

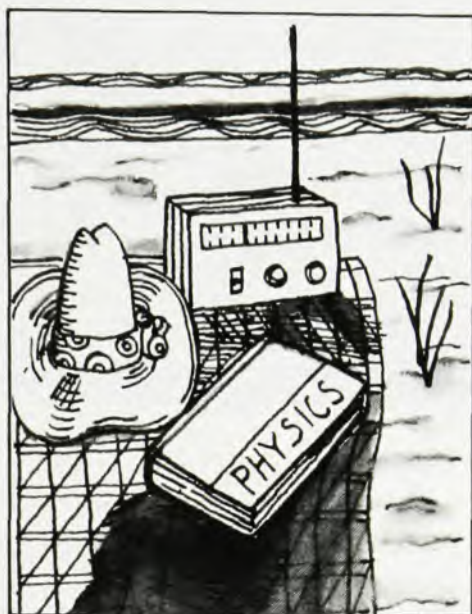
Physics for people

How should society cope with the excess production of PhDs in English? By reducing the number of undergraduate majors in English? By reducing the amount of effort, imagination and money put into undergraduate English teaching? Before you smile at the inappropriateness of such solutions, replace "English" by "physics" in these questions. In fact, we physicists have designed our undergraduate programs primarily to supply students to graduate physics programs. Now that the rate of production of physics PhDs is clearly too large, this misconception about the role of the undergraduate physics major is coming home to roost.

In the National Science Foundation budget submitted by the Administration to Congress this year, educational support—a large part of it for undergraduate education—was \$28 million less than last year. (Fortunately, Congress seems to be restoring most of this financial cut.) Presidential Science Adviser Edward David Jr is quoted in a recent issue of *Science* (12 March 1971, page 986) as saying that the Administration is "trying to cut back on the rate of increase of the pool of scientists and engineers." This is a desirable goal. But a sharp reduction in the support of undergraduate science is an unfortunate choice of means to this end.

On a smaller scale, the American Institute of Physics, in response to its own budget stringencies and guided by advice from representatives of its member societies, is reducing its expenditures for educational activities, most of which are directed to undergraduates. I can not be sure, but I believe that the thinking on the part of some of the advisers was "Why spend money on education? We have too many physicists already."

I believe that we teachers of physics have only ourselves to blame for this situation. To use a word currently popular on the campuses, we have been "elitist" in our attitude toward the undergraduate major. Physics now accounts for less than 0.7% of all bachelors' degrees, far too small a fraction. More than 60% of these physics bachelors pursue graduate study in physics. These numbers tell the story. We have abdicated to our colleagues in other departments the job of providing an



interesting program for students who want to major in a subject without a professional goal in that subject.

Given the typical pattern of our undergraduate instruction, it is in fact logical—however regrettable—to cut down the PhD production rate by discouraging undergraduate majors. Yet we should be going in exactly the opposite direction, rising to our responsibility to educate *people*. One-semester "Physics-for-Poets" courses, commendable though they may be, are not enough. We need interesting and meaningful major programs for future teachers, lawyers, physicians, businessmen, authors and it was good to learn, at the AAPT meeting in Beloit, Wisconsin, in June (Session A) that several institutions are now developing such programs.

Kenneth W. Ford

Council on Physics in Education,
American Association of Physics Teachers

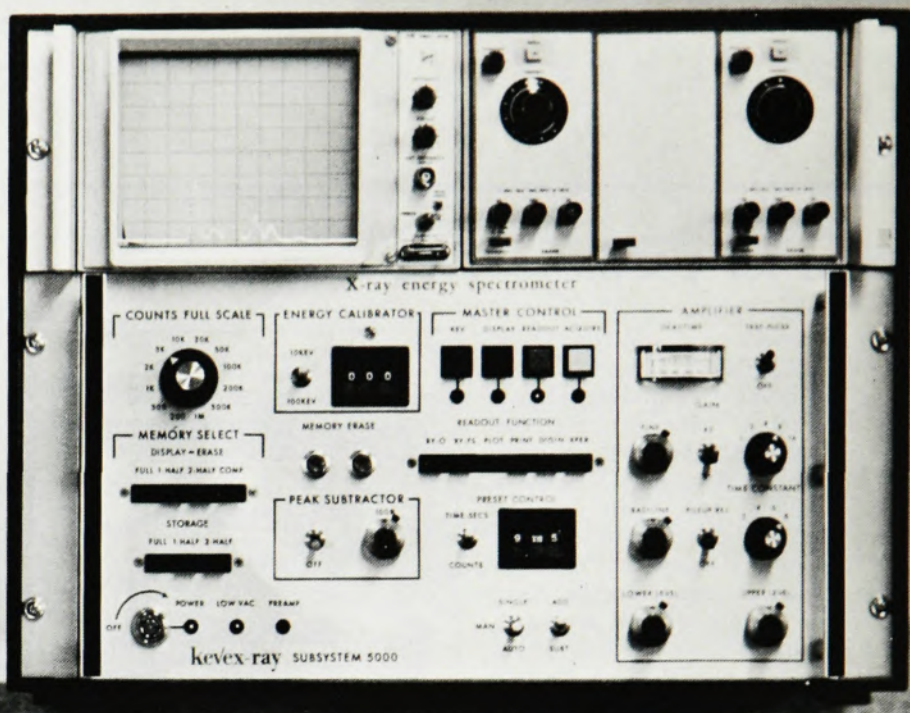
Indian summer institutes

I was gratified to read the positive assessment of the Indian Summer Science Institutes given by Pamela T. Lindstrom in her recent letter (April, page 61). The attention of your readers should also be called to Lester Paldy's article on a Bombay institute, which appeared in the February 1971 issue of

The Physics Teacher. Mrs. Lindstrom notes correctly that the probability of finding a satisfactory institute may be greater at a college situated in a metropolitan area such as Bombay than in a provincial center, and indeed the quality of the institutes offered during any one year do vary considerably. Nevertheless, having been associated with the program in several capacities since 1967 I would agree that in general its overall effectiveness has improved remarkably and has evolved in the directions most appropriate to Indian conditions. Not only have the materials used become more Indianized and the teaching methods less traditional, but in addition a greater fraction of the institutes on both the secondary school and college levels are devoted to specialized topics.

Although we at NSF would like to claim some hand in these developments, the bulk of the credit goes to our Indian colleagues and to the many dedicated US college and high-school physics teachers who have served as institute consultants since the inception of the program in 1964. Contrary to what Mrs. Lindstrom states, however, the institutes are financed entirely by the government of India. NSF's financial assistance consists only in paying the salaries, travel and living expenses of the US consultants. During 1966 and 1967, the peak years of our participation, one or two consultants were sent to almost every institute. Since then the US input has been phasing out, so that beginning this year NSF is sending consultants only to special-purpose institutes as requested by the government of India. The program is now almost completely an Indian one and has become a more or less permanent and self sustaining feature of the educational scene here.

During the years of its existence the summer science-institute program has had a considerable effect on the structure as well as the content of Indian science education. It has got a number of prominent university scientists involved in the problems of school and college education, led to the identification of young, potential educational leaders in all parts of the country, brought the desire for meaningful educational reform down to the level



Edward Woo has done it again

PPB trace analysis using Si(Li) Detector

T. B. Johansson, R. Akselsson and S. A. E. Johansson have reported increased sensitivity of X-ray analysis by using heavy particles for excitation of X-rays instead of the previously used X-rays or electrons. (See Nuclear Instruments and Methods 84: 141-143, 1970.) The cross section for X-ray production is larger for heavy excitation particles and the background contribution from bremsstrahlung is low. The limit of detection reported is of the order of 10^{-11} grams while the theoretical extrapolation shows that 10^{-15} grams level might be obtainable.

Edward Woo has provided detectors for subsequent investigation of heavy particle excitation of X-rays. This time the experimenters are using his 160 eV high-resolving power detectors.

Kevex has developed a new live time corrector that accounts for the pulses "lost" in pulse pileup in the shaping amplifier. This should be important to Ge(Li) and Si(Li) detector users. Ask about the Lowes' Live Time Corrector.



Nuclear Physics Division, Kevex Corporation
898 Mahler Road, Burlingame, CA 94010
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letters

of the college and secondary-school teacher, and stimulated a number of long-range educational projects, such as in the development of curriculum materials, laboratory apparatus, and teaching aids. The government of India has sought the advice of NSF in establishing a number of these programs, and, when requested to do so our office has brought in specialists to serve as consultants. Thus even though NSF's participation in the regular summer-institute program has ended, there are still a number of opportunities for qualified US physicists to offer their services in assisting the development of physics education in India.

W. A. Blanpied

Agency for International Development
New Delhi

Record rapid publication

The rapid publication of the *Proceedings* of the Tenth International Conference on the Physics of Semiconductors, Cambridge, Massachusetts is by no means a record as suggested by J. E. Fischer in his letter in the May issue (page 13). Congratulations are nevertheless in order. The 820-page *Proceedings* of the International Conference on properties of Nuclear States, Montreal, Canada (M. Harvey, R. Y. Cusson, J. S. Geiger, J. M. Pearson, eds.) was available within 14 weeks from the end of the conference. The record, however, I believe is held by the editors of the 990-page *Proceedings* of the 1960 International Conference on Nuclear Structure, Kingston, Canada (D. A. Bromley, E. W. Vogt, eds.) with a production time of less than two months.

M. Harvey

Chalk River Nuclear Laboratories
Chalk River, Ontario

Physicist production

Although the evidence is overwhelming that production of new physicists will continue to exceed demand for many years, there has been a reluctance on the part of most physicists to accept any but voluntary mechanisms to control the production process. Even the gloomy Grodzins report¹ couches its recommendations in language such as:

"Physics departments should tighten their standards for the PhD."

"Physics departments must reexamine their training programs especially for careers for which few employment opportunities exist."

"We should reduce those financial inducements that channel students into fields of little employment potential."

The report makes no suggestions as to

how these recommendations are to be implemented, so we must conclude that the authors of the report believe that departments will altruistically turn away a good fraction of the few students they can now attract, purge research assistants from their research groups, and otherwise seek to reduce graduate enrollments (as well as the "head count").

As one of the few who have suggested that it might be appropriate to consider nonvoluntary constraints on graduate programs to control the production of new physicists,² I have heard from numerous correspondents that natural processes will certainly limit the proliferation of new advanced degree programs. To check this hypothesis I have surveyed the latest three editions of the "AIP Directory of Physics and Astronomy Faculties" to see how many graduate programs were being phased out. The results are shown in the table.

Changes in Physics Graduate Programs

Change in program	Number of institutions	
	1968-9 to 1969-70	1969-70 to 1970-71
B → M	9	13
M → D	1	3
X → D	0	3*
D → M	1*	1*
M → B	2	1
M → X	1	0

B—Highest physics degree granted is bachelors.

M—Highest physics degree granted is masters.

D—Highest physics degree granted is doctorate.

X—Not listed in AIP Directory.

* It appears that one school in each of these three categories may be incorrectly listed as a doctoral-level institution in the AIP Directory.

The disturbing aspect of these data is not so much the proliferation of new programs—a net increase of 21 new masters' programs and 5 new PhD programs (assuming that all PhD-granting institutions also grant masters' degrees)—as the indication that the trend is not slowing down. Six of the seven new doctoral-level programs were instituted in the academic year 1970-71, even though the handwriting has been on the wall for several years. The net increase in masters'-level programs was 16 in this year, as compared with six the previous year. Only two programs were phased out in the latest academic year, as opposed to five the previous year. (If we delete three questionable listings in the AIP Directories, the figures would be five new doctoral programs last year compared with one the year before, and none phased out.)

There is no evidence at all to support the contention that physics departments are reluctant to institute new graduate programs, even though the likelihood that their graduates will find suitable positions is small. Rather, the evidence supports the belief that departments will continue to expand their graduate programs so long as funds and university approval are forthcoming.

This sort of evidence makes it hard to believe that calls for austerity and self-sacrifice on a voluntary basis by individual physics departments will effectively limit excess production of physicists. If voluntary measures fail, the limiting process will clearly be nonvoluntary. The physics community can seek to control the production of new physicists by mechanisms such as accreditation,² or it can sit back and let the Bureau of the Budget and other federal agencies decide which departments give what graduate degrees.

References

1. L. Grodzins *et al.*, "The manpower Crisis in Physics," APS Special Report (April 1971).
2. W. Silver, *American Scientist* 58, 362- (1970); A.P.A. Newsletter, page 1 (5 Jan. 1971); *physics today*, March 1971, page 9.

William Silver
University of Kansas
Lawrence

Polaroid and South Africa

As one of the black workers fired by Polaroid Corporation for protesting their support of South Africa and sale of products since 1938 in South Africa and as a scientist, I would like to respond to the letter in the April issue (page 9).

Polaroid has been doing business in South Africa for 33 years (only one year less than its existence as a corporation), and since 1953 has been the sole supplier of cameras and instant film for South Africa's pass system. Because Polaroid produces a product that South Africa *must* have in order to enforce apartheid, Polaroid receives a special status of taxation and is exempt from undistributed profits tax. All passbooks are produced on instant film; the pass laws are too rigid to allow an African to be without his pass for any length of time. Polaroid has a world monopoly on instant photography, and it is impossible to say that other companies produce South Africa's passes.

The "Polaroid Experiment" is a public fraud; the changes being made by Polaroid have nothing to do with freedom or self-determination, and are merely a buffer to allow Polaroid continued exploitation of black people and their land. Polaroid has stated that it will respect the law, the South African law clearly states that Africans will remain