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