*HOW CAN ENDOWMENTS BE USED MOST EFFECTIVELY FOR SCIENTIFIC RESEARCH?**

I AM not sure that I have rightly apprehended the special phase which it is desired the discussion should take, if, indeed, it is desired that it should take any one trend rather than another among those that are perhaps equally embraced under the broad theme announced. I have interpreted the question as though it read—*By what assignment of endowments can research be most effectually aided?*

I assume that, with some rare exceptions, endowments may be welcomed in whatever form they may come, but that their effectiveness may be much greater or much less according as they are judiciously or injudiciously placed. Some endowments, indeed, may be so hampered by restrictions that they are better declined than accepted, but these, it may be hoped, will grow more and more rare as intelligence relative to what is wise in the endowment of research increases.

I assume that the principles which control modern success in most other enterprises will be found applicable in general to the endowment of research, and that among these principles are specialization in subject, careful choice of talent, the largest possible use of the highest talent, the greatest possible avoidance of inferior talent, concentration of effort by institutions of limited means and coordination of effort between institutions of whatever means, rising to close combination in effort whenever practicable.

1. *Endowment of Chairs of Research.*—The time is fully ripe for the special endowment of chairs of research. The promise of results from such endowment is very great. Not a few of the chairs in our leading universities are devoted chiefly to research, but this is usually due more to the personal force and peculiar endowments of the occupant than to self-determined provision on the part of the institution or its patrons. The chairs that are endowed primarily for research are very rare. There ought no longer to be a struggle on the part of the capable investigator to free himself from obligations to teach that he may devote himself to creative work. It need not be urged here that creative work is more serviceable to mankind than expositional work or even disciplinary training. Real capability for investigation of a high order being granted, all pressure from the institutional environment should be such as to impel the investigator to give himself as undividedly as possible to research.

The endowment of *chairs* of research is here first urged, not because it is superior to the modes of endowment yet to be considered, but because it requires but a moderate gift, as gifts now run, and is, therefore, within the reach of a large number of possible patrons, to whom endowments in more than six figures are impossible. From $100,000 to $200,000 will effectively endow a chair of research from which great results in time may be expected. Endowments of less amounts may be made to provide that a specific fraction of the time of the occupant of a chair shall be devoted to investigation, and thus creative work may be effectively promoted by a modest sum.

2. *Endowments for Departmental Research.*—No scientific staff of a university should regard itself as fulfilling its mission in any adequate way if it does not devote an appreciable portion of its energies to investigation. At present the provision for research is usually rather vague and

* The annual discussion before the Washington meeting of the American Society of Naturalists, January 1, 1903. Dr. W. H. Welch, of Johns Hopkins University, also took part in the discussion, speaking with special reference to the Rockefeller Institute for Medical Research.

uncertain, if, indeed, there is specific provision for it at all. While research is theoretically recognized as a proper function and is perhaps cordially appreciated by the authorities of the institution, there is in actual practice a constant struggle between the demands of instruction and the desire for investigation, in which the preponderance of pressure growing out of the rapid growth of most universities too often lies on the instructional side. Relief for research is to be found in endowments specifically devoted to the purpose. It is here proposed that the endowment shall be made to the *department* rather than to a specific *chair*. The application of the revenue is, in this case, broader and more plastic than in the endowment of a specific chair. The function of research may be distributed among the members of the staff according to their capabilities and tastes, and thus give to them something of the touch and inspiration of creative work, while they may still retain an instructional function of greater or less degree; or it may be concentrated at one time in a given line by a given member, and at another time in a different line by another member, as conditions may favor. It is not in all cases—perhaps not in most cases—altogether best for the investigator to be relieved entirely from instructional function, since the exposition of his work has its good effect in forcing the organization of his thought. The critical review of it, as he assumes the obligation of presenting it to younger minds, is wholesome, as are also the questions and discussions incidental to such presentation. But the amount of such profitable instructional work has rather severe limitations.

Endowments for departmental research may wisely range through the permutations of six figures into those of seven.

3. *Endowments for Special Research-combinations.*—The early settlers of the broad fields of the interior were accustomed to leave a wide unbroken 'turn-row' along their line fences, and long after the general settlement of the country, these presented almost the only remaining virgin soil. It has been much so in the pioneer cultivation of the scientific fields. Between the recognized realms of physics, chemistry, astronomy, biology, geology and other sciences there is a border-ground which has been less cultivated than these recognized fields, and here lie the richest virgin grounds of the scientific domain. Their adequate culture requires the cooperation of men trained in the several cognate fields. A combination of men skilled in physics, astronomy and mathematics is essential to the highest results in astrophysics. An association of men skilled in chemistry, physics, mathematics and geology is requisite to the most promising attack upon the complicated problems of geophysics, and so of other border-grounds. There is, therefore, an eminent opportunity to promote research by endowments which shall provide for the cooperative investigation of two, three or more men whose combined talents and training may fit them to engage jointly in a common inquiry. The endowment here must be large to be effective, but where it can be made adequate, its promise of fruitage is most eminent.

4. *Endowments for Schools or Colleges of Research.*—This is but a larger phase of endowments for departmental research, but with this difference: in the latter it is presumed that the departmental staffs of universities will continue to be, as at present organized, primarily for instructional work, while in the proposed endowment of schools or colleges of research it is presumed that research will be the dominant feature and instructional work will be incidental. Very great creative results would flow from the judicious establish-

ment of schools of research in chemistry, physics, biology, geology and other sciences analogous to the staffs of astronomical observatories where investigative work is now the declared purpose.

In the initial stages of the development of this scheme it is assumed that these schools of research must be individual and localized in different institutions, since no institution does now, or probably can in the immediate future, command the means for the establishment of such schools in all the departments that invite investigation. But if one institution were to concentrate upon one science or one limited group of sciences, and another institution upon another science or limited group of sciences, the universities of the country might *together* cover the field effectively. It were much better, to my mind, if the aspirations of a university should take a definite specialized form of this kind in some one or some few lines, than that it should distribute its effort over all lines with inferior success in each because of its limitation in men and means. It is probably not beyond the resources of any great university to secure the development of some one or two effective schools of research if it were content to make a selective effort and were wise enough to do this.

5. *The Evolution of Universities into Assemblages of Research-schools.*—Ultimately it is to be hoped that each of the greater universities will succeed in developing a large group of research schools, and that with this there will come a gradual reorganization of the constitution of universities, involving their transition from the function of personal education to the higher function of creative work. The English universities are now essentially aggregates of colleges, each of which is mainly devoted to personal education. The ideal of a university, as here entertained, would make the coming university an association of colleges of research for the benefit of mankind as a whole. In the English university, the several colleges cover essentially the same ground and are duplicative in their work and competitive in their relations. In the ideal university the colleges would occupy distinctive fields and be supplementary and stimulative toward each other and in no sense duplicative. Their primary function would be creative work for all mankind rather than didactic or disciplinary work for individuals.

6. *Endowments for Independent Institutions of Research.*—The preceding discussion has related essentially to universities. Aside from organizations under governmental patronage, universities are at present the chief agencies of research. It is doubtless quite within the truth to place to their credit by far the largest amount of creative work done independently of government patronage. None the less there is, to my view, a large and special place for independent institutions of research and endowments for such independent institutions are invited by their promise of fruitfulness. Every university has its special relations with some portion of the social organism by which it is fostered, and to which, because of that fostering, it is in special bonds. While this relationship of support and consequent bondage is one of greatly preponderating good, it is not without its moiety of trammeling and limitation. In order to fill out the full complement of institutions suited to the most effective promotion of creative work, a class of institutions not subject to these relations is needed. These needed institutions might, indeed, likewise have their own special relationships with their own limitations and trammelings, but they should none the less fill a place not occupied by existing universities, nor likely to be occupied by them. More than this, these

independent institutions of research should stand in relations of wholesome competition to the universities, and by representing a different phase of endeavor should thereby contribute to the broadening of the sum total of influences at work for the promotion of research.

7. *Endowments for the Higher Coordination of Research.*—Whatever may be the development in any of the institutions to which the phenomenal generosity of American men of means has contributed, or may yet contribute, it must still remain true that for an indefinite time the whole field of research can not be effectively cultivated by any institution, and there must be large need for adjustment and cooperation, that the energies of research may be distributed to the greatest advantage. Even if it were possible for any institution reasonably to attempt the whole field, cooperation and coordination in research should be cultivated to prevent wastage by unnecessary duplication and to give the greatest and best results by the adjustment of work to work. At the present stage of development, provision for cooperation is eminently desirable and endowments devoted to this end give promise of being preeminently productive. The ideal scheme of coordination contemplates the correlation of talent and equipment in all the institutions devoted to research without regard to institutional relations. It should be as free as human nature may permit it to be from predilection toward one form of institutional organization rather than another. It should be its function to develop, to use and to coordinate talent, effort and equipment wherever it may be, quite regardless of institutional connection, or locality, or of other relations than its possibilities of fruitfulness in creative work.

It need not be remarked here that we seem to be on the threshold of this great realization, and it is not too much to hope that each of the other forms of endowment will, in some large measure, appeal to the phenomenal generosity and appreciation of American men of wealth.

T. C. Chamberlin.

I will confine my remarks to the question as to the most effective use of endowment for the publication of scientific work.

While in Europe, particularly on the continent, we find numerous publishers who undertake the publication of scientific works and periodicals as business ventures, there is no such publication known in our country, except in the applied sciences or in so far as books can be used as text-books. All work in pure science that is published in our country is published by the help of edowment of one kind or another.

It is not quite easy to determine the reason that has led to this state of affairs. It may be due partly to the newness of science in America, partly to the great cost of printing, and partly to the limited number of buyers of scientific books; but it seems also probable that the vast amount of scientific publication carried on by our government, and the lavish distribution of its publications have discouraged private enterprise.

The United States government and the state governments are the most liberal supporters of scientific publication. Next in importance are the scientific societies which are distributed all over our country. Third in order are universities and other institutions of learning; and, finally, wealthy friends of science. The total amount of money invested annually in scientific publications is quite considerable. A comparatively insignificant part only comes from that part of the public which purchases scientific publications on account of their contents. From an economical point of view this is an abnormal condition; and the question arises, whether

the method of scientific publication can not be so improved as to make the available funds more effective, and to secure the support of libraries and of private individuals who make use of scientific publications.

Setting aside the publications supported by the government, scientific publications may be roughly divided into journals devoted to special branches of science, special memoirs supported by scientific societies or institutions, and miscellaneous serials supported by general societies, such as academies of sciences and museums. Among these the only class that is entirely, or at least almost, self-supporting, are the special technical journals, which appeal to a well-defined group of people that constitute a society supporting the journal, or which are published by a few individuals and pay the cost of manufacture through subscriptions. The second and third classes of publications are almost entirely supported by voluntary contributions, not by the public that makes use of them. If it were feasible to readjust the conditions of publication in such a manner as to create a market for the publications here referred to, the facilities for publication would be materially increased, the available endowment would be made more effective, and the claims for more liberal financial support would become justifiable.

It seems to my mind that the traditional policy of societies and other scientific institutions to publish serials devoted to miscellaneous subjects is, to a great extent, the cause of present conditions, and that by proper cooperation between such societies and institutions many of the difficulties under which we are laboring might be obviated. At the present time numerous academies of science publish volumes of transactions, proceedings, annals, etc. Most of these publications are not strong enough to command the support of the scientific public. They find their way into libraries of other societies by exchange. They are sent to the members of the society that publishes the serial, but they are not read by them on account of the miscellaneous character of the publication. For this reason the serials of most of our mixed societies have come to be an excellent means of burying good scientific material. They are not read; they are placed on the shelves of the libraries of societies, which, on the whole, are unable to make their books accessible to the reading public. There are, therefore, two points of view from which the present method of publication may well be criticised. The one is that the material is combined into volumes in such a way that an exceedingly small part of each volume only is useful to the student of a particular branch of science. The second is that these serials find their place, not in important libraries, but rather in small libraries of societies, where it is very difficult to consult books.

This method of distribution is also a survival of conditions which may have been desirable in former times, when there were no great public libraries, and when the scientific society had to perform general educational functions, among them that of maintaining a reference library. At the present time this need is well taken care of by various kinds of public libraries, so that it may well be doubted whether, at least in most of our larger cities, it is worth while for societies to continue the accumulation of books. As a matter of fact, the method of building up libraries by means of exchanges is one that does not seem to fit well into our economic conditions. In all other walks of life the acknowledged medium of exchange is money, and we measure the equivalent of an exchange by this standard. In building up

society libraries we are content with spending money on publications and taking in exchange for them, not what we want, but whatever we happen to get. In consequence of this, the editions of society publications are too large, and the libraries which are accumulated are of little practical use.

These conditions might easily be remedied by a proper cooperation between the societies and institutions of our country. If the total output of scientific matter produced by our smaller mixed societies could be combined and arranged in serials, each covering one of the important branches of science, it would be possible to provide a number of scientific serials, each of which would be of sufficient importance to command the attention of scientists, and which for this reason would have to be taken by some group of men who subscribe for the special journals, and also by all the larger libraries of our country and abroad. A demand for these publications would, therefore, at once be created, and the material that is now difficult of access would become available to all. The society funds devoted to publication would be relieved by the increased subscriptions, and the publication work would, therefore, become much more nearly self-supporting than it is at the present time.

At present the mode of bookkeeping of scientific societies is such that the charges for publication and for accessions to the library are not separated. This is due to the fact that the accessions to the library are paid by exchanges. If in the bookkeeping of societies these two items were clearly separated, it would be found that the amount of money invested annually in the library is entirely out of keeping with the usefulness of the library, except in the few cases of old societies which own houses and sufficient funds for the proper administration of books. In all other cases it would seem more advantageous to discontinue the accumulation of books, and leave this branch of work to public libraries.

The only difficulty in organizing the work of publication in this manner lies in the reluctance of societies to lose any of their individuality and to become closely associated with a larger body; but scientific societies and institutions should recognize the value of cooperation and the fact that the advance of science will be best promoted, not by selfish endeavor to aggrandize each society, but by willing association with others and by cooperation towards a common goal.

If the publication work of societies and institutions were organized in this manner, the serials would, to a greater or less extent, be similar in form to the scientific journals described before. On the whole, it may be said that these journals offer an adequate means for the publication of short papers. It would, therefore, seem appropriate for the mixed societies to devote their energies rather to the publication of memoirs that are too extensive for the journals. Such series of memoirs might well be made supplementary volumes of the special journals, and in this way a unification of the whole subject-matter devoted to a certain branch of science might be brought about.

There is another field in which cooperation might result in much more satisfactory arrangements for the advancement of science than those we have at the present time. Various journals and society publications print in each number a selection of notes, bibliographies, reviews, etc., which to a considerable extent overlap. The preparation of reviews is more or less left to chance, and the attempts at systematic collection of bibliographies are few. Nevertheless, we all recognize that systematic reviews and bibliographies are sorely

needed by students. It might seem that through cooperation of technical and mixed societies such bibliographies might well be prepared, and that in connection with their serials each group of societies might undertake the preparation of a *Centralblatt*.

These considerations make it clear that a vast saving of money and energy may be effected by the proper coordination of the work of mixed societies, and that the publications may be made infinitely more effective. Such coordination would require a certain sacrifice of independence on the part of each society, which would be amply repaid by the greater usefulness of its work. I think, if we succeed in moving on in the direction of thus centralizing effort in every branch of science, we shall be justified in asking for more liberal support of our work, not so much by endowment as by enlisting the interest of friends of education who will support the work of libraries by subscribing to scientific serials. If all the libraries in our country that have more than ten thousand volumes were in a position to subscribe to the organized scientific periodical literature, there would be no difficulty in providing for the publication of the bulk of all scientific matter worthy of publication, and without asking for heavy endowments. There would still remain a number of special and costly works which societies and institutions could not well support out of their own funds. For such publications we might justly ask the assistance of wealthy friends of science. For these we should try to obtain sufficient endowment, which might be allotted by a national council representing the various branches of science.

I thoroughly believe that our first duty is to systematize our efforts, and to economize by such systematization. In this way we shall make the available funds go much further than they have ever gone before. We shall make our work more effective, and enlist the cooperation of the reading public, and we shall be in a position to ask with greater authority for the support of publications that neither the government, nor societies, nor the reading public is able to support.

FRANZ BOAS.

ON the principle that it is sometimes important to know what not to do, I would offer a few remarks on one of the practical aspects of the inverted question: How are we at present using endowments ineffectually in scientific research?

To those who see our fires of learning gleaming only from afar, and are not near enough to see all the smoke, many of our university customs must appear to be enveloped in a haze of sanctity. One of these is the esoteric custom of awarding fellowships for research. In the language of the apiculturist, a university fellowship seems to the uninitiated like a rich mass of 'royal jelly,' to be fed to some fortunate but impecunious larval investigator for the purpose of enabling him to develop into a leader in the hive of scientific workers. And very often the larval investigator is of the same opinion till the food is administered and he suffers the disillusionment of the initiated.

He is no sooner awarded a fellowship of a few hundred dollars—and this is true even in our most richly endowed universities—than he finds that half or the greater portion reverts to his benefactor for tuition and laboratory fees. Nor is he even then permitted to settle down to his work in peace with the small pecuniary remnant and the 'honor' thereto appertaining. He may find that the richer the institution, the more it has need of his services as an instructor or laboratory assistant. This is because the university has

committed itself to what for want of a better term I shall call the 'lunch-counter' policy of perpetually offering new courses and subjects—not so much, perhaps, for the purpose of keeping pace with the multiplying and advancing sciences, as for the purpose of keeping itself constantly before the eyes of the public. One heavily endowed institution is known to have utilized its fellows as attendants in the departmental libraries, because the expensive 'lunch-counter' policy would not enable it to pay the salary of departmental librarians. And it is not impossible that somewhere between Maine and California there may be universities so heavily endowed that they can require their fellows to perform regular janitorial services.

With the insignificant remnant of his fellowship and such scattered remains of his faculties as can be scraped together from the more or less perfunctory study of one or two 'minor' subjects, and from the neglect of his duties as a sort of poor relation in the university household, the fellow is supposed to be 'doing original work,' 'making researches,' 'investigating.' If he was a child with strong investigating impulses, like all normal children, and has retained a shred of these ancient and pithecoid, but nevertheless divine, impulses after running the gauntlet of some of our secondary schools and colleges, he is expected, under the limitations afore-mentioned, and while eating any thing and living in any way, to produce some epoch-making work *ad majorem universitatis gloriam.*

As a matter of fact, the poor fellow—and he is, indeed, a poor fellow—is given some problem which to the body of his chosen science bears about the same proportion as a single nucleus to the whole human body. He proceeds to collate all that Schultze, Mueller, Schmitt & Co. have written on the subject, glues it together with a little of the secretion from his own larval sericteries, and prepares his jaded nerve-centers for the final examination farce. His professors assemble, and, bereft of all sense of humor, instead of smiling at one another like a troop of Roman augurs, sit through the farce with faces as long and as blank as the windows of the favorite-imported-imitation-Gothic-university-architecture—that gingerbread relict of church-ridden mediævalism—till the candidate wriggles through with a *rite* or a *cum laude,* or perchance, if he has been sufficiently intrepid to mount to sources unknown to his professors, with a *summâ cum laude.* And the newly-fledged doctor goes forth into the country to start a fresh center of mental infection of the same old type.

It would, indeed, be difficult to devise a more effectual method of hampering research than by the petty restrictions placed on fellows in most of our universities. Such, among others, are the pusillanimous objections to permitting fellows to work *in absentiâ* or where they can best obtain their materials, consult the best libraries and museums, work in the necessary marine laboratories, botanical gardens, etc. The results of these restrictions, so far as American biology is concerned, are only too apparent in the monotonous output, the few lines of investigation that are being intensively cultivated, and in the not infrequent cases of intellectual parasitism and commensalism, not only on the part of the students—that is to be expected—but between professors of different institutions. In the meantime the whole of tropical America, as well as the tropics of the Old World, abounding in materials of the greatest interest, not only to the botanist and the zoologist, but to the paleontologist, geologist, mineralogist, archeologist, anthropologist and pathologist, are being rapidly opened up to us. For any adequate utilization of such magnificent opportunities,

and in view of the fact that our gilded youth show little inclination to indulge in anything so tame as research, we must have fellowships of some kind, but fellowships with no niggardly academic restrictions. Our young men should be enabled to spend months or even years in localities where they can study organisms in their natural environment. The prevalent type of university expedition, that hurries through a country, collects a few miscellaneous specimens and observations and makes for home, may be better than nothing, but it leaves us little the wiser concerning the most important problems presented by the fauna and flora of foreign countries. Stuffing our museums with specimens is not necessarily advancing biological science. And it is not even necessary to call attention to the tropics in this connection. Vast stretches of our own country are all but unknown biologically, and are liable to remain so as long as our graduate students and fellows are persuaded that the salvation of the science depends on their becoming sessile organisms with *idées fixes* on the twinkling of the centrosomes, the twiddling of the chromosomes and a few other matters of similar import.

I am aware that much of what I have said may belong to past history, and may even apply to men of straw, but there is still a good deal of old straw, or what the Germans call 'Zopf,' in all our universities. Some of this is undoubtedly of our own cultivation, but much of it has come to us in the packing boxes with intellectual commodities from Europe. The sooner we set fire to it the better.

I would venture, in conclusion, to advance the following suggestions as a remedy for some of the evils connected with our fellowships:

1. Let us select as fellows only those young men who have well-developed investigating instincts and the proper preparation, maturity and mental balance to apply themselves perseveringly to the business of research.

2. Let these young men be given sufficient monetary aid to detach themselves from an inadequate environment and to do their work wherever they can find the best facilities, in America or in any other portion of the habitable globe.

3. Let us understand that a fellow is not a recipient of alms, and that he is not only honored by the university, but confers an honor on any institution with which he may become connected in the capacity of investigator.

4. Let us have sufficient knowledge of human nature and the historical development of the sciences not to expect immediate and inordinate scientific returns for any pecuniary aid which we may be able to bestow.

WILLIAM MORTON WHEELER.

IT is very gratifying to note the constantly growing interest in scientific investigation in all parts of America. To this many agencies have contributed. Among them the universities and experiment stations of the government, both national and state, naturally come into the mind as the principal institutions by which research has been fostered. Endowments placed in their hands have been in almost every case wisely administered. Research, however, has not, in any American university of the first rank, been definitely put forward as of primary importance. It has been compelled to conquer a place for itself and show its right to consideration under the university organization. I am not sure that in some instances research in the universities has not been something of a 'fad.' It has been sometimes put before immature and naturally incapable persons as the only goal for their

endeavors. As a result considerable misdirected effort has no doubt been made, and in a certain sense it is to be deplored that the grade of investigation in American institutions has not been higher than it is. The important point is, however, that the universities and colleges have felt the necessity of going beyond the work of formal instruction, and time may be expected to correct the errors and inadequacies of their efforts in investigation.

I view with some degree of pessimism all suggestions concerning cooperation in research between different institutions. I do not mean by this that no cooperation is possible, but in many instances cooperation means subordination, and is one step in the decline of institutional research. It seems to me that institutions are very much like individuals, and that the important thing is to have as many as possible of them take up the work of research and carry it forward to the best of their ability. The principle of natural selection will work among them towards the elimination of the weaker and unfit. It does not seem to me that institutions for research or avenues of investigation have been so greatly multiplied in the United States that the time has now come for combining or ' mergerizing ' them. On the contrary, one should view with enthusiasm the addition of new institutions and foundations by means of which scientific investigation may be more universally developed throughout the country. The situation in America is such, if I read it right, that *results* of research in the discovery of the laws and forces of matter are, after all, not so essential as the *spirit* of research disseminated throughout the nation.

It would seem that in society there is some automatic mechanism at work by means of which emergencies, as they arise, are rightly met. There comes a man for every hour, whether its burden be great or small. Generally speaking, I believe that research in America has developed naturally and reasonably to its present respectable proportions. The great foundations, whether they be universities or learned societies, private or governmental, have shown the higher social wisdom and have done their part, unconsciously perhaps, but none the less excellently, in the development of true science and genuine research. Boards of directors may generally be trusted to use endowments up to the level of the intelligence of their community and generation.

I favor the multiplication of institutions and agencies for research. They should be untrammeled and free to work out their own destiny. Every new foundation should be welcomed and should be permitted to stand or fall as it may show strength or weakness. Experience will be the only teacher of its board of directors and results the only criterion of their success in administration.

Conway MacMillan.

The president of the Society of Naturalists has kindly invited me to represent the psychologists in our discussion. I suppose his idea was that I should formulate some endowable plans for psychological researches. But that has been done, perhaps even overdone; modest and luxurious, possible and fantastic plans have been outlined, sufficient for the psychologists of the whole century, and I have had my full share in it—I felt unwilling to fish in those waters once more. And yet that was the thing to do if I understood and interpreted our president correctly; there was only one chance for me: I might try to misinterpret and to misunderstand his invitation and with this intention I accepted it.

I thus misunderstood my task to mean that I ought to consider the whole problem of research and endowment as a psy-

chological phenomenon, and I can not help it if my psychology has even a certain national flavor; the president knew that my views as well as my English are 'made in Germany.'

I, for one, indeed, believe that, if the improvement of scientific research in America is under discussion, the psychological factor which is involved can not be emphasized too strongly; it is the *psyche* of men and not the physical apparatus that determines the value of research. I know very well that work in a rich laboratory is much more comfortable than in a poor one, but the ultimate productiveness of the research does not depend upon it. Wherever good productive work is done, there is a strong moral claim for greater comfort in work, for greater leisure, for finer devices to make work more effective, more elegant, more complete, but the essentials of research are not touched by these factors. In the sphere of research, as in all spheres of life, there is a dangerous temptation to take greater comfort in itself for greater culture and internal progress. The whole history of science suggests the opposite. Everywhere may we see that the decisive discoveries and experiments were made with modest means and clumsy apparatus, and the change from poverty toward luxury has not seldom meant a change from concentration to superficial expansion. The great Helmholtz once said to me: "In the small laboratories with home-made apparatus they mine gold, while in the large and rich ones they transform the gold nuggets into sounding brasses."

How little important is the equipment is shown just by the situation in this country. It is an insufficient excuse for unproductiveness if the fault is laid to the defective equipments. If the outfit and the means were the determining factors we Americans should be far ahead of European research in many fields. In my own science, experimental psychology, the commercial value of the equipment of the existing psychological laboratories in America is perhaps five times greater than that of all German, yes, of all European, laboratories, but it would be absurd to say that we have really done five times more than those on the other side of the water. The real foundations of our science were laid by Professor Wundt in a German laboratory whose equipment is surpassed to-day by many frontier colleges in this country. And I deny that my science is an exception. In zoology, for instance, there are small colleges here whose names are hardly known, whose equipment surpasses that of universities like Leipzig, and yet, as the poet says, what difference to me!

The only two factors which really count for research are to be found in the minds of the men; they are, first, intellectual quality, and secondly, the will to achieve. These are the two respects in which American research is defective. Have we the right kind of man behind the gun?

The psychologist must ask, of course, in general: Is the right kind of research man to be found at all among this people? I should say: Certainly—perhaps nowhere a more ideal combination of the right features. Quick, sharp grasp of a situation, brilliant inventiveness, persistent energy, talent for organization, unselfish idealism, all these are characteristics of the best type of American and exactly these are the conditions of successful research. The misery of the whole situation is that if we abstract from the numerous exceptions and look on the broad average, this right type of man sits in the counting-houses and law offices, is busy in commerce and industry and politics and medicine and what not—but into the graduate schools and into college work there rushes, together with

some excellent men, the swarm of good modest fellows without much ambition and talent—and rushing is still too energetic a word; that type of man does not rush, but is passively moved forward. Everywhere in this country the average graduate student who prepares for academic work represents as to intellectual energy a lower type of man than the average undergraduate, and yet with second-rate men there can not be a first-rate science, even if a billionaire comes to them, as Jupiter came to Danæ, in the form of a shower of gold.

But why do our finest men shrink away from the career of the scholar, which is sought, in Germany for instance, by the very best: simply because it does not sufficiently stimulate their ambition. There are not the great premiums at the top, and it is well known that in the eyes of youth every career gets its social value just from chief premiums and exceptional gains. The career ranks here with the humble one of the schoolmaster; how can it stand in competition with banking and law? Thus I should say to those who have millions ready for endowment: first make the career attractive, so that it can tempt more men of the first-class type; create great premiums by putting above our present university system a still higher institution, an over-university where the finest masters of research in every field, chosen by their peers, are brought together for far-reaching work which transcends the possibilities of the educational institutions. Whatever you can do to give to the career national glory thus to attract the finest men, will be productive for the work of research.

But I add a second point. From one motive or another a lot of fine men enter the career already to-day, and yet even they do not live up to their best. As I said in the beginning, it is not only a question of capacity, but one of concentrated will to achieve. Even our good men, while they start with high intentions, too often give up after a short beginning; the spirit of research evaporates and the routine teacher remains. I know that there are plenty of external reasons, too many are overburdened—and yet, the chief reason is again a psychological one; there is no stimulus for productive scholarship. They feel too soon that such achievement does not count for their career, yes, that they have to stand below the man who spends his time in mere teaching and administration. Make the academic career in the real universities, the promotion to higher positions, dependent in first line upon research work, as it is in Germany, and the work will be done, in spite of all obstacles. There is at present no greater educational need in this country than to educate the trustees of the universities. Everywhere, with a few exceptions, the universities are still administered after the pattern of college administration, and the research spirit is thus artificially suppressed. Let the trustees understand that research can grow only where it is considered as the backbone of university life, as the condition for appointments, and that only scholars, not laymen, can be judges for it; then we shall have research which will keep pace with the marvelous progress of this country. And to my billionaires I should say: Help us to bring about this change; endow with your treasures those existing universities which show the right appreciation for productive work.

I have so far expressed dissatisfaction with the existing conditions; are there no psychological conditions which are favorable here for scholarly work? Certainly, above all, one most important one—the spirit of helpfulness and ambition in the special academic communities, the readiness of the alumni to stand for their Alma

Mater, to push forward her work and her equipment, to make it strong in the rivalry of the various institutions. This local academic pride has secured the progress which the last decades have seen: here lies the one great advantage which the American institutions have over the German universities, which have to await everything from the governmental center. Thus, if we desire that this noble progress shall go on, by all means do not tamper with this local self-activity by giving favors on application. Do not undermine it by central interference; do not annihilate that feeling of responsibility among the alumni by playing providence. Your good-will would be merely an opiate for the energies of the communities; they would soon leave the whole care to you, and matters would then be worse than before. The only help for the individual researcher which is not to paralyze the eagerness of the community, must come either through the medium of the institution to which he belongs, or from central establishments which shall benefit all alike. For instance, we badly need large printing houses which shall print scientific matter for every one without profit, or mechanical establishments for cheaper apparatus, as in such respects we are really worse situated than Europe.

Furthermore, a patchwork of scattered favors will not only ruin those forces which work for good to-day, the enthusiasm of the alumni, but it will be harmful even to the workers themselves. Firstly, it introduces a central power without self-government: we may have the most ideal men in control, and yet the door would be wide open for all the bad features of the spoils system and favoritism, because in questions of research the decisions must remain dependent upon the prejudices of scientific cliques and schools. We do not want academic party machines and party bosses; we do not want wire-pulling for one scientific school as against another; there are too many alarming reports afloat already. There may be discussion whether state life prospers better with self-government or with paternal autocracy, but there can be no discussion which of the two systems is the better for research and scholarship. Research needs free competition.

But worse than the absolutely unavoidable arbitrariness of the distribution must be the moral effect of the system on the researchers who are favored. The charity system is nowhere more tempting, but just, therefore, nowhere more ruinous than in the republic of scholars. Charity hides the problem but can not solve it. Alms for research, tendered on application with pledges for good behavior and typewritten manuscript, will do what the economists everywhere find as the results of mere charity. Instead of building up the community it will weaken it. Charity is everywhere the easiest way out of a difficulty, because it leaves the real difficulties to those who come later. In the first moment you hear a thousand God-bless-you's and after a little while the energies are emasculated. Research ought not to go begging, research wishes to be free; research wants respect, not clemency; its rights, not favors. Research desires the improvement to come from within, not from without; by applying endowments not according to the principles of politics, but according to the principles of psychology, trying to raise the average type, trying to stimulate everybody to his best work, and trying to create better conditions for all alike; in all these three respects endowments might work wonders.

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