Clin. Cardiol. 14, 622-626 (1991)

Profiles in Cardiology

This section edited by J. Willis Hurst, M.D.

Paul Dudley White: The Father of American Cardiology*

J. WILLIS HURST, M.D.

Department of Medicine (Cardiology), Emory University School of Medicine, Atlanta, Georgia, USA

Paul Dudley White is widely acclaimed as the father of American cardiology (Fig. 1). What did he do? When did he do it? How did he do it? Why did he do it?

Paul White, the son of a family practitioner who taught medicine at Tufts, was born in Roxbury, Massachusetts, on June 6, 1886.[1] As a boy he went on house calls with his father in their horse-drawn buggy.[1] The father undoubtedly influenced the boy in many ways. I expect young Paul heard something like the words his father later wrote in his "journal."[1] Listen—

. . . I have lived long enough to see that eventually right and truth do survive, that the real scientific practice of medicine is only just begun and that there must be some startling and most wonderful victorious discoveries just ahead. . .

His father died of coronary artery disease at the age of 71 (having consumed daily bowls of cream advised because of old tuberculosis).[1]

Dr. White's mother, who died of pneumonia at age 88,[1] was active in volunteer work in a home for the sick and in missionary work.[1] These activities must have influenced young Paul's social conscience.

His younger sister, Dorothy, died of rheumatic heart disease,[1] an event which he stated influenced him profoundly toward the study of heart disease. Warren White, his younger brother, became an orthopedic surgeon. He also had an older sister, Miriam.[1]

His early schooling influenced his life greatly. He studied science, mathematics, history, English, Greek, Latin, French, and German.[1] This set the stage for him to become an expert grammarian and scholar of the classics.

When he was 18 years old young Paul entered Harvard College. He enjoyed history, but was influenced by Theodore Roosevelt to become a forester.[1] He changed his course, however, and decided to become a physician.[1] He needed additional courses to qualify for admission to medical school, and undertook summer studies at the Massachusetts Institute of Technology. He entered Harvard Medical School in 1907 at the age of 21.[1] He received his Harvard College degree, cum laude,[1] in 1908 and graduated from medical school in 1911.

Dr. White enjoyed his contact with patients, but the lectures given by medical school faculty did not please him.[1] This experience influenced his approach to bedside teaching, making the patient the center of his teaching exercises.

He became the first pediatric intern at Massachusetts General Hospital in 1911,[1] which may well have spurred his interest in congenital heart disease. During 1912 and 1913 he obtained additional house staff training as an intern on the general medical service. It was during this period that he worked with Dr. Roger I. Lee to develop

Address for reprints:

J. W. Hurst, M.D.
Department of Medicine (Cardiology)
Emory University School of Medicine
Suite 303 1462 Clifton Road, N.E.
Atlanta, GA 30322

Received: March 5, 1991
Accepted: March 6, 1991

*The words on these few pages are not adequate to describe Paul Dudley White. I urge all those who are interested to read Dr. White's autobiography, *My Life and Medicine*, published in 1971[1] and Dr. White's biography, *Take Heart*, written by Oglesby Paul in 1986.[2] These two books, plus previous articles of my own,[3,4] served as the original sources for most of the information used in the preparation of this document.

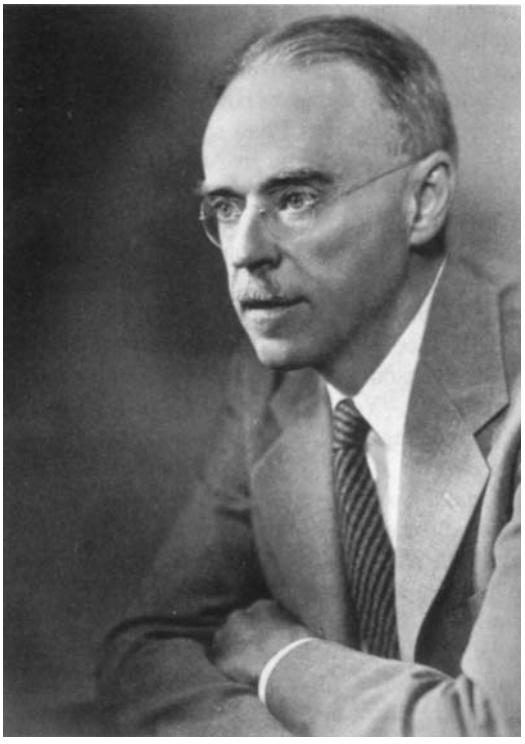

FIG. 1 Paul Dudley White, M.D. (1886-1973). (Photograph courtesy of National Library of Medicine, Bethesda, MD.)

the Lee–White method of measuring the coagulation time of the blood.[1]

Dr. White, apparently still interested in pediatrics, had agreed to become the assistant to Dr. Richard Smith.[1] Dr. David Edsall, chief of medicine at Massachusetts General Hospital, recommended him for a Harvard Traveling Fellowship to study electrocardiography and cardiac physiology with Thomas Lewis in London. The plan was for White to study with Lewis and return to Massachusetts General Hospital to develop an electrocardiographic laboratory. Dr. Smith agreed with the new plan and his work with Lewis began in October 1913.[1]

Lewis was difficult to work with and initially he ignored White. Eventually White won the confidence and friendship of Lewis and they engaged in endless night and day research that resulted in the publication of a number of scientific papers.[1] They were engaged in what would now be called electrophysiologic work dealing with cardiac arrhythmias. While in London Dr. White also visited the cardiac clinics of James Mackenzie and John Parkinson.[1]

As the clouds of World War I were hovering above Europe, Paul White returned to Boston in July 1914. He developed the electrocardiographic laboratory in the "basement of the Skin Ward" of Massachusetts General Hospital[1] and was determined to pursue his study of the heart and circulation, disregarding friends' advice that it was too narrow a field.

Dr. White organized cardiac clinics, taught every one in sight, and soon was asked to see patients in consultation. It was during this time that his friendship developed with Dr. Sam Levine, who was destined to pioneer cardiology research at Peter Bent Brigham Hospital.*

Dr. White spent 25 months in the armed forces and returned home in August 1919. I believe his war experience profoundly influenced Dr. White's interest in encouraging world leaders to pursue peace.

I have written previously of six reasons why Dr. White is recognized as the father of cardiology in the United States.[3] These reasons are, of course, in addition to the fact he was brilliant, kind, gentle, devoted to the cause, hardworking, optimistic, and retained the precious quality of childlike enthusiasm and naivete.

The six reasons are abstracted with the permission of the publisher:[3]

He married Ina Reid on June 18, 1924. She worked in the Social Service Department of Massachusetts General Hospital and became Dr. White's lifelong partner adapting to his life of consultations, teaching throughout the world, writing, and offering instant hospitality to visitors. She now lives near Boston and is revered by all who know her.

In 1920 he organized a training program in cardiology at Massachusetts General Hospital for students, house staff, fellows, and graduate students. Trainees flocked to him from this, and virtually every other country in the world. He stimulated all of them to return to their homes—here and abroad—to teach and write about heart disease. Many of them became world leaders.

He was one of the physicians who urged the New England Association for the Prevention and Relief of Heart Disease to join several other organizations to form the American Heart Association. He was elected its treasurer with a budget of $2,500. He did not become president of the American Heart Association until 1940. He once remarked to me that he regretted that the name, The American Heart Association, did not retain the word *prevention* because prevention is so important. Throughout his life, he traveled far and wide on behalf of the American Heart Association and encouraged many nations to create heart associations.

Dr. White was awarded a traveling fellowship in 1928 to write a book on heart disease. The book was undertaken after he had collected data on 12,000 patients (4,000 of these patients were seen by him in private practice). Accordingly, his own meticulously kept records served as a unique source of information. He went from library to library here and in Europe. He also talked with numerous friends in Europe and finally he and Ina settled in on the Isle of Capri where he wrote most of the book. The book,

*Their friendship was such that Dr. Levine, along with others, initiated the drive to have Paul White nominated for the Nobel Peace Prize. Dr. White did not win the prize but there was a worldwide ground swell in favor of it.

Heart Disease, was published in 1931. It was a scholarly document that represented the most complete work on the heart that had ever been produced in the United States. Quotations from our predecessors were found throughout the book and there were abundant references. Dr. White had translated most of them from their original sources. He emphasized the need to establish the etiology, anatomy, and functional status of each patient—a discipline later recommended by the New York Heart Association. The book did it; he became the leader of American cardiology and was recognized throughout the world.

Dr. White was a major force in the development of the National Heart Institute. He became its executive director and spent one third of his time in Washington. He saw the opportunity to increase the funds for heart research which he felt was needed throughout the country. So as the 1949 academic year came to a close he resigned his position as chief of cardiology at Massachusetts General Hospital and moved his office to Beacon Street. The very capable Ed Bland became chief of cardiology at Massachusetts General Hospital. I, along with Dr. Lee Messer of St. Petersburg were Dr. White's cardiac fellows at the time and we watched the transition—he was sad about making the change but was convinced the National Heart Institute would play a major role in spearheading cardiac research throughout the world. He spent more than eight years as its executive director. Now, of course, the National Heart, Lung, and Blood Institute is recognized throughout the world as the major cardiovascular research institute as well as the major source of funding for cardiovascular research throughout the United States.

Dr. White, along with Dr. Louis Katz, created the International Cardiology Foundation in 1957 in order to raise public funds for the support of the International Society of Cardiology. Dr. White by then was extremely concerned about world peace and saw this organization as a vehicle for his stand against violence and war.

These are the major reasons why Paul White is recognized as the father of American cardiology. These acts do not, however, dwarf the importance of the personality of the man in his day to day work. He listened to his peers and wrote down the essence of conversations he had with them in his little black memo book. He literally gave himself to medicine and cardiology. He never raised his voice in anger; he could soothe an angry group simply by entering the conversation because he was so respected.

It was my privilege to attend Lyndon Johnson at the time of his myocardial infarction in July 1955. Because of my work under Dr. White, who emphasized total rehabilitation, I urged Johnson to return to his vigorous life as majority leader in the Senate of the United States.

Dr. White gained national prominence with nonphysicians when he was asked to consult with the physicians attending President Eisenhower at the time of his myocardial infarction in September 1955. Dr. White advised Eisenhower to return to the presidency, as I later advised Johnson that he could seek the vice presidency and then the presidency. Dr. White had made his point to the world at large; most people with myocardial infarction can return to work.

Dr. White rarely told jokes but he chuckled at humorous situations. Here is one:[5] I had seen Lyndon Johnson at Emory University Hospital in Atlanta in late 1955 and was pleased to find him doing exceptionally well. Johnson asked me to report the result of my examination to the press, so, along with other statements, I reported that Johnson's electrocardiogram had returned to normal. Accordingly, this point was mentioned in the newspapers. The next day I received a call from Dr. White who asked, "Willis is Johnson's electrocardiogram normal?"

I responded, "Yes sir, it is slightly different to his preinfarction tracing but it is now within normal range. Why do you ask?"

He said, "Eisenhower wants me to tell him why his electrocardiogram has not returned to normal too!" I then heard a little Paul White chuckle and could mentally see the twinkle in his eyes. What he did not know was that I promptly got in my car and went to Emory University Hospital to double check my interpretation!

He was an adventurer. He recorded the electrocardiogram of an elephant in 1938[6] and also examined the heart of an elephant. He went on expeditions and tried to record the electrocardiogram of a large whale and actually succeeded in recording the electrocardiogram of a Beluga whale.[7] While this made him happy, he still wanted to record the electrocardiogram of the large grey whale. Was this a foolish whim? Of course not. He wanted to dissect the heart of earth's largest mammal because, he reasoned, the cardiac structures were larger than those of the human and he would be able to examine them more easily. Remember, the electron microscope had not, at that time, been invented.

He wrote four editions of *Heart Disease*[8] and several books on electrocardiography.[9] His book on *Hearts—Their Long Follow-Up*[10] was symbolic of his optimism. A most important book, written with Manard Gertler, entitled *Coronary Heart Disease in Young Adults, a Multidisciplinary Study*[11] emphasized that coronary disease was not simply due to aging alone but represented a disease demanding investigation. In addition to the books, he published more than 700 articles.

As we go about our daily work we might remember who guides our actions:

Dr. White's hand is with us when we recommend a low-fat, low-cholesterol diet, the abstinence from smoking, the maintenance of normal blood pressure, normal body weight, normal blood sugar, and an exercise program in our efforts to prevent coronary atherosclerosis. He taught and emphasized this in the late 1940s and stimulated interest and support of the classic Framingham Heart Study.

Dr. White's hand is with us when we marvel at the molecular biology that is determined by genes. He said more than 40 years ago that if your parents lived into their

80s this was a sign that you were likely to do so. He felt that the basic cause of coronary atherosclerosis was inherited and that modifying factors were the level of serum cholesterol, diet, smoking, exercise (or lack of it), hypertension, etc.

Dr. White's hand is with us when we urge our patients to return to work after a myocardial infarction and when we recommend rehabilitation programs. He spearheaded this approach more than 40 years ago.

Dr. White's hand is with us when we see a patient with atrial tachycardia or atrial fibrillation who, when there is normal rhythm, exhibits a short P-R interval and an abnormally long QRS duration. This, of course, is the Wolff-Parkinson-White syndrome.[12, 13]

Dr. White's hand is with us when we identify any disease of the pulmonary arteries.[14] We especially should think of him when we think of pulmonary embolism and deep venous thrombosis of the leg veins.[2]

Dr. White's hand is with us when we diagnose constrictive pericarditis and recommend the removal of the pericardium.[15]

Dr. White's hand is with us when we classify heart disease according to etiology, anatomy, physiology, and functional status, for this originated with Dr. White.[16] The New York Heart Association deserves the credit for popularizing this discipline. The New York Heart Association changed the Functional Category to Cardiac Status in 1973.[17]

Dr. White's hand is with us when we try to determine the range of normal of the heart and circulation.[18]

Dr. White's hand is with us when we try to establish the cause of chest discomfort.[19]

Dr. White's hand is with us when we identify a congenital anomaly of the coronary arteries.[20]

Dr. White's hand is with us when we order a coagulation time on our patients.[1]

Dr. White's hand is with us when we ponder the effect of digitalis on the electrocardiogram.[21]

Dr. White's hand is with us when we talk with patients and especially when we encourage them. He often said, "In most instances, heart disease is not as bad as the patient thinks it is."

Dr. White's hand is with us when we support research in the prevention of heart disease (including the Framingham program).

Dr. White's hand is with us when we recognize the enormous impact that the National Heart, Lung, and Blood Institute has had on the progress made in cardiology, and when we apply to the National Heart, Lung, and Blood Institute for a research grant.

Dr. White's hand is with us when we apply to the American Heart Association for a research grant, or recognize an American Heart Association-sponsored community educational program. Dr. White was not only one of the founding fathers of the American Heart Association but had encouraged the organization to allow nonphysicians to join it. This action created a source of research money and enabled physicians to extend their educational efforts into the community at large.

Dr. White's hand is with us when we think of and welcome the future. He always did that. For example, he wrote the following paragraph in 1957. It is reproduced here with permission of the American Heart Association.[22]

> We know from our clinical experience in the practice of medicine that in diagnosis, prognosis, and treatment, the individual and his background of heredity are just as important, if not more so, as the disease itself. Far too little attention has been paid to research on the host, i.e., on human genetics, while much study has been done and is projected for the future on the agent, that is, on the effect of the various ways of life. It is timely that we should begin concentrated efforts to determine the candidates for whose sake we should apply in particular the prevention measures that we may discover in the future.

A short time before his last series of illnesses Dr. White asked me, during dinner, to auscultate his heart and listen for mild aortic regurgitation which had been discovered in 1964. I declined because we were in the midst of the wonderful meal prepared by Mrs. White in their home.

He developed angina pectoris in April 1967 at the age of 81.[2] The angina occurred while he was running so he could witness the end of the Boston marathon. The angina, always produced by effort, continued; he used about 5 tablets of nitroglycerin each week.

On December 20, 1970, at the age of 84 he developed chest pain that lasted 3 1/2 hours; it was accompanied by nausea and sweating.[2] His physician, Dr. Allan Friedlich, saw him quickly and, at his insistence, transported him in his automobile to Massachusetts General Hospital. On the way to the hospital Dr. White was determined to stop at his office for a suitcase full of papers because he wished to continue to work while in the hospital.[2] During the 10-day hospitalization he taught the residents and nurses the nuances of coronary disease. He was eager to have the media stress his proper actions when pain occurred as an opportunity for effective public education.

I recall that years earlier he had said to me, "Small heart attacks are so common they are almost within the normal range." He, as recorded by Oglesby Paul, referred to his own attack as "a smidgen of coronary trouble."[2] He addressed the Mexican Heart Foundation on January 21, 1971, one month after his small myocardial infarction.[2]

He developed a stroke which was presumed to be embolic in origin on May 29, 1973, but recovered sufficiently to talk at a cardiac conference on coronary spasm on June 12, 1973.[2] He later developed a subdural hematoma which was evacuated at surgery.[2] Atrial fibrillation became persistent.[2] He then developed pulmonary emboli and was restarted on Coumadin which had been discontinued because of the subdural hematoma.[2] He left the hospital on September 18, 1973, but was admitted for the

last time October 15, 1973, because of another stroke.[2] He died on October 31, 1973, at the age of 87.[2]

Mrs. White asked me to speak at his memorial service at the Harvard Memorial Chapel in Cambridge on November 13, 1973. My eulogy was later published in *Circulation*.[4] A portion of the speech which, in my view, sums up his personality is reproduced here with permission of the American Heart Association.

> A few years ago Dr. White came to Emory University to present a lecture entitled "The Evolution of Cardiology." The lecture room was filled with people. Excitement filled the air. The audience clearly sensed the talent of a master artist at work on one of his finest pieces. The applause, which was rendered on three separate occasions, was thunderous. Dr. White discussed the men who had contributed to our knowledge over the centuries. He pointed out how he and Alfred Boursey would labor for an hour over one word in their efforts to accurately translate into English Lancisi's book on sudden death. (The book was published in 1971). He then came to the contributions that were made in the twentieth century. He started with Sir James MacKenzie, then went on to Sir Thomas Lewis, with whom he had worked, and John Parkinson and on and on. The story he unfolded could only be told by a man who knew them all. He pleaded that the names of various organizations should contain the words "for the prevention and relief of heart disease." He discussed the contributions of his friends in numerous countries who were working for international cardiology which to him was virtually the same as working for world peace. He did all this without mentioning his own contributions. A very special incident occurred near the end of the lecture. He apparently did not wish to take more than his allotted time and to be certain he did not do so he set his alarm wrist watch to signal him. He was in the middle of an important statement when the alarm went off with a startling buzz. He glanced at his wrist watch and turned off the alarm with a quick slap and said, "I'm not through yet." He then went on to quote from poet-physician Oliver Wendell Holmes' "For the Meeting of the National Sanitary Association." He read the first and last stanzas but placed more emphasis on the last.
>
> And lo! the starry folds reveal
> The blazoned truth we hold so dear:
> To guard is better than to heal,—
> The shield is nobler than the spear!

Acknowledgment

The material used from *My Life and Medicine* is reprinted with the permission from the Harvard University Press. Copyright © 1971 Paul Dudley White, M.D.;[1] I thank Dr. Oglesby Paul and the Harvard University Press for permission to use material from the book *Take Heart*;[2] I thank the *American Journal of Cardiology* for permission to quote from the article "Paul Dudley White: To Know Him Better";[3] I thank the American Heart Association for permission to quote from "I'm Not Through Yet"[4] and "The Evolution of Our Knowledge About the Heart and Its Diseases Since 1628."[22] I thank Dr. Allan Friedlich and Dr. Oglesby Paul for reviewing the manuscript.

References

1. White PD: *My Life and Medicine. An Autobiographical Memoir*. Gambit Inc., Boston (1971) 1, 4–6, 10–18, 20, 43
2. Paul O: *Take Heart*. Harvard University Press, Boston (1986)
3. Hurst JW: Paul Dudley White: To know him better. *Am J Cardiol* 56, 169–177 (1985)
4. Hurst JW: I'm not through yet. *Circulation* 49, 199–204 (1974)
5. Hurst JW, Cain JC: *Lyndon: To known him better*. (In preparation)
6. White PD, Jenks Jr JL, Benedict FG: The electrocardiogram of the elephant. *Am Heart J* 16, 744–750 (1938)
7. King RL, Jenks Jr JL, White PD: The electrocardiogram of a Beluga whale. *Circulation* 8, 387–393 (1953)
8. White PD: *Heart Disease*, 3rd Ed. Macmillan, New York (1931), (1937), (1946), (1951)
9. Graybiel A, White PD, Wheeler L, Williams C: In *Electrocardiography in Practice*, 3rd Ed. WB Saunders, Philadelphia (1951) 186
10. White PD, Donovan H: *Hearts—Their Long Follow-Up*. WB Saunders, Philadelphia (1967)
11. Gertler MM, White PD, and others: *Coronary Heart Disease in Young Adults*. Harvard University Press, Cambridge (1954)
12. Wolff L, Parkinson J, White PD: Bundle-branch block with short P-R interval in healthy young people prone to paroxysmal tachycardia. *Am Heart J* 5, 685–704 (1930)
13. Wolff L, Parkinson J, White PD: An undescribed cardiac mechanism: "Intraventricular block" with short P-R interval in healthy young people prone to paroxysmal tachycardia. *J Clin Invest* 9, 28 (1930)
14. White PD, Brenner O: Pathological and clinical aspects of the pulmonary circulation. *N Engl J Med* 209, 1261–1265 (1933)
15. White PD, Churchill ED: The relief of obstruction of the circulation in a case of chronic constrictive pericarditis (concretio cordis). *N Engl J Med* 202, 165–168 (1930)
16. White PD, Myers MM: The classification of cardiac diagnosis. *J Am Med Assoc* 77, 1414–1415 (1921)
17. Criteria Committee of the New York Heart Association: *Nomenclature and Criteria for Diagnosis of Diseases of the Heart and Great Vessels*. Little, Brown & Company, Boston (1973)
18. White PD: The range of the normal heart rate. *Am Scholar* 22, 315–322 (1953)
19. White PD: Neurocirculatory asthenia (Da Costa's syndrome, effort syndrome, irritable heart of soldiers). *Army Med Bull* 65, 196–202 (1943)
20. Bland EF, White PD, Garland J: Congenital anomalies of the coronary arteries: Report of an unusual case associated with cardiac hypertrophy. *Am Heart J* 8, 787–801 (1933)
21. White PD, Sattler RR: The effect of digitalis on the normal heart electrocardiogram, with special reference to A-V conduction. *J Exp Med* 23, 613–629 (1916)
22. White PD: The evolution of our knowledge about the heart and its diseases since 1628. *Circulation* 15, 915–923 (1957)