Thunderstorm Activity

Wilcox *et al.* (13 Apr., p. 185), show a convincing relation between the solar magnetic sector structure and the earth's meteorological activity as indicated by vorticity at the 300-millibar level. Is it possible that this interesting correlation may in some way be related to Markson's observation (*1*) that there is a maximum in thunderstorm activity when the earth is at the leading edge of a negative solar structure?

B. VONNEGUT
Atmospheric Sciences Research Center, State University of New York, Albany 12222

Reference

1. R. Markson, *Pure Appl. Geophys.* **84**, 161 (1971).

The Laboratory Frog

As a coauthor with E. L. Gibbs and G. W. Nace of a number of articles dealing with frog health and having worked with the tetracycline treatment (*1*) for the common frog diseases, I am in full agreement with Papermaster (Letters, 6 Apr., p. 10) that the treatment represents an excellent stopgap solution to the complex and serious problem of laboratory frog disease (*2*).

I agree with Papermaster's suggestion that laboratories refuse to pay for dead frogs, but I seriously doubt whether this will lead to improved preventative measures. Most suppliers already issue credit for frogs that are dead on arrival.

Gibbs, Nace, and I discussed in an article entitled "The live frog is almost dead" (*3*) the complex reasons for the poor condition of the average laboratory frog. Speaking as a supplier seriously concerned with the quality of his product and the quality of science, I suggest that greater progress toward an improved laboratory frog will be made most quickly if researchers are willing to pay slightly higher costs for specially handled animals.

This is not a sales pitch aimed at developing larger profits; it is simply a reflection of the fact that most of the time you get what you pay for, especially in a competitive market.

MARVIN B. EMMONS
Science Education Division, Nasco, Fort Atkinson, Wisconsin 53538

References

1. E. L. Gibbs, *Lab. Anim. Care* **13**, 781 (1963); E. L. Gibbs *et al.*, *ibid.* **16**, 143 (1966).
2. *Amer. Zool.* **13**, 71 (1973).
3. E. L. Gibbs *et al.*, *BioScience* **21**, 1027 (1971).

The Born-Einstein Letters

The correspondence between Albert Einstein and Max Born, published in 1969 in book form in the original German (*1*), is a record of "much that will prove invaluable source material in the history of science" [Bertrand Russell in the foreword (*2*)]. It therefore seems important to correct an unfortunate slip in the English translation of the letters (*2*) which makes it incorrectly appear that criticism of Fritz Haber, in which Einstein joined Born, applied to Kasimir Fajans.

One reads in Einstein's letter of 27 January 1920 (*2*, p. 21): "Haber is complaining bitterly about Fajans. You have described the latter very well. He is unaware of the number of arbitrary assumptions he makes and vastly overestimates the value of consistent results. . . ."

The German original (*1*, p. 32) reads: "Über den Fajans schimpft auch Haber tüchtig. Letzteren hast Du sehr gut gekennzeichnet. Er merkt nichts von der Zahl seiner willkürlichen Annahmen und überschätzt deshalb den Wert der gefundenen Übereinstimmungen masslos. . . ."

In the English translation, the sequence of the two names was changed from that in the German original, but the word "latter" was not correspondingly replaced by "former." Clearly, in the German original, it was not Fajans, but Fritz Haber whom Born "described very well" with criticism which Einstein then amplified.

The error affected a man of outstanding merits. Fajans' part in laying the foundations of classical radiochemistry is history [for example, the Fajans-Soddy displacement law, which was formulated by Fajans independently and published in 1913, slightly before the paper by Soddy (*3*)]. Hardly less fundamental are his contributions to the theory of chemical binding [the Born-Fajans-Haber correlation (*4*), the "Fajans Rules" on polarity, and the comprehensive experimental studies and interpretation of mole refraction as a guide to an understanding of chemical interaction].

While no explanation is found for Haber's "bitter complaint" about Fajans, Einstein's opinion of his friend Haber is illustrated in an earlier letter to Born, of 9 December 1919 (*2*, p. 19). Citing his "forceful methods for trying to wrest truth from nature," Einstein calls Haber "a kind of raving barbarian, but very interesting all the same." Privileged by long friendships both with the late Fritz Haber and with Kasimir Fajans (now professor emeritus at the University of Michigan), I agree with Fajans' characteristically objective comment to me that Einstein's criticism of Haber "is too sharp and too general."

It seems to me that Haber might well be judged a "romantical" scientist under the scheme once proposed by Wilhelm Ostwald (*5*), who classified great scientists depending on their "psychography," or work style, into two types: "romantical" and "classical." Fajans seems to fit the "classical" definition.

MAX A. BREDIG
Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830

References

1. *Albert Einstein, Hedwig und Max Born: Briefwechsel* (Nymphenburger, Munich, 1969, and Rowohlt, Reinbek bei Hamburg, 1972).
2. *The Born-Einstein Letters*, translated by I. Born with commentaries by M. Born (Walker, New York, 1971).
3. K. Fajans, *Radioelements and Isotopes: Chemical Forces and Optical Properties of Substances* (McGraw-Hill, New York, 1931), p. 26, especially footnotes 1, 2, and 6; F. Soddy, *Nobel Lectures, Chemistry, 1901–1921* (Elsevier, Amsterdam, 1966), pp. 371–399, especially pp. 387 and 397.
4. D. F. C. Morris and E. L. Short, *Nature* **224**, 950 (1969).
5. W. Ostwald, *Lebenslinien* (Klasing, Berlin, 1927), vol. 3, p. 115.

The Fudge Factor

Richard Westfall (23 Feb., p. 751) describes the more or less arbitrary nature of Newton's corrections to his calculations of the velocity of sound in air, the acceleration of gravity at Paris (from the moon's motion), and the precession of the equinoxes. The term "fudge factor" is applied to these corrections. However, in fairness to Newton, one should also point out that the process of reasoning backward from an experimental result to correct an inadequate theoretical result is not necessarily dishonest. It may in fact be wholly scientific when used to extract information about probable side effects; and if the theory-minus-side effects is assumed sound, then the calculation becomes a demonstration of the magnitude of these perturbing effects.

To take an example from Westfall's