Light and color in the open air: Introduction to the feature issue

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Received 16 January 2015;
posted 16 January 2015 (Doc. ID 232763); published 30 January 2015

This is a feature issue devoted to optical phenomena in nature. Many of the papers published in this feature issue are based on presentations given at the "Light & Color in Nature" conference held in August 2013 at the University of Alaska—Fairbanks.

OCIS codes: (000.1200) Announcements, awards, news, and organizational activities; (010.0010) Atmospheric and oceanic optics; (290.0290) Scattering.
http://dx.doi.org/10.1364/AO.54.000LC1

As people around the world open a year-long celebration of optical science and technology through the *International Year of Light* in 2015, we are delighted to present this special issue as a reminder of the fascinating and beautiful optical phenomena that can be observed by all who learn where, when, and how to look. In the spirit of Minnaert's classic book whose title we borrowed [1], the issue is devoted to the science of optical phenomena in nature that are visible to the naked eye, as well as technological simulations or measurements that help us better understand these phenomena. A common theme throughout the issue is deepening our understanding of optical processes in nature and encouraging an interest in science through the process of asking and answering questions about natural optical phenomena.

The majority of papers in this feature issue arose from presentations made at the International Meeting on Light and Color in Nature on the University of Alaska—Fairbanks campus during 5–8 August 2013. We are also pleased to include several excellent contributions from colleagues who were unable to participate in the Alaska meeting.

This was the eleventh in a series of meetings, uniquely focused on natural optical phenomena, which have been held approximately every three years since 1978 (past feature issues are listed here as Ref. [2], and the corresponding meetings with organizers' names in parentheses are listed as Ref. [3]). These meetings provide vigorous discussions on topics that many people might be surprised to learn are not "all known" yet. A highlight of each meeting is a session where we share our latest pictures of interesting, mystifying, and beautiful optical phenomena in nature—just for enjoyment. In this spirit, we offer Fig. 1 as an expression of thanks to our host institution, the University of Alaska—Fairbanks Geophysical Institute. This picture captured one moment of a wonderful noctilucent cloud

Fig. 1. Noctilucent clouds shining in the Alaskan sky at 1 a.m. Alaska daylight time on 7 August 2013, as nature's gift to the attendees of the "light and color" meeting, held at the University of Alaska—Fairbanks Geophysical Institute (shown in this photograph by J. A. Shaw).

1559-128X/15/040LC1-02$15.00/0

display that graced the late-summer Alaskan sky late on the evening of 6 and 7 August, in the middle of the 2013 conference.

The papers in this issue offer new insights into optical phenomena you may think are completely understood, as well as ones you did not even know existed. Reading them will take you on an optical tour from astronomical objects, through the entire atmosphere, and down to the ground and into the water around us. Topics include our own sun and moon, stars, sky and cloud colors and polarization, rainbows, halos, coronas, the green flash, mirages, shadows, optics of dust, soil, and rocks, and optical effects on and in water.

We express gratitude to all the authors of papers in this issue, to all the presenters at the meeting who were unable to archive their work here, and to the staff at the Optical Society of America Publications Office who helped to create this issue. We gratefully acknowledge the service of the conference organizing committee, the University of Alaska—Fairbanks for hosting us in 2013, and the National Science Foundation for financial support.

References and Notes

1. M. Minnaert, *Light and Color in the Outdoors* (originally published as *Light and Color in the Open Air*) (Springer-Verlag, 1993).
2. Previous feature issues in this series include: J. Opt. Soc. Am. **69**, 1051–1198 (1979); J. Opt. Soc. Am. **73**, 1622–1664 (1983); J. Opt. Soc. Am. A **4**, 558–620 (1987); Appl. Opt. **30**, 3381–3552 (1991); Appl. Opt. **33**, 4535–4760 (1994); Appl. Opt. **37**, 1425–1588 (1998); Appl. Opt. **42**, 307–525 (2003); Appl. Opt. **44**, 5623–5762 (2005); Appl. Opt. **47**(34), H1–H224 (2008); Appl. Opt. **50**(28), LC1–LC2 and F1–F171 (2011).
3. Meetings in this series include: Meteorological Optics, Keystone, Colorado, 1978 (David Lynch); Atmospheric Optics, Incline Village, Nevada, 1983 (William Mach and Alistair Fraser); Meteorological Optics, Honolulu, Hawaii, 1986 (David Lynch); Light and Color in the Open Air, Washington, D.C., 1990 (Robert Greenler); Light and Color in the Open Air, State College, Pennsylvania, 1993 (Craig Bohren); Light and Color in the Open Air, Santa Fe, New Mexico, 1997 (Ken Sassen); Meteorological Optics, Boulder, Colorado, 2001 (Stanley Gedzelman); Atmospheric/Meteorological Optics, Bad Honnef, Germany, 2004 (Michael Vollmer); Light and Color in Nature, Bozeman, Montana, 2007 (Joseph Shaw); Light and Color in Nature, St. Mary's City, Maryland, 2010 (Charles Adler); Light and Color in Nature, Fairbanks, Alaska, 2013 (Ken Sassen).