

**Planned or by Accident?
The Inception of the Chinese
Materia Medica Research Program
at the Peking Union Medical College**

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Abstract

This report chronicles the events that led to the inception of the Chinese materia medica (CMM) research program at the Peking Union Medical College (PUMC). Dozens of herbal drugs were investigated during the decade after the program was conceived in 1921, including ma-huang, from which ephedrine, an anti-asthmatic drug of global impact, was isolated in 1924. The program was primarily born out of a serendipitous intersection of two independent pursuits by Dr. Ralph G. Mills and Mr. Bernard E. Read, two PUMC faculty members, of their interests in CMM, instead of a preconceived grander aim or strategy by the institution or by any visionary. The establishment of the program, however, was the result of pragmatic handling of personnel and administrative issues by the China Medical Board (CMB)'s key decisionmakers, who accepted the seemingly plausible scientific value and various utilitarian promise of CMM and were open to its research at the PUMC.

The discovery of ephedrine is the most celebrated scientific achievement from the CMM research program, and one of the few highlights of Chinese science during the entire Republican Era. Reconstructing the origin of the program will hopefully place this highly acclaimed scientific event in an accurate historical context and enable the construction of a non-whiggish historiographical narrative.

Introduction

The research program of the Department of Pharmacology at the Peking Union Medical College (PUMC), as described in 1924 by Bernard Read, the department head, was entirely centered on traditional Chinese materia medica (CMM).¹ This seems somewhat paradoxical for an institution billed as the Johns Hopkins (Medical School) of China, since a number of its projects, such as the translation of classic Chinese medical texts and cultivation of local medicinal plants, deviated drastically from experimental pharmacology, a hallmark discipline of scientific medicine. However, Read believed that CMM research would offer a unique opportunity to discover chemically and pharmacologically valid remedies of great value which not only were compatible with, but also enriched and advanced modern medicine. He also hoped that the bibliographical works could reconcile terminology and concepts of the two medical systems. In his article on methods and problems in medical education, Read also credited one Dr. Ralph Mills, from the Severance Union Medical College (SUMC) in Seoul, Korea, for his work, which “included extensive bibliographical work which forms the basis of our present research” that had “made a good nucleus for the pharmacognostic studies upon Chinese drugs.”

In the spring of 1924, Drs. Ko-Kuei (K.K.) Chen and Carl Schmidt, two young associates in Read’s department, isolated a sympathomimetic alkaloid ephedrine from ma-huang (*Ephedra sinica*), a well-known Chinese herb, and characterized its pharmacological activities.² The discovery later became one of the best-known scientific achievements with world acclaim for China during the entire Republican Era (1912-1949) and a poster child of scientization of Chinese medicine until recent decades. However, there is only sketchy historiographical narrative of the discovery per se and occasional discussion in the literature on the much broader CMM research program. Many questions remain: Why did the PUMC engage in research on indigenous medicine materials? Was the program initiated with a specifically crafted agenda, or was it merely the result of a slightly eccentric academic interest? Was Read the “mastermind” behind

the program? How did he become interested in CMM research? How were Mills and his work related to the program? The answers to these questions, by and large, are yet to be researched.

Using the archives of the Rockefeller Foundation (RF) and the China Medical Board at the Rockefeller Archive Center, this report reconstructs the origin of the PUMC's CMM research program in the institutional, personal, and scientific context.

Building the Physiological Science Departments: A Bumpy Process

Franklin C. McLean was appointed the first head of the PUMC in June 1916. One of his main mandates was to design the college's organizational structure and build a faculty body with the academic credential and scientific inspiration in line with the vision and objectives set by Drs. William Welch and Simon Flexner, the leading medical authorities of the Rockefeller philanthropic enterprise. According to his design, the Physiology Department would be one of the six "major" teaching departments, headed by a full professor, and include physiology, pharmacology, and physiological chemistry. They were three kindred disciplines often referred together as physiological sciences, as subdepartments or divisions, each to be led by a specialist of the rank of associate professor and supported by two or three junior members.

At the time of his appointment, the 28-year-old McLean was already an established physiological scientist with impeccable educational credentials, which included both a medical degree (M.D., Rush Medical College) and research degrees (M.A. in pharmacology and a Ph.D. in physiology, the University of Chicago), as well as training in one of the elite European laboratories (pharmacology, with Professor Otto Loewi, Nobelist, 1936). McLean was professor of pharmacology at the University of Oregon Medical School, researcher at the prestigious Rockefeller Institute of Medical Research,

and elected member of essentially all societies related to physiological sciences and clinical investigation in America.

With the guidance, support, and often direct interventions from Simon Flexner and the missionary society representatives on the PUMC board, McLean was able to fill nearly all senior faculty positions for the college, with the exception of the Physiology Department, by October 1919, just in time for the admission of its first medical school class. In December 1917, two full years prior to the commencing of any physiological science instruction, on behalf of the PUMC board of trustees, McLean appointed Bernard Read to be associate professor and head of the Physiological Chemistry Division, making him the first member of the Physiology Department.³ However, until his resignation from his position in April 1920, McLean had made little progress in hiring Read's counterparts for the other two divisions or for the department chairmen.

From a supply-demand perspective, McLean's lack of success in recruiting scientists from his specialty discipline may not be as incomprehensible as it seems. Seasoned physiological scientists were highly sought after by reform-minded North American medical schools in the post-Flexner Report era. The supply was much worse for Peking, as working in China offered little allure for academic pursuit such as in unique subjects or in opportunities for those in basic science fields, including the physiological sciences. China was also viewed rightfully to be a disadvantage for professional development, due to its isolation from world scientific centers. Moreover, unlike the situation for clinical specialties, few missionary doctors in China were qualified or even interested in physiological sciences, a fact which further limited the size of the candidate pool.

In late spring 1919, after extensive consultation, first with many prominent American physiologists and then with the British physiology community, McLean was finally able to secure Scottish physiologist Ernest Cruickshank as the sole candidate for the position of head of the Physiology Division.⁴ Recognizing after the interview that Cruickshank was not a good fit for the job, McLean, along with other key board members, nevertheless still provided him

with one year of refresher training in America to make up for his extended absence from academics during WWI, this being done with an eye to further assess his employability. In the meantime, McLean instructed Henry S. Houghton, his acting director in Peking, to postpone the physiology course slated for winter 1919 until the second school year, hoping to recruit a more qualified physiologist in time, through a resumed search.⁵

On April 15, 1920, the day when he formally submitted his resignation as PUMC director to the RF President and CMB General Director George Vincent, McLean sent an offer letter to Cruickshank, appointing him associate professor and head of the Physiology Division. Displeased by the lesser title and administrative responsibility than he had expected, Cruickshank reluctantly accepted the offer, in part hoping that he would soon be promoted on the merit of his job performance in Peking, as suggested perfunctorily by McLean in a separate letter accompanying the official offer.⁶ What he did not know, however, was that the board, at the same meeting of endorsing his appointment, had also authorized PUMC's administrative board in Peking to elect a local member as the acting chairman of the Physiology Department, to which Bernard Read was duly appointed in early June.⁷

Recruiting the lead pharmacologist was proving to be even more challenging, as the credential requirements for the position were often more stringent (typically requiring a medical degree) and the specialty training programs in America much smaller than those of physiology and biochemistry. McLean, who claimed that he had “done a great deal during the past three years toward canvassing the field,”⁸ was only able to present one candidate of dubious employability at the very end of his directorship. After he phased out of the college's administrative function and the candidate he endorsed dropped out, the recruitment process, which fell upon George Vincent and on Edwin Embree, the secretary of RF, CMB, and PUMC boards, increasingly appeared to be in disarray. Vincent was personally involved in pursuing and evaluating a number of Americans throughout the second half of 1920. He also reached out to the prominent Canadian biochemist Archibald B. Macallum for his recommendation of “a young Canadian who might be sent out immediately on a one-year appointment

in pharmacology,” without disguising his pessimism on the recruiting outlook.⁹ With all the efforts, the Physiology Department nevertheless remained the most staff-deficient unit in the college, with no department head, a pharmacology division only existed on the organizational chart, and with Bernard Read as the sole senior faculty in Peking by September, 1920, a full year after the opening of the medical school.

Bernard E. Read and the Career Evolution of a Pharmacist

Read graduated from South of England College of Pharmacy and qualified for his MPS and Ph.C. in 1908 and 1909, respectively. He was recruited soon after by the Union Medical College (UMC), founded by Anglo-American missionary societies in 1906 in Peking, as its chemistry and pharmacy instructor. In the ensuing years, he gained knowledge of the local culture, became proficient in speaking Mandarin, and befriended many Chinese. Scientific research, however, was not an activity in young Read’s life, as the school was barely equipped and marginally interested in engaging in anything beyond teaching and rudimentary patient care.

On October 9, 1915, Read had a brief conversation with Dr. William Welch and Wallace Buttrick, then the director of CMB, when they were visiting the newly acquired UMC. Welch suggested Read, who was about to take his first furlough, to study biochemistry at the Johns Hopkin University.¹⁰

Read spent three years in America, first as a visiting researcher under Professor Walter Jones of the Biochemistry Department at Hopkins, then as a graduate student under the prominent Yale biochemist Lafayette Mendel in the Department of Physiological Chemistry. He published six research papers on the chemistry of yeast nucleic acid while with Jones, an impressive performance that earned him high praise from the professor and likely influenced later the board’s decision favorably on his appointment.¹¹ Read took a summer course

taught by the famed clinical chemist Otto Folin in 1917 at Harvard Medical School, where he became acquainted with Hsien Wu, a Chinese student who had just become Folin's graduate student, and later introduced him to McLean as a candidate for assistant in his division.¹²

The first eighteen months after WWI, from the beginning of 1919 till mid-1920, were not exactly a peaceful time for the new PUMC or for Read. Having returned to Peking in January 1919, he was immediately exposed to some disgruntled personnel situations and personality conflicts. He had to share and fight over laboratory space with Stanley Wilson, the chemistry instructor of the Premedical School, and Hartley Embrey, a food chemist, as the construction of his own laboratory was severely delayed. Moreover, he had to compete with Wilson regarding the time of their shared assistant, and manage the awkward relationship with Embrey, who was placed in his division by McLean, but only in name. A major disappointment came in April 1920, when Read learned indirectly that McLean had hired Hsien Wu as his own assistant of chemistry in the Department of Medicine, instead of an assistant in his division, as Read had understood all along.¹³ But the real challenge for Read was to develop research projects of his own to fulfill the PUMC's mandate on its senior faculty. His experience with Jones at Hopkins, although very positive, probably also made him aware of his lack of appetite for pure biochemical problems and pushed him to search for areas where his true academic passion might be.

Read had clearly demonstrated his interest in investigating Chinese foods and CMM while in Mendel's food biochemistry laboratory. In February 1918, he submitted one of the earliest scientific reports on Chinese food, in which he reviewed food value and therapeutic activity of lychee, and reported his preliminary chemical analyses on the fruit, in addition to the details of a very small animal feeding experiment.¹⁴ Later in the year, after learning about Dr. Ralph Mills's work on CMM and seeing the samples brought by Mills to the CMB office in New York, the inspired Read wrote to Buttrick:

I hope that its continuance and final completion along chemical and botanical line may be conducted by the Peking Union Medical

College. Might I suggest that a committee be formed to take up this matter? We need especially one or more men to direct the investigations which will naturally be men in the various scientific departments of our school and other schools in China.”¹⁵

This was probably the first attempt to associate the PUMC with any research related to CMM and Read’s first undisguised interest in being involved with it.

When he first returned to Peking, Read had clearly planned to continue Chinese food research and be involved in materia medica, perhaps with special attention paid to those of Chinese origin. But neither of these was within his official capacity at the PUMC or aligned with the mandate specified for him by McLean. Furthermore, the investigation of Chinese food had become an overcrowded space at the new college, with both Wilson and Embrey working on the problem.¹⁶ His work on materia medica, such as contributing short reviews to various journals on new preparation methods and tests for products from plant sources, along with commentaries on CMM, provided useful information for the medical missionary community, but they were all non-research in nature.¹⁷

In line with his official capacity as the lead physiological chemist, Read had quantified various metabolites in urine samples collected from humans and biologically interesting animal models, sometimes in collaboration with clinicians. However, this research space also became narrower when he was asked by McLean, in late spring 1920, to divide the work with Wu. Read complied to the request by yielding the clinically related analyses to Wu and focused his effort on establishing the standards of some physiological parameters for healthy Chinese.¹⁸

His semi-official appointment to lead the department on an interim basis also turned out to be a mixed blessing, as its unsustainable nature also caused his concern, justifiable or not, of “disregarding [by an unknown future boss] the large amount of work he had done in organization” and “a feeling that perhaps the Trustees may not be satisfied because the department has not been able to do research work”.¹⁹

On August 1, 1920, Vincent sent a cablegram to Henry Houghton, PUMC's acting director since McLean's resignation, enquiring about Read's willingness to be a substitute pharmacology instructor.²⁰ Read was likely inspired by the message, since it suggested, at least in Vincent's mind, that he was qualified to teach pharmacology. More importantly, the perspective of securing a bona fide experimental pharmacologist for the college in the near future was rather bleak, in contrast to the time when Dr. Alice Rohde, an acquaintance from his Hopkins days, was to be appointed the lead pharmacologist. To him, a transfer to the Pharmacology Division, a non-option merely two months ago, suddenly became plausible. Read apparently shared his wish with and secured support from Houghton. In his reply to Vincent's urgent request, Houghton not only affirmed Read's cooperative spirit in covering pharmacology instruction, "Professor Read is cheerful and enthusiastic in taking on this added burden," but moreover, voiced PUMC's view on the ongoing recruiting effort and hinted a potential alternative. Houghton wrote:

Read has expressed the hope, in which I join, that no hasty selection should be made for meeting the instruction in this field. We realize the paucity of pharmacologists in the United States. The problem of securing a suitable person for this position is one of the things which I wish to discuss particularly with the officers upon my arrival in New York this autumn.²¹

The Saga of the Mills Collection

Many CMB members and the PUMC trustees had some exposure to CMM at times, especially during their visits to China, but the Mills Collection probably represented their first intimate encounter with any actual materials and literature, as well as their first chance to decide any research proposal on such.

Ralph Garfield Mills was the first head and the professor of the Department of Pathology at the PUMC. After graduating from the Northwestern University School of Medicine in 1907, Mills spent ten years in Korea (1908-1918), first as a field medical missionary. After a year of training in pathology at the University

of Chicago, he served for five years as the professor of pathology and director of the research department at the Severance Union Medical College in Seoul. During that time, he devoted much time to two lines of bibliographical work.²² With the help of his Korean assistants who were proficient in Chinese and Japanese, he translated into English (1) abstracts or synopses of research papers selected from major Japanese medical journals, and (2) some Chinese classic medical texts such as parts of the late 16th century *Compendium of Chinese Materia Medica (Pen Ts'ao Kang Mu)*. He also purchased native drug specimens from the local drugstores and from Chinese markets, and performed some preliminary taxonomical and chemical analyses, making him the first American in the Far East who subjected the native drugs to scientific research.²³

Mills had made his interest and work in Asian drugs known to Flexner and McLean, his family friend, as early as 1916, and to other key CMB members starting in the summer of 1918, when he returned to America for further pathology training in preparation for his PUMC responsibility. Although Mills understood that the new environs and job prospect made it impractical for him to continue his cherished projects, he had been very adamant in keeping them somehow alive, hopefully with the financial support from CMB.²⁴ Struggling to articulate his objectives and plan, Mills nevertheless persistently presented his requests and the samples he brought to America to the key stakeholders. He also reached out to academic experts to gauge their interests, leverage their feedback, and explore possible modes of collaboration.

Initially, few board members were enthusiastic about Mills's request. Buttrick, probably Mills's earliest supporter, admitted to Embree his minority opinion position in the early days, "I was not in accord with most of the members of our Board when I say that I have from the beginning felt that the CMB might properly make an appropriation in order that the material may become available for science."²⁵ Vincent was certainly more skeptical about the value of the collection and cautious in making any commitment. After receiving rather dismissive feedback from the University of Michigan pharmacognosist Henry Kraemer, he effectively ignored Mills's follow-up inquiry on the subject.²⁶ Flexner, in his rather frequent correspondence with Mills between 1917 and

1920, almost never commented on the materia medica work and repeatedly reminded Mills to focus on his pathology work.²⁷ Although McLean was quite accommodating to his friend all along, he was supportive more in principle than action²⁸.

The discussion on the Mills Collection was on again and off again among all the concerning parties after the initial phase of exchange in the fall of 1918. The board members' indecisive and noncommittal attitude changed in the spring of 1920. At least two consensuses were reached among the key decision makers. First, some further studies on the collection were warranted, and second, the collection and associated investigation should be handled by the PUMC's Pharmacology Division. Buttrick first came up with the idea of assigning these to that division in May, telling Embree that "It occurred to me to ask why could not the Department of Pharmacology at Peking do this work when that department shall be established?"²⁹ On this, other key board members quickly concurred.

The evolving view might be attributed to the internal reflection on the PUMC's research objectives and an external competition on the material. Among the PUMC's three scientific aims, codified by McLean and endorsed by the trustees on April 14, 1920, one was "to afford opportunities for research, especially with reference to problems peculiar to the Far East".³⁰ Investigation of CMM would be viewed by most board members an alignment with the direction, although no document shown a direct link is seen.

A more definitive influence was from Edward Kremers, the renowned pharmacy professor and phytochemist at the University of Wisconsin School of Pharmacy. In March, he contacted McLean and Mills to explore the possibility of accessing the collection. While McLean, the outgoing director at the time, was more than happy to leave the affairs to Embree and others, Mills was eager to secure a collaborator in America to continue his project before leaving for Peking in the summer. After a visit to Kremers in mid-April, he was firmly convinced that the professor, who had the right research expertise and assistance (from his Chinese students, including K.K. Chen), and more importantly, a strong interest

in his collection, was a perfect fit for the purpose and brokered a meeting for the professor and Embree.³¹ Kremers's request of financial support for acquisition of and investigation on the Mills material was declined by the CMB, citing that subsidizing an American institution was outside its scope of work, but his enthusiastic pursuit of the collected material prompted an immediate commitment from the board to acquire the collection for the Peking school³². The board's final action on the matter, however, was taken later in the year, when Vincent assigned it to Richard Pearce, the director of the RF's Medical Education Division. In a memo to Pearce which included this item, Vincent not only referred to the Mills Collection, known to him for two years as "a good deal of valuable material on Chinese materia medica", but also enclosed the correspondence from Kremers.³³

The Reorganization of the Physiological Science Units and the Inception of the CMM Program, a Triumph for All?

George Vincent had begun involving Pearce in PUMC affairs starting in March 1920. Soon after McLean's resignation, he decided to send Pearce as a special envoy to Peking in the fall, with the mission, in his words, to those in Peking, "as an expert in medical education, to study the problems of organization and administration and to put his suggestions and advice at the service of the Peking group."³⁴ Pearce would accomplish this "as a counselor to the PUMC, and during Houghton's absence, Acting Director of the College."³⁵

During the few short months prior to his China voyage, Pearce had witnessed Vincent's struggle in recruiting a pharmacologist for Peking. On the same day he decided to cable Houghton for Read's help, Vincent also told Pearce that "we are anxious to secure someone for this position as soon as possible."³⁶ Using his academic connections and other opportunities, Pearce quickly managed to "reserve" Carl Schmidt, a young experimental pharmacologist at the University of Pennsylvania, as a candidate for pharmacology instructor, and secured

Archibald Macallum from McGill University as visiting professor for the Physiology Department. However, neither could immediately ease the department's staffing deficiency stress. Pearce also reached out to the American Society of Pharmacology to solicit members who might be interested in and be fit for the PUMC position. The feedback was essentially a validation of the previous recruiting experience, as disappointingly, it yielded only the name of one pharmacologist³⁷.

Vincent had prepared a long list of issues for Pearce to address in Peking, among which was one specifically about enabling the board to take a formal action on the Mills Collection. The resolution of the two year-long issue turned out rather straightforward, since SUMC, the collection's official custodian, was willing to turn the materials over freely to the PUMC. The institutions reached a preliminary agreement in early November 1920,³⁸ and Bernard Read, on behalf of PUMC's Physiology Department, committed to "see this material is gradually worked out in the normal line of work [of the Department]."³⁹ Further discussions on the arrangements between Mills, Read, Pearce, and Dr. Alfred Ludlow of the SUMC continued, and the matter was settled satisfactorily at the end of the year. A memorandum from Pearce to Vincent and the CMB, issued on December 10, 1920, stipulated the PUMC as the primary curator of the collection and its commitment of studying the materials. "The material will, as soon as professor of pharmacology is appointed to the PUMC, be turned over to him...and during a course of several years, be satisfactorily investigated. Until a professor of pharmacology is appointed, Mr. B. E. Read will act as curator of this material."⁴⁰ Pearce also purposely included in the memo a cautionary term regarding the budget for the investigation that "the PUMC makes no promise concerning special appropriations to cover the cost of this work, but guarantees that as part of the research effort of the department of pharmacology."⁴¹ This note was consistent with his communication with Vincent a month earlier that "no increase in expenditure is necessary with the exception of the addition of one or possibly two clerks."⁴²

The commitment to the SUMC, although somewhat vague, certainly positioned Read favorably in pursuing his interest in CMM research. However, it was

Pearce's presence in Peking that enabled Read to discuss his desire of transferring to pharmacology with someone having direct access to Vincent much sooner than Houghton's scheduled trip to New York. Read already had several meetings with Pearce on these subjects and quickly gained his support, while the terms of the Mills Collection hand-over were still under negotiation⁴³. By late November 1920, Pearce seemed to have made up his mind to recommend Read for the lead pharmacologist position. The justifications for such, as he detailed to Vincent specifically, included the importance of CMM research in China, the commitment on investigating the Mills Collection material, Read's interest in CMM, even his credentials in pharmacy, and, with no surprise, the difficulty of recruiting a pharmacologist.⁴⁴ What is noticeable though, was his projection that "the result of Read's knowledge of the country (China) and people could stimulate enormously the introduction of a western pharmacopeia and the setting aside of the useless part of Chinese pharmacopeia."⁴⁵ This was an interesting spin related to the value propositions Houghton had shared with Embree in early summer, 1920, in his anticipation of appointing Alice Rohde. To advocate the necessity of studying Chinese drugs by the Pharmacology Division, Houghton speculated that "it would appear fundamental to the planting of western medicine in China that we find out and recognize the worth of her own material, hoping that our own may in turn receive just recognition from her."⁴⁶ The point, likely shared with Pearce by him and/or Read, touched on the "Chinese susceptibility," which the RF and CMB officers, Vincent included, were conscious about. However, no document suggests either of these arguments, even if they were genuine, had played a part in motivating the CMB in its decisions on acquiring the Mills Collection or transferring Read to the Pharmacology Division.⁴⁷

At the same time that Pearce was considering Read for the new assignment, he was also contemplating alternative ways of organizing the Physiology Department, in part to respond to an unexpectedly personal clash between Read and Cruickshank. Arrived at Peking the same time as Pearce, Cruickshank soon realized that the department was already under Read's management. This, in his view, contradicted the promise given by McLean in April when he accepted the job offer. However, Read, who was already deeply concerned with the

unsettling organizational future of the department and probably felt insecure by the arrival of a compatriot with a better academic credential, had his interpretation of McLean's statement. Regardless, the situation was presented to Pearce for a resolution, only days after his arrival in Peking.⁴⁸

Pearce laid out before Vincent several schemes and scenarios for organizing the department as possible solutions to the personal conflicts and remedies to the administrative confusion caused by McLean's mixed messages. Most plans were still fixed on the single department structure and would entail recruiting at least one senior faculty,⁴⁹ since Pearce felt neither man possessed the qualities for department head. However, his ideas evolved and by December, about a month into his acting directorship, Pearce had decided on a more drastic yet simpler option by dividing the Physiology Department. The new plan would elevate the Physiology Division to an independent department status, with Cruickshank as its head, and keep the other two divisions temporarily in a single department under Read, with a prospect of gradually promoting both to independent departments, with Pharmacology headed by Read and Physiological Chemistry under Wu, respectively. He submitted the proposal to the boards in late January 1921, after a few confidential deliberations with Vincent. It was met only with minor reservations before a formal approval by the board on February 21, 1921.⁵⁰

To the CMB members and the PUMC trustees, this reorganization was probably not as radical as it appeared. It immediately ended a prolonged and agonizing recruitment conundrum and aligned with the aggressive budgetary control measures which Vincent and Embree had been forcing to tame the PUMC's rapid expansion and associated blooming cost. Hiring foreign staff and maintaining their living in Peking constituted a major budgetary burden.⁵¹ The board members and the foundation officers, therefore, would have likely favored a plan to minimize such. For all directly concerned parties, the organizational change positively impacted their professional growth, far greater than merely deflating personal tension. Cruickshank and Wu, two demoralized new hires who had accepted their offers so reluctantly, were motivated by the new opportunities at the beginning of their PUMC careers. Read, although he

lost his short-lived control of the combined department and his assistant in the personnel reshuffling, nevertheless was able to end his struggle in research direction and finally pursue his scientific interest in his formal capacity at the college, already with the acquired Mills Collection as a good head start.

Read's insufficient qualifications for his new position might not have even been apparent to Vincent, Embree, and other board members, who were nescient in pharmacology or medical science, in general. But Pearce, Houghton, and probably Roger Greene, who became the director of CMB in late 1921, were keenly aware of the fact that, unlike Cruickshank and Wu, who had fair credentials in their respective specialties, Read had none to claim in experimental pharmacology. This probably made him even more underqualified than his appointment to lead Physiological Chemistry, and likely would compromise the Pharmacology Division's research and instruction quality. In the ensuing year, they had made concerted efforts to rectify this problem. The serendipitous success of the ephedrine work greatly elevated the department's academic standing and sustained its CMM research program till the end of the decade.⁵²

Summary

The CMM research program at the PUMC was conceived in early 1921, when Bernard Read was appointed to lead the Department of Pharmacology and execute investigations on the materials of the Mills Collection. It was the result of a coincidental convergence of two independent events, favorably conditioned on the key decisionmakers' acceptance of the merit of some CMM study and facilitated by their pragmatic dealing with the Physiology Department's staffing shortfall and administrative predicaments. The utterly failed recruitment of an experimental pharmacologist presented Bernard Read, a CMM enthusiastic pharmacist struggling for a more satisfactory career, a timely opportunity of transferring to pharmacology. The PUMC's acquisition of the Mills Collection played a catalytic role in favor of Read's appointment and the Pharmacology Department's immediate engagement in CMM research.

Although the CMM research program produced one of the best-known scientific achievements of Republican Era China, its inception, as shown in this report, was clearly not based on any predefined grand strategic aim deliberated by visionary leadership or by an eminent scientist. On the contrary, the CMB and PUMC decisionmakers had constantly expressed their limited commitment to CMM research during the course of 1920. Although the program was, in part, to fulfill an unspecified commitment to the SUMC, it was also different from a “top down” assignment designed for a specific purpose by the institution, such as hiring Hartley Embrey for the nutritional analysis of Chinese food. Instead, it was driven fully by Read’s scientific interest and research strategies, along with the notion of academic freedom to which all PUMC senior faculty members were entitled, and effectively ended with Read’s departure in 1931.

¹ Bernard E. Read. Peking Union Medical College Department of Pharmacology, in “Methods and Problems of Medical Education,” Third series, Rockefeller Foundation, 1925, pp 181-8.

² K. K. Chen and Carl F. Schmidt (1924) “The action of ephedrine, an alkaloid from Ma Huang.” *Proc. Soc. Exp. Biol. Med.* (N.Y.) 21:351-4.

³ CMB, Box 122, Folder 884, letter from F.C. McLean to B.E. Read, Dec. 8, 1917.

⁴ CMB, Box 122, Folder 886, letter from H.J. Smyly to Franklin C. McLean, May 9, 1919.

⁵ Ibid. letter from F.C. McLean to H.S. Houghton, Jan. 3, 1920.

⁶ CMB, Box 122, Folder 888, correspondence between E.W. Cruickshank and F.C. McLean, April 1920.

⁷ CMB, Box 122, Folder 884, memo from H.S. Houghton to R.S. Greene, June 8, 1920.

⁸ CMB, Box 42, Folder 295, letter from F.C. McLean to E.R. Embree, Jan. 24, 1920.

⁹ CMB, Box 122, Folder 883, correspondence between G.E. Vincent and A.B. Macallum, Sept. 27, Oct. 16 and 19, 1920.

¹⁰ RF, RG 4, series I, Box 3, Folder 28, conference of the Commission in Peking, p 6, Oct. 10, 1915.

¹¹ CMB, Box 122, Folder 884, CMB memorandum, Mr. B.E. Read. By W. Buttrick, Oct. 16, 1916.

¹² CMB, Box 122, Folder 884, letter from B.E. Read to F.C. McLean, Jan 23, 1919.

¹³ CMB, Box 73, Folder 511, H.S. Houghton Diary, p67, April 14, 1920.

¹⁴ B. E. Read (1918) “The edible Litchi nut (*Litchi chinensis*).” *J. Am. Chem. Soc.* 40:817-822.

¹⁵ CMB, Box 120, Folder 874, letter from B.E. Read to W. Buttrick, Sept. 24, 1918.

¹⁶ CMB, Box 121, Folder 882, memo from B.E. Read to H.S. Houghton, March 5, 1920.

¹⁷ Ernest C. Faust. “Bibliography of the publications from the laboratories and clinics of the Peking Union Medical College and Hospital for the period from July 1, 1915 to June 30, 1925.” PUMC Press. Pp 38-9.

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- ¹⁸ CMB, Box 122, Folder 884, letters between F.C. McLean and B.E. Read, May 29 and June 30, 1920.
- ¹⁹ CMB, Box 117, Folder 845, R.M. Pearce's comment on "memorandum for Dr. Pearce re China Medical Board, prepared by GEV and MKE on August 12, 1920", pp 19-20.
- ²⁰ CMB, Box 121, Folder 882, cable 196, Aug. 2, 1920. Also see RF, Officers' Diaries, RG 12, G.E. Vincent Diary, 1920. July 29 and 30, 1920.
- ²¹ CMB, Box 121, Folder 882, letter from H.S. Houghton to G.E. Vincent, Sept 21, 1920.
- ²² CMB, Box 116, Folder 839, questionnaire filled out by R.G. Mills, July 27, 1918.
- ²³ CMB, Box 116, Folder 839, letter from R.G. Mills to F.C. McLean, March 19, 1917.
- ²⁴ CMB, Box 116, Folder 839, letter from R.G. Mills to W. Buttrick, Aug. 26, 1918.
- ²⁵ CMB, Box 120, Folder 874, letter from W. Buttrick to E.R. Embree, May 12, 1920.
- ²⁶ CMB, Box 120, Folder 874, correspondences between G.E. Vincent and Henry Kraemer, Oct. 29 and Nov. 6, 1918.
- ²⁷ American Philosophical Society Library, Simon Flexner Papers, Series I, Ralph G. Mills Folder, letter from S. Flexner to R.G. Mills, May 19, 1919 (Simon Flexner APS Microfilm Collection at RAC).
- ²⁸ CMB, Box 120, Folder 874, correspondence between R.G. Mills and F.C. McLean, March 10 and 14, 1920.
- ²⁹ CMB, Box 120, Folder 874, letter from W. Buttrick to E.R. Embree, May 12, 1920.
- ³⁰ Mary E. Ferguson. *China Medical Board and Peking Union Medical College, a chronicle of fruitful collaboration, 1914-1951*. New York: CMB, Inc., 1970, p 44.
- ³¹ CMB, Box 120, Folder 874, letter from R.G. Mills to F.C. McLean, April 22, 1920.
- ³² CMB, Box 120, Folder 874, letter from E.R. Embree to R.G. Mills, May 13, 1920.
- ³³ CMB, Box 64, Folder 1596, memorandum for Dr. Pearce re China Medical Board, August 12, 1920.
- ³⁴ CMB, Box 64, Folder 1596, letter from G.E. Vincent to R.S. Greene, June 24, 1920.
- ³⁵ Ibid.
- ³⁶ CMB, Box 64, Folder 1596, letter from G.E. Vincent to R.M. Pearce, July 29, 1920.
- ³⁷ CMB, Box 64, Folder 1596, letter from E.D. Brown to R.M. Pearce, Sept. 9, 1920.
- ³⁸ CMB, Box 117, Folder 845, R.M. Pearce's comment on "memorandum for Dr. Pearce re China Medical Board, prepared by GEV and MKE on August 12, 1920", p 20.
- ³⁹ RF, Officers' Diaries, RG 12, R.M. Pearce Diary, Nov. 15, 1920 - Feb. 28, 1921. Dec. 10, 1920.
- ⁴⁰ Ibid, Memorandum relating to Chinese Pharmacopeia.
- ⁴¹ Ibid, Dec. 29, 1920.
- ⁴² CMB, Box 117, Folder 845, R.M. Pearce's comment on "memorandum for Dr. Pearce re China Medical Board, prepared by GEV and MKE on August 12, 1920", p20.
- ⁴³ CMB, Box 121, Folder 882, letter from R.M. Pearce to G.E. Vincent, Nov. 11, 1920.
- ⁴⁴ CMB, Box 121, Folder 875, letter from R.M. Pearce to G.E. Vincent, Nov. 24, 1920.
- ⁴⁵ Ibid.
- ⁴⁶ CMB, Box 121, Folder 882, letter H.S. Houghton to E.R. Embree, May 31, 1920
- ⁴⁷ Sean Lei. *Neither donkey nor horse: medicine in the struggle over China's modernity*. Chicago: University of Chicago Press, 2014, pp 88-89. This is the only scholarly work which touched on the reasons behind establishing the CMM program at PUMC, citing one of the two value propositions in the Houghton letter on May 31, 1920, as the sole motivation.

⁴⁸ RF, Officers' Diaries, RG 12, R.M. Pearce Diary, Nov. 15, 1920 - Feb. 28, 1921. Dec. 2, 1920.

⁴⁹ CMB, Box 121, Folder 882, letter from R.M. Pearce to G.E. Vincent, Nov. 11, 1920.

⁵⁰ CMB, Box 42, Folder 296, letter from G.E. Vincent to H.S. Houghton, March 2, 1921. Also see CMB, Box 23, Folder 163, Conference on Peking Union Medical College and China Medical Board, Feb. 18-20, 1921.

⁵¹ Ibid. Also, letter from E.R. Embree to R.M. Pearce, Feb. 1, 1921.

⁵² David Chen. "The rediscovery of ephedrine and the establishment of pharmacology in China." Abstract presented at the 2nd annual meeting of Chinese Society for the History of Science and Technology. Oct. 27-28, 2018, Beijing, China. This study provided the first detailed historiographical narrative of the ephedrine discovery work at the PUMC, including its serendipitous and rediscovery nature, as well as its exceptionally lucky convergence of several technicality advantages. Development of a full manuscript is in progress.