice that plants glow and self-bioluminescence provides information about the state of health of organisms. We may even wonder why it is that parrots have a visual response much further into the ultraviolet than we do.

As optical scientists and engineers, most of us became fascinated with light at some point in our lives. We observe things in our everyday life that we don't often explore or think about, yet there are researchers who spend their careers looking at these effects in nature.

This conference is the fourth in a series of conferences on *The Nature of Light,* begun in 2005 with *The Nature of Light: What is a Photon?* (SPIE vol. 5866, 2005). Other volumes in the series include *The Nature of Light: Light in Nature* (SPIE vol. 6285, 2006) and *The Nature of Light: What are Photons?* (SPIE vol. 6664, 2007).

This year's conference *The Nature of Light: Light in Nature II* is comprised of 12 papers with authors from eight different countries providing a variety of research involving light in the natural world. The papers have been split into two sessions. Session 1 focuses on *Fundamental Properties of Light* while Session 2 focuses on *Light and Biological Systems.* Each of these papers offers its own perspective and provides some insight into the nature of light.

We enjoy having the opportunity to investigate these questions in a forum uniting optical scientists and engineers from all over the world. Come join us, and remember what it was like to be a child asking the question "What is light?"

Katherine Creath