Light and Color in the Open Air: introduction to the feature issue

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This is a feature issue devoted to optical phenomena that can be observed in nature, primarily with the naked eye. Many of the papers published in this feature issue are based on presentations given at the "Light & Color in Nature" conference held in June 2010 at St. Mary's College of Maryland. © 2011 Optical Society of America

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This feature issue is devoted to papers that examine natural optical phenomena, including rainbows, fogbows, coronas, glories, iridescence, halos, mirages, noctilucent clouds, and sky colors.

The "Light & Color in Nature" conference held at St. Mary's College of Maryland in June 2010 was the tenth in a series which started in 1978 [1,2]. This conference series attracts an eclectic group of people including physicists, meteorologists, astronomers, engineers, and mathematicians, as well as amateurs. Although the primary aim of these conferences is to provide scientific explanations of optical phenomena, the participants also recognize the visual splendor of such phenomena. One of the long-established highlights of these conferences is an evening session devoted to pictures taken by the participants. On this occasion, it was supplemented by a superb collection of photographs that were exhibited in a gallery on the Saint Mary's College campus [3].

This combination of scientific analysis and deep appreciation of beauty contradicts the bitter comments directed by the poet John Keats towards attempts, mainly by Isaac Newton, to explain the rainbow [4]:

Do not all charms fly
At the mere touch of cold philosophy?
There was an awful rainbow once in heaven:
We know her woof, her texture; she is given
In the dull catalogue of common things.
Philosophy will clip an Angel's wings,
Conquer all mysteries by rule and line,
Empty the haunted air, and gnomed mine -
Unweave a rainbow…

When one of us (Laven) flew into the USA to attend this conference, an Immigration official asked the usual questions about the purpose of the visit. When told that it was to attend a scientific conference about natural optical phenomena such as rainbows, the official immediately said *"Surely, we already know everything that there is to know about rainbows?"* In retrospect, it is noteworthy that one of the hot topics in the conference concerned the tertiary rainbow. Given that there were very few reliable reports of tertiary rainbows and no photographs, some participants felt that this was a wild goose chase, whereas others felt that it might just be possible to see a tertiary rainbow under ideal circumstances. One of the

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conference participants, Alexander Haußmann, subsequently passed on the challenge of producing photographs of the natural tertiary rainbow to the network of German amateur observers "Arbeitskreis Meteore e.V. (AKM)". This challenge resulted in photographs of not just the tertiary rainbow but also the quaternary rainbow, as detailed in two of the papers in this feature issue.

Although many of the papers in this feature issue are based on presentations given at the 2010 conference, we have been delighted to welcome some excellent contributions from those who were unable to attend the conference. Of course, it is up to the readers of *Applied Optics* to decide on the merits of the individual papers published in this issue, but we feel that the breadth and quality of the papers demonstrates that explanations of natural optical phenomena continue to offer interesting scientific challenges—thus demonstrating that we do not yet know "*everything that there is to know*" about such phenomena!

The next conference in this series is planned to be held in August 2013 in Fairbanks, Alaska. Further information will be made available at http://lightandcolorinnature.org/.

We would like to thank the Optical Society of America and the editorial staff at *Applied Optics* for organizing this feature issue—thus continuing the tradition of publishing a feature issue after each of the conferences [5].

Finally, on behalf of all of the conference participants, we would like to acknowledge the generosity of St Mary's College of Maryland in hosting the 2010 conference and offer grateful thanks to Charles Adler and his colleagues and support staff for handling all of the logistical arrangements that made this conference such a great success.

References

1. Previous meetings in this series were: *Meteorological Optics*, Keystone, Colorado, 1978 (organized by 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 David Gedzelman); *Atmospheric/Meteorological Optics*, Bad Honnef, Germany, 2004 (Michael Vollmer); and *Light and Color in Nature*, Bozeman, Montana, 2007 (Joseph Shaw).
2. R. Greenler and D. K. Lynch, "Light and Color in Nature: A Return to Optics' Roots," Opt. Photon. News **22** (9), 30–37 (2011).
3. An exhibition of photographs, "*The Atmosphere Exposed*", was shown at the Boyden Art Gallery, St. Mary's College of Maryland (June–September 2010) and will be shown at the National Science Foundation, Arlington, Virginia (January–March 2012).
4. Extract from *Lamia (part 2)* by John Keats (1819).
5. 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); and Appl. Opt. **47**, H1–H224 (2008).