

The question of solar oblateness also relates to the recent measurements of a solar neutrino flux that is considerably lower than what one would expect.⁵ This low flux is consistent with models of the sun that give it a rapidly rotating core. Dicke proposed just such a model to account for the solar oblateness observed in his experiment.⁴ However, the value for solar oblateness obtained by Hill and his associates is consistent with a value of 15.7 arc msec that one would expect for a uniformly rotating sun. Clearly this new measurement will cause still more speculation in a field that is already alive with questions.

—Barbara G. Levi

References

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NASA asks for more lunar-research ideas

NASA is encouraging qualified scientists not now involved in NASA lunar research to contribute their ideas, techniques and research capabilities. The program's goal is to improve the scientific understanding of the origin, evolution, structure and composition of the Moon and of its relationships to Earth and the solar system. NASA's lunar studies include

- ▶ experimental and theoretical research on lunar materials (samples and Surveyor parts),
- ▶ lunar data analysis and synthesis, using published or other generally available data and
- ▶ supporting research and technology designed to support the general goals of the other lunar programs such as theoretical studies, laboratory simulations, meteorite research and advanced experiment concepts.

Details on where and how to propose may be obtained from N. W. Hinners, Lunar Programs Office, Code SM, NASA, Washington, D. C. 20546.

Table of fundamental constants is updated

An adjusted set of values for the fundamental constants has been recommended for international adoption by E. Richard Cohen and Barry N. Taylor. These values were worked out under the auspices of the International Council of Scientific Union's CODATA Task

Group on Fundamental Constants; they therefore represent the first internationally "official" adjustment ever carried out. The complete Taylor-Cohen report appears in the *Journal of Physical and Chemical Reference Data*¹; a card listing the recommended values may be found opposite page 81. Both Cohen (Rockwell International, Thousand Oaks, California) and Taylor (US National Bureau of Standards, Gaithersburg, Maryland) have previously done semiofficial and widely used adjustments; the most recent work of Cohen and Jesse W. M. DuMond appeared in 1963 and that of Taylor, William H. Parker and Donald N. Langenberg in 1969.

The new values improve on the 1969 recommendations in several ways, among them the availability of two precise, compatible values for the proton magnetic moment in nuclear magnetons (μ_p/μ_N); inclusion of the now well known value of $2e/h$, known to a few parts in 10^8 because of Josephson junction measurements; and a resultant overall reduction in assigned uncertainties. The new recommendations have not yet resolved inconsistencies in various measurements of the Faraday or of the fine-structure constant.

A major problem in the 1969 adjustment was the discrepancy between two groups of measurements for μ_p/μ_N . The mean values of the two groups differed by more than three times the standard deviation of their difference, a clear indication that either the "high" or the "low" group had to be discarded. Taylor, Parker and Langenberg decided, after careful consideration, to discard the high values. But new, extremely accurate measurements (to less than 1 ppm) by B. A. Mamyrin, N. N. Aruyev and S. A. Alekseenko (A. F. Ioffe Physico-Technical Institute, Leningrad, USSR) and by B. W. Petley and K. Morris (National Physical Laboratory, Teddington, UK) indicate that these higher values were the more nearly correct ones. Then, comparing these sub-ppm direct measurements with the indirect values that may be calculated from an equation that includes the Faraday constant F , they found large discrepancies. Since all other quantities in the equation are relatively well known, the two previously accepted measurements of F must be assumed incorrect. The new recommendation for μ_p/μ_N also leads to changes in the value for the Avogadro constant N_A .

Taylor and Cohen feel that the greatest need for improvement is in measurements of γ_p , the gyromagnetic ratio of the proton. Two techniques are used to measure γ_p , one at low magnetic field and the other at high field. The four available low-field measurements have uncertainties of the order of six ppm, with a somewhat unsatisfactory degree

of scatter. The two high-field measurements are not apparently discrepant but have larger uncertainties. An important feature of the 1969 adjustment was the comparison of the value of α , the fine-structure constant, calculated without quantum-electrodynamic-dependent quantities (the so-called "WQED value"), with its QED counterpart. Although there is no indication now of any basic discrepancies in quantum electrodynamics, Cohen points out to us that this is more a result of the relatively large uncertainty assignment for the spectroscopic data than of good agreement between QED and WQED values. Thus, a critical test of QED theory is not available.

Improved accuracy in both the low-field and high-field measurements of γ_p would not only give us a better value for α but also for K , the ampere conversion factor and for N_A as well as an independent verification of the value of F . Several groups are working on this problem and on remeasuring F . And the recently completed work of Richard Deslattes and his coworkers at NBS² who measured the Avogadro constant with x-ray interferometry, could give us another way to reduce the uncertainty in these values.

—Marian S. Rothenberg

References

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2. R. D. Deslattes, A. Henins, H. A. Bowman, R. M. Schoonover, C. L. Carroll, I. L. Barnes, L. A. Machlan, L. J. Moore, W. R. Shields, *Phys. Rev. Lett.* **33**, 463 (1974).

Isotope separation

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experimenters used a 2500-watt mercury arc lamp. Uranium atom density in the active region was about $5 \times 10^{10} \text{ cm}^{-3}$. For a commercial process, Tuccio told us, one would prefer a laser to do the ionization. It must be energetic enough to raise the U^{235} atoms that are in an excited state to the ionization continuum. However if it is too energetic it will also ionize the U^{238} . In the experiments reported at the conference, light with a wavelength shorter than 2100 Å was removed by a doped quartz filter in front of the mercury arc. This prevented ionization of the unexcited U^{238} . The experimenters were also able to resolve the eight hyperfine components of the 5915.4-Å line in the U^{235} ion current.

The Livermore workers note that scaling of the separation process they used is difficult, at best. They feel that their experiment, however, represents a logical first step in the evaluation of this class of processes. The laser uranium separation work at Livermore, insti-