letters

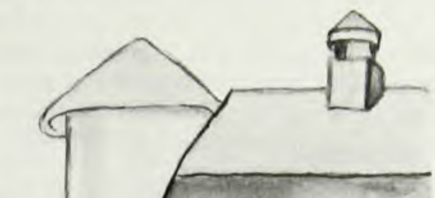
How the barn was born

Some time in December of 1942, the authors, being hungry and deprived temporarily of domestic cooking, were eating dinner in the cafeteria of the Union Building of Purdue University. With cigarettes and coffee the conversation turned to the topic uppermost in their minds, namely cross sections. In the course of the conversation, it was lamented that there was no name for the unit of cross section of 10^{-24} cm^2. It was natural to try to remedy this situation.

The tradition of naming a unit after some great man closely associated with the field ran into difficulties since no such person could be brought to mind. Failing in this, the names Oppenheimer and Bethe were tried, since these men had suggested and made possible the work on the problem with which the Purdue project was concerned. The "Oppenheimer" was discarded because of its length, although in retrospect an "Oppy" or "Oppie" would seem to be short enough. The "Bethe" was thought to lend itself to confusion because of the widespread use of the Greek letter. Since John Manley was directing the work at Purdue, his name was tried, but the "Manley" was thought to be too long. The "John" was considered, but was discarded because of the use of the term for purposes other than as the name of a person. The rural background of one of the authors then led to the bridging of the gap between the "John" and the "barn." This immediately seemed good and further it was pointed out that a cross section of 10^{-24} cm^2 for nuclear processes was really as big as a barn. Such was the birth of the "barn."

To the best knowledge of the authors, the first public (if it may be called that) use of the barn was in Report LAMS-2 (28 June, 1943) in which the barn was defined as a cross section of 1×10^{-24} cm^2.

EDITOR'S NOTE: The above is the full text of Los Alamos report "Note on the Origin of the Term 'barn'," LAMS 523, submitted by the authors 13 September, 1944, issued 5 March, 1947 and declassified 4 August, 1948.



The authors would like to insist that the "barn" is spelled just that way, that no capital letter "b" is needed, and that the plural is "barns" with no letter "e" involved, and that the symbol be a small "b." The meanings of "millibarn" and "kilobarn" are obvious.

M. G. HOLLOWAY
C. P. BAKER
Los Alamos, 1944

Physicists in industry

I should like to "second" most heartily the ideas and principles presented by Donald Hammond in his article, "Physicists in Industry" (April, page 42).

I feel that the concepts he presented should be regarded as "Bible" by physics students and particularly by physics teachers. I speak as a physicist who spent 24 years in industrial laboratories and who has taught physics in universities 21 years. My own experience bears out every point Hammond makes.

My training in college was broad and thorough in the principles of physics, and I was given more laboratory work than is now customary.

Both my master's and doctorate theses were in electronics and high-frequency electricity, and so I felt that I was something of an expert in this field. Consequently when, after some 15 years of teaching physics, I decided I'd like to try industrial research and development, I naturally found a job with one of the large electrical companies.

Here I found myself in a very strange world. No one else in our group had a doctor's degree but the others knew their specialities in a manner that far outclassed me. They knew tricks and short cuts which, had I been asked, I'd have sworn would not work.

I did however take some satisfaction in finding that each of my associates knew only his own field. Outside that field he was relatively a neophyte.

Fortunately for me, my supervisor was considerate and an excellent teacher, and I was given plenty of time to get "acclimated."

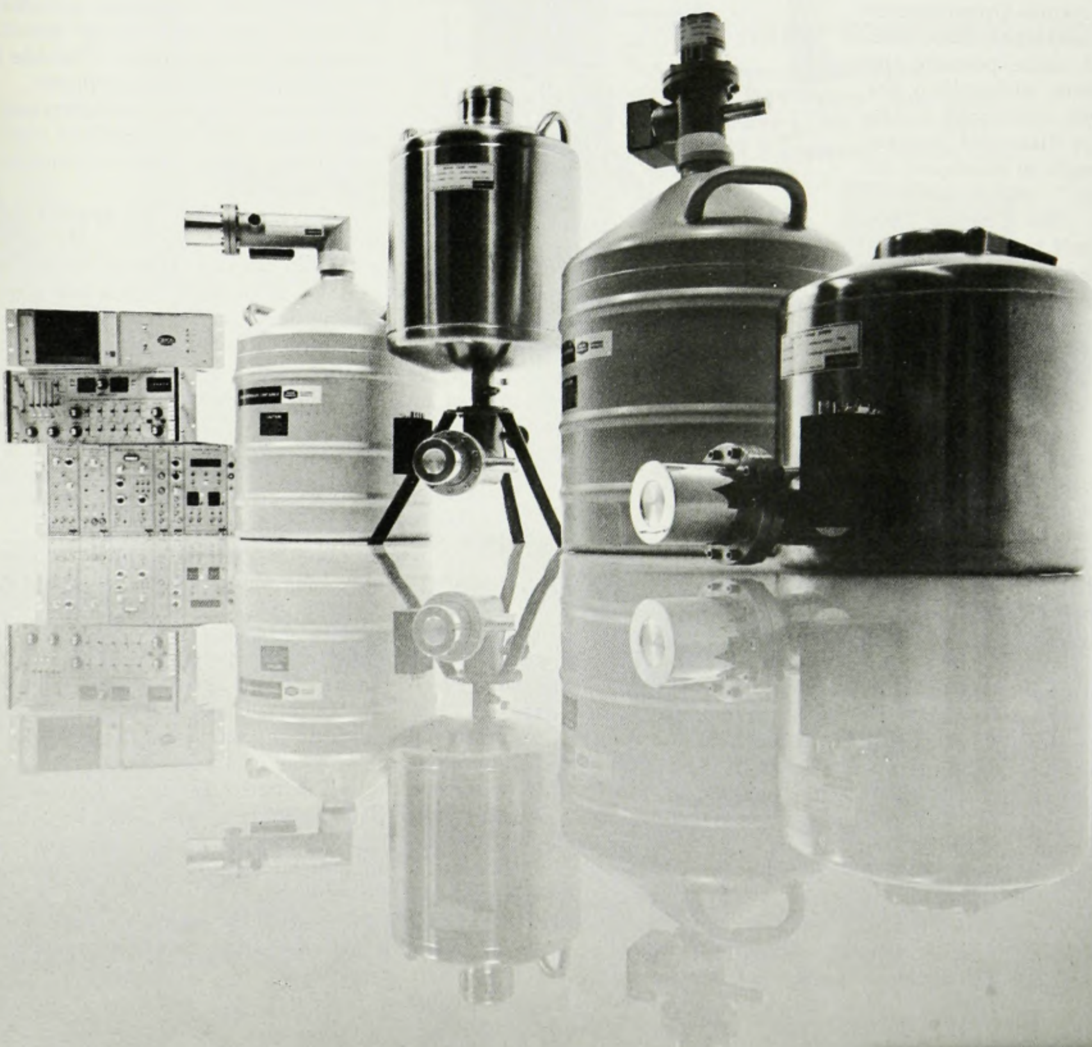
I also found that if I were to do the work expected of me I'd have to learn something about related fields—metallurgy, properties of glass and plastics, elasticities of material and so on.

After a few months of haunting the libraries and a lot of learning from my associates, I began to catch up. And by the end of the first year I was able to apply for my first patent. After a second year I found that I was being regarded as something of an authority in the field and was being invited to talk to engineering societies concerning the new field of high-frequency power applications.

After four years of living in the strange land of the East I yearned to get "back home" in the west and took a new job in the missile-guidance group of a large aircraft manufacturer. Although they had some problems in electronics I was given a badge reading "Consultant in Guidance" and was asked to act like a fireman and work on the hottest problem of the moment. I was a "physicist" wasn't I?

I confided to my group leader that I didn't know the first thing about missile guidance.

"Well then," he replied, "We'll all



learn together . . ." and learn I did. I spent hours reading reports that had been captured from the Germans and picking the brains of any of my associates who had had a bit more experience in some field than I had.

Again, after a year I was able to begin making contributions. I designed a testable model of an integrating accelerometer and it utilized the latest design developments such as air bearings. (I had never heard of a fluid bearing when I came to the guidance group). However, my background in basic physics allowed me quickly to understand the principles involved.

In my career in this field there followed a series of nearly fifty development assignments, no two of which were in the same area and each with some unusual specification or otherwise different than anything produced previously.

In 1966, when the aerospace industry began to falter, I went back to my first love—college teaching. But although I was to teach basic physics courses I was also chosen to teach a new course that was just being put in the curriculum—astronomy. I had never had a formal course in the subject. But, it proved to be another high-interest project, and I found that I liked to work with telescopes and the planetarium. And after all, astronomy is the father of physics and the heavenly bodies operate on the basic physical laws.

Hammond noted the problem of becoming "set" in one's field and for the need to keep "current." This is a very real problem both in industry and in teaching.

I believe however, that I have escaped this fate largely because of the wide variety of my jobs.

Also, I have not found aging the great handicap in getting new jobs, which it is often believed to be. Although the aerospace industry is not known for its job security—and I was forced to find a new job five times during my career—I was actually out of work only seven weeks in the 24 years I was in this activity.

Moreover, I was able to get three new jobs after I was 60 years old.

I think the key to this good fortune was the number of friends I made among my associates. I could always depend on them to give me excellent references and several times they exerted considerable effort in getting their bosses to interview me.

Of course in my application for a job I was always able to cite recent work that I had done and the fact that my experience had been so versatile.

As Hammond suggests I am sure that the physicist must get a new image. He must no longer be regarded as an egghead specialist who is trained to work on the frontiers of new knowledge, but rather as an individual who is so broadly trained, and so well grounded in basic principles and methods of attack, that he can successfully solve *any* physical problem given a reasonable time.

I remember a story published many years ago by the General Electric Company in which they told of hiring a new PhD and, as his first assignment, asking him to design a shed to house some field instruments.

The new hire was greatly incensed and protested that he'd spent eight years on his schooling and yet he was given a job that could be done better by a common carpenter.

The company's reply was that if he couldn't design the shed then they couldn't use him. They said that they could buy more informational knowledge in a $5.00 handbook than he could possibly learn in *sixteen* years of college. Rather, they needed men who could solve *new problems*—whatever the nature of those problems might be.

That story made a great impression on me, and I thoroughly believe that if physics students were taught to *solve physical problems* rather than to become specialists who know a great deal about a very narrow field, the jobless rate among them would drop precipitously.

WESLEY M. ROBERDS
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I read Donald L. Hammond's article with considerable interest. His description of the attitudes and personality traits that industry prefers may help me somewhat in advising students about where to apply for jobs. But does he really mean to suggest that university professors should attempt to mold a student's character to conform to industry's standards regarding such things as the proper amount of self-confidence and the proper degree of interest in salary? I for one have no intention of performing this service for industry or for anyone else.

ROBERT I. GAYLEY
State University of New York at Buffalo

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I am writing this letter to reply to a myth I feel is being perpetuated by articles such as the one by Donald Hammond. The myth is the concept that the present education one receives in physics has become too specialized and that what industry is looking for is people with a broad general background. There is also the implication that the education of a PhD in physics has changed over the years and this is why

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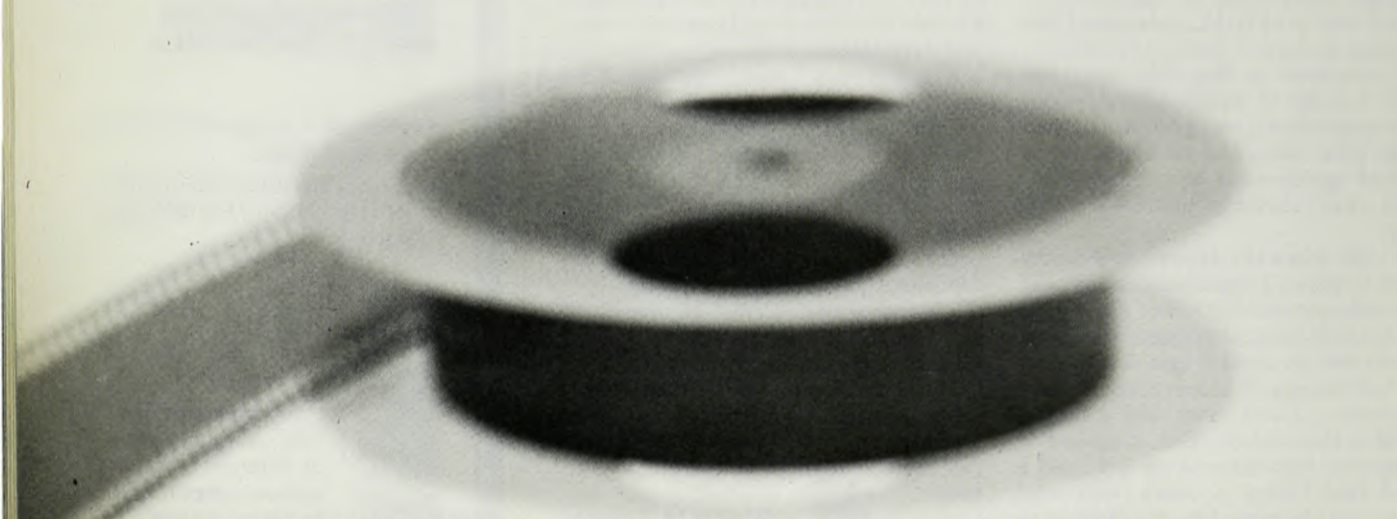

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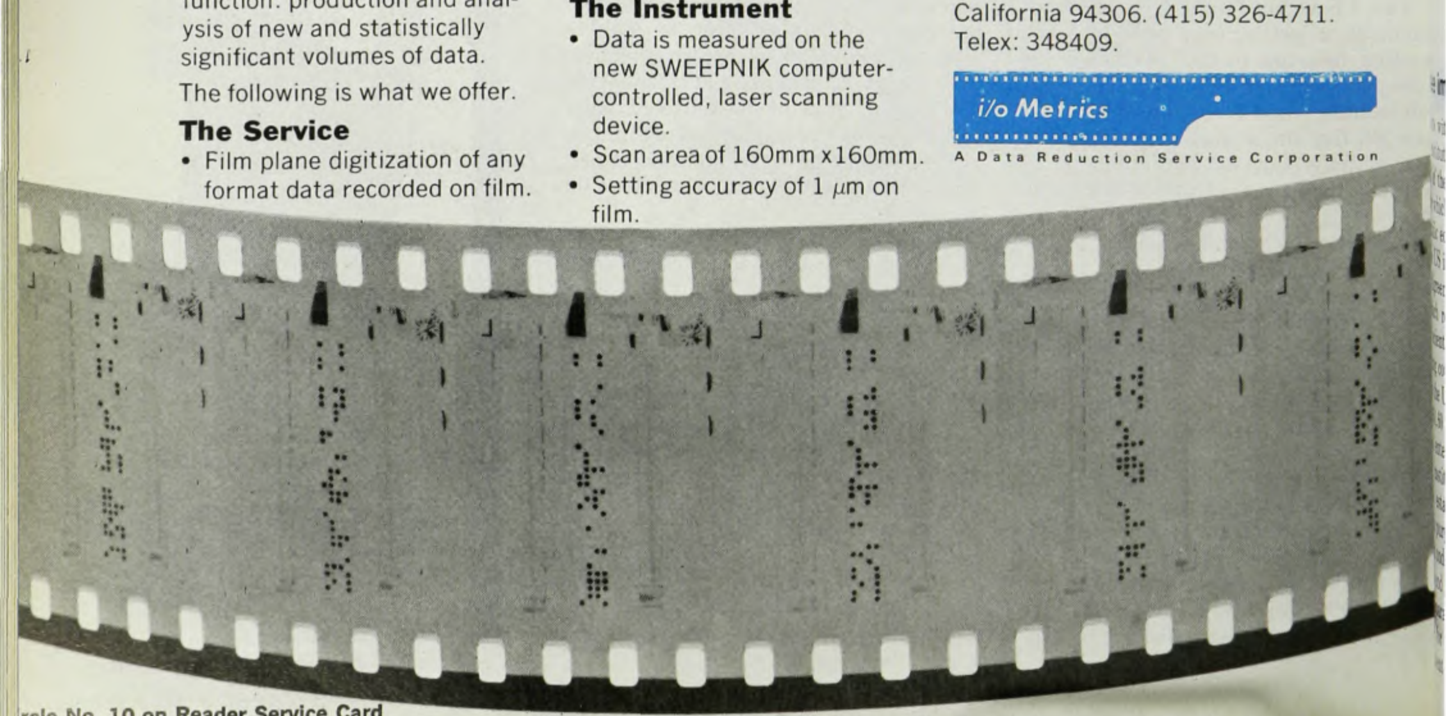

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there are not as many industrial openings for physicists.

The broad scientific education that you receive, *still receive*, in physics at many universities is not an asset—it has become a liability. When there was a shortage of trained technical people, a general background meant you could step into a job in a number of areas and complete it successfully. A good broadly based scientific background is still an asset after you get a job and encounter unexpected developments.

The change has taken place in getting the job in the first place. There is such a glut of trained people in many areas that companies wait to find someone who has done work in the exact area they have a project in, and if they wait long enough they will find somebody who fills the bill. This leaves the person with a good general background out in the cold.

The conclusion isn't that the PhD himself has changed as much as that the hiring practices of American industry has changed. There is the implication that multidisciplinary programs that are not tailored to fill a specific job opening will not be very successful. There is also the implication that very little can be done to a specific PhD program that can have any significant influence on the situation.

What is really needed is a change in national attitude. Getting a PhD, in anything, should not exclude you from employment in nonresearch areas. Unless changes are made in rigid hiring practices and salary schedules, the future of a PhD in physics will continue to be very bleak for some time to come.

JOHN P. SOKOL
University of Notre Dame
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Duty-free imports

My contacts with US universities and research institutes have convinced me that most of them are unaware of the rules under which they can purchase foreign scientific equipment free from US duty. The US is party to the so-called Florence Agreement, an international treaty, which regulates the duty free import of scientific equipment into the participating countries. This matter is covered in the United States Tariff under Item 851.60 which grants exemption to articles entered for the use of any nonprofit institution, whether public or private, established for educational or scientific purposes.

Included under the exemption are instruments and apparatus, if no instrument or apparatus of equivalent scientific value for the purposes for which the instrument or apparatus is intended to be used is being manufactured in the US. These such items can be imported free of duty. Duty-free treatment for the repair components for such instruments is also provided.

When applying for duty-free entry of such equipment, the purchaser will have to indicate that to the best of his knowledge no domestic equipment has the performance features that are required for his application. It is further stipulated that equipment so entered cannot be used for commerical purposes within five years after being entered and must be reserved exclusively for the institution involved.

RUDOLF FELDT
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Population exposure

The values for the cosmic-ray dose to Man given by Joseph Lieberman in his article "Ionizing Radiation Standards for Population Exposure" (November, page 32) appear to be considerably in error. He gives a value of 40 mrem per year for California, (presumably averaged over the entire population) which, taking into account current solar influence on cosmic-ray intensity and latitude effects, corresponds to an altitude of 1.3 km[1], nearly the elevation of Denver. The value given for Colorado, 120 mrem per year, corresponds to an altitude of 3 km, again accounting both for latitude and solar period[1]. By contrast, the corresponding sea-level dose rate is 28 mrem per year, and the corresponding dose rate at the elevation of Denver is 45 mrem per year[1]. As these numbers are used to assist in defining the perspective from which the assessment of risk is made, their accuracy is important.

Reference

1. Keran O'Brien, J. E. McLaughlin, Health Physics (to be published).

KERAN O'BRIEN
Atomic Energy Commission
New York, N. Y.

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Lieberman's article, like most studies on the subject, considers radiation hazards primarily in terms of amount of radiation entering the body from outside the body. Only passing mention is made of the hazards from nuclides that enter the body and remain for a finite time. The radiation dosage from such nuclides in close proximity to or inside of cells of especially vulnerable body parts—bone marrow, vital organs and glands—can be very large.

I would like to see more consideration of these hazards, particularly when computing effects from fallout from bomb tests or when estimating probability of surviving after a nuclear attack. How