

HIGH VOLTAGE OPERATIONAL AMPLIFIERS

- Up to $\pm 20,000V$
- Up to $200V/\mu sec.$
- Up to $200W$ output power



Model 620A:

- 0 to $\pm 20KV @ 1 mA$
- Gain: $2000V/V$ or $100 \mu A/V$
- Slew: $12V/\mu sec.$



Model 664:

- 0 to $10KV$
- $20 mA rms$
- $180 V/\mu sec.$



Model 604A:

- 0 to $\pm 1 KV @ 20 mA$
- $35 V/\mu sec.$
- Discrete amplifier and power supply mounted on separate P.C. boards

- Many other standard models available.
- Special design requirements considered.

Write or call
for more information.



P.O. Box 231 3932 Salt Works Road,
Medina, N.Y. 14103
Phone: (716) 798-3140 Telex: 752228

letters

specialized research too early at the graduate level. How much more is this true at the undergraduate level?

I did a senior honors thesis at Amherst (the equivalent of a three-semester course), and I must admit that the gain was small for the time invested. It was too specialized and I didn't have the knowledge to do anything really meaningful. The time would have been better spent studying something more basic (such as mathematical physics, which, unfortunately, wasn't offered—we were supposed to pick that up on our own, much as today's students are expected to pick up computer skills).

I am not against research at an undergraduate institution. It is fine for those who want to do it. But one shouldn't be deluded into thinking that it has great pedagogical value. Those who argue that they need to do research to avoid getting stale in the classroom should continue to do so. And it is fine to involve the students in "research," but it is basically for the cultural experience, a nice thing to do during the summer or as a part-time campus job.

But I also see a more ominous trend in the undergraduate and state colleges. And that is that the ability to do research in such institutions becomes a requirement to do it. When I was an undergraduate, I much preferred to have teachers who passionately cared about teaching, and devoted their time and energy to it. Who wouldn't? Unfortunately, such people are being squeezed out of these institutions. What prospective physicist would now dare admit to a hiring committee that what he really loved was teaching and not research? He would never be hired if he did. Yet if colleges such as Amherst and Oberlin looked at their past, they would find they had many such people, and they are proud of them. There exist physicists whose first love is teaching, who don't get stale by interacting with undergraduates and who are not so interested in research. I believe those are the ones the small colleges need the most, and they are now the least likely to be hired.

VIKTOR K. DECYK
University of California,
Los Angeles

11/86

GOLLUB AND ABRAHAM REPLY: Viktor Decyk's concerns are reasonable. However, at the colleges we know, there is no evidence that the level of commitment to teaching has declined as research opportunities have increased. Indeed, we suggest that the opportunities available to students have been

considerably enhanced.

As with any educational experience, research participation by undergraduates will have varying degrees of success. Perhaps the best way to respond to Decyk's negative experience is simply to quote from written descriptions of the research experiences of several students we know.

Peter Kaplan (Haverford College class of 1986) writes: "The process of learning physics in a classroom is clearly different from that of learning in a [research] laboratory. Without two summers and three semesters doing research I would have become a stale student whom devoted teachers would have been unable to motivate.... Time spent doing research has allowed me to place the 'well-known' into a more contemporary context. A result is that I can learn quite a bit from currently published journal articles.... Some of my classmates were not interested in doing research, and they have had the benefit of fine teaching.

"The question of how highly to value teaching ability when appointing professors is a difficult one. The answer surely depends on the educational goals of each institution.... In the large and confusing world of physics, it does help to have some access to ongoing and active research."

Mari Maeda (Bryn Mawr College class of 1981; MIT PhD, 1986) writes: "I have found that any knowledge acquired during research has stuck with me much longer than material learned during course work. I also feel that undergraduate research is essential for preparing a student for graduate work, for it builds confidence and dispels any fear of working independently."

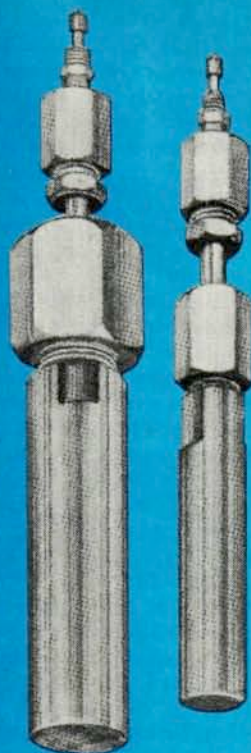
Lois Hoffer (Bryn Mawr class of 1982; University of Arizona MS, 1985; currently a PhD candidate at Bryn Mawr) writes: "Undergraduate research may take time from courses... and it can be frustrating and useless. But with the right professor at the right time it can be not only enjoyable, but also a source of self-confidence, and you may just fall in love with the subject. In that case it may shape the rest of your career in physics."

JERRY P. GOLLUB
Haverford College
Haverford, Pennsylvania
NEAL B. ABRAHAM
Bryn Mawr College
Bryn Mawr, Pennsylvania

4/87

Learning to 'think physics'

I have read the June 1986 PHYSICS TODAY—the special issue on the educa-



HIGH PRESSURE

Tem-Pres Reactor Vessels to 60,000 psi 900°C

Tem-Pres designs and constructs reactor vessels that accept simultaneous temperatures and pressure far beyond the limits of standard commercial units. Constructed of Rene 41, 316 stainless steel and Unitemp L-605, these vessels meet the needs of both academic and industrial laboratories for elevated pressure and temperature applications.

- P-V-T studies
- Accelerated Corrosion Testing
- Special Environmental Testing
- Solubility Determinations
- Electrical Conductivity Measurements
- Syntheses at Elevated Temperatures and Pressures
- Stability and Phase Compatibility Determinations
- High Pressure Differential Thermal Analyses
- Crystal Growth in Neutral or Pressure Media

specialists in high pressure/high temperature research systems

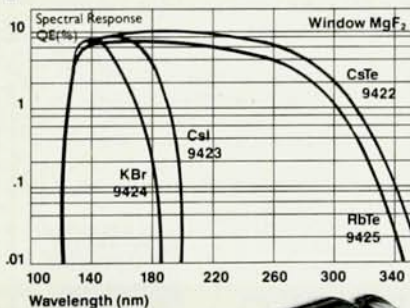


contact R. M. Shoff
Leco Corporation
Tem-Pres Division
Blanchard Street Extension
P.O. Box 390
Bellefonte, PA 16823
Phone: (814) 355-7903

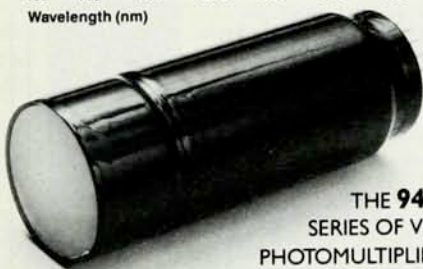
Circle number 73 on Reader Service Card

Concepts from Thorn EMI

For radiation detection between 110 nm and 350 nm the 9400 Series of Photomultipliers with Magnesium Fluoride input windows offer high detection efficiency and large photocathode area (45 mm diameter). These tubes exhibit good SER and high gain which, with their low background, makes them the choice for Photon Counting Applications.



Four photocathode types are available, two of which are insensitive to solar radiation. These tubes enhance the extensive range of photomultipliers produced by Thorn EMI for research and O.E.M. applications. Call us at 1-800-521-8382 for assistance with your detector requirements or for our latest catalogue.



THE 9400
SERIES OF VUV
PHOTOMULTIPLIERS



**THORN EMI
Gencom Inc.**

23 MADISON ROAD, FAIRFIELD, NJ 07006
(201) 575-5586 / TELEX: 221236 TEGI UR

OUTSIDE THE U.S.A. CONTACT:
THORN EMI Electron Tubes Limited
BURY STREET RUISLIP MIDDLESEX HA4 7TA ENGLAND
TELEPHONE 08956 30771 TELEX 935261

Circle number 74 on Reader Service Card

Our .64m Monochromator performs like a 1m

The HR-640 Monochromator Spectrograph has the high aperture of smaller systems and the extended scanning range and resolution of larger spectrometers. Optimization for multichannel and multiport capabilities, combined with the largest selection of gratings and accessories, gives the HR-640 unprecedented performance and flexibility. Call or write ISA today!



JOBIN YVON



J-Y Optical Systems
Instruments SA

In Europe: Jobin Yvon, 16-18 Rue du Canal 91160 Longjumeau, France. Tel. (33) 1.69.09.34.93

6 Olsen Avenue
Edison, NJ 08820-2419
(201) 494-8660
FAX 201-494-8796

Circle number 75 on Reader Service Card

RADON COUNTING

the professional way!

Put your personal computer to work with the Nucleus Personal Computer Analyzer. Many Testing Labs and Health Departments are now using our PC-based systems for routine counting of Radon samples and gaining the benefits of the computer for analysis, report generation, and data filing.

By converting your personal computer into a full feature multichannel analyzer, the Nucleus PCA card offers new dimensions in counting accuracy and cost effectiveness. The real time display of counting data eliminates the uncertainty of single channel analyzer systems.

Available in single or multiple detector systems with lead shield, the PCA Radon System will handle most sample sizes including 3" and 4" diameter canisters.

★ **Analysis Software**
Now Available



EXCELLENCE IN NUCLEAR INSTRUMENTATION

761 EMORY VALLEY ROAD • OAK RIDGE, TN 37830-2561
TELEPHONE 615-482-4041 • TLX 557-482

REPRESENTATIVES WORLDWIDE

the **Nucleus** INC.

Circle number 76 on Reader Service Card

letters

tion of a physicist—with more than ordinary care. With this plethora of words on money and big black boxes with knobs to turn and lights to flash and grants and undergraduate research and computers, there is not a word or a phrase on the essential ingredient in the education of a physicist. Not a word!

This essential ingredient is learning how to think physics. There is little of this in any class at any level, from the kids in the elementary science classes to the upper and graduate courses in the university—and in these it is frightfully wanting. It is now all high-powered mathematical gymnastics and huge costly apparatus—and computers. Those learning their first physics with computers and in upper courses are not learning what physics is nor are they learning how to think physics! The young are enamored of this modern stuff and they consider old-fashioned questions like "Why does a brook gurgle?" beneath their dignity. The story of Ernest Rutherford and the stick in the pool of water has no meaning to these moderns, but look where it took Rutherford.

This decay in a feeling for what physics is does not bode well for the future of physics. And with this essential ingredient so wanting—so lacking—we cannot hope to produce a James Clerk Maxwell or a Michael Faraday—much less a Rudolf Clausius or a Ludwig Boltzmann.

JULIUS SUMNER MILLER
Torrance, California

6/86

English proficiency

I wish to clarify the record regarding a reference to Kent State University in Mark N. McDermott and Edward W. Thomas's article "Foreign physics graduate students in the United States" (June, page 48). The article correctly identifies a communication problem at Kent State as the triggering event leading to state legislation that now requires all teaching assistants at state colleges and universities in Ohio to pass an oral proficiency test in English.

The clear implication within the context of the article is that the communication problem was with a graduate assistant. In fact, the problem was with a part-time instructor, rather than a graduate student.

Quite ahead of the state legislation, Kent State had already instituted its own English proficiency program in 1982. Kent State was the first public institution in Ohio to do so. Since that