LETTERS TO THE EDITOR

Letters are selected for their expected interest for our readers. Some letters are sent to reviewers for advice; some are accepted or declined by the editor without review. Letters must be brief and may be edited, subject to the author’s approval of significant changes. Although some comments on published articles and notes may be appropriate as letters, most such comments are reviewed according to a special procedure and appear, if accepted, in the Notes and Discussions section. (See the “Statement of Editorial Policy” in the January issue.) Running controversies among letter writers will not be published.

UNCERTAINTY OF THE SLOPE FOR HIGHLY CORRELATED DATA

A recent Note by Jack Higbie \(^1\) showed that one can easily obtain the slope uncertainty, for data fitted to a straight line \(y = ax + b\), from the correlation coefficient \(R^2\) provided by most curve-fitting software packages and advanced hand calculators;

\[
\text{relative error of slope} = \frac{\sigma_y}{a} = \sqrt{\frac{1/R^2}{N-2}}.
\]

There is a difficulty, however, when \(R^2\) is so close to unity that the limited number of decimal places displayed leaves no precision in the difference \((1/R^2) - 1\). A simple trick in this situation is the following:

1. Find a first approximation to the slope, which we’ll call \(a_0\).
2. Compute a revised set of data points,
   \[ (y_{\text{new}}) = (y_{\text{original}}) - a_0 x_i. \]
3. Plot \((y_{\text{new}})\) against \(x_i\), and curve fit the line \(y_{\text{new}} = a_1 x + b\). The new correlation coefficient \((R^2)_1\) should now be substantially less than one.
4. Then the (original) slope and its error are given by:
   \[ a = a_0 + a_1, \]
   \[ \sigma_a = a_1 \sqrt{\frac{(1/R^2)_1 - 1}{N-2}}. \]

This trick follows the strategy suggested by Lichten.\(^2\) One can only hope that the next generation of curve-fitting programs will provide the uncertainty estimates directly without extra patchwork by the user.

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WHAT ARE WE TRYING TO DO IN OUR INTRODUCTORY COURSE?

Considerable discussion has been generated lately concerning the content of the two-semester, calculus-based physics course.\(^1-4\) The consensus seems to be that too many students leave the standard two-semester physics course without an appreciation of the broad spectrum of problems currently being addressed by working physicists. This perception carries over into the general populace where, when pressed, the average citizen can only say that physicists study mechanical systems and build bombs. This is certainly contradicted by physics in the news but the perception remains.

While it is true that many students are attracted to the concrete explanations of the world that classical mechanics provides, students are also genuinely interested in the modern problems facing physicists. It is small wonder that students come away from an introductory course somewhat confused and disappointed when they hear about recent developments in physics that are never even mentioned in their college physics course.

One approach to the question of what to do in the introductory course is to consider what tools a working physicist needs. The introductory course should introduce students to the standard mathematical and physical concepts in use in the main stream of current physics research. The primary concepts available in the standard “toolbox” of every working physicist should be introduced in some form at the earliest opportunity.\(^5\)

For example, 34% of the postdoctoral and full-time employed physicists surveyed by the American Institute of Physics in 1987–88 were classified in the field of condensed matter. Since a significant number of physicists find problems in this field worth pursuing, perhaps a greater portion of time in the introductory course should be spent introducing students to concepts useful in condensed matter physics. This is not to say that we should let the market drive our education system; the university is not a technical training school. In an introductory course we should, however, give a realistic representation of what it is that physicists really do and the type of problems physicists are competent to address. By including at least some relevant material from representative areas such as condensed matter in the introductory course we also do a service to the significant portion of students who will end up in that field by encouraging them to think about unsolved problems at the earliest possible point in their career.

This doesn’t mean we have to completely revamp course descriptions and textbooks. (I suspect widespread resistance will make this impossible anyway.) I offer the following suggestions (most of which I am currently trying out) concerning the structure of the introductory course:

(a) Keep classical mechanics first (give them something tangible to hang onto at first) but cut back on rotational dynamics, introduce modern topics and applications (some condensed matter physics for example) as the course proceeds, where they fit in.

(b) Spend a lot more time on waves, wave equations, and wave phenomena.

(c) Include material that relates to the nonphysics major: Schrödinger’s equation for chemists, transistors for...
THE FEYNMAN SPRINKLER

In 1989 I wrote a paper dealing with the inverse sprinkler puzzle posed by R. P. Feynman in his book, Surely You're Joking Mr. Feynman. In good conscience I submitted the manuscript to the American Journal of Physics and received an acknowledgment of its receipt on 8/21/89. I then received a letter dated 9/7/89 from Robert H. Romer which said:

I have been thinking about your manuscript on Feynman's sprinkler (manuscript number 1523). I am afraid that it is time for this Journal to declare a moratorium on publications on Feynman's sprinkler problem. As you know, there have been several that have appeared in print, not all of them in agreement with one another. There are several others that are in the works at the present time. I think that in view of the rather small number of physicists who are in fact interested in this problem (though, I grant you some of those who are interested are passionately interested) I would rather not publish more on this subject.

There was no mention by Mr. Romer of the quality of the physics in my paper as having figured in its rejection.

Imagine my outrage when I looked at the April 1991 issue of Am. J. Phys. and saw an article dealing with the Feynman sprinkler problem. The article had been received on 2/21/90 by Am. J. Phys., exactly six months after my paper was rejected. I was never notified of the lifting of the Romer imposed moratorium. Perhaps it is selectively applied or the rules of its application are secret. I think this arbitrary and inconsistent policy of the editor is unconscionable.

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1Report on the National Science Foundation Disciplinary Workshops on Undergraduate Education, L. M. Lederman, Chair of the Physics Workshop (National Science Foundation, Washington, DC, 1989).


2Victor F. Weisskopf, The Joy of Insight: Passions of a Physicist (Basic Books, New York, 1991), Fig. 1 and p. 3.