# Scientific Property

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PROPERTY RIGHTS ARE SECURED by authors and inventors for their intellectual creations through copyright registration and patents. One covers literary works of esthetic character; the other the useful arts, manufacturers, compositions of matter, and asexually reproducible plants. A scientific creation, even, though it is the basis of great industrial and social progress, financially rewards its creator only through indirect means. A scientist may patent inventions or copyright scientific papers to secure legal rights in these less important results of his research. Title to a scientific discovery is not given a scientist.

*Copyrights.* A copyright is an exclusive privilege which the law allows an author to print or otherwise multiply, publish, and vend copies of his own original work. It lasts for twenty-eight years with a privilege of renewal for fourteen more. The right may be assigned by a written instrument duly attested and recorded.

Copyright privileges offer no advantages for the scientist. In fact, not only do publications of scientists in the learned journals not result in royalty income, but the scientist must also help defray the cost of his publications. This is for his important original scientific contributions and not for such expositions as popular articles in magazines, elementary textbooks, and treatises. The latter probably are of literary character.

Recognition for contributions to science is the actual reward to a scientist for his work. Publication may be looked upon as a type of advertising by which a scientist rises in the ranks of his fellows, but otherwise there is no financial gain. Some new scientific finding may be expounded in copyrighted treatises which helps to sell them. But even here the practical value of publishing a treatise is that the scientist's work becomes known more widely and credit is given to him for possessing a creative mind and distinguishing him as a scientist.

*Patents.* A patent is a legal monopoly granted on the theory that its existence will promote the progress of science and the useful arts. The law concerning patents is highly technical and complex. It concerns the way in which patents are issued and the rights and duties flowing from their issuance. They are given for inventions, again a technical and complex concept.

Invention consists of the application of known principles of knowledge to new facts, situations, or materials, in order to achieve some useful result. This is to be contrasted with discovery—a mental process beginning and ending in the realm of the mind. Discovery itself cannot result in any material application of the newly found knowledge, since then invention is involved. The scientist concerns himself primarily with discoveries not inventions. He thus excludes himself from the rewards of his discoveries unless he makes inventions.

A patentee, through the patent, obtains a legal right to exclude all others from making, using, and selling his patented products or processes. This is an economically valuable property right. Of course, an inventor has a right to make, use, and vend his invention even without a patent. He may deprive the public of the benefits of his invention by keeping it secret. He does not have, however, an exclusive right unless he is also a patentee. A scientist making a discovery must apply it to an invention that he must then patent to assure himself of a financial reward. As a patentee, he is in a strong position, but this is usually a minor matter to a scientist. It consumes his time and effort to secure this right. We at once realize Louis Agassiz' meaning when he replied to a friend who suggested that he avail himself of a tempting financial arrangement: " I have no time to make money." Agassiz had too much to do in making scientific discoveries, let alone making inventions, taking out patents, fighting legal actions, and otherwise consuming his valuable time. It is to be remembered that it was Agassiz who did so much to advance the concept of coal-bed formation during his exploration of the Dismal Swamp in Virginia, an important concept for future geological exploration to find coal deposits.

This series of events may be extended even farther from the point of discovery of a basic new scientific principle which cannot be patented. As already noted, only an application of the scientific principle may be patented. Although possessing a legally sound patent covering part of his scientific research, the scientist must devote considerable effort and thought if he is to exploit commercially his patented invention.

Patents are intangible and fragile property which cannot be valued in the same way as other property. It may be sold outright, licensed, or a nonprofit business established under it. In any case, an economic venture must be undertaken which is not research but management. Competition is keen—there are a half million U.S. patents in force today. It must be protected. It must not infringe upon other patents. Risks are involved. It is easy to see that the value of a patent to a scientist is not worth the trouble and time required to exploit it, if he is to remain a scientist.

An advertisement in *The Scientific American* in

[1] The views and opinions expressed herein are those of the author and not necessarily those of the ICSRD or of its member agencies.

December of 1951 announced an offer of research facilities to inventive Americans who need them: "If you have an idea of this kind (within the petroleum field) you are invited to submit it to the Sinclair Research Laboratories, with the provision that each idea must first be protected, in your own interest, by a patent application, or a patent. . . . If the directors of the laboratories select your idea for development, they will make, in most cases, a very simple arrangement with you: In return for the laboratories' investment of time, facilities, money, and personnel, Sinclair will receive the privilege of using the idea for its own companies, free from royalties. This in no way hinders the inventor from selling his idea to any of the hundred of other oil companies for whatever he can get." This plan apparently recognizes the greater ultimate value of a discovery or of an idea than the more tangible application of the discovery which is patentable.

Popular belief has it that the patent system was established in order to reward inventors. This is not so. Reward to the inventor is merely the incentive by which the law tries to secure the progress of science and the useful arts as provided in the Constitution.[2] The patent system of the United States is based on the theory of getting information. It rewards the inventor only in recognition of his services in making a new idea available to society. Compensation is incidental, but tangible, and available to a scientist who wishes to make the most of this least important result of scientific research. Apparently society at large deems it sufficient that a scientist in simply being allowed to disclose his truly important findings, is rewarded enough (*1*).

*Right to Credit.* Looking beyond patents and copyrights one finds that scientific research results in a kind of scientific property which is not patentable, nor capable of being protected by copyright. A well-known symbol in physics, *h*, represents a fundamental physical quantity. To scientific society it is Planck's constant. The classical laws of motion are called Newton's laws in honor of this famous scientist. These are examples of rewards for scientific discoveries. The creators were honored through association of their names with their achievements. It is common to find scientists' names associated with effects, equations, or other facets of scientific achievements which symbolize these achievements. These are the real rewards to scientists and they indicate existence of scientific property.

The evanescent honor of association of one's name with his scientific achievement is not a right; it is conferred by an appreciative society but there is no law to protect a right to credit. Indeed credit might shift by virtue of public misunderstanding or more vigorous advertising on the part of one of the parties trying to establish credit for creating a new scientific advance. Economic reward is wholly lacking unless the intangible one of position in the ranks of one's fellow scientists is considered ample compensation. Future earning capacity is probably thereby increased. Certainly, sponsorship of scientific research is influenced by the rank of a scientist applying for financial support. This is a typical economic advantage which leads one to regard credit for achievement as a property value. One has only to recall the famous argument between Newton and Leibnitz over priority for credit for discovery of the differential calculus to realize their regard of the property value of such credit. Galileo also diligently protected his inventions and discoveries and was forced upon occasion to publish accounts of plagiarism. In fact his first printed work on "The Operation of the Geometrical and Military Compass" was written to end a dispute as to his invention of this instrument and his later published account of this so-called Capra plagiary was written firmly to establish his priority of this invention and certain astronomical discoveries (*2*).

A close approximation in business activity to the concept of right to credit would seem to involve trade marks. A trade mark is a distinctive symbol affixed by a tradesman in some way to the goods he manufactures or has caused to be manufactured so that they may be identified and known in the market. The mark is registered with the Patent Office and may be renewed each fifteen years. Industry relies upon trade marks to protect it as it tries to build valuable goodwill credit. Conflicts of interest between industrial groups are not infrequent over the ownership of trade marks under which articles are sold. This is for the reason that a name increases in value with every sale. The trade mark owner of a successful commercial product is in an exceptional bargaining position. For example, a manufacturer trade mark owner can turn to other distributors if it is favorable to do so. Also, if the distributor is the owner he can easily find other manufacturers if this is within his interest. Trade marks give real advantages, and they are property. They give significant and valuable protection to a right to credit arising from creating successful products. The scientist, however, is protected only by ethics, not law, even the vague law that applies to businesses through trade mark legislation.

Actual publication in channels that dedicate scientific discoveries to the public is not the sole index of establishment of a right to credit. Much research today is done under blankets of military security. Achievement is thus often excluded from the public eye, although a close circle of an investigator's fellow scientists knows of the accomplishment. Government document centers distribute catalogs and abstracts of classified reports to disseminate knowledge of such accomplishments. The circle is widened thereby, but the finding is still not dedicated to the public at large.

A scientist may have no legal protection for credit, but the work is considered *his* work through general recognition, at best public recognition, and a property value exists in this recognition. This is scientific property. Indeed, it meets a most practical test—taxation is involved.

[2] "The Congress shall have power . . . to promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries." (Art. I, Sec. 8)

Recipients of foundation grants to apply their skills and training to advance research are subject to income taxes. Stipends received under fellowship awards from research foundations involving only education or training of the recipient are excluded, as the award is considered to be a gift. It is apparent that research results are valuable items, as valuable as such side issues as patents and copyrighted articles which are mere applications of the results. The research product possesses property value, and the creator and his sponsor are engaged in an enterprise that is very much like a bonafide business (*3*).

Apparently, scientific property exists at the moment of the scientist's original conception. Professor B. Van der Pol stated recently (*4*), "Some time ago in Holland an inquiry was made asking whether, when any new thought in science occurred to one, a new idea occurred in words or not. The question was also addressed to me. My answer was positively *no,* because it often gave me considerable pains, after a new thought had occurred to me, to express it in words to friends." Intellectual property is thus created without form and probably never is embodied in words or materials as are esthetic works or patentable devices.

The law does not protect ideas. Judge L. Hand has clearly analyzed the situation and draws the following interesting analogy (*5*) : "If Twelfth Night were copyrighted, it is quite possible that a second comer might so closely imitate Sir Toby Belch or Malvolio as to infringe, but it would not be enough that for one of his characters he cast a riotous knight who kept wassail to the discomfort of the household, or a vain and foppish steward who became amorous of his mistress. These would be no more than Shakespeare's 'ideas' in the play, as little capable of monopoly as Einstein's Doctrine of Relativity, or Darwin's Theory of the Origin of Species. It follows that the less developed the characters, the less they can be copyrighted; that is the penalty an author must bear for marking them too indistinctly."

The scientist's rights to his creations demand moral duties on the part of society, although he does not possess legal rights. Since credit is valuable, a scientist is loath to disclose fully his creation until he has solidified his position. When recognition comes, he quickly discloses all aspects of his research.

Credit is the mark of creative genius to distinguish an investigator in the ranks of his fellow scientists. He must secure this value to make his reputation and thus to profit from his labor.

Early workers used anagrams to conceal findings, yet to declare in print their creations. Thus Hooke announced his law in the form: ceiiinosssttuv, which, when arranged becomes *ut tensio sic vis.* Today's technique is by advertising through "letters to the editor," or scientific notes are distributed ahead of full publication to establish credit; for example, through a technical report to sponsoring agencies of research.

*Duties of the Scientific Administrator in Regard to Scientific Property.* The scientific administrator is particularly aware of this situation (*6*) and is acutely concerned with the problem of scientific property. Scientific administration is the name of a new profession—that of the scientist in the Office of Naval Research, the National Science Foundation, or similar organizations concerned with a program of contracted research. He is, in many ways, like the business manager described in Oswald Knauth's book (*7*).

Knauth describes a business manager as a mediator in behalf of the company as an institution who deals with concert and conflict between owners, employees, customers, and government. His decisions affect them all, the future of the corporation, and perhaps even the general welfare of the nation. His profession is a new one and not subject to clear sets of standards. He has a wide margin of discretion in which to make decisions so long as they do not wreck his enterprise. He is not strictly bound by the old and clear imperatives of competition, and nothing very definite has been substituted for them. His intuition is usually correct, although little assurance is given in a given case that his ideas are the best ones.

The scientific administrator is in a similar but more evanescent position. For example, he must mediate in the interest of his agency between the requirements of science, the universities, the scientists, and the nation. His decisions are likewise largely guided by intuition and, within the framework of the larger organization, he has a wide margin of discretion in which to operate. He must respect and guard any privileged communications to protect the intellectual property of his correspondent. Since his position in the world of science is that of catalyzing the advance of science, he must not stifle it by betraying confidences which might jeopardize the sole property value that a scientist obtains from his work—his credit.

The advance of science requires the constant interchange of ideas to engender new ideas. The scientific administrator tightens lines of scientific communication (*6*) by telling of current work in progress often before public announcement of a line of work by an investigator. He may tell of new techniques or discoveries before credit has been firmly established through publication and thus lose for an investigator his right to credit should a competitor seize upon the idea and then advance and establish it as his own. He may, on the other hand, help establish such credit, since credit exists only when recognized by scientific society and he is a link in scientific communication. In either event, the scientific administrator is in a privileged position, and he must judge between these conflicts of interests. Should he tell of learning of a scientific finding in the interest of furthering interchange of ideas or keep the matter to himself in interest of assuring that the right to credit will not be misplaced? Ethics are difficult to specify. Depth of understanding is involved, for a trivial advance may be considered major in the eyes of an investigator.

Institutions submitting reports to supporting agencies often call attention to their disclosure rights by limiting circulation with such words as: "This report is a private communication and must not be repro-

duced in whole or in part without special permission," or "It is urgently requested that no public reference to these disclosures be made until after their publication and that such references then be made to the periodical." The property value of the scientific findings is clearly behind such concern. The scientific administrator is not here concerned with an academic problem, far from it, tangible value rests in the right to credit. It is scientific property.

*Legal Protection of Scientific Property.* There have been attempts to secure legal rights for protection of scientific property. Since science is international in character, these are difficult to resolve, let alone achieve. Scientific councils, in justice to persons making scientific discoveries, have deliberated the problem which will enable scientists to secure economic benefits from the industrial progress based on their discoveries. The nature of such protection for the creations of the mind, over and above that enjoyed by authors of artistic or literary works and by inventors, is more difficult to define than protection given by copyrights (*7*) and patents, or even trade marks. It was suggested, for example, that scientists whose discoveries are applied industrially by others, should be remunerated out of a fund formed from subscriptions paid by, or contributions levied on, the industries profiting by the discoveries (*8*).

The question was raised in 1928 by the Committee on Intellectual Cooperation of the League of Nations: Shall the scientific discoverer be recognized legally and rewarded materially and, if so, how? The National Research Council, being representative of the leading scientific organizations in the nation, was asked to express its views. Two considerations were raised. Is this desirable? Is it feasible? The latter consideration took particular note of three plans.

The Ruffini plan which provided for granting a quasi-patent right to the discoverer of a scientific principle entitling him to a share of the profits accruing to an inventor who makes use of that discovery in some application for which he obtains a patent. The Casares modification of this plan which limited this right to cases in which the scientist foresees its commercial exploitation and places on record a specification of its application. The third plan was identified as the Torres Quevedo and Bariel proposals; it suggested awards to scientists for their discoveries from a state fund formed by contributions levied on the profits accruing to patentees or industrialists from the use of these discoveries.

At its April meeting in 1928 the Executive Board of the National Research Council moved: That the Permanent Secretary be instructed to reply to the Secretary of the American Committee on International Intellectual Cooperation to the effect that the National Research Council found that it was the almost unanimous opinion of its members that the protection by law of a scientist's property rights in his discoveries was not feasible, and was of doubtful desirability. This action was based on consultation with each of the divisions of discipline within the Council. The opinion of the Division of Chemistry was typical in that it felt that it was neither desirable nor feasible to give property rights to American scientists in their discoveries other than those assured by the principles of present patent and copyright legislation.

Twenty years ago the AAAS Committee on Patents, Copyrights, and Trade Marks consisting of Joseph Rossman, chairman, F. G. Cottrell, A. W. Hull, and A. F. Woods studied this problem and concluded "that no effort should at present be made to develop a plan for protecting scientific property." Its forty-page report (*9*) discusses fully the problems raised again here.

A proposal in 1951, striking at the problem by re-examining such general principles and thus protecting a discoverer rather than an inventor or author, was so to amend and extend the copyright laws that right to credit is a legal right (*10*). The present law does not give authors the right to require that their names be published in connection with their writings unless a contract exists. A scientist thus has no recourse if his article is published without his name. Revision of the copyright law is necessary to give the scientist a legal right requiring that his name be associated with his scientific writings (*5*).

Ilosvay's recent paper (1953) based upon a UNESCO report indicates that the issue is currently of international concern (*11*). This splendid paper written from the legal frame of reference penetrates deeply into the problem discussed here. The subject is obviously complex and any formal solution will be difficult if not impossible. However, conversations between scientific administrators and research scientists frequently, if not on each occasion, drift to this topic in many guises. Administrative solutions of problems, as they arise, may be made by noting analogous situations in areas where there is a body of formal tradition. For example, in the frequently occurring problem of multiple authorship of scientific papers, a decision as to the senior author, or whether to include associates as co-authors, might be resolved by following the practice of determining who are inventors. Clearly the rules governing decisions as to priority of invention are useful to resolve arguments of right to credit. Such rules in their more ancient form were undoubtedly used by the University of Padua committee in determining the priority of invention and discovery in the Capra plagiary (*2*).

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