

# W.A.R.F. REPORT

THE WISCONSIN ALUMNI RESEARCH FOUNDATION  
IN REVIEW TO DECEMBER 31, 1947

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# W.A.R.F. REPORT

THIS IS THE short story of an idea.

It is the story of an idea which has made millions of children healthier and millions of dollars for the public.

It is the story of the blazing of a new trail in science, health, and education.

In the words of Dr. Harry L. Russell, former dean of the Wisconsin College of Agriculture, it is the story of an experiment in "socializing profits that may arise from patent procedure so that society at large rather than an individual may receive such profits."

This is the story of the Wisconsin Alumni Research Foundation. It is not the detailed story, because that telling will take a book. This is an outline of WARF history—a brief account of 23 years of Foundation service—prepared especially for the Wisconsin alumni to whom the Foundation owes its first allegiance.

## Let's Go Back to the Beginning

The story begins like this:

For many years it had been known that cod-liver oil could help rickets (a disease especially prevalent in childhood and characterized by weak bones.) In 1919, German scientists, experimenting with children suffering from rickets, found that they could be cured by treating them with ultra-violet rays from a quartz mercury vapor lamp. Then five years later, English investigators, working with rats afflicted with rickets, secured growth in these sick rats by feeding them tissues taken from live rats that had been treated and cured with ultra-violet rays.

A young (38 year old) biochemist at the University of Wisconsin by the name of Harry Steenbock, already famous for his work on vitamin A, became interested prior to 1923 in vitamin D, the rickets-curing factor. He had a great idea. Scientists believed that the almost magic action from the ultra-violet rays was successful only with living bodies. But Dr. Steenbock was first to conceive of and produce a health-giving-effect of those rays upon *other than the living body*. He first took an ordinary ration for rats—containing hog millet, casein, and salts—and exposed that ration to ultra-violet rays from his mercury vapor lamp, then fed it to rachitic rats—and the rats got well. Then he took another leap into the dark. If these rays will work on a ration, he asked himself, why won't they work on oils? He decided to try olive oil.

Under his mercury lamp he placed a pan of oil. He fed this oil to rats suffering from rickets—and in three weeks they were cured. Rats fed untreated olive oil died.

## Dr. Steenbock Makes a Great Discovery

Steenbock spent night and day in his laboratory on the Wisconsin campus. He treated other oils and fats. Always the food treated with the ultra-violet rays cured sick rats. Then he tried the experiment on other animals.

Through a thousand experiments, Dr. Steenbock and his lab assistants proved that all sorts of foods could be activated with ultra-violet rays and given the strange property of bone-building and rickets-curing. In short, he discovered and substantiated a method for the artificial irradiation of foodstuffs to create vitamin D.

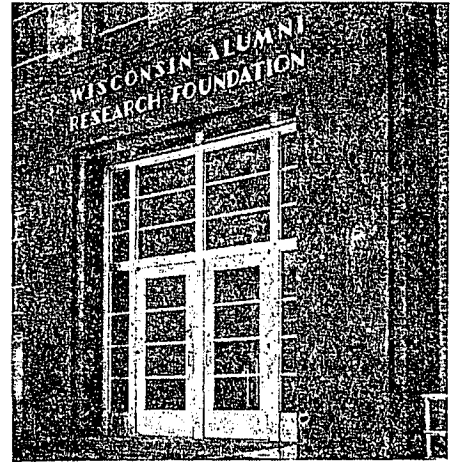
## He Had Four Alternatives

Now once he had made this great discovery, Harry Steenbock had four alternatives.

1. *He could make the sentimental gesture of "giving it to the whole world."* There was good precedence on his home campus for such a move. Prof. Stephen M. Babcock had invented an immensely valuable test for butter-fat in 1890 and had presented it to the public. It is not being unfair to say, however, that this well-meaning generosity on the part of Dr. Babcock actually delayed from the public the benefits of the Babcock test by 10 years. The discovery was exploited by dairy-laboratory equipment manufacturers so carelessly that at one time the Babcock test was very nearly discredited because of improperly calibrated measuring glasses used by irresponsible persons. Not until the Federal Government stepped in and standardized the test was the public protected. Even then, not one cent of revenue ever accrued to the University from Dr. Babcock's discovery.

Professor Steenbock realized that if he were to follow the lead of his predecessor, companies not operating in the public interest would exploit vitamin D. Furthermore, he knew that the University of Wisconsin would receive no financial returns.

2. *He could patent his irradiation discovery himself.* Indeed, one concern approached him with a royalty contract for \$900,000 for only part of the



★ In the fall of 1925 there was organized on the University of Wisconsin campus a corporation with the avowed purpose to "promote, encourage, and aid scientific investigation and research at the University." Between then and now the Wisconsin Alumni Research Foundation has been alternately damned for taking milk from the mouths of babies and extolled as a great social tool for taking discoveries made on public funds and returning to that public the fruits of such discoveries. What are the facts? Here is a short but authoritative life and times of the WARF.

By WARD ROSS, '25  
General Manager and Counsel of  
Wisconsin Alumni Research  
Foundation

and

CLAY SCHOENFELD, '41  
Editor of the *Wisconsin Alumnus*

rights. But Dr. Steenbock was not interested in personal gain.

3. *He could turn it over to the University.* He did offer the discovery to the Board of Regents. But the University had neither funds nor organization for going into business.

4. *There could be created a special foundation for the purpose of patenting and handling the wide commercial application of his discovery in the interests of mankind everywhere, and for funneling back royalties to his University for further scientific investigation.*

This matter was discussed by Dr. Steenbock with Dean Charles S. Slichter, then head of the Graduate School. Dean Slichter called a meeting of prominent and interested alumni which meeting resulted in the organization of the Wisconsin Alumni Research Foundation.

This was a new idea, a social experiment that broke new ground. A private corporation was to function in developing a business, but profits, instead of going to stockholders, were to be utilized in the public interest in the form of support for research in the natural sciences at a state university.

That is how the Wisconsin Alumni Research Foundation began.

Other universities had been offered patentable ideas before by their staff members who were willing that possible profits might be devoted to public rather than private use. Committees had been formed, sometimes made of special faculty groups, sometimes a combination of regent and faculty membership. Such combinations, however well intentioned, were not customarily in position to do business with dispatch. Where such cumbersome machinery had been tried, experience had generally demonstrated that, sooner or later, it became necessary to establish outside business connections before success could be attained.

So a private corporation was formed with the consent and approval of the Board of Regents and the president of the University. The purpose of this administrative device was to get quick action where business was to be done.

The University of Wisconsin was first among state-controlled institutions of learning to experiment in this novel method of handling patentable matters.

## The Foundation Is Organized

The Wisconsin Alumni Research Foundation, a corporation not for private profit, was organized in December 1925.

The business and purposes of the corporation were set forth to be "to promote, encourage and aid scientific investigation and research at the University of Wisconsin by the faculty, staff, alumni and students thereof, and those associated therewith, and to provide or assist in providing the means and machinery by which their scientific discoveries, inventions and processes may be developed, applied and patented, and the public and commercial uses thereof determined, and by which such utilization or disposition may be made of such discoveries, inventions and processes, and patent rights or interests therein, as may be of benefit to mankind or as may tend to stimulate and promote and provide funds for further scientific investigation and research within said University or colleges or departments thereof."

Since its organization, the WARF has been governed by a Board of Trustees, the number of which has varied from five to 10. These Trustees, who serve without any compensation, are all alumni of the University of Wisconsin. No members of the Wisconsin staff or faculty are, or shall be, Trustees of the Foundation.

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**FICTION:** The WARF has directed its funds into University of Wisconsin research projects from which might come profitable patents.

**FACT:** Expenditure of WARF research funds is in the hands of the Research Committee of the faculty, with no strings attached to the grants by the WARF except that they be used for research in the natural sciences. As Harry L. Russell, '88, former agriculture dean, explains it: "The Foundation job is to earn the money and give it to the University. The professors' job is to spend it as wisely as they know how."

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*Here is a list of the Board of Trustees of the Wisconsin Alumni Research Foundation and their occupations when the Foundation was established and under way:*

Thomas E. Brittingham, Wilmington, Dela.; Timothy Brown, attorney-at-law, Madison, Wis.; George I. Haight, attorney-at-law, Chicago, Ill.; L. M. Hanks, president of First National Bank, Madison, Wis., and president, Central Wisconsin Trust Co., Madison, Wis.; William S. Kies, W. S. Kies & Co., New York City. (A short time later, Judge Evan A. Evans of Chicago was added.)

Under the supervision of the Board of Trustees, the Foundation has a full-time staff of personnel for the purpose of conducting its regular business operations.

The WARF operations include the following:

1. The administration of patents on inventions.
2. The conducting of a specialized processing operation in the dairy field.
3. The operation of a testing laboratory for the biological assaying of many nutritional factors such as vitamins, minerals, and insecticides.

The Foundation maintains offices in Madison, Chicago, and New York. Its main office is at Madison and all of its operations there, formerly conducted in space rented from the University of Wisconsin, are now consolidated in the Foundation's own buildings located on Walnut St. near the United States Forest Products Laboratory. At that location the Foundation occupies a sin-

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**FICTION:** The WARF is a drug combine.

**FACT:** The WARF is a foundation, not for private profit, established to protect the public from unscrupulous commercialism, to secure wide-spread use of the products and processes it regulates, and to endow research at the University of Wisconsin.

gle-story laboratory building and a four-story laboratory and office building.

The Foundation came into being, as we have said, as a mechanism to handle the widely heralded invention, made by Professor Steenbock of the biochemistry department of the University in 1925, relating to the production of vitamin D in medicinal products and foods by activation with ultra-violet rays. The Steenbock invention was, after its completion, patented in the United States and in many foreign countries and was the first invention administered by the Foundation. The first license under the Steenbock patent went to the Quaker Oats Company.

The plan of organization was also made broad enough to permit the Foundation Trustees to accept any other proffers of patentable ideas. Hardly a month passes in which the executive office is not called upon to counsel with University staff members or alumni who seek opinions as to the patentability of their ideas. So experienced in such matters has the WARF become that it is frequently being petitioned to act as an agent by colleges and organizations outside of Wisconsin.

## What WARF Is and Isn't

The Foundation is a corporate entity separate and apart from and in no way controlled by the University administration or its governing Board of Regents. It has been the policy of the Foundation to benefit the public by making annual grants, in accordance with its Articles of Organization, of funds for research in the natural sciences at the University of Wisconsin. The amount of these annual grants has approximated the investment income of the Foundation on its portfolio of real estate investments, bonds, mortgages, common and preferred stocks.

Funds given by the Foundation to the University are administered solely under the direction of the University's Research Committee. It has annually been the practice for the Research Committee to outline to the Foundation its need of funds for the carrying on of proposed research work and for the Foundation then to make grants in the amounts indicated by the Research Committee. *The amount of these annual grants from the Foundation to the University now aggregates some \$3,890,000.* These grants have involved a total of 1,852 different research projects. We'll elaborate on these figures later.

In the granting of funds for research at Wisconsin, the Foundation strictly adheres to the policy of "never crossing the campus line." The Foundation never in any way dictates, guides, or suggests the nature of the research work to be done by research workers at the University on funds supplied by the Foundation. The nature of such research work is solely under the control of the University's Research Committee. Funds granted by the Foundation are granted with absolutely no "strings" attached. If a research worker, working on a WARF grant, makes a patentable invention, the Foundation has no vested rights whatever in this invention by reason of having supplied money without which

the invention could not have been made. In other words, the researcher is under no obligation to turn over to the Foundation any such invention. He is wholly free to dispose of the fruits of his efforts as he chooses. An assignment by him to the Foundation is always upon a purely voluntary basis.

Just as the WARF is a distinct corporate entity from the University, so has it no connection with two other organizations with which it is frequently, and easily, confused—the Wisconsin Alumni Association and the University of Wisconsin Foundation.

The Alumni Association was organized in 1861 as a body of alumni and former students of Wisconsin to "promote by organized effort the best interests of the University." It publishes the monthly *Wisconsin Alumnus* and in other ways stimulates interest in and support for the University.

The University of Wisconsin Foundation, set up in 1945, is a group of alumni and friends of the University who are seeking to raise gifts and bequests for it. These funds will be used to create scholarships and fellowships, endow special professorships, purchase valuable equipment, and generally to aid the University in securing funds for purposes for which the legislature cannot be expected to make provision. The Foundation is now engaged in a \$5,000,000 Centennial Fund campaign.

Some of the same alumni who are prominent in Association and University Foundation work are also members of the WARF's Board of Trustees, but the accidental connection between the three organizations ceases there.

## WARF Started with an Idea

As we have said, prior to the organization of the Wisconsin Alumni Research Foundation in 1925, Professor Steenbock had made his truly epoch-making discovery that vitamin D could be created in pharmaceutical products and foods by treatment of them with ultra-violet rays. He had applied for a patent on his invention.

After the organization of the Foundation, Dr. Steenbock assigned to it his then-pending applications for patents.

Most educational foundations start with considerable invested capital. The Foundation started with a fund of \$900, representing \$100 contributed by each of the nine original members of the Foundation. Its sole assets were these \$900 and Dr. Steenbock's idea and patent application which he had financed personally.

Dr. Steenbock's inventions, it is worth repeating, were the result of his long and painstaking period of research. For many years he had been studying in the general field of animal nutrition, in which these inventions lie. Particularly, he had been concerned with the cause of loss of calcium from the body, the nature and storage of vitamin A, and the requirements for growth. His vitamin D discovery was in no sense accidental or unrelated to his research work—on the contrary, it was the culmination of a long period of careful investigation.

The Foundation proceeded under the theory that a patent and its public-spirited administration is necessary to protect a discovery from misuse.

Dr. Steenbock's discovery, being basic and pioneer in character, was consequently of very broad scope. It was early apparent that this discovery would find commercial application in connection with a wide variety of products, including many different kinds of foods and pharmaceutical preparations. It thus was clear that the commercial development of the inventions would involve not simply licensing arrangements with one specific industry, or even perhaps with a few concerns in one specific industry, but would involve a complex licensing program, covering a variety of branches of the food and drug industries.

## Three Great Objectives

From the outset of its handling of the Steenbock patents, the Foundation had several objectives. These were:

1. To protect the public from fraudulent claims and quackery.
2. To facilitate the wide-spread distribution of vitamin D to children and to make them strong-boned and free from rickets.
3. To provide funds for research in the natural sciences at the University of Wisconsin.

All three of these objectives have been accomplished to a degree which has far surpassed early hopes and expectations. Let's see how.

But first, let's take a look at what might have happened without a WARF.

The Steenbock discovery was capable of misuse by quacks and others, and unless properly administered would constitute a tool in the hands of fraudulent advertisers and unscrupulous business men. The inventions, having been among the most important inventions made in 25 or more years, received a very considerable amount of publicity, both in the lay press and in technical journals. The nature of the inventions was such that they peculiarly lent themselves to unscrupulous use.

A particular food substance, when treated by ultra-violet rays, is not changed in taste, color, smell, or other physical characteristics. The only way the increase in vitamin D content of such a treated food can be determined is by a complicated biological assay, involving the use of rats and taking a considerable period of time. At the time of these discoveries vitamins were becoming popular in the public mind. Though there were many first class concerns showing great interest there were also manufacturers of a variety of foods and medicinal products who were anxious to seize upon the inventions and exploit them to the detriment of the public.

To illustrate this point, Dr. Russell, formerly in active charge of the operations of the Foundation, tells this story:

"One day in Chicago, shortly after Steenbock's discovery had been announced in the press, I saw a crowd of people before the show window of a leading State Street drug store watch-

## STATEMENT OF FINANCIAL CONDITION

### WISCONSIN ALUMNI RESEARCH FOUNDATION

December 31, 1947

#### Assets

CURRENT ASSETS .....	\$ 319,778.42
(Cash in Banks, Accounts Receivable, Inventories)	
INVESTMENTS .....	11,586,589.93
(Stocks, bonds, mortgages, real estate)	
BUILDINGS, LAND and OTHER ASSETS .....	566,576.94

TOTAL ASSETS .....

\$12,472,945.29

#### Liabilities and Capital Accounts

CURRENT LIABILITIES .....	\$ 48,528.31
(Royalties due inventors, withholding taxes)	
GRANTS PAYABLE TO UNIV. OF WIS. ....	581,224.58
(Current and accumulated grants)	
RESERVES .....	1,045,788.66
CAPITAL ACCOUNTS:	
A. EARNED SURPLUS .....	10,796,503.74
B. CAPITAL CONTRIBUTIONS ..	900.00

TOTAL .....

\$12,472,945.29

ing a demonstration of Steenbock's discovery of irradiation. Cottonseed oil, as it slowly dropped from a bottle onto a revolving glass plate, was being illuminated with the light of an ordinary Mazda lamp. The product was exposed for only a few seconds and the collected oil was being handed out to a waiting crowd at \$1.00 a bottle. To prevent such barefaced frauds on the public was one of the prime objectives of the Foundation".

## WARF Protected the Public

To protect the public the WARF Board of Trustees early laid down and thereafter followed several policies.

These are:

1. *Limiting licenses to proper carriers for Vitamin D.* Generally speaking, desirable carriers are those foods which are consumed extensively by the babies and children who need vitamin D most, which are consumed regularly as part of the daily diet, and which themselves contain important minerals or are usually consumed with other foods (such as milk) which contain such minerals. The Foundation always considered milk, bread, cereals, and certain accessory food products as the most desirable carriers for vitamin D. Since its organization the Foundation was besieged by applicants for the use of the Steenbock process in connection with everything from chewing gum, hair tonic, pretzels, and beer to pillows, cigarettes, and sorghum. In turning down such applications the Foundation, of course, was turning down thousands of dollars in royalties, but it was likewise protecting the public. In short, the good name of the University and the Foundation was not to be exploited through licensing where there was no inherent justification for vitamin D fortification of the product.

2. *Controlling the advertising of licensees so as to prevent false, fraudulent, and exaggerated advertising claims by appropriate clauses in license agreements.*

3. *Controlling the vitamin D potency of licensed products by appropriate provisions in license agreements.* The main purposes of this policy were, on the one hand, to prevent a manufacturer from adding such a negligible quantity of vitamin D so as to be of no practical benefit to the consumer; and on the other hand to discourage manufacturers from fortifying food products to medicinal levels.

4. *Testing of licensed products by extensive biological assays in the Foundation's own laboratory.* The Foundation was under no legal obligation to protect the public in this fashion but it felt a moral obligation to do so. As pointed out before, neither the presence of vitamin D nor the amount of vitamin D extant in a product can be detected except by animal tests, and since vitamin D, either when produced by direct irradiation of the product or when added to the product in concentrated form, does not affect the color, taste, smell, or other physical characteristics of the product, the Trustees felt it their duty at the outset to test products of licensees for vitamin D content as part of the Foundation's public service function. Up to December 31, 1945, at which time all of the Founda-

tion's licenses under the Steenbock patents were terminated, the Foundation had expended \$370,354 in maintaining and operating its testing laboratory for the purpose of testing licensed vitamin D products. Some 18,000 white rats per year were used in this work. To December 31, 1945, 162,400 white rats had been used in the Foundation's laboratory on vitamin D assay work. Several skilled employees were constantly engaged in assisting in the operation of the Foundation's laboratory. In addition to the Foundation's own laboratory, 12 other laboratories, located from coast to coast, did continuous testing work for the Foundation, on perishable food products, pri-

**FICTION:** Prices on various vitamin D products dropped substantially after the expiration of the Steenbock patent in 1945.

**FACT:** Retail prices of vitamin D capsules, for instance, have remained virtually unchanged since 1942. At the time the patents were dedicated to the public, the WARF royalty on a bottle of 100 massive dose vitamin D capsules retailing for about \$4.50 was 5 cents. The waiving of this fee could not and did not have an appreciable effect on the price.

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**FICTION:** WARF royalties forced up the price of irradiated fluid milk.

**FACT:** WARF royalties on a quart of vitamin D milk were never more than 1/4th of a cent and ranged down to 1/50th of a cent. But state and federal codes forced milk dealers to sell irradiated milk at a premium. The Wisconsin Department of Agriculture and Markets, for instance, ruled that vitamin D milk was a special product and therefore must be sold at a price 1 cent higher than ordinary milk.

marily vitamin D milk which could not be transported over great distances for testing in Madison. In addition to the assaying of licensed products the Foundation did extensive work in its own laboratory on other phases of the subject. For example, the first standard vitamin D preparation in the United States was made and standardized in the Foundation's laboratory in 1930. The first standard unit for vitamin D—the Steenbock unit—was formulated and announced in 1930.

The Foundation cooperated with manufacturers of irradiating equipment, particularly irradiators adaptable for the treatment of fluid and evaporated milk, in designing and testing

such equipment for efficient operation. Also, the Foundation carried on extensive work in its laboratory in determining the stability of vitamin D in many food and pharmaceutical preparations.

5. *Carrying on clinical experiments in connection with various vitamin D preparations.* It was the Foundation's policy from its inception not to grant licenses under the Steenbock patents until the licensed product had been demonstrated to be clinically effective. Extensive clinical work was carried on with Viosterol (one of the most widely used forms of concentrated vitamin D) before that product was permitted to be introduced upon the market by the Foundation's pharmaceutical licensees. The same is true with regard to irradiated vitamin D milks, both fluid and evaporated. At their own cost much of this clinical work was carried on by licensees of the Foundation, or groups of the Foundation's licensees, such as the individual pharmaceutical manufacturers, and for the evaporated milk licensees by the Irradiated Evaporated Milk Institute. However, the Foundation on its own conducted extensive clinical tests. Up to December 31, 1945, \$198,906 had been expended by the Foundation for clinical tests on vitamin D products.

6. *Education of the public as to the need for vitamin D and advantages of its use.* For many years the Foundation has maintained a staff, headed by Dr. Henry T. Scott, for disseminating information concerning vitamin D and vitamin D products to the general public and to the medical profession.

The result of the Foundation's educational and promotional work on vitamin D has been greatly to increase the extent of knowledge on that subject. In the language of Dr. Philip C. Jeans of the University of Iowa Medical School, one of the most prominent clinical investigators of vitamin D in the United States:

"And the knowledge on the part of physicians and of parents has increased to the extent that probably there exist now few mothers in this country and certainly no physicians who do not know that vitamin D in some form is a necessary part of the infant's regimen".

These six policies have made it possible for the Foundation handsomely to live up to its No. 1 objective: to protect the public from fraudulent claims and quackery and to prevent misuse of the Steenbock inventions. Spurning money for money's sake, the Foundation aimed to benefit every family in the United States.

## WARF Spread Vitamin D

To make vitamin D produced by the Steenbock process, and products containing such vitamin D, widely available to the consuming public at reasonable prices, the Foundation laid down in the early days of its operations and followed through the years two policies:

1. *To charge very low royalties so as to induce widespread adoption and use of the Steenbock process.*

2. *To grant a large number of licenses to reputable manufacturers.*

In the early days of the Foundation, its royalties were higher than in later years. In those early days, no one—certainly not the Foundation's Board of Trustees—knew how low royalties should be to encourage wide-spread use of the Steenbock patents and at the same time be sufficient to provide funds for the cost of testing and administration and for scientific research at the University of Wisconsin. Whenever the Foundation felt that Steenbock vitamin D would be made more widely available to the public by royalty reductions in various fields, it voluntarily reduced such royalties. To obtain initial distribution, some exclusive rights had to be granted. But in certain fields, where exclusive rights had earlier been granted to an individual company or group of companies, the Foundation drastically reduced royalty rates in order to open up such an exclusively licensed field to obtain wider distribution of Steenbock vitamin D products.

Illustrative of the insignificant royalties charged by the Foundation are the following:

Per can of evaporated milk, royalties ranged from 1/32¢ to 1/48¢.

Per quart of bottled milk, royalties ranged from 1/4¢ to 1/50¢.

Per bottle of 100 multi-vitamin capsules, retailing in the drug store for between \$2.50 and \$7.50, royalties in 1942 were 1/2¢ and dropped as low as 1/20¢ in 1945.

For sufficient vitamin D to supply a child with his minimum daily requirement of vitamin D for nearly seven years, 10¢ (in 1942).

During the period of its administration of the Steenbock patents, the Foundation granted a total of some 400 licenses to manufacturers in many fields, notwithstanding its rigid requirement that only proper products and reputable concerns be licensed. A partial list of licensed products includes bottled milk, evaporated milk and other dairy products, cereal breakfast foods, flour, bread, crackers, biscuits, yeast, malted health foods, and many other food products for human consumption; a wide variety of pharmaceutical products including viosterol, cod liver oil with viosterol, oleum percomorphum with viosterol, practically all the leading vitamin capsules and tablets, and various elixers, emulsions, wafers and other sorts of pharmaceutical preparations; poultry feeds; and animal feeds for consumption by dairy cattle, pigs, dogs, cats, foxes and the like.

As a result of the Foundation's policy of seeking widespread distribution of vitamin D by low royalties and the issuance of a plurality of licenses, Steenbock vitamin D rapidly became available to the consuming public on a world-wide basis.

In the United States, for example:

Over half of all evaporated milk consumed by the late 1930s had its vitamin D content increased by the Steenbock process, the pre-war total being equivalent to some 1,310,000,000 quarts of bottled milk a year. This licensed product was available in every hamlet throughout the country.

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**FICTION: The WARF issued exclusive licenses for the irradiation of milk.**

**FACT: Irradiation of fluid milk was always available to anyone willing to abide by supervision and regulation in the public interest.**

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Vitamin D fluid milk, produced by the Steenbock process, was available in more than 125 cities and towns at the time the unexpired Steenbock patents were dedicated. Every drug store in the country carried dozens of the many different types of pharmaceutical products containing Steenbock vitamin D.

As a result of Dr. Steenbock's inventions and with improved processing techniques and royalty reductions put into effect by the Foundation in later years, at the time of expiration of the main Steenbock patent in 1945 vitamin D was the lowest-priced of the then known vitamins on the basis of established minimum daily requirements. It cost a mother less to supply her child with his requirements of vitamin D than with the same child's requirements of vitamin A, vitamin B, vitamin B<sub>2</sub>, vitamin C or any other then known vitamin.

### WARF Fought Rickets

It is now generally accepted by the medical profession that during the past 25 years the incidence of rickets and tetany has greatly decreased. Dr. Jeans has testified that the decrease has been a gradual one, starting in the early 1920's, but that by 1941 it was so great that one could then see practically no active rickets in babies. He stated:

"It is most difficult to find satisfactory material with which to do our teaching to the medical students for both rickets and tetany".

The making of the Steenbock inventions, the commercial use of these inventions by licensees, and the Foundation's work in administering the Steenbock patents on those inventions, including its educational program, have not, of course, been the only factors in the decrease of rickets referred to by Dr. Jeans. However, they have without question been important factors. Prior to the Steenbock inventions prac-

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**FICTION: The WARF capriciously restricted the amount of vitamin D that might go into such products as milk and cereals.**

**FACT: Restriction was quite necessary in the eyes of the American Medical Association so that food could be offered merely as a prophylactic and not as a medicant.**

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tically the only known rich source of vitamin D was cod liver oil. This was a sharp tasting product, particularly in those days, and could not always be tolerated by large numbers of infants and children. Dr. Steenbock's inventions made available to the public not only vitamin D foods, such as the vitamin D milks, but also the product viosterol, a tasteless, odorless, highly potent antirachitic which could be and has been widely administered both as a pharmaceutical preparation, and as an ingredient of pharmaceutical preparations, to infants and children. The availability of viosterol as such an antirachitic and the availability of vitamin D foods, particularly fluid and evaporated milks, on a wide scale have uncontestedly been vastly important contributions to the significant decrease in rickets.

The Foundation thus was wholly successful in its second main objective in the administration of the Steenbock patents: achieving widespread distribution of Steenbock vitamin D with a marked reduction—indeed, almost complete elimination—of vitamin D-deficiency diseases.

### WARF Supports Research

Since its organization in 1925, until the present time, the Foundation, as we have pointed out, has made grants for research in the natural sciences at the University of Wisconsin aggregating \$3,889,919.

In addition, the Foundation has accumulated capital assets, mostly in the form of mortgages, real estate, bonds, common stocks and preferred stocks, the book value of which as of December 31, 1947 was \$12,472,945. This permanent fund constitutes an endowment, the income of which assures the University of Wisconsin of substantial annual grants for research for the benefit of future generations in the years to come.

Thus the Foundation has accomplished its third main objective in administering the Steenbock patents, the building up of a substantial endowment fund, the income from which will assure ample research funds annually for the University of Wisconsin for all time to come.

### No Monopoly on Vitamin D

In the past many persons have apparently been under the false impression that the Foundation, through its ownership of the Steenbock patents, "had a monopoly in vitamin D". This is not true. The fact of the matter is that prior to Dr. Steenbock's inventions cod liver oil had long been known as the most important source of vitamin D, and notwithstanding that the Steenbock inventions made an important contribution in supplementing cod liver oil with viosterol, vitamin D fortified foods, etc., even today cod liver oil is a widely used source of vitamin D. This is particularly true when fields of animal and poultry nutrition, as well as human nutrition and medicine, are considered.

Furthermore, there are today on the market many other vitamin D preparations not made by the Steenbock process. In the fish liver oil field, in addi-

tion to cod liver oil and concentrates made from it, there are other fish liver oils and concentrates made from them which are rich in vitamin D. Livers of the tuna, shark, dog fish and other fish contain varied quantities of vitamin D, and these products have during the past 20 years come into fairly wide commercial use. Also, there are today available upon the market other forms of what might be called synthetic vitamin D. That is, there are processes for activating ergosterol and other provitamin substances which do not make use of ultra-violet rays, and did not come under the Steenbock patents.

It is correct to state only that the Foundation, through its Steenbock patents, merely controlled *one* method of producing vitamin D, and in no sense did it ever have any monopoly—patent monopoly or otherwise—on vitamin D.

### Foreign Patent Situation

Neither at the beginning of its operations nor today has the Foundation maintained a foreign staff or organization to handle foreign patents turned over to it. As a result, in the Steenbock situation and in others later, foreign patents (other than those in Canada, which can be conveniently administered from the United States), were usually handled either by foreign licensees who were empowered to grant sub-licenses, or by the granting of an exclusive license, in a given foreign country, to one outstanding firm.

Both procedures were employed with respect to the foreign Steenbock patents. Glaxo Laboratories (formerly Joseph Nathan & Company, Ltd.), an old, established British pharmaceutical and baby food manufacturer with branches or plants well distributed throughout the world (Australia, New Zealand, India, South Africa, Cuba, several South and Central American countries, etc.) was granted a license under the Steenbock patents throughout the world (except for the United States, where it did no business, and Germany), with an accompanying right to sub-license others.

In Germany, the situation was handled somewhat differently. The Steenbock patent, then in the application stage (not issued) was exclusively licensed in 1928 to a large and well known chemical concern, I. G. Farben Industrie Aktiengesellschaft, commonly known as the I. G. The I. G. license

was in usual form and contained the usual terms found in patent licenses. The I. G. was put to heavy expenses in the early years in having to defend a series of oppositions filed against the issuance of the Steenbock German patent. Notwithstanding this, the I. G. paid to the Foundation for research at the University of Wisconsin an aggregate of \$142,738. After Hitler's rise to power in 1933—over five years after the issuance of the I. G. license—the I. G. apparently became thoroughly Nazified and today officers serving it in the war period are being tried by an American military court for the war crimes with which they are charged. The Foundation Trustees for a period of many years obtained substantial annual payments from Germany for Dr. Steenbock's inventions. These payments continued until May 19, 1941, a year and a half after the start of World War II and only a few months prior to this country's entry into that war, in the face of the fact that the Hitler regime had forced I. G. Farben to repudiate almost all of its other foreign contracts.

### Story of Anti-WARF Suits

From the date of issuance of the first Steenbock United States patent on August 14, 1928, American industry highly respected that patent and those Steenbock United States patents subsequently issued (two in 1932 and one in 1936). Many of the largest and most powerful and reputable concerns in this country, in the drug, chemical, and food fields, had able patent counsel examine the validity of the Steenbock patents before recognizing their validity. Some concerns, as the Foundation later learned, were anxious to attack the Steenbock patents but were advised by their counsel not to risk possible heavy damages by so doing.

Consequently, until 1939 the Foundation's infringement problems were minor. A few small infringement situations developed but these were handled without great difficulty either with or without the filing of infringement suits.

In 1939, however, a small infringement situation developed in California. Suit was filed in September of that year and was vigorously contested. After an exhaustive trial, Judge Charles C. Cavanah, sitting in the Dis-

trict Court at Los Angeles, in October, 1941, in a well considered opinion, found and adjudged all three Steenbock patents in suit valid and infringed by the defendant. An appeal was then taken by the defendant and the cause was orally argued before the United States Court of Appeals for the Ninth Circuit at San Francisco in May, 1943. A short time later, in June, 1943, the Court of Appeals handed down a decision holding all three Steenbock patents invalid, primarily upon the ground that they attempted to cover a "process of nature".

In this opinion, the three members of the Court were not in complete agreement. Judge William Healy wrote a separate concurring opinion in which he highly extolled Dr. Steenbock's work and discovery, though concluding that his patents were invalid.

After the June 1943 opinion of the Court of Appeals, the Foundation, in August of that year, filed a petition for rehearing, pointing out what it believed to be serious errors committed by the Court. Later that same month the Court took the unusual action of withdrawing its opinion from publication. The matter then remained dormant for a period of almost 17 months from the date of the Court's first opinion; that is, until November 24, 1944, when the Court handed down a completely new opinion in which, while the holding was again against the Foundation, the three judges were again not in complete agreement and two separate opinions were written. In this decision the majority of the Court completely reversed itself in respect to the view that the Steenbock patents were void as covering a "process of nature".

The majority opinion now held the patents invalid on new grounds—anticipation and lack of invention—and further, severely criticised the Foundation for its alleged refusal to grant licenses for the activation of oleomargarine. In his concurring opinion, Judge Healy of the Court observed in substance that the majority of the Court went too far in its determination respecting oleomargarine. Strangely, the propriety of the Foundation's conduct with respect to oleomargarine had never been challenged by the defendant, or argued by either side or considered by the lower Court. Because of this, the pertinent facts did not appear in the record. Therefore, in December, 1944, the Foundation sought another rehearing and simultaneously (based upon a verified showing that only one concern had ever asked the Foundation for a license under the Steenbock patents which was not granted because, for good reasons which were given, it was not a suitable licensee) asked the reviewing court to send the case back to the trial court for the taking of evidence on the oleomargarine issue which the Court had raised. In a third opinion handed down in January, 1945, the Court of Appeals summarily denied the Foundation this leave.

Following this third opinion of the Court of Appeals early in 1945, the Foundation made every effort to obtain a review by the Supreme Court of the United States, although it recognized that the chances of securing a review

## THE FOUNDATION CHARTER

"TO PROMOTE, encourage, and aid scientific investigation and research at the University of Wisconsin by the faculty, staff, alumni, and students thereof, and those associated therewith, and to provide or assist in providing the means and machinery by which their scientific discoveries, inventions, and processes may be developed, applied, and patented, and the public and commercial uses thereof determined, and by which such utilization or disposition may be made of such discoveries, inventions, and processes, and patent rights or interests therein, as may be of benefit to mankind or as may tend to stimulate and promote and provide funds for further scientific investigation and research within said University or colleges or departments thereof."

were slight because the Supreme Court rarely reviews decisions with respect to the validity of a patent unless there is a conflict of opinion between different circuits. The Supreme Court in June, 1945, denied the Foundation's petition.

In the meantime, after the first opinion of the Court of Appeals in San Francisco in June, 1943, the Foundation looked about for other prospective defendants against whom infringement suits might be filed in other Federal Circuits than the Ninth Circuit. The purpose was to provide the opportunity to secure the opinion of another Court of Appeals upon the Steenbock patents. By September, 1943, the Foundation was able to find only two other infringers of the Steenbock patents in the whole United States. These were both small concerns.

In that month suits were filed in the Federal District Court in Chicago against these two. In one of the suits, the Department of Justice's Anti-Trust Division approached the parties with the suggestions that it might become a party to the suit in order to present to the Court for decision the question of whether the Foundation and its licensees under the Steenbock patents had violated the anti-trust laws of the United States, as had previously been charged by the Department of Justice in testimony before a Senate committee, in press releases, in speeches by its personnel, and even in a book written by the then chief of the Anti-Trust Division. The Foundation, believing that it had been guilty of no such violations, welcomed the opportunity for a full hearing of the matter in Court and actually assisted the Department of Justice in becoming a party to the suit.

In August, 1945, the main Steenbock patent expired. In October of that year, when the Supreme Court finally refused to review the adverse holding of the California Court on the Steenbock patents, the infringement suit in Chicago, in which the Department of Justice had become a party, was still pending. Sixteen of the Foundation's licensees had been made parties to the suit at the Department of Justice's insistence.

The Foundation had years before considered winding up its licensing program under the Steenbock patents upon the expiration of the main Steenbock patent in August, 1945. Certain subsidiary and subservient Steenbock patents had then a short period to run before their expiration. Hence negotiations were entered into between all parties to the litigation in the fall of 1945 to determine whether the whole matter might be disposed of by the termination of the Foundation's license agreements and the dedication of the remaining Steenbock patents to the public.

Such an arrangement was worked out and in December, 1945, all license agreements under the Steenbock patents were terminated and the unexpired patents dedicated to the public. In January, 1946, all litigation on these patents was likewise terminated.

In deciding upon this course of action the Trustees were motivated by the following considerations:

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**FICTION: Pediatricians complained about the high retail prices of certain vitamin D preparations.**

**FACT: The conclusion arrived at by a special committee of pediatricians was that the royalty paid to the Foundation on a small bottle of Viosterol (concentrated vitamin D) was not so great as the cost of the carton and the bottle in which the Viosterol was packaged.**

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1. Carrying through the litigation to its ultimate outcome would have cost the Foundation an estimated \$200,000. The Trustees felt it wiser and in their line of duty as Trustees to devote that money to scientific research at the University of Wisconsin rather than spend it in litigation.

2. As indicated above, the thought of winding up the Steenbock licensing program in 1945, after the expiration of the first Steenbock patent, was not new and had many times been discussed; the main reason being that as of August, 1945, the Foundation had enjoyed a full 17 years of licensing life with respect to the Steenbock inventions.

3. The Foundation did not consider it fair to its 16 licensees, who had paid it thousands of dollars in royalties during the lives of their respective licenses, to put those licensees to the heavy expense of time, effort, and money in going through the litigation.

4. The Foundation's own staff was small in size. In the view of the Trustees this staff should devote itself to the handling of other inventions assigned to the Foundation instead of tying up its key members to a probable aggregate of two years of litigation.

In the words of Foundation President George I. Haight at the time:

"Dedication of the patents and termination of the litigation does not carry with it any admission of any wrong doing by the Foundation or its licensees. These issues have not been adjudicated by the court".

While anti-trust charges may have been made against the Foundation, they were never proved. The Trustees were of the unanimous opinion that these charges were baseless, and in this view were sustained by the opinion of eminent counsel wholly familiar with the facts. As a matter of principle from a

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**FICTION: High WARF royalties denied irradiated evaporated milk to many babies.**

**FACT: The WARF royalty on a case of irradiated evaporated milk was less than 1 1/2 cents, ranging from 1/32 to 1/48 cent a can.**

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selfish viewpoint the Trustees would have liked to have defended the Foundation in the lawsuit, but the main patent having expired, the Trustees felt they had no right to try through to a finish what in its effect on the Foundation would be an expensive moot case.

## WARF and Oleomargarine

As mentioned earlier in this story, the Court of Appeals in San Francisco criticised the Foundation for its failure or refusal to license oleomargarine manufacturers.

Here are the facts:

In 1925, when the Foundation was organized, and today there is the strong practical argument that oleomargarine, if sold colored yellow to simulate butter, will be fraudulently passed off upon the public as butter. In those early days it was recognized that oleomargarine lacked at least one important nutritional factor found in butter—vitamin A. It was the fear of Dr. Steenbock and the Trustees of the Foundation that if licenses were granted under the Steenbock patents for the activation of oleomargarine, ammunition would be given the oleomargarine manufacturers to make unsupported claims that their product was equal to or even superior to butter.

For this reason Dr. Steenbock assigned his inventions to the Foundation upon condition that no licenses should be granted for the activation of oleomargarine without the consent of the President of the University of Wisconsin and the dean of the College of Agriculture. These officials, of course, at all times had at their command, and would be expected to rely upon the advice of leading nutritionists and dairy experts.

Until war exigencies in 1943 demanded oleomargarine fortification with vitamin D *only for export to certain foreign countries*, the Foundation during its administration of the Steenbock patents had not licensed the activation of oleomargarine either by direct irradiation with ultra-violet rays or by fortification with Steenbock vitamin D.

In judging this procedure, the following facts are pertinent:

1. During the 18-year period between 1925 and 1943, the Foundation received *one—and only one—*application for a license to activate oleomargarine; and that was from an oleomargarine manufacturer which in about 1917 had been indicted, prosecuted, and convicted of violating Federal statutes with respect to oleomargarine manufacture and sale in defrauding the United States government of lawful taxes on oleomargarine. The company had been fined and some of its officers were sentenced to imprisonment in a Federal penitentiary.

2. The American Medical Association never has approved of or accepted the addition of vitamin D to oleomargarine.

3. From 1943 until the end of 1945, several licensees of the Foundation under the Steenbock patents were permitted to market Steenbock vitamin D for the fortification of oleomargarine, and they vigorously attempted to de-



velop sales in this field. Since 1945 there have, of course, been no restrictions whatever upon the sale or use of vitamin D produced by ultra-violet irradiation. Yet even today very little oleomargarine sold in the United States markets is fortified with vitamin D.

### Dr. Steenbock's Finances

Dr. Steenbock flatly turned down flattering offers for the use of his vitamin D inventions early in 1925. His assignment to the Foundation of those inventions was without stipulation of any financial return to him. The Foundation Trustees, however, felt strongly that the Foundation should establish a principle of reasonably rewarding the inventor and thus providing an incentive to future researchers among students, faculty, alumni, and friends of the University of Wisconsin who might make inventions. After much argument, the Trustees prevailed upon Dr. Steenbock to accept 15% of the net returns from his inventions. He very reluctantly agreed to accept such payments.

From 1929 to 1937 Dr. Steenbock was paid by the Foundation upon the basis of 15% of the net income from his inventions. In 1937 he refused further participation in these amounts and since 1942, in accordance with an agreement which is still in effect, Dr. Steenbock has been receiving payments of \$12,000 a year. The agreement further provides that the difference between the \$12,000 annual payment and 15% of the net returns from his inventions will be held and accumulated by the Foundation in a special research fund, to be spent for scientific research at the University of Wisconsin under Dr. Steenbock's direction. Although payments by the Foun-

dation to Dr. Steenbock through December 31, 1947, aggregate \$870,711.01, it is significant that the Special Research Fund in the Foundation's hands now aggregates \$810,429.00.

Since receiving Dr. Steenbock's assignment of his inventions and insisting upon the payment to him of 15% of the net returns from those inventions, numerous other inventions have been assigned by research workers at the University of Wisconsin and in every case the same 15% arrangement has been followed.

### WARF Royalties and Prices

Two and one quarter years have passed since the unexpired Steenbock patents were dedicated to the public, all license agreements thereunder terminated, and royalty collections stopped.

What has been the effect of these events upon the public in respect to vitamin D?

The answer is that there has been no noticeable or measurable effect.

As was earlier pointed out, at the time of the events in question vitamin D was the cheapest of the known vitamins, based upon normal daily human requirements. Today it is still the cheapest. The Foundation's royalties were so low that their elimination could not as a practical matter, and in fact were not, passed on to the public as a saving.

For example, in December, 1945, the Foundation's royalty on a bottle of 100 multi-vitamin capsules, retailing for between \$2.50 and \$7.00 a bottle, was 1/20¢. The elimination of this nominal

charge was in no way reflected by any price reduction to the public. By the same token, elimination of the royalty of 1/48¢ per can of evaporated milk had no effect upon the consumer price of that product. As any housewife well knows, in the past two years the price she pays for that product, as well as all other dairy products, has increased several hundred times the amount of the Foundation's royalty.

Some of the Foundation's critics claim that cessation of royalties has resulted in marked savings to the public as reflected in lower prices. One such writer referred to a drop in the price of vitamin D<sub>2</sub>—a product used primarily in chicken feeds—from over \$1.17 per million units to 28¢ for the same quantity. What the author neglected to point out is (1) that the price reduction of this commodity has resulted entirely from the discovery of a new and far more efficient process of producing the raw material from which vitamin D<sub>2</sub> is made and (2) that the Foundation's royalty on vitamin D<sub>2</sub> at the time that royalty was eliminated was one-half of one cent per million units.

The net effect, then, of the elimination of the Foundation's royalties on vitamin D in December, 1945, was not to benefit the public by lowered prices or increased availability of vitamin D.

### WARF Testing Laboratory

Several operations of the Foundation, still being carried on today and in no way dependent upon the Steenbock patents, evolved from the Foundation's administration of those patents.

Realizing from the outset the need for protecting the public in the matter of assuring proper vitamin D potency of products licensed under the Steenbock patents, the Foundation adopted a policy of periodically running biological assays on all vitamin D products licensed by it, sold in the United States. Licensees were required to meet and maintain certain standards of potency. Licensees of the Foundation, being concerns of high repute, used their best efforts to meet standards set forth in license agreements. On occasion, however, there arose problems of the stability of vitamin D when combined with certain other ingredients. In one such case one of the Foundation's pharmaceutical licensees, a concern of excellent standing, withdrew a product from the market when assays made by the Foundation established that vitamin D was not stable in that product.

The making of these control tests—biological assays—requires the use of rats and is time-consuming and expensive. Originally many of these assays were conducted in Dr. Steenbock's own laboratory under his supervision. Later, however, the Foundation took over a small laboratory building and conducted its own assays. This laboratory work, operated as an adjunct to the licensing program under the Steenbock patents, occupied the time of several technical personnel, employed as high as 20,000 laboratory animals per year and cost the Foundation many thousands of dollars annually.

## SUMMARY OF ANNUAL GRANTS OF THE FOUNDATION TO THE UNIVERSITY

Year	Number of Projects	Total Funds from Foundation
1928-29	1	\$ 1,200
1929-30	7	9,700
1930-31	5	15,810
1931-32	10	18,723
1932-33	30	35,653
1933-34	85	147,663
1934-35	64	169,384
1935-36	75	128,700
1936-37	109	142,500
1937-38	121	163,000
1938-39	100	173,175
1939-40	103	165,375
1940-41	116	201,768
1941-42	143	200,000
1942-43	120	224,268
1943-44	82	230,000
1944-45	95	230,000
1945-46	111	300,000
1946-47	138	404,000
1947-48	157	437,000
1948-49	180	492,000
<b>TOTAL</b>	<b>1,852</b>	<b>\$3,889,919</b>

By the end of 1945 the Foundation's laboratory had built up an outstanding reputation for its impartiality, fairness, and reliability. In it had probably been conducted more biological assays for vitamin D content of food and drug products than in any other biological laboratory in the world. Also, by that time the laboratory was running tests on many factors other than vitamin D—other vitamins, minerals, amino acids, etc. As a result, when the Steenbock licensing program was discontinued at the end of 1945 and royalties ceased, the Foundation continued supplying its laboratory services to former licensees, but upon a reasonable fee basis rather than without charge.

From an arm of a patent-licensing program the testing laboratory has become a self-supporting institution. This laboratory continued to grow and had developed so greatly that the Foundation found it necessary to erect a new building to house its activities. The Trustees believed that its reputation was such that its operation was a real service to the public and to business and hoped that the large expenditure for new facilities would be justified and that the laboratory would continue to be self-sustaining. The Foundation moved its laboratory into its new home in January 1948 with expanded space and facilities.

## The Famous WARF Seal

Some years prior to the expiration of the main Steenbock patent in 1945, the Foundation, realizing the prestige being built up by its testing lab, adopted a seal or "shield" suitable for use upon the label of a food or drug product and indicating approval of the vitamin or mineral content of that product by the Foundation upon the basis of periodic tests.

The Seal was adopted by a number of licensees, especially on vitamin D containing food products. By the end of 1945 the Foundation's Seal, in respect to vitamin D content, was being used by several of the largest and best known producers of evaporated milk. Likewise, in respect to iodine content (in connection with another patent being administered by the Foundation) the Seal was used upon the labels of all iodized table salt produced by the world's largest salt producer. The Seal was and is effective in informing the consumer of the laboratory services carried on by the Foundation and became of substantial value to the manufacturer in denoting independent outside testing of his product for various nutritional factors.

Upon the termination of the Foundation's Steenbock patent licensing program, arrangements were entered into between the Foundation and concerns using its Seal relating to vitamin D content. Under this new set-up the Foundation agreed to continue periodic testing and the manufacturers agreed to pay the Foundation for this service and for the use of the Foundation's Seal.

The Foundation's Seal in its various forms is now well established and is producing reasonable revenues for scientific research at the University of Wisconsin.

## Concentrates Operation

There are two ways in which certain food products, such as fluid or evaporated milk, can be activated: (1) by direct irradiation with ultra-violet rays and (2) by the addition to or incorporation in that food of a vitamin D concentrate, which itself may be produced by ultra-violet irradiation of a concentrated provitamin substance.

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**FICTION:** The WARF rigidly controlled the use of irradiation in order to protect the interests of a handful of licensees.

**FACT:** The WARF had over 400 licensees in all parts of the world. The WARF indeed regulated the use of irradiation but always in the interests of the public at large. The WARF served the public in three ways: it prevented unscrupulous commercialization of Steenbock vitamin D, it stimulated widespread use of anti-rachitics, and it secured money for further valuable research.

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**FICTION:** The WARF had a monopoly on vitamin D.

**FACT:** Vitamin D is the "sunshine" vitamin. It is formed in the skin when directly exposed to sunlight. It is found in fish-liver oils. The Steenbock process was merely one method of artificially creating vitamin D—therefore could not be a monopoly on vitamin D.

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In the early and middle 1930s, direct irradiation, under Steenbock patent licenses from the Foundation, was the preferred method of activation of both fluid and evaporated milks. Gradually, however, a change came about so that today no evaporated milk and only a small volume of fluid milk is directly treated with ultra-violet. The almost universal method of producing vitamin D fluid and evaporated milks today is by the addition of a vitamin D concentrate.

Vitamin D is an oil-soluble vitamin and is almost always prepared in an oil carrier. Such oil products—without a proper carrier—will not readily mix with or disperse in milk or evaporated milk. Beginning in 1937 the Foundation started making available to the dairy industry its technical services in processing oil solutions of vitamin D into constituents of milk in the production of vitamin D concentrates which were suitable and convenient for the fortification of fluid milk. These concentrates were made available as homogenized, canned, ster-

ilized products and offered many advantages to the dairyman. In 1945 a demand arose for similar products in the evaporated milk field and the Foundation, in view of its 10 years' experience in the processing of such concentrates for the fluid milk industry, was called upon by the evaporated milk industry to offer similar services. It therefore expanded into this field.

Today the Foundation, in a separate new building located near its new laboratory and office building, carries on this highly specialized processing operation as a service to the dairy industry. During 1947 over 300,000 cans of vitamin D concentrates were processed by the Foundation—sufficient to fortify the equivalent of over 3 billion quarts of bottled milk. The operation, another normal outgrowth of the Steenbock licensing program, produces, as in the case of the Control Laboratory and the Foundation's Seal, appreciable revenue for further scientific research at the University.

## Other WARF Inventions

Under the patent policy of the University of Wisconsin any faculty member who makes an invention (except as a result of work financed by the United States Government) is free to make such disposition as he wishes of such invention. Usually such faculty member, however, has neither the time nor experience to handle the many business and legal problems involved in the commercial development of his invention. The Foundation offers a distinct service to such an inventor in taking over inventions, attempting to obtain patent protection, and handling the licensing of commercial firms to develop the invention on a royalty basis. The Foundation has had more than 22 years' experience in this field and is in a favorable position to handle inventions assigned to it.

While it is true that Dr. Steenbock's inventions, during the lives of patents issued on them, yielded financial returns larger than returns produced by any other invention handled by the Foundation, nevertheless the Foundation has during its 22 years of operation successfully administered a number of other important inventions. For every invention which is commercially successful there are, of course, many which do not reach the commercial stage and fail to produce any net revenue whatever.

To list and explain all the inventions processed by the Foundation would take many pages. Here are four typical cases:

1. *Hart Copper-Iron Patent.* In 1928 Prof. E. B. Hart of the biochemistry department discovered in the course of research work that in certain types of secondary anemias copper along with iron is essential for the building of hemoglobin in the blood. Neither metal alone does the job and no metal other than copper can be used successfully with iron in hemoglobin building. This invention was assigned to the Foundation, a patent applied for thereon, and the patent issued September 13, 1932. This patent was initially disregarded on a wide scale by the pharmaceutical industry, so litigation was brought on

it. In 1936 the patent ultimately was sustained by a Court of Appeals. The Foundation adopted a program of non-exclusive licensing of all reputable pharmaceutical houses under the Hart patent. Today there are 22 licensees operating under this patent. Gross royalties received by the Foundation through December 31, 1947, aggregate \$509,696.

The life of the Hart patent is nearly over. It expires on September 13, 1949. Its administration and development, however, have been successful and well illustrate the Foundation's services to inventors at the University of Wisconsin and in turn to the University.

**2. Hart, Clifcorn, and Griem Iodine Patent.** In the late 1930s, Prof. Hart, the patentee of the Hart copper-iron patent, with two co-workers—Mr. Walter Griem, director of the State Feed and Fertilizer Research Laboratory at Madison, and Dr. La Verne Clifcorn, now director of Product and Process Research for the Continental Can Company in Chicago and at that time a graduate student—tackled the problem of the enormous loss of iodine from iodized salt and other mineral mixtures. The prevention of this loss of iodine, which is essential in combating goiter, had for years been an unsolved problem in the salt industry. These three research workers finally evolved a method of stabilizing iodine in iodized salt and iodized mineral mixtures. Their invention was assigned to the Foundation and a patent was obtained. A licensing program was then adopted in conjunction with Merck & Company, one of the largest producers of potassium iodide in the United States. Through the issuance either of direct licenses from the Foundation or sublicenses from Merck & Company under the Hart, Clifcorn, and Griem patent, today all of the major iodized salt producers in the United States and many of the manufacturers of mineral mixtures are stabilizing their products under licenses under this patent.

**3. Link Dicumarol and Salicylic Acid Inventions.** The dramatic story of the brilliant research endeavors of Dr. K. P. Link and his co-workers in the biochemistry department of the University in the synthesis of the anti-coagulant "Dicumarol" has frequently been told. After years of painstaking work this research group synthesized the chemical compound 3,3'-methylenebis (4-hydroxycoumarin) a chemical naturally found in spoiled sweet clover. The compound is a potent weapon in the hands of the physician in lengthening the clotting time of the blood and thereby preventing the development of thromboses. Many lives have been saved by the administration of this drug.

The Dicumarol invention was assigned to the Foundation in 1941 and patent applications were filed. After going through the time-consuming and painstaking job of obtaining approval of the U. S. Food & Drug Administration to introduce the product commercially on the market, the Foundation licensed four leading pharmaceutical houses under its pending patent applications and the drug was released for sale August 1944. At the present time sales of Dicumarol are still relatively small. In this case gross royalties re-

ceived from licensees through December 31, 1947, have been only \$4,431.72, while the Foundation's expenses in developing this invention have been considerably greater. Dicumarol, however, saves lives and the Foundation firmly believes that regardless of financial return it has performed an important function in aiding the inventors and its licensees to make the drug available to the physician.

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**FICTION: The WARF "milked" the public for large sums.**

**FACT: In no case was the WARF royalty fee large enough necessarily to affect the retail price of the irradiated product. What the WARF did do in effect was to collect a fee from food and drug manufacturers and pass this money on to the public in the form of grants-in-aid at a state university.**

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**FICTION: The University of Wisconsin doesn't need WARF help, anyway.**

**FACT: To quote Willard R. Smith of the Milwaukee Journal: "The state of Wisconsin, which can take great pride in the scientific accomplishments of the University, actually deserves little of the credit. The facilities which it has provided for this work are crowded and antiquated. State funds have been meager. Only through the provision of adequate finances by the Wisconsin Alumni Research Foundation and the federal government have the brilliant minds of faculty and student researchers been backed by adequate apparatus and opportunity to turn out trained workers and perfected processes."**

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As an outgrowth of the Dicumarol work, Dr. Link discovered during his researches that ordinary aspirin, salicylic acid, (Dicumarol is a derivative of acetyl-salicylic acid) likewise functioned as an anti-coagulant and tended to produce hemorrhage in the consumer. Dr. Link likewise learned that minute amounts of vitamin K administered with aspirin would counteract the hemorrhagic producing tendencies of aspirin. He assigned rights in this invention to the Foundation and a patent was issued on compounds containing salicylic acid and vitamin K-active substances.

**4. Allen Insecticide Patent.** The Foundation is today the owner of an issued United States patent and a pending patent application covering two methods of enhancing the insecticidal properties of Sabadilla seed, a botanical grown in South America and primarily in Venezuela. These methods were developed by Dr. Thomas C. Allen and his associates in the entomology department at the University of Wisconsin. Due to limitations on the supply of Sabadilla seed, it was known at the beginning that any large scale commercial development of Dr. Allen's inventions was most unlikely. However, today the Foundation has three licensees under the Allen inventions and activated Sabadilla insecticides continue to enjoy a small market notwithstanding the wide publicity and large development in recent years of the insecticide D. D. T.

The Foundation has other partially developed inventions which are expected to produce royalty income in the near future and several more ideas still in the exploratory stage.

## WARF and the University

What has the Foundation meant to the University? Here are some significant contributions:

1. *Grants-in-Aid.* By far the larger part of the aid which has been given to the University by the WARF has been for the support of a steadily increasing number of specific projects that are yearly proposed by the several departments in the field of the natural sciences. These projects, as we have emphasized, are administered entirely through the University Research Committee of the Graduate School and the selection of the approved projects is in no way controlled by the Foundation authorities.

While most of the grants-in-aid are for the salaries of assistants and the necessary supplies connected with research work, the Graduate Committee has in special instances used substantial sums to provide for the purchase of expensive apparatus that could not be supplied from regular University funds.

Foundation funds have found their way into nearly every nook and cranny of the University's natural science labs. Never has subsidy been limited to a few select departments.

Penicillin, hormones, bait minnows, synthetic rubber, history of science, blood fractionation, stabilization of carotene, and nitrogen fixation—these are only a few typical examples from the far-reaching list of UW research projects which have been aided by WARF funds.

2. *Scholars and fellows.* The University of Wisconsin is not always financially able to induce the most outstanding men in science to join its staff in competition with richly endowed private universities and labora-

tories. But through WARF funds the University has been able to set up scholarships and fellowships with which to attract an unusual group of young men and women especially interested in science. "Apprenticeships" are offered outstanding undergraduates in science.

3. *Full-time professorial summer research.* Most of the research work at the University has to be carried on during the period of the regular academic year. WARF funds have enabled the University to finance the prosecution of summer research on a whole-time basis.

4. *Lectureships and symposia.* To stimulate the spirit of research, the Foundation has provided funds to enable outstanding men of science to be brought to the campus annually for series of lectures and conferences.

5. *Emergency relief.* During the worst period of the depression, in 1932 and 1933, numbers of post-graduate students were completing the UW requirements for the PhD degree. Most of these students found it quite impossible to secure any job for which their training had prepared them. To salvage some of these trained individuals, the Foundation gave the University a special grant of \$20,000 for emergency post-doctorate fellowships. At the same time the income of the University from state funds was so materially reduced that it appeared as though some very valuable research men would have to be dropped from the salary roll. The Foundation realized that if key men in science were allowed to drift away from the institution, its primary function of aiding in the continued development of scientific research would be destroyed. So the WARF assumed the responsibility of paying the salaries of a group of the natural science staff. Under this plan, 74 semester leaves of absence were granted to 61 professors during 1932-33 at a cost to the Foundation of \$166,241.

6. *Game management.* With the rapid growth in sentiment relative to conservation of native fauna and flora, the Foundation made available in 1933 a sum of \$8,000 a year to enable such a study to be undertaken on the UW campus on a broad basis. The University was fortunate in being able to obtain the services of the late Prof. Aldo Leopold, whose international reputation in this field placed the WARF-supported wildlife ecology work in the foreground.

7. *University Press.* In 1937 another special type of work was started on the campus with WARF support. This was the organization of the University Press for the publication of the scholarly works of the institution.

8. *Enzyme Institute.* Only recently the WARF has loaned the University Building Corporation the sum of \$300,000 for the erection of an Enzyme Institute Building on the campus as a lab home for scientists in the fields of cancer research and other important biological investigations.

9. *Slichter Professorship.* Last year the WARF created an endowed profes-

sorship at \$12,000 a year in the field of the natural sciences. The chair has been named in honor of Charles S. Slichter, for many years dean of the Graduate School and an important figure in the genesis of the Foundation.

10. *University Houses.* This summer a 150-family unit apartment project for University personnel will open on the campus and help to ease the serious Madison housing shortage. This permanent housing development was made possible by a loan made by the Foundation to University Houses, Inc.

11. *Staff morale.* Intangible yet important is the intellectual impulse which the WARF has given to the University. On the record is case after case where the retention of key men in the institution has been made possible only through aid and encouragement from the Foundation.

## Story of Public Service

This, then, is the story of the Wisconsin Alumni Research Foundation:

1. It has taken over the administration of a valuable discovery in the field of health and has protected the public from quackery.

2. At the same time, it has so encouraged the wide-spread use of food-stuffs containing vitamin D that rickets is now practically unknown as a childhood ailment.

3. Furthermore, it has astutely invested minute per-unit royalties to the end that the University of Wisconsin has an annual endowment of some \$400,000 for scientific research.

As Frazier Hunt has written of the WARF: "It is good to know such things, because it straightens out some of our twisted viewpoints. It revises some of our lost faith, and awakens new faith."

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## FOUNDATION STAFF

UNDER THE supervision of the Board of Trustees, the Foundation has a full-time staff of personnel for the purpose of conducting its regular business operations. This personnel at present includes Ward Ross, '25, general manager and counsel; Boynton Butler, business manager; Edwin O. Rosten, '33, comptroller; Henry T. Scott, '25, director of biological research; and Carl H. Krieger, '33, laboratory manager.

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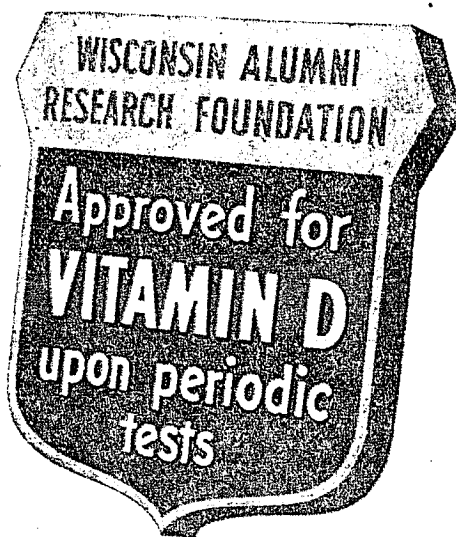
## ABOUT FOUNDATION GRANTS-IN-AID

1. WHILE THE SUM of money which the Foundation turns over to the University may seem large, actually it is only a small percentage of what might profitably be spent for research at Wisconsin. In terms of the national research budget and in terms of a fair percentage of the state's income to be "plowed back" into research, the WARF grants are only a small, but vital, drop in a large bucket.

For instance, according to the report of the President's Scientific Research Board in August, 1947, a commonwealth should be devoting "at least one per cent" of its income to research. Total income payments to individuals in the state of Wisconsin in the year 1946 amounted to \$3,800,000,000. One per cent of that figure would be \$38,000,000; yet the University of Wisconsin's total research for the year 1946-47 was only \$2,414,243.73.

2. Foundation support did not in the past, does not now, and cannot in the future replace state funds in financing research on the University campus. Since 1917 the State Legislature has recognized the need for scientific research at the University by appropriating state funds for that purpose each biennium. These state appropriations provide the solid base for the University's research program in medicine, agriculture, botany, engineering, economics, and a host of other fields. The WARF grants merely supplement the state funds. They are the "frosting on the cake."

3. WARF grants are doubly prized on the campus because they are so fluid. The Foundation brings the money to the edge of the campus. From there on in, the Research Committee of the faculty takes over. The University of Wisconsin scientist is under no compunction to produce something of immediate "practical" value. He is not encouraged to "chase patents." He can hire and train a continuous chain of top-notch assistants.



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