

MOST INSTITUTIONS of higher education have maintained that the graduate school is the agency most concerned with research pursuits and the training thereof. In addition, in many institutions, a special title or chair awarded for excellence in research has been established. Frequently such awards are made by the university administration upon recommendation of the graduate dean and/or the graduate council. Such a situation exists at the University of Oklahoma where careful scrutiny of the faculty by the graduate dean and the graduate faculty—using all available information including publication record, evaluation of research output and referee reports from off-campus experts—permits the nomination of not more than two persons each year for the title of research professor. Such nominations are made only upon the unanimous recommendation of the graduate council (eight elected members of the graduate faculty), the associate dean and the dean of the graduate college. Such positions are, of course, potentially available to professors in all fields, and at the present time there are twelve such professors in science and engineering at the University of Oklahoma.

We certainly defer to the academic excellence of many institutions in the Ivy League, the Big Ten and on the West Coast, but characteristics and background shared by our distinguished scientists and engineers are, we believe, revelatory of similar characteristics common to many research scientists. Assuming this to be a valid hypothesis (the validity of which will doubtless be challenged by many), the dean of the graduate college has investigated the background of science and engineer research professors and found the following relevant characteristics shared by them.

These distinguished people reported an early, pervading and abiding curiosity about environments—physical,

biological, psychological, moral and aesthetic. All had early research experiences—many at the elementary and secondary school levels. Research interests have persisted in all their adult lives—to the age of retirement, for those nearing retirement, and probably beyond. And while they were not asked to do so, all probably subscribe to excerpted segments from Albert Szent-Gyorgyi's, "Secret of the Creative Impulse":

"Research wants egotists, real egotists, who seek their own pleasure and satisfaction, but find it in solving the puzzles of nature.

... To be driven by the desire to find new knowledge is only part of the story. I myself, being fairly ignorant of scientific literature, could find more knowledge new to me in an hour's time spent in the library than I could find at my workbench in a month or a year. It is not the truth that I am searching for; it is *new* truth.

... A scientific researcher has to be attracted by ... blank spots on the map of human knowledge, and, if needed, to give his life to fill them in. I am often ashamed of my ignorance when meeting colleagues whose knowledge of scientific literature is infinite as compared with mine. But if I am alone, I feel nice in my ignorance. It would weigh me down too much. I like to see things simply, a bit childishly, without much sophistication. I like to wonder about simple things. People often fail to see that something is a miracle if they see it often. To me the greatest and most exciting miracles are what I see around me every day.

... Scientific research is a sort of solving of puzzles, playing chess with nature, the grandest partner anyone could find. But solving puzzles or playing chess is not all there is to it, however fascinating this may be. There must be something afterward. A creative scientist, or artist, must find satisfaction in having created something—something that was not there before, however small it may be."

All of our science and engineering research professors encountered stimulating teachers in their background. Often these encounters came quite

early in their academic careers. The stimulus of an exciting teacher cannot be assessed quantitatively, of course, but the effects are significant and pervading.

The research professor group had a broad educational background, and not infrequently their interest shifted from one area to another as their intellectual exposure broadened. Broad backgrounds provided insights into the values of things other than the scientific. Certainly they would subscribe to John Tyndall's admonition,

"The inexorable advance of man's understanding in the path of knowledge, and those unquenchable claims of his moral and emotional nature, which the understanding can never satisfy, are here equally set forth. The world embraces not only a Newton, but a Shakespeare ... not only a Boyle, but a Raphael ... not only a Kant, but a Beethoven ... not only a Darwin, but a Carlyle. Not in each of these, but in all, is human nature whole."

All have engaged in a wide and continuous reading program—reading within the discipline and without. All have read critically, perceptively and quickly. Reading in one area has caused a snowballing into and beyond the bounds of that realm. Reading has whetted an insatiable appetite never dulled or surfeited.

They range in age from 43 to 70 years. They have been educated at many institutions. All have received their Ph.D. degree from well-recognized institutions of higher education. Three received their terminal degree at the University of Michigan, two at the University of Wisconsin, and one each at the University of Illinois, the University of Minnesota, Cal Tech, Cal, Harvard, Columbia and Cornell.

Undergraduate degrees and master's degrees were taken at a large number of institutions of varying qualities spread across the country and overseas. No significant pattern of undergraduate and master's degree institutions emerges.

THE RESEARCH PROFESSOR

A man attracted by blank spots on the map of human knowledge

By DR. ARTHUR H. DOERR

This group of distinguished researchers in science and technology has recognized the importance of a basic training in their academic discipline and ancillary areas. They subscribe to the importance of the essential tools of research, including especially mathematics (particularly statistics) and foreign languages. Most say, however, that an intimate knowledge of one foreign language is better than a perfunctory "reading" knowledge of two. They stress the importance of an understanding of the history and philosophy of science.

All have served an apprenticeship with a creative researcher, and certainly all agree that such a pursuit is most important for aspiring research scientists. The University of Oklahoma group would agree, too, that a researcher must let his imagination soar. He must not be trapped in a circumscribed set of "rules" or "laws." He must ask the simple question and expect the complex answer.

Always, and perhaps above all else, he must maintain a sense of perspective—a recognition that others are doing important work, too. Nor can he ever forget his debt to the past. Sir Isaac Newton put it simply, "If I have seen further than others it's because I have stood on the shoulders of giants."

He must view his task as urgent. The first-rate scientist recognizes a debt to society, to the state and to mankind. Surely Rathbone was right when he said, "The most important capital that any economy possesses is the skills which people carry around in their heads."

Perhaps the most difficult trait to acquire is toleration of dissent. Response to the challenge of a capable colleague often leads both to greater discovery. No scientist worthy of the name is satisfied with anything less than the best.

University of Oklahoma research professors would agree that the quest of a goal is important—its attainment sublimity.

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