SCIENCE

http://www.aaas.org

Published by the **American Association for the Advancement of Science (AAAS),** *Science* serves its readers as a forum for the presentation and discussion of important issues related to the advancement of science, including the presentation of minority or conflicting points of view, rather than by publishing only material on which a consensus has been reached. Accordingly, all articles published in *Science*—including editorials, news and comment, and book reviews—are signed and reflect the individual views of the authors and not official points of view adopted by the AAAS or the institutions with which the authors are affiliated.

The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objectives are to further the work of scientists, to facilitate cooperation among them, to foster scientific freedom and responsibility, to improve the effectiveness of science in the promotion of human welfare, to advance education in science, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.

Membership/Circulation

Director: Michael Spinella
Deputy Director: Marlene Zendell
Member Services: Rebecca Dickerson, *Manager*; Mary Curry, *Supervisor*; Pat Butler, Helen Williams, Laurie Baker, *Representatives*
Marketing: Dee Valencia, *Manager*; Jane Pennington, *Europe Manager*; Hilary Baar, *Associate*; Angela Mumeka, *Coordinator*
Research: Renuka Chander, *Manager*
Business and Finance: Robert Smariga, *Manager*; Kevin Bullock, Nina Araujo de Kobes, *Coordinators*
***Science* Member Services**
Danbury, CT: 800-731-4939
Washington, DC: 202-326-6417
Other AAAS Programs: 202-326-6400

Advertising and Finance

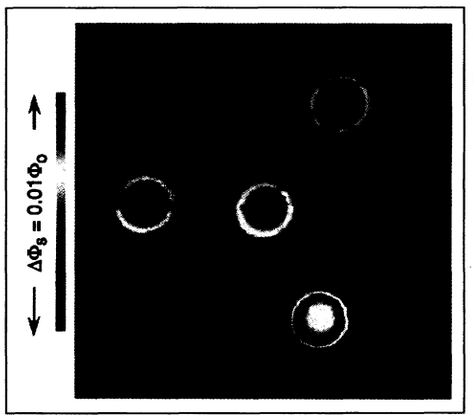
Associate Publisher: Beth Rosner
Advertising Sales Manager: Susan A. Meredith
Recruitment Advertising Manager: Janis Crowley
Business Manager: Deborah Rivera-Wienhold
Finance: Randy Yi, *Senior Analyst;* Shawn Williams, *Analyst*
Marketing: John Meyers, *Manager;* Allison Pritchard, *Associate*
Traffic: Carol Maddox, *Manager*; Christine Pierpoint, *Associate*
Recruitment: Terri Seiter Azie, *Assistant Manager*; Pamela Sams, *Production Associate*; Celeste Miller, Bethany Ritchey, Rachael Wilson, *Sales*; Debbie Cummings, *European Sales*
Reprints: Ordering/Billing, 800-407-9191; Corrections, 202-326-6501
Permissions: Lincoln Richman
Exhibits Coordinator: Arlene Ennis
Administrative Assistant: Caroline Althuis
PRODUCT ADVERTISING SALES: East Coast/E. Canada: Richard Teeling, 201-904-9774, FAX 201-904-9701 • **Midwest/Southeast:** Elizabeth Mosko, 312-665-1150, FAX 312-665-2129 • **West Coast/W. Canada:** Neil Boylan, 415-673-9265, FAX 415-673-9267 • **UK, Scandinavia, France, Italy, Belgium, Netherlands:** Andrew Davies, (44) 1-457-838-519, FAX (44) 1-457-838-898 • **Germany/Switzerland/ Austria:** Tracey Peers, (44) 1-270-760-108, FAX (44) 1-270-759-597 • **Japan:** Mashy Yoshikawa, (3) 3235-5961, FAX (3) 3235-5852
RECRUITMENT ADVERTISING SALES: US: 202-326-6555, FAX 202-682-0816 • **Europe:** Debbie Cummings, +44 (0) 1223-302067, FAX +44 (0) 1223-576208 • **Australia/New Zealand:** Keith Sandell, (61) 02-9222-2977, FAX (61) 02-922-1100
Send materials to *Science* Advertising, 1333 H Street, NW, Washington, DC 20005.

Information for Contributors appears on pages 93–94 of the 5 January 1996 issue. Editorial correspondence, including requests for permission to reprint and reprint orders, should be sent to 1333 H Street, NW, Washington, DC 20005.

***Science* World Wide Web address:** http://www.aaas.org
Other Internet addresses: science_editors@aaas.org (for general editorial queries); science_letters@aaas.org (for letters to the editor); science_reviews@aaas.org (for returning manuscript reviews); membership@aaas.org (for member services); science_classifieds@aaas.org (for submitting classified advertisements); science_advertising@aaas.org (for product advertising)

LETTERS

The cutting edge



TSUEI *ET AL.*

This week's Letters section opens with a comment about the latest wave of high-temperature superconductivity experiments (at right, superconductor symmetry). Another writer recalls how the creation of a supercool Bose-Einstein condensate, achieved in 1995, was foretold by physicist Fritz London in 1946. Climate experts debate the importance of liquefied petroleum gas (used for home cooking and heating), which has been recently tagged as a fuel contributing to air pollution over Mexico City. An earlier letter questioning the scientific consensus about global warming is answered. And a test for measuring the amount of human immunodeficiency virus in tissue is noted.

Superconductivity Researchers

Daniel Clery (Research News, 19 Jan., p. 288) did a good job of reporting the current status of the s-wave versus d-wave controversy in the field of high-temperature superconductivity. However, one key experiment was omitted. In 1995, Fred Wellstood and his co-workers presented a convincing interferometry experiment (*1*) using a superconducting quantum interference device (SQUID) in favor of d-wave symmetry. Wellstood's experiment answered questions raised about crucial omissions in the earlier experiments of van Harlingen *et al.* (*2*) and Brawner and Ott (*3*). In addition, Wellstood was the inventor of the scanning SQUID microscope (*4*), which enabled Tsuei *et al.* to perform their beautiful tricrystal ring experiments (Research Article, 19 Jan., p. 329) (*5*). Wellstood's institution (the University of Maryland at College Park) has been granted the patent on the scanning SQUID microscope, which has many potential uses beyond the experiments reported by Clery.

Richard L. Greene
Director,
Center for Superconductivity Research,
University of Maryland,
College Park, MD 20742, USA
E-mail: rgreene@squid.umd.edu

References

1. A. Mathai, Y. Gim, R. C. Black, A. Amar, F. C. Wellstood *Phys. Rev. Lett.* **74**, 4523 (1995).
2. D. van Harlingen *et al.*, *ibid.* **71**, 2134 (1993).
3. D. Brawner and H. R. Ott, *Phys. Rev.* **B50**, 6580 (1994).
4. A. Mathai, D. Song, Y. Gim, F. C. Wellstood, *Appl. Phys. Lett.* **61**, 598 (1992).
5. R. C. Black *et al.*, *ibid.* **62**, 2128 (1993).

A Prediction of the Bose-Einstein Condensate

I very much enjoyed the special article "A new form of matter unveiled," by Elizabeth Culotta (p. 1902), about the Bose-Einstein condensate as well as Floyd E. Bloom's fine editorial "Molecule of the Year 1995" (p. 1901) in the 22 December issue. I am writing to remind your readers that the idea of the macroscopic wave function for the condensate was put forward by Fritz London, who with his younger brother had already developed the idea for superconducting electrons.

A major international physics conference held after World War II was organized at Cambridge in July 1946 by Sir Lawrence Bragg and J. F. Allen. People attended who had not seen each other for many years. There were two topics, fundamental particles and low temperatures. London, then at Duke University, gave the opening lecture of the low temperature part, which he named "The present state of the theory of liquid helium." His first paragraph refers to superconductivity and superfluidity (*1*).

Apparently these phenomena represent more than just another special subject of physics. There seems to be good reason to suspect that they are manifestations of quantum mechanisms on a macroscopic scale. If this conjecture should prove to be true it would, of course, be a matter of fundamental significance. . . . Here would be a case where quantum mechanisms would directly reach into the macroscopic world.

London would have enormously enjoyed reading about the "Molecule of the Year."

Russell J. Donnelly
Department of Physics, University of Oregon, Eugene, OR 97403–1274, USA

References

1. *Report of an International Conference on Fundamental Particles and Low Temperatures, Vol. II, Low Temperatures* (Physical Society, London, 1947).

■

Air Quality in Mexico City

D. R. Blake and F. S. Rowland, in their report "Urban leakage of liquefied petroleum gas [LPG] and its impact on Mexico City air quality" (18 Aug., p. 953), state that LPG gas leakage and incomplete combustion of LPG are major precursors of ozone, the contaminant that most frequently exceeds Mexico air quality standards. Since 1992, the Instituto Mexicano del Petroleo has sampled Mexico City air and performed detailed chemical analysis of the volatile organic compounds (VOC) following the Environmental Protection Agency TO-14 protocol (*1*). In order to correlate the samples with ozone formation, a 3-hour sampling period was followed, as recommended by the U.S. National Ambient Air Quality Standards (*2*). The VOC sampling and analysis were carried out twice a year in different locations around the Mexico City metropolitan area (MCMA). From the earliest campaign (*3*) to the latest, in March 1995, propane and butane have been the most abundant compounds, constituting up to 30% of the VOC in the samples. These results made us aware of the impact that LPG has on the formation of ozone. The authorities have also expressed their concern about this problem.

It has been well established that the "reactivity" or relative ozone formation potential of individual VOCs differs (*4*). In general, alkanes and alcohols form less ozone than an equal mass of alkenes and carbonyls. More than 15 different reactivity scales have been proposed (*5*). The maximum incremental reactivity, developed by W. P. L. Carter (*6*) and chosen for regulatory application in California, has also been applied in Mexico City, with local adaptations. However, Carter (*7*) has suggested that this scale might not be applicable to Mexico City conditions, as it was designed for the relatively low ratios of VOC to nitrogen oxides (NO_x) typical of U.S. urban areas. In contrast, the mean VOC/NO_x ratio in MCMA is about four times that value (*8*).

The third most abundant compound found in our samples was toluene. We also found substantial amounts of ethylene, acetylene, and isopentanes—compounds mainly associated with solvent use and vehicular emissions (*9*). These compounds together constitute between 25 to 45% of the total VOC in the air. High concentrations of toluene have been measured during the morning traffic rush hours using remote sensing instruments. As the toluene concentration drops significantly at about 11:00 a.m., the absence of this compound in Blake and Rowland's samples may be attributed to their sampling protocol.

We also measured ambient carbonyl compounds, using the DNPH cartridge technique followed by high-performance liquid chromatography analysis (*10*). Formaldehyde, acetaldehyde, methylketone, benzaldehyde, *i*-propylmethylketone, and hexanal were the most significant carbonyls identified. Other major hydrocarbon components of the atmospheric mixture could be corre-