

Audiotape labeled:

Philip Dow, Physiology Seminar on "The Hamilton Days" given on 10/11/1976

Transcribed by Renée Sharrock, June 2020

NOTE: The speaker references the inclusion of slides in the presentation; however, it is not known the whereabouts of said slides. When additional information on places and names were confirmed by the transcriber, that information is enclosed in {brackets}.

Brief biography on William Ferguson Hamilton, PhD:

Dr. Hamilton was a native of Arizona. After obtaining his A.B. from Pomona College (1917) and Ph.D. in zoology from the University of California (1921), he worked at the following universities:

- University of Texas (1920-1921)
- Yale (1921-1923)
- University of Louisville (1923-1932)
- George Washington University (1932-1934)

Dr. Hamilton joined the faculty at the Medical College of Georgia as the Professor and Chair of the Physiology Department in 1934. He was active member of the American Physiological Society and served in numerous roles, including its president (1955-1956). Dr. Hamilton retired in 1960 and passed away in 1964.

Speaker: Philip Dow, Ph.D., worked with Dr. Hamilton and served as Physiology Department Professor and Chair after Dr. Hamilton until his retirement in 1971.

Greetings to all my friends and colleagues. I'm horrified of this. I've never been recorded. I tried to record myself on my own recorder in constructing this presentation and it sounded perfectly terrible. So, I hope this goes better than that. My principle worries in planning this presentation. The first one, how to begin it, the second one, what to include, and finally the third one, how will I ever finish it up.

Since this is going to be mainly my recollection of things, I decided I better begin with my first introduction to Dr. Hamilton. And for that I read from a copy of a letter from W.F. Hamilton to H.R. Hitchcock dated April 30, 1935. "Dear Dr. Hitchcock, we have developed an optical manometer with which we can register blood pressure changes in any part of an animal body and nearly any part of the human body. The work has shown great promise and the university has granted the department of physiology facilities and development and a \$900 research fellowship to help with the physical and mathematical interpretations of our results. In response to a letter sent to Dr. Mendel, Dr. Arthur Stevenson advises me to write to you concerning Mr. Philip Dow. Will you advise me to his availability and competence in mathematics and physics or that of some other candidate that may come to mind? We hope to use our measurements in working out

the hydrodynamics of elasticity in relation to the human circulation in health and disease. Dr. H.G. Barber can advise Dow as to what the work can entail.”

Hitchcock wrote to Hamilton expressing some doubt as to what they were trying to buy for this fellowship and Hamilton wrote back: “Dear Dr. Hitchcock, the position is nearly full-time research and not a mere assistantship. It is a fellowship and it will rather nicely fill in a year or two time. Our problem is a fundamental one. All opportunity will be given the fellow to develop the physical side independently.” So, I wrote and said I would like to be considered but I didn’t know a lot about the subject and the school and this part of the country. A week later I got the following in the mail: “Dear Mr. Dow, your work will involve getting the hydrodynamic reading of such things as the pressure curve of the femoral artery. The pressure in the artery goes up to 50 to 100% when it is shut off even though there is no great change in the general blood pressure. Why? How can coffee double the blood pressure while the heart ceases to make the artery pulsate? There are many problems. We have done enough experiments on man and animals to get started, but not enough so. The fellowship will cover a variety of experiments as well as analytical experience. It is the mathematical analysis that we have the most need for help. The job runs 10 months from the middle of September. One can probably spent most of June in New Haven. I am asking Dr. Stokes to write to you about living conditions here. I think one can board quite well on \$30 to \$35 per month including room.”

I arrived in Augusta by train on a Sunday afternoon and checked into the old Richmond Hotel. And the Hamiltons came down and took me up to their cooler house. Monday morning, probably by taxi, I arrived at the Newton Building and signed in, meeting Dean Kelly, and the rest of the department, which was Bob Woodbury and Elkin Vogt. Elkin had been serving as assistant and also going to medical school for six years. Finally, I met Mr. Heath about whom you will hear more about later.

I was told about some possible rooms to rent but was happy to accept the offer of Mrs. Swain, the receptionist in the medical school whose husband was a first-year medical student and who had already two junior transfer students in a house down on Greene Street. So, I became the semi-roommate and was glad to go along with their decisions on places for breakfast and dinner, and later in the year a boarding house. Also, I could get a ride to and from school if I took the lowest priority seat in the trunk of the framed car.

The Newton Building where the department was then, is not around anymore. It was the old Tuttle-Newton Orphan Home and the medical school administrative dean and other offices were here and the library back here. And pathology and anatomy and biochemistry and bacteriology were on the first and second floors. Physiology and pharmacology and dog surgery were up on the top. This dormer window here, I think was the place where I was put into a not quite finished room, and I stayed there until the year we moved to the Dugas Building.

To qualify me as a worker, Bill {Hamilton} had me do the Wiggers monograph {named after Carl John Wiggers} in the cardiovascular system from cover to cover. And I was roped into various angles of the current laboratory work. I measured some records they took and put together an artificial heart aortal model to study. I put together various needles to try to verify the

differences in pressure which should be found in a flowing stream. We took yards and yards of records trying to duplicate the picture which Bill had recorded with {Frederick S.} Brackett before he left Washington {George Washington University} and published after he got to Augusta to the great disbelief of the Wiggers group especially.

We ran several experiments attempting to get simultaneous records from different parts of the aorta by needle puncture, then took Bob Woodbury's suggestion to insert a very long cannula at the femoral and run it up and down the aorta. It worked fine and the slides I have are from the Washington federation meeting in April of '36. Each picture is of a single heartbeat but a different heartbeat all in the same animal. The solid line is from a fairly fixed cannula into the arch of the aorta and the baseline is a record taken from the long cannula run up the femoral and pulled out gradually.

The last slide was prepared for Bill's and mine first joint publication. We wrote it in 1938 and it came out in January 1939 and earned me an invitation to spend a year in the Wiggers department in Cleveland. But I'm getting ahead of the story. That Washington meeting paper got me a job offer from Henry Long at Tulane and Bill and Dr. Kelly were equally impressed with my fellowship so I stayed here.

That first summer Mr. Heath put together for me a gadget to hook onto one of the manometers and serve as a monitor. I piled all the gear into the Model A Ford I had bought with what I had saved from the year's pay and took it back to my old lab in New Haven for a trial that was highly successful. I think it was on that trip also that I combed the Connecticut countryside for metal companies in search of a better manometer membrane metal than the coined silver that we were using. The thing I found was a beryllium copper alloy.

At Christmas time I got married and the next summer we went back to New Haven where I took advantage of the Yale library for historical research in pulse wave study. I also arranged for much of the important scarce material to be microfilmed. And that was the start of what became a respectful start of the department's library.

The year before we went to Cleveland was the year we only got half of our pay. We were on leave and did eventually get the remainder but on our return found that budgets were still tight and Elkin Vogt had gotten his MD and left. I got a promotion and better pay but Bill and Bob and I had to do all the teaching for both courses for the full year.

A letter from Bill shortly before our return has some interesting points. "Bob has got all steamed up about Withers turtle paper and has been recording cold-blooded pulses by the roll. The paper seems to make too ridged a point, both of which are wrong, but I won't spoil Bob's belief in telling you about it. We have all our back pay. Things are uncertain for the next year but I am confident that we will get our salary, perhaps not always on time, but we will get them eventually. I have grants for the department's research amounting to \$525 which will enable us to carry on with our usual modest efficiency."

We did get through that episode and the following summer we were greeted with the announcement of an increase of the freshman class from 50 to 75 and plans for the addition to

the Dugas Building. That program turned out to be more rugged than expected because we got caught in the wartime steel restrictions and we had only curtains for some of that severe winter weather. The department, which was still combined, did add Ben Abram and Bob Shure for the extra teaching lower and the following year, Dave Marsh. After two years Bob Shure had Bill in a bind and said he would like to become a part-time medical student. But Bill wrote some letters and located John Remington to replace Bob who found another school where he could carry on both activities. Bill had been sensitized by the Vogt episode and he would never allow another, until Walter Brown came as a hopeful PhD prospect and had to go for the MD instead.

That same year the department was split with Bob Woodbury becoming head of the separate pharmacology and the next year he brought Ray Ahlquist who took over his place when he left for Memphis in 1947. I am calling that the end of my beginning.

Authoritative source material: For details of the subject we're considering is the final report which Bill Hamilton prepared for the determination of his grant support. He distinguishes three eras. First, his years from his arrival in Augusta until 1946 when he started to get a significant level of grant support. Second the years of life insurance and NIH support. And finally, the years of the cardiovascular training program.

During the early years the combined physiology and pharmacology department got about \$2,000 a year from the school for teaching and research expenses. For the manufacture and maintenance of equipment, Bill had inherited a variable jewel from his predecessor. This was Walter C. Heath, a one-eyed, one-time cotton mill machinist who had been in the department for at least eight years and was able to turn even incomplete ideas into workable instruments with square corners and accurate dimensions. He had been there at least from two previous department heads and he stayed there under Bill until he died.

Heath made a perfect partner for Bill Hamilton in improvements for the manometer Bill had brought with him from Washington. It was no long before other schools were asking him to make them some, and out of this business grew a small supplement to the department fund. In fact, it ran through as a special fund until the end of my time here. I do not have records of his death except for a 1948 letter before Anson Clark took over. I think his death was during my first year as chairman, but I haven't been able to find it in any of the records.

During the first era, the work centered around Hamilton and Woodbury, and then John Remington. But many clinical staff members became collaborators in both clinical and animal experiments. Wofford, Woods, {M.} Robinow, Slaughter, Murphey, {Hervey M.} Cleckley, {A.P.} Briggs, and {B.E.} Abrams are names that appear on these papers.

For most of the years covered, lunch together in one of the offices was a free-form for any arguments or any other features. Bill and Bob and Elkin and Heath kept a common stock of crackers and cheese replenished by the messenger from the neighborhood market. I preferred peanut butter and a big pot of tea was always made.

Bill's own words best summarize his first era. "During this time, we made some 65 contributions to standard journals, textbooks and to medical physics, and wrote a textbook of human

physiology. We developed and inter arterial manometer with a high figure of merit, priced \$35 and many all over the country thus helping to pay for shop and materials. With this manometer we made the first quantitative record of the human arterial gram, compared true pressures, followed the pulse pressure arterial gram in patients during surgical time under different anesthesia, and in convulsive psychiatric therapy. In dogs we studied the pulse wave velocity and its transformation. We also studied the relation of the pulse pressure curve to the pattern of cardiac injections to the total ballistic cardio graphic points. We published on the indicator dilution method of measuring cardiac output and in 1944 published a theory of cardiac output control which has recently – 20 years later – been accepted by Homer Warner... We branched out into pressure pulses in small animals – fish, reptiles, small birds, mice, and so forth, and in relation the lesser circulation of un-anesthesia dogs.”

The Life Insurance Medical Research started in 1946 was broadly titled Blood Flow and Blood Pressure under Experimental and Pathological Conditions. The NIH grant which started in 1950 was similarly general, Physiological and Clinical Cardiovascular Studies. Associated with the latter was a construction grant which greatly enlarged the working area in the Dugas Building. The Life Insurance grant supported many activities including research by medical students and the cardiopulmonary laboratory whose first director was Don Fowl followed by Bob Ellison, and then by Lois {Ellison}. One of the significant projects was the joint undertaking with Cunard laboratory in New York, successfully comparing the dye dilutions and direct input methods for cardiac output. And with these funds and some other supplements, we were able to get the first image amplifier in this region.

The cardiovascular research training program started in 1953 and operated jointly with Ray Ahlquist has been an appropriate flowering of all things started in the first and second eras. The trainees came from all over the country and the world, and each had brief exposure to basic followed by strong and current training to define the problem pursuant with guidance and have something ready for publication by the end of the year. Eight of the trainees stayed on at the Medical College of Georgia for various numbers of years; three are still here. They’re in the room today. We are in varying degrees of contact with the other 24, most of whom are still active in cardiovascular research.

The connection with the second and third eras, Bill’s report lists 7 areas of research in which he and the other department members and trainees had concerned themselves. First, the theory and practical techniques of dilution method; second, the physics of pulsatile flow and elasticity of tissues; third, the measurement and control of blood volume; four, cardio number graphic changes and electrocardiographic norms; five, renal blood flow and intravascular volume; six, the distribution of pressure and flow in the micro-circulations; and seven, congestive failure of the circulation where Bill was always very proud of the early in recognizing the primary role of the kidney.

And now the fini. Folks who knew and worked with Bill or more particularly in competition with him will surely come up with sharply different descriptions. His first letter to me which you saw was as good as an example as you could want of the good and bad sides of the man. And I am deeply in debt to him because I let the enthusiasm of the message sell me in spite of the warnings

of technical imperfections. He had an excellent background in biology and an extremely accurate and far-ranging mind. He collaborated with almost every individual who was ever in the department and he was always a very active partner in such collaborations. He was full of ideas and usually of ways to test them. And he kept abreast of all the significant literature. He had high standards for the teaching and when it was going on, it was everyone's first responsibility. He did a particularly fine job of integrating discussions in small groups of students. As department head, he got most energy he needed from the group. The overall results of his 24 years bore out well his insistence on the cardiovascular boundaries of the work. His contributions to the school over these critical years surely justify the actions of the regents in giving his name to the new wing. Thank you.

Oh, I almost forgot, there is one of the manometers out in the center of the room. Last year the library wanted to put a school exhibit up in Atlanta for some purpose and they asked us if we would fix up a Hamilton manometer to go with some of the other things, and especially with the assistance of Jake in the lab here, we fixed this up, which is almost perfect. It's made out of pieces that were part of the regular equipment the last time they were made. There is, uh, also I didn't show the description of the manometer, and how it works, and why. There is also a sheet of that out there that can be consumed.