letters

Graduate student support

In the fall of 1975 a questionnaire seeking information concerning support levels of graduate students of physics, among other things, was sent to each PhD-granting institution of physics in the United States. As is the case of a similar study conducted in 1972, about a 90% response was obtained.

GUEST COMMENT
by
Robert B. Hallock

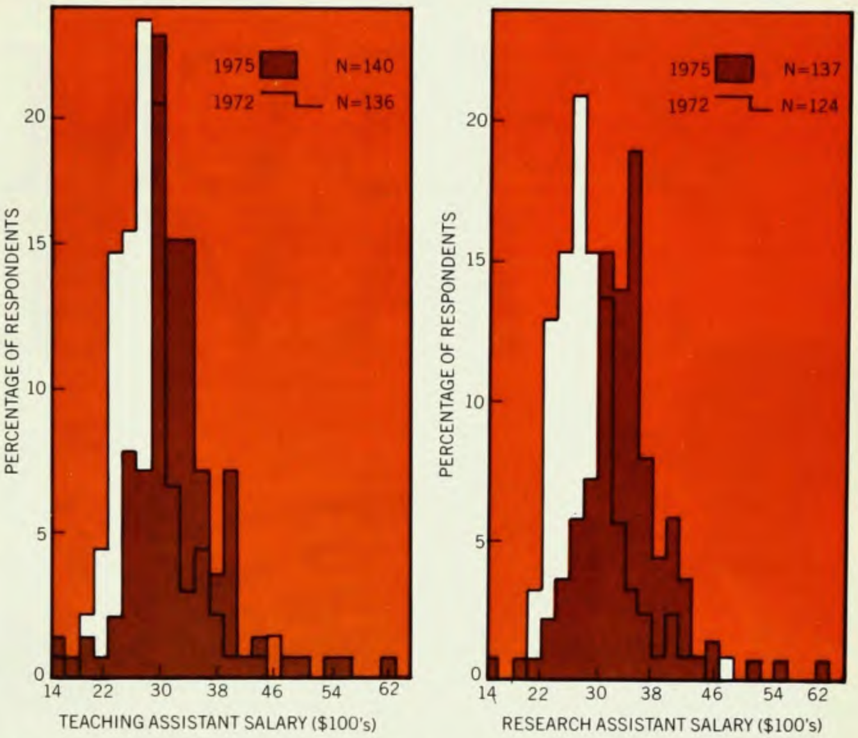
Traditionally students of physics have supported their education by means of fellowships, teaching assistantships or research assistantships. Our results from the 1975 survey again show that four out of five graduate students of physics are able to support their education by one of these traditional means. Among those who receive support we find the following distribution of the type of support:

	1972	1975
Fellowship	13%	10%
Research assistantship	43%	41%
Teaching assistantship	44%	49%

Again in 1975 an unmarried third year student was selected to gain more information. The dollar figures given below represent dollars which are available to the student after applicable tuition fees for which the student is responsible have been paid:

	1972	1975
9 month Teaching assistantship	\$2902	\$3252
9 month Research assistantship	\$2685	\$3258
12 month Teaching assistantship	\$3385	\$3909
12 month Research assistantship	\$3378	\$4288

The tuition figures used for these computations were always instate figures in those cases where instate and out of state tuition costs differed. A direct comparison between the 9 month support levels can be made between 1972 and 1975. In the case of 12 month support levels caution is necessary since a somewhat different percentage of cases may have offered summer support in 1975 than did so in 1972. The data have not been examined in sufficient detail to account for that possibility.



Salaries for Teaching (left) and Research Assistantships (right) for school year, less tuition.

Two examples of the more detailed results of the survey are presented in the figures. In each case the histogram records the percentage of respondents in the particular survey year which fall in the various salary ranges. The salary figures represent dollars available to the unmarried third year physics graduate student after applicable tuition fees have been paid.

The 1975 questionnaire was less narrow in scope than that used in 1972. For example, information on the number of entering first year graduate students of physics, number of full time faculty, number of tenured faculty and post-doctoral salaries was requested. These data were then tabulated in various ways. For example, the ratio of the number of entering first year students to the number of faculty was obtained for each respondent. The histogram for these particular data is broad, with a median of 0.4.

A report which contains a copy of the 1975 questionnaire and histograms of the results of the survey, including comparisons to 1972 where appropriate, has been prepared. A limited number of copies are available by postcard request.

ROBERT B. HALLOCK
Department of Physics and Astronomy
Hasbrouck Laboratory
University of Massachusetts
Amherst, Massachusetts 01002
8/18/76

Laser safety

Edward Breinan, who appeared closely observing a laser glazing process on the cover of the November issue should have been wearing eyeglasses as a precaution against reflections from the laser. In view of the very high power densities involved,

CMX-4/PM Pump Module. Extra pump modules are available as an accessory to the CMX-4 to allow quick changeover from one dye to another. Features include quick disconnect fittings and storage space inside the cover for flow tubing.

CMX-4 Flashlamp Pumped Dye Laser System. Now firmly established as the new standard for quality and reliability in tunable laser systems, the Chromatix CMX-4 features many innovations that provide the experimenter with operating ease and convenience. The basic version of the CMX-4 operates in the visible region, producing continuously tunable high energy radiation with superb beam quality. For ultraviolet operation, the **CMX-4/UV Ultraviolet Accessory** extends the tuning range into the ultraviolet through efficient intracavity second harmonic generation. For bandwidths narrower than the standard 3 cm^{-1} of the basic unit, the **CMX-4/FP Narrow Bandwidth Accessory** offers bandwidths as narrow as 0.1 to 0.15 cm^{-1}.

CMX-4/EOS Electro Optical Shutter. This accessory is useful for experiments such as fluorescence studies that require a sharp trailing edge on the output pulse. Operating with either visible or ultraviolet outputs, the CMX-4/EOS electro-optically terminates the CMX-4 pulse with fall times of 2 to 5 nanoseconds. An output signal is available to trigger ancillary equipment such as detector systems.

THE CMX-4 FAMILY

EVERYTHING YOU NEED IN TUNABLE LASERS

CMX-4/ASA Automatic Scanning Accessory. For applications requiring automatic scanning, the CMX-4/ASA is available in three versions: visible, ultraviolet, and narrow bandwidth. These options may be purchased together or separately. The CMX-4/ASA offers complete computer compatibility when used with either a dedicated minicomputer or a time-shared computer. An output to drive a recorder is also available at the back panel.

CMX-4/IR Infrared Accesory. This moderately-priced accessory extends the CMX-4 tuning range to 2.6 μm in the near infrared. Employing an updated and easy-to-operate version of Chromatix's field proven Optical Parametric Oscillator, the CMX-4/IR offers simple, fast changeover to infrared from ultraviolet or visible.

CMX-4/MB Mounting Bench. For operational versatility, the CMX-4/MB combines the convenience of secure alignment with rapid changeover when using accessories such as the CMX-4/IR and CMX-4/EOS. It consists of an optical bench with leveling feet and attachment clamps.

chromatix

1145 Terra Bella Avenue
Mountain View, CA 94043
Phone: (415) 969-1070
Telex: 910-379-6440

In Europe:
D6903 Neckargemünd 2
Unterestrasse 45a
West Germany
Phone: (06223) 7061/62
Telex: 461691

Circle No. 17 on Reader Service Card

it would have been appropriate to mention something about the potential human risks associated with observing the process too closely.

The picture on the cover was a very interesting one but I question the wisdom of publishing photographs of potentially unsafe practices without some comment concerning the potential human risk involved.

DONALD E. BARBER
University of Minnesota
11/18/76 *Minneapolis, Minnesota*

The cover note in our November issue mentions that this photograph is a double exposure—Edward Breinan does not literally "observe" the laser beam but moves away whenever the laser beam (normally covered by a gas shield) is switched on. Breinan has told us of other safety precautions taken in his laboratory, including the Lucite shield through which we see him in the cover photograph. This shield affords about five seconds of protection from the direct laser beam; long enough for one of the "kill buttons" carried by all present to turn off the beam. Also the safety glasses he is wearing afford good protection to 10.6-micron radiation.

EDITOR

Administering applied physics

As a member of an older—and perhaps, who knows?, not even better—Applied Physics Department than Caltech's, I am moved to second David Goodstein's recent letter. Our experience is that applied physics cannot be distinguished from physics insofar as methods of approach and problem solving are concerned. The stimulus for work undertaken may come as much from without as from within the physics community (consistent with the quoted Liepmann definition). About one half of the 80 PhD's from our department have gone into industry, one third are at universities, and the remainder are mainly in government labs.

The tough problem posed by Goodstein concerning the number of graduate students to be trained by a professor or a department must be faced in applied physics, of course, as well as in physics and in all graduate departments. We have no reliable model to use as a guide; so we operate empirically. We try to admit as many students each September as a rough survey of our faculty the previous February indicates there will be "room for" (translated: "research support for"). Our estimates of four to five years ago seem to have been reasonable. The system depends upon a judicious administering of research funds in order to satisfy student aspirations and education, faculty research interests, and the agencies in Washington that support the research.

We see, as the real problem, the tendency of the Washington agencies to become increasingly concerned with short-term "visible" accomplishments, and we suspect that some mission-oriented administrators have little understanding of, or interest in, an essentially academic concern, namely the proper coupling of teaching with research. It is becoming very difficult to find sufficient overlap between the academic and agency interests. If the trend in Washington is not altered, we will either retrench substantially or else surrender freedom of choice in attacking and solving problems, and thus no longer be applied physicists.

T. H. GEBALLE
Stanford University
11/9/76 *Stanford, California*

Kirkhoff pairs

In response to John A. Baldwin's letter in the September issue (page 88), it is possible to find dual-transform pairs for continuum electrodynamics. The starting point is Kirkhoff's laws in point form:

$$\nabla \times \mathbf{E} + \frac{\partial \mathbf{B}}{\partial t} = 0 \qquad \text{(KVL)}$$

$$\nabla \cdot \mathbf{J} + \frac{\partial \rho}{\partial t} = 0 \qquad \text{(KCL)}$$

The dual-transform pairs are

A, vector potential	**D**, displacement
ϕ, electric potential	**H**, magnetic field
B, magnetic flux density	$4\pi\rho$, charge density $\times 4\pi$
E, electric field	$4\pi\mathbf{J}$, current density $\times 4\pi$
ϵ, dielectric constant	μ, magnetic permeability
curl	div or grad
$\Box^1$, d'Alembertian	1

The results are pairs of equations (including the pair above):

$$(2)\quad \nabla \cdot \mathbf{D} = 4\pi\rho \qquad \nabla \times \mathbf{A} = \mathbf{B} \Leftrightarrow \nabla \cdot \mathbf{B} = 0$$

$$(3)\quad \nabla \times \mathbf{H} - \frac{\partial \mathbf{D}}{\partial t} = 4\pi \mathbf{J} \qquad -\nabla\phi - \frac{\partial \mathbf{A}}{\partial t} = \mathbf{E}$$

$$(4)\quad \Box^2\phi = -4\pi\rho/\epsilon \qquad \mathbf{H} = \mathbf{B}/\mu$$

$$(5)\quad \Box^2\mathbf{A} = -4\pi\mu\mathbf{J} \qquad \mathbf{D} = \epsilon\mathbf{E}$$

(The "1-operator" is used when there are no other operators involved.)

There are no blanks for inserting magnetic charge or current. The key is to set magnetic flux density equal to the curl of the vector potential.[1]

NEW

Programmable Precision Pulse Generator

Model 9010

Here's a programmable precision pulse generator with unmatched performance and versatility—the BNC Model 9010. Two major features of the 9010 are: **remote programming of the pulse amplitude** from 0 to ±9.999 V with 1 mV resolution, and a **Pulse/DC Mode** which allows direct measurement of the pulse top with a DVM. Application areas include: nuclear research, stimulus for data acquisition systems and bench and field calibration of NIM systems. The price is $1520. For a brochure on this and other BNC instruments, call (415) 527-1121 or write to:

BNC

Berkeley Nucleonics Corp.
1198 Tenth St.
Berkeley, Ca. 94710

Circle No. 18 on Reader Service Card