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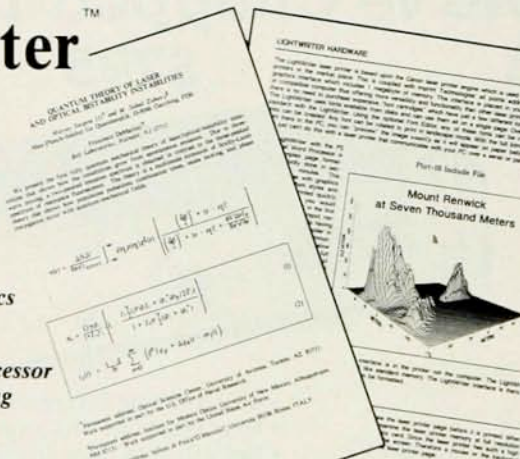
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letters

Engineers in the United States: 1983, publication NSF 85-303, National Science Foundation (1985).

MARK N. McDERMOTT
University of Washington
Seattle, Washington
EDWARD W. THOMAS
Georgia Institute of Technology
Atlanta, Georgia

4/87

CLARK REPLIES: Joseph Lang and his coauthors raise a valid question regarding the constancy of the value that our society places on professional physicists. That value can and does vary sharply with time, as most of us who received our degrees in the late 1960s and early 1970s can testify. Just as the price of gold or West Texas crude is influenced by factors such as supply and demand, so also does the value of the particular talents or skills that an individual has to offer to society rise and fall with time. Professional physicists are not immune to these economic influences. As we plan for the education of professional physicists, we should earnestly endeavor to provide those opportunities that will best develop their talents and skills.

The point that I tried to make in the editorial is that the opportunity for participation in research by undergraduates provides an exceptional means to accomplish this end.

ROBERT BECK CLARK
Texas A&M University
College Station, Texas

4/87

Value of undergraduate research

I would like to comment on the article "Physics in the colleges," by Jerry P. Gollub and Neal B. Abraham (June, page 28). I was a physics major at Amherst College, 1966-70, and I am currently a research physicist at UCLA. It is my opinion that the faculty's research interests are of little, if any, concern to undergraduate physics majors. The level of skill and understanding required to contribute meaningfully to a worthwhile research project is considerably above that of an undergraduate major. How many of us as undergraduates could understand even a single (then) currently published journal article?

It is better to master the well-known before venturing into the unknown, and there certainly is plenty of the well-known to master. The companion article by Malcolm R. Beasley and Lawrence W. Jones, "Education for research" (page 36), argues that it is best to resist the pressure to get into

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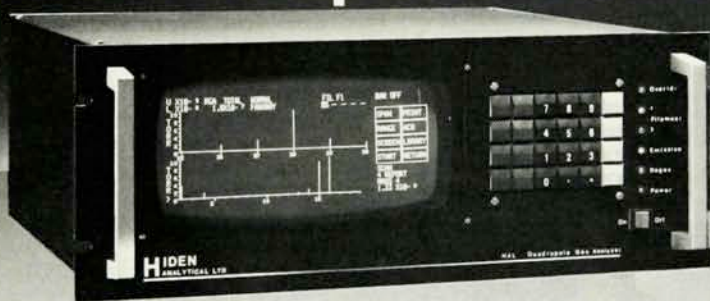
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letters

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-