SCIENCE

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THE UTILIZATION OF PATENTS FOR THE PROMOTION OF RESEARCH

ON September seventh of the current year an agreement was executed between Dr. T. Brailsford Robertson, professor of biochemistry and pharmacology, and the regents of the University of California, whereby the ownership of his patents covering the growth-influencing substance "Tethelin" which he has isolated from the anterior lobe of the pituitary body, and which, among other possible applications to therapy, promises to be of value in accelerating the repair of slowly healing wounds, was transferred to the University of California, upon the condition that the proceeds or profits which might accrue from their ownership of these rights should be devoted to the furtherance of medical research, such research to be conducted under the immediate direction of a board of directors constituted in the first instance of the undersigned individuals.

The proposal thus advanced by Professor Robertson and accepted by the regents of the University of California constitutes, we believe, a new development in the relationship of science to the industries, and of scientific investigators to the institutions employing them, and we believe that, as such, it should receive the serious consideration of the scientific public, entirely apart from the separate question of the possible merits of this particular invention.

The growing recognition of the intimate dependence of the industries upon science and the increasing complexity and requirements of scientific research itself, have led

many to the belief that some modification is desirable of the traditional relationship between the investigator and the material product of his discoveries. In the initiation of such changes, of which the present proposal is one among a number which might be suggested, many serious problems present themselves, and we feel that the solution suggested by Professor Robertson should be subjected to careful scrutiny and the fullest possible criticism. We have accordingly requested Professor Robertson to publish a statement of the fundamental conceptions underlying his proposal, together with the text of the agreement itself. Professor Robertson's statement follows:

H. M. Evans (Professor of Anatomy),
F. P. Gay (Professor of Pathology),
T. Brailsford Robertson (Professor of Biochemistry and Pharmacology),
C. L. A. Schmidt (Research Assistant in Pathology),
G. H. Whipple (Director of the Hooper Foundation for Medical Research and Professor of Research Medicine).

At the present time, as in the historic past, the scientific investigator looks to public or private generosity to supply him with the means of subsistence and the material prerequisites of his work. This relationship of the investigator to the public, while it has been unquestionably fruitful, is nevertheless fraught with many and serious disadvantages. To enumerate but a few of the more salient of these, the investigator is placed in a relationship of direct or indirect dependence upon his patron, a relationship which is not conducive to the best and most complete mutual understanding and appreciation. The income proceeding from these haphazard sources is of variable and unpredictable magnitude, and bears no necessary relationship whatever to the development of our material environment and the concurrent increase in complexity and proliferation in detail of scientific problems. The donors to a greater or less extent modify by their imperfectly informed preferences the channels of expenditure, so that the resources available for the development of any particular field of research are frequently disproportionate to its intrinsic importance.

It is obvious that a much more desirable condition of affairs might be attained if some automatic mechanism could be devised whereby a proportion (and a very small proportion would be sufficient) of the values created by scientific investigation would flow back to provide the material foundations of further discoveries, just as, at the present time, the intellectual foundations of fresh discoveries are automatically afforded by the information flowing in from the discoveries of the past.

A number of separate attempts to achieve this end have already been made, but while the results achieved have frequently been admirable in themselves, they have hitherto failed to afford any precedent which is generally acceptable to scientific men or to the institutions employing them. In some cases individuals have set aside a proportion of the proceeds from their inventions for the support of isolated scientific enterprises, the Solvay Institute in Brussels being a noteworthy instance of this type. In others an institution or an individual affiliated with the institution has entered the commercial field, selling certain articles manufactured in the laboratory, the proceeds from the sales being devoted to the upbuilding of the institution. Illustrious examples of this method of procedure have been afforded by Behring and by Pawlow. The objection to this

method lies in the fact that the efforts and attention of the individuals concerned are to a greater or less extent and more or less permanently deflected from their proper business of investigation and that certain dangers and abuses might conceivably arise from the too close identification of the individual and the laboratory in which he works with purely business enterprise.

In other instances, of which Ehrlich's disposal of the proceeds from salvarsan affords the most illustrious example, the discoverer has patented his invention, leased the patents to manufacturers, and dedicated the proceeds to the furtherance of a particular field of research, usually closely allied to the field from which the patented discovery arose. While the result of this procedure in the particular example chosen to illustrate it was in the highest degree successful, and the work accomplished by this means has been of incalculable value to humanity, yet, as a precedent, it has been felt by many that it presents several imperfections, notably that afforded by the association of an individual investigator with a particular business enterprise and the absence of any supervisory control over the commercial exploitation of the discovery.

The industrial fellowships which in recent years have been established in many institutions in the United States and particularly in affiliation with the Mellon Institute of Pittsburgh, represent another stage in the evolution of the relationship between the sciences and the industries. The industrial fellowship plan has proved to be far more widely acceptable as a precedent than any of the plans which I have heretofore mentioned. It is, however, more especially designed to be of direct service to existing industries, to bridge the gap between pure science and industrial progress and to meet the immediate needs of existing industries as they arise rather than to initiate new developments of science itself. Their purpose diverges, therefore, from that of the purely scientific investigator, and while they are of unquestionable value in the field for which they are designed, they leave unsolved the problem of providing automatic support for the development of the deeper foundations of industrial and social evolution.

A plan of wider scope, and applicable to the support either of the pure sciences or of industrial research was launched some years ago by my former colleague Dr. F. G. Cottrell, in the form of the Research Corporation of New York,[1] to which he donated certain of his patent rights in his electrical precipitation process. The certificate of incorporation of this company decares that its purposes are:

(*a*) To receive by gift and to acquire by purchase or otherwise, inventions, patent rights and letters patent either of the United States or foreign countries and to hold, manage, use, develop, manufacture, install and operate the same, and to conduct commercial operations under or in connection with the development of such inventions, patent rights and letters patent and to sell, license or otherwise dispose of same and to collect royalties thereon, and to experiment with and test the validity and value thereof and to render the same more available and effective in the useful arts and manufactures and for scientific purposes and otherwise.

(*b*) To provide means for the advancement and extension of technical and scientific investigation, research and experimentation by contributing the net earnings of the corporation, over and above such

[1] "The Research Corporation, An Experiment in Public Administration of Patent Rights," Eighth International Congress of Applied Chemistry, New York meeting, October, 1912, Vol. XXIV., p. 59.

sums as may be reserved or retained and held as an endowment fund or working capital and also such other moneys and property belonging to the corporation as the board of directors shall from time to time deem proper, to the Smithsonian Institution and such other scientific and educational institutions and societies as the board of directors may from time to time select in order to enable such institutions and societies to conduct such investigation, research and experimentation.

The efficient business administration which is thus provided and the separation of the scientific laboratories or investigators from responsibility for the administration of the funds and exploitations of the inventions combine to render the Research Corporation in many respects an ideal means of accomplishing the ends we have in view. It is impossible, however, for purely physical reasons, for the Research Corporation to handle all of the vast variety of profitable inventions, great and small, which issue or may come to issue from the laboratories of the United States, and it would obviously not be in the best interests of research to too greatly centralize the control of the means of its continuance and development. Some system is required which, like the Industrial Fellowship System, is indefinitely reproducible, and adaptable to all of the great variety of learned institutions which might desire to utilize it, so that the system may become an organic part of the investigator's environment and numerous foci come into existence from which the means for the furtherance of investigation may proceed. It was to provide a possible solution of this problem and a precedent which might be acceptable to other investigators and other institutions that the subjoined agreement between the regents of the University of California and myself was drafted.

There are highly profitable discoveries, of course, which are of such a nature as to demand expensive field-trials, or the expenditure of capital to ensure their successful flotation and protection during the period of tentative ultilization. The plan which I have to propose is not designed to deal with inventions of this type, but rather with the equally numerous inventions which are complete in themselves and ready to be leased or sold to existing commercial establishments. Public institutions, holding their funds on trust, can not, of course, enter into speculative enterpises. For dealing with discoveries requiring extensive initial expenditure and the flotation of new commercial enterprises to handle them, the Research Corporation and analogus corporations which may come to be founded for a like purpose provide an acceptable means of ensuring the adequate development of the invention and the return of the proceeds to the support of scientific investigations.

The fundamental administrative basis of the agreement which has been concluded between the regents of the University of California and myself consists in the provision for as complete a separation as is consonant with stability of the responsibility for the business administration of the trust and that for the actual performance of investigations financed from the proceeds of the trust. The successful scientific investigator is usually, for the simple reason of his success as an investigator, a very indifferent financier. The professional administrator or financier, whose interests and information are far removed from the battle-front of the conquest of nature, and whose preoccupation is rather the consolidation of conquests previously achieved, is usually a very in-

different director of scientific investigation. The truth of the former of these propositions will be admitted on every hand; that of the latter is not so generally recognized. It is, however, very clearly evidenced in many contemporary scientific enterprises which, under the too exclusive guidance of professional administrators, are comparatively inefficient in production of results of the highest intrinsic value, while the most successful scientific enterprises of our day are those which are being administered, so far as actual investigation is concerned, by men who are themselves practical investigators of distinction.

In the terms of the agreement it is provided that sole responsibility for every phase of the business administration of the patents and of the proceeds accruing therefrom rests with the regents of the University of California, while the proximate responsibility for the performance of investigations which may be financed by these proceeds rests with the board of scientific directors, under whose immediate direction, subject to the supervisory control of the regents of the university, all researches must be carried out. It is furthermore provided, in order to ensure that the personnel of the board shall consist exclusively of men in living touch with contemporary scientific problems, that the directors shall be persons themselves engaged directly and primarily in research work, and upon ceasing to be so engaged they shall be under obligation to resign as such directors, and if they do not resign their positions shall be declared vacant by the regents of the university. It is furthermore provided that the position of any director shall become vacant upon his attaining the age of sixty years, unless the regents of the University shall, for strong reason existing in the particular case, extend his term of office.

The conquest of nature, which is the material preoccupation of the scientific investigator, is not unlike a military campaign, in that those who retire from immediate contact with operations speedily lose the instincts which underlie and determine practical success. The scientific investigator who ceases to pursue active investigation and turns to administrative or other pursuits, sooner or later loses the intuitions which formerly led him to detect the weak spots in the defense which nature opposes to our inquiry, and that grasp of the field of investigation as a whole which actual contact keeps alive.

A true estimate of any professional man can only be formed by his professional colleagues, and it is therefore provided that any vacancies in the board of directors must be filled on nomination of the remaining members. Such nominees, however, must be approved by the regents of the university, and responsibility for the personnel of the board is thus shared in the fullest possible measure between the members of the board itself and the regents of the university. This provision, and the preceding provisions, are designed to obviate the notorious defects attaching to self-perpetuating boards, while introducing a just sufficient element of self-perpetuation to ensure the perpetuation of the essential character of the present board.

There is a very prevalent misunderstanding even among scientific men, of the true function of the protection extended by patents. While they are designed among other things to ensure a monetary return to the discoverer by granting him a temporary monopoly of his discovery, yet this is only one and not by any means the most successful feature of their purpose. As summarized by Dr. F. G. Cottrell, the basic reasons for granting patents are the following:[2]

[2] "Government Owned Patents," *Proceedings of the American Mining Congress*, Nineteenth Annual Session, Chicago, Illinois, November 13–16, 1916.

Firstly, to substitute a definite and regulated form of monopoly under the law for the broader and entirely unregulated one which the patentee might otherwise secure by retaining his secret.

Secondly, to encourage and stimulate invention.

Thirdly, to give adequate opportunity and encouragement for intensive commercial development of the invention which is almost invariably necessary to make it generally available on its own merits to the ultimate consumer.

Among medical investigators a very definite prejudice exists against the patenting of any medical discoveries, and this view is to some extent shared by not a few investigators in other fields. The fundamental instinct which leads to this aversion is unquestionably a sound one. It consists in the feeling that monopoly renders possible commercial exploitation, which increases the cost of the article to the consumer disproportionately to the cost of production, while among medical men the word "patent" arouses the repellant idea of the so-called, but mis-named "patent medicine." That notorious abuse is, of course, not patented and should correctly be designated the "proprietary medicine." If existing proprietary medicines were patented (and of course the vast majority, being merely recipes, would not be patentable) their most undesirable feature, that of secrecy, would be at once removed, since, in Great Britain and America at least, the issuance of letters patent is the completest and most accessible form of publication possible. As regards the objection to the feature of monopoly, it is to be recollected that letters patent are only one and not the most efficient among many methods of securing monopoly, and it may be questioned whether the non-issuance of patents would in any important degree lessen the average cost of medical articles to the ultimate consumer. It is, however, to be admitted that the possibility of outrageous extortion from the public does exist and has occasionally been realized in practise. In the subjoined agreement it is, however, provided (subdivision *a*) that the regents of the University of California undertake to utilize the rights granted to them in such a manner as will in their judgment best produce a monetary return and at the same time render the use of the preparation patented most generally available for the benefit of the human race. The regents of the university are thus clearly authorized, in event of their considering it to be desirable in the interest of availability of the preparation for the benefit of humanity, to deliberately sacrifice monetary advantage, and, the element of personal interest being entirely excluded, the public has the fullest procurable guarantee that they would, if occasion arose, take such action.

In subdivision *b* are contained clauses which provide for the reimbursement and "conditional insurance" of the donor. In this particular instance the reimbursement is confined to the repayment of actual expenses incurred, but in many other instances it might very properly consist in a sharing of profits, either expressed as a lien consisting of a cash sum or of a definite sum per annum, or as a percentage of the proceeds, or geographically, the patent rights in certain countries or localities being retained by the donor. The "conditional insurance" clause is inserted to forestall the obvious injustice which might arise were the surviving family of the donor to find themselves in actual need while the university might at that moment be reaping large returns from his discoveries. If, however, the university were to be compelled from the beginning to accumulate a fund to cover this contingency, the result might be, at least for a considerable term of years, to completely stultify the gift and

the purposes of the donor. In order to neutralize this it is therefore provided that the university shall not be required to make any provision for this purpose in advance of the actual event of the death or disability of the donor, and the claims of his survivors only become operative at the moment of his death.

In subdivision *c* are included certain individual preference-clauses which, collectively considered, must form an essential and very valuable part of any widely acceptable plan of this nature. In the first place the donor expresses his preference that the proceeds be expended in the furtherance of research on the physiology, pathology and chemistry of growth. This is expressed merely as a preference, however, and is not mandatory. It is merely equivalent to a consistent vote in a certain direction which may, if necessary or advisable, be outweighed by a majority of the votes of the board. It is felt by the writer that the expression of such preference in each and every case of the kind will help to automatically adjust the material resources of the different fields of scientific investigation to their current needs. The donor is usually likely to desire that the proceeds be appropriated to the support of a field of investigation which he considers to be, at that time, lacking in sufficient material support. Such preferences should not be rendered mandatory, however, for the reason that the condition which the donor seeks to rectify may turn out to be only temporary, or the intrinsic importance of the field may ultimately prove to be insufficient to warrant the expenditure of the entire proceeds upon it.

The donor also expresses his preference regarding the locality in which a proportion of the proceeds should be expended. This arises from his conviction that the welfare of scientific investigation, as a whole, demands the widest possible distribution of the facilities for conducting practical investigation.[3] At the present time in New York, London, Paris or Berlin the young man who has capability for original investigation has every opportunity of acquiring facilities for his work and of gaining inspiration from the example of investigations proceeding to a successful issue in his own vicinity and under his own observation. He sees in actual operation the methods of work adopted by masters of his subject, and examples and opportunity alike combine to make the path easy to his chosen career. But what shall we say of the opportunities of the young man or woman in Siberia, China, Australasia, South America or Africa? In certain localities in these countries every necessary institution exists for providing the essential preliminary training of the investigator, but, training in the fundamentals of his subject secured, where is he now to turn for the living example of the successful experimental investigator or for the opportunities of a large and abundantly equipped laboratory, partly or wholly devoted to research? The bare possibility of creating fresh fields of knowledge will probably never even occur to him, since he has never seen or been stimulated to imagine investigation conducted on a broad and practical scale. As a means of tapping new sources of talent for investigation a centripetal disposal of investigators and the opportunities for investigation has become a paramount necessity. The fact that the donor received his fundamental training in Australia determined the preference which he has expressed. It is not rendered mandatory, however, for the reason that it is not clear that the opportunity to so dispose of the proceeds in this particular instance will ever arise, or if it did arise, whether unforeseen political or other events might not, at some time in the fu-

[3] "The Strategics of Scientific Investigation," *The Scientific Monthly*, December, 1916, p. 547.

ture, render this disposal of the proceeds inadvisable.

In conclusion, although the plan incorporated in this agreement is applicable to any and all completely developed patentable discoveries which may be made by the employees of learned institutions, the board of directors herein created confines its functions to the administration of *medical* research. It was felt that it would be impossible to choose a board commanding the confidence of investigators in all the various fields of scientific research without making up the personnel by ex-officio appointments, as the dean of this or the professor of that particular college or subject, and thus introducing the very atmosphere of bureaucracy and officialism which it was sought to avoid. In event of this precedent being at all extensively copied it will obviously be necessary, for universities at all events, to establish three or four separate foundations and a like number of boards of scientific directors.

The text of the agreement follows:

T. Brailsford Robertson

This Indenture, made this 7th day of September, 1917, between T. B. Robertson, the party of the first part, and The Regents of the University of California, a corporation, the party of the second part,

Witnesseth:

Whereas the party of the first part is the discoverer of a medical preparation named Tethelin, covered by United States and British patents, and is the owner of such preparation and of such patents and of the trade-name "Tethelin,"

Now, Therefore, It Is Agreed as Follows:

I

The party of the first part hereby conveys and grants to the party of the second part the said preparation, patents and trade-name, and all his rights as the discoverer of said preparation and the owner thereof and of said patents and trade-name, upon the following trust, to wit:

(*a*) To utilize the rights hereby granted in such a manner as in the judgment of the party of the second part will best produce a monetary return therefrom and at the same time render the use of such preparation most generally available for the benefit of the human race. The party of the second part shall have the right to sell or dispose in any other manner of said rights or any of them, in whole or in part, or to grant subsidiary rights and privileges thereunder, either upon royalties or otherwise. The party of the second part agrees that it will use all reasonable diligence to utilize said rights as aforesaid, but it is particularly agreed, and the party of the second part accepts said trust only upon the condition, that it shall be the sole judge as to what is reasonable diligence in the respect mentioned, and that it shall not be pecuniarily or legally responsible for any want of diligence in such respect unless the same be in bad faith or the equivalent of bad faith, and that in view of the fact that the party of the second part is a public eleemosynary corporation all of whose funds are held upon other trusts, the party of the second part shall not be pecuniarily or legally liable under any circumstances whatsoever except to the extent of such rights or the proceeds, profits or returns thereof at the time of recovery against it in the hands of the party of the second part:

(*b*) To apply any proceeds, profits or returns from the utilization of said rights, after paying the expenses of the party of the second part in connection with the trust, to the reimbursement of the party of the first part in the sum of one thousand dollars ($1,000) for expenses incurred by him in making such discovery of such preparation, and, in case of his disability, to the payment to him thereafter for his life of the sum of five thousand dollars ($5,000) annually, and in case of his death to the payment of a like amount to his wife for her life, and in case of the death of both himself and his wife leaving a minor child or children, to the payment of a like amount to such child or children until such child or the youngest of such children shall have reached majority: provided, however, that such annuities shall each year be payable only out of such proceeds, profits or returns as may come in during that year and any balance on hand at the beginning of the year unexpended and unappropriated for the purposes mentioned in the following subdivision (subdivision *c*):

(*c*) To apply any unexpended balance of such proceeds, profits or returns to research work in medicine and preferably in the physiology, chemistry and pathology of growth either under the auspices of the University of California or otherwise, it being the wish of the party of the first part, but

not a condition, that in case such proceeds, profits or returns amount to a sum sufficient to justify it, such research work be conducted in part in Australia, either under the auspices of some institution of learning there or otherwise. The party of the second part shall direct such research work in consultation with the men hereafter named as the first members of the board of directors of the Institute of Medical Research whose creation is hereinafter provided for and their successors. The party of the second part shall have the right, subject to the provisions of subdivisions (*a*) and (*b*) preceding, to expend such proceeds, profits or returns on such research work either in whole or in part, holding and investing such accumulation as a fund and expending the income of such fund in the maintenance of research work:

PROVIDED, however, that in case at any time such proceeds, profits or returns are sufficient in the judgment of the party of the second part to justify it, it shall create an Institute of Medical Research which shall, under the immediate direction of a board of directors of five members subject to the supervisory control of the party of the second part, carry on and direct the work of research mentioned. Such Institute, if created, shall also be authorized to conduct other kindred lines of research with funds received or appropriated by the party of the second part for that purpose from other sources, and particularly from the utilization of other discoveries transferred by the discoverers to the party of the second part, provided that in case of conveyance to or acquisition by the party of the second part of other discoveries or patents or rights from which and from the discovery patents and rights hereby conveyed, come proceeds which are joint to both, the party of the second part shall be the sole judge as to the relative proportion of such joint proceeds as are attributable to each of the joint sources thereof. Such board of directors shall in the first instance be composed of F. P. Gay, H. M. Evans, G. H. Whipple, C. L. A. Schmidt, and the party of the first part. Any vacancy in said board shall be filled on the nomination of the remaining members approved by the party of the second part. The directors shall be persons themselves engaged directly and primarily in research work either of the character mentioned or of some kindred character, and upon their ceasing to be so engaged they shall be under obligation to resign as such directors, and if they do not resign their positions shall be declared vacant by the party of the second part and upon such declaration shall be vacant. The position of any director shall become vacant upon his attaining the age of sixty (60) years unless the party of the second part shall, for strong reasons existing in the particular case, extend his term of office.

II

The party of the second part accepts the foregoing grant and conveyance upon the trust above set out.

IN WITNESS WHEREOF the party of the first part has hereunto signed his name and the party of the second part has by its officers thereunto duly authorized hereunto signed its corporate name and affixed its corporate seal all on the day and year first above written.

T. BRAILSFORD ROBERTSON,
THE REGENTS OF THE UNIVERSITY OF CALIFORNIA,
By WM. D. STEPHENS,
Governor of the State of California, and ex-officio President of the Regents of the University of California,
By V. H. HENDERSON,
Secretary of the Regents of the University of California

SCIENTIFIC EVENTS

JOSEPH YOUNG BERGEN

JOSEPH YOUNG BERGEN, author of several well-known text-books of botany and physics, died at his home in Cambridge, Mass., on October 10. Born at Red Beach, Maine, on February 22, 1851, he spent his youth in Ohio, where in 1872 he graduated from Antioch College, and where in connection with the State Geological Survey he performed his first scientific work. In 1876 he married Fanny Dickerson, who has collaborated with him in the production of several of his papers on evolution and Darwinism, and who herself has made notable contributions to the literature of American folklore. In 1887 Mr. Bergen became teacher of physics in the Boston Latin School and later for many years he was instructor in biology in the Boston English High School.

In 1891, in collaboration with Professor E. H. Hall, of Harvard University, he brought out "A Text-book of Physics." This had passed through subsequent editions in 1897 and 1903, and is still widely used in secondary schools.