NATIONAL ACADEMY OF SCIENCES

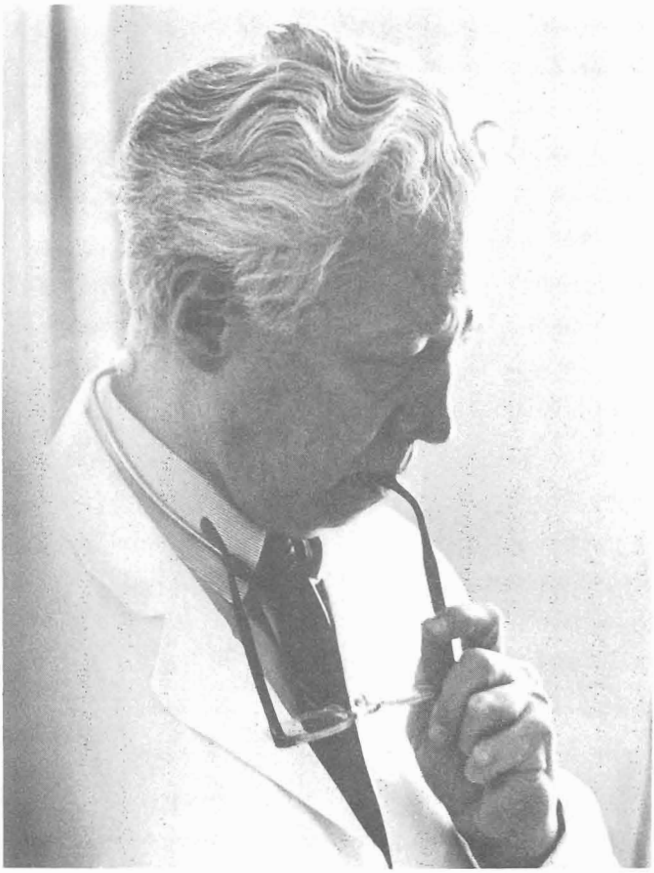
CARL VERNON MOORE

1908—1972

A Biographical Memoir by

OLIVER H. LOWRY

Biographical Memoir



CARL VERNON MOORE

August 21, 1908–August 13, 1972

BY OLIVER H. LOWRY

CARL VERNON MOORE was a truly unique human being. This is said advisedly. I have known no other person who so combined exceptional ability with the most admirable personal traits, including leadership, teaching ability, skill in patient care, modesty, and, above all, consideration and service for others. He also belonged to a new breed of clinicians who thought that basic medical science is too important to be left to the preclinicians.

Many who knew Carl as the epitome of integrity, industriousness, unselfishness, and devotion to medicine may not have realized how human he was and that he may have had a few potential weaknesses like the rest of us, one of which he freely admitted.

Carl Moore was a St. Louisan all his life. He was born in St. Louis and was largely trained there, and there he spent all but four years of his career. His grandmother on his father's side was a relative of Henry Clay. She married a Missouri farmer and died while Carl's father (also Carl Moore) was still a boy. When the grandfather remarried, Carl Moore senior ran away from home and eventually became a St. Louis policeman with no greater ambition than to walk a beat.

Carl's maternal grandmother was married to a factory

worker of German ancestry. They were very poor. The grandmother had to take in washing, and Carl's mother had to leave school after the third grade. At the time of her marriage, she was working in a laundry.

Carl had to work all during his schooling. His interest in medicine may have started at age ten when he began working after school for a drugstore delivering prescriptions on his bicycle. His sense of responsibility, so characteristic all his life, must have impressed the owner, who let him fill capsules and make up prescriptions. During this period Carl and his sister played a game in which he was the doctor and she the nurse.

Other part-time jobs while growing up were trimming trees, running elevators, taking children camping, and working in a box factory. Later in college and medical school, he cleaned houses and set up pins in a bowling alley and during the summers worked as a riveter in the steel mills.

There is no sign that Carl enjoyed having to work so hard. Although he never craved riches, he hated to be poor. However, it would be inaccurate to say he grew up in poverty. There was opportunity to take violin lessons, starting in grade school and continuing into college. He even eventually gave a concert, which he described as being "so terrible that I never played again."

There was also a chance to go to baseball games with his mother and time after school to chase baseballs for the St. Louis Browns during practice. As a result, Carl developed a lifelong love of baseball and knew almost as much about baseball statistics as he did about medicine. He was physically very strong, but to his sorrow had no great athletic ability.

One other extracurricular interest must be mentioned that may come as a surprise to those who knew Carl only on duty. He loved to gamble. His mother was a good card

player, and he often played pinochle with his maternal grandfather. Carl became a very good poker player and would have liked to play every night if he had had the time. He would also have loved to play the stock market. Fortunately, his father convinced him that the odds were usually against the gambler. Because of this and because he recognized his gambling instinct, Carl made very few investments and these were all most conservative.

Three people were especially important in Carl's development: his father, his mother, and the Reverend Paul Press, a minister of the Evangelical Church. Although Carl did not admire his father's lack of ambition, he learned one most significant thing from him. Carl's father, because he was a policeman, often saw people at their worst. He became convinced that people are basically self-interested and greedy, and he persuaded Carl that this is true and that people are primarily motivated by a desire for power.

Consequently, although Carl himself can only be described as noble, and although those around him felt he expected you as well to try to be noble, the fact is that Carl apparently never really did expect people to act unselfishly. Instead, he was prepared for the worst and thereby avoided disappointment in the behavior of others, overlooked their defects, and took great pleasure when they did behave unselfishly.

In contrast to his attitude toward his father, Carl greatly admired his mother, Mary Moore. She had drive and energy, was up early and worked late. But she was gregarious and had a strong sense of humor, which she and Carl shared. She went to church three times a week, more for social than religious reasons. While Carl was still in secondary school, he helped his mother buy a confectionery store, which she ran with the aid of her stepdaughter, and Carl worked there after school (in addition to his other jobs).

It was the Reverend Press who introduced Carl to a liberal religious environment centered around the Eden Seminary, where Paul Press's brother was a professor, and this association led to Carl going into the ministry. Thus, when he graduated from high school (at age fifteen!), he enrolled in Elmhurst College, which is supervised by the Evangelical Church. This was probably against the wishes of Carl's father, who was afraid Carl would become a missionary. Instead, he wanted him to become a doctor!

Richard Niebuhr (brother of Reinhold) was the head of Elmhurst College. On several occasions Carl was stimulated by sitting in on long philosophical-religious arguments between the Niebuhr brothers. This or something else at Elmhurst changed his mind about the ministry. In fact, thereafter he was never a churchgoer; he "couldn't take the time." Having decided, after all, to go into medicine, he left Elmhurst at the end of three years and proceeded to Washington University, where he accomplished what the registrar said could not be done by completing all the medical school requirements in one year.

In medical school three staff members are believed to have been decisive in attracting Carl to medical research: Edward S. West, in the Biochemistry Department, who always kept the door to his laboratory open for students such as Carl; Leo Loeb, professor of pathology; and Joseph Erlanger, professor of physiology and subsequent Nobel laureate.

Carl's house officer training consisted of a half year in pathology and a year and a half in medicine (six months of this while still in medical school). This was followed by an eighteen-month fellowship at Ohio State University with Charles A. Doan, who was one of the last two people to exert a decisive influence on Carl's career. From Doan and his group, Carl acquired his lifelong fascination with hematology and iron metabolism.

In Columbus he also met an even more influential person, his future wife, Dorothy Adams, daughter of a Presbyterian minister, granddaughter of missionaries, recipient of a master's of science in history from Clark University, and dedicated fighter for the rights of man. Having more faith than Carl in people's good intentions, she tended to counterbalance his skepticism on this score.

William Daughaday, a longtime colleague, describes Carl's subsequent career: Returning to Washington University in 1938, Carl proceeded to organize the hematology laboratories of the Department of Medicine. By the late forties, Carl's laboratory was recognized as a leading training center for hematologists, attracting talented fellows from around the world. Carl Moore encouraged his young associates to investigate the importance of immunological mechanisms in accelerated removal of blood cells. This resulted in the classic demonstration by Harrington of antiplatelet antibodies in thrombocytopenic purpura and of antileukocyte antibodies in transfusion reactions by Chaplin and Brittingham. To establish these disease mechanisms, a number of plasma-transfer experiments with high potential risk were undertaken. In characteristic fashion, Carl insisted that he should be a subject for one such experiment. This resulted in hospitalization with a frightening thrombocytopenia.

It was not long before Carl Moore's influence in the school extended beyond hematology. In 1948 Barry Wood asked him to share the departmental burdens as cochairman. They divided the heavy tasks of running the clinical service and charting the course of the department. After Barry Wood resigned the chairmanship of the Department of Medicine in 1955 to return to Johns Hopkins University, it was inevitable that Carl was selected to succeed him.

Carl Moore created a great Department of Medicine by selecting outstanding young men, equipped with experi-

ence in basic scientific disciplines, and providing them with the freedom to develop to their full potential. He recognized that application of the sophisticated techniques of modern science to medical research requires periods of uninterrupted time. He did everything in his power to free his faculty from unreasonable administrative chores and meaningless meetings. To provide the necessary balance, he encouraged respect for the activities of full-time and part-time men who devote most of their time to patient care and teaching.

Although Carl Moore's heart always remained with the Department of Medicine, he did heed the call for help from his medical school on two occasions. From 1953 to 1955 he served as dean, and from 1964 to 1965 he was vice-chancellor for medical affairs. During each period his wisdom and patience carried his school through difficult periods of growth.

Despite his contributions as an investigator and an administrator, Carl Moore was primarily a great teacher of medicine. By steady application and continuous study, he became an excellent general internist. He felt a personal obligation for all the patients on his service and always exhibited the greatest concern for their welfare and sympathy for their suffering. This quality was immediately sensed by house officers and students, and it created an unmatched environment for learning medicine. He was able to achieve the difficult task of building a department with strong investigative interests that at the same time excelled in teaching clinical medicine. He taught students and house officers more by listening and inspiration than by didactic brilliance. His students came to ward rounds primed with information derived from bedside and library study and prepared to contribute. They always found a professor equally well prepared. His "professor's rounds" were always con-

ducted a free discussions, where the lowliest student commanded attention and respect.

Carl Moore's love of teaching never flagged. Even after seventeen years of directing his department, he still approached his teaching with the same enthusiasm and obvious pleasure that he had exhibited at the start of his tenure. In the brief periods when he relinquished "running the service" to his senior associates, he exhibited a restlessness that did not abate until he was back on the wards.

Carl Moore exerted a tremendous influence on many generations of house officers. He took a warm personal interest in their goals and accomplishments. He guided their training more by example than decree, and he had the capacity to inspire superior performance.

In Carl Moore's view, "One of the great privileges accorded the academic clinician is the satisfaction of being a physician and a teacher while he enjoys the luxury of being able to pursue his investigative interests."[1]

What kind of person was Carl Moore? Four of his close associates wrote: He was a truly compassionate physician, never abrupt or hasty, and always available. How moving was the response of his patients to his presence, though so many had fatal diseases.

Carl was uncomplicated. He was an expert on proved formulas for professional and academic achievement, and his department and school were never subjected to risky, untested ventures. He usually spoke last in group deliberations and typically with the best comprehension and analysis.

He was profoundly thoughtful and considerate. He knew that his department was made up of people—not himself, but other people: colleagues, house officers, fellows, students, and nonacademic personnel. All had ready access to him, regardless of an overburdened schedule.

From the Department of Medicine under Carl Moore came

one university president, three vice presidents, three deans, seven department chairmen, and twelve directors of hematology in American medical schools, as well as many men of stature in other fields of internal medicine and in other countries. There are scores of academic and practicing hematologists as well as hundreds of other physicians whose lives were meaningfully influenced by Carl.

In addition to all of these, the at-large indebtedness to Carl Moore is incalculable; the impact he had for twenty-five years on public and private health-related national agencies and organizations directly influenced the form and character of all of medicine, particularly the careers of its academic members.[2]

THE IDEAL DEPARTMENT OF MEDICINE

Carl Moore worried a good deal about how medical schools as a whole, and departments of medicine in particular, could operate without diminishing any of their three missions: teaching, exemplary patient care, and research. He devoted some time to this in his presidential address to the Association of American Physicians in 1964: "One of the great strengths of American medicine certainly is that research is concentrated in our medical schools, where students can be stimulated by creative minds rather than in a large collection of research institutes.

"We have held too long, I think, to the vision that the only desirable member of a department is so broad in his capabilities—a modern version of the renaissance man—that he is a polished clinician, a stirring teacher, and an investigator of great distinction. Many will regard as heresy the statement that this form of tripodal idolatry is in need of reformation. Within any department the responsibilities for patient care, teaching, and research must without question be kept in balance, but the time has come for the

equilibrium to be provided by the department as a whole, rather than to insist that it be provided by each individual. Unless that is done, we are doomed to mediocrity, doomed to lose to other disciplines an increasing number of outstanding young men. I don't see why the capable, productive investigator should not be free to spend 75 or 80 percent of his time in the laboratory provided he is willing to devote his remaining efforts with enthusiasm to teaching and to working at the bedside—as an internist in general and not only within his special field of interest. He must identify himself enough with clinical medicine to become a competent physician, but he doesn't necessarily have to be the standard of reference for every unusual syndrome or to be equally informed in all subspecialty areas.

"If he learns from the house officers, if the resident must interpret the vectorcardiogram for him, there is no cause for embarrassment. He is in good company, as a matter of fact, and the best house officers will be quick to realize and appreciate that many things of importance can be learned from him. While a fair proportion of all research done in a clinical department should admittedly be disease oriented, not all needs to be. The increased understanding of disease that may come from the geneticist working with bacteria, the nephrologist studying cation transport across the toad bladder, the endocrinologist measuring the effect of insulin on the transport of glucose or amino acids across cell membranes, or the coagulationist working with fibrinolytic mechanisms has been demonstrated frequently enough; these activities must not be denied departments of medicine because the relationship to the patient at any given time seems remote. But if arrangements are made to provide this kind of freedom and a major fraction of time for research, the investigator takes on an obligation to use the time well—an obligation to his colleagues who assume a

greater percentage of the teaching and patient care and to our society in general for providing the time, the tools, and the space for his creative efforts. I am constantly amazed by the attitude, evidenced fortunately by only a few, that opportunities such as these are an individual's God-given right rather than one of life's greatest privileges to be earned and safeguarded. The struggle to provide the investigator with 75 to 80 percent of his time for research is wasted effort if he elects to let himself be consumed by an interest in administrative matters or fritters life away by making three project site visits per week.

"The investigator must also be willing to respect the activities of those full-time men in the department who provide the balance for him, the men who devote three-fourths of their efforts to patient care and teaching, who express their intellectual curiosity by studying and describing the clinical manifestations of disease as their contribution to knowledge.

"All I am trying to say is that the clinical investigator closely allied to the basic sciences and the clinical investigator closely allied to the patient are both needed. Given both types of men, a department of medicine can fulfill its function, provide maximum opportunity for growth of each individual, achieve excellence in all three areas of responsibility, and increase steadily in scientific nature. Such departments will become increasingly different from those of the present or the past, but the change is inevitable if we are to participate as important partners in the scientific biological revolution that now surrounds rather than permeates us."[3]

CARL MOORE'S RESEARCH

Moore's scientific contributions were the result of clinical research of the highest order. The term "clinical re-

search" has sometimes carried a slightly derogatory connotation, a step below "pure" research or "laboratory" research. To the contrary, Carl's clinical research could not have been more elegant or rigorous and because it dealt with human beings was an order of magnitude more difficult than the usual laboratory study. His subjects were human beings of all ages, with many inherited differences, and in which the specific disease of interest was often attended by other disease entities. Moore's classical studies proved that clinical research could be made as definitive as the best in any field.

IRON METABOLISM

Carl Moore began his lifelong study of iron transportation and metabolism in health and disease during his postdoctoral fellowship with Charles Doan at Ohio State University. He published altogether more than two dozen papers on the subject beginning in 1937 and ending with a posthumous paper in 1975.

The issue at the outset was how iron is absorbed from the diet and how it is transported around the body. It seemed probable that transport to the tissues is via the blood plasma, but it was hard to be sure because there is 500 times more iron in red blood cell hemoglobin than in the plasma, and it is difficult to separate the plasma without slight hemolysis with release of a significant trace of this hemoglobin. Carl's first paper was therefore devoted to developing an improved analytical method for measuring serum iron and to perfecting a procedure for collecting the necessary large volumes of plasma or serum with minimal red cell damage. His original measurements had to be made with the only device available, a visual colorimeter.

A companion paper describes what are probably the first time curves for serum iron changes after ingestion of oral

doses of iron. Six or eight blood samples (each had to be 50 milliliters in volume!) were drawn for analysis at intervals over a twenty-four-hour period. The subject for the first experiment was Carl Moore. This was only one of many occasions on which he was the guinea pig. Habitually, he first tried out on himself every unpleasant or possibly dangerous diagnostic procedure or any potentially harmful substance.

These serum iron studies, combined with a dog experiment (1939) that ruled out the lymph as a significant means for iron transport, clearly showed that blood plasma is the primary avenue for transferring iron from the intestinal tract to the rest of the body. (This was independently established by Heilmeyer and Plotner,[4] a fact that Moore freely acknowledged.)

With his own analytical iron method, plus the use of radioactive iron, which had just been introduced by Hahn et al.,[5] Moore and his group now launched a series of classical studies of iron absorption and utilization in a wide variety of blood diseases as well as in normal men and women. The care and thoroughness with which each patient was studied was a model for clinical investigation in general.

This work established or confirmed the following: (1) Iron is absorbed chiefly from the duodenum, to a lesser extent from the jejunum, and not at all from the colon. (2) Low-serum iron levels are a reliable index of iron deficiency. (3) If anemia is due to iron deficiency, most of the initially absorbed iron is rapidly incorporated into the new red cells. If the anemia is due to a defect in hemoglobin synthesis, most of the absorbed iron enters the tissue stores but is available for hemoglobin synthesis if and when the defect is cured. (4) The absorption of iron from the diet is extremely variable but rarely amounts to more than 10 percent of that ingested and over long time periods is only

sufficient to balance the very small losses from the body. (5) Absorption is affected by the chemical form of the iron and by other components of the diet as well as by the presence or absence of iron deficiency. Moore used built-in radioactive iron to test the availability of iron from different foodstuffs. For this purpose, he himself grew vegetables with radioactive iron in the soil and raised chickens and rabbits with radioactive iron in their diets.

THROMBOCYTOPENIC PURPURA

Thrombocytopenic purpura is a condition with hemorrhage caused by a deficiency of blood platelets (thrombocytes), which are required for normal blood coagulation. With Dr. William Harrington in the lead, Moore and his laboratory (1951, 1953) showed that this disease is caused by circulating antibodies that destroy the platelets. As part of the proof, a pint of a patient's plasma was injected into normal volunteers. Harrington and Moore were two of the first volunteers. Their platelet counts rapidly fell to dangerous levels, and both had to be hospitalized for a week.

As a follow-up with Drs. Steinkamp and Dubach (1955), it was shown that certain drug reactions (e.g., to quinine) were caused by a similar immunological reaction, but in this case the allergen (i.e., the drug) had to be present for the reaction with platelets to occur.

OTHER HEMATOLOGICAL STUDIES

There were many other hematological studies from Moore's laboratory. The following mentions some of them. His laboratory contributed much valuable information about the hematology of pernicious anemia, the nature and roles of intrinsic factor, extrinsic factor, and folic acid, which had erroneously been thought to be the extrinsic factor (now known to be vitamin B-12).

A study with over 100 patients treated with radioactive phosphorous (^{32}P) for a wide variety of blood diseases and blood-cell-related tumors showed that ^{32}P is of no value for some of these (e.g., lymphosarcomas); no better than X-ray for others (e.g., lymphatic leukemia); and is the treatment of choice for polycythemia (excessive numbers of red blood cells). (Since then, better means of treatment for polycythemia have been discovered.)

Important contributions were made to the mechanism of biosynthesis of heme and hemoglobin and the effect of oxygen on hemoglobin metabolism and red blood cell formation. Several genetic blood diseases were studied in great detail, particularly sickle cell anemia and thalassemia and their effects on hemoglobin metabolism.

EDITORSHIPS

Moore was in constant demand as an editor and contributor of textbook chapters and for major medical reviews. The preface of the fourteenth edition of *Cecil's Textbook of Medicine* says:

> When the planning for the present edition was just getting under way, Carl Moore died suddenly, to be mourned by friends and students everywhere. He had contributed powerfully to the development of his section on Hematologic and Hematopoietic Diseases, and because of his great experience and breadth of understanding had been able to write about one quarter of that section himself. We believe that his Introduction to Hematologic Diseases in the eleventh to thirteenth editions deserves to rank with another Cecil "classic," Fuller Albright's Introduction to the Endocrine section, which appeared in the seventh to tenth editions. We prized Moore's association with the book not only for the standard of his own section but also for his advice about organization of the entire work.

EPITAPH

We frequently hear that a strong research interest and

compassion at the bedside are antithetical qualities not to be found in the same man. Carl was an outstanding example of the fallacy of this view. In the care of his own patients he communicated a degree of concern and sensitivity rarely encountered.[6]

Carl was one of the kindest and most gentle men I have known. He never forgot that a patient was a human being and not just an interesting case. He listened to everyone. He appeared to have as much time to talk about baseball with Will Anderson as he had to talk to a staff member about departmental affairs.[7]

Carl led his associates in a low-keyed manner, but lead them he did. He relied on his personal example to spur them to heights greater than they would otherwise have achieved. He appeared shy and humble to the casual observer, yet his was an intricate mixture of pride and humility.

Carl was an excellent poker player, and I often thought his talent served him well in creating a team out of the diverse personalities in his department. Only once I called his bluff and found him without a pat hand. When Carl was elected to the National Academy of Sciences in 1970, the members of the department of medicine held an impromptu champagne fest in the laboratory. After a few glasses of champagne we walked out of Wohl Hospital together. "It's a great honor for Washington University, but I wish it had gone to some younger man on the faculty rather than to me," Carl confided. In answer to my "incredulous profanity," he puffed his pipe, chuckled quietly, and walked away.[8]

Carl Moore was a man who looked on medicine and his daily work in the medical center as a privilege and a joy and as a means of attaining personal rewards far higher than fame, financial gain, or stature in society. For him the

satisfaction of helping others led to his giving all his energy to the task before him, whether it was planning a complex new project, conducting student rounds, or helping a total stranger find his way in the hospital.

Carl was always willing to drive himself a bit harder, to go the second mile, to achieve the goals that he had decided were worthwhile. For those with whom he dealt whose ambition and maneuvering led to meanness and petty bickering, he had nothing but contempt in his heart but remarkably little rancor in his speech. He was a humble man. His humility was a source of wonder and even distrust to some of the powerful and arrogant people with whom his high offices brought him into contact.

Carl had a disarming simplicity and directness to his speech, with a knack for saying the proper thing; his writing reflected this simplicity with careful elimination of all that was wordy, flowery, or trite. Many people awed by his position, his international reputation, and his leonine visage were not privileged to see his pervading warmth, sensitivity, and attention to the small things that helped to righten the lives of friends he made wherever he went.

Carl Moore, despite his remarkable achievements, was not a genius whose every effort met with easy success. His achievements were the result of hard work. He recognized the superior intellectual endowments of a number of his associates, and without jealousy he encouraged them to excel and to reap their due rewards. His ambition was for his department, his school, and the fulfillment of the task at hand, not for his own personal aggrandizement.

I am left with the vision of a man whose life revolved around his desire to get on with the tasks he identified as being important, to tackle them with all the intensity he could muster without sparing himself in the effort, but along the way he radiated sensitivity, warmth, integrity, simplicity,

and humility that struck a chord in the hearts of people who knew him, a chord that helped restore faith in man's basic humanity.[9]

I AM GREATLY INDEBTED to Dorothy Moore for the details about Carl Moore's family background and his own early years.

NOTES

1. W. J. Daughaday, *American Journal of Medicine,* 54(1973):140–42.
2. W. J. Harrington, E. B. Brown, E. H. Reinhard, and V. Loeb, Jr., *Blood,* 40(1972):771–74.
3. Carl Moore, "Presidential Address: Behold Now Behemoth," *Transactions of the Association of American Physicians,* 77(1964):1–7.
4. L. Heilmeyer and K. Plotner, *Das Serumelsen und die Eisenmangelkrankheit* (Pathogenesis, Symptomatology and Therapy) (Jena, Germany: Gustav Fischer, 1937).
5. P. F. Hahn, W. F. Bale, E. O. Lawrence, and G. H. Whipple, "Radioactive Iron and Its Metabolism in Anemia," *Journal of the American Medical Association,* 111(1938):2285–86.
6. M. Kenton King, *Outlook,* 1972, vol. 9, p. 1 .
7. Ibid., Virginia Minnich, p. 2.
8. Ibid., Philip W. Majerus, p. 5.
9. Ibid., Elmer B. Brown, p. 5.

HONORS AND DISTINCTIONS

DEGREES

1928 A.B., Washington University
1932 M.D. (cum laude), Washington University School of Medicine
1955 LL.D., Elmhurst College

UNIVERSITY AND HOSPITAL APPOINTMENTS

1932–34 Internship and residency, Department of Medicine, Barnes Hospital, St. Louis, Missouri
1934–35 National Research Council Fellow in Medicine, Ohio State University
1935–36 Instructor in Medical Research, Ohio State University
1936–38 Assistant Professor of Medicine, Ohio State University
1938–41 Assistant Professor of Medicine, Washington University
1941–46 Associate Professor of Medicine, Washington University
1946–55 Professor of Medicine, Washington University
1953–55 Dean of the School of Medicine, Washington University
1955–72 Busch Professor of Medicine and Head of Department, Washington University
1964–65 Vice Chancellor-in-Charge of Medical Affairs, Washington University

MEMBERSHIP IN AMERICAN ORGANIZATIONS AND SOCIETIES

American Association for the Advancement of Science, Fellow
American College of Physicians, Fellow (Governor for Missouri, 1953–56; Vice President, 1960–61; Regent, 1961–72)
American Institute of Nutrition
American Medical Association, Fellow (Secretary, Section on Experimental Medicine and Therapeutics, 1946–49; Vice Chairman, 1949–50; Chairman, 1950–51)
American Society for Clinical Investigation (Vice President, 1952–53; President, 1953–54)
American Society of Experimental Pathology
American Society of Hematology (President, 1959–60)

Association of American Physicians (Councillor, 1956–61; Vice President, 1962–63; President, 1963–64)
Central Interurban Club
Central Society for Clinical Research (Secretary-Treasurer, 1939–44; Vice President, 1945–46; President, 1946–47)
International Society of Hematology (Vice President, 1960–66; President, 1966–68)
St. Louis Society of Internal Medicine
Society for Experimental Biology and Medicine

COMMITTEES

1946–49	Member, Hematology Panel, Division of Research Grants and Developments, U.S. Public Health Service
1951–56	Chairman, Hematology Panel, Division of Research Grants and Developments, U.S. Public Health Service
1952–56	Chairman, Hematology Study Section, National Institutes of Health
1953–60	Chairman, Blood and Blood Derivatives Committee, National Research Council
1955–72	Part-time Consultant, Research and Development Program, Department of Defense
1956–58	Member, Advisory Committee on Institutional Research Grants, American Cancer Society
1956–64	Consultant, Clinical Center, National Institutes of Health
1956–72	Member, U.S.P. XVI Panel on Hematology
1957–59	Member, National Cancer Institute Board of Scientific Counselors
1958–62	Member, National Advisory Arthritis and Metabolic Diseases Council, and National Institutes of Health
1959	Member, Advisory Committee, Burroughs Wellcome Fund
1959–60	Special Advisor, Committee on Clinical Research Centers, National Advisory Health Council, National Institutes of Health
1960–66	Member, Advisory Committee for Biology and Medicine, Atomic Energy Commission
1961–62	Member, Council on Foods and Nutrition, American Medical Association
1967–72	Member, American Board on Nutrition
1967–72	Member, Norman Jolliffe Medical Student Fellowship

Awards Committee, American Society for Clinical Nutrition

1967–72 Consultant, Hematology Advisory Committee, Food and Drug Administration

1967–72 Chairman, Advisory Council, Life Insurance Medical Research Fund

1967–72 Member, Panel of Expert Consultants to Assist the Technical Committee, Pakistan-SEATO Cholera Research Laboratory

1968–72 Member, National Advisory Arthritis and Metabolic Diseases Council, and National Institutes of Health

EDITORSHIPS

1942–44 Assistant Editor, *Nutrition Reviews*

1944–49 Editor, *Journal of Laboratory and Clinical Medicine*

1949–53 Editorial Board, *Journal of Laboratory and Clinical Medicine*

1944–72 Editorial Board, *Blood*

1950–53 Editorial Board, *Journal of Nutrition*

1955–72 Editorial Board, *American Journal of Medicine*

1955–72 Editorial Board, *Journal of Chronic Diseases*

1956–66 Editorial Board, *Modern Medical Monographs*

1964–71 Coeditor, *Progress in Hematology*

1967–71 Coeditor, *Cecil's Textbook of Medicine*

HONORS

1955 Modern Medicine Award for Distinguished Achievement

1958 Elected as Affiliate of the Royal Society of Medicine, London

1959 Joseph Goldberger Award in Clinical Nutrition, American Medical Association

1962 William McIlrath Guest Professor of Medicine, Royal Prince Alfred Hospital, Sydney, Australia

1962 Honorary Life Member, Haematology Society of Australia

1962 Alumni Award, Washington University

1964 Stratton Medal, International Society of Hematology

1967 Elected as Fellow of the American Academy of Arts and Sciences

1968 Corresponding Member, German Society of Hematology

1970 Elected Member of the National Academy of Sciences
1970 John Phillips Memorial Award for Distinguished Contributions in Internal Medicine, American College of Physicians
1970 Centennial Achievement Award of Ohio State University
1971 Flexner Award of the Association of American Medical Colleges
1972 Master of the America College of Physicians (Posthumous)

BIBLIOGRAPHY

1935

With V. Suntzeff and L. Loeb. The specific nature of the inhibition of the coagulating effect exerted by tissue extracts on plasma resulting from incubation of tissue extract with blood serum. *Am. J. Physiol.* 114:1–18.

1937

With C. A. Doan and W. Arrowsmith. Studies in iron transportation and metabolism. II. The mechanism of iron transportation. Its significance in iron utilization in anemic states of varied etiology. *J. Clin. Invest.* 16:627–48.

1939

With W. Arrowsmith, J. Welch, and V. Minnich. Studies in iron transportation and metabolism. IV. Observations on the absorption of iron from the gastro-intestinal tract. *J. Clin. Invest.* 18:553–80.

1940

With V. Minnich, S. T. Wright, and T. D. Spies. Whole blood and plasma ascorbic acid concentrations in patients with pellagra and associated deficiency diseases. *Proc. Soc. Exp. Biol. Med.* 45:441–46.

1943

With V. Minnich, R. W. Vilter, and T. D. Spies. Hypochromic anemia in patients with deficiency of the vitamin B complex: Response to iron therapy with and without yeast. *JAMA* 121:245–49.

1944

With E. H. Reinhard, R. Dubach, and L. J. Wade. Depressant effects of high concentrations of inspired oxygen on erythrocytogenesis. Observations on patients with sickle cell anemia with a description of the observed toxic manifestations of oxygen. *J. Clin. Invest.* 23:682–98.

With L. A. Hempelmann, Jr., E. H. Reinhard, O. S. Bierbaum, and

S. Moore. Hematologic complications of therapy with radioactive phosphorus. *J. Lab. Clin. Med.* 29:1020–41.

With R. Vilter, V. Minnich, and T. D. Spies. Nutritional macrocytic anemia in patients with pellagra or deficiency of the vitamin B complex. *J. Lab. Clin. Med.* 29:1226–55.

1945

With O. S. Bierbaum, A. D. Welch, and L. D. Wright. The activity of synthetic lactobacillus casei factor ("folic acid") as an antipernicious anemia substance. I. Observations on four patients: two with Addisonian pernicious anemia, one with nontropical sprue and one with pernicious anemia of pregnancy. *J. Lab. Clin. Med.* 30:1056–69.

1946

With E. H. Reinhard, O. S. Bierbaum, and S. Moore. Radioactive phosphorus as a therapeutic agent. A review of the literature and analysis of the results of treatment of 155 patients with various blood dyscrasias, lymphomas, and other malignant neoplastic diseases. *J. Lab. Clin. Med.* 31:107–218.

With R. Dubach and V. Minnich. Studies in iron transportation and metabolism. V. Utilization of intravenously injected radioactive iron for hemoglobin synthesis, and an evaluation of the radioactive iron method for studying iron absorption. *J. Lab. Clin. Med.* 31:1201–22.

1949

With J. C. Tinsley, R. Dubach, V. Minnich, and M. Grinstein. The role of oxygen in the regulation of erythropoiesis. Depression of the rate of delivery of new red cells to the blood by high concentrations of inspired oxygen. *J. Clin. Invest.* 28:1544–64.

1950

With M. Grinstein, M. D. Kamen, and H. M. Wikoff. Isotopic studies of porphyrin and hemoglobin metabolism. I. Biosynthesis of coproporphyrin I and its relationship to hemoglobin metabolism. *J. Biol. Chem.* 182:715–21.

With V. Minnich, D. E. Smith, and G. V. Elliott. Studies on the

acute toxic effects of 4-amino-pteroyl-glutamic acid in dogs, guinea pigs and rabbits. *Arch. Pathol.* 50:787–99.

1951

With R. Dubach. Observations on the absorption of iron from foods tagged with radioiron. *Trans. Assoc. Am. Phys.* 64:245–56.

With W. J. Harrington, V. Minnich, and J. W. Hollingsworth. Demonstration of a thrombocytopenic factor in the blood of patients with thrombocytopenic purpura. *J. Lab. Clin. Med.* 38:1–10.

1953

With W. J. Harrington, C. C. Sprague, V. Minnich, R. C. Ahlvin, and R. Dubach. Immunologic mechanisms in idiopathic and neonatal thrombocytopenic purpura. *Ann. Int. Med.* 38:433–69.

1955

With R. Dubach and S. Callender. Studies in iron transportation and metabolism. IX. The excretion of iron as measured by the isotope technique. *J. Lab. Clin. Med.* 45:599–615.

1957

With E. B. Brown, R. Dubach, D. E. Smith, and C. Reynafarje. Studies in iron transportation and metabolism. X. Long-term iron overload in dogs. *J. Lab. Clin. Med.* 50:862–93.

1958

With E. B. Brown and R. Dubach. Studies in iron transportation and metabolism. XI. Critical analysis of mucosal block by large doses of inorganic iron in human subjects. *J. Lab. Clin. Med.* 52:335–55.

1959

With M. Grinstein and R. M. Bannerman. The utilization of protoporphyrin 9 in heme synthesis. *Blood* 14:476–85.

1962

With V. Minnich, J. K. Cordonnier, and W. J. Williams. Alpha, beta and gamma hemoglobin polypeptide chains during the neonatal

period with description of a fetal form of hemoglobin D. *Blood* 19:137–67.

1964

Presidential address: Behold now behemoth. *Trans. Assoc. Am. Physicians* 77:1–7.

1966

The angry medical student and the changing face of medicine. *The Pharos of Alpha Omega Alpha* 29:72–77.

1975

Iron and hypochromic anemia. *Prog. Food Nutr. Sci.* 1:245–62.