Casimer Funk, Nonconformist Nomenclature, and Networks Surrounding the Discovery of Vitamins

Alesia Maltz
Department of Environmental Studies, Antioch University New England, Keene, NH

Abstract
In the 2 decades between when the existence of vitamins was first postulated and when they were isolated, scientists and research physicians could produce no conclusive evidence for their existence from the laboratory or clinic. By the time the first vitamin was chemically isolated, vitamins were already widely accepted by scientists, clinicians, the public, and government agencies. In the period between when vitamins were postulated and the Nobel Prize was awarded for their discovery, a debate over nomenclature served as a substitute for a priority dispute. The most popular term “vitamine” was introduced by Casimer Funk in 1912 and was changed to “vitamin” by Cecil Drummond in 1920. Initial conditions surrounding the discovery of vitamins, including World War I, necessitated the creation of unusual networks for the dissemination of scientific information about vitamins. In Great Britain, research institutes, government agencies, and individual researchers were instrumental in creating a set of national and international networks for the dissemination of information from research laboratories to hospitals, physicians, pharmaceutical houses, and the public. These networks of dissemination still exert an influence on how scientific information about vitamins is communicated to the public today. J. Nutr. 143: 1013–1020, 2013.

Introduction
The term “vitamine,” one of the most recognized terms in the history of nutrition, was introduced by a Polish biochemist in December of 1912. Casimer Funk (1884–1967), who, not surprisingly, spoke 5 languages, developed the term while conducting research on beriberi and the deficiency theory of disease at the Lister Institute in London. The term “vitamine” was initially suggested to Funk by Max Nierenstein, a lecturer in biochemistry at the University of Bristol (1,2). Funk was the first researcher worldwide to identify and name these micronutrients. Once World War I broke out, vitamins were introduced to the public, who embraced the discovery. Within the medical and scientific communities, Funk ignited a raging dispute about who would be considered the actual originator of the concept of deficiency disease. The hundredth anniversary of the coining of the term vitamine is an auspicious time to consider the significance of the discovery and its name.

Much like the recent discovery in quantum physics of the Higgs boson, a scientific discovery can be predicted, and even widely anticipated, long before the evidence emerges to prove its material validity. In the case of vitamins, the time between prediction and proof lasted about 20 y. These anomalies can create a charged environment. Because biochemists required a tangible object of study, it was difficult to conclusively prove the vitamin hypothesis without first isolating at least one of the vitamins. Biochemists considered isolation to be the only real determinate of proof of the existence of vitamins (3). Fractionations and extractions did not retain chemical activity for long and tested the limits of the laboratory techniques of the day. Even before a vitamin was successfully isolated in a biochemical laboratory, in the public arena, “vitamania” had already set in (4).

The purpose of this paper is to describe the initial social conditions surrounding the scientific discovery of vitamins and how those initial conditions still influence nutritional research and its dissemination. Circumstances around World War I necessitated that scientists, such as Frederick Gowland Hopkins, become government spokespersons to communicate with the public about nutritional research. The role that nongovernment scientists, such as Funk, played in the dissemination of knowledge about vitamins is less recognized. They inadvertently forged a set of networks among scientists, physicians, and industry that still influences the way new scientific information about vitamins is disseminated to the public today. This paper describes: the state of the research around 1912 when the term vitamine was coined, Funk’s role in the discovery of vitamins, the controversy over naming vitamins, the process by which the name vitamine was modified to reflect standard scientific nomenclature, and the consequences of these initial conditions for scientists, physicians, industry, and the public today.

State of the Field
The varied strands of research leading to the deficiency theory of disease were gathered together slowly. These strands included: the Japanese, Norwegian, and Dutch medical researchers who were
looking at particular diseases such as scurvy and beriberi; holders of folk knowledge on foods that served as specific cures for certain diseases; and several calorimetrists and biochemists who questioned the limits of their experimental protocol. Because American scientists today are more familiar with American biochemists who anticipated the deficiency theory of disease or sought credit for the discovery of vitamins, including E.V. McCollum, Joseph Goldberger, Thomas Osborne, and Lafayette B. Mendel, this paper will focus primarily on European researchers (5-14).

Clinical evidence suggested that scurvy, beriberi, and perhaps pellagra could be cured by certain foods, but the significance of these studies was not placed in a larger conceptual framework (8). General Kaenhiro Takaki of Japan eradicated beriberi from the Japanese Navy in 1884 by giving sailors increased amounts of meat, barley, and fruit. Gerrit Grijns, a Dutch researcher, showed in his 1901 study of experimental birds that there was a substance specific to prevent certain foods that prevented and cured beriberi. The Norwegian researchers Holst and Frolich in 1907 produced scurvy in guinea pigs and cured it with the addition of small quantities of single grains and antiscorbutic vegetables. These and other researchers concentrated their efforts on finding “specific” cures for certain diseases but did not develop a theory of deficiency disease or search for a new biochemical class of substances.

Between 1905 and 1912, the presence of essential nutrients in milk and other foods was postulated by several biochemists, each of whom realized they could make history and establish their preeminence in the newly emerging field of biochemistry by being considered the first to make the discovery. Biochemists had fractionated and precipitated several substances and cured deficiency diseases in animals with these substances, but they had not yet isolated or synthesized a single vitamin. Because the methods of “biological analysis” (animal experimentation in nutrition) were just beginning to be developed in the newly emerging field of biochemical research, many clinicians remained skeptical of the biochemists’ claims about the deficiency theory of disease.

Discoveries in the scientific community are not recognized until the legitimacy of the methods is widely accepted and the results can be accurately reproduced. The process of acceptance of the vitamin hypothesis and the deficiency theory of disease proved slow. In 1905 and 1906, pronouncements were made that “unsuspected” nutrients might exist in milk. The 2 leaders who first predicted the existence of vitamins were the Dutch physician and researcher Cornelis Adrianus Pekelharing (1848–1922) and the British biochemist Sir Frederick Gowland Hopkins. In 1886, Pekelharing led a commission to conduct research on beriberi and achieved ambiguous results (15). In 1905, out of a concern about artificial milk (infant formula), Pekelharing announced, “not without trepidation,” his belief in the importance of minute amounts of a nutritional substance found in milk. Pekelharing asked why he was speaking about a substance whose existence he could not prove. “Why not keep silence as long as we have no definite data from the scales and from the test tubes?” Although he was unable to separate the substance from the whey, Pekelharing felt it was important to point out that, "there is a still unknown substance in milk, which, even in very small quantities, is of paramount importance to nourishment. If this substance is absent, the organism loses the power properly to assimilate the well-known principal parts of food, the appetite is lost and with apparent abundance the animal dies of want.

Undoubtedly this substance not only occurs in milk but in all sorts of foods, both of vegetable and animal origin” (6, 7, 16). His intention was to warn physicians of the possible dangers of feeding their patients the newly manufactured “artificial milk” products.

In 1906, Frederick Gowland Hopkins asked a similar question to a group of professional chemists. Hopkins hinted that other nutrients might be needed beyond fats, proteins, and carbohydrates. Rather than predicting a discovery, he “prophesized” the existence of highly complex, unknown, and unsuspected dietary micro-nutrients occurring in foods that were not found in the basal components of the experimental diets of biochemists (17). He announced this prophecy to encourage more people to enter the newly emerging field of biochemistry.

By 1911, an active substance had been fractionated, precipitated, and used in animal testing to cure polyneuritis (18). Until the end of World War I, no direct laboratory, experimental, or clinical evidence existed that conclusively proved the existence and importance of vitamins to skeptical chemists and physicians. Between 1911 and the end of the war, in Great Britain, there was no clinical consensus about which foods to feed children, or how much protective food was needed to prevent disease, or which diseases might be deficiency diseases. A leading British physician, W. D. Halliburton, considered vitamins to be “a matter of inference” (19). He believed there was little known about the influence of vitamins on growth and nutrition and wrote that, “as research proceeds it may be necessary to modify the immature views and guesses at present in the air” (19).

Immediately after the war, scientific consensus was developed about the existence and importance of vitamins, and solid proof, in the form of isolation, emerged a few years later. By 1928, in acknowledgment that a major health discovery had been made, a Nobel Prize was awarded to Adolf Windaus (1876–1959) for his work on steroids. That research laid the foundation for explaining how rickets could be caused by both environmental restrictions and a dietetic deficiency (20). The following year, Sir Frederick Gowland Hopkins (1861–1947), the “father of British biochemistry,” and the Dutch physician Christiaan Eijkman (1858–1930) were awarded the Nobel Prize in Medicine. Hopkins received it for his work on the growth-stimulating vitamin and Eijkman for his work on the anti-neuritic vitamin (21).

During the period between when the first pronouncements were made and the Nobel Prize was given to Hopkins and Eijkman, the name of the elusive substance became a substitute for a contested discovery. The term “vitamine” was coined by Casimer Funk, who was also nominated to receive the Nobel Prize. Upon his nomination, Funk published a letter in Science stating that, given the circumstances of surrounding the discovery of vitamins, there could be no single person who should receive the Nobel Prize for their discovery (22). Sir Frederick Gowland Hopkins, in his Nobel Prize acceptance speech, agreed with Funk that no one person deserved credit for the Nobel Prize and commented that Funk had received, “too little credit for his vitamin research” (11). During his life, Funk created a series of autobiographical sketches documenting his contribution, along with a scrapbook of newspaper articles and magazine articles, even a Post cereal box, underscoring his importance as the discoverer of vitamins.

**Casimer Funk**

Casimer Funk was born into a Polish/Jewish physician’s family in 1884. His father was a skin specialist. Funk had a congenital limp and was considered shy. His biography suggests that, from
an early age, Funk was aware that his ethnicity set limits on his success. He was home schooled until he was 16 y, because Jews were not permitted to matriculate into Russian government schools. He left his native Poland for his academic training and went to graduate school in Berne, Switzerland. He received a Ph.D. in organic chemistry from the University of Bern at the age of 20 y. Switzerland was a center for experimental research on protein. The Russian researcher Nikolai Lunin worked in Gustav von Bunge’s laboratory. While conducting experiments on the addition of milk to the diets of mice, Lunin observed that milk contained some unknown substance essential to life.

Between 1904 and 1906, Funk worked at the Pasteur Institute and then moved on to the laboratory of the Nobel Prize-winning chemist Emil Fischer (1852–1919) in Berlin. In Fischer’s laboratory, Funk conducted research under Emil Abderhalden (1877–1950) on the structure of proteins and synthetic protein diets (23-25). Abderhalden, a controversial figure, is remembered as the founder of German biochemistry and President of the Leopoldina (the German Academy of Natural Sciences) from 1931 to 1946. Recent papers in Nature have depicted Abderhalden as a bully, eugenicist, and (citing his research on defense reaction) a scientific fraud. Under his tenure as President of the Leopoldina, all Jewish members, including Einstein, were “extinguished from the membership list,” or as some would say, purged (24, 26). Others claim that, as a Swiss citizen, Abderhalden was never forced to join the Nazi Party, was reputed to have stayed away from the party, and that the Nazis even tried to remove him from his university chair (27). These contradictory interpretations of Abderhalden’s professional treatment of Jews will be resolved in time, but they suggest the need to reinterpret the difference of opinion between Abderhalden and Funk on feeding experiments. These differences were important in spurring Funk to develop his deficiency theory of disease.

Under Abderhalden, Funk was the animal feeder, an unusual responsibility for a researcher who had already received his Ph.D. Funk had the job of encouraging the dogs to eat when they were on the verge of starvation. Abderhalden believed that with “verbal persuasion (Zureden), a dog can be made to eat anything” (23,27). Abderhalden blamed Funk for not being persuasive enough with the dogs to keep them healthy. Funk began experimenting with the addition of milk and meat to the diet and found that the dogs rapidly recovered and thrived when minute quantities of milk and meat were added to their diet. These experimental results led Funk to question presuppositions in calorimetry research protocol. Differences of interpretation between Abderhalden and Funk precluded the 2 from publishing most of their research (1,28). Funk, but not Abderhalden, became convinced that it was essential to add a dietary supplement to the dogs’ protein rations to preserve the health of the experimental animals (32, 38).

In 1910 Funk took a position at the Lister Institute for Preventive Medicine in London, where he again stayed for a few years. Shortly after he began, a person walked into the Lister Institute, was greeted by a number of people, and then asked Funk if he would go for walk. Despite his congenital limp, Funk agreed, and found himself on a long walk with Charles Martin, Director of the Lister Institute. Martin, who had just returned from a trip, had a request that research be done on an anti-beriberi protein. Martin asked Funk to conduct protein research on beriberi. Soon thereafter, Funk put down the protein research and began using biological analysis (animal feeding experiments) and chemical analysis to fractionate and attempt to isolate the anti-beriberi vitamin (29). This laboratory research eventually led Funk to write a review article in 1912, in which he coined the term vitamins and developed “the deficiency theory of disease” (30).

During the 1910s, the Lister Institute functioned, like many other Victorian organizations of the time, paternalistically. Funk felt that it operated like a family (31). Even though Funk tried to adapt to the British cultural model, e.g., by wearing British clothes, he felt marginalized as a foreigner. Funk wrote in his autobiography that practically the whole institute suffered from “golfomania,” because conversations on the topic of golf dominated discussions. Most institute members played golf together several times each week, an activity in which Funk chose not to participate (Fig. 1).

Funk’s research on chemical isolation of vitamins was conducted in a setting of social isolation. For him, the professional atmosphere at the Lister Institute promulgated neither teamwork nor mentorship (39). In his autobiography, Funk noted that Martin arranged for him to spend the 1910 Christmas break with Frederick Gowland Hopkins, a man who reminded Funk of his father. During that visit, Funk shared all his research experience, hopes, and dreams with Hopkins, and later realized he said more than he should have (39). Hopkins was not doing any research on milk at that point yet; within a year, Hopkins published his paper on the addition of milk to the diet (43).

In 1912 Hopkins published laboratory research about the effects of the addition of small amounts of milk to growth of experimental animals, which some biochemists consider a landmark paper (44). In 1933, W.R. Aykroyd, recalling the relationship between the “proud ascendant curve” and the “waning curve” of the graph, deemed it “the prettiest experiment imaginable,” one that “ranks aesthetically beside the best short stories of H. G. Wells” (4,46). According to other chemists, this assessment seems quite generous for several specific reasons, including weaknesses inherent in the method of animal feeding experiments, a multitude of problems with the experimental design, and the inability of researchers at other labs to reproduce Hopkins’ experiment.

While the new method of biological analysis (animal feeding experiments) was in the process of being developed, the experimental design and protocol was not yet established. Funk thought that Hopkins’ paper replicated Lunin’s work. Other critics of Hopkins’ 1912 paper have claimed that it was poorly designed by today’s standards. In an extended analysis of this paper, the historian Stanley Becker found many mistakes, although none were large enough to negate the conclusions: “Hopkins’ 1912 paper is, at first glance, superlative, specific in detail, statistically valid and graphically persuasive. A more thorough study reveals glaring omissions, numerous arithmetical errors, a lack of some critical details and a series of graphs so constructed as to be misleading” (36). Becker found upward of twenty-five arithmetical errors and five different measurement scales to represent the results on seven different graphs. Becker’s analysis explains why the results of Hopkins’ experiment could not be reproduced in other laboratories (36–42).

During this time, Funk was in a state of intense excitement about his research and on the verge of a breakthrough that he called an “illusion to stand before a discovery” (31). He said: “the whole magnitude of the problem stood clearly before my eyes” (31). That discovery emerged directly from his beriberi experiments on birds. Funk supplemented the birds’ diets with extracts he derived from rice polishing (the pericarp or membrane of unpollished rice). He worked in the laboratory, processing rice polishings by the ton, without assistance and without appropriate equipment. Funk described himself as working alone, “full blast,” often until 3:00 in the morning. From each ton of polishings, he extracted a spoonful of the active anti-beriberi fraction. He was frustrated to find that the fractions were unstable and their biological activity diminished with each subsequent stage of chemical analysis. He was trying to cover as much ground as
was contaminated with the anti-beriberi vitamin. Funk did not
had produced an almost pure version of nicotinic acid, which
had almost succeeded in his search of an elusive vitamine. He
was on the brink of chemical isolation. Ironically, by 1912 Funk
from “the right path” (31).

In the extracts of the rice pericarp, Funk found a cure for
beriberi. Pigeons on death’s door would dramatically recover
with the administration of minute amounts of Funk’s extracts.
In his autobiography, Funk claimed that his colleagues at the
Lister Institute were of the opinion that the laboratory evidence he
put forth in his beriberi experiments was not valid. His co-workers
noted that his cure for beriberi in birds lasted only 7–12 d, not long
enough to be considered a bona fide cure. They claimed that it was
not enough that Funk cured the birds of beriberi; they expected
that a cure would eliminate the disease entirely. Funk believed that
the criticisms of his co-workers, coupled with the lack of support
of the administration, dampened his enthusiasm and made him
feel he could not cope. His co-workers at the Lister Institute
influenced him to abandon the curative test and derailed him
from “the right path” (31).

Funk took a break from the work, even though he believed he
was on the brink of chemical isolation. Ironically, by 1912 Funk
had almost succeeded in his search of an elusive vitamine. He
had produced an almost pure version of nicotinic acid, which
was contaminated with the anti-beriberi vitamin. Funk did not
realize at the time that nicotinic acid was also a vitamin (8, 43). 3
Soon after his work was published, however, it was recognized
that “Funk’s vitamine has been proved to be the most powerful
and rapid remedy we possess in beri-beri” (44). Although the
anti-beriberi vitamine was not pure, Funk could say, even 15 y
later, that its level of purity had not been improved upon (22). As
Funk found out each time he went back to this research, the
process of isolating a vitamine was more technically challenging
than biochemists had initially suspected. In retrospect, Funk felt
that his beriberi experiments had crystallized all the unrelated
work conducted by others and that it validated the vitamin
hypothesis in a clinical setting and coordinated all the known
facts. He believed that his work on experimental beriberi “in
effect, proved for the first time and in an irresistible manner, that
a grave illness, leading to death, could be provoked by a diet
lacking in one specific vitamine” (10). J. L. Harris, Director of
the Nutrition Laboratory at Cambridge, commented: “It was
not until the more elaborate attempts at isolation, made in 1912
by Funk, the same Funk who invented the catchword ‘vitamin’,
that really world-wide attention was at last attracted to what we
may call the “vitamin point of view of beriberi” (45, 46).

A New Branch of Nutrition

Funk admitted, “I had the ambitious plan to start a new branch
of nutrition” (31). Lacking sufficient institutional support to
make a breakthrough in chemical isolation, but confident that
his experimental research was sufficient to inform a theoretical
framework for the deficiency theory of disease, Funk wrote a
forceful literature review about vitamines, which proved to be a
catalyst for the next generation of biochemical research on
nutrition.

In 1912, the editor of The Journal of State Medicine invited
Funk to write a review article (26). When Funk hurriedly wrote
his article, he felt that he had found a venue for introducing his
vitamine nomenclature (28). The authorities at the Lister Institute
had put a ban on Funk’s use of the term vitamine and refused him
permission to publish any paper with the word vitamine in it.
They objected that the “amine” suffix did not accord with
standard chemical nomenclature. Every time Funk presented a
paper to the editors of the Lister Institute that included the
nomenclature of vitamines, “the term was crossed out and partially
replaced by something like that: On the chemical nature of the
substance which cures polyneuritis in birds induced by a diet of
polished rice” (31). He found that the editorial change rendered
the title unattractive and misleading, because it drew attention to
the chemical and away from the new field of nutrition he was
trying to establish. Funk believed the request from the journal
editor offered him a means of bypassing the Lister Institute’s
censorship ban. His perception of censorship eventually contrib-
uted to his decision to leave the Lister Institute for the Royal
Cancer Hospital Research Institute in London.

In the 1912 review article, Funk presented clinical and
biochemical evidence for the deficiency theory of disease. Funk
postulated that several obscure and unrelated diseases of unknown
etiology, including beriberi, polyniecritis in fowls, epidemic dropsy,
scurvy, experimental scurvy in animals, infantile scurvy, ship
beriberi, pellagra, and perhaps rickets, all shared a common
etiology. Under the rubric of “deficiency diseases,” Funk was
able to pull together the seemingly unrelated experimental,
laboratory, and clinical findings of many researchers around
the world. Funk also postulated that rickets, which was devastat-
ing children in certain urban areas of Great Britain and the United
States, with estimates of incidence between 50 and 90%, might
also be a deficiency disease.

Before Funk published his literature review, the nosological
category of deficiency diseases was not recognized. Funk’s article
was as much a literature review as a manifesto. It presented
evidence in a bold and eloquent way that brought together
disparate diseases under one rubric. The article was designed
to stimulate research and open a new field of nutrition. In
1914, it was expanded into a book, Die Vitamines, which

FIGURE 1 Funk at the Lister Institute.
3 Frances Frankenburg claims that the chemical structure of thiamine (B1), the
first vitamin to be chemically isolated, was determined in 1933 by Robert
Williams (1886-1965) and synthesized 3 y later (43). Carpenter claimed that
thiamine was isolated in 1926, the structure determined in 1926, and synthe-
sized in 1936 (8).
was intended for use by physicians (47). The book also proved to be of interest to the general public and was translated into several languages (29).

**The Debate about Names**

The effort that went into the subsequent argument about naming the micronutrients was all out of proportion to its seeming importance. Even the historian Paul de Kruif, who sees the history of nutrition science as a story of persistence, dignity, and courage, viewed the discovery of vitamins as a “gold rush to a scientific Klondike” (14). The debate about names served as a substitute for a priority dispute. Biochemists pushed to give a name to a substance before it had actually been isolated and suggested that a name usually was accepted until further evidence disavowed its existence. Privately, Funk suspected that alternatives were selected to “wrestle” from him “even this last admitted credit” (28). Publicly, Funk argued that the evidence for vitamins was much stronger than other substances whose names were not under dispute. If terms could be applied only to chemically pure, fully identified substances, then the names of ferments, proteins, nucleins, polysaccharides, lipoids, cerebro-sides, and “90% of the already existing names in physiological chemistry would have to be discontinued” (50, 56). He argued that a well-chosen, “appropriate and somewhat striking nomenclature” had the power to stimulate research and bring a previously obscure problem into prominence (29). Funk valued his term, because it beat the competition, served as a catchword for the uninitiated, and had become popular. He said, “a badly chosen catchword, like a folksong without feeling, can never become popular” (1).

Funk’s defenders argued that, despite many drawbacks, the term was the best one available. The leading American biochemist, Carl Voeghlin, admitted that there was no good proof that the anti-beriberi substance (vitamine) was an amine, but nevertheless suggested that the name be accepted in the scientific community “as it is brief and undoubtedly has some truth in it” (57). The British rickets researcher Edward Mellanby suspected that it impeded acceptance of the theory. He thought that most physicians and researchers would be whole-hearted believers of the importance of vitamins “were it not for their name” (53). The American biochemist R. R. Williams later wrote, “the name was a stroke of genius,” and he suggested that “such a captivating word . . . [was] necessary to focus attention upon the possibilities of the field” (58).

**Jack Drummond’s Scientific Diplomacy**

Jack Cecil Drummond (1891–1952) is perhaps the most well-known historical figure in the history of British nutrition, whether because of his science, policy work, popular book on the history of nutrition or his untimely death. That fame may be attributed to a combination of factors. Drummond became involved in dispassionate experimental research through the British government during World War I, and during WWII he was the face of British food policy on the home front. Drummond and his wife later wrote a comprehensive history of the British diet, a book that has remained popular for five decades (59). An unfortunate reason for his fame is that Drummond and his family suffered an untimely death in 1952, which has been an object of much speculation (60). Drummond’s contribution is again being reassessed in a fascinating reinterpretation of World War II and the role that food played in the creation and outcome of the war (61). When he became the Scientific Advisor to the Minister of Food During World War II, Drummond was determined to use this position as an opportunity to enhance the quality of the British diet. He designed the domestic food efforts during World War II so well that, rather than suffer wartime food deprivations, the British public enjoyed an unusually high quality of diet during the Second World War (21).
Drummond began his interest in nutritional research in Funk's laboratory and shared with Funk a lifelong inclination to focus on the big picture and to attend to the immediate practical implications of laboratory research. At the age of 23 y, Drummond received a research assistantship under Funk, who by then had moved from the Lister Institute to become the Director of Biochemical Research at Royal Cancer Hospital Research Institute in London. In 1914 Drummond published a paper with Funk on the chemical composition of rice polishings (pericarp), which contained a substance that cured beri-beri (62). In 1917 when Funk resigned from his position at the cancer institute, Drummond became Funk's successor.

As a young researcher, Drummond's experience of nutritional sciences was colored by war and the urgency of making the scientific knowledge of nutrition serve the immediate practical needs of the British public. Drummond became a member of the Joint Committee of the Medical Research Council and Lister Institute and served with the leading lights of British nutritional research: Frederick Gowland Hopkins (who was the committee chair), Harriette Chick (who was the secretary), Arthur Harden, and Edward Mellanby. The committee was charged with the important responsibility of bringing the knowledge of vitamins to the public. The committee produced a Special Report, *The Present State of Knowledge Concerning Accessory Food Factors* (*Vitamines*), which had widespread influence in the British government circles and among the public during and after World War I (25). The outbreak of war created an urgent need for scientifically sound nutritional information and established certain expectations among the public about vitamins and about the role government would play in disseminating information about them.

After the war, Drummond played a crucial role in the creation of the vitamin nomenclature we use today. In 1920, he wrote a brief piece in *The Biochemical Journal* to address how the literature had become “a good deal confused” on the nomenclature of vitamins (63). He found a diplomatic and elegant way to weave together Funk’s terms vitamins and McCollum’s terms fat-soluble A and water-soluble B. Drummond noted that there was no evidence to support Funk’s idea that these indispensable dietary constituents are amines and that the Chemical Society’s standard nomenclature permits the suffix “in” to refer to a neutral substance of undefined composition. He suggested that the final letter “e” be dropped and that McCollum’s alphabetical letters be incorporated to distinguish individual vitamins. “This simplified scheme should be quite sufficient until such time as the factors are isolated and their true nature identified” (63).

Funk was one of the few people who objected to the change. “I still believe in the nitrogenous nature of these substances,” he wrote in the much-delayed second edition of *The Vitamines*, which came out soon after Drummond’s paper. Even though others had gotten credit for a number of ideas that originated with him, Funk felt it “a source of great pleasure to witness the great progress that has been made in vitamine research” (32). He was acutely aware of the importance of nutritional knowledge to the post-war political economy of Europe. In his opinion, the term vitamine expedited the dissemination of the idea. The term “served as a catchword which meant something even to the uninstructed, and it was not by mere accident that just at that time, research developed so markedly in this direction” (1).

The Americans dropped the final letter “e” in the term by the early 1920s and, at Drummond’s urging, the British followed suit. By 1921, it became clear that it was “too late” for Fletcher’s term, ergotropes, and Hopkins term, accessory food factors. “I think ‘vitamin’ has come to stay,” said Sir Walter Morley Fletcher, the first Secretary of the Medical Research Council in a letter to a colleague. “We must wait till accurate theoretical knowledge gives us a new name or set of names” (49).

For 2 decades following Drummond’s suggestion, Funk was himself inconsistent with the spelling, intermittently using vitamins and vitamins. In 1925, Funk proposed another change in the nomenclature to “correct the chaos existing in the literature.” He suggested that substances containing nitrogen retain the term vitamins and that the fat-soluble substances be referred to a “vita sterols” and he offered a new nomenclature: Vitamine B (anti-beriberi); Vitamine C (anti-scorbutic); Vitamine D (yeast growth); Vitamine P (anti-pellagra); Vitasterol A (anti-xerophthalmic); Vitasterol E (anti-rachitic); and Vitasterol F (reproduction) (64). However, as Fletcher had observed, the term vitamin had come to stay.

Drummond’s diplomatic efforts to modify Funk’s term went a long way to establish proper scientific nomenclature in the field. Moreover, it helped establish a much-needed sense of consensus in a newly emergent field of research. Because some members of the research community were not operating within standard norms of professionalism, it also served to provide some acknowledgment of Funk’s contribution to biochemical and nutritional research.

The creation of a name became a means to achieving the keenly sought-after individual recognition for the discovery of vitamins and contributed to the establishment of the new discipline of biochemistry.

**Conclusion: What’s in a Name?**

“Vitamin” was a term that aided in the dissemination of the idea across the borders from the scientific laboratory to the clinic to the home. Funk himself was never able to find a permanent academic home, because prejudice and political upheaval influenced his career trajectory. He helped forge the lucrative vitamin supplement industry by taking out 2 U.S. patents on vitamins in 1915 despite the criticism that “Old Mother Nature does not patent her products” (65). The patents provided Funk with opportunities for economic and, more importantly, geographic mobility during the First World War (which broke out during Funk’s honeymoon). Because of war-time attitudes toward foreigners, Funk and his family soon moved from Great Britain to the United States, where he worked for several pharmaceutical companies and Cornell and Columbia Universities. Under his direction at Metz pharmaceutical house, Funk was able to produce Oscodal, the first vitamin preparation to be accepted by the American Medical Association as an ethical product (66). After World War I, at the request of the League of Nations, Funk returned to Poland for a few years until political unrest in Warsaw left his laboratory full of shrapnel and his house full of bullet holes. On more than one occasion, he was forced to flee, leaving everything behind, including his laboratory and his research notebooks. With great tenacity, he recreated his laboratory many times.

Throughout the course of his career, Funk moved repeatedly among 6 countries and worked in a variety of institutions, including medical laboratories, universities, pharmaceutical corporations, and private research institutions, including Columbia College of Physicians and Surgeons, Cornell University, Warsaw State Institute of Hygiene, H. A. Metz and Co., Biochemica in Paris, the US Vitamin Corporation, and his own Funk Foundation. These experiences made it difficult for him to establish a sense of belonging in institutions in which he was a part and they had an impact on the recognition he received during his career as a scientist and disseminator of scientific information.
Nevertheless, Funk managed to achieve quite a lot. He had a hunch that a well-chosen term would attract attention, which it did. His textbook on vitamins, which was first published in 1914 and translated into several languages after World War I, significantly contributed to the dissemination of the concept of deficiency diseases among physicians and the public. In London, New York, and elsewhere, Funk seemed to be a catalyst for major breakthroughs in nutrition, endocrinology, oncology, and other disciplines. In the industrial sector, Funk made scientifically ethical vitamin supplements readily available to the public. He helped popularize biochemical research at a time when many physicians did not understand the significance of vitamins or biochemistry.

The same unstable political conditions that created personal upheaval for Funk and his family also created a set of networks that still influence the dissemination of vitamin research today. Because of war, prejudice, and unfamiliarity with other languages, nutritional scientists suffered from a lack of communication with scientists in other countries. For example, in the short preface to the first edition of his book before the war, Funk requested that other researchers be kind enough to send him reprints of their work which, he noted, were sometimes available only with great difficulty (1). Hopkins expressed unfamiliarity with the work of other nutritional researchers before the war, which he believed contributed to the length of time it took for vitamins to be discovered. Harriette Chick attributed the success of her post-war clinical work in Vienna in part to the resumption of the flow of scientific knowledge (3).

The fact that Funk moved, or was forced to move, every few years and set up new laboratories in Europe, Great Britain, and the United States made him a pivotal creator of networks. The networks that Funk created enabled him to make a unique contribution to the discovery of vitamins and the deficiency theory of disease and to encourage the contributions of others, such as Drummond. Actor-network theory in the sociology of science proposes that historians and sociologists “follow the actors” to see how ideas are connected and how actors influence each other and events (67). Because of prejudice, politics, and war, Funk crossed contested social and intellectual borders. The trajectory of his movement, between the laboratory and the clinic, science and the public, research and industry, played no role in having vitamins become accepted by physicians, consumed by members of the public, and invested in by industry. In addition to his extraordinary laboratory technique, skills in experimental design, and ability to synthesize new ideas, it is also important to recognize the contribution that Funk made as a conduit and disseminator of nutritional research.

The political-economic conditions that initially influenced the scientific research and dissemination of information about vitamins still affect how physicians and members of the public perceive vitamins. Today, vitamin supplements are part of the daily practice of millions. It is unusual for a scientific field of research to be met with such keen public interest and for members of the public to talk about whether or not they “believe” in chemical substances. Health magazines and tabloids quickly pick up scientific papers and reports and disseminate them to the public. Articles about vitamins are often tinged with claims of miracle cures and quote highly visible scientific and medical personalities, much as they were in the 1910s.

Funk’s name and the name of the substance he helped discover endure in many unexpected ways. Today, there is even a rock band named “Casiner Funk.” In retrospect, one would be hard pressed to say whether more recognition accrued to the person who received the Nobel Prize or to the one whose terminology is part of everyday speech. More important, Funk created networks as he moved from place to place that have endured and influenced the history of the discovery and acceptance of vitamins.

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Literature Cited

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