Alfred Newton Richards, 1876-1966

C. F. Schmidt


**Email alerting service**

Receive free email alerts when new articles cite this article - sign up in the box at the top right-hand corner of the article or click [here](http://rsbm.royalsocietypublishing.org/subscriptions)
ALFRED NEWTON RICHARDS
1876-1966
Elected For. Mem. R.S. 1942

Alfred Newton Richards was born in Stamford, New York, U.S.A., on 22 March 1876, the youngest of three sons of the Rev. Leonard E. and Mary Elizabeth (Burbank) Richards. His father, who was pastor of the First Presbyterian Church in Stamford from 1864 until his death in 1903, was a descendant of Godfrey Richards, an emigrant from the Rhenish Palatinate to Pennsylvania about 1740. His mother's ancestors came from England to New England prior to 1640 and, unlike the Richards line (all of whom were farmers), many of them received a college education and several (including her father) were clergymen. She herself was teaching at a school in Norwalk, Ohio, when she first met her future husband. At the time she lived in the home of the Rev. Alfred Newton, who is still referred to as one of the most influential and beloved of Norwalk's inhabitants, and whose daughter, Martha Newton, was the future Mrs Richards's best friend. This is the source of the name Alfred Newton Richards.

Life in the Richards's home in Stamford centred around church activities and, by present standards, was quite austere. During most of the period the total income was less than $1000 a year, on which the family maintained a universally respected position in community affairs, put three sons through college, and set enough money aside to keep Mrs Richards in her home after her husband's death without assistance from her sons or anybody else. In Dr Richards's own words: 'We were poor, but like Eisenhower's folks we were unaware of it.'

After preliminary education at home and in the Stamford Seminary and Union Free School, Alfred Newton Richards was admitted to Yale College in the autumn of 1893. Until he encountered chemistry in his third year, his work in college was adequate but undistinguished. He was fascinated by the laboratory exercises in chemistry and was permitted to do extra work that led to his being graduated in 1897 with honours in chemistry. The great event, however, was a course in physiological chemistry under R. H. Chittenden. This course was intended primarily for seniors in the college who expected to study medicine, and at the time young Richards considered himself to be one of these. Shortly before his graduation, however, his father let him know that he could expect no further financial assistance and was now on his own.
Chittenden at that time was one of the leading authorities in America on the new science of physiological chemistry. Trained in the rigid requirements of contemporary German laboratories, he was a stickler for accuracy and thoroughness and his laboratory was so operated as to create an ambition for perfection. He also took a personal interest in his students, and so it was natural for him to ask young Richards about his plans after graduation. When informed that the original idea of going on to medical school had to be abandoned for financial reasons, Chittenden offered Richards a fellowship for a year of graduate study in physiological chemistry at Yale. The fellowship covered only tuition, but Richards worked during the summer to raise a little money, waited on tables in a student boarding house to provide room and board, and with a little extra help from his father managed to finance the year 1897-1898 in Chittenden’s laboratory.

During this year he was assigned a series of tasks having to do with quantitative chemical methods and he learned that if he took enough pains, he could do things on his own initiative and do them well. The great experience, however, was a study of the starch-digesting power of human saliva (his own) under different conditions. This work brought him into close association with Chittenden, a relationship that determined the subsequent course of events. It also led to a joint paper in Volume 1 of the new American Journal of Physiology, a fact that places Richards among the pioneers in American physiology.

Near the end of the school year Chittenden accepted an invitation to reorganize the Department of Physiological Chemistry in the College of Physicians and Surgeons of Columbia University, with the understanding that he would spend only one day a week in New York, depending on a small permanent staff of his choosing to implement his ideas there. He invited Richards to be one of these, at a salary of $800 a year, which was far more than the latter had ever had to spend.

So in September 1898, Richards came to New York to begin a ten-year association with the old College of Physicians and Surgeons on West 59th Street. He started as a laboratory assistant in physiological chemistry while working for a Ph.D. degree in that subject and when he got the degree in 1901 he was the first ever to receive it from the Department of Physiological Chemistry at Columbia. In 1902 he first met George B. Wallace, who had just been brought to New York from Cushny’s Department of Pharmacology at Michigan to introduce pharmacology as an experimental science in the Bellevue Medical College. Richards and Wallace took to one another from the start and soon became room-mates. From that time on Richards’s interest in pharmacology grew steadily and within a year he accepted an invitation to become identified with the new science.

This invitation was the result of work done toward his Ph.D. in the Columbia Laboratory of Bacteriology under Professor Philip Hanson Hiss, who asked the young graduate student in biochemistry to help him prepare a carbohydrate culture medium that would yield only laevulose on hydrolysis.
Richards was soon able to meet this requirement with inulin, which he prepared from dahlia tubers. This accomplishment attracted the attention of T. Mitchell Prudden and Christian A. Herter, prominent members of the Columbia faculty who were about to become trustees of the nascent Rockefeller Institute for Medical Research. As a result, Richards became one of the first recipients of a Rockefeller scholarship, which he held from 1901 to 1904. He spent the year 1901-1902 working with Herter in the Columbia Laboratory of Physiological Chemistry on a problem related to the glycosuric effects of adrenaline locally applied to the pancreas of the dog. This is what he was doing when Wallace's arrival served to increase his budding interest in pharmacodynamics.

In 1903 Herter accepted an invitation to establish a Department of Pharmacology and Therapeutics at Columbia. He offered his young friend and colleague Richards an instructorship and assigned him the task of organizing a laboratory course in pharmacology for the Columbia medical students. Richards was given leave of absence to prepare himself for the new job, and he and Wallace left in June 1903, for Strasbourg, where they intended to participate in a student course in pharmacology under Oswald Schmiedeberg.

They were disappointed to find no student laboratory exercises in Schmiedeberg's institute, but only didactic lectures and pedestrian research Arbeiten, and after three months they returned to New York without having made significant progress. Richards then got Wallace's permission to assist in the new student course in pharmacology at Bellevue. Thus he learned to carry out a number of relatively simple experiments while studying some of the textbooks and literature on the subject he was soon going to teach.

Early in 1904 the President of Columbia found it necessary to cancel the plan for a new Laboratory of Pharmacology. Herter was still in Europe and Richards, who had already terminated his affiliation with biochemistry, had to act quickly to retain his connexion with the Department of Pharmacology. He got the permission of the head of the Department of Physiology at Columbia to use a newly-equipped student laboratory of physiology for an elective course in pharmacology for 24 medical students. The proposal was approved by the President of Columbia and by Herter, who was studying pharmacology in Germany with Paul Ehrlich and Hans Horst Meyer. The elective course must have been successful because, after it had been in existence for three years (i.e. in the spring of 1907), the authorities at Columbia decided to make it part of the regular medical course with Richards in charge, provided that he could equip a laboratory for 24 students for $500. He managed to do this by performing much of the work himself, including the assembling of tables and cabinets fabricated in his home town, and shipped from there in a knocked-down state.

The new course was in operation for less than one year when he was offered the Professorship of Pharmacology at Northwestern University in Chicago. By this time he had fallen in love with Lillian Woody and the
salary offered by Northwestern would make it possible for them to be married sooner than appeared likely if he remained in New York. Therefore he accepted the invitation and in August 1908, he left for Chicago.

Here he was forced to repeat the performance of equipping a new student laboratory largely through his own efforts. The medical class had to be handled in the laboratory in six sections, which meant a student laboratory exercise every day of the week except Sunday. He also gave two lectures and conducted two student conferences each week, while keeping up with the assistant (managing) editorship of the *Journal of Biological Chemistry*, which he had held since the journal was founded in 1905. On 26 December 1908, he and Lillian Woody were married and set up housekeeping in an apartment on Michigan Avenue.

He stayed two years at Northwestern, during which the faculty and students came to regard his course in pharmacology with steadily increasing enthusiasm. During the second year he was offered the Professorship of Pharmacology at the University of Pennsylvania. He accepted the offer, and in the autumn of 1910 he began his affiliation with the institution in which most of his active life was spent.

Once more he had to begin by redesigning and re-equipping a student laboratory. This time he had adequate space in a new building, but he had to overcome prejudices against pharmacology (which had a reputation for being dull and useless) and against the new-fangled research approach to medicine, which a small but influential group of the faculty were trying to introduce in a school that had grown complacent about its clinical superiority. Once more he set out to provide the medical students with an interesting and challenging experience in laboratory and lecture, and he had to do it practically single-handed. It was necessary to give the course twice during 1910-1911, so that it could be moved from the third year (where it had been) to the second (where he insisted that it should be). To complicate matters further, Christian Herter, who had been editor of the *Journal of Biological Chemistry* since its foundation, died in December 1910, and the business and editorial activities of the journal then were turned over to Richards. He acted as editor until 1914, when he relinquished these duties because he had to choose between them and serious research.

The year 1910-1911 was the nadir of his scientific career. What with preparing and conducting two sets of student lectures, conferences and laboratory exercises, and carrying on his editorial tasks, there was no time for research. As the year went by his new-type course in pharmacology aroused interest, respect and eventually admiration on the part of the medical students at Pennsylvania, as it already had done at Columbia and Northwestern. When academic year 1911-1912 began the quiet young professor of pharmacology had established a reputation as a conscientious and effective protagonist of the functional, dynamic medical sciences. This approach was a novelty in an institution with a strong tradition of the preponderance of the autopsy table. An important event of 1911 was the...
arrival of Oscar Plant, who already had some experience in teaching pharmacology and who soon was capable of taking over the organization and preparation of the student laboratory exercises. Richards, however, continued to give all the lectures and to take an active part in student laboratories and conferences. Such spare time as he could find was devoted primarily to improvement in his student lectures and laboratory exercises. In the latter category was the development of procedures for perfusing the isolated mammalian heart, which resulted both in a memorable experience for the students and a minor research project on the actions of alcohol, camphor and anoxia on the heart.

In June 1913, began a series of events which determined the course of his subsequent career. The first was a request from Cecil K. Drinker, who was about to graduate from the Pennsylvania Medical School with one of the most brilliant scholastic records ever achieved there, that he be permitted to spend the summer working with Richards. In retrospect, it is evident that Drinker was the first of a considerable number of medical students who were so impressed by Richards as a teacher, scientist and person that they sought further experience with him before going on with their careers. Richards already had conceived a plan for an improved mechanical perfusion pump, and Drinker had considerable skill in working with metals. They proceeded to construct a device which they proved capable of maintaining the functional activity of a perfused mammalian brain before Drinker had to leave to begin a year’s work under Howell at Johns Hopkins.

After Drinker’s departure Richards and Plant decided to use the new device to perfuse a mammalian kidney, with the primary objective of elucidating the mechanism of caffeine diuresis. This decision was another instance of Richards’s constant striving to improve his teaching. For some years he had been dissatisfied with the necessity for telling the students that the diuretic action of caffeine might be explained equally well in terms of the filtration-reabsorption theory of Ludwig or the tubular secretion concept of Heidenhain. Richards hoped that by administering caffeine while keeping the renal circulation constant with the pump, he might obtain decisive evidence on this controversial point.

The technical problems turned out to be more difficult that anticipated. This was long before the discovery of heparin and the only non-toxic anticoagulant available was hirudin (leech extract), which was expensive, not entirely inert, and almost unobtainable after the outbreak of World War I in July/August 1914. It was not until the summer of 1915 that appropriate experiments finally were made, and the results (increased urine formation from caffeine in a rabbit kidney perfused at a constant rate and with fall rather than rise in arterial pressure) favoured Heidenhain’s concept rather than Ludwig’s.

Richards was unwilling to let the matter rest here, and he and Plant proceeded with another series of experiments in which, with renal blood-flow constant, perfusion pressure was intentionally increased by gentle compression.
of the renal vein, stimulation of the splanchnic nerve, or introduction of small amounts of adrenaline. The common result of all these procedures was to increase urine flow, an outcome that was regarded as incontestable support for the Ludwig filtration-reabsorption theory. The next step was to encase the kidney in an oncometer, and when this was done it was found that appropriately small doses of adrenaline produced increased urine flow concomitantly with rise in perfusion pressure (indicating constriction of renal arterioles) and swelling of the kidney (indicating renal vasodilatation). Corresponding perfusion experiments on the hind limb showed nothing but shrinkage with any dose of adrenaline that raised perfusion pressure. Richards therefore concluded that the different behaviour of the kidney might be attributed to the glomerular circulation, in which a set of capillaries, enclosed in a fibrous capsule, is intercalated between an afferent and an efferent arteriole. More specifically, he believed that if adrenaline, in smallest effective dosage, were to constrict the efferent arteriole more strongly than the afferent, the increase of filtration could be ascribed to swelling and increased filtration pressure of the glomerular capillaries.

This concept, now a fundamental part of nephrology, then was novel and Richards chose to seek direct experimental support before he advanced it in public. Appropriate evidence was eventually obtained in his laboratory, but not until four years later, and from a totally new approach.

Meanwhile America became involved in World War I and in the summer of 1917 Richards was invited by the British Medical Research Committee to join in experimental investigations of the nature of wound shock and related problems. In the National Institute for Medical Research he collaborated with H. H. Dale in a definitive study of the actions of histamine and began an enduring friendship with the future leader of British pharmacology. After serving nearly a year in London he was commissioned Major in the Sanitary Corps of the U.S. Army and was sent to France to establish and direct a laboratory for the study of problems related to casualties of chemical warfare. The war ended before the equipment arrived and few significant results were obtained before Richards returned to America to receive an honourable discharge in December 1918.

He plunged immediately into the teaching programme, which was arousing greater admiration as time went on. He also resumed the kidney perfusion experiments which he and Plant began five years previously. The new Dean of the Pennsylvania Medical School, William Pepper, soon developed a great respect and admiration for the self-effacing young professor of pharmacology and this pair quietly but effectively initiated a set of steps that led Pennsylvania out of lethargic complacency into a position of prominence in medical science. One such step involved an increase in Richards's budget, which made it possible for him to make room on his staff for a succession of recent medical graduates. These young men contributed importantly to his teaching and research programmes, and made possible the establishment in 1922 of a programme in clinical pharmacology, the
first of its kind in America. Other steps were the appointments in 1921 of Henry C. Bazett as head of the Department of Physiology, in 1922 of D. Wright Wilson as head of Physiological Chemistry, and in 1926 of Eliot R. Clark as head of Anatomy. A new wing was added to the Medical Laboratories to accommodate Anatomy, Biochemistry and surgical research and research in these and other medical sciences advanced rapidly.

Early in 1920 one of the members of Richards’s staff, while perusing Cushny’s recent monograph, ‘The secretion of the urine’, encountered an inconspicuous allusion to recent experiments by Ghiron, who claimed to have been able to make continuous microscopic observations of the course of an injected dye through the functioning kidney of a mouse. Attempts at repeating this observation proved unrewarding until Richards suggested that the thin, flat kidney of the frog might be more satisfactory. This quickly turned out to be the case, and thus began the series of experiments that established the reputation of Richards and his laboratory.

The first step involved direct observations of the glomerular circulation in the frog, in the course of which it became obvious that both the number of active glomeruli and the areas of active capillaries within a given glomerulus are subject to fluctuation, and considerable effort was directed toward elucidation of the control mechanisms involved. Richards soon conceived the idea of studying the effects on glomerular volume of adrenaline acting selectively on the efferent arteriole, and was considering the use for this purpose of a micropipette introduced into the glomerular space with the help of a micromanipulator recently developed and demonstrated by Robert Chambers. At this point Joseph T. Wearn, a recent accession to the department, suggested that if a pipette could be inserted without trauma into the glomerular space, it might as well be used to withdraw glomerular fluid for direct chemical analysis. The result was a decisive experiment such as researchers dream of but seldom attain. Glomerular fluid was readily obtained in amounts sufficient for qualitative tests for chloride (with silver nitrate) and reducing sugar (with Benedict’s solution), and both tests were positive. Bladder urine, collected concomitantly, was negative for both. Thus tubular reabsorption of two normal blood constituents was established beyond question, and with this the probability of glomerular filtration was greatly increased.

These experiments were reported and demonstrated at the annual meeting of the American Physiological Society at Yale University in December 1921, where they shared the spotlight with the first public announcement of the isolation of insulin by Banting and Best. Within the next two years, thanks to an increased budget, he was able to add to his department a group of young medical graduates including Starr, Hayman, Barnwell, Montgomery, Elsom and Walker, who worked with him on quantitative studies of the chemical composition of fluid collected from the glomerular spaces and at various tubular levels in the frog.

By ingenious and painstaking modifications of existing chemical methods,
he, Wearn, and the new colleagues succeeded in making quantitative measurements of glucose, urea, uric acid, creatinine, ammonia, acid and alkali, phosphate, sulphate, total molecular concentration and protein, in fluid samples of the order of 1 cubic millimetre or less. The studies were first made on frogs, then on snakes and salamanders (necturi), and eventually on mammals. Corresponding methods were also developed for various foreign substances (dyes, sucrose, xylose, inulin).

The major conclusion was that the renal excretion of substances normal to the body involves separation through the glomerular capillaries of large amounts of ultrafiltrate of blood plasma. In their subsequent course along the renal tubule the different constituents of this filtrate normally are taken back into the blood-stream at different sites and to different degrees ranging from complete (glucose) through nearly complete (water, alkali) to not at all (creatine and polysaccharides such as sucrose and inulin). Foreign substances (such as phenol red) were clearly demonstrated to be secreted by the walls of the tubules, but Richards was never convinced that tubular secretion plays an important role in the elimination of normal urinary constituents in any animals except those fish that have no glomeruli. One observation of immediate practical importance was that selective re-absorption through the tubular walls is abolished by cyanide or mercury, after which the glomerular filtrate and all its contents simply diffuse back into the blood and anuria and azotemia ensue. This was hailed as an explanation of lower nephron nephrosis, which had only recently been recognized as a clinical entity.

By 1924 the quiet, modest young professor of pharmacology had become one of the most respected and influential members of the Pennsylvania faculty. In 1925 the University awarded him an honorary degree (Sc.D.), the first of the twelve he was to receive. The next year (1926-1927) he was granted sabbatical leave to accept an invitation to work with his friend H. H. Dale in an exploration of the depressor (vasodilator) action of adrenaline. During the year he joined his early colleague Cecil Drinker in Krogh's laboratory in Copenhagen, and here he proved the occurrence of secretion of phenol red by the tubules of the excised kidney of the frog by methods characteristically simple, direct and unambiguous. Later in the year he made similar experiments on slices of excised rabbit kidney in Dale's laboratory in London, with similar results.

In 1927 he was elected to membership in the U.S. National Academy of Sciences, of which he was to become President twenty years later. Quantitative chemical studies on fluid collected at various levels of the nephrons of frogs, snakes and necturi were proceeding steadily and reports of the results were arousing world-wide admiration. His teaching programme continued to attract recent medical graduates and a year or more in his laboratory was an eagerly-sought experience.

In 1931 the Commonwealth Fund began a ten-year period of substantial financial support for his kidney research programme. The University made
available some additional laboratory space, which his new support enabled him to modernize and equip. For the first time in his life he had adequate quarters and finances. He turned over responsibility for the teaching programme to his senior associates and devoted his full energy to research.

The years 1931-1939 were the Golden Age of his research career. With Arthur Walker as the right-hand man, assisted by a small permanent staff (Barnwell, Westfall, Bott, Kempton), the work of his laboratory attracted a succession of able young physicians from all over the world. The earlier accessions (Starr, Hayman, Montgomery, Elsom) were supplemented by a group that included Howard Florey, Leonard Bayliss, Andre Simonart, Osler Abbott, Charles Hudson, James Hendrix, Thomas Findley, James Bordley, John Brown, Frank Queen, Earl Wood, Eugene Landis, Julius Comroe and Robert Dripps. In 1932 he and his colleagues performed the experiments that led to the creatinine clearance method for measuring glomerular filtration rate. In 1933 a comparison between creatinine and inulin (which Richards had known since 1901 as a diffusible polysaccharide yielding only laevulose on hydrolysis) led him and his associates to use inulin clearance as a measure of glomerular filtration in the dog. As it turned out, this was a critical event in the development of modern nephrology.

Richards now was world-famous and honours came to him correspondingly. His initial Sc.D. from Pennsylvania in 1925 was followed by the same degree from Western Reserve (1931), Yale (1933), Harvard (1940), Columbia (1942), Williams (1943), Princeton (1946) and New York University (1955). He was awarded the LL.D. degree by Edinburgh in 1935 and by Johns Hopkins in 1949. An honorary M.D. was presented to him by Pennsylvania in 1932 and by Louvain in 1949. Awards and medals included the Gerhard Medal of the Philadelphia Pathological Society (1932), the Kober Medal of the Association of American Physicians (1933), the Keyes Medal of the American Association of Genito-urinary Surgeons (1933), the Gold Medal of the New York Academy of Medicine (1936), the Lasker Award (1946), and the Kovalenko Medal of the National Academy of Sciences (1953). In 1938 he was invited to give the Croonian Lecture of the Royal Society of London and in 1942 he was elected a Foreign Member of that Society. In 1934 he received the John Scott Medal of the City of Philadelphia and in 1937 he was named recipient of the annual Philadelphia (Bok) Award. He was presented with the Medal for Merit of the U.S. Government in 1946 and was made an Honorary Commander of the Order of the British Empire in 1948. Final honours were the Abraham Flexner Award of the Association of American Medical Colleges in 1959, for outstanding service in the teaching of medical students, and the dedication at Pennsylvania in 1960 of a new medical research building named after him.

After 1931 he became increasingly involved in administrative duties and his influence progressed as Pennsylvania emerged as a leader in medical research. In 1939 he was appointed Vice-President for Medical Affairs at Pennsylvania, a position he held until his retirement for age in 1948. He
went about the new job with characteristic zeal and effectiveness and among the enduring consequences are a new Agnew-Dulles Wing in the University Hospital, and a world-famous Department of Anesthesiology organized by Robert Dripps, a former member of his department.

His vice-presidential duties forced a curtailment of his participation in the kidney research project, which now entered what proved to be a final phase of work (led by Walker) on the mammalian kidney. Early in 1941 Richards was invited to come to Washington to assume the duties of Chairman of the Committee on Medical Research of the newly-organized Office of Scientific Research and Development, an organization intended to enlist the cooperation of American scientists with the government in World War II. He was given leave of absence from Pennsylvania and began his new duties on 15 July 1941. From then until the end of 1946 he divided his time between Washington and Philadelphia and returned to full-time service at Pennsylvania when the Washington organization was dissolved on 31 December 1946. Walker brought the work on the mammalian kidney to a close and followed Richards to Washington in 1942 as executive secretary. The quarters previously used for the kidney research project were turned over to a new project in Aviation Medicine and were never used again for the original purpose.

In his Washington career Richards displayed the same qualities that had won him respect, admiration and devotion in all his previous endeavours, and with similar results. Under his personal guidance, and with the help of a new set of devoted colleagues, his Committee on Medical Research enlisted an unprecedented type and degree of cooperation of academic, industrial and military medical scientists in research projects involving aviation medicine, trauma, burns, blood substitutes, tropical diseases, bacterial chemotherapy, shock, protection against chemical and biological weapons, and others. Among the noteworthy achievements were new antimalarial drugs, field use of plasma expanders, improved protective equipment for aviators, and (perhaps most important) development of penicillin from a laboratory curiosity to a practical therapeutic agent.

In the latter development the long arm of coincidence played a large role. A commission of British scientists who came to America about the time Richards began to organize his new committee included Howard Florey, who had worked under Richards in Philadelphia twelve years previously. In the summer of 1941 British and American chemists were confident of their ability to make penicillin synthetically, but Richards, true to his tradition of going from the known to the unknown one step at a time, used his influence to promote production by natural fermentation with cultures of Fleming’s original mould. It turned out to be an inspired decision because within two years the production of penicillin by fermentation was increased from 1 or 2 to 900 units per ml. of culture medium, through changes in the composition of the medium and selection and development of more productive strains of the mould. In 1944 there was enough penicillin from American
and British sources to treat the casualties of the Normandy invasion, and at
the time of the Japanese surrender in August 1945, the production in the
United States had risen to 650 billion units per month, thanks largely to the
depth-vat fermentation process undertaken two years earlier. In 1945 British
and American chemists at last succeeded in synthesizing minute amounts of
authentic penicillin but the cost of producing 100 000 units by natural
fermentation already was less than the cost of labour and material required
to put it into an ampoule and there was (and is) no prospect of economic
advantage from synthesis.

The activities of the Washington Committee were gradually terminated
during 1946 and Richards then returned to his post as Vice-President for
Medical Affairs at Pennsylvania. He served in that capacity until 1948, when
he retired at the age of 72. During these final years he received three more
honorary degrees as well as medals of merit from the American and British
governments. In April 1947, he was elected President of the U.S. National
Academy of Sciences and held this post until he resigned in 1950 to make
room for a younger man. In 1948 he was made a member of the first Hoover
Commission on the Organization of the Executive Branch of the U.S.
Government. During this year he also became a member of the Board of
Directors of Merck and Company, to whom he had been a consultant for
some twenty years.

His relationship with the Merck Company occupied a large share of his
time and energy during his retirement. He also spent considerable time at
the University, writing notes and participating in numerous informal
activities. His last years were clouded by the death of his son and only child
in an airplane accident in November 1962, and by the slow advance of an
inoperable pelvic neoplasm. Death came to him from pneumonia on
24 March 1966, two days after his 90th birthday. He is survived by his
widow (the former Lillian Woody), and four grandchildren.

In the preceding pages I have attempted to present a brief, impersonal
account of the career of Alfred Newton Richards. The bare facts leave little
doubt that he was one of the most distinguished medical scientists of his
generation. Having been associated with him in one capacity or another for
fifty years, I am quite certain that that is how he would want this story to
close. I am equally certain, however, that his importance depended more on
the impact of his personality on his contemporaries than on his scientific
accomplishments, great as these were. Actually the two were so intimately
related that a meaningful evaluation of his career requires an attempt to add
the contours of a warm human being to the bare skeleton of his accom­
plishments. Therefore I venture to append a brief account of the influence
of his personal traits, as I knew them.

His career seems to have been determined by a series of apparently
accidental openings of doors whose very existence could not have been
suspected by him at the time. Those who subsequently worked with him can
discern here the imprint of the character traits that attracted and held us to
him. The most important of these traits were utter honesty (including an
extraordinary capacity for objective self-criticism), simplicity (manifested in
abhorrence of pretention as well as in organization and performance of
scientific activities), unselfishness, deep concern for others, constant striving
toward perfection (coupled with a surprising physical stamina and a great
willingness to draw upon it), high intelligence, and a rare, gentle sense of
humour. All but the last enabled him to set a behaviour pattern that turned
an association with him into a most rewarding experience. The sense of
humour made him a delightful companion. The combination gave rise to
personal devotion of an intensity seldom aroused by a man of such
distinction.

With characteristic consideration for his biographer, he left extensive notes
on events prior to the Golden Age of his career at Pennsylvania. These notes
suggest that the sense of humour was not conspicuous at that time, but the
other traits must have been in full operation. He was perhaps more than
slightly fortunate in the timing of his first encounters with Chittenden,
Herter and Wallace, but these men probably soon counted themselves even
more fortunate in being able to benefit from the exceptional qualities of this
young man.

His arrival in New York coincided with the beginning of the combination
of research and teaching that subsequently transformed the pattern of
medical education in America. He was one of the organizers of the Journal of
Biological Chemistry and was a charter member of the American Society for
Pharmacology and Experimental Therapeutics. He (with Chittenden) had
a paper in the first number of the American Journal of Physiology. His associa-
tion with the Rockefeller Institute for Medical Research began before the
Institute was even organized and continued until it became the Rockefeller
University. When he came to Pennsylvania he was the youngest and most
inconspicuous of a group of four devotees of the research approach to medical
education whose advent was expected to bring to that venerable institution
some of the ferment that he had known and admired in New York. He was
the only one of the four to stay long in Philadelphia and he had the satisfac-
tion of playing a vital part in bringing Pennsylvania from a position of
contented backwardness to one of leadership. Again he was fortunate in
becoming the trusted advisor of a new dean, William Pepper, and again the
impact of his personality must be given much of the credit.

His success in research was in large measure due to his ability to attract
promising young men, and the chief attraction in the critical period before
his research became famous was the imprint of his personality on his teaching
programme. From first-hand experience, I know the incessant search for
improvement and the enormous expenditure of energy that underlay the
favourable reactions of the students. He used to say that the main if not the
sole function of a teaching department in a medical school is to teach medical
students. His success in research was a direct result of his unremitting search for improvement in his teaching, and those of his associates who went on to teach medical students followed his example, with similar results. My own efforts along those lines underlay the discovery of ephedrine (which resulted from the injection of a crude extract of an unknown Chinese drug in the course of a practice experiment for a student exercise) as well as my interest in respiratory control and the cerebral circulation (which was part of a lifelong search for an explanation of the actions of morphine on respiration). Thirty years before the project system of teaching medical students became popular in America he encouraged his younger associates to incorporate their current research activities into the student laboratory programme, and we did as much of this as we could with the very limited resources then available. Eventually I realized that in so doing we were attaining two goals of supreme importance, viz. maximizing the interest of the students by letting them in on the formative stages of the solution of problems, and maximizing the interest of the younger staff members in the teaching programme. This interplay was one of the main reasons for the attraction of his laboratory for recent medical graduates.

Items such as these were largely responsible for his rise from obscurity to international fame at Pennsylvania. In his subsequent career in Washington he made an entirely new set of admirers and friends, and from conversations with some of these I know that the same character traits were responsible. The performance was repeated in his relations with Merck and Company after his retirement.

Thus from the start of his career to its close his impact on his environment went from obscurity through uncertainty to interest, admiration and eventually to affection. Many anecdotes attest to his wisdom and personal charm. Those of us who knew him well will remember the infectious grin and chuckle that characterized his moments of relaxation as well as the example of self-criticism and search for perfection that he set us. Some of this may have been derived from his parents and his early teachers, but some was all his own. It was a unique combination.

C. F. SCHMIDT

BIBLIOGRAPHY


1904. (With C. A. Herter.) The influence of chloroform on intravital staining with methylene blue. Amer. J. Physiol. 12, 207-212.


1914. A note on the combined action of camphor and lack of oxygen upon the isolated mammalian heart with an observation upon the direct action of lack of oxygen upon blood vessels. J. Pharmac. exp. Ther. 6, 73-82.


1918. (With H. H. Dale.) The vasodilator action of histamine and of some other substances. J. Physiol. 52, 110-165.


1924. (With W. L. Mendenhall & E. M. Taylor.) The action of minute amounts of barium chloride upon the kidney. Amer. J. Physiol. 71, 174-177.

1924. (With Carl F. Schmidt.) A description of the glomerular circulation in the frog's kidney and observations concerning the action of adrenalin and various other substances upon it. Amer. J. Physiol. 71, 178-208.


1926. (With J. M. Hayman, Jr.) Deposition of dyes, iron and urea in the cells of a renal tubule after their injection into its lumen: glomerular elimination of the same substances. Amer. J. Physiol. 79, 149-169.

341


1929. Methods and results of direct investigations of the function of the kidney; the Beaumont Foundation Lectures, Series 8, Wayne County Medical Society, Detroit, Michigan. 64 pp. Published by the Williams & Wilkins Co. Baltimore.


1948. Annual Reports of the National Academy of Sciences Submitted to the President of the United States Senate:


