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The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects are to further the work of scientists, to facilitate cooperation among them, to improve the effectiveness of science in the promotion of human welfare, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.

Technicians, Equipment, and Originality

Research mores are changing radically with the times. With the shift in attitude toward research from indifference to almost idolatry, there has come financial backing. And money has a powerful chemotactic effect, even on scientists. American science must "double and redouble" in size and strength, as several official reports have recently put it.

One reason for concern is the increasing growth of complexity, number, and cost of instruments and the growth in number, but decrease in capacity, of technicians. Instruments and technicians may, I suggest, reduce seriously the creativeness and originality of the young investigator. Before he has had the experience of being a naturalist, a man with his butterfly net, he is cast into a world consisting of a laboratory full of modern apparatus and two technicians who know how to do reliably almost nothing.

How can investigators keep the possibilities of fresh and creative approaches open for study? My suggestion is simple and, I am sure for many, simple-minded. When a young man starts his research, let him get his butterfly net out and put his thinking cap on. Sit down with the problem as it exists in nature—see and feel the problem—then decide how it can best be solved. With simple equipment and a clear plan, first he should try some preliminary orienting experiments with his own eyes and hands, not those of a technician. Then he should buy, or design, the necessary equipment and hire the technicians who may accelerate the work. Thus a problem might get solved, instead of just a paper being written.

Sir Alexander Fleming didn't have the benefit of modern instrumentation, a dishwasher, and a statistician to tell him what he had found. The latter, of course, could only tell him whether the results were "significant." I suspect Sir Alexander knew this already, don't you?

Am I trying to say that too much money is being spent on research? No, I am not. You must remember that research was a tenement-type operation just 15 years ago, and it takes time and money to clean out slums. Many laboratories need renovation, and many need rebuilding, and new ones need to be started. The total budget for research is still very small compared with items in the total budget of the United States, especially when you ruminate on how some of it is spent.

But the amount of money is not as important as how it is spent. I have touched on one problem. There are other problems such as the bigness of institutions, the tyranny of departmentalization, administrative rights, and responsibilities; the problem of expertness in mendicancy and problems of the ethics of science.

Neither scientists nor administrators have given much attention to the environment in which science is to grow. Until we are willing to give serious attention to these problems, we are not in a position to say "how much?" How much depends on what you have in mind. What I have in mind is to create a research environment in which originality thrives and technicians, equipment, and money are contributors—not roadblocks.—IRVINE H. PAGE, *Research Department, Cleveland Clinic, Cleveland, Ohio.*