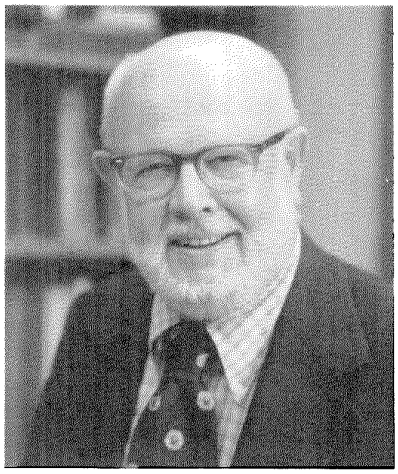
Opinion



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The following remarks were excerpted from the Oral History Project of the Caltech Archives.

As physics becomes more and more sophisticated, requiring larger and larger facilities, it seems almost inevitable that physics is going to be done in big central locations. The trend is to form university teams, or users' groups, working at large national laboratories; the federal agencies claim they cannot continue to support expensive projects at individual universities. This has already happened in elementary particle physics; you just cannot perform the actual experiments at a university anymore. The Caltech synchrotron was shut down years ago along with many other on-campus university installations, and elementary particle physicists now do their work at CERN or DESY in Europe, or at Fermilab, SLAC, or Cornell in the United States. What goes on at SLAC (Stanford) or Cornell is not on-campus research in my use of the term.

Now the same thing is happening in nuclear physics. There is enormous pressure to cut down on National Science Foundation support for accelerator groups. University accelerator labs have been closed down all over the country. Kellogg Laboratory here at Caltech is an exception. At 52 years old it is one of the last ones left, and it has continued to be enormously successful. I can't really complain about the tremendous amount of support for our work there. When we decided that we needed a new low energy accelerator a few years ago, the NSF provided a million dollars, and Caltech built a new million-dollar laboratory for us.

Kellogg will continue to do low energy nuclear astrophysics, using established techniques to accumulate more and more information. But low energy nuclear physics is no longer quite the glamorous subject it once was, and younger people entering the field now are attracted to the intermediate energy accelerators that exist only at national laboratories such as Los Alamos and the new electron accelerator proposed for construction near Norfolk, Virginia. It's thought to be more "exciting" than the work in low energy physics as applied to astrophysics.

National labs may well be an efficient use of resources, but the trend still worries me. I think the trend should not be allowed to happen just by default without at least giving serious thought to the consequences. What will happen is that university campuses will become places where research is done in chemistry, geology, biology — but more and more branches of physics will have to be done at the big central installations. Hands-on physics research — research with actual results — will disappear from university laboratories. Yes, users' groups still do use university laboratories; they build a lot of equipment on campus before taking it to the national labs. But that's a completely different mode of operation from graduate students actually doing their work and getting their results at a university. If graduate students do their course work in a couple of years and then disappear to Fermilab for three years to do their theses, I think this is going to change the whole character of university research, and I'm not sure it's for the better.

I think we've *got* to keep physics alive in the university laboratories. In the system that has been developed in the United States since World War II, physics is done in a three-way partnership — in universities, in industrial labs, and in national labs. All three have made substantial contributions, and for us to give up one of them may turn out to be disastrous. The comparison that always comes up is with the Soviet Union, which may not be a very good example since they don't have any industrial labs anyway. But they also have pratically no laboratories in their universities. Students go to the university to learn graduate work and then to one of the big institutes of the Soviet Academy of Sciences to do experimental work. And, quite possibly as a consequence of this, while the Russians are tops in theoretical work, the contributions in experimental physics that have come out of the Soviet Union in the last decade have not been first class in my opinion.

The Nobel Prize that was awarded to me last year was essentially an award to the Kellogg Laboratory. I am convinced that I was chosen among a great number of other candidates because of the *experimental* work (on the nuclear reactions that produce the chemical elements in the universe) performed in Kellogg by Charles Lauritsen, Thomas Lauritsen, Charles Barnes, Ralph Kavanagh, Tom Tombrello, Ward Whaling, myself, and our many graduate students and postdoctoral fellows. I now want to use any influence I have to urge the National Science Board and the Department of Energy to conduct a study of the funding of on- campus university laboratories and then decide what is best for future generations of physicists. □