

1995). While in exile, Rumer published 10 papers and the book *Studies in 5-optics* (Gostekhizdat, 1956). Later he worked in Akademgorodok, the academic community near Novosibirsk, where I was pleased to make his acquaintance. When we celebrated his 70th birthday, he decided not to give a formal speech. Instead, he told the audience about his favorite work of the past: his work on quantum chemistry with Teller and Weyl.

Reference

1. G. Rumer, E. Teller, H. Weyl, *Nachr. Ges. Wiss. Göttingen Math.-Phys. Kl.*, 1932 p. 499.

Vladimir Zelevinsky
(zelevins@nsl.msu.edu)
National Superconducting
Cyclotron Laboratory
Michigan State University
East Lansing

Illumination on Noctilucent Clouds

The article "Dusty Plasmas in the Laboratory, Industry, and Space," by Robert Merlino and John Goree (PHYSICS TODAY, July 2004, page 32) was interesting, informative, and well written. However, allow me to correct three statements. Although they are admittedly not central to the point of the article, it would be a shame to misinform readers with outdated information.

Recent results by Michael Gadsden¹ and by Sheila Kirkwood and Kerstin Stebel² show that the apparent increase in the observed frequency of noctilucent clouds over the past 30 years does not hold up to rigorous reanalysis of the observations. I concede that the belief in the increased frequency was widespread until August 2002, but it is wrong. The occurrence of these clouds does exhibit an apparent anticorrelation with the solar cycle, but their minimum occurs before the sunspot maximum. Whether the correlation is real or coincidental is still under study. There is no linear trend in the occurrence of noctilucent clouds.

Among hundreds of published temperature measurements taken near the high-latitude mesopause in summer, only one has been as cold as 100 K. To my knowledge, even the author who published that measurement no longer quotes it. Consensus among scientists working in the field is that noctilucent clouds occur when the temperature at an altitude between 80 and 88 km drops below 150 K, which occurs often at high latitudes in summer. The average mesopause temperature at high latitudes is near 128 K. Even that value is rather sensational, the coldest temperature on or near Earth.

It is completely new that water vapor released at high altitudes tends to collect near the poles, and such a statement should not be published without proof or reference. The global circulation in the summer stratosphere and mesosphere is upward and slightly poleward.³ The large-scale, long-term average upward motion is a consequence of acceleration by breaking buoyancy waves. Through adiabatic cooling, the updraft leads to the cold temperatures that create the noctilucent clouds. The water vapor content in the mesosphere is difficult to measure, but appears to be near 5 parts per million by volume in summer at high latitudes.⁴ The source of the vapor is still under study. Michael H. Stevens and coauthors have published one slightly elevated water vapor observation in the high-latitude mesosphere,⁵ which may be a plume from a space shuttle launch. It is unlikely that any significant portion of observed noctilucent clouds should be due to shuttle

launches, as those clouds have been observed since 1884.

References

1. M. Gadsden, "Statistics of the Annual Counts of Nights on Which NLCs Were Seen," Paper given at the Mesospheric Clouds 2002 meeting in Perth, Scotland, 19–22 August 2002, *Memoirs British Astron. Assoc.*, vol. 45, Aurora Section.
2. S. Kirkwood, K. Stebel, *J. Geophys. Res.* **108**, 8440 (2003).
3. World Meteorological Organisation, *Atmospheric Ozone 1985*, WMO Global Ozone Research and Monitoring Project rep. no. 16, WMO, Geneva, Switzerland (1985).
4. C. Seele, P. Hartogh, *Geophys. Res. Lett.* **26**, 1517 (1999).
5. M. H. Stevens, J. Gumbel, C. R. Englert, K. U. Grossmann, M. Rapp, P. Hartogh, *Geophys. Res. Lett.* **30**, 1546 (2003).

Ulf-Peter Hoppe
(ulf-peter.hoppe@ffi.no)
Norwegian Defence Research
Establishment (FFI)
Kjeller, Norway

Correction

February 2005, page 80—Harvey S. Leff, vice president of the American Association of Physics Teachers, is a professor emeritus of physics at California State Polytechnic University in Pomona. ■



CRYOMAGNETICS, INC.

INNOVATIVE SUPERCONDUCTING MAGNET SOLUTIONS

- **Liquid Cryogen-Free Superconducting Magnet Systems**
4.2K GM or Pulse Tube
- **Standard Liquid Helium-Based Superconducting Magnet Systems**
NMR, ICR, Gyrotron, Custom-design
- **Laboratory Superconducting Magnets**
Solenoids, Split-pairs, High field, High Homogeneity, Custom-Design
- **Electronic Instrumentation**
Power supplies, Liquid cryogen level monitors and sensors, Gaussmeters and Hall effect sensors, Temperature monitors and sensors.
- **Accessories**
Vapor cooled current leads, Buckel downers, Magnet support assemblies, all items for complete superconducting magnet system integration



www.cryomagnetics.com

Tel: (865) 482-9551 • Fax: (865) 483-1253 • e-mail: sales@cryomagnetics.com