

## PUBLISHER

Randolph A. Nanna  
Tel: 301-209-3102  
rnanna@aip.org

## ASSOCIATE PUBLISHER/EDITOR

Kenneth J. McNaughton  
Tel: 301-209-3051  
kmcnaugh@aip.org

## ART DIRECTOR

Steven R. Black

## SENIOR CONTRIBUTING EDITORS

Jennifer Ouellette  
Patrick Young

## CONTRIBUTING EDITORS

Jay C. Charniak  
Eric J. Lerner  
Ineke Malsch

## WEB DESIGNER/ADMINISTRATOR

Tom Connell

## CIRCULATION DIRECTOR

Jeff Bebee

## PUBLISHING ASSISTANT

Cynthia B. Cummings

## ADVISORY COMMITTEE

Richard E. Swanson (chair),  
Larry E. Antonuk, Vincent M. Donnelly,  
Patrick P. McCurdy, William H. Prest,  
Joseph B. Reagan, Harold J. Reitsema,  
Beth A. Rosner, Jennifer J. Zinck  
Kenneth J. McNaughton (staff liaison)

## SENIOR PRODUCTION MANAGER

Christine DiPasca

## DIRECTOR, ADVERTISING & EXHIBITS

Rich Kobel

## SENIOR PRODUCTION ASSISTANT

Rita C. Wehrenberg

## APPLICATION TIPS EDITOR

Jennifer L. Huergo

## EDITORIAL OFFICES

One Physics Ellipse  
College Park, MD 20740-3842  
Tel: 301-209-3051  
Fax: 301-209-0842  
e-mail: tip@aip.org

## ADVERTISING OFFICES

Tel: 800-247-2242

## WORLD WIDE WEB

www.tipmagazine.com



## EXECUTIVE DIRECTOR

Marc H. Brodsky

## MEMBER SOCIETIES

The American Physical Society  
Optical Society of America  
Acoustical Society of America  
The Society of Rheology  
American Association of Physics Teachers  
American Crystallographic Association  
American Astronomical Society  
American Association of Physicists in Medicine  
American Vacuum Society  
American Geophysical Union

## OTHER MEMBER ORGANIZATIONS

Corporate Associates  
Sigma Pi Sigma Physics Honor Society  
Society of Physics Students

## LETTERS

# Equations and formulas

Today I received the April/May 2003 issue of *The Industrial Physicist* (my first copy ever) and found it quite interesting, especially the letters and the article "Curve Fitting Made Easy," by Marko Ledvij (p. 24). I would like to make Mr. Ledvij aware of a little-known detail of the English language—"formula" designates chemical compounds ( $H_2O$  is the formula for water); "equation" should be used for all mathematical expressions that contain an equal sign, e.g.,  $Y = A \cdot \exp(-X/X_0)$ .

Allen Cedilote  
WABCO Freight Car Products  
Wilmerding, Pennsylvania  
Acedilote@Wabtec.com

[*Copy editor replies:* Thank you for your comment. The Merriam-Webster Online dictionary defines a formula as "a general fact, rule, or principle expressed in usually mathematical symbols." The word "rule" in that definition includes equations.]

## Terahertz

In regard to your recent News Brief "20 watts of terahertz" (April/May, p. 9), even though I think the topic is interesting and the results described are important, I found the article to be sloppy and misleading about the terahertz field in general. A 20-W average-power terahertz source is impressive and will allow some nice measurements in the future. However, using accelerators to generate coherent terahertz radiation has been around for a long time, for example, at the Center for Terahertz Science and Technology at the University of California at Santa Barbara, and FELIX in The Netherlands.

The beginning of the second paragraph is in some sense correct in that the average power levels of most existing terahertz sources tend to be low compared with this new source, but many can exceed 1 mW. Some techniques are just limited by scaling, and, given the money and large enough accelerators, many smaller sources could be power-combined to yield 20 W as well. There just is not a driving force to do so.

The first paragraph makes it sound like the only gap in the spectrum is 100 to 300  $\mu\text{m}$ , while the actual "gap" is much larger, if one is thinking of commercial devices. However, devices such as molecular gas lasers fill in many discrete portions of this range, and quantum cascade lasers and many other techniques also can be used in the terahertz range. These were not the point of the article, but they should not be disregarded by saying that there were no good coherent sources until recently.

The last thing I wish to point out is that terahertz radiation is also known as submillimeter (not submicrometer as stated in the first sentence). This is important because many people are claiming that terahertz is a new field of research, while a large amount of literature exists dating back decades that seems to be generally forgotten (or ignored). The technology is improving rapidly, but the field has been around for a long time.

Michael Wanke  
Sandia National Laboratory  
Albuquerque, New Mexico

[*Gwyn P. Williams of Jefferson Lab responds:* Two relevant articles appeared in the 14



THE INDUSTRIAL PHYSICIST (ISSN 1082-1848; CODEN INPHFA), volume 9, number 3,

Copyright © 2003 American Institute of Physics. **Subscriptions:** *The Industrial Physicist* is available free to qualified parties in the USA. New subscriptions, renewals, address changes, and other subscription needs can be facilitated at [www.ezsub.net/ipy](http://www.ezsub.net/ipy), or complete and return the qualification card in each issue to The Industrial Physicist, P.O. Box 96000, Collingswood, NJ 08108, or fax to 856-488-6188. Questions? E-mail [jbebee@aip.org](mailto:jbebee@aip.org). **Non-qualified readers** can receive the magazine for \$44/year in the USA or \$74/year outside the USA. **Libraries and institutions** pay \$159/year in the USA or \$189/year outside the USA (airfreight only). **To order a paid subscription**, please send your request with name, address and payment—a check for \$U.S. drawn on a U.S. bank, or credit card information (indicating VISA/MC/AMEX, credit card #, expiration date, name as it appears on the card, and billing address)—to AIP, Attn: TIP Payments, P.O. Box 503284, St. Louis, MO 63150-3284. **Back copies** are available for \$20 each postage paid from the AIP office listed under "paid subscriptions," using the same pre-payment instructions. **Republication** or systematic or multiple reproduction of any material in this publication is permitted only under license from AIP. Please send requests for permission to AIP Office of Rights and Permissions, Two Huntington Quadrangle, Suite 1N01, Melville, NY 11747-4502; fax (516-576-2450); phone (516-576-2268); e-mail ([rights@aip.org](mailto:rights@aip.org)). Copies of articles may be made upon payment of a fee of \$20/copy through the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

November issue of *Nature*. In one (*Nature* 2002, 420, 153), colleagues from three national laboratories and I reported the generation of broadband terahertz light at average powers “several orders of magnitude higher than any existing source.” In the other (p. 131), Mark Sherwin of the University of California at Santa Barbara—commenting independently—wrote that “such a beam has never previously been created,” and that the work has “opened the door to new investigations and applications in a wide range of disciplines.” However, we absolutely agree with Michael Wanke that this work in no way lessens the importance of techniques and facilities for terahertz light having other characteristics. As Sherwin noted, “The 20-W broadband beam complements other sources of terahertz radiation.”]

[The error in the first line has now been corrected online—*Ed.*]

## Thin-film solar energy

Just a note to say congratulations on the article “Thin Flms Seek a Solar Future,” by Ineke Malsch (April/May, pp. 16–19). It was exceptionally well researched and written. Well done.

Michael T. Eckhart  
Solar International Management, Inc.  
Washington, D.C.  
Meckhart@aol.com

I recently helped my university build a 25,000 sq ft energy research center in Muskegon, Michigan. The building will be powered (combined heat and power) by a molten-carbonate fuel cell running nearly 85% efficient on natural gas. The building’s roof will feature 30 kWp (kW “peak”—at full sun with the material at 20 °C) of building-integrated photovoltaics. This is the first application of United Solar’s ([www.unisolar.com](http://www.unisolar.com)) thin-film amorphous silicon on stainless steel, which will be bonded to the single-ply membrane roof. The peel-and-stick film features eight layers with a total thickness of less than 1  $\mu\text{m}$  and operates at 8% efficiency.

The UniSolar thin-film amorphous silicon on stainless steel continuous deposi-

tion process now running in Auburn Hills, Michigan, is a nearly a football field long and cost \$67 million to build. Its annual capacity (adding all the wattage from the material made in one year) is about 30 MWP. This is now the least-cost option for photovoltaics—bar none.

James Wolter  
Grand Valley State University  
Grand Rapids, Michigan  
wolterj@gvsu.edu

## Possessive

Jeers to whomever edited the article “Industry Salaries Still Rising,” on page 13 of the April/May issue. The author and editor apparently do not understand the difference between plural and possessive nouns. Throughout the article the term “Ph.D.’s” (possessive) was used when the correct form would be “Ph.D.s” (plural). Somebody needs to repeat an English class!

DeVon Griffin  
NASA Glenn Research Center  
Brookpark, Ohio  
DeVon.W.Griffin@nasa.gov

[*Copy editor replies:* The use of Ph.D.’s as the plural is widely accepted by language authorities. *The Chicago Manual of Style* (14th ed., Sec. 6.17), states: “Abbreviations having more than one period, such as M.D. and Ph.D., often form their plurals by the addition of an apostrophe and an s.” And *The New York Public Library Writer’s Guide to Style and Usage* (p. 397) says, “The question of how to form plurals of abbreviations is largely stylistic, and authorities differ over whether to use an apostrophe before the s. This book recommends using only s to form plurals of abbreviations, initialisms, and acronyms—HMOs, YMCAs, WASPs—but with the following exceptions to ensure clarity: abbreviations with periods (M.A.’s) and abbreviations that are single letters (A’s) or all lowercase letters (rpm’s).” Thank you for your interest in this fine point.] **W**

Mail letters to The Editor, The Industrial Physicist, One Physics Ellipse, College Park, MD 20740-3842; fax (301-209-0842); e-mail ([tip@aip.org](mailto:tip@aip.org)); or respond from our Web site ([www.tipmagazine.com](http://www.tipmagazine.com), click “Write to the Editor”).