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CONTENTS

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SOME CONDITIONS FOR EFFECTIVE RESEARCH[1]

THE first requisite for effective research has to do with the make-up of the research worker. Although it is outside the province of this paper to enter into an exhaustive discussion of the qualifications of a scientist, it is pertinent to point out some of the most essential characteristics. Training, intellectual power, physical fitness, application and integrity are requirements which need no explanation. Stability is a trait which is often given too little weight. Some of the ablest men are affected with a restlessness which impairs their usefulness. We need investigators who will devote a lifetime, if necessary, to a single problem instead of pursuing the latest scientific fad. In research, as in other fields, he who would succeed must be able to stand up under the strain of criticism, disappointment and failure. It is well to get away from the notion that the research man must be a genius or an abnormal type. With occasional exceptions he is merely an average person whose training and experience have fitted him for research and perhaps rendered him unfit for other vocations.

Assuming that we have the right type of investigators, what is needed to make their efforts most productive? The time was when the research worker's equipment consisted almost solely of an inquisitive frame of mind. This is still a primary requisite, but this alone is not enough. We are in an era of experimental research where facts count for more than logic. The world is no longer satisfied with general laws and principles. There is a call for specific information on thousands of subjects ranging from the education of children to the prediction of weather. Modern research requires modern facilities. This may mean laboratories fitted with expensive instruments, or it may mean comparatively limited apparatus but abundant facilities for travel and transportation. Research is as dependent upon equipment as is the modern factory.

The volume of work is so great that only a small part of it can be performed by investigators of first magnitude. This situation can be met by delegating work of a routine character to assistants who are trained to perform such duties but who for one reason or another are not qualified for independent research. Where a large number of instrumental

[1] Read at the fifth annual meeting of the Southwestern Division of the American Association for the Advancement of Science, El Paso, Texas, May 5 to 7, 1924.

readings is required, these can often be made as well by an apprentice as by a seasoned investigator. Draftsmen, accountants and typists can take a great load from the shoulders of the research worker. These well-known principles are not always practiced, with the result that research talent is wasted on relatively unimportant details.

Very often the investigator encounters problems which lead him outside the field in which he is trained. Studies of plant life, for instance, call for a knowledge not only of plants but of physics, chemistry, meteorology, geology and soils, not to mention the many phases of biology. Since the capacity of one individual to master various branches of science is limited, the logical solution is to obtain the assistance of specialists in the fields where he finds his own training deficient. Theoretically, the proper method of handling such problems is by a coordinated plan of attack involving specialists in the various lines concerned. In practice, such cooperation is difficult to secure because each worker usually finds his time more than taken up by his own problems.

All the foregoing suggestions point to the need for organized institutions for research where equipment, technical assistants and clerical help are provided and where the efforts of individual workers may be coordinated. There can be no doubt that such organizations promote efficiency. The one thing to be guarded against in any organization, however, is undue curtailment of individual freedom. This danger is especially great in state and government work, where appropriations are often made for specific projects or lines of work, and where the worker may be placed under pressure to make a quick showing of results. On the other hand, supervision and restrictions are often necessary to insure the direction of work along useful channels. Whether or not the advantages aimed at in organized research are realized depends very largely upon the directing head. In a large organization this head may be obliged to devote his time largely to administrative duties. He must be an administrator and at the same time a broad-gauge scientist—a combination which, unfortunately, is difficult to find.

By no means the smallest considerations are those affecting the living conditions, the home and social life of the workers. The research man is no longer a recluse who shuts himself up in a laboratory and whose thoughts are centered entirely on his own problems. He is made of the same clay and has much the same needs and desires as other human beings. If he lives a life of self-denial it is usually because of a small income rather than because of the exactions of his calling. He may be willing to make personal sacrifices for the sake of science, but he strives to give his family the advantages to which he feels that they are entitled. The opportunities for social life, recreation and contact with interests outside of his own profession afforded by adequate compensation will make of him a better scientist and a better citizen. If research does not offer such opportunities, it can not hope to attract men of ability.

Much depends upon the objects of research. But when we attempt to classify different kinds of research as to relative merit we immediately encounter difficulties. The discoveries which pass unnoticed to-day may acquire vast importance to-morrow. Investigations which aim directly at the solution of current problems command greatest attention from the public and even in the scientific world; yet every scientist knows that without the general store of knowledge accumulated by fundamental research the solution of current problems would be impossible. In the present age when utilitarian investigations are occupying the foreground we must look to our universities and institutions of a similar character to uphold fundamental research.

To make the most of his intellectual powers and opportunities every research worker should have a worthy incentive. Scientists take just pride in the feeling that their work is more to them than the means to a livelihood. To the true scientist the love of research is its own reward; but it is not an adequate reward. The thrill of discovery is a stimulus which quickens the pulse and brings forth temporary bursts of enthusiasm and energy, but it is not a sustaining force. Public appreciation and the esteem of fellow-workers has a strong appeal. The fact that positions of responsibility and distinction await those who can qualify for them is a spur to greater achievement. The greatest reward that can come to the research worker is to see the result of his labors applied in some line of human endeavor. In research, as in all other callings, service to mankind is the true measure of success.

Whatever may be the specific needs of research, their fulfillment is conditioned upon public approval. Whether research is supported by taxation or by private bequest, the public ultimately pays the bill. Those in whose power it lies to render material aid to research are usually not sentimentalists but business men, in the broader sense, who expect commensurate returns for every dollar expended. We must convince these people that research is a good investment. We must teach them to measure values by other standards than the dollar, but at the same time we must not ignore this standard. The medium through which the public can be most extensively reached is the press. Not all research problems lend themselves to popular treatment, but most subjects

can be presented in such form as to interest the more thoughtful and enlightened class of people. Needless to say, the aim of popular articles should be educational and should contain no suggestion of propaganda. Under certain conditions more can be done by personal contact than by writing. We should welcome every opportunity to explain our work to those who exhibit an interest in it. Above all, we should let it be known that we have definite objectives, and as far as possible point out what the attainment of these objectives will accomplish. It thus becomes the duty of research not only to discover new facts but also to disseminate and impress them upon the public conscience, for it is only when the public understands the value of research that it will be accorded the place it should occupy in our national life.

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A SUGGESTION FOR ABSTRACTS OF ANTHROPOLOGICAL LITERATURE

THE informing idea of abstracts is that, as cut-shorts, they indicate the important knowledge printed in a specific article about a certain subject. By their perusal the reader may quickly know whether or not he desires to read the original article. An abstract is simply a short, impersonal analysis of a longer printed original. It does not criticize or comment.

Abstracts are of two main kinds: One is the so-called *author's abstract;* the other may be called the *collaborator's abstract.*

The author's abstract is prepared by the author. It may have two designations—depending on whether it appears with the article abstracted, or appears separately. The former is a "preliminary abstract" —being a short digest of the longer article which immediately follows it in the same volume. When the author's abstract appears separately it may be designated a "lifted abstract"—which, elsewhere, was a preliminary abstract but which has now been lifted from the place of its first printing and appears unaccompanied by the article of which it is the abstract.

The second of the main kinds of abstracts, the collaborator's abstract, is prepared by a collaborator and not by the author. It is unaccompanied by the original article. In other words, the collaborator's abstract is never a preliminary abstract; it is more nearly akin to the lifted abstract.

Both the author's abstracts and the collaborator's abstracts may have been, and probably ought to have been, under the blue pencil of an expert editor, but the work of the editor as such does not give name to the abstract.

NEED FOR ABSTRACTS

The need for abstracting the literature in a scientific field is inevitable at a certain advanced stage in the increasing amount of the published data in that field. No one who teaches a full-time schedule can read all he desires to read, or ought to read, in any live scientific field to-day. His available time is insufficient. All of us habitually lay aside for vacation reading certain excellent articles or books which come to our libraries in the busiest periods of the university year.

If we agree that this is the condition in anthropology, what is to be done in an attempt to meet the situation? We must note, in passing, that we are not going to publish fewer articles in anthropology, simply because constantly we are publishing more—as all other growing sciences are doing. There are two reasonable answers to our question: *One,* we can, of course, read our customary amount and "forget" the increasing amount which, like the waters, will go over us if we sit still. This, as we grow old, all of us may increasingly do; but it is an extremely difficult thing for a vital American thus to sit still and let the waters go over him. *Two,* we can get some one else to read for us much of the increasing volume of printed matter.

A few of the most productive American scholars have possessed private funds, or other sources equally as rare to American university professors, which have enabled them for years at a time to multiply, as it were, their brains, pens and typewriters, and they have thus been able to accumulate for personal use a vast fund of information. Thus a secretary and a staff of readers read virtually everything, excerpting or abstracting those parts which it is believed their employer desires. This glimpses the plutocratic stage of abstracting, possible for only a few men.

PRESENT STATUS OF ABSTRACTING IN UNITED STATES

To-day the democratic stage of abstracting has dawned in a few fields for the use of all workers in those subjects. I quote the advertisement of a new abstract service to show how democratic and how inexpensive this service is in the field of sociology:

> The new abstract service offered by the American Sociological Society will provide subscribers with galley proof of the 100 abstracts each issue, 600 a year appearing in the *American Journal of Sociology,* of articles from the leading social-science periodicals in English, French, German, Italian, Scandinavian, and Spanish.

This service is to cost each subscribing member of the society one dollar per year. The following, ac-