goal of helping the better graduates of the financially poorer colleges to make the transition from their undergraduate work to graduate work.

Such transition years would perhaps soften the curricular arrogance of schools that refuse to give credit for, or to even offer, academic work that is deemed to be high-school work, or to give graduate credit for work that is said to be undergraduate work.

It would seem appropriate that the federal government should undertake a program of scholarship aid for students wishing to enter these transition programs and that the colleges and universities should have another hard look at this curricula to see whether they are really serving the needs of the people of our country.

ALBERT A. BARTLETT
University of Colorado

Boom claim was paid

In your June issue you printed my letter in which I reported a $10 000 claim paid to me and a reply from Harvey H. Hubbard, author of your original article, "Sonic Booms" (PHYSICS TODAY, February, page 31).

In Hubbard's reply, he states that he has been "informed by knowledgeable people in the government that no cash settlement has been made in this case." That is correct. The entire $10 000 was paid by check.

When I asked the US attorney why my case was not appealed, he said: "When we have lost we don't want that loss underscored or put in parenthesis. We want you forgotten."

BAILEY M. SMITH
Oklahoma City

In your June "Letters" department Smith counters Hubbard's claim that sonic booms do only negligible damage to well constructed buildings by citing major damage done to his own house during the 1964 sonic-boom tests in Oklahoma City and referring to a court award of $10 000 for this damage. Hubbard questioned whether the claim was paid.

Smith most certainly was awarded $10 000; the insurance company that lost was aided by government lawyers employing government-paid experts. Smith won, and the government agreed to reimburse the insurance company. The facts are summarized as follows in paragraph 2 of a letter of 1 April 1968 by Edwin L. Weisl Jr, assistant attorney general, US Department of Justice: *"Bailey Smith vs Valley Forge Insurance Company* was a suit in federal district court by Mr Smith against his insurance company. This suit resulted in a $10 000 award for the plaintiff, which was not appealed by the insurance company."

WILLIAM D. SHURCLIFF
Director, Citizens League against the Sonic Boom

A new introductory approach

The article by Peter G. Roll (PHYSICS TODAY, January, page 63) and many of the articles in the March issue are part of a growing literature indicating the present concern of the college and university community for undergraduate physics instruction. It is somewhat surprising and discouraging, therefore, that almost without exception the "new courses" take the same approach and have the same content as physics courses have for the last century. This situation probably results from the extreme difficulty of translating a coherent picture of physics, now only encountered at the graduate level, into an interesting and digestible course for freshmen.

At Trinity we are developing a new approach to introductory physics in which microscopic physics plays a central role from the very beginning. As a first step we are modifying the first semester of our regular four-semester course for physical-science majors. This one-semester course is complete in itself, however, and can be followed by science courses for which a good grounding in physics is a necessary prerequisite but which are designed as terminal courses for the nonscientist.

The working title of the course is "Physical Description and the Conservation Laws." The title reflects the two-part thrust of the course. First, we wish to give a coherent, accurate and complete account of the way physics currently describes the world at both the macroscopic and microscopic levels.

Second, we have taken as the fundamental laws of physics the conservation laws: conservation of energy, momentum, charge, hypercharge, angular momentum, etc. This method gives a more unified approach, keeps the mathematics elementary and does not force one to begin with such concepts as force and precise trajectory, which are at best only valid in macroscopic

vibration characteristics of most mechanical refrigerators have long barred their use in cooling Mössbauer experiments, where minutely controlled motion is vital. Scientists wishing to operate at 20°K have been forced to use liquid neon, which is frightfully expensive, liquid hydrogen, which is dangerous, or cold gas boiled off from liquid helium, which is cumbersome and expensive. We have felt for some time that our slow-speed CRYODYNE® Helium Refrigerators had low-vibration characteristics that would make them apt candidates for Mössbauer work.

We are happy to report that Wiggins and Oleson at Johns Hopkins University have successfully used one of our 20°K CRYODYNES in a full-scale experiment, in which the Mössbauer effect in U^{238} was observed for the very first time. Their experimental set-up is pictured below. The refrigerator was operated over the temperature range of 27°K to 60°K with thermal loads of up to 6 watts. Vibration was no problem.

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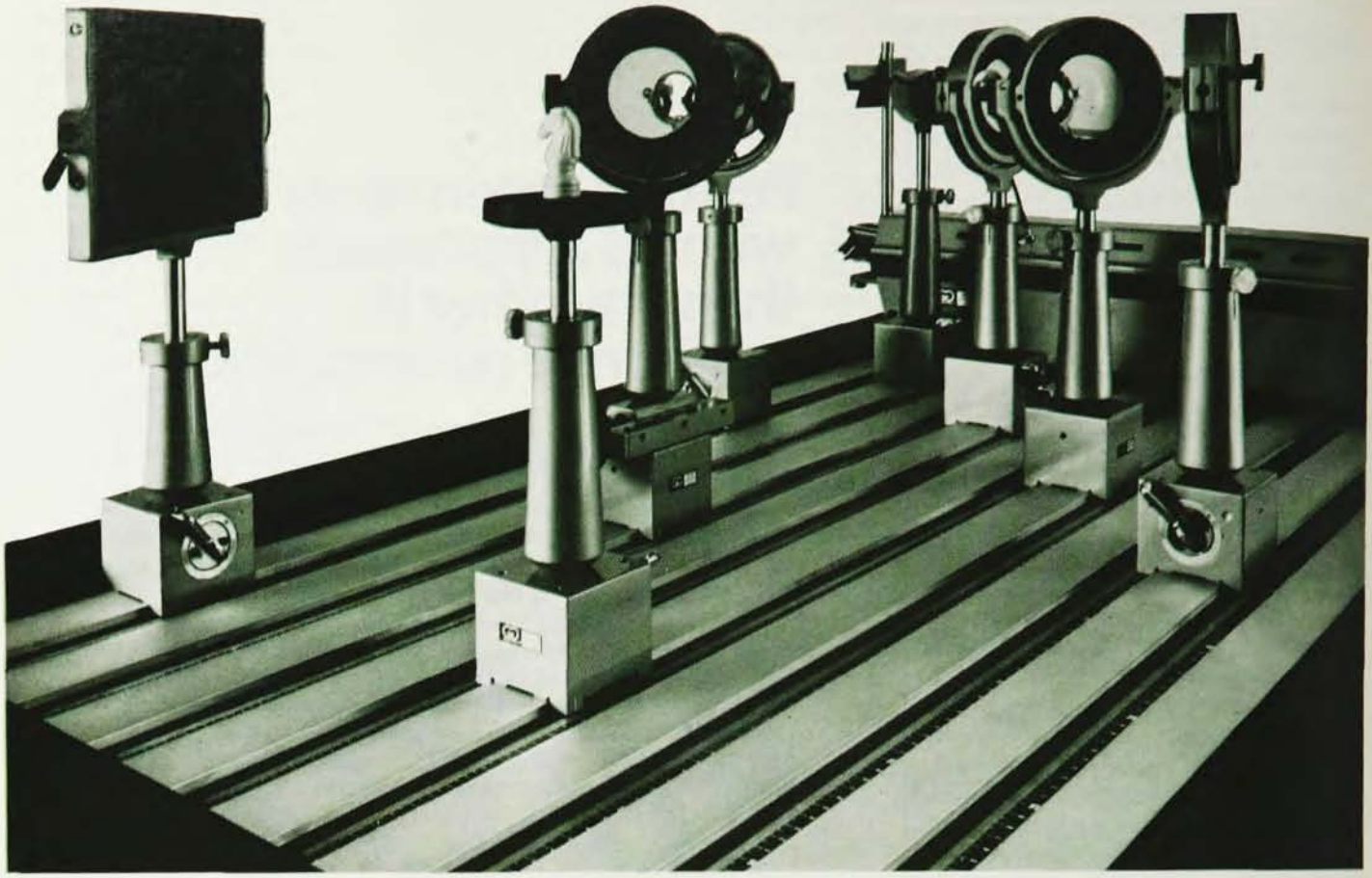
physics. In this way we are able to continue the discussion of microscopic systems within the framework of present day microphysics.

The following set of topics forms the present outline of the course: levels of description of matter (including radiation); waves and particles—the description of a physical state; elementary particles and conservation laws; kinetic energy, momentum and relativity—the role of space and time; potential energy and interactions; elementary dynamics—the time development of a physical state; kinetic theory and random processes.

The first two topics relate purely to the physical description. Initially we emphasize that the characteristic distance and energy at a certain level of physical reality form the basis for the units used at that level, for example, fermi and GeV at the elementary-particle level. The description of a physical state at both the macroscopic and microscopic levels is then discussed.

Elementary particles are then brought in as the objects that a simple theory of motion can describe. (However, the organized, conservative motion of many particles, such as a car on an air track, is often used as an example.) The conservation laws of charge, hypercharge and mass–energy are introduced at this point to develop the concept of a conservation law. Elementary particles are used extensively in the next topic, where galilean and relativistic kinematics (three-vectors and four-vectors) are introduced simultaneously with the conservation of mass–energy and momentum.

Interactions between particles are introduced with the concept of potential energy. To describe one-dimensional, macroscopic motion, conservation of mechanical energy is sufficient. In two or three dimensions one must introduce the postulate that the direction of the change in momentum is the direction of greatest change in potential energy. This leads to Newton's law of motion as the time-development equation of the macroscopic state although it is written in the form of Hamilton's equations to emphasize the underlying importance of energy, momentum and position as dynamical variables. A full description of the microscopic state and its time development initially had to be postponed until the beginning of the second semester of the four-semester sequence.



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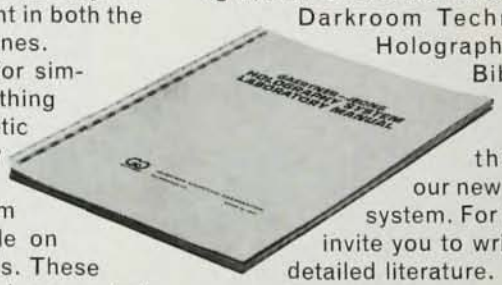
Finally, we want you to have all the necessary information for taking full advantage of our new versatile holography system. So we prepared the *Gaertner-Jeong Holography System Laboratory Manual.*



Here's its Table of Contents: (A) Apparatus Description and Operating Instructions; (B) Experiments in Wavefront Reconstruction. (Which includes holograms of point object at infinity, of point objects at finite distance, and of two- and three-dimensional scenes; multiplexed, multichanneled, white-light, and differential holograms); (C) Darkroom Techniques for Holography; and (D) Bibliography. That's part of the story of our new holography system. For the rest, we invite you to write to us for detailed literature. GSC-8-219

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The final topic develops the concepts necessary for the statistical description of a state of disorganized energy: temperature, internal energy and entropy. Kinetic theory is used as an example.

CHARLES MILLER
BRADLEY PERRY
Trinity College, Hartford, Conn.

Potential financial crises

I would like to draw the attention of physicists to a statement about national science policy. Although the statement appeared in the McGraw-Hill publication *Scientific Research*, I write to PHYSICS TODAY because I feel that PHYSICS TODAY reaches the audience whose attention I want.

The statement appeared in the "Washington Science Outlook" section of the 13 May *Scientific Research* under the inauspicious title, "Handler Proposes Way to Soften Crises in University Funding." It said:

> "National Science Board Chairman Philip Handler has been trying to formulate a new national science policy to support higher education and research, particularly at the graduate level [SR, 1 Apr '68, 27]. To shield universities against the loss of funds during times of budgetary stress, he wants to return to the former grant-in-aid philosophy, which would substantially reduce total federal funds to the universities, but at least let them know how much money they can count on receiving.
>
> "Handler suggests that grants should no longer provide for faculty salaries, stipends to graduate students, and indirect costs and overhead now charged by the universities. Rather, he would have the universities pay for all salaries and provide modest support for your researchers. These shifts, he feels, would soften the blow of potential future financial crises."

If the fear of "potential future crises" is to be the philosophical foundation of national science policy in this country, I suggest a greater easing of tension would result if funds were cut off altogether; then there could be no blow to soften and we would all feel safe and secure. What is Philip Handler doing at Duke?

EDGAR LIPWORTH
Brandeis University □