

Study of 1919 eclipse sparks talk of terms and terminology

In "Testing Relativity from the 1919 Eclipse—A Question of Bias" (PHYSICS TODAY, March 2009, page 37), Daniel Kennefick makes synonyms of two words—observation and experiment—that traditionally have described different ways to gain knowledge of the physical world.

In his first paragraph, Kennefick describes Arthur Eddington's work on the 1919 eclipse as an observation, but elsewhere he usually calls it an experiment. He mentions "observation" or some form of it 5 times in that first paragraph and does not mention "experiment." Yet "experiment" or forms of it appear 19 times elsewhere in the text of the article where "observation" or forms of it appear 3 times.

In December 1919 Eddington wrote in the preface to the second edition of his *Report on the Relativity Theory of Gravitation* (Fleetway Press, 1920), "I think it may now be stated that Einstein's law of gravitation is definitely established by observation." Eddington appears never to have used the word "experiment" to describe results of the 1919 eclipse expedition, but he does use it to describe anticipated work on Fraunhofer lines, which agrees with traditional understanding of the word. And Albert Einstein himself, in early October 1919, reported that he had received provisional eclipse results of the "Beobachtung" (observation).¹

Having spent 18 years doing experiments on water waves, I am aware, along with Kennefick, that measurement and insight—seeing the link between existing knowledge and the observed phenomenon—are forms of observation accompanying experiment.

However, experiment differs essentially from observation by prescribing the values of variables believed to be relevant.

Although ongoing changes in dictionary definitions tend slightly to agree with Kennefick's usages, I think the traditional distinction between observation and experiment is logically necessary for the results of the 1919 eclipse expedition. The data obtained then are observations, as Eddington and his contemporaries called them.

Reference

1. A. Einstein, *The Collected Papers of Albert Einstein*, vol. 7, M. Janssen et al., eds., Princeton U. Press, Princeton, NJ (2002), p. 200.

Cyril Galvin

(galvincoastal@juno.com)
Springfield, Virginia

Two items interestingly coincide in the March 2009 issue of PHYSICS TODAY. Daniel Kennefick's article (page 37) on the 1919 eclipse observations to test predictions of gravitational light deflection vindicated the traditional conclusion in favor of general relativity and Arthur Eddington's role in the matter. Charles Day's Search and Discovery story (page 14) concluded that a cosmological term in Albert Einstein's equations can account for present data on the acceleration of cosmic expansion.

Eddington was a strong proponent of the cosmological term even after the discovery of the expansion of the universe removed Einstein's original rationale for it and many physicists had rejected it dogmatically. He argued that the term had a fundamental character because its "cosmical constant" Λ provided a universal standard of length, and he asserted in his picturesque way that "to drop the cosmical constant would knock the bottom out of space."¹ (Italics in the original.)

The speculative theories Eddington developed in later life have tended to prejudice physicists against his views, but he was surely right that the cosmological term should not be regarded as a mere fudge factor. If Einstein had not introduced it to make a static universe possible, someone eventually would have realized that it was a legitimate addition to the original field equations. There are even purely affine generalizations of

Einstein's Riemannian theory, such as Schrödinger's, that not only allow but demand a cosmological term.² Wolfgang Pauli's rejection of Schrödinger's version precisely because it required a cosmological term is an example of the dogmatism I mentioned above.³

I hope present observations of the acceleration of cosmic expansion will convince physicists to be more open-minded. Eddington may once again be vindicated.

References

1. A. Eddington, *The Expanding Universe*, Macmillan, New York (1933), p. 148.
2. E. Schrödinger, *Space-Time Structure*, Cambridge U. Press, New York (1960), chap. 12.
3. W. Pauli, *Theory of Relativity*, G. Field, trans., Pergamon Press, New York (1958), p. 225.

George L. Murphy

(gmurphy10@neo.rr.com)
Trinity Lutheran Seminary
Columbus, Ohio

Interpretations of climate-change data

In the January 2009 issue of PHYSICS TODAY, Philip Duffy, Benjamin Santer, and Tom Wigley attempted (page 48) to rebut our argument that there is significant climate response to solar variability (PHYSICS TODAY, March 2008, page 50). We find their arguments unconvincing.

The composite curve in their figure 1 is the PMOD composite of satellite data for total solar irradiance (TSI), which has no upward trend for the period 1980–2000. However, the second well-known composite, ACRIM, does show a significant upward trend during that period.¹ We find it curious that Duffy and coauthors cite the PMOD composite as the only one of consequence.

For the period before 1995, any TSI composite is constructed with data from ACRIM1, NIMBUS7, and ACRIM2 satellite experiments. The ACRIM composite uses these data as they are published by the experimental teams, while the PMOD composite is constructed by altering the published data on the basis of a TSI proxy model and the low-quality ERBS (Earth Radiation Budget Satellite) record. The ACRIM and NIMBUS7

Letters and opinions are encouraged and should be sent by e-mail to ptletters@aip.org (using your surname as "Subject"), or by standard mail to Letters, PHYSICS TODAY, American Center for Physics, One Physics Ellipse, College Park, MD 20740-3842. Please include your name, affiliation, mailing address, e-mail address, and daytime phone number on your attachment or letter. You can also contact us online at <http://www.physicstoday.org/pt/contactus.jsp>. We reserve the right to edit submissions.