port lie largely with this mix of applied and undirected science?

"Yes, through relating a social need to the schools as in Themis. On the other hand, for those scientists who decide they want to do research unrelated to a social need—whose only concern is to advance fundamental knowledge—I believe that a self-conscious analysis of their scientific activity is in order. In the future we must do only those experiments that are crucial to theoretical issues. Some scientists seem to want to do research only if it is useless."

• *Do you feel that basic science could profitably perform its own hindsight analysis over a longer time period?*

"I think one could learn a great deal about how to proceed more efficiently in basic science by a retrospective analysis of the really critical contributions. Basic science should look at what basic science has done. If they want to have a happy future, scientists should invest their time in a study of their own accomplishments. John Platt, formerly of the University of Chicago, makes the point in various articles and books that, in high-energy physics and molecular biology, a very sharply focused pattern of research has developed, aimed not at the truth but on blocking out error efficiently. He feels this approach accounts for their very high rates of progress.

"I believe the theory of the efficient advance of scientific knowledge is an open subject for research. Until a systematic analysis of what scientific discoveries were really critical historically, we really don't know what the relation is between focused and unfocused effort. Such a study is probably one of the most valuable activities of society in the long run, and yet it is not being subjected to critical understanding by anybody, least of all by scientists."

• *Do you think that the pure physicist whose devotion is only to his subject will become an increasingly rare individual in the future?*

"A smaller fraction of physicists today and in the future, no matter what their inclinations, are going to do the really frontier basic science, simply because of the high unit costs. Many who want to do basic research because of the long tradition of the community are just not going to be funded unless they invent a new frontier field that is relatively inexpensive.

"On the other hand, there are tremendous opportunities in the newer fields of oceanography and transportation where a good physics training makes an ideal basis. Physics has practically taken over the chemistry analysis business. There is a wonderful future for physics in the whole field of medical instrumentation."

• *But the newer disciplines that attack our social problems do not generally require extensive application of physics research.*

"That is true. The needs of society today are not matched by physics to the same degree they were 20 years ago. One reason, of course, is that the frontiers of physics have moved well away from urgent practical affairs. Basic science is in crisis, a crisis caused by success."

• *What do you foresee after Vietnam for basic research support?*

"The United States is an extremely wealthy country, and we can even now increase enormously our basic-research effort. But we are afraid to let loose and spend our resources on public goals: increased scientific research as well as pollution control and improved cities. We still have a Depression mentality; we still remember the days of poverty for most of us. We lack only the will to accomplish our many goals."

• *How long will it be before the public is sufficiently sophisticated to exercise this will?*

"I say it will be another decade before we realize we are rich and know how to spend our riches. And I also think the fine arts and other activities that don't have immediate economic or social benefits will also profit. In other words, we will be able to afford a whole lot of elegant, complicated and exciting intellectual activities that we never had thought we could afford before. And I think science will share in this realization." —BH

UNESCO Sponsors Project For Teaching Crystallography

United Nations Educational, Scientific and Cultural Organization will sponsor a pilot project on the teaching of crystallography in relation to the physics and chemistry of solids. The endeavor will concentrate on developing new learning materials that can be integrated into existing curricula or that may inspire new approaches.

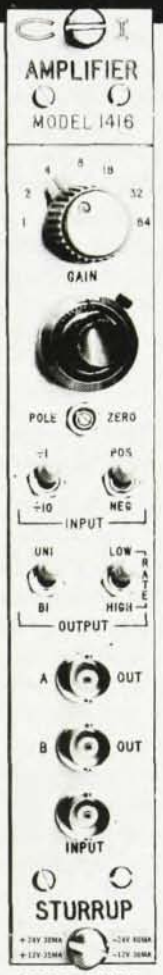
The International Union of Crystallography will collaborate with UNESCO on the project, and the International Commission on Physics Education of the International Union of Pure and Applied Physics will help publicize it. It is expected that groups will form in several countries at laboratories known for their research and teaching and that such groups will be the focal points of activity for carrying out the project. All proposals can be sent to (and further information can be obtained from) A. Guinier, chairman of the teaching commission of IUCr, Laboratoire de Physique du Solide, Faculté des Sciences, Bâtiment 210, Orsay (Essonne), France; with a carbon copy to N. Joel, UNESCO, Place Fontenoy, Paris 7, France.

AIP Initiates New Manpower Surveys with NSF Support

A study of attrition from the ranks of physics students and another on supply and demand for research physics personnel will be undertaken by the Education and Manpower division of the American Institute of Physics under a recent grant of $63 825 for two years from the National Science Foundation. Susanne Ellis, who will supervise the two new programs, explained to PHYSICS TODAY that the new studies will pursue questions raised by previous studies. The older programs, initiated under NSF grants which led to the report *Physics Manpower 1966* (PHYSICS TODAY, January, page 103), are being carried on with AIP funds.

The study of attrition among students begins with undergraduate physics majors at the junior and senior level and follows those students who comprise the attrition between successive physics degrees. A similar survey was previously conducted by the Education and Manpower division (PHYSICS TODAY, March, page 75), but then it was the physics department chairmen who supplied only general reasons for student dropout. In the new survey

CANBERRA'S NEW AMPLIFIERS will improve the resolution of your Spectroscopy System!



MODEL 1416

MODEL 1417

A BOLD STATEMENT... BUT WE CAN PROVE IT IN YOUR LABORATORY!

The Canberra Model 1416 Spectroscopy Amplifier incorporates the many recent advances in nuclear pulse amplifier design.
A few of its many unique features are as follows:

- Active element pulse shaping.
- Adjustable Pole/Zero cancellation via front panel.
- Ten turn fine gain control.
- Linear integrated circuit construction.
- Switch selectable count rate performance optimization.
- Ultra-low noise contribution of less than 6 V RMS referred to input.
- Prompt and delayed outputs.
- Internally selectable gaussian shaping time constants of 0.5, 1.0, and 2.0 microseconds.
- Constant gain regardless of shaping time constant or mode selected.

The Model 1417 Spectroscopy Amplifier is similar to the model 1416 in overall performance, specifications and design. It does however, offer a number of features not found on the 1416.

- Selectable gaussian shaping time constants of 0.25, 0.5, 1.0, 2.0 and 4.0 via front panel control.
- Adjustable controls to set DC level outputs.
- Input mode selection of 1000 ohms, 93 ohms or —10 input attenuation.

The Canberra Amplifiers are truely state of the art design. Because of their near-optimum gaussian pulse shaping, they offer unmatched performance in high resolution spectroscopy systems, and with their extremely low crossover jitter and excellent overall performance they are equally well suited for coincidence timing or high count rate applications.

Write today or call us (203-346-9681)
for a demonstration in your lab . . .
we know you'll like it!

CANBERRA Canberra Industries, 50 Silver Street, Middletown, Conn. 06457

all students are directly polled to ensure greater precision in the results. With this method the surveyors can construct a clear picture of the flow of dropouts into the labor market and the reasons for changes in the original plans of the students.

The other study will attempt to answer the question of whether our academic institutions supply the need for technically trained personnel at various levels for research laboratories all over the country. A member of the Education and Manpower staff will visit laboratories (the survey will include approximately 40 laboratories from industry, government and education) and will work with the personnel departments to compile data on their physicists and supporting staff. The survey will compare the occupational specializations of individuals with the types of training they received and compare the existing balance between these with the needs of the laboratories. For example, one of the questions is how much time a physicist actually spends on physics in relation to other work. The data are compiled from company records established at intervals of three years and six years. These records show what the laboratories could or could not do in the past and how these demands might reflect on future training and specialization.

AIP Information Program Receives Four NSF Grants

The National Science Foundation in recent months has provided four new grants to the American Institute of Physics for its information activities. The grants are currently supporting preliminary investigations of problems concerning indexing, vocabulary, standardized data elements, existing information programs and computerized composition.

The first grant provides for a series of committee meetings and seminars that will stimulate discussion of current developments in the information field. The grant is for $14 175. A group of 14 prominent physicists, representing the institute's member societies and with professional interests in the information project, will meet to gather background information and to represent the views of their respective societies. So far, the committee has held two meetings, the most recent in April at The Hotel Roosevelt in New York City. Because of the fundamental nature of the talks, the eminence of the speakers and the overall picture of the information area to be presented and discussed, the AIP governing board was invited to attend. Committee members, board members and AIP staff numbered approximately 48, and, in addition, eight speakers participated in part of the session. Committee members are as follows: Lucien Biberman, Walker Bleakney, Sanborn C. Brown, Robinson Burbank, Paul Cross, Edward E. David Jr, Conyers Herring, Elliot A. Kearsley, Thomas Lauritsen, David W. McCall, Philip M. Morse,

FELLOWSHIPS

The National Science Foundation has announced six fellowship programs for predoctoral and postdoctoral scientists and science teachers.

Graduate fellowships: Approximately 2500 awards for study or work leading to MS or PhD degrees in physics and other sciences at US or foreign institutions. Stipend: $2400 for first-year level, $2600 for intermediate and $2800 for terminal-level students. For fellows on 12-month tenure, $500 allowance each dependent. New applicants may request one or two-year tenures. Current NSF graduate fellows may apply for only one year. Applicants must be US citizens or nationals and already admitted to graduate status by school they select. Deadline for applications: 8 Dec. Apply to: Fellowship Office, National Academy of Sciences, 2101 Constitution Ave., N. W., Washington, D. C. 20418.

Postdoctoral fellowships: Approximately 150 awards for full-time study or research at the postdoctoral level at US or foreign institutions. Stipend: $6500 for 12 months, $500 for each dependent. Tenure: Usually nine or 12 months, but tenures ranging from six to 24 months may be awarded. Applicants must be US citizens or nationals with a PhD or equivalent in research experience. Deadline: 11 Dec. Apply to: same as above.

Senior postdoctoral fellowships: Approximately 65 awards for full-time study or research at the senior postdoctoral level at US or foreign institutions. Stipend: Based on the fellow's salaried income for 1967-68 academic year, up to $15 000 per year. Tenure: Usually nine or 12 months, but tenures ranging from three to 24 months may be awarded. Applicants must be US citizens who have held the PhD for at least five years or who have equivalent research experience. Deadline: 9 Oct. Apply to: Senior Fellowships Program, Division of Graduate Education in Science, NSF, Washington, D. C.

Science faculty fellowships: Approximately 275 awards for full-time study or research at US or foreign institutions for college science teachers. Stipend: Based on fellow's salaried income for 1967–68 academic year, not to exceed $15 000 per annum. Tenure: Usually nine to 12 months; three to 15 months tenures also possible. Applicants must be US citizens or nationals with a BS or equivalent, who have three or more years teaching experience at the college level and who intend to continue teaching. Deadline: 9 Oct. Apply to: Division of Graduate Education in Science at NSF.

NATO postdoctoral fellowships: About 40 awards for full-time research or study at the postdoctoral level in a NATO-member country or one coöperating with NATO. Stipend: $6500 for full year, $500 for each dependent. Tenure: Normally nine or 12 months. Applicants must be US citizens or nationals with a PhD and competence in the language of country chosen for study. Deadline: 2 Oct. Apply to: Fellowship Office, National Research Council, 2101 Constitution Ave., N.W., Washington, D. C. 20418.

NATO senior fellowships: About 20 awards for full-time research or study at the senior postdoctoral level in a NATO-member or NATO-coöperating country. Stipend: Per diem allowance of $16 and jet coach travel to and from country. Tenure: Normally one to three months, maximum up to six months. Applicants must be US citizens with full professional standing and competence in language of country chosen for study. Deadline: applications considered periodically. Apply to: Division of Graduate Education in Science at NSF.