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PATENTS AND NONPROFIT RESEARCH

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FOREWORD

This report was prepared by Dr. Archie M. Palmer for the Subcommittee on Patents, Trademarks, and Copyrights as part of its study of the United States patent system, conducted pursuant to Senate Resolutions 92 and 167 of the 84th Congress and Senate Resolution 55 of the 85th Congress. It is one of several now in preparation under the direction and supervision of John C. Stedman, associate counsel for the subcommittee.

The authors of these studies have been selected on the basis of their understanding, experience, and vision insofar as the patent system is concerned. For many years Dr. Palmer has been a recognized and leading authority on the patent policies of the Government and educational and nonprofit institutions. He has been associated with the patent-policy program of the National Research Council since 1933, and was appointed Director of its Office of Patent Policy Survey in 1946, a position he still holds. He was the first chairman of the Government Patents Board, serving in that capacity from 1950 to 1955. In addition, he has held a number of important positions with various educational institutions, including the presidency of the University of Chattanooga. He is the author of a number of publications on the subject of patents, including Nonprofit Research and Patent Management Organization (1955), Administration of Medical and Pharmaceutical Patents (1955), and University Patents Policies and Practices (1952).

The present study incorporates and brings up to date much of the information contained in some of these previous publications. In addition, it includes information not previously published especially with respect to the actual operations of these programs, important patents involved therein, and the receipt and disposition of income received from them.

Universities and other nonprofit research organizations have made a material contribution to scientific progress through their research efforts. This report sets forth the practices, policies, and experiences of these universities and organizations. Insofar as their relationship to patents is concerned. The analysis and collected information should prove useful to others who may be contemplating similar programs.

In publishing this report, it is important to state clearly its relation to the policies and views of the subcommittee. We point out here, as we have in other studies in this series, that the views expressed by the author are entirely his own. The subcommittee accepts, and welcomes, the report for consideration and study, but its publication in no way signifies or implies acceptance or approval by the subcommittee or its members of the facts, opinions, or recommendations contained in it. Such publication does, however, testify to the subcommittee's belief that the report represents a valuable contribution to the literature concerning the patent system and its operation, and that the public interest will be served by its publication, distribution and consideration.

JOSEPH C. O'MAHONEY,
Chairman, Subcommittee on Patents, Trademarks and Copyrights, Committee on the Judiciary, United States Senate.

AUGUST 9, 1957.

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PATENTS AND NONPROFIT RESEARCH

Introduction

Patentable discoveries and inventions are usually fortuitous byproducts of research. They are not necessarily the conscious or inevitable end result of scientific investigation or technological experimentation. This is especially true of the products of research conducted on the university campus and at other nonprofit research centers.

Whether concerned primarily with search into the unknown for a new idea, understanding of nature and its laws, solution of a specific research problem, development of a new product or improvement of an existing process, most scientists working in university laboratories and in nonprofit research organizations are content to pursue their investigations without giving much, if any, thought to the patentability of the results. Their research efforts are directed primarily to the task at hand, and many take the attitude that wide dissemination of the results through publication is preferable.

Yet frequently new ideas, discoveries, and inventions growing out of experiments and investigations undertaken with quite a different purpose in view may have valuable commercial application and require patent protection and control in the public interest. They may not only be essential to scientific and technological progress and to cultural and social advancement, but they may also contribute to industrial development and expansion.

The protection and control provided under the patent laws may have to be invoked to obtain the maximum public benefit and usefulness from these products of nonprofit research. In such instances the universities and other nonprofit research organizations have a responsibility to the public and to the inventors, as well as to themselves and to those who sponsor the research in cases of externally supported projects, to see that the discoveries and inventions are patented and are so administered and controlled that they will produce the greatest benefit to all concerned.

The Patent Act of 1952 provides that "any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof" is subject to patent.[1] Under this provision of the law many of the products of nonprofit research can be patented.

Since the turn of the century, and particularly during the past 15 years, there has been a steadily increasing recognition and appreciation of the contribution of scientific and technological research to the protection and improvement of the health, security, and prosperity of

[1] 35 U. S. C. (1952), sec. 101.

this Nation and of the world at large. Through the research efforts of scientists, engineers, and other creative individuals tremendous strides have been made in the advancement of the economic and social welfare and well-being of mankind.

As Vannevar Bush so aptly expressed it in his letter transmitting to the President his report on Science, the Endless Frontier in 1945:

> Scientific progress is one essential key to our security as a nation, to our better health, to more jobs, to a higher standard of living and to our cultural progress.[2]

Universities and other nonprofit research organizations have made a material contribution to scientific progress through their research efforts. Through the conduct of both fundamental and applied research, some of it institutionally sponsored but a considerable amount supported by industry and the Government under contract and grant-in-aid, these organizations have aided in restocking the storehouse of fundamental scientific and technical information, which was so extensively depleted to meet the urgent demands of World War II, and also in providing solutions to problems of immediate concern to industry and the Government.

This monograph contains factual information concerning nonprofit research and patent management in the United States and an interpretative analysis of the policies, practices, and procedures of universities and other nonprofit organizations in the conduct of their research activities and in the disposition and administration of the patentable results of such research. Both the factual information and the interpretative analysis are based upon the author's extensive studies and experience with these problems over the past 30 years and his publications on the subject of patents and nonprofit research.[3]

University Research

Although universities, colleges, technological institutes, and professional schools are primarily teaching institutions, research is and always has been an integral part of their overall educational program. Research is an essential adjunct of informed and effective teaching: it is the lifeblood of a good teaching institution. Through their research activities the members of the university community and the universities themselves are enabled to fulfill their fundamental function of extending the boundaries of human knowledge, of arousing and encouraging attitudes of scientific and critical inquiry, of training their students for scholarly and technical pursuits, and of disseminating scientific and technological information.

Universities attract the type of independent thinker who is interested in the discovery and dissemination of new knowledge. Both by nature and by reason of the university environment he is disposed to delve into the unknown and to conduct fundamental research as a means of gaining knowledge for its own sake. He performs the experimental and investigative work necessary to obtain this new infor-

[2] Bush: Science, the Endless Frontier (1945), p. vi.

[3] Especially the 4-volume series on Nonprofit Research and Patent Management (1955–56); also University Patent Policies (1934), Survey of University Patent Policies (1948), University Research and Patent Problems (1949), Medical Patents (1948), University Patent Policies and Practices (1952), Supplement to University Patent Policies and Practices (1955) and Administration of Medical and Pharmaceutical Patents (1955).

mation unhampered by the pressures and demands encountered by the scientist in an industrial laboratory.

Another, and perhaps even more important, aspect of university research concerns the training of scientific and technological personnel to meet the urgent needs of industry and government, as well as the educational institutions themselves, and to relieve the present critical shortage of adequately trained scientists and engineers. Learning to become a competent research worker requires not only the acquisition of factual information but also the experience in research techniques and procedures that can only be obtained through actual participation in experimental research.

UNIVERSITY RESEARCH PRACTICES

At some educational institutions research plays a more important role than at others. Many of the larger universities, both public and private, and the land-grant colleges include both regular divisions and special research units which engage in extensive research programs.[4] By their very nature technological institutes and professional schools operate in fields which involve both basic and applied research. The agricultural and engineering experiment stations affiliated with the land-grant colleges and State universities perform research as a public service,[5] as do the State bureaus of mines and other specialized units located at these institutions.

University research has also been given further impetus during recent years by cooperative and sponsored projects supported by government, industry, foundations, scientific societies, trade groups and other off-campus agencies through grants and contracts.[6] Such support of university research is of two general types, distinguished by the objectives of the research and the limitations and restrictions placed upon the investigators themselves and on the use of the findings:

(1) Unrestricted gifts, grants-in-aid, and graduate research fellowships, given without expectation of any direct return to the sponsors but rather as contributions toward the general educational programs of the universities, usually in response to requests for financial aid of research activities initiated by faculty members and advanced students; and

(2) The financing of specific projects of immediate interest and benefit to the sponsors, through fellowships and research contracts, with limitations on the areas of study and restrictions on the control and use of the research findings.

In such an atmosphere it is inevitable that research and patent problems will arise, particularly at those institutions where any considerable amount of scientific or technological research is conducted. These problems concern not only the institutions themselves, but also their employee-inventors and the sponsors of the research. To deal effectively with these problems many universities, colleges, technological institutes, and professional schools have found it necessary and desir-

[4] Palmer, Nonprofit Research and Patent Management in the United States (1956), pp. 12–24; also Palmer, Nonprofit Research Institutes (1956).
[5] Pp. 14–20, infra.
[6] Footnote 4 supra: also Palmer, Industry Sponsored University Research, 26 Chemical and Engineering News (July 12, 1948), pp. 2042–2045.

able to adopt institutional policies and practices and to formulate procedures both for the conduct of research on the university campus and for the handling of patentable discoveries and inventions.[7]

There is a wide diversity of practice among educational institutions, and often in the various divisions of the same institution, in the handling of these patentable discoveries and inventions. Existing practices vary from strictly drawn research and patent policies to laissez-faire attitudes, and even an unwillingness to become concerned with patents. At a considerable number of institutions little or no serious official consideration has been given to the patent problem, despite the steadily increasing volume of scientific and technological research conducted on the university campus during recent years.

Some institutions observe a hands-off attitude, leaving to the individual inventor the responsibility for determining what disposition is to be made of the products of his research efforts. Others take the position that the institution has an interest in all research activity on the campus and have established formalized research and patent policies or follow generally accepted practices for handling any patentable discoveries that may result. Still others observe a definite policy of not having a research or patent policy. Frequently the failure on the part of an institution to establish such a policy is the result of limited experience or no experience at all with patent problems.

Of the more than 1,850 institutions of higher learning in the United States less than one-fourth have given much serious thought to research and patent problems. Most of the other institutions are junior colleges, law schools, theological seminaries, other specialized institutions, and small liberal arts colleges which do not engage in any significant amount of scientific or technological research. As a result they have little or no concern with research and patent problems.

Nevertheless, there is evidence of a definite trend [8] on the part of the higher educational institutions to adopt formalized research and patent policies or to develop and observe practices which, while not established by formal trustee or other action, are generally accepted as applicable to research throughout the institution.[9] Some institutions have adopted special policies or recognize general practices for dealing with those results of scientific investigation that affect public or private health.[10] Others have developed policies and practices only with respect to sponsored research, particularly when conducted in special research units.[11]

FORMALIZED RESEARCH AND PATENT POLICIES

General research and patent policies have been adopted, as a definitive course of action formulated and expressed in a systematic statement, by the boards of control, State legislatures, or other governing

[7] Palmer, Survey of University Patent Policies (1948), University Research and Patent Problems (1949), University Patent Policies and Practices (1952), and Supplement to University Patent Policies and Practices (1955).

[8] The trend is indicated by the following tabulation of dates of original adoption of formalized research and patent policies:
Prior to 1930, 3; 1931–35, 6; 1936–40, 12; 1941–45, 19; 1946–50, 25; 1951–55, 20.

[9] Footnote 7, supra.

[10] P. 8 infra; also Palmer, Medical Patents (1948) and Administration of Medical and Pharmaceutical Patents (1955).

[11] Pp. 6, 9–13, infra; also Palmer, footnote 6, supra.

bodies of the following 85 universities, colleges, technological institutes, and professional schools:[12]

Agricultural and Mechanical College of Texas[13]
Alabama Polytechnic Institute
California Institute of Technology
Carnegie Institute of Technology
Case Institute of Technology
Chapman College
Clarkson College of Technology
Clemson Agricultural College
Columbia University
Cornell University
Drexel Institute of Technology
Florida State University[14]
Institute of Paper Chemistry
Iowa State College
Johns Hopkins University
Kansas State College[14]
Lehigh University
Lowell Technological Institute
Massachusetts Institute of Technology
Medical College of Virginia
Michigan College of Mining and Technology
Mississippi State College
Newark College of Engineering
Northeastern University
Northwestern University
Ohio State University
Oklahoma Agricultural and Mechanical College
Oregon State College[14]
Pennsylvania State University
Pratt Institute
Princeton University
Purdue University
Rensselaer Polytechnic Institute
Rutgers University
St. John's University
St. Olaf College
South Dakota School of Mines and Technology
Southern Illinois University
Stanford University
State College of Washington
State University of Iowa
State University of New York[15]
Tufts University
University of Akron
University of Alabama
University of Arizona
University of Arkansas
University of California
University of Chicago
University of Cincinnati
University of Colorado
University of Connecticut
University of Delaware
University of Detroit
University of Florida[14]
University of Hawaii
University of Idaho
University of Illinois
University of Kansas[14]
University of Kansas City
University of Kentucky
University of Louisville
University of Maine
University of Miami
University of Missouri
University of Nebraska
University of New Hampshire
University of North Carolina[16]
University of North Dakota
University of Notre Dame

[12] Palmer, University Patent Policies and Practices (1952), pp. 28–229, and Supplement to University Patent Policies and Practices (1955), pp. 46–90, in which verbatim statements of these policies are presented.

[13] The policy of the Agricultural and Mechanical College of Texas, which was adopted by the board of directors of the Texas Agricultural and Mechanical College System, is applicable not only to the college itself but also to the Arlington State College, to the Tarleton State College, to the Prairie View Agricultural and Mechanical College, and to the other units of the system.

[14] The policies of the Oregon State College and the University of Oregon are identical; a similar policy applies also to the other public higher educational institutions in that State, which are under the control of the Oregon State Board of Higher Education. The similarity of the policies of Florida State University and the University of Florida and of the policies of Kansas State College and the University of Kansas will also be noted.

[15] The policy of the State University of New York applies to all the State-operated units of the university, which consist of 11 colleges for teachers and teachers colleges, 6 agricultural colleges and technical institutes, 2 colleges of medicine, a college of forestry, the Maritime College at Fort Schuyler, and Harpur College.

[16] The policy of the University of North Carolina is applicable on a universitywide basis to members of the university staff and to graduate students and assistants at the university located in Chapel Hill, at the North Carolina State College of Agriculture and Engineering located in Raleigh, and at the Woman's College located in Greensboro.

University of Oregon [14]
University of Pennsylvania
University of Puerto Rico
University of Rhode Island
University of South Dakota
University of Texas [17]
University of Tulsa
University of Utah
University of Washington
University of Wyoming
Vanderbilt University
Virginia Polytechnic Institute
West Virginia University
Wittenberg College
Yale University

Harvard and Western Reserve Universities have formally adopted special research and patent policies with respect to inventions and discoveries primarily concerned with therapeutics or public health, which are applicable on a universitywide basis and deal with the subject matter of the research rather than the site of its performance.[18] The policy of Harvard University also applies to Radcliffe College because of its affiliation with that university.

Boston and Louisiana State Universities, Linfield College, and the Universities of Michigan and Minnesota have adopted definitive research and patent policies with respect to cooperative or externally sponsored research, as has New York University with respect to research conducted in its college of engineering under the auspices of the research division of the college.[19] At most institutions patentable products of such contractual research are subject to the provisions of the contracts made with the sponsors of the research.

A number of other institutions which have not formally adopted policies but which have entered into patent development agreements with Research Corp., a nonprofit patent management foundation, consider the provisions of those agreements in the nature of a broadly formulated policy and apply both the provisions and the philosophy of those agreements on an institutionwide basis.[20]

Of the 85 formalized research and patent policies currently in effect, 20 have been adopted during the past 5 years. The policy of Lehigh University was the first to be established: it was adopted more than 30 years ago, on April 25, 1924. Eight others have been in existence more than 20 years, but five of these have been revised or amended since their original adoption. The frequent revisions which have been made, especially during the past several years, indicate that these policies are under constant review and reconsideration. Since 1950 11 previously adopted policies have been revised or amended: several of them were completely rewritten and the others were modified in part.[21]

Most of the formalized policies have been established through trustee action, usually after extended prior study by special faculty or joint faculty-administration committees; whereupon they have

[14] See footnote p. 5.
[17] The policy of the University of Texas is applicable on a universitywide basis, not only to the units of the university located in Austin but also to the medical branch located in Galveston, to the Southwestern Medical School located in Dallas, and to the Texas Western College located in El Paso.
[18] Palmer, Medical Patents (1948), pp. 9, 26; and Administration of Medical and Pharmaceutical Patents (1955), pp. 12–13, 67.
[19] Palmer, University Patent Policies and Practices (1952), pp. 38–40, 123–124, 141–142, 143–144, and Supplement to University Patent Policies and Practices (1955), p. 50.
[20] Pp. 36–38, infra.
[21] Footnote 8, supra.

then been adopted with administrative approval and recommendation. A few of the policies have been established merely by administrative action. Some of the more recently adopted policies are patterned after those already in effect at other institutions, particularly the earlier policies of Lehigh University, Pennsylvania State University, Massachusetts Institute of Technology, and the University of Illinois, with variations to fit local situations.[22]

In some instances the policy statements have been incorporated in the official bylaws and regulations of the institutions concerned; in certain other instances they are to be found only in the minutes of meetings of the boards of control. A few of the policy statements are included as part of general research and other faculty regulations, and have been so published in booklet form.

The patent policies of several of the State universities have been established by legislative action and are part of the organic laws of their States, as in Connecticut, North Dakota, and Ohio; the same is true with respect to the University of Puerto Rico.[23] At Alabama Polytechnic Institute the research and patent policy adopted by the Auburn Research Foundation, a separately incorporated but affiliated research organization, applies as the policy of the institute.[24]

The formalized research and patent policies of several of the institutions are included in agreements signed by their employees, particularly those engaged in research activities. The policies of the Michigan College of Mining and Technology and of St. John's University are embodied in patent agreements which every employee is required to sign when accepting a position at either institution.[25]

At Case Institute of Technology all staff members and students working on research supported by the Case Research Fund or under contracts with the Government or industry are required to sign an inventions agreement which contains the institute policy.[26] The policy of the Lowell Technological Institute is embodied in an inventions agreement signed by all faculty members of the institute who devote time to the research activities of the Lowell Technological Institute Research Foundation, a separately incorporated but affiliated organization.[27]

Although the formalized policy of St. Olaf College is applicable on a collegewide basis, all members of the departments of physics and chemistry are required to sign a special agreement which includes the policy.[28] The policy of Wittenberg College is a provision of the memorandum agreement between the college and the membership of the Wittenberg Research Institute, an unincorporated function of the college.[29]

Certain of these 85 formalized policies are currently under review to meet changing conditions in the institutions, and at a number of other institutions new policies are in process of preparation, some of which have been under consideration for years. Several institutions have the formulation of a patent policy under current study as a

[22] Palmer, University Patent Policies and Practices (1952), pp. 95–98, 121–122, 133–136, 169–170.
[23] Ibid., pp. 67–70, 154–155, 160–162, 177–179.
[24] Ibid., pp. 28–30.
[25] Ibid., pp. 139–141, 194.
[26] Palmer; Supplement to University Patent Policies and Practices (1955), pp. 46–47.
[27] Footnote 22, supra, pp. 127–129.
[28] Footnote 26, supra, pp. 65–68.
[29] Footnote 22, supra, pp. 224–225.

result either of specific research and patent problems which have arisen at those institutions or of a recently accelerated interest in sponsored research activities.

SPECIAL FEATURES OF POLICIES

The policy statements vary in length and in delineating the procedures to be followed, also in the extent to which they provide for the various possibilities that might arise. In practice the policies are all subject to and are given local interpretation, in conformance with institutional regulations and other pertinent local considerations.

A number of universities with affiliated medical schools, such as Columbia, Cornell, and Johns Hopkins Universities and the Universities of Cincinnati and Pennsylvania, include in their policies special provisions with respect to patentable results of scientific research that affect public and individual health, particularly discoveries and inventions of a medical, pharmaceutical, therapeutic, or hygienic nature. Even though a medical school or a college of pharmacy which is affiliated with a university is located in another city, it is nevertheless subject to the provisions of the universitywide policy, and particularly to any special provisions with respect to inventions and discoveries affecting public health which are included in a number of the policies.[30]

As previously indicated, Harvard and Western Reserve Universities have formally adopted special research and patent policies with respect to inventions and discoveries primarily concerned with therapeutics or public health, which are applicable on a universitywide basis and deal with the subject matter of the research rather than the site of its performance.[30a]

The formalized policies are all applicable on a university- or college-wide basis to both faculty and staff members. Some of the policies also include provisions with respect to patentable discoveries resulting from student research, especially when the discoveries are made by graduate students employed or receiving specific fellowship or other financial aid provided under Government or industrial research contracts. On the other hand, inventions made by students holding academic scholarships or fellowships are generally considered to be the personal property of these student-inventors, who accordingly retain the right to assign or otherwise dispose of their patent rights.[31]

Both the aforementioned 85 formalized research and patent policies and most of the generally accepted practices followed at the other institutions cover all types of research conducted on the campus and, insofar as practicable, all types of situations from which patentable discoveries and inventions might reasonably be expected to arise. The wide variety of circumstances under which research and patent problems may occur are usually grouped in three general categories, designated for convenience as (1) personal or unorganized research, (2) organized or institutionally supported research, and (3) externally sponsored or cooperative research supported by industry, government, and other off-campus agencies.

In order to provide incentive and encouragement to their faculty members and other employees in pursuing their personal research

[30] Footnote 10, supra.
[30a] Footnote 18, supra.
[31] See especially policies of Carnegie Institute of Technology and of Massachusetts Institute of Technology in Palmer, footnote 22, supra. pp. 51, 133–136.

interests, most educational institutions place little or no restriction on the disposition of discoveries and inventions resulting from research conducted on an individual's own time and at his own expense, even though institutional facilities and equipment may have been used in their development. Such discoveries and inventions are considered to be the exclusive property of the inventor, and he retains the full patent rights and complete freedom to dispose of them as he deems proper.[32]

Institutions having formalized research and patent policies usually recognize, by explicit reference or by implication in their formal policy statements, that a patentable discovery or invention which is not related to the individual's official field of employment belongs to the inventor and accordingly waive all claim to or equity in the discovery or invention and in any patents that may issue thereon. Similarly, at institutions which, in the absence of established policies, observe generally accepted practices, the ownership of a discovery or invention resulting from personal or individual research rests exclusively with the inventor.[33]

Products of programmatic or institutionally supported research conducted by faculty members and other employees as a regular part of their teaching and/or research responsibilities, especially when patentable, require specific policy determination. When the invention is directly related to the official duties and responsibilities of the inventor, it is usually the practice to require assignment of title to the institution or its designated agent, with or without provision for participation of the inventor in any income that may accrue from the sale or exploitation of patents obtained on the invention.[34]

In such cases the institution bears the costs of obtaining the patent and assumes responsibility for its exploitation, either directly or through an outside patent management organization. Provision is also ordinarily made for the patent rights to revert to the inventor if the institution or its designated agent does not file an application for patent within a reasonable time. The exact period of time is sometimes, but not always, specified in the institutional patent policy or in the assignment agreement.[35]

EXTERNALLY SUPPORTED RESEARCH

The recent increase of cooperative and externally sponsored research in educational institutions, supported by industry, Government agencies, foundations, scientific societies and trade groups, raises many problems.[36] While certain of this research is of a fundamental or basic nature, much of it is developmental in character and the findings may have valuable commercial application. The effect of such research activities on the overall educational program of an institution and on the discharge of its responsibility for training scientific personnel often poses problems of policy and administration.

Nevertheless, through sustained interest and financial assistance, these outside research sponsors give the educational institutions assur-

[32] Footnote 12, supra.
[33] Ibid.
[34] Ibid.
[35] Ibid.
[36] Footnote 6, supra.

ance of the stability and continuity of financial support that is essential for carrying on basic and fundamental research, especially when the support extends over a period of years. Such interest and support help the universities to enrich the academic curriculum, to retain on the staff outstanding teachers, and also to encourage and make possible the continuance in school of promising young research scientists who, in the absence of this aid, might be forced to abandon their advanced studies and be lost to science.

The additional funds provided for sponsored research, as well as unrestricted corporate contributions for research, place the universities in a position, through the payment of more adequate salaries and providing better working conditions, to attract to the campus experienced teachers and qualified research workers. Such assistance also makes possible the purchase of new and modern equipment for expanding their educational programs. Further, through cooperative research relations with industry, faculty members enjoy contacts with current industrial developments that are mutually beneficial and enhance both their teaching and their professional growth.

Emphasizing the stake of business in American education, Frank W. Abrams, former chairman of the board of directors of the Standard Oil Company of New Jersey, recently said:

> If business and industry could not draw upon a large reservoir of educated manpower, they would be handicapped in every phase of their operations. * * * The intelligence and initiative of people is a tremendous natural resource of any nation. All other natural resources are meaningless without it. * * * If we let our educational system decay, we will gravely injure the foundation of our greatness as a nation. By the same token, if we develop our educational system—expanding it and making is stronger—we will be cultivating the greatest of our natural resources, the people of America. And no one has a greater stake in the future of America than American businessmen.[37]

The growing concern of industry in strengthening the hands of the universities and providing them with the tools for doing a better job is well expressed by 2 outstanding industrial leaders—to cite but 2 of many such expressions. At the 52d Congress of American Industry, Robert E. Wilson, chairman of the board of the Standard Oil Company (Indiana), said:

> Industry must recognize an increasing responsibility to support basic research in our universities.[38]

Roy C. Newton, vice president in charge of research for Swift & Co., has also been outspoken in pointing out industry's responsibility. He says:

> Each day it becomes more apparent that there is a definite need for a general program of promotion calling for more widespread support of basic research.

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[37] Abrams, The Stake of American Business, pp. 6–8.
[38] In panel discussion on What Should Be the Role of Government in Research? (1947), p. 38.

He indicates industry's responsibility in the following words:

> The challenge in the future lies in accelerating the pace of these basic studies in colleges and universities and under conditions which provide the greatest possible freedom for initiating this kind of research, developing it, and publishing the results. Colleges and universities reach out beyond the limited spheres of interest of any single industry or even a group of industries. They train the men who are needed to broaden our scientific frontiers.[39]

A similar challenge to industry, to fill the gap at least partially and participate in the expansion of scientific research through its support of pure science in the universities, came from Sumner T. Pike, a businessman who was formerly Vice Chairman of the Atomic Energy Commission. Recently, in discussing the future of pure science in this country, he called attention to the stringent financial problems confronting the universities which prevent them from financing the vast amount of basic research which is crying to be done and which obviously can best be performed on the university campus. As he said:

> Since * * * the universities are unable to finance such work out of their own funds, it is highly preferable that industry should step into the breach with individual contributions, rather than that Government, in the absence of adequate private support, should come to dominate this field.[40]

If industrial research is to flourish, exploratory research in the universities must be supported and proportionately emphasized. Only in that way can we assure the restocking of our storehouse of basic information. During recent years, largely for war purposes and the national security, we have been using up our supply of fundamental knowledge faster than we have been adding to it.

The need for more fundamental research and the desirability of fostering such research in the colleges and universities were well stated by the late Thomas Midgley, Jr., in a discussion of the future of industrial research. He gave as reasons for entrusting fundamental research to the universities and for industry giving them both encouragement and support:

> First, the university staffs are generally able to bring a much broader vision to bear on these fundamental problems; second, where fundamental problems are being prosecuted in industrial laboratories they have a habit of being set to one side and forgotten when more urgent work develops; and third, the work thus given to the educational staffs will be of considerable value in educating future scientists to do more such work.
>
> On the other hand, applied research should not be given to the university or college staffs when the industrial unit is capable of performing this service for itself. Universities do not maintain the industrial tempo, nor are their staffs in

[39] Newton. Industry's Responsibility for Basic Research, p. 7.
[40] As quoted in Hutchins, Industrial Applications of Atomic Energy, in a symposium on What's Ahead for Patents, Industrial Research, and Atomic Energy? (1947), p. 7.

> the habit of, nor should they be asked to, work in the confidential capacity required for successful patent control.[41]

Through its support of university research, industry encourages fundamental investigation in broad fields of industrial interest and helps advance the teaching of basic subjects and postgraduate research in the universities. Such aid is also required if the educational institutions are to perform their major function of training men and are to provide a continuing and steadily increasing supply to relieve the present critical shortage of adequately trained scientific and technological personnel.

Industry support of university research is not a new phenomenon. For years industrial corporations and trade associations, as well as individual industrialists, have provided funds for the conduct of both basic and fundamental research and specialized developmental, or applied research, investigations at educational institutions. Progressive business executives recognize the potential value of the research facilities and the scientific personnel available in universities and technological institutions in the promotion and expansion of industrial progress.

A considerable number of companies are presently giving, or have at one time or another given, financial support to university research, although in some instances it has been on a limited scale.[42] Many have made extensive use of university facilities on specific research problems of immediate concern to their own operations. Some—and the number is increasing—have developed or are developing systematic programs for supporting university research through long-term or continuing grants and fellowship aid to promising graduate students. Others are participating in the cooperative research activities at universities sponsored by various national, regional, and State trade groups.

In its return to peacetime status after World War II, industry has turned more than ever to the colleges, universities, and technological institutes for assistance in solving its reconversion problems. When unable to provide within their own organizations means for producing new ideas for the improvement and replacement of obsolete facilities and processes to meet postwar conditions, large and small companies alike, as well as trade associations and groups of related industrial firms, have sought the services of educational institutions in research on specific developmental problems.

The educational institutions have been quick to respond to this new call upon them, despite the heavy teaching load resulting from swollen postwar enrollment and their own lack of adequate instructional personnel. A number have for years been rendering such service to industry, both on an institutional basis and through consulting and research work on the part of individual staff members. This has been particularly true in State universities, land-grant colleges, and technological institutes. However, largely as the result of their experience with war contracts and observation of what others have done or are doing, there has been a material increase during the past several

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[41] Midgley, The View of a Chemist, as presented in a forum on the Future of Industrial Research (1945), p. 39.

[42] Hull and Timms, Research Supported by Industry Through Scholarships, Fellowships, and Grants, 24 Chemical and Engineering News (September 10, 1946), pp. 2346–2358.

years in the number of colleges and universities interested in offering research services to industry and Government.

PATENTABLE DISCOVERIES AND INVENTIONS

Patentable discoveries and inventions resulting from sponsored university research are handled in many different ways, the ownership and control of patent rights sometimes being retained by the university but more often being turned over to the sponsor under a predetermined contractual arrangement. Certain institutions are unwilling and a few refuse to undertake research projects which are likely to entail patentable developments. Others are willing to undertake such research projects only when they retain complete control over both the patent rights and the publication of the results of the investigation. Still others will enter into contracts under which the sponsor receives, for a consideration, ownership of all patentable discoveries, as well as full and confidential reports on the research findings.[43]

Scientific and technological research sponsored and supported externally, especially by industry and by Government, is today a major activity on many a university campus. It is conducted both as an integral part of the educational program and as a special service to industry and the Government. The support is given in various forms: as unrestricted gifts, grants-in-aid, fellowships and contracts for the financing of specific research projects.

As the sponsor of the research usually executes the contract with the institution, rather than with the individual research worker, arrangements must be made by the institution for compliance with the terms of the contract in order that it may fulfill its contractual obligations. These arrangements may be, and ordinarily are, included in the institution's research policy or may be handled through a collateral patent waiver agreement or employment contract with the research workers engaged on the project.

Most institutions require full-time research personnel and others employed on special research projects to sign patent assignment agreements covering all patentable ideas and discoveries that may result from their investigations. Such agreements are also generally required of full-time research workers in state agricultural and engineering experiment stations, as well as those employed on projects conducted in or under special research institutes affiliated with educational institutions.

Certain university research and patent policies include reference to patentable discoveries and inventions resulting from student research, especially when the student is employed or receives specific fellowship aid under an industrial or Government research contract. However, except when subject to the terms of a research contract, such discoveries and inventions are generally considered to be the private property of the student. It is recognized that a student paying tuition is entitled to reasonable use of the facilities of the institution, as is a student receiving an academic scholarship or fellowship.[44]

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[43] Footnotes 6 and 12, supra; see especially University of Michigan policy, in Palmer, footnote 22, supra, pp. 141–142.

[44] Footnote 31, supra.

The procedures established for administering an institutional policy or practice and for determining equities in inventions are usually designed to eliminate, insofar as is practicable, all complicated and burdensome effort on the part of the research workers and to encourage disclosure of and cooperation in obtaining patents on inventions. Incentive may also be provided through the participation of the inventors in any revenue derived from the sale or exploitation of patents obtained on their inventions.[45]

In order to assure the same equitable treatment to all employee-inventors the appropriate authority responsible for the administration of the institutional policy, whether a qualified individual, committee, board, or designated agent of the university, is so selected that it will function judicially and impartially in the determination of rights. In most instances provision is also made for appeal from the decision of this administrative authority in the event of disagreement.[46]

It is the usual practice for educational institutions to retain control over the publication of the results of all research conducted on the campus, except personal research. When an investigation is financed through outside funds, that control is frequently, but not always, exercised subject to prior consent of the sponsor, and publication is withheld for a reasonable time to protect patent applications and the interests of the sponsor in the commercial development of new discoveries or processes. A few institutions turn over all the results of the research to the sponsor, including publication privileges as well as patent rights, merely reserving approval of any reference to the institution or its part in the investigation. In most instances the use of the name of the institution or of the inventor in any advertising is proscribed.

Institutional copyright policies are incorporated in a few research and patent policy statements, mainly in order to protect the interests of outside sponsors of contractual research. However, as a general practice, especially at educational institutions, the copyrighting of books and other writings is considered the prerogative of the author, except with respect to the results of institutionally supported or externally sponsored research.

Certain policies also include provisions concerning consultation services by faculty members, especially when such services involve the use of the facilities of the institution. Patentable discoveries and inventions resulting from such services are subject to those policy provisions. Ordinarily, reasonable use of institutional facilities by faculty members is permitted, both for personal research and for outside consultation services for industry.

Experiment Station Research

Through the systematic study of problems relating to agriculture and engineering, the State agricultural and engineering experiment stations, most of which are located at the land-grant colleges and the State universities, have also made many outstanding contributions affecting the agricultural and industrial economy and public welfare. Although primarily concerned with the advancement of the interests

[45] Footnote 12, supra, and Palmer, Survey of University Patent Policies (1948), pp. 110–112.
[46] Footnote 12, supra.

of their respective States and Territories, many of the stations have engaged in the solution of regional and national problems through cooperative research in which two or more stations have participated, and frequently also the United States Department of Agriculture, pooling their technical resources and facilities according to their respective responsibilities and capabilities.[47]

AGRICULTURAL EXPERIMENT STATIONS

In the following States and Territories the agricultural experiment stations are located at the land-grant colleges and universities indicated, with additional stations in three of the States—Connecticut, New York, and Ohio; a number of the stations have branches in other parts of their respective States:

Alabama, at Alabama Polytechnic Institute in Auburn
Alaska, at the University of Alaska in Palmer
Arizona, at the University of Arizona in Tucson
Arkansas, at the University of Arkansas in Fayetteville
California, at the University of California in Berkeley
Colorado, at Colorado Agricultural and Mechanical College in Fort Collins
Connecticut, at the University of Connecticut in Storrs; also one in New Haven
Delaware, at the University of Delaware in Newark
Florida, at the University of Florida in Gainesville
Georgia, at the University of Georgia in Athens
Hawaii, at the University of Hawaii in Honolulu
Idaho, at the University of Idaho in Moscow
Illinois, at the University of Illinois in Urbana
Indiana, at Purdue University in Lafayette
Iowa, at Iowa State College of Agriculture and Mechanic Arts in Ames
Kansas, at Kansas State College of Agriculture and Applied Science in Manhattan
Kentucky, at the University of Kentucky in Lexington
Louisiana, at Louisiana State University in Baton Rouge
Maine, at the University of Maine in Orono
Maryland, at the University of Maryland in College Park
Massachusetts, at the University of Massachusetts in Amherst
Michigan, at Michigan State University of Agriculture and Applied Science in East Lansing
Minnesota, at the University of Minnesota in St. Paul
Mississippi, at Mississippi State College in State College
Missouri, at the University of Missouri in Columbia
Montana, at Montana State College in Bozeman
Nebraska, at the University of Nebraska in Lincoln
Nevada, at the University of Nevada in Reno
New Hampshire, at the University of New Hampshire in Durham
New Jersey, at Rutgers University in New Brunswick

[47] Federal Legislation, Rulings, and Regulations Affecting the State Agricultural Experiment Stations, U. S. Department of Agriculture Miscellaneous Publication No. 515 (1954), pp. 1, 10.

New Mexico, at New Mexico College of Agriculture and Mechanic Arts in State College
New York, at Cornell University in Ithaca; also one in Geneva
North Carolina, at North Carolina State College of Agriculture and Engineering (of the University of North Carolina) in Raleigh
North Dakota, at North Dakota Agricultural College in Fargo
Ohio, at Ohio State University in Columbus; also one in Wooster
Oklahoma, at Oklahoma Agricultural and Mechanical College in Stillwater
Oregon, at Oregon State College in Corvallis
Pennsylvania, at Pennsylvania State University in University Park
Puerto Rico, at the University of Puerto Rico in Rio Piedras
Rhode Island, at the University of Rhode Island in Kingston
South Carolina, at Clemson Agricultural College in Clemson
South Dakota, at South Dakota State College of Agriculture and Mechanic Arts in College Station
Tennessee, at the University of Tennessee in Knoxville
Texas, at the Agricultural and Mechanical College of Texas in College Station
Utah, at Utah State Agricultural College in Logan
Vermont, at the University of Vermont in Burlington
Virginia, at Virginia Polytechnic Institute in Blacksburg
Washington, at the State College of Washington in Pullman
West Virginia, at West Virginia University in Morgantown
Wisconsin, at the University of Wisconsin in Madison
Wyoming, at the University of Wyoming in Laramie

Although formally organized through the encouragement and assistance of Federal-grant funds authorized by the Hatch Act of 1887 [48] and laws supplementary thereto, the research activities of many of these State agricultural experiment stations originated in earlier movements in various States growing out of State geological and agricultural surveys beginning in the 1840's and were accelerated by the establishment of the land-grant colleges and universities under the Morrill Act of 1862.[49] Even earlier, beginning with the settlement of Jamestown in 1607 and of Plymouth in 1620, when attempts were made by the newly arrived colonists to improve the primitive agriculture practiced by the native Indians, significant contributions to the agricultural economy of the American people had resulted from individual effort and colonial subsidies designed to improve the raising of crops and livestock through experimentation and research.[50]

These experiment stations conduct a wide range of research and disseminate information concerned with the development of higher yielding and disease-resistant crops, insecticides and fungicides, soil fertility and conservation, as well as more productive soil use, silviculture and forest management, plant and livestock breeding, livestock and dairy problems, and the preservation of foods. The results of laboratory investigations are supplemented and tested through the

[48] 24 Stat. 440.
[49] 12 Stat. 503.
[50] True, A History of Agricultural Experimentation and Research in the United States, 1607–1925 (1937).

experimental farms and herds maintained by many of the land-grant colleges and universities.

The activities of the agricultural experiment stations, which are financed largely through State appropriations supplemented by Federal-grant funds, are designed to promote a sound and prosperous agriculture, increase farm productivity, improve the standards of farm living and enable agriculture to make its maximum contribution to the welfare of the consumer, having due regard to the varying conditions and needs of the respective States.[51] Many of the stations also conduct research on problems of general interest to agriculture and related industries in cooperation with national, regional, and State or local trade associations and receive financial assistance in support of such research from these associations. A few undertake research projects supported by private companies and individuals, when the subject of the investigation is of public concern and is broad and basic in character.[52]

ENGINEERING EXPERIMENT STATIONS

More recent in origin are the State engineering experiment stations which are also located at many of the land-grant colleges and State universities and operate in conjunction with the colleges of engineering at those institutions. The oldest of these stations are those at Iowa State College of Agriculture and Mechanic Arts and at the University of Illinois, both of which were organized in 1904 "in recognition of the need for more accurate knowledge of the materials and processes of engineering and the conservation of these resources upon which the engineering industries depend."[53]

In the following States the engineering experiment stations are located at the institutions indicated; in six of the States—Alabama, Colorado, New Mexico, North Dakota, Utah, and Washington—such stations are located at both the land-grant college and the State university:

Alabama, at Alabama Polytechnic Institute in Auburn; also at the University of Alabama in Tuscaloosa
Arizona, at the University of Arizona in Tucson
Arkansas, at the University of Arkansas in Fayetteville
Colorado, at Colorado Agricultural and Mechanical College in Fort Collins; also at the University of Colorado in Boulder
Connecticut, at the University of Connecticut in Storrs
Delaware, at the University of Delaware in Newark
Florida, at the University of Florida in Gainesville
Georgia, at Georgia Institute of Technology in Atlanta
Idaho, at the University of Idaho in Moscow
Illinois, at the University of Illinois in Urbana
Indiana, at Purdue University in Lafayette
Iowa, at Iowa State College of Agriculture and Mechanic Arts in Ames

[51] 69 Stat. 671, sec. 2; see also footnote 47, supra.
[52] Based upon information contained in reports from agricultural experiment stations; also Report on Research Work in State Agricultural Stations Supported by Trade Associations, Individual Corporations, and Cooperatives (1946).
[53] Richards: The Functions of the Engineering Experiment Station of the University of Illinois (1921), p. 6.

Kansas, at Kansas State College of Agriculture and Applied Science in Manhattan
Kentucky, at the University of Kentucky in Lexington
Louisiana, at Louisiana State University in Baton Rouge
Maine, at the University of Maine in Orono
Maryland, at the University of Maryland in College Park
Michigan, at Michigan State University of Agriculture and Applied Science in East Lansing
Mississippi, at Mississippi State College in State College
Missouri, at the University of Missouri in Columbia
Montana, at Montana State College in Bozeman
Nebraska, at the University of Nebraska in Lincoln
New Hampshire, at the University of New Hampshire in Durham
New Jersey, at Rutgers University in New Brunswick
New Mexico, at the New Mexico College of Agriculture and Mechanic Arts in State College; also at the University of New Mexico in Albuquerque
New York, at Cornell University in Ithaca
North Carolina, at North Carolina State College of Agriculture and Engineering (of the University of North Carolina) in Raleigh
North Dakota, at North Dakota Agricultural College in Fargo; also at the University of North Dakota in Grand Forks
Ohio, at Ohio State University in Columbus
Oklahoma, at Oklahoma Agricultural and Mechanical College in Stillwater
Oregon, at Oregon State College in Corvallis
Pennsylvania, at Pennsylvania State University in University Park
Rhode Island, at the University of Rhode Island in Kingston
South Carolina, at Clemson Agricultural College in Clemson
South Dakota, at South Dakota State College of Agriculture and Mechanic Arts in Brookings
Tennessee, at the University of Tennessee in Knoxville
Texas, at the Agricultural and Mechanical College of Texas in College Station
Utah, at Utah State Agricultural College in Logan; also at the University of Utah in Salt Lake City
Vermont, at the University of Vermont in Burlington
Virginia, at Virginia Polytechnic Institute in Blacksburg
Washington, at the State College of Washington in Pullman; also at the University of Washington in Seattle
West Virginia, at West Virginia University in Morgantown
Wisconsin, at the University of Wisconsin in Madison
Wyoming, at the University of Wyoming in Laramie

The fields in which research is conducted in the State engineering experiment stations cover a wide range of technological and industrial interest, including aeronautics, ceramics, electric communication, electronics, farm equipment, flood control, fuels, heating, gas technology, heat transfer, hydraulics, irrigation, materials of construction, metallurgy, ordnance, power generation (steam and internal combustion), power transmission, refrigeration, sanitation, structures, transporta-

tion (air, highway, rail and water), waste disposal and utilization, weather forecasting and work simplification.[54]

On occasions two or more of the stations engage in cooperative research projects on problems of regional concern, each concentrating in that phase of the work for which it is best qualified. Through such collaboration the necessity for duplicating expensive equipment is eliminated, as is the often insurmountable difficulty of obtaining the staff required. Regional cooperation between engineering experiment stations also makes possible optimum utilization of the talent and facilities available in the cooperating stations and the institutions with which they are affiliated. In the solution of engineering problems of concern to agriculture, the engineering experiment stations collaborate with and assist the agricultural experiment stations.

Cooperation between the State engineering experiment stations and Government agencies, individuals, firms, corporations, and trade associations in the conduct of enginering research affords opportunity for the investigation of large and important problems, the solution of which is of immediate value to the Government, to industry of the State and Nation and to the general public. Through such research, supported under contract or grant, the stations are able to engage in projects involving expenditures too large for them to provide out of their own budgets, to employ and retain competent research personnel and also to maintain relations of mutual advantage to the stations as well as to the sponsors and to the public.

DISPOSITION OF RESEARCH FINDINGS

Both the agricultural and the engineering experiment stations conduct research of a basic or fundamental nature, as well as investigations of problems of an applied or developmental character. Although the products of their research efforts are usually of particular concern to the thousands of farmers and industrial organizations, both large and small, within their respective States, the many important discoveries which have been made in these stations have also contributed materially to the national welfare, prosperity and security. Streptomycin is an example of a significant discovery of wide public value which was made at an agricultural experiment station.[55]

Because of their public-service function, the experiment stations endeavor to give the widest circulation to their research findings by prompt publication and dissemination through regular station bulletins, occasional circulars of timely interest, reports and addresses before scientific and technical societies, articles in professional and trade journals, as well as the press, and the advisory and consultative services of the stations. In this way valuable information and data, which might not otherwise be available to those who are in a position to make effective use of such information and data, are presented promptly and generally for the benefit of the public and particularly the agricultural and industrial segments of the economy.

Discoveries and inventions made in the laboratories of the agricultural and engineering experiment stations are very infrequently

[54] Potter, Contributions of Land-Grant College Engineering Experiment Stations, included in Proceedings of the Association of Land-Grant Colleges and Universities (1947), pp. 122–123.

[55] Pp. 13–44, infra.

patented, and then only when it is in the public interest as a protection against unwise or improper use. When a patent is obtained, it is administered in accordance with the policies and procedures of the educational institution with which the station is affiliated, or its designated agent, and is ordinarily made available on a nonexclusive, royalty-free basis to all qualified licensees under such conditions and controls as are deemed necessary to protect the public.

At many of the State agricultural and engineering experiment stations full-time members of the research staff and others, including university faculty members, research fellows and student assistants, employed on special projects are required to sign patent waiver agreements concerning patentable discoveries and inventions as well as all other results of their research efforts in connection with organized station activities. Where the institution with which the station is affiliated has a formalized research and patent policy, these arrangements are consistent with that policy, especially with respect to discoveries and inventions made by an individual on his own time and at his own expense.[56] This practice enables the stations either to publish or to patent their research findings as they deem most desirable.

Other Nonprofit Research

Nonprofit research is also conducted at a number of independently incorporated research organizations not affiliated with universities.[57] Although they also encourage fundamental research by their staff members when the pressure of other work permits, these organizations are primarily engaged in the promotion of scientific and technological progress through the conduct of contractual research for industry and Government.

INDEPENDENT RESEARCH CENTERS

The pioneer in this field is the Mellon Institute of Industrial Research,[58] originally founded as the Mellon Institute in 1913 and subsequently incorporated under its present name in 1927. This independent nonprofit research center grew out of an earlier organization brought together by Andrew W. and Richard B. Mellon to develop the industrial research procedure conceived and initiated by Robert Kennedy Duncan at the University of Kansas in 1907 and carried on by the institute under its industrial fellowship plan as a constituent part of the University of Pittsburgh from 1910 until its separate incorporation in 1927.

The policy of the institute with respect to patentable discoveries and inventions resulting from its research activities provides that all such discoveries and inventions, as well as all other results of a sponsored research project, developed under a research fellowship belong to the industrial sponsor of the fellowship. The results of investigations supported by the institute itself are dedicated to the public.

Another important independent nonprofit research organization is the Battelle Memorial Institute,[59] established in 1925 to carry out the

[56] Palmer, University Patent Policies and Practices (1952), pp. 28–229, and Supplement to University Patent Policies and Practices (1955), pp. 46–90.
[57] Palmer, Nonprofit Research and Patent Management in the United States (1956), pp. 31–36; also Palmer, Nonprofit Research and Patent Management Organization (1955), and Nonprofit Research Institutes (1956).
[58] Palmer, Nonprofit Research and Patent Management Organization (1955), pp. 81–82; also Palmer, Nonprofit Research Institutes (1956).
[59] Ibid., pp. 20–21.

educational, charitable and benevolent purposes of the original donor, Gordon Battelle, in accordance with the terms of a bequest contained in his will, which was later supplemented by a bequest from his mother. As stated in its articles of incorporation, the institute was formed for the purpose of "Education * * * encouragement of creative research * * * and the making of discoveries and inventions * * * in connection with * * * the coal, iron, steel, zinc and * * * allied industries." This specified purpose has been broadly interpreted by decision and practice to include research in all sciences, arts and technologies useful to American industry. The institute, which began operation in 1929, is today the largest independent nonprofit research organization in the United States and is exceeded in size by only a few industry-owned research laboratories.

In its contractual research, the institute usually gives the sponsor all rights to any information obtained and to all inventions and discoveries made during the period of the contract by members of the institute staff while working on the sponsor's project. When such inventions or discoveries are patentable, the patents are assigned outright to the sponsor. When, as under most Government research contracts, the sponsor of the research derives only a limited royalty-free license under patents on inventions and discoveries made during the contract, the institute assigns the patents to the Battelle Development Corp.,[60] a nonprofit subsidiary organization formed for the express purpose of commercializing inventions. All income from the patents assigned to the corporation is used for the furtherance of research at the institute. Employees of the institute are required to sign an employment contract which provides that any patentable development they make during the course of their employment will be assigned to the institute.

The success of these two independent nonprofit research organizations has led to the establishment of a number of others, most of them since 1940, such as the Southern Research Institute, the Southwest Foundation for Research and Education, the Southwest Research Institute, the Midwest Research Institute and the Texas Research Foundation, as well as the Armour Research Foundation and the Stanford Research Institute which, although affiliated respectively with the Illinois Institute of Technology and Stanford University, operate essentially independently of those institutions. These organizations have been set up primarily with the object of offering contractual research services related to specific geographic regions.

The Southern Research Institute,[61] which was originally incorporated in 1941 as the Alabama Research Institute, was established to fill the need for a technological research facility in the southern States and to aid in the industrial expansion of that area. In its sponsored research program it is the generally accepted practice of the institute that any discoveries arising from an investigation become the sponsor's exclusive property, and the institute assigns all rights, patents and titles to the sponsor. In the case of investigations sponsored by the institute itself, all patents on discoveries made by members of its staff become the property of the institute.

[60] Pp. 39, 48, infra.
[61] Footnote 58, supra, pp. 112–113.

The Southwest Foundation for Research and Education [62] and the Southwest Research Institute [63] are two independent but closely affiliated nonprofit research organizations established during the 1940's by trust indenture. The former was organized in 1941 as the Foundation for Applied Research for the purpose of conducting research on medical, agricultural and public health problems on a basic or fundamental level; the latter was estabished in 1947 to maintain and operate research facilities for industry, the Government and the public generally on a nonprofit basis.

Neither organization has a formalized patent policy: both follow the generally accepted practice that patents arising from sponsored research are assigned to the sponsor in accordance with the terms of the research contract. Also, independent inventors submitting patentable as well as patented devices, methods and processes are assisted in further development of their inventions through the efforts of the staff of the Southwest Research Institute. In some cases, such patents, methods and processes are managed by one of its divisions, the Institute of Inventive Research, on behalf of the submitting individual.

The Midwest Research Institute [64] was established in 1944 to benefit industry, agriculture and the public welfare through the advancement of science in its region of the country. The institute has no formalized patent policy but in its contractual research program follows the generally accepted practice, in the case of industrially sponsored research contracts, that all patent rights belong to the sponsor of the project. Patents on discoveries and inventions which develop from regional research or from research sponsored by any other funds available to the institute belong to the institute. All members of the staff execute a patent waiver agreement at the beginning of their employment.

In 1947 the Texas Research Foundation,[65] which is the outgrowth of the Institute of Technology and Plant Industry established at Southern Methodist University in 1944, was incorporated as an independent nonprofit research organization for the purpose of halting the reduction in the productive capacity of the soils in that area and of rebuilding the land. The foundation does not have a formalized research or patent policy, but its contracts with sponsors of research generally provide that any and all patentable discoveries and inventions, as well as applications for patent and patents thereon, relating to the subject matter of a sponsored research project which may be made by staff members employed by the foundation on such a project shall become the property of the sponsor, subject to the terms and conditions of the contract.

The foundation also agrees to require every staff member who participates in contractual research projects to deliver to the foundation an agreement for the assignment of inventions. The agreement states, in part, that any and all discoveries, improvements or inventions which they solely or jointly with others may conceive or make during the period of their employment by the foundation pertaining to, or resulting from, any work they may do in connection with their em-

[62] Ibid., pp. 113–114.
[63] Ibid., pp. 114–115.
[64] Ibid., pp. 82–84.
[65] Ibid., pp. 120–121.

ployment by the foundation, or any of the matters which during the period of their employment are the subject of experimentation or investigation by the foundation, or any methods, machines or tools used, or capable of being used, by the foundation in connection with such experimentation or investigation, shall become the property of the foundation.

Although technically affiliated with the Illinois Institute of Technology, the Armour Research Foundation[66] was established in 1936 to operate essentially as an independent nonprofit research organization providing research and experimental engineering services to industry and government. The foundation is financed by sponsored research contracts and income from patents. All employees of the foundation are required to sign contracts in which they agree to assign to the foundation any patents arising from their work. In accordance with the specific contract made with a research sponsor, all patentable inventions developed by a staff member while working on a sponsored research project become the property of the sponsor. Patents which the foundation holds in its own name are managed by the foundation.

Similarly, the Stanford Research Institute,[67] established in 1946, operates essentially as an independent nonprofit research organization to assist in the development of the resources of the Western States and to provide industry and government with confidential research services, primarily of an applied or developmental nature. Although the institute has its own staff and laboratory facilities, it operates in close cooperation with Stanford University and occasionally utilizes the personnel and facilities of the university. With respect to sponsored research, the institute enters into an agreement with the sponsor providing for the assignment to the sponsor of any and all rights the institute may have or obtain in discoveries and inventions relating to or arising out of work on the project covered by the contract. The contract of employment made with each employee of the institute provides for assignment to the institute of all inventions made by him during the period of his employment.

In addition, the Franklin Institute,[68] which was founded in 1824 as a memorial to Benjamin Franklin to continue work which throughout his long life Franklin regarded as his best, the discovery of physical and natural laws and their application to the well-being and comfort of mankind, has since 1925 operated as an independent nonprofit research institute, both through its own research activities and by offering its services to industry and government. It is the policy of the institute to share with its employees any returns from the exploitation of patents, assigned to or owned by the institute, on discoveries or improvements made by employees in the course and in consequence of their employment by the institute in its research activities. Such patents are administered by Research Corp., as patent management agent for the institute. Patents relating to and arising out of work on sponsored research projects are usually, by contractual agreement with the sponsor, assignable to the sponsor and do not come under the patent policy of the institute.

The Haskins Laboratories[69] is another independent nonprofit re-

[66] Ibid., pp. 15–16.
[67] Ibid., pp. 116–118.
[68] Ibid., pp. 46–47.
[69] Ibid., pp. 53–54.

search organization, incorporated in 1937 to conduct basic research and training in certain pioneer areas involving several scientific disciplines. Originally organized in 1935 in affiliation with Union College, it has operated independently since 1939. As the research program of the laboratories is concerned primarily with conceptual rather than operational goals, with particular emphasis on investigations in pure rather than applied science, research results are ordinarily made freely available to the public, except with respect to classified projects conducted for the Government.

SPECIALIZED RESEARCH INSTITUTES

Several independent nonprofit research organizations are concerned primarily with the interests of specialized industries. Included in this group are the Lithographic Technical Foundation, the Institute of Paper Chemistry, the Institute of Gas Technology and the Institute of Textile Technology.

The Lithographic Technical Foundation [70] was established in 1924 to conduct and promote scientific research, education, and employee training activities for the advancement of the lithographic industry. The foundation has no direct affiliation with any other educational or research organization, although in the past it maintained a research laboratory at the University of Cincinnati, from 1925 to 1944. In 1945 the foundation entered into a cooperative research agreement with the Armour Research Foundation whereby its research laboratories were established near the campus of the Illinois Institute of Technology and for the past 7 years the Lithographic Technical Foundation has carried out its research with its own staff at that location. The foundation has no formal research or patent policy but, as a general practice, patents on research developments are not exploited as a source of royalty income but are held for the protection of the industry as a whole. Research results are usually published and, when patented, are licensed nonexclusively to members of the industry.

The Institute of Paper Chemistry [71] was established in 1929 as an independent nonprofit corporation in affiliation with Lawrence College, to make available graduate training and research facilities, primarily in fields of interest to the pulp and paper industry, as a constructive, collective program on the part of that industry to provide for itself what its leadership believes would best protect the future of the industry. The institute carries on three types of research, all intended to be of service to the industry: academic research of a fundamental nature by students in connection with their doctoral dissertations; institute research of a fundamental or applied nature on specific problems by staff members and supported by institute funds, the results of which are published; and cooperative research of a fundamental or applied nature by staff members, confidentially conducted on a contractual basis for individual companies or groups of companies.

The objectives of the Institute of Gas Technology,[72] which was established in 1941 as an independent educational and research institution in affiliation with the Illinois Institute of Technology, are to prosecute fundamental and applied research, to train personnel for the gas indus-

[70] Ibid., pp. 73–75.
[71] Ibid., pp. 59–60.
[72] Ibid., pp. 58–59.

try, to collect and disseminate scientific and technical information and to stimulate and correlate research within the gas industry. The institute is empowered to conduct basic and applied research, sponsored research, and graduate studies leading to the degrees of master of gas technology and doctor of philosophy. Since the research facilities of the institute have been developed through the financial support of members of the gas industry, including appliance manufacturers as well as natural and manufactured gas companies, and the staff is sustained by the membership dues and contributions, the patent policy of the institute provides that any benefits accruing from the result of its research activities be made available to the gas industry without further cost.

Research projects are accepted by the institute if they are of potential value to the industry. Where a project is of recognized importance and its support is obtained from member companies or from a gas association, any patents which result from its prosecution are made available on a nonexclusive, royalty-free basis to all members of the gas industry. However, the institute reserves the right to license such patents outside the industry on a royalty basis for its own benefit. Where the project is not of recognized importance and an individual sponsor wishes to accept the development of the project, the sponsor receives full patent rights exclusive of shoprights for the institute.

The Institute of Textile Technology [73] was organized in 1944 to provide laboratories, facilities, and personnel to study problems arising in the textile industry and to develop new provisions and improvements in the business operations of institute members which would require the services of specialists trained in science, commerce, and industry. The institute conducts a graduate school to provide for its students courses of study in subjects pertaining to problems arising in the business of the members and to make it possible for the members to secure employees from among the students. The institute also enters into individual, mutually acceptable research contracts with its members in the textile industry, with allied industries, and with Government agencies.

The institute has no formalized research or patent policy, but members of its research staff are required to assign to the institute all inventions, discoveries, and patents thereon resulting from their employment by the institute. The institute carries on five types of research: fundamental research as a background for applied research investigations; academic research conducted by students in connection with their master's theses or doctor's dissertations; industrial research on specific problems presented and sponsored by a textile mill or by a group of mills, the results of which are reported solely to the sponsors; industrial research on general problems financed from institute funds and reported to all members of the institute; and industrial research performed for an allied industry or a Government agency under contract.

Specialized nonprofit research organizations in the medical field, such as the Rockefeller Institute for Medical Research, the Institute

[73] Ibid., pp. 61–63.

for Cancer Research, the Palo Alto Medical Research Foundation, the Roswell Park Memorial Institute, the Roscoe B. Jackson Memorial Laboratory, and the Sloan-Kettering Institute for Cancer Research, are concerned primarily with investigation of the nature and causes of disease and of methods for its prevention and treatment. As a general practice they make the results of their research activities freely available through prompt dissemination to those who may make use of them in the alleviation of suffering and the protection of the public health. Nevertheless, instances frequently arise when, in order to insure purity of product and to protect the public against exploitation, it is deemed desirable to patent discoveries and inventions made by members of their staffs, as in the case of tryparsamide, a drug developed at the Rockefeller Institute for Medical Research.[74] When this is done, these organizations usually license the patented discoveries and inventions on a royalty-free basis under conditions designed to maintain the quality of the product and to regulate its marketing at a reasonable price.

UNIVERSITY-AFFILIATED RESEARCH ORGANIZATIONS

A number of special research institutes, foundations, corporations, departments, and divisions established as units of or affiliated with educational institutions handle for the respective institutions the administration and/or conduct of sponsored research, under contract or grant, and in some instances the coordination of all research activities at the institutions, as well as the management of patentable results of such research. These organizations are located in all parts of the country and at all types of institutions, both large and small, public and private, at endowed universities, land-grant colleges, State universities, small colleges, medical schools, and technological institutes.[75]

Many are independent nonprofit research organizations, separately incorporated but closely affiliated with the educational institutions and often utilizing the regular personnel and facilities of the institutions. Others are integral parts of the administrative and organic structure of the institutions concerned and operate as special departments or divisions. Some of them maintain their own research laboratories and employ separate research personnel distinct from the regular teaching staffs of the institutions with which they are affiliated. Combinations of full-time services of their own special research workers and part-time research and supervisory services of the regular teaching faculty of the educational institutions are found at a number of these organizations.

At the following institutions research sponsored by Government and/or industry, or supported by gift or grant, is conducted either by the full-time research personnel of the independently incorporated research institutes and foundations indicated or by members of the regular institutional teaching and research staff under special con-

[74] Palmer, University Patent Policies (1934), pp. 33–34.
[75] Footnote 57, supra, pp. 37–39.

tractual arrangements entered into with the organizations indicated, or both:

Agricultural and Mechanical College of Texas.	Texas A & M Research Foundation
Alabama Polytechnic Institute	Auburn Research Foundation
Augustana College	Augustana Research Foundation
Chicago Medical School	Chicago Medical School Research Foundation
College of Medical Evangelists	Alumni Research Foundation of the College of Medical Evangelists
Colorado Agricultural and Mechanical College.	Colorado A & M Foundation
Colorado School of Mines	Colorado School of Mines Research Foundation
Georgia Institute of Technology	Georgia Tech Research Institute
Hahnemann Medical College	Hahnemann Research Foundation
Institutum Divi Thomae	Institutum Divi Thomae Foundation
Lowell Technological Institute	Lowell Technological Institute Research Foundation
Medical College of Virginia	Medical College of Virginia Foundation
Montana State College	Research Foundation at Montana State College
North Carolina State College	North Carolina State College Foundation
North Dakota Agricultural College	North Dakota Research Foundation
Ohio State University	Ohio State University Research Foundation
Oklahoma Agricultural and Mechanical College.	Research Foundation of Oklahoma Agricultural and Mechanical College
Purdue University	Purdue Research Foundation
Rutgers University	Rutgers Research and Endowment Foundation
Southern Illinois University	Southern Illinois University Foundation
State University of New York	Research Foundation of State University of New York
Stevens Institute of Technology	Stevens Research Foundation
Temple University	Research Institute of Temple University
Tuskegee Institute	George Washington Carver Foundation
University of Cincinnati	University of Cincinnati Research Foundation
University of Connecticut	University of Connecticut Research Foundation
University of Delaware	Haskell Research Foundation
University of Georgia	University of Georgia Foundation
University of Illinois	University of Illinois Foundation
University of Kansas	University of Kansas Research Foundation
University of Kentucky	Kentucky Research Foundation
University of Louisville	University of Louisville Institute of Industrial Research
University of Maryland	Maryland State Institute for Industrial Research
University of North Dakota	North Dakota Research Foundation
University of Oklahoma	University of Oklahoma Research Institute
University of Toledo	Research Foundation of the University of Toledo
Wayne University	Wayne Engineering Research Institute

All but one of these separately incorporated research institutes and foundations have been in existence for more than 5 years, many of them for a considerably longer time. The oldest is the Purdue Research Foundation, which was created in 1930 as an outgrowth of an earlier all-University Department of Research Relations established in 1928. More than half of these organizations came into being between 1942 and 1946, largely in connection with the handling of Government research contracts.[76]

Also, the Agricultural Engineering Research Foundation and the Agricultural Research Foundation handle contractual research arrangements in their respective fields for Oregon State College, as do the University of Louisville Institute for Medical Research and the Oklahoma Medical Research Foundation for the Universities of Louisville and Oklahoma, respectively, and the North Carolina Pharmaceutical Research Foundation for the College of Pharmacy at the University of North Carolina in the medical and pharmaceutical fields.

Many of the university-affiliated foundations, especially those associated with State universities and land-grant colleges, have been created with broad powers which enable them to engage in a wide range of activities, of which the administration of contractual research conducted at or through the affiliated institutions is only one. A number are empowered to, and do, promote the interests of the institutions with which they are affiliated through a variety of services, including the management of patents and the development of new sources of revenue, not only in support and promotion of research but also for the endowment and current expenses of the institutions.

Similarly, a number of other nonprofit organizations affiliated with educational institutions, usually outgrowths of alumni activity or institutional fund-raising, solicit and administer gifts and grants for research, as well as contracts, from Government, industry, and individuals in conjunction with their general fund-raising efforts for the institutions. In some instances the research is conducted under the auspices of these organizations by members of the faculty and staff of the affiliated institutions.

UNINCORPORATED INSTITUTIONAL UNITS

At the following institutions sponsored research is conducted and/or administered under contractual arrangements made by the unincorporated institutional units indicated, some of which maintain full-time personnel for the conduct of research, but most of which utilize the part-time services of the regular teaching staffs of the institutions:[77]

Alfred University	Alfred University Research Foundation
Johns Hopkins University	Institute for Cooperative Research
Lehigh University	Lehigh Institute of Research
Marshall College	Marshall Research Institute
Massachusetts Institute of Technology	Division of Industrial Cooperation
Meharry Medical College	Meharry Biological Research Fund
Milwaukee School of Engineering	Industrial Research Institute
New Mexico Institute of Mining and Technology	Research and Development Division

[76] Footnote 58, supra, pp. 12–146.
[77] Footnote 57, supra, pp. 39–41.

ing at the university. The institute does not have a separate research staff or facilities of its own, but utilizes the laboratories and physical facilities of the department of engineering.

Special purpose grants and contracts for research in the department of biochemistry in the St. Louis University School of Medicine, as well as in other departments of the school, are administered by the biochemistry committee on grants for research of that institution. The Pharmaceutical Foundation of the College of Pharmacy at the University of Texas, which is an unincorporated unit of the college, aids in fostering and promoting the growth and progress of pharmaceutical education, research, and graduate study in the college.

Contractual research relations in their specialized fields are also handled at the University of Washington by its applied physics laboratory, at the University of Illinois by an institute of aviation, at the University of Alaska by a geophysical institute, and at the University of Arizona by an institute of atmospheric physics.

Where the educational institution has a formalized research and patent policy, the provisions of that policy are applicable to research conducted by or under the auspices of a separately incorporated affiliated organization or a special institutional research unit. In the case of externally sponsored contractual research, the disposition of patentable discoveries and inventions is subject to the terms of each individual research contract. Similarly, in the case of a research grant the conditions, if any, of the grant govern the handling of the results of the research.

At those institutions where a substantial volume of research supported by industry and government is conducted, the contractual arrangements and administrative details are usually centralized and the research coordinated through a single office. Harvard University has an office for research contracts, Wayne University has a division of contract services, and the University of Pennsylvania has an office of project research and grants, each of which is headed by a director who handles both Government- and industry-sponsored research contracts, as does the chairman of the industrial contracts division at California Institute of Technology. The University of Texas has an office of Government-sponsored research headed by a director, the University of Chicago has an adviser on special projects, and Wesleyan University has an administrator of Government research.

Specially designated coordinators of research activities are to be found at Case Institute of Technology, at Cornell University, at the Illinois Institute of Technology, at the Milwaukee School of Engineering, at the University of Akron, at the University of New Hampshire, at the University of Rochester, at Tufts University, and at the College of the Pacific. The University of Utah has a coordinator of cooperative research and George Washington University has a coordinator of scientific activities. Both the University of Delaware and the Polytechnic Institute of Brooklyn have administrators of research, Fordham University has a director of research services, Rensselaer Polytechnic Institute has a director of research activities, and the Institutum Divi Thomae has a dean of research. All of these perform much the same function.[78]

[78] Footnote 57, supra, p. 42.

Nonprofit Patent Management

Most universities and other nonprofit research organizations endeavor to avoid becoming involved in the intricate technical and commercial aspects of patent management, mainly because they do not have the personnel with the requisite specialized knowledge and experience. They recognize that patent management is a complicated business, that it is expensive, and that it demands a high degree of legal competence, administrative astuteness, and promotional zeal—a combination of talent not always readily available in an educational institution or a nonprofit research organization.

The patent search is a specialized technical service. The preparation and processing of patent applications are exacting work for trained patent attorneys. The administration of the patent rights requires careful attention to many intricate details and constant watch for infringement and interference. The exploitation and disposal of patents, through sale and licensing agreements, call for both salesmanship and legal counsel of a high order, as well as experience with the varied commercial aspects of patent management.

Except with respect to externally sponsored contractual research, the results of which are handled in accordance with the terms of the research contracts, it is generally both the policy and the practice of educational institutions and other nonprofit research organizations to make their research findings, especially those of a basic or fundamental character, available freely and widely through publications and other media of dissemination. This is particularly true when the research results are of a medical, pharmaceutical, therapeutic, or hygienic nature and affect public or individual health or, as in the case of agricultural and engineering experiment station research, they might benefit the general welfare or improve the national economy.

Some scientists in university circles take the attitude that the publication of the results of scientific research and their dedication to the public are sufficient. However, as Karl T. Compton said in one of his annual reports while president of Massachusetts Institute of Technology:

> Responsibility does not always end with the mere publication of a patentable scientific discovery or invention; the public benefits derivable from the patent laws and contemplated by the framers of those laws should not be lost through a failure to solicit patent protection.[79]

Discoveries or inventions possessing commercial potentialities that are merely published and are thus made available to everybody equally are seldom adopted. As Elihu Thomson so aptly put it:

> Publish an invention freely, and it will almost surely die from lack of interest in its development. It will not be developed, and the world will not be benefited. Patent it and, if valuable it will be taken up and developed into a business.[80]

University Administrative Procedures

When patent protection is necessary, it is natural for educational institutions, as well as other nonprofit research organizations, to make

[79] 35 Technology Review (December 1932), p. 101.
[80] Elihu Thomson, address before graduating class, Massachusetts Institute of Technology, 75 Electrical World (1920), p. 1505.

every effort to avoid becoming directly involved in the intricate legal and commercial aspects of patent management.[81] Some endeavor to accomplish this by adopting a laissez-faire or hands-off policy and refusing to handle patents. Others have established, or have encouraged the organization of, separately incorporated patent management foundations and, for legal or fiscal reasons, utilize their facilities and personnel. Still others have entered into patent development agreements with Research Corp., an independent nonprofit patent management foundation, to handle patentable discoveries and inventions in their behalf, with full protection of their interests as well as the interests of both the inventors and the public.

Nevertheless, a few educational institutions attempt to handle patents as a part of the routine duties of already established administrative units, such as the comptroller's or business office, or through specially designated committees responsible directly to the administration or the trustees of the institution. A number have faculty or joint faculty-administration committees on patents, which exist primarily for the purpose of insuring that the pertinent institutional regulations are observed. Often these committees also serve in an advisory capacity, with responsibility for recommending action on matters that range from the desirability of taking out a patent to the determination of equities.

Even at those institutions which leave to the individual inventors the handling of any patentable discoveries or inventions which may result from their research activities, a faculty or staff member who believes that he has made a discovery or invention which may have patentable possibilities is usually required to bring the matter to the attention of the administration, either directly or through an appropriate committee. Determination is then made by the administration or by the committee whether the institution has any equity in the discovery or invention and what procedure should be followed.

This procedure is frequently specified in the formalized research and patent policy of the institution, usually with provision for the establishment of a standing patent committtee or board to deal with all such matters. Such a committee or board may also advise and aid faculty members and research workers on questions of patentability, on the prosecution of patent applications and, occasionally, on the commercialization of the patents when issued and on the general business aspects of patent management.

In this way the institution also seeks to guard against the expropriation and exploitation, by personal and private interests, of the results of scientific and technological research performed in the laboratories of the institution, the cost of which may have been paid with institutional funds or from funds provided by outside sponsors of the research and administered by the institution.

The disposition of the patent rights and their protection present many and varied perplexing business problems. Unless the patents are obtained for dedication to the public or merely to prevent outside interests from expropriating and patenting the discoveries or inventions in their own names and for their own profit, to the possible detriment and complication of further research in the field, the patents are salable assets.

[81] Palmer, Nonprofit Research and Patent Management in the United States (1956), pp. 43–53, and Nonprofit Patent Management (1956).

In many instances the educational institution has a substantial investment in the discoveries or inventions and in the patents obtained thereon, and promotional effort is necessary to sell or license the patents. Placing the inventions or the finished products based upon the inventions in commercial production, introducing them to the public and gaining their acceptance and use require additional investment in money and services on the part of the licensees.

UNIVERSITY-AFFILIATED FOUNDATIONS

Frequently these functions are performed in behalf of an educational institution by a separately incorporated nonprofit patent management foundation affiliated with the institution.[82] Such an organization is expected to protect the interests both of the institution and of the inventors, the sponsors and the general public when handling the exploitation of patentable discoveries and inventions assigned to them for management.

The establishment of a nonprofit foundation, corporation, or institute, independent of but closely affiliated with an educational institution, for the management of the patentable results of university research is a comparatively recent development in American higher education. A few of them have been in existence more than 20 years, but the majority have come into being since 1942.

The oldest is the Wisconsin Alumni Research Foundation,[83] which was established in 1925 to serve as patent-management agent for the University of Wisconsin and its faculty and staff. It was not only the pioneer among such university-affiliated nonprofit organizations but has also been financially the most successful. The Purdue Research Foundation,[84] which has served as a model for a number of the more recently established university research and patent-management foundations, particularly at State institutions, was created in 1930.

The Cornell Research Foundation [85] was established in 1932 while the University of Florida Endowment Corp.[86] and the University of Tennessee Research Corp.[87] were organized in 1934, primarily for the purpose of holding title to and administering patents in behalf of their respective institutions and also, by voluntary assignment, for inventors among the faculty.

Although they are located in all parts of the country and collaborate with all types of institutions, a considerable number of these nonprofit patent-management organizations are to be found in affiliation with State universities and land-grant colleges. In many instances they were created to relieve the administrative staffs of the institutions of the complicated and time-consuming technical and commercial aspects of patent management and to perform functions which the institutions prefer, for legal or fiscal reasons, not to undertake themselves or for which they do not have adequate technically qualified personnel.

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[82] Palmer, Nonprofit Research and Patent Management in the United States (1956), pp. 45–48; also Palmer, Nonprofit Research and Patent Management Organization (1955) and Nonprofit Patent Management (1956).
[83] Palmer, Nonprofit Research and Patent Management Organization (1955), pp. 147–150.
[84] Ibid., pp. 97–98.
[85] Ibid., pp. 84–86.
[86] Ibid., pp. 123–124.
[87] Ibid., pp. 137–139.

Many of these affiliated patent-management organizations also represent the institutions in contractual relations with research sponsors, while several of them are also concerned with the development of new sources of financial support for the institutions. A number of them have entered into patent-management agreements with Research Corp., either directly or through the institutions with which they are affiliated, whereby that nonprofit organization acts as patent-management agent for them as well as the institutions.

At present more than 50 of these separately incorporated organizations are performing, or are authorized to perform, patent-management functions for the institutions with which they are affiliated, as indicated below:[88]

Alumni Division of the South Dakota State College Foundation.	South Dakota State College
Alumni Research Foundation of the College of Medical Evangelists.	College of Medical Evangelists
Auburn Research Foundation	Alabama Polytechnic Institute
Augustana Research Foundation	Augustana College
California Institute Research Foundation.	California Institute of Technology
Chicago Medical School Research Foundation.	Chicago Medical School
Colorado A & M Research Foundation	Colorado Agricultural and Mechanical College
Colorado School of Mines Research Foundation.	Colorado School of Mines
Cornell Research Foundation	Cornell University
Foundation for Research at the University of Washington.	University of Washington
George Washington Carver Foundation	Tuskegee Institute
Georgia Tech Research Institute	Georgia Institute of Technology
Hahnemann Research Foundation	Hahnemann Medical College
Haskell Research Foundation	University of Delaware
Indiana University Foundation	Indiana University
Institutum Divi Thomae Foundation	Institutum Divi Thomae
Iowa State College Research Foundation	Iowa State College of Agriculture and Mechanic Arts
Kansas State College Research Foundation.	Kansas State College of Agriculture and Applied Science
Kentucky Research Foundation	University of Kentucky
Lowell Technological Institute Research Foundation.	Lowell Technological Institute
Maryland State Institute for Industrial Research.	University of Maryland
Medical College of Virginia Foundation	Medical College of Virginia
Noned Corp	University of Rochester
North Carolina State College Foundation.	North Carolina State College of Agriculture and Engineering
North Dakota Research Foundation	University of North Dakota and North Dakota Agricultural College
Ohio State University Research Foundation.	Ohio State University
Pennsylvania Research Corp.	Pennsylvania State University
Purdue Research Foundation	Purdue University
Research Foundation at the Montana State College.	Montana State College
Research Foundation of the Oklahoma Agricultural and Mechanical College.	Oklahoma Agricultural and Mechanical College
Research Foundation of State University of New York.	State University of New York

[88] Footnote 82, supra.

Research Foundation of the University of Toledo.	University of Toledo
Research Institute of Temple University.	Temple University
Rutgers Research and Endowment Foundation.	Rutgers University
School of Mines Research and Development Association.	South Dakota School of Mines and Technology
Southern Illinois University Foundation.	Southern Illinois University
Stanford Research Institute	Stanford University
Stevens Research Foundation	Stevens Institute of Technology
Texas A & M Research Foundation	Agricultural and Mechanical College of Texas
University of Cincinnati Research Foundation.	University of Cincinnati
University of Connecticut Research Foundation.	University of Connecticut
University of Florida Endowment Corp.	University of Florida
University of Georgia Foundation	University of Georgia
University of Idaho Research Foundation.	University of Idaho
University of Illinois Foundation	University of Illinois
University of Kansas Research Foundation.	University of Kansas
University of Louisville Institute of Industrial Research.	University of Louisville
University of Nebraska Foundation	University of Nebraska
University of Oklahoma Research Institute.	University of Oklahoma
University of Tennessee Research Corp.	University of Tennessee
Utah Scientific Research Foundation	Utah State Agricultural College
Washington Research Foundation	State College of Washington
Wayne Engineering Research Institute.	Wayne University
Wisconsin Alumni Research Foundation.	University of Wisconsin

Certain of the specialized nonprofit research and patent-management organizations affiliated with educational institutions also perform, or are authorized to perform, patent-management functions in their respective fields for the institutions with which they are affiliated. At Oregon State College the Agricultural Research Foundation,[89] which operates in collaboration with the Oregon State Agricultural Experiment Station, is authorized to act as patent-management agent for the college.

The University of Louisville Institute for Medical Research[90] is authorized to handle patents on discoveries and inventions resulting from research in the medical school of the University of Louisville, as similarly are the Oklahoma Medical Research Foundation[91] for the school of medicine at the University of Oklahoma and the North Carolina Pharmaceutical Research Foundation[92] for the school of pharmacy at the University of North Carolina.

Although it is primarily a special research organization offering research and experimental engineering services to industry and Government, the Armour Research Foundation[93] is authorized to handle the management of patents for the Illinois Institute of Technology, with which it is affiliated, as well as patents on discoveries and inventions growing out of its own research activities which the foundation holds in its own name.

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[89] Footnote 83, supra, pp. 7–10.
[90] Ibid., pp. 132–133.
[91] Ibid., pp. 93–95.
[92] Ibid., pp. 87–89.
[93] Ibid., pp. 15–16.

Under certain circumstances the Institute of Gas Technology,[94] which operates in the field of gas technology as an independent educational and research institution, although affiliated with the Illinois Institute of Technology, may manage patents, as may the Institute of Paper Chemistry,[95] which is also an independent educational institution providing graduate training and research facilities in fields of interest to the pulp and paper industry.

Several unincorporated organizations, such as the Alfred University Research Foundation[96] and the Syracuse University Research Institute,[97] are authorized to perform patent-management functions for Alfred and Syracuse Universities, of which each is respectively an integral part. At Princeton University the committee on project research and inventions[98] and at St. Louis University the school of medicine biochemistry committee on grants for research[99] represent the administrations of their respective institutions in the handling of patentable discoveries and inventions.

The special faculty or joint faculty-administration committees and boards which administer the research and patent policies at a number of institutions frequently include among their responsibilities at least an advisory function, but often also administrative duties, in the patent-management field.[100] However, the technical and commercial aspects of patent management are usually handled either by the appropriate members of the institutional administrative staff or through special arrangements with outside organizations.

RESEARCH CORPORATION

The following 69 colleges and universities have, directly or through affiliated patent-management organizations, entered into patent development agreements with Research Corp.,[101] for that nonprofit foundation to serve as their patent-management agent and to handle patentable discoveries and inventions both in behalf of the institutions and in the interest of inventors among their faculty and staff:

Agricultural and Mechanical College of Texas
Amherst College
Baylor University
Beloit College
Case Institute of Technology
Clarkson College of Technology
College of Emporia
College of Puget Sound
Colorado Agricultural and Mechanical College
Cornell University
Duke University
Fenn College
Florida State University
Fordham University
George Washington University
Grinnell College
Harvard University
Hillyer College
Johns Hopkins University
Kansas State College
Linfield College
Louisiana State University
Massachusetts Institute of Technology

[94] Ibid., pp. 58–59.
[95] Ibid., pp. 59–60.
[96] Ibid., pp. 10–11.
[97] Ibid., pp. 118–119.
[98] Ibid., pp. 33–34.
[99] Ibid., pp. 21–22.
[100] P. 32, supra.
[101] Footnote 83, supra, pp. 99–101; also Palmer, Nonprofit Patent Management (1956).

Michigan State University
Mills College
Montana State College
New York University
Northeastern University
Northwestern University
Oregon State College
Pennsylvania State University
Polytechnic Institute of Brooklyn
Princeton University
Purdue University
Reed College
St. Edward's University
St. John's University
Stanford University
State College of Washington
Stevens Institute of Technology
Tufts University
University of Arizona
University of Chicago
University of Connecticut
University of Detroit
University of Florida
University of Georgia
University of Houston
University of Kansas
University of Miami
University of Michigan
University of Missouri
University of Nebraska
University of New Hampshire
University of North Carolina [102]
University of Oklahoma
University of Oregon
University of Pennsylvania
University of Rochester
University of Southern California
University of Tulsa
University of Utah
University of Vermont
University of Washington
University of Wyoming
Virginia Polytechnic Institute
Wesleyan University
West Virginia University
Yale University

Several of the institutions refer specifically to the use of Research Corp. in their formalized research and patent policies, while in a few instances mention is made of Research Corp. or a similar independent nonprofit patent management organization. A number of other institutions have arrangements with Research Corp. under contemplation, while still others encourage their staff members to avail themselves of the facilities and services of that foundation through the voluntary assignment of their inventions.

In addition 18 other nonprofit research organizations, including the Armour Research Foundation, the Franklin Institute, the Hickrill Chemical Research Foundation, the Sloan-Kettering Institute for Cancer Research and the Texas Research Foundation, have entered into similar patent development agreements with Research Corp.[103]

Research Corp. was established in 1912 by Frederick Gardner Cottrell, with the gift of his patent rights in the field of electrical precipitation, as a nonprofit organization embodying the ideal of utilizing the proceeds derived from applied research to the further advancement of science and technology. The corporation's charter requires that its net earnings be contributed to such scientific and educational institutions and societies as its board of directors may from time to time select, to enable such institutions and societies to conduct technical and scientific investigations, research, and experimentation.

Under a patent development agreement with an educational institution or other nonprofit organization, Research Corp. agrees to handle the patent management and commercial aspects of the exploitation of

[102] The patent development agreement with the University of North Carolina applies to the North Carolina State College of Agriculture and Engineering located in Raleigh and to the Woman's College located in Greensboro, as well as the university located in Chapel Hill.

[103] Research Corporation Annual Report for the Year 1955, p. 26.

such patentable discoveries and inventions as the institution or members of its faculty or staff, may offer or cause to be offered to the corporation, as are acceptable to the corporation under its charter and as should, in the belief of the corporation, be patented either in the broad public interest or as revenue-producing possibilities. Each agreement is tailormade to fit the institution's individual situation, but follows a fairly uniform pattern which has been developed over the years.

A contract-set percentage of the income derived from each patent so managed is paid to the inventor. Where a university's policy prescribes that a percentage, not in excess of 15 percent, of the gross income go to the inventor, the contract provides for payment of this amount directly to the inventor. The remainder is divided with the university on a 50–50 basis. Where the university has no fixed policy as to the inventor's share, the agreement usually provides for Research Corp. to retain 42½ percent of the gross income, with the balance to be paid directly to the university for division between itself and the inventor on a mutually acceptable basis.

The corporation bears all patent prosecution and management expenses from its share. Under this plan the institution is relieved of all patent and administrative problems involved in the exploitation and commercialization of the invention. Similarly, when an individual inventor makes an agreement with the corporation to handle a personally owned patent or patentable invention for him, he is relieved of these problems and responsibilities. Such portion of the corporation's share of the income obtained from all the patents which it handles, as becomes surplus, is applied, in the discretion of the board of directors of the corporation, for the support of scientific research through its grants-in-aid program.[104]

INDEPENDENT RESEARCH CENTER PRACTICES

As most of the research performed at the independent nonprofit research centers is conducted on a contract basis for industry or the Government, the patentable products of such research ordinarily become the exclusive property of the sponsors. Such is the case at the Mellon Institute of Industrial Research, the Battelle Memorial Institute, the Southern Research Institute, the Southwest Research Institute, the Midwest Research Institute, the Texas Research Foundation, and the Franklin Institute, as well as the Armour Research Foundation and the Stanford Research Institute.[105] Despite the interest of these organizations in the advancement of knowledge and their responsibility to science in general, once an industrial or Government research project is undertaken, the work is done in complete confidence and all rights to technical information, as well as patentable discoveries and inventions, are assigned to the sponsors of the research in accordance with the prearranged terms of the research contract.

These organizations provide complete patent protection to their clients and do not publish or otherwise disseminate the results of a contractual research project without the permission of the client. Occasionally, under the provisions of the research contract, the research organization is required to patent a discovery or invention resulting from a sponsored project and to give the sponsor a limited

[104] Ibid., pp. 27–31.
[105] Pp. 20–23, supra.

license, as in the case of most Government-supported research. In such instances, as already indicated, several of these organizations utilize the facilities of Research Corp. under the provisions of a patent development agreement made with that nonprofit foundation. Others either handle patentable discoveries and inventions themselves or assign their rights to an affiliated patent management agent.

The Battelle Development Corp.[106] was established in 1935 as a separately incorporated, wholly owned subsidiary of the Battelle Memorial Institute to hold and license patents resulting from institute research or acquired from other sources, including free-lance inventors to whom its patent management services are available. The broad purpose of the corporation is to provide a mechanism for developing and commercializing inventions that might otherwise be lost to mankind and, at the same time, to create funds for financing further research at the institute, usually of a fundamental nature or highly speculative in regard to its leading to commercial products or processes.

When patents are assigned to the Battelle Development Corp., arrangements are made by the corporation for the development and commercialization of the inventions by established business concerns. In most instances nonexclusive, royalty-bearing licenses are granted, so that small firms may have the same opportunity as larger corporations to put the inventions to use. Royalty income derived from the licensing of patents is used by the corporation and the institute to finance more research, thereby starting a new cycle.

In the case of a free-lance inventor who submits an idea to the Battelle Development Corp., the usual agreement gives the corporation exclusive rights to the invention. In return for these rights and under mutually agreeable terms, the corporation will pay all patent costs and will perform such research as may be necessary to develop the invention to the point of licensing or sale. The agreement also provides for payment to the inventor of a mutually agreed share of the royalty income received from licensing the invention. Some of the corporation's most important research developments have originated with free-lance inventors.

In 1946 the Institute of Inventive Research[107] was established as an independent patent management organization closely affiliated with the Southwest Research Institute and the Foundation of Applied Research (now the Southwest Foundation for Research and Education), to provide assured income for the foundation, to aid the advancement of industry and the general welfare through the development of new and useful inventions, to create a living endowment for the support of fundamental research and the stimulation of scientific research and development and to assist inventors in profiting financially from the commercialization of inventions which otherwise might not reach maturity. However, in December 1953 the Institute of Inventive Research was dissolved as a corporate entity and became the inventions development division of the Southwest Research Institute.

Although the division also handles patents resulting from the research activities of the Southwest Research Institute and the Southwest Foundation for Research and Education, it is primarily designed

[106] Palmer, Nonprofit Patent Management (1956).
[107] Ibid.

to provide a comprehensive service to independent inventors, many of whom do not have the finances, technical facilities, patent advice, or sales experience properly to develop and market inventions. When an invention is submitted to the division for consideration, it is subjected to a thorough evaluation by the technical staff of the Southwest Research Institute. If it is found suitable for development, the inventor is offered a contract covering the working procedure to be followed in bringing the invention to commercial fruition and setting forth the percentage interest in the invention which he agrees to assign to the Southwest Research Institute in return for the services of its inventions development division. Neither the division nor the institute itself organizes or underwrites projects or companies to manufacture new products, processes or devices, or lends money for such or any other purposes or manufactures articles for sale. The Institute of Inventive Research confines itself entirely to bringing inventions to a marketable stage and then licensing or selling the patent rights to manufacturers.

OTHER PATENT MANAGEMENT ORGANIZATIONS

To assist in building up an independent chemical industry in this country following World War I, the Chemical Foundation [108] was established in 1919 as an independent nonprofit corporation primarily to acquire the chemical processes covered by enemy-owned United States patents, most of which were held by Germans, by purchase from the Alien Property Custodian under the original and amended Trading With the Enemy Act of Congress and to make those patented processes available to American manufacturers. Although now relatively inactive, the foundation subsequently formulated plans for the acquisition of patent rights by assignment from universities, medical schools, and other research institutions, as well as individual inventors, for management under a flexible plan whereby a portion of any royalties received by the foundation were to be set aside for the disposal of the assignee and the balance used for the general activities of the foundation.

In furtherance of the purposes for which it was formed, including the development, patenting, and commercial application of scientific discoveries, inventions, and processes, the foundation is authorized to grant licenses, under any patent rights owned or controlled by it, to American citizens and corporations upon reasonable and equal terms and without advantage as between licensees. The foundation may prescribe the terms and conditions under which a license is issued and may refuse to issue a license or revoke one already granted. Ordinarily such licenses are granted on a nonexclusive basis. However, an exclusive license may be granted when it is deemed that the interests of the American people would be best served by such a license or that the benefits of the invention would be lost or seriously lessened if such a license were not granted.

Although organized primarily for the support of meritorious research projects through grants-in-aid to qualified institutions and individuals, the Lasdon Foundation [109] also manages patents in its

[108] Ibid; also Palmer, Nonprofit Research and Patent Management Organization (1955), pp. 24–26.
[109] Ibid., pp. 71–72.

own behalf and for others by voluntary assignment. Established in 1946 as an independent nonprofit organization for the furtherance of research in the fields of medicine, chemistry, pharmacology, and physiology, the foundation derives its income from the original and continued contributions of its founders and from the licensing of patents in which it has a proprietary interest or which have been assigned to it by others for management under a mutually beneficial patent development agreement. The income received by the foundation from such sources is devoted to the support of research grants in the medical and allied sciences.

As previously mentioned,[110] independent nonprofit research organizations concerned primarily with the interests of specialized industries, such as the Lithographic Technical Foundation, the Institute of Paper Chemistry, the Institute of Gas Technology, and the Institute of Textile Technology, ordinarily publish the results of their research activities for the benefit of the industries they serve. However, they also occasionally handle patents, again for the benefit of the industries they serve and for the furtherance of research in their respective fields, except when the patent is on a discovery or invention resulting from a research project which is subject to some prior contractual arrangement.

Similarly, the specialized nonprofit research organizations in the medical field ordinarily make their research findings freely available to the public. However, in order to insure purity of product and regulate its selling price, they will in certain instances seek patent protection. Other than granting licenses and specifying the conditions of manufacture, these organizations do not participate in the commercial preparation or sale of the manufactured products and receive no royalties or other pecuniary benefits. Several of the organizations have entered into patent-development agreements with Research Corp. and utilize the facilities of that nonprofit foundation in handling patented discoveries and inventions.[111]

Patent Portfolios

For the reasons previously given, especially in the chapter on Patent Management,[112] most educational institutions and other nonprofit research organizations have had little, if any, direct experience with patents. As a general practice they have avoided becoming involved themselves in the actual administration and exploitation of patents. In relatively few instances has patent protection been sought with a view to obtaining income from discoveries and inventions which they own or control; usually it has been as a precautionary measure in the public interest or for defensive purposes. When such protection has been deemed desirable or necessary, they have ordinarily utilized the facilities and services of Research Corp. or of an affiliated patent management organization.[113]

[110] Pp. 24–26, supra.
[111] P. 37, supra; also Palmer, Nonprofit Patent Management (1956).
[112] Pp. 31–33, supra.
[113] Pp. 33–36, supra.

UNIVERSITY PATENT HOLDINGS

The comparatively small number of discoveries and inventions patented by educational institutions is indicated in the unpublished findings of a survey of university patent holdings made in 1954.[114] That survey revealed that, exclusive of some 500 patents then being administered in behalf of educational institutions by Research Corp. under patent development agreements, only 277 active United States patents and 89 foreign patents had been obtained by a total of 20 institutions or their affiliated patent management agents.

Less than 600 applications for United States patents and 155 for foreign patents had been filed, of which 139 United States applications and 54 foreign applications were then pending. Under these patents, both issued and pending, 188 domestic and 67 foreign licenses had been granted; of these, 67 domestic and 61 foreign licenses were under an exclusive licensing arrangement with a commercial organization which, directly or through its subsidiaries, both manufactured under the patents and exploited the patents by sublicensing independent manufacturing companies.

The following table analyzes the patent portfolios of the eight institutions which had had the most extensive experience with patentable discoveries and inventions:

Institution	United States patents—			Foreign patents—		
	Applied for	Obtained	Pending	Applied for	Obtained	Pending
A	113	71	26	4	3	1
B	99	43	24	71	47	14
C	80	29	21	4	4	----
D	49	28	10	----	----	----
E	40	20	10	3	2	1
F	32	28	4	----	----	----
G	26	3	5	----	----	----
H	21	15	5	4	1	3

Each of the 12 other institutions which reported experience with patentable discoveries and inventions had filed less than 20 applications for United States patents, on which none of them had obtained more than 10 patents. Eight had filed a total of 69 applications for foreign patents, from which 32 patents had issued, while 35 were pending and 2 had been abandoned.

As discussed later in this chapter,[115] a number of significant discoveries and inventions were then, as now, included in the patent portfolios of educational institutions or their affiliated patent management agents, as well as in the portfolios of other nonprofit research centers. Many possess high economic value and have been useful both in the stimulation of new business enterprises and in the expansion and improvement of existing industrial operations. Some have been important contributions to the public welfare and to the prevention of disease and alleviation of suffering, both human and animal.

[114] Palmer, University Patent Holdings (unpublished).
[115] Pp. 43–50, infra.

CURRENT UNIVERSITY PATENT SITUATION

The following brief descriptions of the patent management practices and experiences of a number of educational institutions, which have been productive of patentable discoveries and inventions, and of their patent management agents are illustrative of the current university patent situation.

Patentable discoveries and inventions made at the University of Wisconsin are administered by the Wisconsin Alumni Research Foundation,[116] which was the pioneer among nonprofit university-affiliated patent-management organizations. The foundation has had not only the longest, but also the most extensive experience of any of these organizations and has been financially the most successful. It was organized in November 1925 with the immediate objective of administering and giving wide commercial application to the patent then pending on the discovery by Dr. Harry S. Steenbock, a biochemist at the university, of the antirachitic properties of the ultraviolet ray in the enrichment of the vitamin D content of foods and medicinal products.

Although authorized to administer patents and patent rights "regardless of where, how, or from whom acquired,"[117] the foundation confines its patent management activities almost exclusively to inventions made by faculty members and students of the university, in order to handle with intelligence and dispatch the inventions and discoveries brought to it by university personnel and to explore and exploit their commercial possibilities. At the present time the patent portfolio of the foundation includes 119 active United States and 87 foreign patents. In addition, applications for 69 United States and 31 foreign patents are pending, and 30 previous United States and 73 foreign patents have expired.

The most valuable item handled by the foundation during its more than 30 years of operation was the basic patent on the original Steenbock discovery, which has since expired, as have three subsidiary and subservient patents which were dedicated to the public in 1945. Two other valuable patents administered by the foundation, both of which have also expired, relate to compounds containing salts of iron and copper for use in secondary anemias and to the stabilization of iodine in salt and mineral mixtures. Among the more important patented discoveries and inventions in the current portfolio of the foundation are the anticoagulant drug Dicumarol; compounds containing salicylates, such as aspirin, and vitamin K or vitamin K-like compounds; Warfarin, an anticoagulant rodenticide and drug for human medication; discoveries relating to the insecticidal properties of the sabadilla seed, and a butyl alcohol fermentation process for the production of solvents.

Although more recently organized, the Rutgers Research and Endowment Foundation [118] has also been highly successful in administering patentable discoveries and inventions in behalf of inventors at Rutgers University, particularly streptomycin and neomycin. Under its patent policy,[119] the university retains no proprietary inter-

[116] Palmer, Nonprofit Research and Patent Management Organization (1955), pp. 147–150.
[117] Ibid., p. 148.
[118] Ibid., p. 108.
[119] Palmer, University Patent Policies and Practices (1952), pp. 192–193.

est in any invention made by a member of its staff, excepting inventions made by members of the staff of the Institute of Microbiology. Established in January 1946 to promote, encourage, and aid scientific investigation and research at the university, the foundation holds patents, grants licenses, and receives royalties as a subsidiary entity of the university, which is the beneficial owner thereof. The patent portfolio of the foundation includes 5 active United States patents, on actinomycin, streptothricin, streptomycin, fumaric acid, and a method and apparatus for converting light energy into electrical chemical energy, as well as 7 pending applications for patents on neomycin, candicidin, candidin, xerosin, concentration of lactobacilli, exocellular keratinase from Streptomyces sp., and fish solubles, and, in addition, 20 active foreign patents, 14 of them on neomycin, and 12 pending applications for foreign patents.

In February 1930 the biochemistry committee on grants for research [120] was created in the St. Louis University School of Medicine by the president of the university to carry out the terms of an agreement with Dr. Edward A. Doisy and his associates regarding the patent rights assigned to the university for the process of manufacturing the crystalline ovarian hormone Theelin, the first steroid hormone to be isolated in pure crystalline form. Since October 1948 the university has encouraged, but does not require, the assignment of inventions to the university under mutually acceptable terms and has utilized the facilities and experience of the committee in the handling of inventions, and the patents thereon, resulting from research activities in the various departments of the university. Of the 10 United States, 6 Canadian, and 7 foreign patents administered for the university by the committee, those on Theelin, Theelol, and Antuitrin-S, all of which have now expired, and those on vitamin K have been the most significant and of the greatest financial importance.

The University of Tennessee Research Corp.,[121] which was organized in October 1934 primarily to hold title to and administer patents issued to the faculty and staff of the University of Tennessee and voluntarily assigned to the corporation by mutual agreement, currently holds 32 active United States patents and 1 Canadian patent. Those producing income cover an apparatus for measuring cotton fiber, a fertilizer, a stelometer, an arealometer, an apparatus for determining the physical properties of porous materials, a phenolic molding composition, and several varieties of Tennessee strawberries and raspberries.

As successor to the board of patent trustees of the Iowa State College Alumni Association, which in 1935 had taken over the patent management functions of a college faculty committee established in 1926, the Iowa State College Research Foundation [122] was formed in October 1938 as an independent nonprofit corporation to provide more workable machinery for the management of patents as a service to Iowa State College. As of April 1956 the foundation had in its patent management portfolio 43 active patents, both United States and foreign, with 36 applications pending.

After nearly 20 years of operation the foundation is just now beginning to realize a substantial return from the patent rights it ad-

[120] Footnote 116, supra, pp. 21–22.
[121] Ibid., pp. 137–139.
[122] Ibid., pp. 64–67.

ministers. Among the more significant patented discoveries and inventions included in its portfolio are a network analyzer for electric power circuits, methods of preparing fertilizer compositions, of treating growing ruminants and young mammals and of preparing their feed materials, of recording colorimetric information on black and white film, of separating nitrogen isotopes by ion-exchange and of isolating sterol from fats and oils, a process for producing indoleacetic acids, a foaming method of mixing asphalt, and a solvent extraction apparatus and process. Two others, on which the basic patents recently expired, were a method of making blue-veined cheese and an earth terracing apparatus.

The Ohio State University Research Foundation,[123] which was established in November 1936 to provide an organization through which the research objectives of the university, industry, and government might be effectively furthered through the cooperation of the university and off-campus organizations, acts as patent management agent for Ohio State University and controls 58 United States patents and 16 foreign patents, most of them Canadian. Several of the inventions covered by these patents have been licensed and others are considered to have commercial importance, although further research of a developmental nature may be necessary to adapt them to commercial use. Under a State statute all inventions made in the laboratories and with the use of the facilities of the university become the sole property of the university, which assigns its patent rights to the foundation for administration.

Currently 97 issued patents, United States and foreign, are in the portfolio of the Institutum Divi Thomae Foundation,[124] as well as a number of pending applications for patents. The most significant inventions covered by those patents relate to ultraviolet sources and include sunlamps, germicides, meat tenderizers, juice and milk concentrating processes and drugs, particularly those useful in healing wounds. The foundation, which was incorporated in September 1938, acts as the fiscal agent of the Institutum Divi Thomae, a scientific research center and graduate school of science with which certain other Catholic educational institutions are affiliated.

The California Institute Research Foundation,[125] which was organized in June 1940 to provide a legal corporate body to handle patents and inventions for the benefit of the California Institute of Technology, owns 34 patents. The most significant income-producing inventions included in the foundation's portfolio are a contour sensing apparatus, a magnetic drum readout, orthodontic appliances, an oxygen meter, a porous wall construction, and a radiation meter.

Although it has a number of applications for patents pending, the University of Cincinnati Research Foundation[126] at the present time holds no active patents. The foundation was created as an independent nonprofit corporation in June 1943 to administer research in the several departments of the University of Cincinnati, whose staff and other facilities are available to it, and also to act as patent management agent for the university.

The Auburn Research Foundation,[127] which was established in November 1944 as a fiscal agency to aid research and to promote the

[123] Ibid., pp. 91–93.
[124] Ibid., pp. 63–64.
[125] Ibid., pp. 23–24.
[126] Ibid., pp. 121–122.
[127] Ibid., pp. 16–19.

general welfare of the State of Alabama and which acts as patent management agent for Alabama Polytechnic Institute, owns 2 active United States patents and has applications for 2 others pending. The most important invention, which is also income-producing, is a coccidiosis poultry vaccine.

The University of Idaho Research Foundation,[128] which was authorized originally by the board of regents of the University of Idaho in 1947 and incorporated in January 1949 to protect the interests of the inventor, the university and the public in inventions made by members of the staff of the university, currently holds one active United States patent and has two applications for patents pending. The patent is on a solvent recycling process; no licenses have been granted under this patent.

UNDER RESEARCH CORPORATION AGREEMENTS

Several other nonprofit foundations, which currently utilize the facilities and services of Research Corp. under patent development agreements, have also had some previous patent management experience. The Purdue Research Foundation,[129] which was established in December 1930 as an outgrowth of an all-university department of research relations organized in 1928, has owned and administered a number of patents; but as rapidly as possible these are being taken over by Research Corp., except those developed for particular research sponsors who have in effect been granted exclusive licenses in accordance with prior contractual arrangements.

The Cornell Research Foundation,[130] which was organized in January 1932 to handle patents on discoveries and inventions made by the members of the staff of Cornell University, to assist research at the university, and to encourage the broad public distribution of the benefits of such research, still has 10 or 12 active patents and applications for patents in its portfolio. The most lucrative ones cover a wine process on which the patent will shortly expire, an oximeter, and an egg washer designed for use by poultry farmers and egg wholesalers in preparing eggs for market. Another, on which the patent has expired, related to a honey process under which a product commonly known as honey butter was made.

There are currently 32 active patents, both United States and foreign, in the patent-management portfolio of Pennsylvania State University and Research Corp. The most significant are on a mushroom spawn, helices, a single-column distillation apparatus and magnetostriction transducers. Formerly patents had been administered for the University by the Pennsylvania Research Corp.,[131] established in February 1934 to take over the functions of a trustee committee which had previously handled patents for the university.

Noned Corp.,[132] which was created in April 1935 to retain and manage patents in which the University of Rochester possessed any rights, holds 8 United States patents and 3 foreign patents. Only one of these patents, relating to shoe construction and last, has been income

[128] Ibid., pp. 126–127.
[129] Ibid., pp. 97–98.
[130] Ibid., pp. 34–36.
[131] Ibid., pp. 96–97.
[132] Ibid., pp. 85–87.

producing; the others relate to means for recording the gait and muscle functioning of animate bodies, shank pieces for shoes, bacteriostatic base for medicinal cosmetic and toilet preparations, antioscillation mountings for optical instruments, infrared photography, methods of rendering infrared radiation visible, and methods and compositions for regulating plant growth. Under its patent development agreement with Research Corp., the university has also referred several potential inventions to that nonprofit organization, but no patents have as yet issued through its services.

Prior to the patent development agreement between the University of Michigan and Research Corp., the Engineering Research Institute,[133] an unincorporated institutional unit of the university organized in January 1948 as successor to the department of engineering research originally created in 1920, had administered patents for the university. A total of 18 patents have been issued to the university; 3 applications for patents are pending, and searches are being conducted on 2 others. The most valuable patents have been on the Bailey motors and on two pharmaceuticals, thienyalkyl esters and basic esters of substituted thienylacetic acids.

The Kansas State College Research Foundation,[134] which was organized in September 1942 to foster scientific research at Kansas State College and to aid in giving practical application to the findings of such research, owns three United States patents. These patents, which are administered for the foundation by Research Corp. under a patent development agreement, are on the differential inactivation of enzymes, a dehydrating process for starchy vegetables and a double stage sediment tester.

Similarly, two patents owned by the Texas A & M Research Foundation,[135] are administered in its behalf by Research Corp. under a patent development agreement, as are pending applications for patents on two additional inventions. The active patents are on a radio frequency titrimeter and a sludge-removal device for sewage-disposal installations. The pending applications are on a cotton stripper roll and a bacterin for infectious keratoconjunctivitis.

Research Corporation,[136] which handles inventions, patents and patent rights for 69 educational institutions and 18 other nonprofit organizations under patent development agreements,[137] has in its portfolio 456 active United States patents and 277 foreign patents, in addition to 138 pending applications for United States patents and approximately 100 for foreign patents. These cover a wide range and include a number of significant discoveries and inventions of humanitarian as well as industrial value. Among the patents which are currently producing substantial income are those relating to pantothenic acid, Vitamin B_1, cortical hormones, ergotrate, Vitamin A, Vitamin B_{12} extraction, synthetic crystals and nystatin. Some of the items in its portfolio have been acquired from independent inventors, to whom the services of the Corporation are also available.

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[133] Ibid., pp. 41–42.
[134] Ibid., pp. 67–69.
[135] Ibid., pp. 119–120.
[136] Ibid., pp. 99–101; also Palmer, Nonprofit Research and Patent Management in the United States (1956), pp. 49–51; and Nonprofit Pateent Management (1956) and Research Corporation Annual Report for the Year 1955, especially pp. 22–26.
[137] Pp. 33–36, supra; also footnote 136, supra.

SITUATION AT INDEPENDENT RESEARCH CENTERS

As previously discussed, in the chapter on Patent Management,[138] most of the research performed at the independent nonprofit research centers is conducted on a contract basis for industry and the Government. Under the terms of the research contracts the patentable products of such research, as well as related technical information, become the exclusive property of the sponsors of the research. For example, at the Mellon Institute of Industrial Research,[139] the oldest of these independent nonprofit research organizations, only five United States patents have been taken in the name of the Institute. These five patents, all of which have now passed into the public domain, relate to certain chemotherapeutic agents derived from chinchona alkaloids which originated in the Department of Research in Pure Chemistry at the Institute.

In the period from 1911 through 1955 a total of 1,416 additional United States patents and 1,068 foreign patents, which have been issued to institute personnel, have all been assigned to the sponsoring companies which supported the research activities that led to the patents. Many of these patents cover discoveries and inventions of high commercial value. However, under the policy of the institute, all patentable discoveries and inventions, as well as all other results of a sponsored research project, developed under a research fellowship belong to the industrial company supporting the fellowship. The results of investigations supported by the institute itself are dedicated to the public.

Although the Battelle Memorial Institute[140] operates under a similar policy with respect to sponsored research, its wholly owned patent-holding subsidiary, the Battelle Development Corp,[141] owns or controls about 150 United States patents and 250 foreign patents, many of which are currently dormant. Among the more than 200 discoveries and inventions developed at the Institute or acquired from free-lance inventors and promoted by the corporation are a number which have valuable commercial potentialities, including a dry graphic reproduction process known as Xerography, an electropolishing process, a leather waterproofing process and a correct fluid for typed copy.

The Midwest Research Institute[142] is currently managing only two patents, neither of which is considered significant. As the institute is engaged principally in the conduct of research for outside sponsors, neither the institute nor any member of its staff retains a proprietary interest in any patentable discoveries or inventions resulting from the sponsored research program of the institute, under which all patent rights would belong to the sponsors.

Of the 29 patents, which have resulted from the research activities of the Southern Research Institute,[143] only 4 are in the name of the institute. The other 25 have been assigned to the sponsors for whom the research was conducted under contract.

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[138] Pp. 38–39, supra.
[139] P. 20, supra; also Palmer, Nonprofit Research and Patent Management Organization (1955), pp. 81–82, and Nonprofit Research Institutes (1956).
[140] Pp. 20–21, supra; also Palmer, Nonprofit Research and Patent Management Organization (1955), pp. 20–21, and Nonprofit Research Institutes (1956).
[141] P. 39, supra; also Palmer, Nonprofit Patent Management (1956).
[142] P. 22, supra; also Palmer, Nonprofit Research and Patent Management Organization (1955), pp. 82–84, and Nonprofit Research Institutes (1956).
[143] P. 21, supra; also Palmer, Nonprofit Research and Patent Management Organization (1955), pp. 112–113, and Nonprofit Research Institutes (1956).

Despite the fact that it accepts for management discoveries and inventions submitted by free-lance inventors, which are received at the rate of approximately 100 a week, the Institute of Inventive Research,[144] which is now the inventions development division of the Southwest Research Institute,[145] has in its portfolio only 13 on which it is actively fostering the commercialization. It also has about 25 others under consideration which may prove worthy of inclusion in its portfolio. The three most important inventions presently included are the Poulter seismic process, the so-called Vibrotron precision measurement device and a new type of loadbinder.

The Armour Research Foundation[146] has approximately 100 patents which have been issued in its name, the vast majority of them in the magnetic recording field. Others are on titanium alloys and on solution and flame ceramics.

From the beginning the Stanford Research Institute[147] has adhered, as closely as the realities of research permit, to a carefully considered policy which avoids the holding and licensing of patents for royalty income. Where discoveries or inventions are made in the course of sponsored research, all patent rights go to the sponsor. Research activities conducted with institute funds generally have been directed toward basic research problems for the purpose of obtaining new knowledge and normally do not lead to discoveries or inventions out of which any patent problem might arise. However, the institute policy recognizes the possibility that, research being what it is, occasional ownership and disposition of patents by the institute might be inescapable.

Under their programs the independent nonprofit research organizations concerned primarily with the interests of specialized industries, and those in the medical field, ordinarily publish the results of their research activities. However, the Institute of Paper Chemistry[148] does hold 119 patents in its own patent management portfolio and, in addition, has acquired and assigned to others 102 patents. As applied to the pulp and paper industry, all of these have been significant in one way or another.

In its 32 years of experience the Lithographic Technical Foundation[149] has obtained only 14 patents. Every one of those patents is considered significant in relation to the lithographic industry and a number of them have been useful to other branches of the graphic arts and even to other industries. The seven patents in the foundation's current portfolio cover an integrating light meter apparatus, methods of removing images from planographic plates, of making deep-etched lithographic plates and for the preparation of lithographic plates, a process of coating aluminum known as Brunak, an etching process, and a spray dampening system for lithographic offset printing presses.

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[144] Pp. 39–40, supra; also Palmer, Nonprofit Patent Management (1956).

[145] P. 22, supra; also Palmer, Nonprofit Research and Patent Management Organization (1955), pp. 114–115, and Nonprofit Research Institutes (1956).

[146] P. 23, supra; also Palmer, Nonprofit Research and Patent Management Organization (1955), pp. 15–16, Nonprofit Research Institutes (1956), and Nonprofit Patent Management (1956).

[147] P. 23, supra; also Palmer, Nonprofit Research and Patent Management Organization (1955), pp. 116–118, and Nonprofit Research Institutes (1956).

[148] P. 24, supra; also Palmer, Nonprofit Research and Patent Management Organization (1955), pp. 59–60, Nonprofit Research Institutes (1956), and Nonprofit Patent Management (1956).

[149] P. 24, supra; also Palmer, Nonprofit Research and Patent Management Organization (1955), pp. 73–75, Nonprofit Research Institutes (1956), and Nonprofit Patent Management (1956).

Although the principal products of research performed at the Institute of Gas Technology [150] are made known through its own research publications and the technical press, the institute owns 19 United States patents and 1 British patent. These patents were obtained to protect the gas industry in the use of processes, equipment, and techniques developed at the institute. They cover mainly processes and apparatus for manufacturing natural-gas substitutes from petroleum fractions and liquefied petroleum gases, for the gasification of coal, and for coal treatment and metallurgy.

LITIGATION AND OTHER EXPERIENCES

In their handling of patentable discoveries and inventions the educational institutions and other nonprofit research organizations have kept relatively free of litigation and other controversial experiences. A number of factors have been responsible, among them an unwillingness to become involved in such experiences, the limited and uncertain return on the expense incurred, the generally preferred practice of publishing the results of nonprofit research, the contractual arrangements under which sponsored research is conducted and the objectives of nonprofit patent management.

Few educational institutions and none of the independent nonprofit research organizations are themselves interested in obtaining and holding patents nor do they have the professional personnel with the requisite specialized qualifications and experience to handle the intricate technical and commercial aspects of patent management. Instead, as indicated previously in the chapter on patent management, many of them avoid the necessity of becoming directly involved by utilizing the facilities and services of affiliated patent management organizations and or Research Corp.

Occasionally several of these patent management organizations have been parties to patent litigation, usually initiated by others, but the number of such instances has not been large. When controversies and disputes have arisen, they have ordinarily been amicably settled out of court. When one invention went sour because of unexpected but suspected toxicity, one affiliated patent management foundation contributed $50,000 toward an out-of-court settlement and issued widespread warning in the public interest. On another occasion an outlaw manufacturer was successfully sued for infringement by this foundation to insure supervised quality of product and also protect the interests of law-abiding licensees under another patent.[151] An infringement of the Theelin patent was settled out of court by the payment of a nominal sum by the infringer.[151a]

Prior to 1945 the Wisconsin Alumni Research Foundation was involved in extensive infringement litigation over the Steenbock vitamin D patents and the copper-iron patent.[151b] The litigation over the Steenbock patents, which was long and complex,[152] extending from 1939 through 1945, was finally terminated in a consent decree, pur-

[150] Pp. 24–25, supra; also Palmer, Nonoprofit Research and Patent Management Organization (1955), pp. 58–59, Nonprofit Research Institutes (1956), and Nonprofit Patent Management (1956).

[151] Based upon confidential information furnished the author and disclosed with the permission of the source of the information.

[151a] Footnote 151, supra.

[151b] Footnote 151, supra.

[152] WARF report (reprinted from the Wisconsin Alumnus, June 1948), pp. 8–9.

suant to the terms of which the three subsidiary and subservient patents were dedicated to the public, the basic patent having expired earlier in 1945. After a bitterly fought and costly contest, the patents had been held invalid, originally on the ground that they attempted to cover a "process of nature" but subsequently, in a complete reversal by the court, on the grounds of anticipation and lack of invention.

A decision more favorable to the foundation resulted from the litigation over the copper-iron patent, initiated shortly after its issuance in 1932. After an earlier adverse decision holding the patent invalid, which was reversed on appeal, the defendant in another infringement suit before the same circuit court settled by taking a license under the patent. The final decision was accepted by industry and some 50 infringement situations, extant at the time of that decision, were all disposed of by the infringers either discontinuing their infringement activities or taking licenses. During the remaining life of this patent no further infringement difficulties were encountered and the patent continued to produce substantial revenue for the foundation.

The Rutgers Research and Endowment Foundation has been involved in two instances of litigation with respect to its streptomycin patent. In 1950 a scientist, who, at the time streptomycin was discovered, was a graduate student and one of the laboratory assistants in the department where the discovery was made, sued the foundation claiming that he was a coinventor. The legal action was settled by compromise, whereby a part of the royalties received was apportioned among the plaintiff, staff members, and other graduate students and laboratory assistants who had participated directly or indirectly in the research which led to the discovery. The other litigation grew out of an unsupported claim that the streptomycin patent infringed an earlier patent for treatment of psoriasis.[152a]

In its long and extensive experience in handling patents for educational institutions, other nonprofit organizations and independent inventors, Research Corp. has on only two occasions been involved in litigation; both were the result of honest differences of opinion as to the validity or the scope of the claims of the patents and were settled amicably. It is the judgment of the corporation that, if patents are offered for development and public use under licenses containing reasonable terms, litigation is not normally encountered.[152b]

The few outstanding instances of substantial financial returns from patent royalties,[153] such as those received on the vitamin, insulin, streptomycin, and certain other patents on medicinals and pharmaceuticals, have encouraged the belief that considerable revenue may be obtained from patents on the products of nonprofit research. However, the expense, both in money and effort, involved in obtaining a patent and in development and promotion have proved to be far greater than the actual return.

One institution reported that, although it had spent more than $12,000 on a patentable discovery which appeared to have promising commercial value, it had yet to receive a single penny in return. A number of others reported the expenditure of large sums, both in development and in promotion, where the resulting income had failed to justify the expenditure. Several had incurred heavy expenditures,

[152a] Footnote 151, supra.
[152b] Footnote 151, supra.
[153] Pp. 59–61, infra.

with relatively inconsequential returns in revenue, in connection with patented discoveries and inventions considered of extreme importance from the standpoint of scientific achievement and benefits to mankind.[153a] A further discussion of patent revenue will be found in the next chapter, on licensing experiences.[153b]

In fulfillment of their public-service function universities especially, but also many of the other nonprofit research organizations, have generally preferred to disclose the results of their research activities through publication and other media of public dissemination, in lieu of patenting. Occasionally such disclosure is mandatory under their charters, as in the cases of certain State-controlled educational institutions, especially when the disclosure affects the natural resources and other interests of the State. The results of experiment station research are also generally published, except when patenting is deemed necessary in the public interest.[154]

The patent clauses usually included in research and development contracts, especially when patentable discoveries and inventions are anticipated, provide that such discoveries and inventions, as well as related technical information, become the exclusive property of the sponsor. In some instances the insertion of such a clause is optional,

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GOVERNMENT PATENTS BOARD
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Archie M. Palmer, Chairman

Katharine:
See pages 53 ff for data
on licensing experiences — also note
at bottom of page 54.
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discoveries and inventions have originated, from the burdens of patent prosecution and protection, but have also successfully introduced and promoted the use of many important new discoveries and inventions. In addition, they have handled the complicated and often difficult relations with inventors and licensees. Especially in the case of public institutions, these services have saved the institutions from becoming involved in situations, both legal and personal, which might otherwise have entailed serious political and fiscal complications.

In many ways the economy has been substantially enhanced and significant contributions have been made to the public welfare through the activities of these nonprofit patent-management organizations. In the case of streptomycin, which was developed at Rutgers Univer-

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[159] P. 31–40, supra; also Palmer, Nonprofit Patent Management (1956).

agement agents, illustrate both the diversity and the complexity of nonprofit patent management.[160]

Since 1927 the Wisconsin Alumni Research Foundation has granted approximately 600 licenses under the patents included in its portfolio, nearly 500 of them under the Steenbock vitamin D patents. The majority of the licenses have been on a nonexclusive basis. However, on occasions, especially with respect to the Steenbock patents, the foundation has entered into exclusive licenses for the life of the patents concerned, or what might perhaps be more properly designated as "partially exclusive" licenses, with individual companies or small groups of companies in widely different, noncompetitive fields. In certain other instances exclusive licenses for a limited period of time have been granted in order to stimulate commercial development and promotion by the licensee. Also, when the original nonexclusive licensee is adequately meeting the market demand for a product, subsequent licenses under that patent have been withheld.

The policy and thinking of the foundation on the important subject of exclusive versus nonexclusive licensing has varied considerably over the years, largely as a result of its experience. Originally, with a view to obtaining wide distribution and public benefit, exclusive licenses were granted in the various fields covered by the patents. When it was found that this practice led to serious administrative complications in later years, the foundation adopted a wholly nonexclusive licensing policy and avoided, insofar as possible, any exclusive commitments. In more recent years the foundation has in most cases reverted to the policy of granting exclusive licenses. Such commitments, however, have in practically all cases been for a limited period of time, rather than for the life of the patent concerned.

The type of license granted and the terms of the license agreement have in each instance been determined by a number of factors, such as the nature of the patented discovery or invention, the amount and expense of developmental work necessary to achieve its commercial potentialities, the demand for the licensed product and the field of operation of the licensee. Accordingly each license agreement is, of necessity, tailor-made to meet the particular situation, except for the usual clauses common to all licenses and, in the case of nonexclusive licenses, equitable treatment of all licensees, particularly with respect to the royalty rate.

The royalty rates charged by the foundation vary widely as between different patents, depending upon the importance of the invention, whether the license is exclusive, partially exclusive, or nonexclusive, the extent of the foundation's investment in development work, the margin of the licensee's profit, the assistance rendered by the foundation in the promotion and commercial marketing of the licensed product and the customary or established royalty rate in a particular industrial field. Licenses in the pharmaceutical field, for example, are at the royalty rate more or less common in the field, 5 percent of net sales. On the other hand, the royalty rate under the sabadilla seed insecticide licenses is 3 percent of net sales. Because of the manner in which Warfarin is processed and marketed, a special royalty rate is charged for its use as a rodenticide, whereas licenses covering its use for human medication are at 7½ percent of net sales. Graded scales of

[160] The individual descriptions in this chapter are based upon confidential information furnished the author and disclosed with the permission of the sources of the information.

royalty, related to the quantity sold, apply under the Nu-World cheese and processed cranberries licenses.

Similarly, in the foundation's licensing of its expired and abandoned patents a variety of royalty rates were used, depending upon the field of operation of the licensee. The copper-iron, progesterone, and microdensitometer licenses carried a royalty rate of 5 percent of net sales. In the pharmaceutical field the Steenbock patents were in the beginning licensed on a percentage of net sales, originally 10 percent on certain products and 6 percent on others, which were later reduced respectively to 5 percent and 3 percent; still later the royalties were placed on a flat amount of 10 cents per million units of vitamin D used. In the evaporated-milk field the royalties were based upon so much per case of 48 cans of evaporated milk, ranging from 1½ down to 1 cent per case, while in the fluid-milk field they were a specified amount per quart, ranging from one-tenth of a cent down to as low as one-fiftieth of a cent per quart; in other fields a flat-sum royalty per year was charged. On stabilized iodized salt for human consumption the royalties charged under the stabilized iodine licenses ranged from 17½ to 25 cents per ton; on stabilized iodized salt or mineral mixtures for animal consumption they ranged from 14 to 32 cents per ton, depending upon the quantity of iodine used.

The Rutgers Research and Endowment Foundation has 21 nonexclusive licenses currently in effect under which each licensee pays a royalty of 2½ percent on net sales of streptomycin, 2 percent on net sales of dihydrostreptomycin, which is covered by the streptomycin patent, and 2½ percent on net sales of neomycin. It is the policy of the foundation to license all reputable and financially responsible manufacturers upon equal terms. The foundation has not granted exclusive licenses, except in one instance where a limited exclusive license was granted to the sponsor of the research who made application for the patent and assigned it to the foundation.

Through its biochemistry committee on grants for research, St. Louis University has granted 9 nonexclusive licenses under its Theelin, Theelol, Antuitrin-S, and vitamin K patents, all at 5 percent of gross sales. Without exception, its licensees have exhibited an excellent spirit of cooperation, and the attitude and helpfulness of the first one to obtain a license under the Theelin patent has far exceeded contractual requirements. The pattern developed with respect to the licensing of Theelin has served as the model for the successful handling of the later patentable discoveries. The number of license granted under these four patents has been limited in order to maintain sufficient control over the reliability of the product.

The University of Tennessee Research Corp. has granted licenses under the patents on 14 inventions, all of which have been income-producing in some degree. As is generally the practice, no standard license form is used; individual contracts are drawn providing for an appropriate minimum royalty, the amount depending upon the type of invention. No rigid licensing policy is followed, although Tennesseans are given preference in the issuance of licenses, all things being equal. The general practice of the corporation is to grant nonexclusive licenses, as the patents cover the results of research supported by public funds. Exclusive licenses are issued only in unusual cases, when it is apparent that the public welfare will be served thereby, and then only for a limited period of time.

With a view to safeguarding the interests both of the public and of Iowa State College and taking into account the relation of specific inventions to agriculture and the other industries of the State, as well as any possible relation to life and health of both humans and animals, the Iowa State College Research Foundation has since 1938 been highly effective and successful in acting as patent management agent for the college and members of the college faculty and staff. It has granted both exclusive and nonexclusive licenses at varying rates of royalty under the patents it has administered. Eighteen nonexclusive licenses bearing a royalty of one-fourth of a cent per pound were issued during the life of a basic patent, which has now expired, on a method of making blue-veined cheese. As the process covered by the basic patent made possible the development of a thriving new industry which would hardly have otherwise occurred, the foundation considers its experience with this patent a vindication of the philosophy of the United States patent system.

Under the most productive patent in its portfolio, on a method for treating growing ruminants and preparing their feed material, the foundation granted an exclusive license for 5 years to protect the large development expense incurred by the licensee, charging a royalty of 5 percent of the net selling price. Similarly, an exclusive license was granted on a solvent extraction apparatus and process at 5 percent of the net selling price, because of the large development investment required. On another invention, of an earth terracing apparatus on which the patent has expired, an exclusive license was also issued for the life of the patent at a royalty of 4 percent of the selling price. Because the patent was prosecuted and the necessary development work was performed at the licensee's expense, a sewage treatment method was exclusively licensed.

Under a special licensing arrangement, the Institutum Divi Thomae Foundation licenses its patents to a commercial company, Sperti, Inc., or its subsidiaries, who may manufacture under these patents or may sublicense independent manufacturers. Sublicensees normally pay royalty to Sperti, Inc., or its subsidiaries, from whom the foundation receives no direct royalties but instead holds a substantial block of stock in those companies and its return comes from their overall operations. Under this arrangement Sperti, Inc., and its subsidiaries are responsible for the commercial exploitation of the inventions and bear the expense of patent prosecution and maintenance.

The California Institute Research Foundation has granted 1 exclusive and 11 nonexclusive licenses under the patents included in its portfolio. On the basis of a development program carried out by the licensee, an exclusive license on an oxygen meter with a 9 percent royalty rate was issued in exchange for production assistance. One nonexclusive license on the foundation's contour sensing apparatus carries a 10 percent royalty charge, as do the two under its radiation meter patent. The royalty rate under the nonexclusive license on the porous wall construction is 9 percent, while under the licenses on the magnetic drum readout it is one-half of 1 percent. Royalty rates on the patented orthodontic appliances are charged at so much per dozen of each item.

The foundation's policy specifically precludes the use of exclusive licenses beyond a limited period, except in the case of high develop-

mental expenditures by the licensee or for other special reasons, and then generally with a suitable cancellation clause. In the case of licenses for materials affecting public health, the foundation reserves the right to control the quality of the product marketed and to reject license applications when the proposed licensee does not meet the standards of ethics, quality control or market coverage deemed desirable for the purpose of making available to the public a suitable product at a reasonable price in as many territories as practical. Because of the nonexclusive license as well as cancellation and quality control provisions in public health licenses, the administration of the license is relatively simple.

To insure both national and international distribution of its patented coccidiosis vaccine, after approval by the Pure Food and Drug Administration, the Auburn Research Foundation has licensed dealers to promote its use. As an indication of the recognized effectiveness of the vaccine against cecal and intestinal coccidiosis in poultry, more than 1 million doses were administered to flocks of poultry during 1954 and it was estimated that over 2 million doses would be used the following year in the State of Georgia alone.

Under the one patent in its portfolio which is income-producing, on shoe construction and last, Noned Corp. has granted two exclusive licenses under which the prime licensees have issued 10 sublicenses. These licenses all fall into a pattern of nonassignable rights, either exclusive for a limited period of time (3 to 5 years, subject to renewal), with royalties to be paid on a percentage of the wholesale price of the shoes or, in one instance, on the basis of a fixed amount per pair of shoes made under the license. In all cases the royalty rate decreases as production increases; the percentages start at 2 percent and the fixed amount at 2½ cents per pair.

Six nonexclusive licenses, arranged by a commercial concern in behalf of the University of Michigan, under the three Bailey motors patents administered by the Engineering Research Institute of the university, provided for royalties on a graduated scale based upon the horsepower of the motor. Five cents was charged on a one-sixteenth horsepower motor, 50 cents on a 1-horsepower motor and $1 on a 15-horsepower motor. In an exclusive license granted under the two pharmaceutical patents, on thienyalkyl esters and basic esters of substituted thienylacetic acids, royalties are based upon a grant by the licensee of $4,000 plus a percentage of gross sales.

Over the years Research Corp. has granted both exclusive and nonexclusive licenses with a wide variety of terms and royalty rates. The general policy of the corporation with respect to licensing is to use the patent rights to promote the development and usefulness of the invention, to bring about its widest possible public use, and to derive reasonable royalty income therefrom for the support of research in educational and scientific institutions.

In negotiations with industry, careful attention is given to the terms of the license so that the licensee will be encouraged to undertake the further developmental costs that are almost invariably necessary to bring the invention from the laboratory stage to that of a useful and economic industrial process or product. As a matter of policy the corporation does not seek large initial payments for licenses, nor does it impose onerous minimum royalties. License fees are usually

in an amount sufficient only to assure that the licensee has a real interest in securing the license. Occasionally minimum royalties are imposed, but only in an amount sufficient to assure that the licensee will cancel the license if he loses interest in the development of the invention.

A rather frequent use is made, by the issuance of exclusive licenses, of the monopoly granted in the patent. The grant of an exclusive license is essential in many instances if the licensee is to be induced to risk the considerable investment necessary to fully develop the invention into a useful product or process. However, it is the corporation's policy to limit the exclusivity of the license to a few years to assure the licensee that its product can be established on the market and its developmental costs recovered before competitors can market the same product and take unfair advantage of the costly development work which the first licensee has done. Upon the expiration of such an exclusive period in a license, the corporation uses its best judgment as to whether or not other licenses should be issued, bearing in mind its own interests and the contingent interests of the inventor and his institution, the degree of success that the licensee has achieved in marketing the invention, and whether there would be any real benefit to the public from the issuance of additional licenses.

However, as a general practice the corporation grants several licenses on each invention. Under its pantothenic acid patent 11 nonexclusive licenses have been granted, each with a royalty rate of 7½ percent of the bulk sales price, and 4 nonexclusive licenses have been issued on vitamin B_1, 2 at 5 percent of the bulk sales and 2 at 2½ percent, one with a minimum royalty of $10,000 a year. Fourteen nonexclusive licenses have been granted on the cortical hormones, 5 of them at 7 percent of the net packaged sales price, 2 at 1.4 percent and 7 at 0.9 percent.

Many of the licenses are at 5 percent of net sales, some with a minimum royalty; others are at a higher or lower percentage. The three nonexclusive licenses under the vitamin A patent carry a graduated scale royalty rate of from 2 percent to 1¼ percent of bulk sales, depending upon the volume. One of the licenses under the synthetic crystals patent is at 5 percent of net sales and the other 2 at 10 percent. One nonexclusive license, on a lens coating, is at 20 percent of the royalties received from sublicensees. Another, on pile fabrics, is at 5 percent of net sales and 2½ percent of rentals.

The exclusive licenses carry various royalty rates and are for various periods of time. Some are for 4 years, others for 5 or 7 years, while one is for 8 years and another for 10 years, both with the provision for termination after 5 years from the date of the first commercial use or sale. The license on nystatin is for 4 years from the date of license or 2 years from the date of the first commercial sale, whichever occurs first. Several of the licenses, both exclusive and nonexclusive, have been issued on a paid-up basis.

The Battelle Development Corp. has never attempted to use standard-type licenses. The corporation's extensive experience in handling patents has demonstrated that each agreement is an original one which must be worked out through negotiation. Under its electropolishing patents, for example, 50 nonexclusive licenses have been granted to interested parties to practice the processes, 1 exclusive li-

cense has been issued for its use on twist drills and 7 nonexclusive distribution-type licenses are currently in effect. Royalty rates, which necessarily vary on different products, are based upon such factors as ampere hours of electricity used, upon square feet of metal treated, upon installed tank gallonage and upon quantity of solution purchased.

The corporation's handling of licenses under its Xerography patents is an excellent example of the way in which technological advances in an art may necessitate subsequent changes in the form and scope of a licensing arrangement. Originally the license agreement with one company was nonexclusive and covered a very narrow field. Later developments and applications of the process, both by the corporation and by the company, resulted in so many significant inventions coming under the agreement that it became evident that the licensee really controlled the field; consequently, the license was made exclusive.

In its administration of three licensed inventions the Institute of Inventive Research does not follow a uniform pattern in its arrangements with licensees. The Poulter seismic process is licensed nonexclusively, the Vibrotron device is licensed exclusively with respect to certain applications and nonexclusively with respect to others, while its loadbinder device is licensed exclusively. In addition to these three inventions, the institute has been successful in exploiting the Youtz-Slick lift slab method of construction, a new type of drilling tool and a new metallurgical process under arrangements whereby new companies have been formed by venture capitalists and all rights in the inventions have been turned over to them for licensing, with the institute taking as consideration an equity position in the companies plus profit sharing.

Under a policy of granting nonexclusive licenses only, which may be modified under special circumstances, the Armour Research Foundation has some 60 licenses under its magnetic recording patents and a half dozen in other fields relating to alloys and ceramics. The royalty charges vary according to the patent field covered.

ROYALTY INCOME

From its Steenbock vitamin D patents the Wisconsin Alumni Research Foundation obtained gross royalty income of $14 million through 1946 and $1,734,000 from Warfarin through 1955. Under the expired copper-iron and stabilized iodine patents $652,000 were received through 1952 and $450,000 through 1955, respectively. The other patents in the foundation's current portfolio have brought in varying amounts, in some instances less than the expenses incurred.

From the two income-producing inventions in its portfolio the Rutgers Research and Endowment Foundation has thus far received approximately $7 million in royalties under the streptomycin licenses and $150,000 under those on neomycin, both domestic and foreign.

In 1951 St. Louis University received $116,635 in royalties from the licenses under 4 patents, most of it from the licenses on Theelin, the patent on which expired that year, as did the one on Theelol. Since then approximately $12,000 a year has been paid in royalties under the vitamin K patent and, through 1953, a lesser amount under the Antuitrin-S patent. At present royalty payments as such have not been the major income, but rather the return from investments derived from past royalties.

From 14 patented discoveries and inventions which have been income-producing the University of Tennessee Research Corp. has received approximately $60,000 in royalties. More than half of this amount came from an apparatus for measuring cotton fiber. Others producing in excess of $2,500 include a fertilizer process, a stelometer, an apparatus for determining the physical properties of porous materials, an aerolometer, and several varieties of Tennessee strawberries, with smaller amounts from the others.

During the past 5 years the Iowa State College Research Foundation has received more than $260,000 in royalties on 5 patented inventions, over two-thirds of it coming from a short-term exclusive license on a method for treating growing ruminants and preparing their feed material. Of the total amount $168,000 was received during the year ending April 30, 1956. Under nonexclusive licenses on a method for making blue-veined cheese, on which the basic patent expired in October 1955, the foundation obtained in excess of $200,000 in royalties during the life of the patent.

A small number of the inventions covered by the 58 United States and 16 foreign patents administered by the Ohio State University Research Foundation have been licensed, but only minor amounts of royalties have accrued. Some of the other inventions are considered important but may require further research to develop commercial applications.

During the past 5 years royalties totaling $77,800 have been received by the California Institute Research Foundation from licenses on 6 of the inventions included in its portfolio. Of this amount $53,261 has come from those on an oxygen meter and $15,238 from those on orthodontic appliances, with small amounts from the licenses on the other four.

In excess of $50,000 per year has been derived from licenses under the patent on a poultry vaccine, the only one of the two patents owned by the Auburn Research Foundation which is income-producing.

Under its honey butter patent, one of the 14 income-producing patents held by the Cornell Research Foundation since its inception, the foundation has received more than $100,000 in royalties. Licenses on a wine process have brought in a somewhat smaller return. Two other inventions have each produced in excess of $10,000 in royalty income, while less than $10,000 has been received on the remaining 10, of which 6 have not brought in even $1,000.

Prior to 1949 royalties totaling $139,124 were received by the Pennsylvania Research Corp. under a mushroom spawn patent and, through May 31, 1955, additional royalties of $22,838 from licenses on patented magnetostriction transducers and of $10,258 from licenses on patented helices. Under a patent development agreement with Research Corp., that nonprofit foundation has replaced the Pennsylvania Research Corp. as patent management agent for Pennsylvania State University.

Through November 30, 1940, 6 licensees paid the University of Michigan $138,208 under nonexclusive licenses, arranged by its Engineering Research Institute through a commercial company, under the 3 patents on the Bailey motors; out of this amount the commercial company received $34,000 for acting as agent and handling the licenses. In addition, an exclusive license on 2 pharmaceuticals,

thienyalkyl esters and basic esters of substituted thienylacetic acids brought in $24,000 in royalties for the period ending February 6, 1956.

From its extensive patent portfolio Research Corp. has received approximately $1,500,000 a year in royalty income during the past 5 years, or a total of $7,447,896. Of that amount $2,657,682 has been paid under the licenses on vitamin B_1 $1,597,114 under those on the cortical hormones and $1,006,000 under those on pantothenic acid. Licenses on 2 others, ergotrate and vitamin A, have brought in more than $500,000 each, while substantial amounts have been received under a number of the other patents, including those on merthiolate which expired in 1952.

Through the Battelle Development Corp., its wholly owned patent holding subsidiary, the Battelle Memorial Institute is the only one among the independent research organizations which has obtained any substantial return from its patent portfolio. As of December 31, 1955, the Battelle Development Corp. owned or controlled approximately 90 United States patents on 33 inventions which were earning some income. Out of more than 200 patentable discoveries and inventions developed and promoted by the corporation and its parent organization, the Battelle Memorial Institute, only these 33 had produced income. One, Xerography, had earned more than $750,000; another had earned approximately $150,000, and a third approximately $75,000. Nine others had each earned somewhat less than $50,000, while 11 had each earned between $1,000 and $5,000, and none of the remaining 10 had earned as much as $1,000.

Of the inventions administered by the Institute of Inventive Research, the inventions development division of the Southwest Research Institute, only three are presently under license. The Poulter seismic process has produced $45,983 in royalty income, the Vibrotron precision measurement device, $45,496; and the loadbinder, $1,605.

During the past 5 years the Institute of Paper Chemistry has received $79,000 in licensing fees under 12 United States, 1 Canadian, and 5 Australian patents included in its portfolio. Although it has enjoyed a nominal income from patents in recent years, the institute does not view patents as an important source of institutional funds. Its primary purpose in obtaining patent protection is to keep the fields in question open for further investigation and inquiry.

On the two patents held by the Midwest Research Institute, about $600 has been received in royalties under one on a fluid bed-drying process, which had been given to the institute, and only $25 under the other, which covers a metal-treating process.

No licenses have been granted and consequently no return has been received on the five chemotherapeutic patents owned by the Mellon Institute of Industrial Research, even though nonexclusive, royalty-free licenses were offered to a number of reputable drug manufacturers.

FURTHER RESEARCH AND DEVELOPMENT

Further research and development work on a patentable discovery or invention, where necessary for the improvement of the finished product or in order to obtain its public acceptance, is ordinarily left to the licensee. Exceptions may be made when such research or development is supported by a grant-in-aid or a special research-and-development contract. Public educational institutions and their agri-

cultural and engineering experiment stations may perform further work gratuitously on an invention when its application is considered likely to benefit the industries of the State or contribute to the general welfare of its citizens.

Internal research is frequently conducted by both educational institutions and independent nonprofit research organizations on the improvement of their patented and patentable discoveries and inventions and on new developments in the fields covered by the patents they own, as well as other fields in which the discoveries and inventions may be applied. Also, when further research and development fits into the general program of the institution, members of the staff are encouraged to continue their efforts to make a promising product useful commercially, with or without outside financial support.

Under the special licensing arrangement with Sperti, Inc., and its subsidiaries, the Institutum Divi Thomae Foundation will conduct further research and development on licensed inventions when necessary, which is usually supported by direct research grants from the appropriate companies. However, the amount of such research constitutes a very small part of the overall research activities of the foundation.

The Battelle Memorial Institute will provide funds so that its staff members may investigate and develop ideas of both staff members and outside inventors, on which industry does not feel disposed to spend money. If an idea shows promise, the institute will provide the funds for the research and then, if such research improves the possibility of further development of the idea, the Battelle Development Corp. will take it to industry. This practice has resulted in new ideas being made available to the public which it would not have otherwise enjoyed. An excellent example in point is Xerography, which was turned down by a large number of industrial organizations before the institute underwrote its development.

The few nonprofit patent management organizations which accept patentable discoveries and inventions submitted by independent or free-lance inventors will conduct the further research and development required only when financed by the inventor or through a sponsored project from an industrial company having a possible interest in the invention. Educational institutions and independent research institutes will assist their own personnel or seek financial support from outside sources, either directly or through affiliated foundations, to enable them to develop an idea which possesses prospects of contributing to the advancement of science or of enhancing the general welfare or economy.

Further development of the inventions handled by Research Corp. under its licensing program is ordinarily left with the licensees. While the inventor is usually consulted by industry, there is normally no continuing development work in the laboratories of the inventor's institution. On occasion, however, a cooperative program may be developed under which the inventor continues research in his field of interest jointly with the licensee. Agreements covering such programs are worked out in accordance with the institution's policy concerning this type of cooperative research.

DISTRIBUTION OF PATENT REVENUE

Many of the educational institutions having formalized research and patent policies provide in those policies specific arrangements for the distribution of any income accruing from patents which may result from the research activities of members of their staffs and faculties, as well as recognition of the rights and equities of the inventors. Others handle each case on its merits and, through mutual agreement, allocate in advance the anticipated patent revenue.[161] The affiliated patent management foundations and Research Corp. follow similar procedures, as do most of the independent nonprofit research organizations.

When an invention is assigned to the Wisconsin Alumni Research Foundation, a standard contract is made with the inventor, under which he, or his estate, is paid a 15-percent royalty on the net avails derived from the patent, after the expense of securing, maintaining, and defending it have been repaid to the foundation. The remaining 85 percent of the net returns accruing to the foundation is invested by the foundation. The income from the foundation's investment portfolio is turned over to the University of Wisconsin for the support of scientific research.

The contributions to the university are made annually, without restriction as to their specific use; their administration is the responsibility of the university. By far the larger part of the financial aid which has been thus given to the university has been used for the support of specific projects proposed by the several departments in the field of the natural sciences. These projects are administered entirely through the university research committee of the graduate school and the selection of the approved projects and the manner of their prosecution are in no way controlled by the foundation.

The entire net income of the Rutgers Research and Endowment Foundation is devoted to the support of scientific research and graduate instruction at Rutgers University conducted in the Institute of Microbiology, a department of the university devoted primarily to basic research and graduate study in microbiology. The building occupied by the institute, which contains laboratories, a pilot plant and classrooms, was equipped at a cost of approximately $3,500,000 paid from royalties received by the foundation from licensees and given by it to the university. The balance of the royalties have been devoted to the annual operating budget of the institute and to the accumulation of an endowment fund for the institute.

As the patented discoveries and inventions administered for St. Louis University by its biochemistry committee on grants for research were all voluntarily assigned to the university, the inventors have not received any of the royalties. Their salaries, which conform to those paid other members of the medical school faculty, are derived in whole or in part from the royalty income received under the patents, as are salaries of other faculty members, graduate student stipends, supplies, and equipment for other departments of the university as well as the department of biochemistry.

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[161] Palmer, University Patent Policies (1952), pp. 28–229, and Supplement to University Patent Policies and Practices (1955), pp. 46–90; also Survey of University of Patent Policies (1948), pp. 109–116.

As a general practice the University of Tennessee Research Corp. pays the inventor a share, averaging about 15 percent, of the gross revenue derived from the patents it administers. The remaining income is allocated by the board of directors of the corporation to research projects at the university, for development work and expenses incurred in the promotion of the invention. Because of its policy of sharing liberally with the inventor whatever income may be received, faculty members have been willing to assign their patents and pending patent applications to the corporation.

Under the research and patent policy of Iowa State College, as adopted by the Iowa State Board of Education, all net revenue from patents handled by the Iowa State College Research Foundation reverts eventually to the college, where it is used in the form of grants-in-aid to stimulate further research, not necessarily related to the patented invention. The policy also provides that the inventor shall receive a bonus equal to 15 percent of the net receipts from the licensing of his patent, to be paid annually as accrued.

As no significant income has been obtained from the patents held by the Ohio State University Research Foundation as patent management agent of the Ohio State University, no established policy for the use of such income has been adopted by the university. However, under the provisions of the Ohio State statutes all rights in and to patentable discoveries and inventions resulting from research conducted in any department or laboratory of the university, including the State engineering experiment station, shall be the sole property of the university.

The income received under the special licensing arrangement the Institutum Divi Thomae Foundation has with Sperti, Inc., and its subsidiaries is all plowed back into the research and educational activities of the Institutum Divi Thomae. No inventor receives any individual return; the staff of the institute is dedicated to research and is quite satisfied that incidental returns from their activities be used for the common good.

From the gross patent revenue received by the California Institute Research Foundation on each invention 15 percent is reserved for the inventor or inventors. After the payment of cost of patent drawings and certain clerical, legal, and filing expenses out of the remaining 85 percent, the entire balance is turned over to the California Institute of Technology for further research.

The research and patent policy of the Auburn Research Foundation, which is also applicable to the faculty and staff of the Alabama Polytechnic Institute, provides that the foundation will pay an inventor a minimum of 15 percent of the net proceeds from any patented discovery or invention assigned to the foundation for management. The amount may be varied by the board of directors of the foundation, depending upon the circumstances under which the invention was made. The remaining money is used as unrestricted funds for the support of research of benefit to the State of Alabama and the southern region, conducted by the personnel either of the foundation or of the institute.

Patent revenue received by the Cornell Research Foundation from its income-producing patents is ultimately used for appropriation to the Cornell University faculty research grants committee, which considers applications from faculty members for grants to assist them in

their research activities. These grants are made in fields, particularly the humanities, where outside support is difficult to obtain. In making its grants, this committee gives no consideration to the possible production of patentable inventions. Under the patent development agreement with Research Corp., which presently handles patents for the university through the foundation, the inventor is given a share, ordinarily 7 percent, of the gross income derived from the sale or exploitation of patents on his invention.

Out of the income from the patents it manages, the Pennsylvania Research Corp. provides financial assistance to the council on research of Pennsylvania State University for its program of allocating money to the members of the faculty and staff of the university for research on projects for which the necessary funds cannot be obtained from other sources. Under the research and patent policy of the university, the equities of an inventor in his invention are recognized and he receives a just compensation from the net proceeds from patents obtained on the invention, the determination in each case being made by the council on research. At the time of his employment every member of the university faculty signs a memorandum of agreement which includes his acceptance of the general policy of the university.

When an inventor at the University of Rochester assigns a patent to Noned Corp. for management, the university enters into an agreement with him providing for a fixed percentage of the royalty income to be paid to the inventor, the percentage varying from 15 to 50 percent depending upon the inventor's relationship to the university and the conditions under which the invention was made. All of these agreements provide for the major portion of the net royalty received, less the amount paid directly to the inventor, to be used in support of research in the scientific field or in the specific laboratory in which the invention was made.

Royalties obtained from patents administered for the University of Michigan by its Engineering Research Institute are placed in the expendable trust funds of the university and are subject to disposition by the board of regents of the university. There is no standard policy with respect to the percentage of the royalties given an inventor, which is determined in each case by the board after a separate review of the circumstances surrounding the making of the invention.

Sponsors of contractual research performed under the auspices of the Engineering Research Institute may, upon payment of a special patent charge, obtain a 6-month option of acquiring ownership of any patentable discoveries or inventions made during the performance of the sponsored research project. If the sponsor exercises the option, he pays an inventor's fee of $100 for each patent application or divisional application. Otherwise the sponsor is granted an irrevocable, nonexclusive royalty-free license under any patents issued, as a result of the project, to the university or to any of its employees engaged on the project. All university employees participating in the sponsored research activities of the Enginering Research Institute execute inventor's agreements which enable the university to fulfill its contractual obligations.[162]

As previously discussed in the chapter on patent management,[163] the patent-development agreements with Research Corp. provide for

[162] Palmer, University Patent Policies and Practices (1955), pp. 141–142.
[163] Pp. 36–38 supra.

the equitable sharing of the income received from its management of patents in behalf of colleges and universities, other nonprofit organizations and individual inventors. In accordance with the specific terms of each agreement, the inventor usually receives a prearranged percentage of the income derived from his invention.

Under an institutional agreement the inventor's share is paid directly to him by the corporation, when it does not exceed 15 percent of the gross income, and the remainder is divided on a 50–50 basis between the corporation and the institution, after deducting those expenses incurred with respect to foreign patenting and litigation to assert the validity of the patent. If the inventor's share, as established by the institution, is greater than 15 percent, Research Corp., after deducting the specific expenses referred to above, retains 42½ percent of the income and pays over the balance to the institution for division between the institution and the inventor in accordance with the institution's policy.

Through its grants-in-aid program the corporation devotes its share of the patent revenue to the support of research and scientific investigation in educational and scientific institutions in the United States and in foreign countries. The corporation also uses for this purpose the income received from its wholly owned subsidiary, Research-Cottrell, Inc., which handles the electrical precipitation business based upon the original patent rights given by Frederick Gardner Cottrell to establish the corporation in 1912.

Research Corp. also administers inventions given to it by inventors who are not affiliated with any institution, or inventors who are affiliated with an institution with which Research Corp. does not have a general patent agreement. Naturally the terms of these agreements vary from case to case. A share of any income derived from an invention handled under such an agreement goes to the inventor and, in many instances, those associated with him in the technical development of the invention. The maximum share that goes to any individual or group of individuals is limited by the corporation's own policy to 25 to 35 percent of the gross income. The balance is retained by Research Corp. for its own corporate purposes in the support of its grants-in-aid program, in some instances earmarked for the support of research in a field of particular interest to the inventor or, in those cases where the inventor is associated with an educational institution, a share is usually paid to that institution.

After deducting the inventor's share, where applicable, all of the income received from the sale or licensing of a patent administered by the Battelle Development Corp. is added to the corpus of the Battelle Endowment Fund and is used for the furtherance of research at the Battelle Memorial Institute and the general purposes of the institute. A percentage of the royalty income from the inventions of free-lance inventors not on the staff of the institute is shared with the inventor on the basis of the stage of development of his idea at the time it is accepted by the corporation and the amount of his own funds previously expended in the development of the idea. The rate varies with each individual situation but in no event is less than 10 to 25 percent of the net receipts and might be as much as 50 percent.

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