

continuous and finite surfaces are the same, the boundary conditions are different, which results in substantially different solutions for the two types of surfaces. Continuous surfaces are primarily encountered in industrial processes—for example, in fiber spinning,² sheet casting,³ and film coating⁴—where the production of such surfaces is technically feasible and economically desirable.

References

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4. S. J. Weinstein, K. J. Ruschak, *Annu. Rev. Fluid Mech.* **36**, 29 (2004).

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Anderson replies: The letters from Alan Faller, Barry Klinger, and Byron Sakiadis are a welcome addition to my article on the boundary-layer concept. Faller correctly points out the work of Vagn Ekman on three-dimensional boundary layers in rotating fluids. Ekman's discovery, and his subsequent experimental and analytical work, was contemporary with Ludwig Prandtl's and is an interesting example of an idea or concept whose time had come.

The history of science and technology is replete with such examples. The invention of the first successful heavier-than-air, pilot-controlled flying machine was an idea whose time had come at the beginning of the 20th century. The Wright brothers were simply the first to make it happen.

Both Faller and Klinger point out the role of the boundary-layer concept on the study of the motion of oceanic flows and circulation, a dimension of the concept not addressed in my article, written by an aerodynamicist from an aerodynamicist's point of view. Sakiadis discusses an even more general application to flows over continuous surfaces.

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Saving our view of the night skies

Of the many forms of pollution caused by humans, none is more obvious than the misuse of lighting. Unwanted and unwelcome light trespass began with the invention of the electric light and has expanded in proportion to the electrification of the planet (see PHYSICS

TODAY, June 2005, page 24). The major sources of light pollution include street lighting, outdoor sports arenas, the promotional lighting of buildings and monuments, and car sales lots.

Simply put, light pollution is blinding ground-based astronomy. Extensive light pollution is gradually and inexorably reducing the quality and utility of astronomical observations made from major observatories all over the planet. To add insult to injury, more recently a number of medical researchers have discovered a correlation between extensive light pollution and an emerging number of serious human disorders.¹

The International Dark-Sky Association (IDA) was founded by Kitt Peak astronomer David Crawford more than 18 years ago, and is made up of concerned astronomers and others who are accepting the challenge to slow down the continually advancing march toward brighter and brighter night skies. The IDA has taken the unusual stance of enlisting the major utilities, lighting manufacturers' associations, professional lighting engineering societies, and municipalities in finding better ways to achieve the objectives of lighting for safety and commerce without denigrating the natural dark sky environment. Organizations that have joined in supporting the IDA include the Illuminating Engineering Society of North America, the International Association of Lighting Designers, the Illuminating Engineering Society of Australia and New Zealand, and the Vienna-based International Commission on Illumination.

Although adopting coherent and effective lighting ordinances can provide immediate gains—including less energy consumption, improved security, and reductions in glare and light trespass—the improvement in preserving our dark skies for astronomical research is insufficient. The institution that has the responsibility to advance astronomical sciences in the US is the venerable American Astronomical Society. However, that organization is failing to address the problem. Although AAS has always agreed with the goals of the IDA and has written numerous papers and articles in support of the IDA's efforts to reduce light pollution, it has failed to aggressively encourage its members to join and support the IDA. Of all the members of the physics community, AAS has the most to lose by not directly supporting the IDA.

I call on the US physics community and all readers of PHYSICS TODAY to support the IDA, with your time and treasury, and to actively engage in any of the

IDA's many sections throughout the world. Failure to act today will doom future generations from ever experiencing the wonder of seeing the stars from a dark and natural site and will ensure that the dark skies can only be experienced through planetariums and other artificial media. Astronomers of the future will only speculate on why this generation did not take the lead in protecting our dark skies when the opportunity was so clearly and readily available.

Reference

1. See, for example, B. Harder, *Science News* **169**, 8 (2006).

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[Editor's note: We invited a response from Craig Wheeler, president of the American Astronomical Association, and Kevin Marvel, AAS's executive officer.]

Wheeler and Marvel reply: The International Dark-Sky Association does valuable work to preserve precious dark skies. Through education, outreach, and consultation with lighting designers and policymakers, the association promotes more efficient use of nighttime lighting to reduce light pollution. We endorse the association's activities. The American Astronomical Society has been an affiliated organization of the IDA for years, one of us is a lifetime member, and many AAS members and astronomy institutions are active in the association as well. However, we believe that the IDA will draw members principally through its accomplishments and the value they provide.

The membership of the IDA is growing rapidly. The association currently has nearly twice as many members as the AAS. Even if all US AAS members joined, IDA membership would only increase by about 20%. Roberts correctly states that the IDA is composed of "astronomers and others." What he does not make clear is that the others far outnumber the astronomers who are members, and rightly so. Light pollution predominantly affects the general public. Poor nighttime lights threaten our health and safety, put migrating wildlife at risk, waste energy and money, and deprive countless millions of the beauty of the nighttime sky.

Light pollution, radio-frequency interference, and space debris are all issues of concern to the AAS. All of these detrimental aspects of human technology can potentially limit our ability to make astronomical observations. Light pollution certainly does negatively