APPENDIX 1

One Hundred Years of Physiology at West Virginia University, 1869-1969

Edward J. Van Liere, Ph.D., M.D.

Dean Emeritus and Emeritus Professor of Physiology

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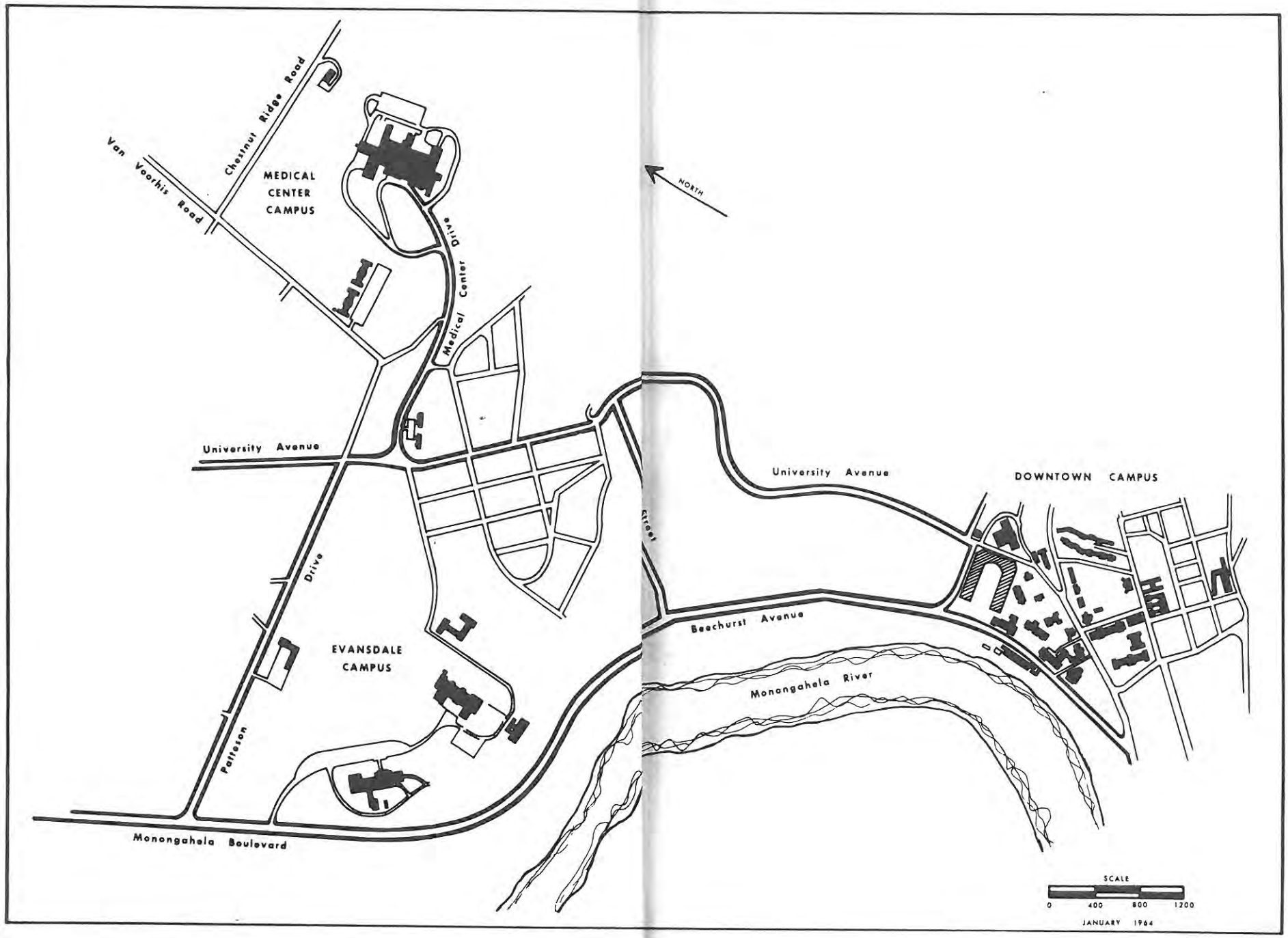
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Chestnut Ridge Road
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Medical Center Drive
University Avenue
EVANSDALE CAMPUS
Patterson Drive
Monongahela Boulevard
NORTH
University Avenue
DOWNTOWN CAMPUS
Beechurst Avenue
Monongahela River
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JANUARY 1964

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WEST VIRGINIA UNIVERSITY
SCHOOL OF MEDICINE

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Physiology is the science which deals with the function of the living organism and its parts.

Claude Bernard (1813-1878)
French Physiologist

To:

My mother and father

CONTENTS

FOREWORD

In this treatise—which tells about the first one hundred years of physiology at West Virginia University—an attempt is made to outline briefly how physiology developed at the university and also presents the academic qualifications of teachers in the department. In the beginning physiology was taught along with anatomy and hygiene, and the course consisted largely of lectures and a few demonstrations; eventually some laboratory work was added. Later physiological chemistry was combined with it.

It is of interest that not until 1920, over half a century from the time physiology was first offered, that a full-time man was employed to teach physiology who had taken postgraduate training in physiology and was capable of doing research in the field. From that time on there was always at least one man in the department who had had training in biologic research. It is noteworthy also that with the exception of one year (1926-27) there was always a man in the department who held an M.D. degree, who, of course, appreciated the clinical significance, so that there was a balanced presentation of basic and clinical viewpoints.

It was not until 1921 that physiology was entirely separated from all other basic sciences. Finally, following the modern trend, by 1966 the department had acquired faculty members trained in biophysics, and it is now known as the department of physiology and biophysics.

PERIOD COVERED—1869-1969

West Virginia University was founded in 1867. Although during the first two years of its existence a course in general physiology was offered by Samuel G. Stevens, M.A., professor of natural sciences, medical physiology was not taught until 1869. In that year Hugh Workman Brock, M.D., gave a course in anatomy, physiology, and hygiene. It is noteworthy that this was the beginning of a continuous program in the teaching of physiology. This treatise deals with the teaching of medical physiology during the first one hundred years, that is, from 1869 to 1969.

ACKNOWLEDGMENTS

The author wishes to express his thanks to several people who were of aid in compiling material for this treatise. I am indebted especially to three of my colleagues presently in the department of physiology and biophysics, namely David W. Northup, Ph.D., J. Clifford Stickney, Ph.D., and Hugh A. Lindsay, Ph.D. I wish also to express my thanks to Michael F. Wilson, M.D., chairman of the department, for matters concerning the department between the years 1965-69.

It is a pleasure also to acknowledge the aid of Dr. Robert F. Munn, Dean of Library Services of West Virginia University, for valuable editorial counsel. The author wishes, furthermore, to express his thanks to Lysander L. Dudley, Sr., Executive Director of West Virginia Foundation, Inc., and to Audley Wolfe, Jr., Academic Liaison for the Foundation for their services. The pleasant cooperation of George A. Smith, Jr., Vice-President of the McClain Printing Company, is appreciated.

The help of all these men is acknowledged with pleasure. The author wishes to emphasize, however, that errors of commission or omission are mine and mine alone.

MEANING OF THE WORD "PHYSIOLOGY"

It may be useful to outline briefly the various meanings which have been ascribed to the word physiology. Currently we understand that physiology is a science which treats of the functions of the living organism and its various parts, and is not concerned with structure. A long time elapsed before this present meaning was firmly established.

The word physiology is derived from the Greek (*physio* [physics and/or physical] + *logy* [discourse]), that is a discourse on physics or physical matters. Its early meaning was obscure and remotely removed from its present concept. In the beginning, physiology was interpreted to mean an inquiry into nature and especially in the nature of things. It eventually lost its philosophical character and became the study and description of natural objects and phenomena.

Jean Fernel (1497-1558) in his book *Physiologia* published in 1554, included in physiology the normal structures and functioning of the human subject. His book became popular and was reprinted long after his death. Although his meaning was not accepted by all, many employed the term "physiology" as outlined by Fernel. Due to Albrecht von Haller (1708-77) and a few other scientists, a more or less purely physiological connotation became widely accepted, and the word "physiology" included the study of human structure and function. Structure, of course, concerns anatomy. It took a long time to separate the studies of structure and function, and Johannes Purkinje (1787-1869), a Bohemian physiologist, stated that the physiology of his century was just a commentary on anatomy.

For many years there was a marked inclusion of comparative anatomy in physiology, even up to the end of the

nineteenth century. After about 1830 the tissues of the body were studied microscopically, and the physiologists became more and more interested in histology. The first Physiological Institute was built in Breslau in 1834 for Purkinje. Despite what he had previously stated about nineteenth century physiology, Purkinje worked mostly in histology. Indeed his name is associated with several anatomical structures, such as Purkinje fibers, Purkinje cells, and Purkinje network. He also made important physiological observations, especially those concerned with vision. In France by the beginning of the nineteenth century, studies of animal function began to include more and more a study of function rather than of structure.

Thus it may be seen that it took a long time for the term "physiology" as understood today—the normal functioning of organisms or their constituent parts—to gain acceptance in the biologic literature. The present concept is that physiology is one of the biologic sciences, and in medical schools it is considered one of the important basic medical sciences.

PHYSIOLOGY AS PART OF THE MEDICAL CURRICULUM

In 1726 the University of Edinburgh founded a chair which was termed "The Institutes of Medicine." The man who filled this chair taught internal medicine and also physiology. The founding of this chair was a momentous step, for it was the first time that physiology was recognized as an integral part of the medical curriculum in English-speaking schools. For 175 years, that is, until 1901, these chairs of "The Institutes of Medicine," were recognized not only in Scottish universities, but in those of the dominions as well. In fact, Sir William Osler occupied such a chair when he taught at McGill University. Gradually the term "Institutes of Medicine" disappeared from the catalogues of most institutions, as departments of physiology were established.

For many years some institutions did not separate physiology entirely from other basic sciences. Some medical schools, for example, listed courses, such as physiology and biochemistry, or in combination with pharmacology. Presently, with very few exceptions, nearly all medical schools have separate departments of physiology, although many of them are now called departments of physiology and biophysics.

Physiology was, of course, taught in the early medical schools of the United States. The first medical school was founded in 1765, and later became known as the School of Medicine of the University of Pennsylvania. The Harvard Medical School was founded in 1782. As a rule physiology was taught along with anatomy, and Harvard followed this plan until 1871. Oliver Wendell Holmes, M.D. (1809-94), author and physician, taught both anatomy and physiology at the Harvard Medical School from 1847 to 1871. Presumably

he gave only lectures in physiology, the number is not exactly known, but apparently from five to twenty were given toward the end of the anatomy course. No laboratory work was offered. It is related that Dr. Walter B. Cannon, the late eminent professor of physiology at Harvard, pointed out that there are no known experiments of a creative or productive character made by Dr. Holmes or his students. The picture in physiology at Harvard was changed in 1871 when a physiology laboratory was founded by Dr. H. P. Bowditch.

FIRST PHYSIOLOGY LABORATORY IN THE UNITED STATES

Henry Pickering Bowditch, M.D. (1840-1911), founded the first physiology laboratory in the United States at Harvard University in 1871. He received his M.D. from Harvard in 1868; following graduation, he went to Europe to complete his scientific education. While there he came under the influence of Karl Ludwig (1816-95) at Leipzig, an outstanding physiologist. Dr. Bowditch had a fruitful year at Leipzig, and while there he was the first to demonstrate the phenomenon of "treppe" or "staircase contraction" of muscle. He also demonstrated in heart muscle the so-called "all or none law." Obviously he was a talented and creative physiologist.

Dr. Bowditch returned from Europe and joined the staff of the Harvard Medical School in the autumn of 1871 as an assistant professor of physiology, and, incidentally, was the only man in the department. He had brought a considerable amount of physiological apparatus from Europe which he could use for his experiments. He promptly set up a laboratory of physiology, and physiology became separated from anatomy at the Harvard Medical School.

Dr. Bowditch performed research in many fields of physiology. Among the areas he explored, besides those already mentioned, were: investigations on the interference between acceleratory and inhibitory nerves to the heart and on variations of arterial blood pressure, the effects of respiratory movements on pulmonary circulation, and the nervous control of blood pressure.

His laboratory became famous and attracted many outstanding investigators. In fact, experimental work in fields besides physiology were pursued, such as pathology, pharmacology,

psychology, surgery, and bacteriology. Dr. W. B. Cannon wrote concerning Bowditch's laboratory as follows: ". . . these rooms might perhaps be designated the first laboratory for experimental medicine in this country, for every phase for experimental medical work was represented there within a few years of its establishment." Many who worked in Bowditch's laboratory scattered widely to fill important posts elsewhere in the United States.

Dr. Bowditch's laboratory was open to all members of the faculty interested in the advancement of scientific medicine. Unfortunately only an occasional medical student, on an elective basis, could work in the laboratory. Obviously this was not a satisfactory arrangement, so in 1893 Dr. Bowditch invited William Townsend Porter, M.D., who had done outstanding physiologic research in Saint Louis, to come to Harvard and reorganize the teaching of physiology. Dr. Porter introduced routine laboratory experiments for the students. To do this he needed considerable equipment, which he found so expensive that he had mechanics of the physiology department make it for him. Later, he formed the Harvard Apparatus Company which manufactured laboratory equipment for many schools, including West Virginia University.

In sum, the students of the Harvard Medical School did not all have an opportunity to perform laboratory experiments in physiology until Dr. Porter came in 1893, despite the fact that Dr. Bowditch founded his laboratory in physiology in 1871. Other medical schools soon established physiology laboratories for their students, and the teaching of physiology became quite separated from anatomy.

RESEARCH IN PHYSIOLOGY

It is not my intention to outline in detail the history of research in physiology, but a few statements regarding research may be in order. It is difficult to ascertain exactly when research in physiology or in medicine started. It has been claimed that the experimental method was introduced in A.D. 150 by Claudius Galen (ca. 130 to ca. 200 or A.D. 210), the celebrated Greek physician. He has been spoken of as the father of physiology; one of his contributions was exploration of the circulatory system. His doctrines dominated medicine for over one thousand years. It has been claimed by others that Erasistratus (300 B.C. to 250 B.C.), an anatomist and physician who practiced in Alexandria, should be called the father of physiology. Be that as it may, the author of this treatise is inclined to accept Galen as the father of physiology. After Galen's death there was a total void of experimental work for over twelve hundred years.

No biological research appears to have been done during the Dark Ages. However, with the Renaissance there was a revival in practically all branches of learning. Andreas Vesalius (1514-64) made dissections on cadavers and animals and became the foremost anatomist of the sixteenth century. William Harvey (1578-1657), a name known to all physicians, demonstrated the circulation of the blood in 1628; he is viewed by some scientists as being the founder of the experimental method in biology. In the latter part of the nineteenth century the Nobel Prize was awarded to physiologists who had made outstanding contributions.

Two groups of workers, one in Canada and one in the United States, received the Nobel Prize award during the 1920s. Many readers will recall the work of Banting and his

colleagues of the University of Toronto. In 1922 these men discovered insulin which is used for the control and treatment of diabetes. Another important discovery was that of Whipple of the University of Rochester and Minot and Murphy of the Harvard Medical School who discovered the treatment of pernicious anemia, a heretofore fatal illness. It is not given to many men who do research in physiology or in medicine to make such brilliant discoveries. Although the average physiologist may not make outstanding discoveries, his researches contribute to the sum of human knowledge. Indeed, some of the researches may be pedestrian in nature, or even of the so-called Edisonian type, but often valuable work is reported upon which a more imaginative worker can build. Most physiological research is eventually of some value to the practice of medicine, although some of it may have no apparent clinical significance. Dr. Simpson's (see Simpson) criticism of research work in small medical schools was not entirely justified. It is true, as he said, that many men who do research are often poor teachers, but it may be added that men who do not do research may also be poor teachers. It is not necessary to belabor the value of research, especially in the basic medical sciences. There is presently no accredited medical school in the United States in which the majority of men who teach basic sciences are not engaged in research.

The teaching of undergraduate students should, of course, not be neglected, and certainly should not be delegated solely to instructors or to graduate students. Medical students, and for that matter, all students, should be taught by outstanding and experienced teachers. I have always been impressed by the late Professor A. J. Carlson of the University of Chicago, who although a renowned experimental physiologist, gave a course in physiology to nonmedical students.

It is possible that in recent years too much emphasis has been placed upon research, and in some instances good teaching and contact with undergraduate students have been neglected. Indeed, it is thought by some that this has been a factor in causing student revolt on campuses. I am not sure that this is actually true. It must be emphasized that research work is

an integral part of the functions of a university. It is my belief that research makes a more competent and stimulating teacher.

In order to do first class research it is almost necessary to do it continuously. I recall what Professor A. J. Carlson, who then was chairman of the department of physiology at the University of Chicago, said about this. During World War I he assisted Herbert Hoover in food distribution in the Balkan area. Dr. Carlson had been quite active in biological research for many years. After he had completed his assignment in the Balkans, he returned to his duties at the University of Chicago. He stated that it took him almost two years to feel that he was again established in his research program. A part of the difficulty of returning to research after an interval as described by Dr. Carlson may be ameliorated by working on a long-range research program. This probably is not the only answer, but I am inclined to believe that it may be of help to some workers. One difficulty is, of course, that as an individual grows older he loses some of his enthusiasm and there may also be some loss of the imaginative powers.

It is true that a physiologist is judged by the quality and quantity of research reported. Important posts in physiology are generally offered to men who have made significant contributions in their field. Often their personality, their teaching and administrative abilities are not seriously considered. The idea of "publish or perish," a phrase which has been widely used during the past decade, does play a part in the life of a physiologist.

There are some well-trained physiologists who are intelligent, industrious, and are good teachers, who never produce worthwhile research. Some are not interested in research or lack imagination, and perhaps some are lazy. Some enjoy teaching and reviewing the literature, but such people are not considered leading physiologists.

I believe that all people who teach basic sciences in a medical school should be interested in creative work, but should not, of course, neglect their teaching duties. As a medical student at the University of Wisconsin I was impressed by a statement

made to me by Dr. J. A. E. Eyster, a brilliant physiologist, who was then chairman of the department. I remarked to him one day that a professor, who was chairman of the department of physiology in an old established medical school, must be a good man. He had written a textbook in physiology which was rather widely used. Dr. Eyster quietly stated that this particular professor had never done any creative work in his field. This made such an impression upon me that I vowed that if I ever taught physiology I would attempt to do research. This has been my philosophy throughout the years.

CLINICAL RESEARCH

Much clinical research is physiologic in nature and many of the clinicians who do research have had special training in the basic sciences, such as physiology and have learned research methods. As a rule, clinical research cannot be as well controlled as research in the basic sciences, but this, of course, is to be expected. Even full-time clinicians in medical centers often do not have much, if any, time for investigation. Their researches are apt to be interrupted on account of their patients and also, because of their teaching duties. They, moreover, as do basic science teachers, serve on committees of the Medical Center and even outside the Medical Center. In many instances they are called upon to speak throughout the state, and, of course, attend many national meetings.

Despite the multifarious duties of the clinicians, I feel that they should be interested in some type of research work. If they themselves have not the time to devote to investigation, they should guide the younger workers and stimulate them to do some type of creative work. Some, however, believe that research by clinical men can be overdone. Rather recently Dr. Wilbur Davison, formerly dean of the School of Medicine of Duke University and professor of pediatrics, and who had been a student of Sir William Osler, published an article in the *Journal of the American Medical Association* (*210*:2219 [December 22] 1969), "Memories of Sir William Osler." He quoted Sir William as follows:

> Lastly and chiefly, divert the ardent souls who wish to be whole-time professors away from the medical school, in which they are not at home, to the research institutes to which they properly belong, and in which they can do their best work.

Dr. Davison stated that he had heard Sir William say the following a number of times, "A research man often was not fit to teach medical students."

Dr. Davison himself has very definite ideas concerning overemphasis on research and obtaining research grants. He criticizes the National Institutes of Health (NIH) for distributing grants lavishly since 1946. He writes:

> This flood shifted the minds of many of the faculty from teaching students and creative thinking to grantchasing, empire building, supervising hordes of Ph.D. graduate students and other technicians, and persuaded many young physicians, so greatly needed in community hospitals, as well as in medical practice, to remain in the ivory-towered medical schools.

There are many other men who agree with the sentiments expressed by Dr. Davison. I feel, myself, the force of his arguments, for actually there appears to be a shortage of practicing physicians, and, furthermore, not many men are particularly suited for research. Presently there is a great curtailment in the distribution of research grants by the NIH because of a decline in its operating budget. The entire matter needs careful study and perhaps reappraisal.

APPOINTMENT OF STAFF MEMBERS IN THE DEPARTMENT OF PHYSIOLOGY

I am not familiar with the details of how the early staff members in physiology were chosen, but assume that until 1902 they were selected by the president and governing board of the university. After 1902 John N. Simpson, M.D., who was employed by the university to teach physiology and anatomy, doubtless chose the men he needed to help him and made his recommendation to the president of the university. I do not know, moreover, how many persons applied for a teaching position in physiology at West Virginia University or what qualifications they had.

I wish to digress a moment and tell about the application of a most able man who later became well known throughout the United States. The name of the applicant was Ray Lyman Wilbur, M.D. So far as I know, the fact that he applied for a position at West Virginia University has never appeared in print. It is not mentioned in his memoirs. Dr. Wilbur received the B.A. and M.S. degrees from Stanford University. He enrolled in the Cooper Medical College in San Francisco (which later was taken over by Stanford University) and obtained his M.D. degree there in 1899. I am not sure of the exact year he applied for a position at West Virginia University, but presumably about the turn of the century.

Dr. Wilbur was for many years president of Stanford University and made a distinguished record there. While president of Stanford he served for a while as chairman of the Council of Medical Education and Hospitals of the American Medical Association. This council for many years had great influence on medical education in the United States, for actually it was an accrediting agency. I knew Dr. Wilbur only slightly, but had

occasion to have a conference with him about 1943 which had to do with certain problems in medical education at West Virginia University. Dr. Wilbur was thought by some to be a rather austere man and some of the younger deans of medical schools regarded him with awe. I found him very approachable, friendly, and cooperative. In the course of our conversation he informed me, much to my surprise, that many years ago he applied for a position in physiology at West Virginia University, but told me smilingly that he did not receive the appointment.

Dr. Wilbur did become a teacher and taught physiology at Stanford University, and later became associated with Cooper Medical College. He became professor of medicine, was then promoted to the deanship, and finally was appointed president of Stanford University. When Herbert Hoover assumed the presidency of the United States, he invited Dr. Wilbur to become Secretary of the Interior. In essence, Dr. Wilbur during his lifetime served in several important capacities: as a teacher and administrator of a medical school, as a president of a university, and as an administrator in public service in the United States. It is interesting to speculate what Dr. Wilbur might have accomplished at West Virginia University had he been added to the staff. He was brilliant, forceful, and ambitious. He would have left a marked imprint on any institution which he served.

It is in order to return to the matter of how staff members in physiology are chosen. It appears that in the early days the man responsible for teaching physiology was selected by the president of the university as previously mentioned. John N. Simpson, M.D., was chosen to teach this subject in 1902 and held this position until 1919. In 1912 he was made dean of the School of Medicine, but continued his work in physiology. As dean of the School of Medicine he played an important part in selection of his entire faculty. In fact, he chose the teachers in physiology until 1923.

Dean Simpson invited me to become chairman of the department of physiology in the spring of 1921. At the time I held a M.S. degree in physiology from the University of Wisconsin, an M.D. from the Harvard Medical School and had

a fair amount of teaching experience. When Dean Simpson wrote me, I was acting professor of physiology at the School of Medicine of the University of South Dakota, a two-year school. I accepted the appointment and commenced my duties at West Virginia University in September 1921.

Dean Simpson employed me entirely on the basis of recommendations he had received from the department of physiology of the University of Chicago, especially those made by Arno B. Luckhardt, M.D., an excellent and well-known professor of physiology at the university. It seems in retrospect that Dean Simpson was taking something of a risk in hiring me without a personal interview; however, in those days this was not an unusual procedure.

The story is told how George H. Whipple. M.D., dean of the School of Medicine of the University of Rochester, hired Wallace O. Fenn, Ph.D., who was only thirty years of age, as chairman of the department of physiology in 1924. Dean Whipple was asked why he did not seek a personal interview before he filled a post so crucial to the whole concept of the new medical school. He replied that Walter B. Cannon, M.D., distinguished professor of physiology at the Harvard Medical School was a close friend of his, and he had recommended Wallace Fenn and he (Dean Whipple) simply took Dr. Cannon's word. Parenthetically it should be mentioned that Dr. Fenn eventually became one of the outstanding physiologists in the United States.

In summary, it may be said that those were the days before much stress was laid on the benefits of our modern systems of committees, consultings, evaluations, and reviews. For good or ill, those days are gone.

Dean Simpson had offered a position as associate professor of physiology and pharmacology to C. Royal Kessel, M.D., who had just graduated from Jefferson Medical College. He remained in the department for two years. Dean Simpson then in 1923 offered J. Floyd Morrow, M.D., the position which Dr. Kessel previously held. He had received his doctor's degree from the University of Cincinnati. Dr. Morrow taught only one year. These men held dual appointments and divided their

time between physiology and pharmacology. It seems that Dean Simpson had made certain commitments to these men; at any rate, I was not consulted about their appointments. Both Dr. Kessel and Dr. Morrow were capable men and conscientious teachers, but they had not received graduate training in physiology.

After 1923 I was allowed to choose my own staff members. Dean Simpson was most cooperative and never questioned my recommendations. The method I chose to secure staff members was to get in touch with an institution in which outstanding graduate training was given in physiology. For example, to replace Dr. Morrow, I wrote Dr. A. J. Carlson, chairman of the department of physiology of the University of Chicago, and asked him to recommend a young physiologist. He suggested J. Frank Pearcy, Ph.D. (see Pearcy), a brilliant fellow who had just completed his doctorate in Dr. Carlson's laboratory. Up to 1935 I depended pretty much upon the recommendations of Dr. Carlson to supply me with well-trained physiologists. I also depended upon Maurice B. Visscher, Ph.D., M.D., chairman of the department of physiology of the University of Illinois College of Medicine, who later went to the University of Minnesota Medical School. Both Dr. Carlson and Dr. Visscher sent me excellent men.

When I became dean of the School of Medicine in 1935, I continued to be chairman of the department of physiology, so I was still responsible for obtaining staff members. Since my duties as dean increased, I recommended to the president of the university in 1955 that David W. Northup, Ph.D. (see Northup), be made chairman of the department. He had obtained his A.B. degree at Reed College, his A.M. degree at the University of Oregon, and his Ph.D. degree at the University of Illinois. He had been a colleague of mine for twenty years and we had worked closely together. When he became chairman of the department, he made his recommendations for staff members to me, and I always sent them on promptly to the president of the university. Dr. Northup, of course, became solely responsible for departmental affairs and served as chairman for ten years (1955-65).

After Dr. Northup resigned as chairman of the department of physiology, the dean of the School of Medicine appointed an ad hoc committee to search for a new chairman. The committee recommended Michael F. Wilson, M.D. (see Wilson), who was serving as associate professor of physiology and biophysics at the University of Kentucky College of Medicine. He had received an A.B. degree from West Virginia University and an M.D. from the University of Pennsylvania. He was an exceptionally well-trained man, not only in physiology and in biophysics, but also in internal medicine.

The present method for choosing a chairman of the department is as follows: The selection is the responsibility of the dean of the School of Medicine. He generally appoints an ad hoc committee, and the chairman of this committee reports to him. When a candidate is recommended, he is invited to visit the School of Medicine and meet with members of the ad hoc committee, with the personnel of the department, and with certain administrators of the Medical Center. He generally gives a seminar before the departmental members. If the candidate is chosen and if he accepts the appointment, the dean of the School of Medicine makes his recommendation to the Provost of the Health Sciences, who in turn recommends him to the president of the university. It is hardly necessary to state that the selection of a departmental chairman is an important matter, and an earnest attempt is made to secure the services of a well-trained and experienced man.

HOUSING THE DEPARTMENT OF PHYSIOLOGY

The department of physiology was housed in various buildings over a period of one hundred years. In the early years when physiology largely consisted of lectures and a few demonstrations, not much space was needed; but, when laboratory work for students was emphasized, a larger teaching area was needed. For a time the course was taught in Woodburn Hall. This must have created many problems, because this building was certainly not planned for the teaching of medical subjects. It is difficult, for example, to see how dogs could have been used in this class-room building.

When the Medical Building was completed in 1916, the department of physiology was housed on the first floor. In 1923 it was moved to the second floor, which was a much more desirable location. In the student physiology laboratory there were twelve tables, and since two students worked together, twenty-four students could be comfortably accommodated. About 1920 approximately fifty first year students were admitted, so it became necessary to hold two laboratory sessions of about twenty-five students each. This greatly increased the work in the department. Student enrollment continued to increase in the 1920s and the entering class contained sixty or more students. In order to accommodate this number of students in the physiology laboratory, two of the twelve tables were removed and three students were assigned to each of the remaining ten desks. This was not a satisfactory arrangement, but nothing could be done about it.

In 1935-36 the School of Medicine was reorganized and only thirty first year students were admitted. This eased the

pressure, so far as space was concerned. The department was well able to handle this number of students satisfactorily. There was no increase in the number of first year students admitted until 1957. On July 1, 1957, the School of Medicine moved into the Basic Sciences Building of the new Medical Center. The entering classes were gradually but substantially increased, so that by 1969 approximately sixty-eight students were admitted each year. The faculties, of course, of all the departments too were enlarged.

It must be emphasized that not until the School of Medicine was moved to the new Medical Center was the department of physiology adequately housed. Until then, there were too many students for the space available, and it was also difficult for the faculty to carry on research work. Furthermore, the provision for animal quarters was deplorable. For many years the animals were kept either in the student laboratory or the research laboratory. About 1948 a fairly suitable animal quarters was constructed adjacent to the old Medical Building. This was a boon, indeed, to the School of Medicine. Despite the lack of space and the absence of good animal quarters in the early years, every effort was made by members of the staff to do good teaching and acceptable research work. It should be mentioned that during these trying times some members of the faculty believed that eventually more suitable quarters would be provided and this proved to be true when the Medical Center was developed.

LABORATORY WORK AND LABORATORY MANUALS

When I became responsible for conducting the department of physiology at the School of Medicine of West Virginia University, I compiled my own laboratory manual. There were acceptable laboratory manuals obtainable; one of the best known was, *A Laboratory Course in Physiology* by Walter B. Cannon, M.D., of Harvard, and published by the Harvard University Press (1911). Despite the fact that manuals were available, none of them suited my purpose. My own laboratory manual contained, what I considered, the most desirable experiments which I had seen used at the University of Wisconsin, the University of Chicago, and the Harvard Medical School. The manuals were distributed in loose-leaf form and from time to time revised. As the department grew and the teaching staff increased more and more changes were made in the manual. An earnest attempt was made to keep them up-to-date.

The students spent a three-hour period twice a week for one semester in the laboratory. They were expected to keep a record of their laboratory data, together with any tracings obtained, and these records were inspected and evaluated. This plan was used by nearly all medical schools.

The past few years, however, there has been a change made in the laboratory work. The time the students spend in the laboratory has been lessened and the number and type of experiments the students perform have been markedly changed. Laboratory books are no longer required of the students and presently a good deal of the laboratory work is demonstrated by the instructors. The students no longer use mammals (cats

and dogs) in the laboratory. Presently they perform experiments which concern nerve-muscle physiology, and also make certain observations on man, such as studies on respiration, which includes blood gases following exercise, and studies of normal heart sounds and blood pressure.

Nonmedical students: In recent years changes have been made also in laboratory work for nonmedical students, that is, those in dentistry, pharmacy, nursing, medical tecnnology, and dental hygiene. Only a minor portion of the students perform as much as one-half of the laboratory exercises themselves. The great part of the laboratory work consists of demonstrations; many of these are similar to those witnessed by medical students. Since all of these students are in the health sciences a certain amount of clinical application is emphasized.

I believe it may safely be stated that many medical schools have shortened the time the students spend in the physiology laboratory. More and more stress is laid on clinical studies, and since the vast majority of medical students expect to practice medicine it is fitting that they be introduced early to clinical observations. As a senior physiologist, I cannot entirely agree with a marked curtailment of laboratory time for medical students. I appreciate, nevertheless, that medical education is changing and a certain amount of curtailment of laboratory work in physiology is probably justified.

PHYSIOLOGICAL APPARATUS USED

No attempt will be made to give a detailed account of the apparatus used in the department of physiology throughout the years at West Virginia University. For many years physiology was taught with anatomy and some of the work in the physiology laboratory consisted of microscopic anatomy. In the beginning, the equipment of physiological laboratories consisted chiefly of charts and models with perhaps a few simple instruments, such as stethoscopes or apparatus for measuring blood pressure in man.

When the first two years of the medical curriculum was established at West Virginia University (1902-03), physiology laboratory work was expanded. Equipment for counting blood cells and determining the amount of hemoglobin and apparatus for measuring blood pressure in both man and animals were available. In the first decade of this century laboratory tables were provided, each accommodating two students who worked together. Each table had an adequate set of apparatus made by the Harvard Apparatus Company of Cambridge, Massachusetts. The students were made responsible for their own apparatus and if it disappeared or were broken the student was held responsible.

Since many medical schools and research laboratories use physiological apparatus made by the Harvard Apparatus Company, and since it has played a rather important part in the American Physiological Society, it seems in order to comment briefly on its history. This manufacturing company was founded by William Townsend Porter, M.D., professor of physiology at Harvard Medical School, from 1893 to 1929. In its first years the apparatus was made by the technicians of the

Harvard physiological laboratory, but since some of the apparatus was sold for profit, certain legal problems arose, namely, this apparatus could not be manufactured on non-taxed property. On this account the Harvard Apparatus Company was formed. In 1921 Dr. Porter began to contribute the profits from the company for the annual award by the American Physiological Society of the Porter Research Fellowship. After Dr. Porter retired from Harvard in 1929 he offered the company to the American Physiological Society as a gift; his offer was declined. According to A. Clifford Barger (*The Physiologist*, November, 1971): "In 1934 the Harvard Apparatus Company became a non-profit organization and dedicated to: 1) to develop and manufacture equipment needed in education and research in physiology and 2) to assist young men and women of promise in their study of physiology."

Among other apparatus made by the above named company, the kymograph (a revolving drum on which smoked paper was used) was a most useful instrument. It enabled the student to record various tracings obtained from animals (or from man), such as blood pressure, respiration, muscular contraction and the like. About the middle of this century the smoked drum virtually became obsolete and gave way to electrical recording equipment, such as the Grass polygraph. This electric recording equipment is quite expensive, needs considerable care and at times requires the services of an electronic technician. One difficulty with this complicated recording apparatus is that the student may become so fascinated with the instrument that he does not appreciate the significance of the experiment he is trying to perform.

Of late years physiology laboratory work has been greatly curtailed in medical schools, as has been previously mentioned. I wish to reiterate that it is my belief that laboratory work should play an important part in the training of medical students.

ANIMAL QUARTERS IN MEDICAL SCHOOLS

Before discussing animal quarters at West Virginia University, it may be of interest to comment upon the problems that all medical schools experience in housing animals for biological research. Small animals, such as frogs, turtles, rats, mice, guinea pigs and hamsters do not offer too much trouble, because as a last resort these animals can be kept in a research laboratory, but it is better, of course, to have proper rooms for them.

Housing larger animals, such as cats, dogs, and monkeys becomes a more complicated matter. A few medical schools keep dogs on the roof of the medical building or use one of the upper floors. This often is not satisfactory because the barking of dogs is a real nuisance, especially when the medical building is adjacent to a hospital. Under these conditions, sometimes rather rigid procedures are needed to prevent the dogs from barking. One extreme measure is to anesthetize the dogs and cut the vocal cords. This is not a satisfactory method, because if the dogs are kept for a while the vocal cords heal and the dog again barks. This procedure is seldom used today. Theoretically, the animals should be kept in a soundproof room or building, but such a space is often hard to provide. Sometimes they can be maintained in an isolated area so their barking does not disturb sick people.

The best solution to house dogs, and for that matter, all laboratory animals, is in a building which can be kept properly closed, and in which adequate ventilation is provided by an air conditioning system. The latter should be a separate system and not connected with that of any other building.

There are, of course, other problems connected with animal quarters. For example, odors emanating from them are offensive to most people. This nuisance may be greatly lessened if the animal quarters are cleaned well every day and good ventilation afforded. Air conditioning such as described in the above paragraph is of distinct help. There are still other difficult problems associated with animal quarters, such as pulmonary infections, which often spread rapidly among animals; intestinal disorders too are common; fortunately, much less frequent, is the appearance of rabies. In order to prevent such infections and to deal with them properly, if they arise, it is well to have an individual who has a degree in veterinary medicine in charge of the animal quarters. He (or she) should outline its policy, and should receive counsel and aid from a faculty committee appointed by the dean of the school.

In summary, the entire question of housing laboratory animals for research in a medical school is a vexing one. The answer seems to be in providing quarters which can be made virtually soundproof and one that is thoroughly ventilated by an air conditioning system. Arrangements must be made, of course, to provide adequate space for exercise for the larger animals. It is hardly necessary to state that at all times laboratory animals should receive adequate daily care and humane treatment.

The most magnificent facility for housing laboratory animals has been completed recently at the University of Chicago. The building is named The A. J. Carlson Animal Research Facility, in honor of Dr. Carlson who was chairman of the department of physiology at the University of Chicago for many years. It is a two-story rectangular structure built underground at a cost of $4,750,000. As may be imagined, the facilities are excellent. Briefly, it contains administrative offices, a small veterinarian clinic for ill animals, a large operating theater, a radiology suite, an autopsy room, and a large variety of laboratories. There are many rooms for housing different animals, a large space for food preparation, an area for cleaning and sterlizing animal cages and a space for incineration. To my knowledge, this structure is probably the most complete and satisfactory animal quarters in connection with a medical school in existence.

ANIMAL QUARTERS USED BY DEPARTMENT OF PHYSIOLOGY

The history of physiology at West Virginia University would not be complete without mentioning the various places where animals were kept. Laboratory work in medical physiology cannot be given satisfactorily without the use of live animals. They are used by the students in the laboratory, for demonstration by members of the faculty, and for research. In fact, a medical school will not be approved by the accrediting agencies unless adequate space is provided for live animals.

Among the animals used in the physiology laboratory at West Virginia University are: frogs, turtles, mice, rats, hamsters, pigeons, guinea pigs, cats, dogs, sheep, and goats. Small animals, such as mice and rats, can be kept in appropriate cages in the laboratory if necessary. Housing larger animals is a different story. Cats will not thrive unless considerable space is afforded them and dogs, too, need an area for exercise. Large mammals, such as sheep and goats, of course, require special pens.

I do not aim to give in detail a description of all the animal quarters used throughout the years or the exact years they were employed, but will attempt to outline briefly the salient areas. Some of the early alumni will recall the various areas where dogs were kept. I do not know where the dogs were kept in the days before the Medical Building was constructed (1916). No research was in progress and presumably not many dogs were used in the laboratory. After the Medical Building was available, there were a few areas which could be used for housing dogs, but these were not adequate for no special space had been planned for animal quarters. When I assumed my duties at West Virginia University (1921) an old frame house directly across the street from the Medical Building was

available. It was a two-story affair which had been built for housing university students during the First World War, and actually served very well as a place to keep animals. It was built on the site where the Field House now stands, that is, adjacent to the University Heating Plant. One night in the late 1920s the building burned down. I always believed that some vandals set fire to it after releasing the cats and dogs. It is true that it stood next to the railroad tracks and the fire may have been caused by a spark of a passing locomotive, but this does not seem likely and I still feel after many years that an arsonist was responsible. At any rate, the destruction of the old house was a great loss to the physiology department.

The maintenance men of the university built a small lean-to in vicinity of the heating plant, which could hold about twenty dogs, but it was not desirable since it had no heat or running water. Furthermore vandals would break the padlock and allow the dogs to escape. This caused many problems, because often the dogs had been collected for student use in the laboratory, and if there were no dogs the laboratory schedule would have to be changed. The lean-to proved so worthless that it was not used for any length of time.

For several years it was necessary to house the animals in the medical building. They were kept in a number of places: the basement, in a room on the first floor, and finally in cages in the physiological laboratories. None of these places was desirable. In the early 1930s an arrangement was made with the department of athletics to use the ground floor of one of the towers of the university stadium, the one nearest Woodburn Hall. The space had a concrete floor, a supply of running water, and was heated by a gas stove which had a self-adjusting mechanism. However, vandals broke into this place repeatedly and on several occasions let all the dogs escape. It was practically impossible to stop this practice for the vandals would destroy the heaviest padlocks and also pry the heavy wire-screens from the windows to gain access into the room. Only once or twice were they apprehended. Finally, the dogs were removed from the area and only goats and sheep were

housed there. It appears that vandals were not interested in these animals.

Eventually in the middle 1940s a small animal house was erected on the south end of the Medical Building and was the best animal quarters we had ever had. The vandals never broke into it. The building was light and airy and in winter the temperature could be adequately controlled. A full-time man took care of the animals and kept the place clean. It housed the animals for all the departments of the Medical School, and was used up to the time the Medical School was moved to the Medical Center (July 1957). It hardly need be stated that the reason such a modest building was not erected earlier was that there were no funds available for construction purposes.

When the Medical Center was planned in 1951, a part of the ground floor of the Basic Sciences Building was set aside for animal quarters. The entire space is air-conditioned, but on a separate system from that of the remainder of the building. This was done to prevent the odors of the animal quarters to permeate throughout the entire Basic Sciences Building. According to some members of the School of Denfistry, which school is situated directly above the animal quarters, there are times when animal odors may be detected.

On the whole, the animal quarters are well planned. There are many rooms for the various animals, some of which can be used for large mammals, such as sheep and goats. There is adequate space for the storage of food and its preparation. There is a large sterilizer for disinfection of animal cages, and also an area for incineration. The entire area is well lighted and is kept tidy. A man who has the degree of veterinary medicine is in charge and is aided by a group of workers who care for the animals and keep the place clean. I understand, however, that with the rapid growth of the Medical Center the animal quarters are already too small. Plans are being made to erect a separate building to house laboratory animals; this should, of course, be placed adjacent to the Basic Sciences Building. The present animal quarters could be used to advantage for experimental laboratories and for office space.

ANTIVIVISECTIONISTS

In speaking of animal quarters one naturally thinks of antivivisectionists, for these people inspect the quarters where animals are housed. They are often queer individuals and Dr. Carlson spoke of them "as those misguided people." The antivivisectionists have, in many instances, caused real hardships to physiologists. They are very intense people and, indeed, some are fanatics. Perhaps it should be said that they mean well. During my tenure of office I got along pretty well with the antivivisectionists, but they are capable of stirring up a lot of trouble and often cause bad publicity for an academic institution, because they are frequently quoted by the press. It appears they are more interested in dogs than in any other animals. Many people, of course, are fond of dogs.

On one occasion when some vandals broke into our animal quarters and let all our dogs escape the local newspapers reported the incident which, of course, they had a perfect right to do. The news item created considerable excitement and many newspapers throughout the United States also printed the story. It was mentioned that I was the professor of physiology. I received letters from all parts of the United States and some of them were the nastiest ones I have ever received. While none of them threatened me, the letters were vitriolic and reminded me that I must be a horrible monster to experiment on dogs. Some letters were signed and the address given, but several carried no signature. I did not answer any of them, but did keep them in my files for several years. I felt it quite unfair since I really am very fond of dogs and have had several pets in my home, among them, a German shepherd, a terrier and a black

cocker spaniel, and I had great affection for them. I still like dogs and always will.

I do not know whether the people who wrote me were bona fide antivivisectionists. It is noteworthy that I did not receive any letters from any antivivisection society.

It is possible that in the early days some animals were mistreated in the physiology laboratory, but those days are gone. The physiology department is carefully supervised and medical and graduate students do not inflict pain on laboratory animals if any surgery is done the animals are carefully anesthetized.

Occasionally unanesthetized animals are used for minor purposes, such as drawing blood from the vein of the leg of a dog. They are subjected to the same routine as that of human beings. The story I like to tell deals with drawing blood from a large collie dog. A small quantity of blood was withdrawn about every other day. He would stand on his hind legs and put his front paws on a laboratory table, and when the blood was withdrawn he would try to lick the surgeons hands or even his face. Many other like stories could be told about laboratory animals. In essence, a trained physiologist does not believe in animal torture in any way no matter what some antivivisectionists say.

The following excerpt expresses very well the ethics involved in animal experimentation:

GUIDING PRINCIPLES IN THE CARE AND USE OF ANIMALS

(Approved by the Council of the American Physiological Society)

Only animals that are lawfully acquired shall be used in this laboratory, and their retention and use shall be in every case in strict compliance with state and local laws and regulations.

Animals in the laboratory must receive every consideration for their bodily comfort; they must be kindly treated, properly fed, and their surroundings kept in a sanitary condition.

Appropriate anesthetics must be used to eliminate sensibility to pain during operative procedures. Where recovery from anesthesia is necessary during the study, acceptable technic to minimize pain must be followed. Curarizing agents are not anesthetics. Where the study

does not require recovery from anesthesia, the animal must be killed in a humane manner at the conclusion of the observations.

The postoperative care of animals shall be such as to minimize discomfort and pain, and in any case shall be equivalent to accepted practices in schools of Veterinary Medicine.

When animals are used by students for their education or the advancement of science such work shall be under the direct supervision of an experienced teacher or investigator. The rules for the care of such animals must be the same as for animals used for research.

This notice concerning the use of animals was posted in the main student physiology laboratory.

RESEARCH IN PHYSIOLOGY AT WEST VIRGINIA UNIVERSITY

Research in physiology at the School of Medicine of West Virginia University was actually started by J. Earl Thomas, M.D., who was appointed associate professor of physiology in 1920 (see Thomas). Dean Simpson, who had previously taught physiology, was a clinician and had had no training in research methods; he believed that research should not be done in a small medical school. He, however, did not interfere with staff members engaged in research.

Withrow Morse, Ph.D. (see Morse), who became associated with the School of Medicine in the autumn of 1918, was a trained biochemist. He was responsible for teaching physiological chemistry, but also taught physiology for two years (1918-20). His researches concerned problems in biochemistry. Dr. Thomas studied the physiologic action of epinephrine, nicotine, and acid fuchsine. He remained for one year and so far as I know did not publish any papers while at West Virginia University. Later in his career he published a great deal of research on the gastrointestinal tract. He was a sound and careful worker.

When I came to West Virginia University in the autumn of 1921, following the resignation of Dr. Thomas, I tried to foster research. I had been connected with schools, such as the University of Wisconsin and the University of Chicago, and had learned the value of creative work. The first two years I found but little time for investigation, because I was also associated with the Student Health Service, and, furthermore, had rather heavy teaching responsibilities. In 1924 under the supervision of Professor A. J. Carlson, chairman of the department of

physiology at the University of Chicago, I worked with my colleague, J. Frank Pearcy, Ph.D., concerning reflexes from the gastrointestinal tract.

Dr. Pearcy had just completed his Ph.D. under Dr. Carlson and I was planning to take graduate work under the latter's direction also. (I obtained my Ph.D. degree from the University of Chicago in 1928.)

In the school year of 1924-25 I commenced research on the affect of oxygen want (hypoxia) on the body, a subject which had always fascinated me, and from that time on I published mostly in this field. I acquired a small low-pressure chamber, which could withstand practically complete air evacuation and which could hold about two or three small dogs comfortably. Later we acquired a large low-pressure chamber which could accommodate approximately ten men. These two chambers are still in use today.

Although my major research efforts have been devoted to the affect of hypoxia on the body, researches in other areas have been pursued. Among these are studies on: cardiac dilatation and hypertrophy, autonomic nervous system, conditioned reflexes, glands of internal secretion, inanition, affect of noise on body, carbon dioxide, anesthetic agents, gastric emptying time of human stomach, affect of physical training on the body, and certain researches in the field of obstetrics.

My colleagues, after Dr. Pearcy resigned in 1927, in chronological order were: Myron M. Weaver, M.S. (later Ph.D., M.D.); George R. Crisler, Ph.D. (later M.D.); David W. Northup, Ph.D.; and J. Clifford Stickney, Ph.D. All of these men became interested, in some degree, in studies in hypoxia. We also received splendid help in our researches from some of the assistants in the department whose names are listed under the heading "Assistants in the Department of Physiology." Several of these men had considerable research ability and their names appear on some of the publications of the department between the years 1930 and 1940.

In 1955 when the department became larger and more staff members were added, research interests widened. Hugh A.

Lindsay, Ph.D., who came in that year, did research on the endocrines; Wilbert E. Gladfelter, Ph.D., who came in 1959, worked on problems concerned with neurophysiology; and Don H. Blount, Ph.D., who came two years later, worked on cardiac research; he resigned in 1967.

In 1965 when Michael F. Wilson, M.D., became chairman of the department, he recruited individuals, who for the main part had been trained in physiology and biophysics. Dr. Wilson had received training in both these fields and his researches principally concerned cardiovascular physiology. The names of the full-time individuals he added to the staff together with their degrees and their research interests are given in chronological order: William M. Caldwell, B.S.E.E. (medical electronics and medical instrumentation), came in the summer of 1965; Jack Hildebrandt, Ph.D. (respiratory physiology), and Judith R. Hildebrandt, Ph.D. (neurophysiology), man and wife, came in the summer of 1966. These two persons remained on the staff for only one and one-half years. In 1968 three men were added to the staff: Ping Lee, Ph.D. (membrane transport, renal and body fluid physiology); Kenneth C. Weber, Ph.D. (respiratory physiology, mechanics of breathing, pulmonary circulation, and lung metabolism); Gunter N. Franz, Ph.D. (systems biophysics, receptor physiology, neurocirculatory control).

It may be seen that the fields of research were greatly widened in the department with the addition of these capable and well-trained individuals.

A LONG-RANGE RESEARCH PROGRAM

There are some physiologists who limit their researches largely to some special field, and who continue to work rather closely in one area. They may stray from their field of endeavor for a short time, but generally return to their major research interest. In point of fact, something can be said for a worker who confines his area of research to rather definite limits. The field of physiology is so vast that it is impossible for one individual to keep abreast of all the recent literature. If an individual confines his work to a definite area, he can become conversant with the literature, and it is likely that his work will become known. This may be of help to him in many ways, for example, he will become acquainted with other workers in his field and will benefit by an interchange of ideas. Other benefits may be mentioned, such as invitations to participate in appropriate symposia and receive requests to write reviews of his subject.

Certain criticisms can be leveled, of course, at the above suggestion and some of them may be justified, for example, in doing research often certain "leads" present themselves, which are not relative to the problem being studied. If it is possible, a good "lead" probably should be investigated, because it may prove fruitful. The criticism has also been made that working strictly in one field an individual can get into a rut which may stifle his imagination; his contributions become less and less important and finally deteriorate markedly in substance.

Be all that as it may, I, myself have confined most of my long research career to studies in hypoxia. Besides working on man, my colleagues and I have used the following animals: monkeys, sheep, goats, dogs, cats, guinea pigs, rats and mice.

I became interested in studies in oxygen want (hypoxia) on the body in 1925 and am still working in this field. I have had a number of well-trained and able workers collaborate with me. In 1928 George R. Crisler, Ph.D. (see Crisler), came to our laboratory as assistant professor of physiology and did considerable research with me. He remained for seven years and we published a number of papers. When Dr. Crisler left in 1935, David W. Northup, Ph.D. (see Northup), came into the department as assistant professor, and he also chose to work on the effect of hypoxia on the body. In 1940 J. Clifford Stickney, Ph.D. (see Stickney), joined the department and also became interested in hypoxia. The three of us (Van Liere, Northup and Stickney) worked closely together for many years and published numerous papers. It has been a great source of satisfaction to me to work with these two able men throughout the years as our relations were cordial at all times. In fact, all of us are still working on problems which in one way or another relate to hypoxia.

I must make it clear that although I was chairman of the department and dean of the School of Medicine, I did not insist that the men I have mentioned work with me in my researches. They saw the importance and fascination of the problem and voluntarily chose to work in this field.

Over the years there were other individuals who worked with us in our researches, and although none of them had a doctorate degree, nevertheless, they were of distinct help. In chronological order they were: Floyd H. Gaston, B.S., 1927-28; Homer S. Parker, B.S., 1928-29; Joseph E. Hall, B.S., 1929-30; W. Thurlow Booher, B.S., 1930-31; Dennis H. Robinson, B.S., 1931-33; Donald H. Lough, B.S., 1933-34; Isaiah A. Wiles, M.S., 1934-35; Clark K. Sleeth, B.S., 1935-37; Arthur D. Pickett, M.S., 1937-39; and William F. Hewitt, M.S., 1939-40. Thus it will be seen that a considerable number of individuals worked with us. There were several outstanding men in this latter group and some of them became leaders either in medical practice or in medical administration.

If a long-range research program is adopted, many important problems present themselves, and this is not always true if one works in widely divergent fields of research. This becomes more important as one grows older, since it is generally recognized that there is some diminution in imaginative powers as age advances. Furthermore, if for some reason or other, it becomes necessary to discontinue research for rather a long period it is not so difficult to return to one's former field of research.

In my own experience a long-range program in research has been satisfactory indeed. I have been able to write two monographs dealing with hypoxia (one in conjunction with J. Clifford Stickney) and several extensive reviews in *Physiological Reviews* and a review for the *Encyclopaedia Britannica*. I have been invited to participate in several symposia, one in Lima, Peru, in 1949 and another in Interlaken, Switzerland, in 1962. It so happened that I chose an area of research that turned out well, but I recognize that this may not always be so in some other fields of investigation.

GRADUATE TRAINING IN PHYSIOLOGY

It is quite important that graduate training be offered in a department of physiology, or for that matter in most departments in a university. In order to conduct a good graduate program it is necessary that the members of the staff be actively engaged in research and publishing their results in recognized national scientific journals. Graduate students need close supervision so not too many should be annually accepted. It has been stated that no professor should guide more than two graduate students each year. If the number of graduate students is appropriate, the professor will have time to give them careful attention. In the majority of cases the research problem in which the student is to engage is suggested by his mentor. It is only the exceptional graduate student who suggests his own research problem, and in many cases the problem suggested is for one reason or another impracticable. The writing of a doctor's thesis also requires a great deal of careful supervision. In short, a professor has to be prepared to give a good deal of time to his graduate students.

In these days of electronics, computers, and statistical analysis the life of a graduate student is not a sinecure. A good educational background not only of biology is needed, but he must also take higher mathematics, such as calculus, and must possess a good knowledge of chemistry (both organic and physical) and also have a good knowledge of physics.

Students accepted for graduate study should be chosen carefully, and only those who have outstanding ability, and who show promise that they will continue to use their ability throughout their career should be selected. Students who have failed in a medical school should, as a rule, not be encouraged

to work for a doctorate degree in physiology or in any science basic to medicine, for many of these graduate students will eventually teach medical students. It is paradoxical for men who have failed in the study of medicine later to teach medical students. By the same token those who have failed to gain admittance to a medical school should be screened carefully to determine whether there are circumstances which justify their admission to a basic sciences Ph.D. program. Ultimately, however, it is the quality of the finished product that is important and a department should never have to be apologetic about the quality of the instructors responsible for teaching medical students.

Finally, it is not necessary to emphasize the wholesome effect of graduate training on the department and on the individual members of the staff. In essence, a graduate program greatly aids in making a university a community of scholars.

Graduate training in physiology at West Virginia University: Although medical physiology was first taught at West Virginia University in 1869, no graduate work was offered until the middle 1920s, a period of over half a century. Permission was obtained in the early 1920s from the Graduate Council to offer a master's degree in physiology. Even though an active research program was carried on in the department, no candidate appeared to be interested in graduate training. In the late 1940s, however, several students became interested in graduate work and several were awarded the Master of Science degree in physiology.

Due to lack of space and physiologic equipment it was virtually impossible to offer the Ph.D. degree in physiology until the Medical School was moved to the Medical Center (July 1957). In 1955 permission was obtained from the Graduate School to offer the doctorate degree. In the late 1950s a Training Grant was obtained from the National Institutes of Health (NIH) and this helped attract graduate students.

It seems appropriate to mention that the matter of liberal financial support from the federal government for scientific

research has been criticized by able men. For example, Dr. Philip H. Abelson, present editor of *Science*, has been quoted (*Saturday Review*, October 6, 1962) as follows:

> Heavy financial support from the Federal Government for scientific research has attracted to the scientific world many men and women with no adequate motivation or intellectual capability to contribute anything important to science. Mediocre research has diluted the scientific literature and made valuable work more difficult to recognize.

Be that as it may, training grants the past few years have been greatly curtailed by NIH because of budgetary difficulties. Dr. Abelson undoubtedly has a point and the question arises whether such training grants should be continued. Presently the entire matter is being evaluated. There are, of course, many other research grants available but these are of a different type than the Training Grant.

The first Ph.D. degree in the department of physiology at West Virginia University was granted in 1964. Presently there are about ten graduate students in the department of physiology working toward a doctorate degree. Theoretically at least three years are required to obtain this degree, but this is the minimum. Much depends upon the student's educational background when he enters the graduate program. For example, if he has had higher mathematics and other necessary subjects, the work can be done in three years, but often four are needed. Those who have a master's degree in physiology could possibly complete their work in two years. Much depends upon the completion of their research problem and the final acceptance of their doctorate thesis.

Under the able leadership of Dr. Michael F. Wilson, chairman of the department, the department has grown in the past several years, in terms of highly qualified personnel, equipment, and institutional support. Although in research the department has moved strongly into the biophysical area, the teaching of medical students is appropriate to their goals and heavily accented with clinical correlations.

PHYSIOLOGY TAUGHT TO NONMEDICAL STUDENTS

Members of the department of physiology and biophysics are responsible not only for teaching medical students and graduate students physiology, but also are called upon to teach physiology to students in various health sciences. Physiology, for example, has been taught to students in pharmacy for many years. In 1914 the board of regents of the university made provision for instruction in pharmacy and a department of pharmacy was established in the School of Medicine. Ever since that time, a period well over a half a century, physiology has been a required course. Parenthetically, the pharmacy curriculum was made a School of Pharmacy in 1936.

As the years went on, other curricula were established in which physiology was taught by members of the department. In chronological order these curricula are: Medical Technology (1945), School of Dentistry (1957), School of Nursing (1960), and Dental Hygiene (1961). The number of nonmedical students taught in the school year 1968-69 are as follows:

Dentistry	58
Pharmacy	67
Nursing	59
Medical Technology	29
Dental Hygiene	22
	235

Since only sixty-eight medical students and about twelve graduate students were enrolled in physiology, it is obvious that teaching nonmedical students is an important function of the department.

There are those who believe that nonmedical students (with

the exception of graduate students in physiology) should not be taught by full professors or even associate professors. These individuals believe that nonmedical students should be taught by men of lower academic rank, such as assistant professors, instructors, assistants or even graduate students in the department. I have never agreed with this philosophy and always believed that the reasoning was unsound. In my judgment all students deserve the best and most experienced teachers available.

In some instances (but of course not in all) the young and inexperienced teacher often tries to impress his students and is anxious to show them his wide knowledge of the subject. They, moreover, often expect far too much of students not taking medicine or graduate work in physiology. As a result the students often receive poor or failing grades, and what is more important, learn to dislike physiology heartily. Older and more experienced teachers are much less apt to make this mistake.

Physiology taught to students, such as dental, pharmacy, and nursing, should at times at least, be somewhat different from that taught medical and graduate physiology students. The teacher should recognize that each discipline suggests a somewhat different approach or emphasis. I do not mean to imply that the teacher should talk down to his students, but that he should emphasize certain phases of physiology depending upon the discipline. For example, dental, pharmacy, and nursing students should all be taught the general principles of the electrocardiogram and its clinical application, but should not necessarily be exposed to the many details concerning its theoretical aspects and its detailed clinical usage. Another example could be given; that is, the physiology of the autonomic nervous system. I believe it is more important to the pharmacy students than it is to the dental and nursing students. Other examples could be given, but some of them will occur to the reader when he peruses this section of the book.

In the final analysis, I have always been impressed by the fact that Professor A. J. Carlson, Ph.D., professor and chairman of the department of physiology at the University of Chicago, and

a most distinguished man, taught a large group of arts and science students who had not planned a career in the health sciences. He made them understand physiology and taught them to like the science of physiology.

CHANGE OF NAME OF DEPARTMENT

In 1966 the name of the department of physiology at West Virginia University School of Medicine was changed, namely to the department of physiology and biophysics; this followed the modern trend. The following guest editorial by Michael F. Wilson, M.D., chairman of the department, telling of this change appeared in *The West Virginia Medical Journal*, October 1967:

Department of Physiology and Biophysics

During the past year the physiology department at West Virginia University Medical Center has been given a new name—The Department of Physiology and Biophysics. With the new nomenclature there are occurring rather fundamental departures in staffing the expanded department. The changes reflect both a reemphasis of the origins of physiology and a re-orientation of this medical basic science to cope with present trends of increasing quantification of biological and medical knowledge.

From its inception the science of physiology was grounded in and supported by the older disciplines of physics and mathematics. Indeed, the 19th century physician-physicist, Ludwig von Helmholtz, who is often referred to as the father of modern physiology, saw the study of the function of the body as a natural extension of the simpler laws that govern inanimate relations of the universe. His principle of the conservation of energy remains a fundamental tenet of physics and medical science. The corollary, conservation of matter, is the basis for the use of oxygen consumption in the calculation of pulmonary blood flow by the Fick method and for the evaluation of renal function by clearance measurements. The famous Poiseuille formula for evaluating resistance to flow, and the unit of viscosity (the poise), named in honor of the French physician who made the pioneer measurements (ca. 1820), represents a scientific "collaboration" ranging over three centuries of effort. Our current understanding of the manner in which blood flows, stems from the basic equations of: (1) Sir Isaac Newton, the 17th century English physicist, which evaluate the viscosity or inner friction of a fluid, (2) Daniel Bernoulli, 18th century Swiss

mathematician, which characterize the dynamic events, e.g., velocity, lateral pressure and energy losses of a moving column of fluid, and (3) Poiseuille.

These early giants, who contributed to quantitative physiology, have been followed by whole generations of scientists who, at times, seem to speak a language of their own which is directed primarily to their peers. The process of specialization and subspecialization has created problems of communication for the medical basic sciences comparable to those of clinical medicine. Biochemistry, an early offspring from the parent discipline of physiology, increasingly speaks in terms of enzyme-substrate reactions, enzyme kinetics, chromosome dynamics and the DNA double helix. The Cell Biologist refers, for example, to molecular receptor sites, inherited "biochemical" diseases, and messenger RNA. The Molecular Biophysicist relates electrochemical potentials to transmembrane ion exchange, measures active and passive transport across cell membranes, and uses molecular diffraction patterns from x-ray crystallography in determining structure. However, each of these offspring from physiology use the general notations of the physicist and the physical chemist, e.g., millimols, nanomols, coulombs, dynes, ergs, et cetera; and present their concepts by graphical and mathematical means. Most are familiar with the concepts of coding, decoding and encoding.

All of these analytic fundamentals must be interpreted by some comprehensive method if they are to be generally useful to the student of the medical sciences in his future role as a physician. The most promising method is the Analysis of Systems which utilizes the language of control theory, developed initially by the communications engineer, to characterize the informational content of a given set of reactions or the flow of information from one set of reactions (i.e., system) to another. In this way the medical basic scientist can, at least, collate the existing knowledge into a meaningful whole; and in concert with the clinician, identify the features of importance to patient care. The new breed of teacher—the General Biophysicist, or Quantitative Physiologist, if you will—is bringing this approach to medical physiology at West Virginia University Medical Center.

A SYNOPSIS OF PHYSIOLOGY AT WEST VIRGINIA UNIVERSITY—1869-1969

When the university was created February 7, 1867, it was called "The Agricultural College." It opened its doors to students in September 1867. The next year the state legislature changed the name to West Virginia University. During the first year of its founding a course in anatomy, physiology, and hygiene was offered by Samuel Stevens, M.A., professor of natural sciences. This course was presumably quite elementary in nature, so far as physiology was concerned, and could probably be classified as one in general biology and was in no way designed to be professional in character.

During the first year under the designation of West Virginia University Hugh Workman Brock, M.D., a distinguished physician and surgeon of Morgantown, was appointed "Special Lecturer in Anatomy, Physiology and Hygiene" on a part-time basis. Dr. Brock (see H. Brock) was the only man on the university faculty who had the M.D. degree. He must be considered the first teacher of medical physiology at West Virginia University. Moreover, he has the distinction of being the first of an uninterrupted series of men with the M.D. degree who has served the university up to the present time.

The course initially given by Dr. Brock was probably general in nature and not designed for students looking toward the study of medicine. It was scheduled for one of the three terms in which the junior year was then divided and was one of about four courses carried by the average student.

The course presumably became more and more professional in name and content and in 1878 the university catalogue announced the establishment of a "Medical Department" with Dr.

Brock in charge. The course in anatomy, physiology, and hygiene serving as a nucleus around which it was hoped to establish a fully organized medical department. Parenthetically, this did not take place until 1903, twenty-five years later, at which time John N. Simpson, M.D. (see Simpson), organized the first two years of the medical curriculum.

Dr. Brock was a surgeon and in his teaching emphasis was laid on anatomical structure rather than upon function. The instructor dissected a cadaver before the class, surgical operations were demonstrated upon the cadaver, and on occasion the students were permitted to witness surgical operations on private patients. The students themselves were supplied with anatomical material and made their own dissections. "Minute anatomy" was taught by means of the microscope. The students were also taught to examine urine and other body fluids. The course given by Dr. Brock certainly had a strong medical aspect, and as mentioned previously, anatomy was greatly stressed.

Dr. Brock died in 1882, at the relatively early age of fifty-two years, and the course in anatomy, physiology, and hygiene was given by Benjamin W. Allen, M.D. (see Allen), an exceptionally well-trained physician and scholarly individual. He obtained his M.D. degree at the University of Virginia. Presumably the content of the course remained unchanged, but it was lengthened; the class met daily and was given during two of the three terms of the junior year. Dr. Allen was more interested in pathology, especially tissue pathology, and he must be reckoned as one of the early pathologists of the state. Due to his splendid education and his scholarly instincts there is every reason to believe that he gave a good course in anatomy, physiology, and hygiene. After four years of excellent service, he was forced to resign in 1886 on account of ill health.

Luther Sansome Brock, M.D. (see L. S. Brock), a graduate of Jefferson Medical School, and a younger brother of Dr. Hugh Brock, was made responsible for teaching the course. He was given the title "Acting Professor of Anatomy,

Physiology and Hygiene." Apparently he was well acquainted with the academic work which his brother and Dr. Allen had presented and made no changes in the course. Dr. Luther Brock presumably was not interested in teaching for he resigned at the end of the school year.

In 1877 James W. Hartigan, M.D. (see Hartigan), a graduate of Bellevue Hospital Medical College, became responsible for teaching the course in anatomy, physiology, and hygiene. Although Dr. Hartigan was trained as a surgeon, he was also a good biologist. He eventually became in charge of all the biological sciences in the university and gained the title of "Professor of Biology." He not only strengthened the courses in anatomy, physiology, and hygiene, but did much toward elevating the scholastic standards of all the biological sciences. He was the author of a book, *Textbook of Anatomy, Physiology and Hygiene,* which was used in about fifteen states by high schools and normal schools. He advocated advanced work in anatomy and physiology, which courses were obviously planned for students seeking advanced standing in established medical schools. There is no doubt but that Dr. Hartigan played a very important role in the development of medical physiology at West Virginia University. Due to a series of grave misunderstandings with the university administration, Dr. Hartigan was dismissed from the university in December 1900.

Following Dr. Hartigan's dismissal the "College of Medicine" which had been established by the university in 1900 was deemed a failure, and the governing board of the university did away with it in 1901. During the school year 1901-02 the courses in anatomy and physiology were listed in the catalog in the College of Arts and Sciences.

In 1901 William A. Caldwell, M.D. (see Caldwell), a graduate from Columbian University, Washington, D.C. (this school no longer exists), taught the work offered in anatomy and physiology. The university catalog listed three courses in anatomy, including dissection and four courses in physiology. No course in hygiene was listed. Unfortunately Dr. Caldwell was presumably suffering from a rather advanced pulmonary

tuberculosis while he taught at West Virginia University. Despite his ill health he appeared to be able to meet his classes regularly and performed an acceptable job of teaching. It is doubtful whether he made any worthwhile changes in the subjects which he taught. He remained only one school year at West Virginia University and died the next year in the month of June.

In June 1902 John N. Simpson, M.D. (see Simpson), a recent graduate of the Johns Hopkins University School of Medicine, was appointed instructor of anatomy and physiology. His appointment marked a noticeable advance in medical physiology at West Virginia University. Shortly after he came he organized the first two years of the medical curriculum, which was put into effect in the school year 1903-04. In this curriculum much more emphasis was laid upon the teaching of physiology. Dr. Simpson added a man to the staff to teach anatomy, and Dr. Simpson then devoted his time largely to physiology.

While at Johns Hopkins University Dr. Simpson had taken physiology under the direction of William H. Howell, Ph.D., M.D., an outstanding physiologist. It is fair to assume that Dr. Simpson fashioned the course in physiology at West Virginia University much after the way it was given at Johns Hopkins—at least as closely as his laboratory facilities would permit. In the two-year medical curriculum set up by Dr. Simpson physiology was offered during the first year in the winter and spring terms, and in the second year in the fall term. Dr. Simpson acquired more modern laboratory equipment, and in other ways strengthened the department. Dr. Simpson, however, had not received any graduate training in physiology, and oddly enough, felt that research work should not be pursued in a small medical school. It must be emphasized that despite his feeling about research, he laid the groundwork for a sound course in medical physiology, and was in charge until 1919.

In 1918 Dr. Simpson, who was then dean of the School of Medicine as well as professor of physiology, secured the ser-

vices of Withrow Morse, Ph.D. (see Morse), who had received his doctorate in physiological chemistry at Ohio State University. He was brought to the School of Medicine primarily to teach physiological chemistry, but he also aided in physiology. He held the rank of associate professor of physiology and physiological chemistry. Dr. Morse was a capable, well-trained man, and an experienced teacher and research worker. In 1919 Dr. Morse was made professor of physiology and physiological chemistry, and was made chairman of the combined departments. Dr. Simpson retired from the physiology department and became professor of medicine in 1920. Dr. Morse served in this capacity until the end of the school year 1920-21. Although he was of distinct help to Dean Simpson in physiology, he made his principal contribution in the field of physiological chemistry and established the department of physiological chemistry in the School of Medicine.

The above summarizes the work given in physiology at West Virginia University during approximately the first fifty years of its existence.

A new era developed in medical physiology at West Virginia University in 1920 when J. Earl Thomas, M.D. (see Thomas), came to the School of Medicine as associate professor of physiology. He had obtained his M.D. degree in 1918 from Saint Louis University, taught physiology there and had received training in research methods. He was an able man and actually was the first full-time man in the department of physiology at West Virginia University, which enabled him to devote all his time to teaching and research. At that time, of course, physiology was a well-established science and no longer combined with anatomy. Dr. Thomas remained for only one year at West Virginia and returned to his alma mater, Saint Louis University, to teach physiology. Later he became chairman of the department of physiology at Jefferson Medical College, and served there with distinction until he reached the mandatory age of retirement.

In September 1921 Edward J. Van Liere, M.D. (see Van Liere), who had a master's degree in physiology from the

University of Wisconsin and an M.D. degree from the Harvard Medical School, became professor and chairman of the department of physiology at the School of Medicine. He had had teaching experience at the University of Wisconsin, Southern California, Chicago, and South Dakota. At West Virginia University he made an attempt to promote research in the department and to select teachers to aid him who had done graduate work in physiology at some well-recognized university and who were capable of performing independent research—also a considerable amount of equipment was purchased.

Dr. Van Liere took a leave of absence during the school year 1926-27 to complete work for his Ph.D. degree at the University of Chicago under the direction of Professor A. J. Carlson. During his absence J. Frank Pearcy, Ph.D. (see Pearcy), who had received his Ph.D. in physiology from the University of Chicago, functioned as acting chairman of the department. He had been associated with Dr. Van Liere for two previous years. Dr. Pearcy was a well-educated man and a most capable physiologist. He left West Virginia University at the end of the school year 1926-27 to complete his work for the M.D. degree at Rush Medical College and did not return to West Virginia University.

Dr. Van Liere inaugurated graduate training in the department. He became dean of the School of Medicine in 1935 but continued as chairman of the department of physiology until 1955. He resigned the chairmanship because of pressing duties of the dean in connection with establishing a new Medical Center. He remained as a professor in the department until he reached the mandatory age of retirement in 1966. He had been associated with the department for forty-five years.

On July 1, 1955, David W. Northup, Ph.D. (see Northup), who had been in the department for twenty years and a full professor for some time, became chairman of the department. He had received a Ph.D. degree in physiology from the University of Illinois School of Medicine and had had some teaching experience there. He was a well-trained investigator

and an excellent teacher. During his chairmanship graduate training was enhanced in the department and a Ph.D. degree was offered in physiology. This was possible because the department of physiology had moved into the Basic Sciences Building of the new Medical Center in 1957. Dr. Northup served as chairman for ten years resigning June 30, 1965; he continued to serve as professor of physiology in the department.

On July 1, 1965, Michael F. Wilson, M.D. (see Wilson), who had obtained his doctorate degree from the University of Pennsylvania in 1953, was made professor and chairman of the department of physiology. Dr. Wilson had several years of excellent training in internal medicine in Philadelphia hospitals. From 1958 to 1960 he was a research fellow at the University of Washington School of Medicine in the department of physiology and biophysics. In 1960 he became assistant professor of physiology at the University of Kentucky School of Medicine and in 1963 was promoted to associate professor of physiology and biophysics in that institution.

Dr. Wilson made a number of significant changes in the physiology program at West Virginia University. He added individuals to the staff who had been trained both in physiology and biophysics. The name of the department was changed from the department of physiology to the department of physiology and biophysics. This change was beneficial, and many departments of physiology in the United States had made a similar change. He also invited to the staff one man from each of the following departments: medicine, neurology, and surgery, so these men held a dual appointment. These and other developments have increased the department's ability to contribute both to teaching and research.

BIOGRAPHIC SKETCHES OF TEACHERS IN PHYSIOLOGY

Physiology teachers in the order their biographic sketches appear:

Benjamin W. Allen, M.D.
Donald H. Blount, Ph.D.
Hugh W. Brock, M.D.
Luther S. Brock, M.D.
William A. Caldwell, M.D.
William M. Caldwell, B.S.E.E.
George R. Crisler, Ph.D.
Guntner F. Franz, Ph.D.
Thomas M. Gilfoil, Ph.D.
Wilbert E. Gladfelter, Ph.D.
James W. Hartigan, M.D.
Jacob Hildebrandt, Ph.D.
Judith R. Hildebrandt, Ph.D.
Ping Lee, Ph.D.
Hugh A. Lindsay, Ph.D.
Rowland E. Logan, Ph.D.
Withrow Morse, Ph.D.
David W. Northup, Ph.D.
J. Frank Pearcy, Ph.D.
Kenneth E. Penrod, Ph.D.
John N. Simpson, M.D.
J. Clifford Stickney, Ph.D.
J. Earl Thomas, M.D.
Edward J. Van Liere, Ph.D., M.D.
Myron M. Weaver, M.S.
Kenneth C. Weber, Ph.D.
Michael F. Wilson, M.D.

Assistants who had completed two years of medicine at West Virginia University:

Howard T. Phillips, B.S.
Ray I. Frame, B.S.
Paul R. Wilson, B.S.
Norman H. Joliffe, B.S.
Harold G. Young, B.S.
Lloyd H. Gaston, B.S.
Homer S. Parker, B.S.
Joseph E. Hall, B.S.
W. Thurlow Booher, B.S.
Dennis H. Robinson, B.S.
Donald H. Lough, B.S.
Isaiah A. Wiles, B.S.
Clark K. Sleeth, B.S.

Instructors or assistants who had not taken their work at West Virginia University:

Henri Christian Van der Hyde, D.Sc.
Carl A. Johnson, B.S.
Abel R. Miller, B.S.
Arthur D. Pickett, M.S.
William F. Hewitt, M.S.
Rowland E. Logan, Ph.D.
Thomas M. Gilfoil, Ph.D.

Part-time teachers in physiology (1921-1924):

C. Royal Kessel, M.D.
Julius F. Morrow, M.D.

Part-time teachers in physiology and biophysics:

John L. Hankinson, M.S.E.E.
Daniel C. Upthegrove, Ph.D.
Lauralee Sherwood (Marshall), D.V.M.

Part-time clinical teachers in department of physiology and biophysics:

Ludwig G. Gutmann, M.D.
Robert J. Marshall, M.D.
Walter H. Moran, M.D.

Benjamin W. Allen, M.D.

After the death of Hugh Workman Brock, M.D., Benjamin W. Allen, M.D., was appointed to teach the courses which had been taught by Dr. Brock. Dr. Allen was then fifty-eight years old. In a sense he could be regarded as a native son because he was born (June 11, 1824) in Kingwood, Virginia (now West Virginia), which lies about twenty miles east from Morgantown. He had received a splendid education and probably was one of the best educated physicians in West Virginia. He had taken his B.A. degree at Washington College (now Washington and Jefferson College) at Washington, Pennsylvania, in 1844. He then entered the medical department of the University of Virginia and was graduated with the M.D. degree in 1848. In order to broaden his clinical education he enrolled in Jefferson Medical College in Philadelphia for a course of lectures and in 1849 was granted an M.D. degree by that well-known institution. His education is rather unusual since in those days most students entered medical school following graduation from high school. Indeed, the University of Pennsylvania School of Medicine, the oldest medical school in

the United States, did not require any college premedical work until September 1909.

Following graduation from Jefferson Medical College Dr. Allen practiced medicine in Kingwood, the city of his birth. In 1852 he was appointed demonstrator in anatomy at the University of Virginia, a position he held with distinction for nearly ten years. During the War Between the States he joined the Confederate army and became a surgeon in the general hospital at Charlottesville, Virginia. Somewhat later he assumed the post of surgeon in charge of the general hospital in Harrisburg, Virginia.

In 1867 Dr. Allen moved to Wheeling, West Virginia, and soon established a successful surgical practice. He became interested in pathology and made microscopic examination of suspected pathologic tissues for other physicians. He must be reckoned as one of the early pathologists of West Virginia.

In 1882 he was invited to teach at West Virginia University and was said, ". . . to be well fitted for his position by habits of thought and early studies and experience, that his knowledge was accurate and comprehensive, his experience ripe, and his skill well-founded." This laudatory statement was well deserved, for as we have pointed out he was an exceptionally well-educated man, and there is reason to believe that he had scholarly instincts. He was the author of various medical and surgical reports. Some of them were published in "The Medical and Surgical History of the War" (the Civil War).

It is true, of course, that he had not had any special training in physiology, but he obviously was well versed in anatomy and also in pathology. He, furthermore, had had nearly ten years teaching experience at the University of Virginia. There is no doubt that he was an able and stimulating teacher. It, too, must be remembered that in those early days physiology was not completely separated from anatomy although the separation had begun in some of the older medical schools, such as Harvard University, but on the whole it was a rather slow process. The textbooks used in physiology during this era were either by Carpenter, or by A. Flint, Jr., or by Dalton. These texts were widely used throughout the country; copies of some of them may be found in our Medical Center Library.

During the tenure of Dr. Allen (1882-86) the courses in medicine were expanded. The courses which were formerly designated as "The Medical Department" were now called "The School of Anatomy, Physiology and Hygiene" and retained this name for five years. The courses were given in two of the three terms of the junior year, instead of one as previously given, and the class met daily. The work was recognized by several well-established medical schools, and the students when they entered these schools received credit for the work previously taken. The printed list of students includes several who in later years became prominent citizens of Morgantown, some of them physicians.

Dr. Allen manifested a keen interest in organized medicine both at the county and state level, and in 1883, a year after he assumed his teaching duties at the university, became president of the Medical Society of West Virginia. (It was not called the West Virginia State Medical Association until 1902.) This honor indicated that he was highly regarded by his medical colleagues.

In conclusion, Dr. Allen was a successful clinician, a pathologist, and an anatomist. Despite the fact that he had had no special training in physiology, his knowledge of anatomy and pathology and his years of teaching at the University of Virginia doubtless aided him in teaching physiology. It must be remembered that when he taught anatomy and physiology these courses were not distinctly separated. He had a keen intellectual curiosity, an excellent education, and had scholarly instincts. Dr. Allen was a worthy successor of Dr. Hugh Brock; they were both men of refinement and of high mental stature.

Dr. Allen died of a heart ailment in Morgantown on November 12, 1887, at the age of sixty-three.

Donald H. Blount, Ph.D.

Donald H. Blount was born in Cape Girardeau, Missouri, March 25, 1929. He obtained three degrees from the University of Missouri. In 1950 he was granted a B.A. degree and the following year did graduate work in psychology. In 1956 he was given the M.A. degree, and in 1958 a Ph.D. degree in

physiology. Before he came to West Virginia University he had had teaching experience as a graduate student in the University of Missouri, and had taught for two years in the department of physiology at the University of Vermont College of Medicine. The first year there he served as an instructor and the following year as an assistant professor.

Dr. Blount came to the School of Medicine of West Virginia University in July 1961 as an assistant professor of physiology. His field of research was cardiac metabolism, and while at the university published several papers in this field. He was active in graduate training and was on a committee which concerned recruiting graduate students for the department.

In the summer of 1966 he attended a course "Classical Physiology with Modern Instrumentation" at Baylor University College of Medicine. Dr. Blount was a dependable worker, a good teacher, lectured well, and worked closely with his students. He was also interested in community affairs, especially those which concerned elementary education. He remained in the department for six years, resigning on June 30, 1967. Presently he is associated with the National Institutes of Health, Bethesda, Maryland.

Hugh Workman Brock, M.D.

Hugh Workman Brock, M.D., a distinguished physician and surgeon, who had a very active practice in Morgantown, was appointed in 1896 on a part-time basis "Special Lecturer in Anatomy, Physiology and Hygiene." The university then was only two years old, and Dr. Brock was the only man on the faculty who held the M.D. degree. He may be considered the first teacher of physiology who understood the relationship of physiology to clinical medicine, and during his tenure the university administration announced the establishment of a "Medical Department." We may assume then that physiology, so far as its relation to medicine was concerned, was started in 1869.

Hugh Brock was born January 5, 1830, at Blacksville, Virginia (now West Virginia), a village about twenty miles west of Morgantown. He attended the private schools of that day

and later enrolled in Monongalia Academy at Morgantown, Virginia (now West Virginia). At the age of sixteen he served as an apprentice to Dr. Charles McClane, a highly esteemed physician in Morgantown. After serving his apprenticeship, Hugh entered Jefferson Medical College in 1850 and received his M.D. in 1852. He was then only twenty-two years old, but it must be remembered that he never took any premedical work in college. After graduation he came to Morgantown and practiced medicine with Dr. Charles McClane under whom he had taken his apprenticeship. In the War Between the States he served in Sheridan's Field Hospital in Winchester, Virginia. At the close of the war he returned to practice medicine in Morgantown, and in 1874 formed a partnership with his younger brother, Luther Sansome Brock.

In 1869 the work offered by Dr. Brock was modest indeed. The course was part of a program of the scientific department of the university, and was scheduled for one of the three terms in which the junior year was then divided. It presumably was designated more for general education in science rather than for students looking toward medicine. Nine years after his appointment, that is, in 1878 Dr. Brock was promoted to professor of anatomy, physiology, and hygiene. The work he gave became more professional in character and content and the university catalog announced the establishment of a "Medical Department." The catalog announced that it "was designed to serve as a nucleus around which it was hoped a fully organized medical department may soon be established." This indeed was an optimistic statement, because the two-year Medical School was not established until 1912. The medical curriculum, however, for the first two years was established in 1903, and was much like the curriculum of 1912. The four-year curriculum was not established until 1958, a period of eighty years from the time the "Medical Department" was formed.

Eighteen students attended Dr. Brock's courses during the first year of existence of the "Medical Department." At the time there were only forty students in the university (i.e., in degree granting colleges), so nearly one-half of the enrolled students

took his courses. Presumably most of the emphasis in the classroom was laid on the study of anatomy, for we find the first record of the use of cadavers in teaching at the university. Instruction in the use of the microscope was also given. On occasion, patients were demonstrated before the class. It is obvious that structure rather than function was emphasized. It must be recalled that physiology was a young science—at least in the United States—and not definitely separated from anatomy. A separation of these two courses was not made at West Virginia University until the early part of the twentieth century.

Dr. Brock was said to be a splendid teacher. He laid the groundwork for two important basic medical sciences, namely anatomy and physiology. A few of his students used the courses he taught as a basis for continuing their work in various accredited medical schools in this country.

Besides his teaching duties and his medical practice Dr. Brock was active in community affairs. Among other things he promoted sanitary conditions in the city and schools and advocated a board of health, both municipal and state. He actively supported organized medicine and often represented the state at national medical conventions. He helped organize the State Medical Society and signed the "Call" for the first meeting in Fairmont, April 10, 1867. In 1869 he had the distinction of becoming president of the State Medical Society of West Virginia (later called "The West Virginia Medical Association"). His keen interest in organized medicine benefited the university, and especially the medical department.

Dr. Brock died of pneumonia on April 24, 1882, at the relatively early age of fifty-two. He was buried in Oak Grove Cemetery in Morgantown.

In summary, Dr. Hugh Brock served the university with distinction on a part-time basis for thirteen years (1869-82). He was the first man with an M.D. degree to become associated with West Virginia University, and laid the groundwork for two basic medical science courses, namely anatomy and physiology. His fine character, his high intelligence and scholarly interests were of great help to the entire university.

Luther Sansome Brock, M.D.

Dr. Benjamin W. Allen was forced to resign his teaching duties in 1886 because of ill health (he died shortly after his resignation), and Luther Sansome Brock, M.D., was made "Acting Professor of Anatomy, Physiology, and Hygiene." Luther was a brother of Hugh Workman Brock. He was born in Greene County, Pennsylvania, which lies adjacent to northern West Virginia (then Virginia) on December 14, 1844. He was fourteen years younger than his brother, Hugh. His education was much like that of his older brother, that is, he attended the Monongalia Academy at Morgantown, Virginia (now West Virginia), and completed a full classical course at the age of fourteen. He then "read medicine" with his older brother, Hugh, and later entered Jefferson Medical College in Philadelphia, Pennsylvania, and was granted the M.D. degree in 1874. Following his graduation he began the practice of medicine in Morgantown and formed a partnership with his brother, Hugh, under the name of Brock Brothers and maintained this relation until Hugh died in 1882.

Luther Brock was apparently well acquainted with his brother's teaching methods and procedures and also those of Dr. Allen. At any rate he carried out about the same program as had been followed by these two men. At the time Luther taught there were 136 students registered in the university and of these 19 students were enrolled in his class. He taught at the university for only one year.

Presumably he was not especially interested in teaching, and it must be remembered that his title was that of an "Acting Professor." Dr. Brock had many outside interests, namely his private practice of medicine, his participation in organized medicine, and also his several substantial business interests. Like his brother, Hugh, he became president of the Medical Society of West Virginia (later called West Virginia Medical Association) in 1888. He became a trustee of the Methodist Episcopal Church, and president of the Bank of the Monongahela Valley. He was also intensely interested in the public schools. Dr. Brock was highly regarded as a citizen and as a physician. He practiced

medicine in Morgantown until the infirmities of old age forced him to retire. He died in Morgantown, November 10, 1924, at the age of eighty.

In summary, Luther Brock did not teach long enough to formulate any new policies, but carried on the work much in the manner of his brother, Hugh. He had many interests outside of his teaching duties. It is significant, however, that he was an outstanding citizen and was highly regarded by his medical colleagues in the state, as shown by the fact that he was chosen president of the State Medical Association. His fine character and his standing with the medical profession in the state brought distinct credit to the entire university.

William A. Caldwell, M.D.

Following the dismissal of James W. Hartigan, M.D., in December 1900 (see Hartigan) there was apparently no one in the university qualified to teach anatomy, physiology, and hygiene. Presumably this course was not offered until the following September, that is, 1901. "The College of Medicine" created in 1900 was deemed a failure and the governing board of the university did away with it in the spring of 1901. During the school year 1901-02 the course in anatomy, physiology, and hygiene was listed in the College of Arts and Sciences. It is significant that this change occurred and must be regarded as a temporary setback for the expansion of the medical courses.

Despite this unfortunate event, a man with an M.D. degree was procured to teach anatomy and physiology, namely, William A. Caldwell from Washington, D.C. Whether he knew that the course was transferred to the College of Arts and Sciences or whether it made any difference to him is not known. In any event he commenced his duties in September 1901. He was then thirty-nine years old having been born in 1862. In 1892 he had received the M.D. degree from Columbian University Medical College, Washington, D.C. (This school no longer exists.) He had not taken any graduate work in the subjects for following his graduation he practiced medicine in Washington, D.C. He remained at West Virginia University only one year.

There is a paucity of information concerning Dr. Caldwell

while he was associated with West Virginia University. It would be of interest to know his ability as a teacher, how he was regarded by his colleages in the College of Arts and Sciences, how he got along with his students, and also something about the contents of the courses he gave. We may presume that he followed pretty much the same academic program as that presented by his predecessor, Dr. Hartigan. Be that as it may, he was at that time the only full-time member of the faculty who held an M.D. degree. He was listed in the university catalog as follows:

> William A. Caldwell, M.D., Assistant Professor of Anatomy and Physiology; M.D., Columbia; Member of Medical Society of District of Columbia; Medical Association and other Medical Societies; Resident Physician of Garfield Memorial Hospital, Washington, D.C.; and practitioner of medicine in that city from graduation to 1899; WVU, 1901.

This announcement is confusing because he did not take his medical work at Columbia University, but at Columbian University as previously mentioned.

During the year Dr. Caldwell taught, the university catalog lists three courses in anatomy and four in physiology. No courses in hygiene are listed. No records could be found of the number of students in his classes. At that time there were 440 students enrolled in the university and it is likely that a fair number of students attended the courses he taught.

Dr. Caldwell resigned his position at the end of the school year (June 1902) undoubtedly because of ill health. In point of fact he died June 6, 1903, one year after he left the university at the early age of forty-one years. The cause of death was attributed to tuberculosis. He was buried at Rockville, Maryland. It is reasonable to suppose that he was in failing health when he accepted the appointment at West Virginia University, and probably sometime before that. It is not unlikely that he gave up practice in Washington, D.C., on account of ill health, and sought a teaching position which would be less demanding on his health. It is unfortunate that he taught at the university if at the time he was suffering from advanced tuberculosis. Under no circumstances should he have had close contact with young people. One wonders whether any of his students contracted tuberculosis from him. It is earnestly hoped that none did. Despite his illness Dr. Caldwell, so far as it is known, met his classes regularly and was capable of performing his teaching duties in an acceptable manner.

A further word might be said about the reason the "College of Medicine" was deemed a failure in 1901. The governing board of the university had had a bitter experience with Dr. Hartigan the preceding year and also in the same year had an unpleasant experience with William S. Magill, M.D., who taught bacteriology and pathology. It is possible that these two episodes were important factors in deciding to close the "College of Medicine." It may be, of course, that there were other reasons which were not revealed. Be that as it may, the board of regents of the university the following year (1902) restored the "College of Medicine" and the school retained this title until 1911.

William Morton Caldwell, B.S.E.E.

William Morton Caldwell was born in Louisville, Kentucky, September 1, 1940. He obtained a B.S. degree in electrical engineering at the University of Kentucky in 1964. As a student there, he served as a part-time electronic electrician in the department of maintenance of the university. Later he held a similar position in the department of physiology and biophysics. Following his graduation in engineering he served for a year as an electrical engineer in the Sperry Phoenix Company, Phoenix, Arizona. He is a member of the Institute of Electrical and Electronic Engineering, and also belongs to the IEEE Group in Engineering and Medicine and Biology.

Mr. Caldwell came to the department of physiology (later, department of physiology and biophysics) of the School of Medicine of West Virginia University in the summer of 1965 as a biomedical engineer, with the assignment to establish departmental electronic and machine shops. He is concerned with medical electronics and instrumentation, and is especially responsible for developing research instrumentation. He is engaged in research and is the author of several papers. Mr. Caldwell was given the appointment of instructor in physiology and biophysics in 1967. He presents lectures and gives demonstrations both to medical

and dental students, and is a very useful member of the department.

George Russell Crisler, Ph.D.

George Russell Crisler was born in Normal, Illinois, February 27, 1902. He pursued his higher education at the University of Chicago. After taking his B.A. degree, he obtained his Ph.D. in 1928, and his M.D. in 1931. He came to the School of Medicine of West Virginia University in 1928 as assistant professor of physiology. The previous year he had served as assistant professor of physiology at the University of Missouri School of Medicine. He remained at West Virginia University for seven years (1928-35).

Dr. Crisler had a good personality, an active mind and was a conscientious worker. He was a good teacher, spoke well and was well liked by the students. He was research minded and published a number of papers in scientific journals during his tenure at the university. His researches lay in a number of different areas: endocrinology, conditioned reflexes, physiology of dehydration, and hypoxia. He was a careful and critical research worker.

After he obtained his M.D. degree, he became more and more interested in clinical medicine and at the end of the school year 1934-35 left the university to accept a fellowship in medicine at the Mayo Foundation which he held for two years. He then commenced the practice of medicine; for a short time he practiced in Charleston, West Virginia, but moved to Florida and practiced in Winter Park. During World War II he served in the armed forces as a captain. At the end of the war he returned to his medical practice in Florida.

He was a member of the American Physiological Society, the American Medical Association, and the Aero Medical Association.

In summary, Dr. Crisler was a member of the physiology department for seven years. He was a splendid teacher and a good research man. At the age of thirty-three he prepared himself to practice internal medicine, and left the field of physiology. He practiced medicine in Florida for many years and died September 26, 1966, of lung cancer at the age of sixty-four.

Gunter Norbert Franz, Ph.D.

Gunter Norbert Franz was born March 13, 1935, in Backa Palanka, Yugoslavia. He was of German origin and became a citizen of Germany and took his early training in that country at the Technical University of Karlsruhe, and at the Technical University of Munich. He received a diploma in electrical engineering from the first named school in 1959. In 1960 he came as a student to the United States and from 1960 to 1962 held a NATO Research Fellowship. He entered the graduate school of the University of Washington and in 1968 obtained his Ph.D. degree in physiology and biophysics.

Dr. Franz came to the School of Medicine of West Virginia University in July 1968 as an assistant professor of physiology and biophysics. He had a fine background in electrical engineering and in biophysics, and is a splendid mathematician. He has used his mathematical talents in his researches in the field of physiology and biophysics. His researches are concerned with receptor physiology, biophysics, and cardiovascular control systems, and has published several papers in these highly specialized fields. He is a member of the Biophysical Society, the Institute of Electrical Engineers, and is an associate member of the American Physiological Society. Dr. Franz has proven to be an able teacher and is well regarded by the medical and graduate students alike. He has been at West Virginia University for only one year.

Thomas M. Gilfoil, Ph.D.

Thomas M. Gilfoil was born in Springfield, Massachusetts, October 16, 1922. He came to the School of Medicine of West Virginia University as an instructor of physiology in September 1958. In his early years he took training in pharmacy, and in 1952 was graduated with a B.S. degree in pharmacy from the Hampden College of Pharmacy. He then took two years of pharmacology at the University of Kansas City and in 1954 received an M.S. degree in pharmacology. Mr. Gilfoil then became a graduate student in physiology at the Medical School of

the University of Wisconsin, and remained there for four years and in 1958 received his Ph.D. degree in physiology.

Before he came to West Virginia University Dr. Gilfoil had had some teaching experience; he had served as a teaching assistant at the University of Kansas City and at the University of Wisconsin Medical School. His researches were concerned with respiration and circulatory reflexes, neuropharmacology and with analgesics. He published a number of papers in national scientific journals. He resigned at the end of the school year to accept a neuropharmacology traineeship at the Veterans Administration Research Laboratories in neuropsychiatry in Pittsburgh, Pennsylvania.

Wilbert E. Gladfelter, Ph.D.

Wilbert E. Gladfelter was born in York, Pennsylvania, April 29, 1928. Following graduation from high school he enlisted in the United States Navy for two years as pharmacist mate. He then entered Gettysburg College in Pennsylvania, received a B.A. degree in 1952 and was graduated magna cum laude. The following two years he was an analytical chemist for National Drug Company in Philadelphia. In 1954 he entered graduate school at the University of Pennsylvania, remained there for six years, and in 1960 obtained his Ph.D. degree in physiology under the direction of John J. Brobeck, Ph.D., M.D., chairman of the department of physiology.

Dr. Gladfelter came to West Virginia University School of Medicine as an instructor of physiology in the autumn of 1959. He had had some teaching experience as an assistant instructor at the University of Pennsylvania. Dr. Gladfelter's research interests are in the field of neurophysiology, especially that portion of neurophysiology related to behavior and regulatory systems. Presently research is being pursued to determine the role of the hypothalamus in the control of the general activity level of the individual. The work is done on rats. He has published a number of papers in his field. His appointment was timely because at that time no one in the department of physiology was engaged in research in the central nervous system.

In 1961 Dr. Gladfelter was made assistant professor of physiology and in 1969 associate professor. He belongs to a number of scientific organizations, among them are the American Physiological Society and the American Institute of Biological Sciences. He has a distinct interest in community affairs, especially those concerned with the school and church. He is a sound and conscientious teacher and is well regarded by the students and is serving the Medical Center well.

James William Hartigan, M.D.

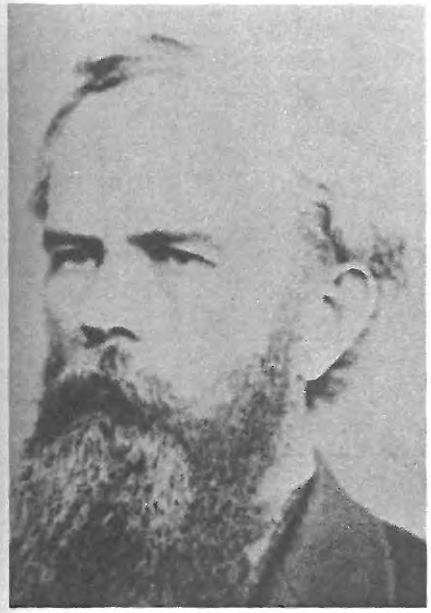
Although James William Hartigan took an M.D. degree and later practiced medicine, he apparently was deeply interested in the basic biological sciences, especially early in his career. He was born in Lexington, Virginia, on April 19, 1863, and received his preliminary education in Piedmont, West Virginia, and in Cumberland, Maryland. In 1882 at the age of nineteen he entered West Virginia University and enrolled in "School of Anatomy, Physiology, and Hygiene" which was supervised by Benjamin W. Allen, M.D. (q.v.). In 1883, a year later, he obtained an M.D. from the University of Wooster Medical Department, Cleveland, Ohio. (This school no longer exists.) He evidently was not satisfied with the medical education offered by this school and in 1887 received an M.D. from Bellevue Hospital Medical College in New York City. (He also attended two other medical schools: Indiana Eclectic Medical College, Indianapolis, Indiana, and Baltimore Medical College, Baltimore, Maryland.) Why he attended all these medical schools is not known. He spent a considerable period of time in these various institutions, and probably on the whole received a fairly good education, especially in the biological sciences, although some of the schools he attended surely must have had indifferent scholastic standards and inadequate equipment. In 1888 he was awarded as M.A. degree by West Virginia University.

After he had received his M.D. degree from Bellevue Hospital Medical College in 1887, he returned to West Virginia University to teach biological subjects, which, of course, included the courses given in anatomy and physiology. He held a full pro-

JOHN NATHAN SIMPSON, M.D. 1869-1947.
First Dean of the School of
Medicine 1912-35.
Taught physiology 1902-19.

EDWARD J. VAN LIERE, PH.D., M.D.
Taught physiology 1921-66.
Departmental Chairman 1921-55.
Dean of Medical School 1935-61.

CLARK K. SLEETH, M.D.
Dean, School of Medicine 1961-70.
Taught physiology 1935-37.



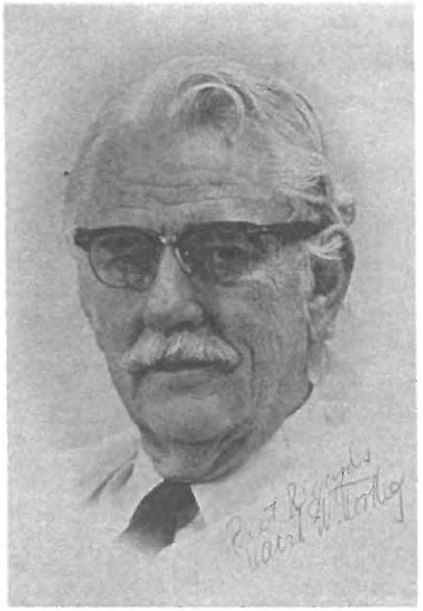
BENJAMIN W. ALLEN, M.D.
Taught physiology 1882-86.

HUGH WORKMAN BROCK, M.D.
Taught physiology 1869-82.

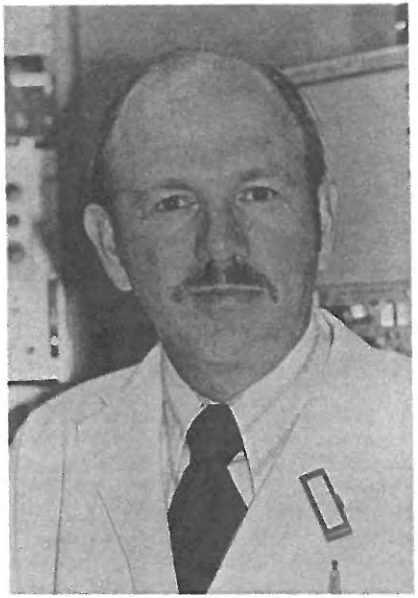
WITHROW MORSE, PH.D.
Taught physiology 1918-21.
Chairman of department 1920-21.

J. EARL THOMAS, M.D.
Taught physiology 1920-21.

J. CLIFFORD STICKNEY, PH.D.
Taught physiology 1940- .
Acting Departmental Chairman (after 1969).



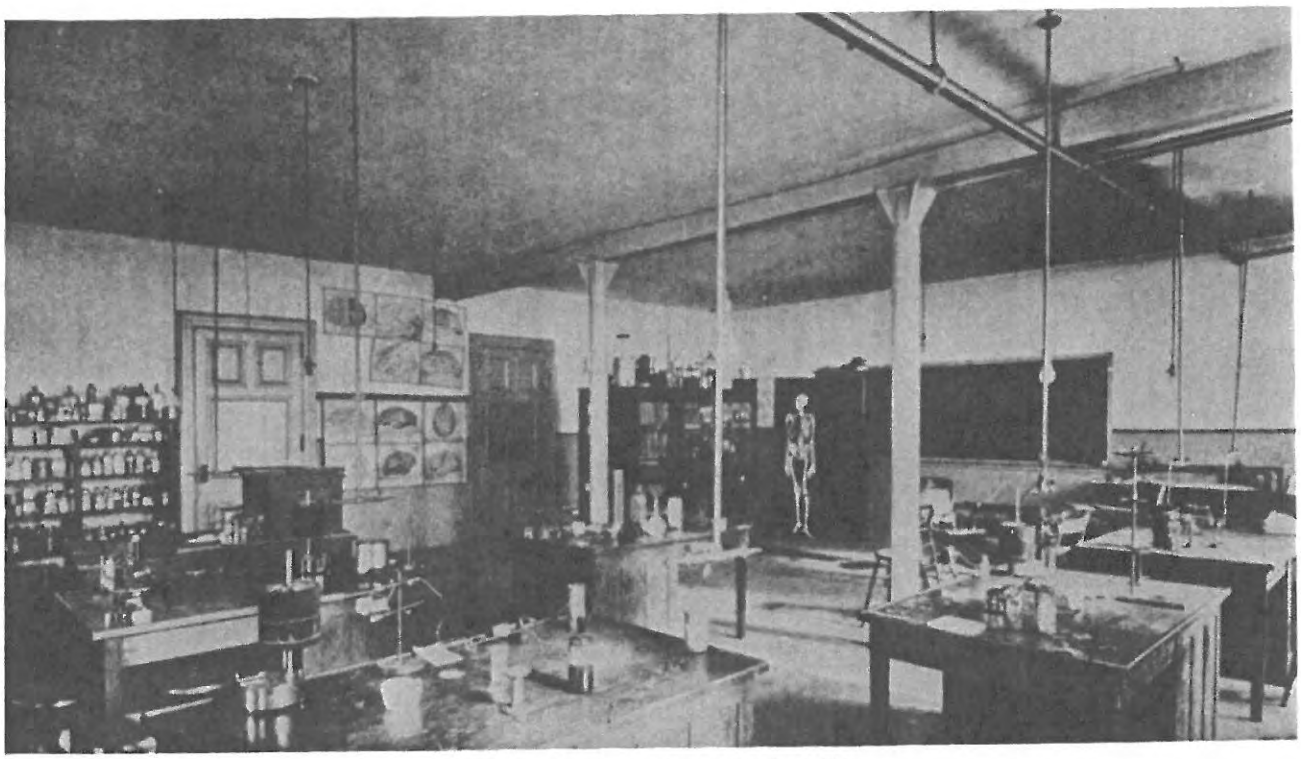
DAVID W. NORTHUP, PH.D.
Taught physiology 1935- .
Departmental chairman 1955-65.



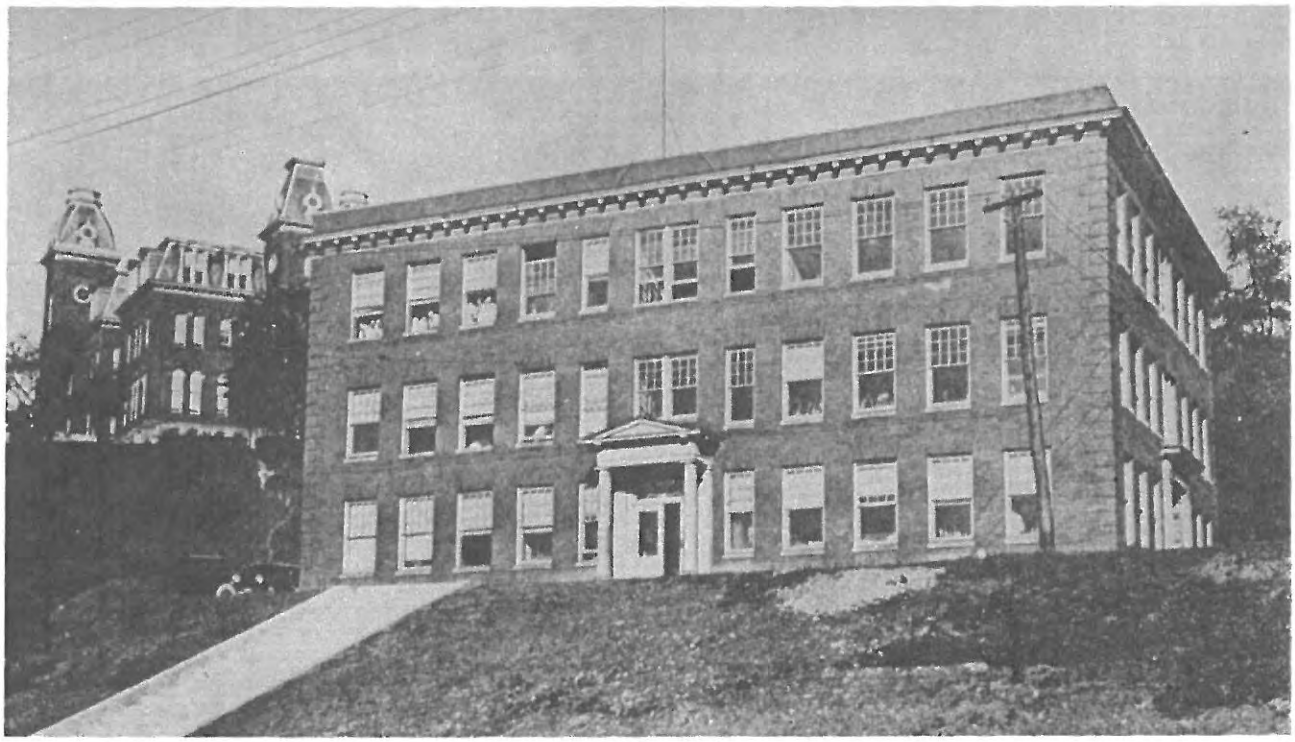
MICHAEL F. WILSON, M.D.
Chairman of Department 1965-

JAMES WILLIAM HARTIGAN, M.D.
Taught physiology 1887-1900.

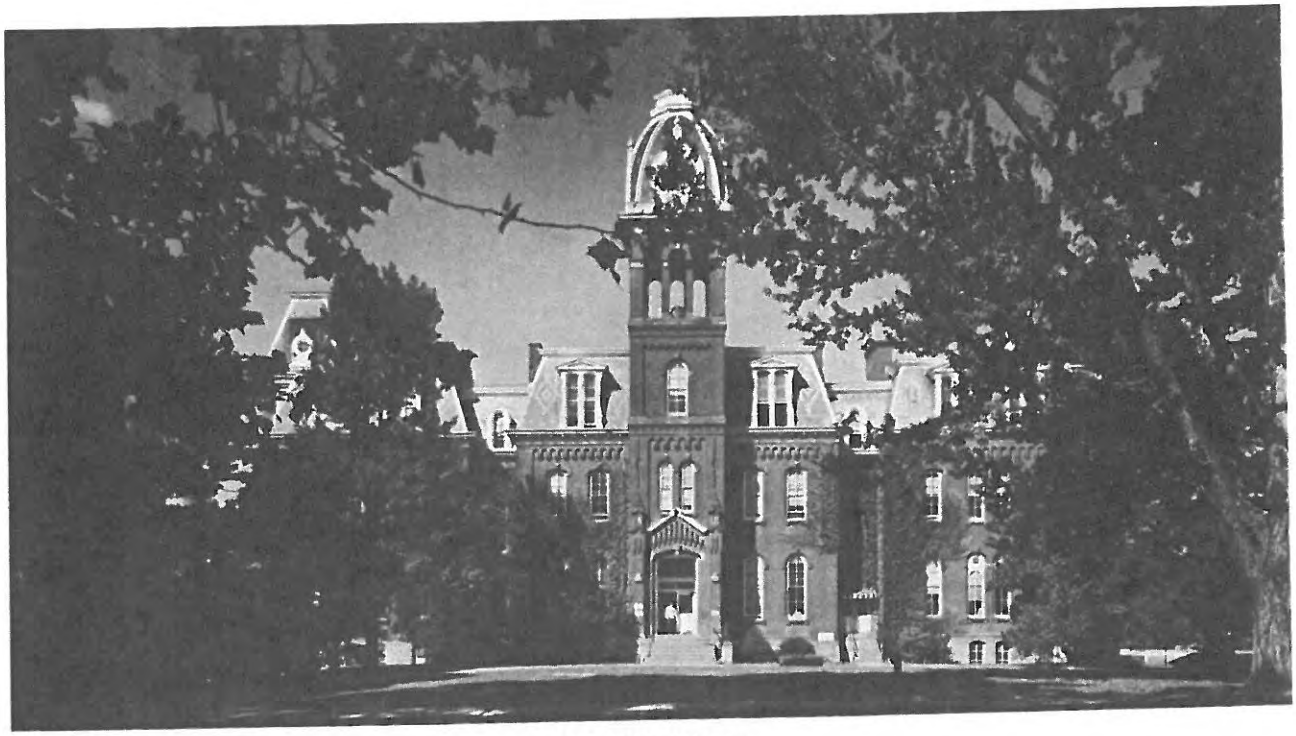
J. FRANK PEARCY, PH.D.
Taught physiology 1924-27.
Acting chairman 1926-27.



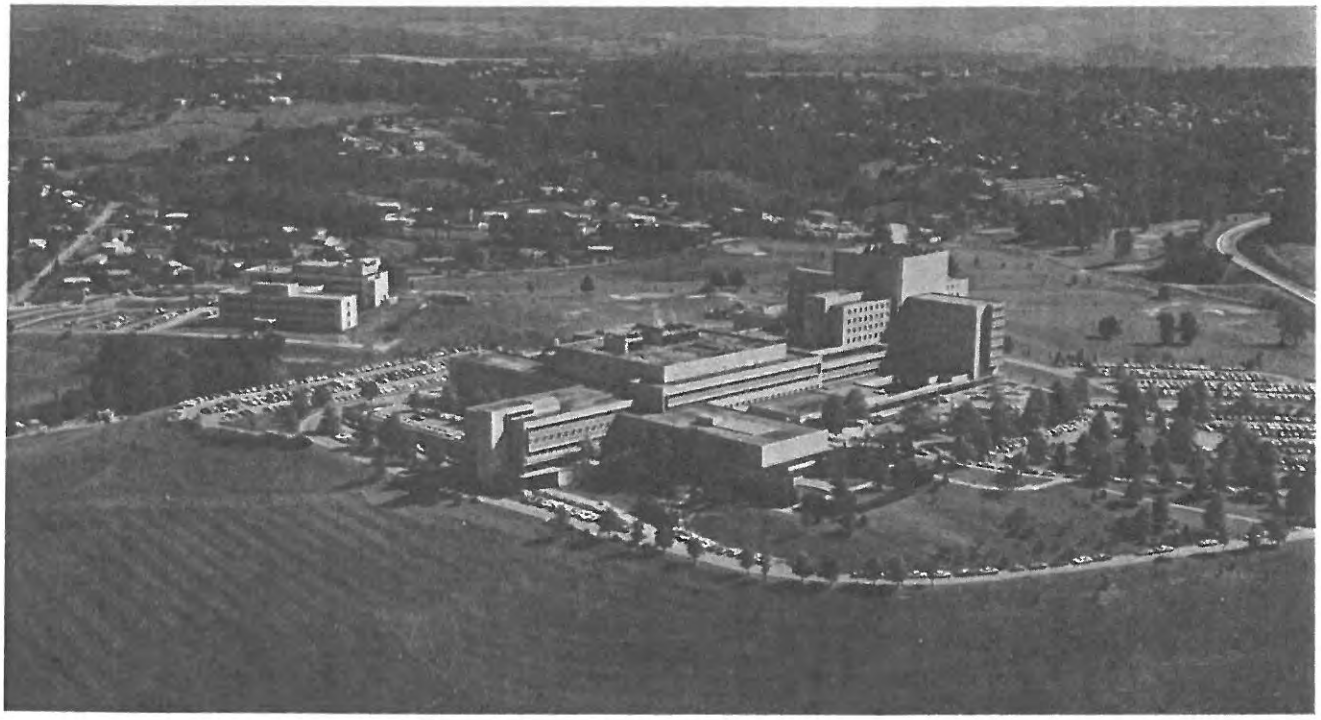
PHYSIOLOGICAL LABORATORY—1912.



MEDICAL BUILDING, 1916-57.



WOODBURN HALL
Physiology taught there in early days.



MEDICAL CENTER
Occupied in 1957.

fessorship and became in charge of all the biological sciences taught in the university. His rather unusual title was "Professor of Anatomy, Physiology, and Hygiene and Natural History." He evidently taught a wide range of subjects for one of his early duties was teaching structural botany. Despite his interest in biology in the final analysis his main interest was in medicine. During his tenure at the university we find names of the biological courses: "The School of Anatomy, Physiology, and Hygiene," later "A New School of Anatomy, Physiology and Hygiene," still later "The School of Biology," and finally "The A.B. Medical Course." The last title mentioned definitely slanted toward medicine. It is likely that Dr. Hartigan suggested some of these titles and was probably aided by the president of the university.

Early in his teaching career (1890) he published a book, *Textbook of Anatomy, Physiology and Hygiene*; the subtitle was "The Effects of Alcohol and Narcotics on the Human Body." This subtitle was probably justified since the book also deals with hygiene. On the title page the author lists himself as "Professor of Human and Comparative Anatomy and Structural Botany in the University." In point of fact, he is the only person who taught physiology in the university who wrote a textbook on the subject. The book consists of 419 pages and seventy-four illustrations, most of which are diagrammatic and many are in color. It is said to have been used as a textbook in some high schools and in normal schools in fifteen states. A copy of this book is in the university library.

Dr. Hartigan continued his efforts to expand the medical courses. In December 1892, five years after he had been associated with the university, he asked the board of regents for a building in which to dissect cadavers. The building was sorely needed and the board granted his request with the stipulation that the cost not exceed $350. This shack, fourteen by twenty feet, was the first building erected for the sole use of medical education; it was in use for about ten years. Although it was obvious that Dr. Hartigan was expanding the medical subjects, nevertheless, he developed the entire field of biological sciences

in the university to a higher scholastic level. In later years he was listed in the university catalog simply as "Professor of Biology." Apparently he was genuinely interested in basic biology and had he had an opportunity of taking graduate work in biology in some well-established institution he might have become a well-recognized biologist. He was, however an aggressive and ambitious person and since he was medically trained eventually he probably would have practiced medicine, especially surgery. He doubtless saw some patients when he was a full-time teacher in the university.

Dr. Hartigan was associated with the university from 1887 to 1900, a period of thirteen years. His later years were unfortunately characterized by conflicts and serious differences of opinion and policy between him and the university administration. The president of the university was James Hall Raymond who had earned his Ph.D. at the University of Chicago, and who assumed the presidency of West Virginia University in 1887. He had come highly recommended by no less a person than William Rainey Harper, Ph.D., the famous first president of the University of Chicago. The differences between Dr. Hartigan and president Raymond worsened and could not be resolved, and finally ended in the dismissal of Dr. Hartigan from the university on December 18, 1900, presumably at the close of the autumn quarter. At the time of his dismissal Dr. Hartigan was only thirty-seven years old. He took his dismissal to the State Supreme Court of Appeals, but the court ruled that since Dr. Hartigan was a professor in the university and not a public officer he was not entitled to trial in case of removal. Parenthetically, it should be mentioned that president Raymond resigned on the following April. Neither individual was ever again associated with the university.

Following his dismissal from the university Dr. Hartigan practiced medicine and surgery in Morgantown, but continued his interest in the university for many years. He entered the field of politics and was elected a member of the state legislature. In 1927 he introduced a bill in the legislature calling for the establishment of a four-year medical curriculum. The bill never came to a vote. There is evidence that he hoped to become the first professor of surgery in the university, although in 1927 he was sixty-four years old.

Dr. Hartigan died in Morgantown on January 21, 1950, at the age of eighty-seven years.

In summary, Dr. Hartigan was associated with the university for thirteen years. He helped lay the groundwork for a strong department of biology in the university and played an equally important role in expanding the basic medical sciences, anatomy, and physiology. He was a strong-minded and aggressive person, presumably not always mindful of the rights of others. After dismissal from the university he practiced medicine and surgery in Morgantown and later became a member of the state legislature. Despite his early difficulty with the university administration, he maintained his interest in the School of Medicine for many years. He was an able man and in many ways served the university well.

Jacob Hildebrandt, Ph.D.

Jacob Hildebrandt, a Canadian, was born September 21, 1930, in Ernfold, Saskatchewan, Canada. He took a B.A. degree in physics and chemistry in 1957 at the University of British Columbia, and in 1960 an M.Sc. in biophysics also at this institution. He held a National Health Predoctoral Fellowship from 1961 to 1965. In 1966 he received a Ph.D. degree in physiology and biophysics from the University of Washington.

Dr. Hildebrandt came to the School of Medicine of West Virginia University in July 1966 as an assistant professor of Physiology and biophysics. Before he came to West Virginia University he had served as an instructor of physiology and biophysics for several months at the University of Washington. His research interest concerned respiratory physiology and he had published a number of abstracts and papers in this field. He was co-author with A. C. Young of a chapter "Anatomy and Physics of Respiration" in the textbook *Physiology and Biophysics* by Ruch and Patton (19th ed.). Dr. Hildebrandt is a well-trained and able physiologist and biophysicist and an excellent teacher. He remained at West Virginia University for only one and one-half years to return to Seattle, Washington, December 1967.

Judith Rose Hildebrandt, Ph.D.

Judith Rose Hildebrandt (Mrs. Jacob Hildebrandt—see preceding) was born October 30, 1936, in Detroit, Michigan. In 1958 she received a B.S. degree from the University of Michigan; her major study was zoology. Following graduation she became a teaching assistant in the department of zoology at the University of Washington, and the following year a research assistant in that department. From 1961 to 1966 she held a predoctoral fellowship from the National Institutes of Health. In 1966 she was awarded a Ph.D. degree in physiology and biophysics by the University of Washington.

She came to the School of Medicine of West Virginia University (with her husband, Jacob Hildebrandt) July 1966 as an assistant professor of physiology and biophysics. Her research interest was neurophysiology and neurocontrol, and she published several abstracts in this field. She was considered a capable teacher. She remained only one and one-half years at West Virginia University and returned with her husband to Seattle, Washington, December 1967.

Ping Lee, Ph.D.

Ping Lee was born in Sumatra, April 17, 1936. He received a B.S. degree from National Taiwan University (Taiwan or Formosa) in 1959, an M.A. degree from Duke University in 1961, and a Ph.D. degree in physiology from this institution in 1964. He came to the School of Medicine of West Virginia University in the summer of 1968 as assistant professor of physiology and biophysics. Before he came to West Virginia University he had had some teaching experiences in the department of zoology at Duke University, and in North Carolina College in biology. His research interests concern membrane transport, and renal and body fluid physiology. He is an ardent and imaginative worker, and has published several abstracts and papers in his field. Dr. Lee is a well-trained and able physiologist and biophysicist and a capable teacher. He has been at West Virginia University for only one year.

Hugh Alexander Lindsay, Ph.D.

Hugh Alexander Lindsay was born March 5, 1926, in Moose Jaw, Saskatchewan, Canada, and was educated in Canadian schools. In 1949 he received a B.Sc. degree from the University of Western Ontario and in 1952 an M.S. from this institution. In 1955 he was granted the Ph.D. degree in pharmacology from the University of Toronto. He is, therefore, a well-educated and a well-trained biologist.

In November 1955 Dr. Lindsay came to the School of Medicine of West Virginia University as an assistant professor of physiology. His field of interest is endocrinology. He is very intelligent, is well trained in mathematical principles, is versed in modern statistical methods and their application to biologic problems. He has, moreover, the facility to write well and to express himself well, and is a good teacher. In 1960 he became associate professor of physiology and in 1970 was promoted to a full professorship.

His researches are concerned with problems associated with endocrinology; this is fortunate since he is the only man in the department who is especially trained or deeply interested in endocrinology. He has shown an imaginative approach in his investigations and has published a number of papers in national scientific journals. He has always taken a keen interest in graduate training and has devoted a great deal of time and energy to this problem. For several years he was largely responsible for recruiting desirable graduate students and later to advising them in their graduate curriculum, and did a splendid job. For a number of years he served as secretary to the medical faculty.

Dr. Lindsay belongs to a number of national scientific organizations, among them are the American Physiological Society and the Canadian Pharmacological Society. He has attended a number of meetings of these societies and has presented papers on several occasions at their annual meetings. In 1967 Dr. Lindsay became a naturalized American citizen. He has taken a healthy interest in community affairs, especially those concerned with elementary schools. He is indeed a valuable member of the department of physiology and of the Medical Center.

Rowland Elizabeth Logan, Ph.D.

Rowland Elizabeth Logan was born in Los Angeles, California, August 1, 1923. She was graduated with a B.A. degree from the University of California, Los Angeles, in 1945 with a major in zoology. In 1946 she was enrolled in graduate studies in zoology at the University of Chicago. During the summers of 1946 and 1947 she was in residence at the Roscoe B. Jackson Memorial Laboratory at Bar Harbor, Maine. In 1947 she was a research assistant at the above named laboratory and in 1948 served in a similiar capacity at the Biology Division at Oak Ridge National Laboratory, Oak Ridge, Tennessee. In March 1949 she enrolled as a graduate student in the department of physiology at Northwestern University Medical School, and obtained a Ph.D. in physiology in 1954. Obviously, she was a well-trained biologist. Her researches concerned light-darkness rhythm on the estrous cycle of rats with particular attention to the occurrence and timing of ovulation.

Dr. Logan came to the School of Medicine of West Virginia University as an instructor of physiology in January 1954. Before she came to West Virginia University she had had some teaching experience at Northwestern University Medical School and had been placed in charge of teaching physiology to nurses. At West Virginia University her principal duties concerned teaching medical, pharmacy, and medical technology students, in the physiology laboratory. Considerable time was afforded her to pursue her researches. She was a very capable individual and a conscientious worker. She remained at West Virginia University for three full semesters and resigned July 1, 1955.

Withrow Morse, Ph.D.

Withrow Morse, Ph.D., who was trained as a physiological chemist, came to the School of Medicine of West Virginia University in the late summer of 1918 as associate professor of physiology and physiological chemistry. He was born in Dayton, Ohio, May 7, 1880. Dr. Morse was a well-trained scientist and held three degrees from Ohio State University: a B.S. de-

gree in 1903, an M.S. degree in 1904, and received a Ph.D. degree (in biochemistry) in 1910.

Dr. Morse had had a wide experience in teaching and in research before he came to West Virginia University. He had spent several summers at Woods Hole, Massachusetts, before he completed work for his Ph.D. degree, and in the summers of 1907 and 1908 was an instructor in the Marine Biological Laboratory there. He taught biochemistry and physiology in a number of institutions before he came to West Virginia University. The schools at which he taught were: Cornell University School of Medicine, University of Wisconsin School of Medicine, and the University of Nebraska School of Medicine. In 1917 he served as director of chemical research at Michael Reese Hospital in Chicago, and from there he came to West Virginia University. He was principally responsible for teaching physiological chemistry, but he also assisted Dean Simpson in the department of physiology. The following year he was made professor of physiology and of physiological chemistry.

Parenthetically, Dr. Morse was also called upon to teach pharmacology for one year, as the professor of pharmacology (Dr. W. H. Schultz) had resigned to become professor of pharmacology at the School of Medicine of the University of Maryland. It is of interest in this highly specialized era that Dr. Morse was called upon to teach three disciplines, namely biochemistry, physiology, and pharmacology. In earlier days this was not uncommon. When I taught at the University of South Dakota School of Medicine (1920-21), I was called upon to teach physiology, biochemistry, and pharmacology.

At the time Dr. Morse taught physiology, the laboratory manual compiled by Dr. W. B. Cannon, professor of physiology at the Harvard Medical School, was used. When I assumed my teaching duties at West Virginia University in September 1921, I had occasion to see some of these manuals. I noted that Dr. Morse had perused them carefully and had written critical comments on the margins of the pages for the benefit of the students.

For two years (1918-20) Dr. Morse was largely responsible for the teaching of physiology. In 1920 Dean Simpson withdrew

from the department of physiology and became professor of medicine. As a result of this, Dr. Morse automatically became chairman of the combined departments. When J. Earl Thomas, M.D., came to the department of physiology in September 1920 as associate professor of physiology, he was under the supervision of Dr. Morse. However, Dr. Thomas did virtually all the teaching in physiology; in a personal communication to me he mentioned that Dr. Morse was always cooperative and in no way interfered in the way Dr. Thomas conducted the department. He remained only one year.

In September 1921, Edward J. Van Liere, M.D., became chairman and professor of physiology at West Virginia University. Physiological chemistry was separated from physiology and Dr. Morse devoted his full time to the department of physiological chemistry.

Dr. Morse, as has been previously stated, had a splendid biological educational background. He fostered research and his own researches concerned enzyme activity, mineral physiology, and water and electrolyte balance. He had a fertile imagination and showed considerable ingenuity in attacking research problems. A number of his articles were published in national scientific journals while he was in residence in West Virginia University. During the last two years he spent at the university he devoted a good deal of his time in writing his textbook, *Applied Biochemistry*. He did not complete his book until he became affiliated with Jefferson Medical College. The writing of this book curtailed his research work.

Dr. Morse was not a popular teacher, but everyone respected him. The students thought him rather stern and unfriendly, and felt that much of the work he presented was theoretical and but of little practical importance so far as clinical medicine was concerned. I do not know about this; it is significant that the title of his book, *Applied Biochemistry*, suggested that he recognized the relationship of biochemistry and the practice of medicine.

Dr. Morse was a quiet, dignified man and on the whole a good and dependable teacher. He was a man of culture and had many interests outside his profession. He was not a practical

person, and felt, for example, that money was simply a means of exchange, and had no concept of a realistic departmental budget. This caused him trouble later when he became chairman of a large department of biochemistry. He was visionary and an idealist. Despite his lack of understanding of money matters he appreciated educational values, and should be given credit for establishing a department of biochemistry in the School of Medicine. The establishment of this department was important, for the School of Medicine no longer had to depend upon members of the College of Arts and Sciences to teach biochemistry.

Dr. Morse taught five years at West Virginia University (1918-23). He left in the summer of 1923 to accept a position as chairman of the department of biochemistry at Jefferson Medical College in Philadelphia.

In summary, Dr. Morse although primarily trained as a biochemist had an appreciation of physiology, and brought an impetus to the department of physiology at West Virginia University School of Medicine and for one year served as chairman of the department. He was a dependable teacher, a scholar, and a gentleman. He recognized the value of research in medical education and the importance of laboratory work in physiology to the medical student. His lack of administrative ability and his philosophy of money matters were a handicap to him all his life, but he was an idealist and an academician at heart. In essence, he served the School of Medicine well.

David Wilmarth Northup, Ph.D.

David Wilmarth Northup was born in The Dalles, Oregon, April 14, 1906. He was graduated from Reed College, Portland, Oregon, with the B.A. degree in 1930; in 1932 he was granted the M.A. degree by the University of Oregon, and in 1935 obtained a Ph.D. in physiology from the University of Illinois, College of Medicine, Chicago, Illinois. His graduate work was supervised by Dr. Ernst Gellhorn and by Dr. Maurice B. Visscher, both outstanding physiologists. Dr. Northup had a splendid education; he was always interested in physics and in

mathematical concepts. He served as an assistant in the department of physiology at the University of Illinois College of Medicine.

After Dr. Northup had completed his Ph.D. requirements he came to West Virginia University School of Medicine in the late summer of 1935 as an assistant professor of physiology. He brought to the department of physiology a helpful mathematical approach in regards to statistical methods. He himself had considerable enthusiasm for making statistical analyses. In his early researches while under the direction of Dr. Gellhorn he worked on muscle physiology, and later under Dr. Visscher on gland physiology. When he came to West Virginia University, he became interested in gastrointestinal physiology and in studies in hypoxia and published many papers in this field.

In 1938 he was made an associate professor, and in 1949 was advanced to a full professorship and in 1955 was appointed chairman of the department of physiology. He served as chairman for ten years, that is, until 1965 and then continued his work as professor of physiology and still remains in this position. For many years he has been a member of the American Physiological Society, has attended many of its annual meetings, and has often presented papers before the society. He is an outstanding teacher, and although possessing a fine mind, he is quite patient with students who are not as gifted as he. His good teaching is appreciated by the students and is well regarded by them. He is a widely read individual and has a splendid understanding of clinical medicine which many men with the Ph.D. degree do not have. For a number of summers he has offered a ten-week course "Introduction to Biophysics," which is given largely for graduate students. Dr. Northup has been a member of the department of physiology for thirty-five years and has made many contributions to the department.

J. Frank Pearcy, Ph.D.

J. Frank Pearcy was born in Kelso, Washington, on August 24, 1895. He received his B.A. degree from Reed College in Portland, Oregon, and his Ph.D. degree from the University

of Chicago under the direction of Professor A. J. Carlson. In September, at the age of twenty-four, Dr. Pearcy came to the School of Medicine as assistant professor of physiology, and remained for three years. During the academic year of 1926-27 he was acting chairman of the department, since I was on leave of absence. He left in the spring of 1927 to complete work on his M.D. degree.

Dr. Pearcy was a well-trained physiologist and an enthusiastic research man in his early years. In the main, his researches concerned reflexes from the gastrointestinal tract which studies he had commenced under the direction of Professor Carlson. Dr. Pearcy and I were about the same age and under Dr. Carlson's supervision we worked together on some of the gastrointestinal studies and published our results in the *American Journal of Physiology* in 1926 and 1928.

Had he remained in physiology he might have gone far, for he was imaginative, and had not only a fine mind, but a highly critical one. He was a cultured person but in some ways a nonconformist. He spoke well and was considered a splendid teacher, and had the respect of the students. It is a pity that he left the field of physiology, although when I worked with him he was much interested in psychology, especially abnormal psychology. Presumably he came to the conclusion that psychiatry was his real field of interest rather then the basic medical sciences.

It is rather unusual for a person who has taken a doctorate in the basic sciences, and who has done considerable amount of research in the field to transfer to psychiatry, which so often deals with the abstract. I do not mean to speak disparagingly of psychiatry, because I believe it to be an important subject and needs well-trained scientists and able and dedicated men. In any event, I presume that Dr. Pearcy found that his excellent basic scientific training stood him in good stead in his chosen field.

Kenneth E. Penrod, Ph.D.

Kenneth E. Penrod was born in Blanchester, Ohio, March 30, 1916. In 1938 he received a B.S. degree from

Miami University (Oxford, Ohio) and in 1942 obtained a Ph.D. degree in physiology at Iowa State University. From 1942 to 1946 he served in the armed forces as an aviation physiologist. At the close of the war he accepted a position in the department of physiology at Boston University School of Medicine. In 1950 he became associate professor of physiology at Duke University School of Medicine and two years later was made assistant to the dean of the Duke University School of Medicine, and also was promoted in physiology to full professional rank.

On July 1, 1959, Dr. Penrod became vice-president of the Medical Center of West Virginia University and professor of physiology. He served in this dual capacity until 1965. In physiology his research interest concerned studies on the effect of increased oxygen tension on the body, and he published a number of papers in national scientific journals. After he became vice-president of the Medical Center his heavy administrative duties did not allow him time for biologic research. He, however, took an active part in the department of physiology and most of the years while in residence gave a series of lectures to the medical students on the physiology of metabolism. He was an enthusiastic teacher, lectured extremely well, and held the attention of the students. Dr. Penrod resigned in July 1965 to become provost of the University of Indiana Medical Center. He made many worthwhile contributions to the Medical Center of West Virginia University.

John N. Simpson, M.D.

Shortly after the turn of the century (1902) John N. Simpson, M.D., who had just completed his work for the M.D. degree at Johns Hopkins University School of Medicine, came to West Virginia University School of Medicine as an instructor of physiology and anatomy. He was a native West Virginian and was born March 19, 1869, in Masontown, on the Ohio River. John Simpson had received a B.A. degree from the University of Nashville in 1893, and then followed a teaching career for six years before entering a school of medicine. He taught at Marshall College, at Huntington, West Virginia, for five years and

served as principal of the high school in Huntington for one year. He was thirty-three years old when he accepted the position at West Virginia University.

Dr. Simpson had had no graduate training in the subjects he was to teach, that is, anatomy and physiology, because he accepted this position immediately following graduation from Johns Hopkins University School of Medicine. He was a cultured person, had a very good mind, a likable personality and had administrative ability. Furthermore, he had received excellent training in physiology as a medical student. At the time he took his work at Johns Hopkins, William H. Howell, Ph.D., M.D., was professor of physiology. Dr. Howell was one of the outstanding physiologists in the United States and the author of a textbook in physiology which was widely used not only in the United States, but also in several foreign lands. Dr. Howell was a research physiologist and made many contributions to the physiologic literature. It is singular, however, that Dr. Simpson never became interested in research. Actually he felt that research should not be done in small and young medical schools as will be mentioned later.

Although most of the early work in physiology at West Virginia University probably consisted of lectures and quizzes, laboratory experiments were also performed. Dr. Simpson presumably had the students perform many of the laboratory experiments which were in use at Johns Hopkins, that is, as many as could be done with the apparatus at hand. We may assume that the students were exposed to a reasonably adequate course in laboratory physiology.

We may assume further that Dr. Simpson recommended the purchase of additional laboratory equipment. Within a few years the laboratory desks were provided with apparatus manufactured by an outstanding firm, that is, the Harvard Apparatus Company of Cambridge, Massachusetts. In the Bulletin of the School of Medicine for 1913-14 the following information concerning the physiology laboratory and physiologic equipment appears:

> The laboratory devoted to the work of physiology is large and well lighted. It is supplied with tables, each accommodating two students who work together. Each table has a complete set of Harvard physiological apparatus which is lent to the students with a charge of breakage only. There are for general use kymographs, apparatus for work in blood pressure, and blood counting, hemoglobinometers, charts and models.

At that time Harvard Physiological apparatus was widely used in medical schools in the United States. It is significant that the physiology laboratory at West Virginia University was equipped with good apparatus.

But little change was made in the teaching of physiology until 1918. In the autumn of that year Withrow Morse, M.D., came to West Virginia University School of Medicine as associate professor of physiology and physiological chemistry. Although primarily trained as a biochemist, he assisted Dr. Simpson in physiology and presumably took over the laboratory teaching. This gave Dr. Simpson more time for his administrative duties. (Dr. Simpson was then dean of the School of Medicine.) J. Earl Thomas, M.D., was added to the department in September 1920 as associate professor of physiology. Dean Simpson withdrew from the department of physiology in 1920 and became professor of medicine. Withrow Morse, Ph.D., became chairman of physiology and physiological chemistry for one year (1920-21).

Dr. Simpson, in a way, ushered in a new era in teaching physiology at West Virginia University, for shortly after he came he commenced to organize the first two years of the medical curriculum (see table 1). This curriculum was put into effect in the school year 1903-04. Several factors must be borne in mind in evaluating Dr. Simpson's contribution to physiology at West Virginia University. Although a good and an experienced teacher he was not research minded. He had had no experience in research methods and did not feel that research work should be carried out in a small medical school. In his presidential address given before the West Virginia Medical Association in June 1923 he spoke as follows:

> There has likewise been a change towards the matter of research in medical schools and the matter of teaching. It has been urged that research should be a part of every teacher's work, with the result that much of the work that has been turned or ground out has had little or no value, and men who could do that kind of work were often almost valueless as teachers. The trend now is that teaching should be the primary consideration and while the teacher may not have the genius for research if he has been well-trained, he can appreciate and interpret the results to his students often more satisfactorily than the research man leaving the matter of research to the large endowed institutions, where that alone can best be done.

It is somewhat difficult to understand his philosophy about research since he had taken his doctor of medicine degree at Johns Hopkins University and this school was widely known for fostering research. Furthermore, Dr. Simpson was a highly intelligent and scholarly individual. Be all that as it may, research had been done in the School of Medicine in the field of bacteriology, biochemistry, pathology, and physiology several years before Dr. Simpson gave his talk before the State Medical Association. It is important that he did not interfere with teachers doing research despite his feeling toward it.

Dr. Simpson at the time he was responsible for teaching physiology had a rather heavy teaching load, and there was a great deal of work in connection with organizing the first two years of the medical curriculum. Organization was completed in 1912 and in that year he was made the first dean of the School of Medicine. For many years he had no secretarial service and was forced to carry on his correspondence in long hand. Not long after 1912 he was instrumental in obtaining a medical building which was completed in 1916. The building was a three-storied structure, seventy-seven feet by fifty-seven feet, built of brick and contained no structural steel. It was a modest building, but served a real purpose and was used for forty-one years.

For many years Dr. Simpson was active in organized medicine which helped establish good public relations with the physicians within the state. In 1923 he served as president of the West Virginia Medical Association.

Dr. Simpson had the good judgment to bring well-trained personnel into the department. In chronological order there were Withrow Morse, Ph.D., in 1918, J. Earl Thomas, M.D., in 1920, and Edward J. Van Liere, M.D., in 1921. All three of these men had had special training in physiology and all had had teaching experience. Dr. Simpson did all he could to aid them in their teaching and in their research programs.

In summary, Dr. Simpson taught physiology at West Virginia from 1902 until 1920, a period of eighteen years. Although he was an experienced teacher and had a good mind he probably would have to be considered an old-fashioned physiologist, for he did not engage in research nor did he foster any. Nevertheless, he had a keen appreciation of the value of physiology in the medical curriculum. He had the good judgment to invite well-trained teachers into the physiology department when his budget allowed him to do so. Besides teaching physiology he organized the first two years of the medical curriculum. He was appointed the first dean of the School of Medicine in 1912. During his deanship he was responsible for obtaining a medical building which was used for forty-one years. He served the university well.

Table 1. The School of Medicine-Curriculum in 1912

First Year	
First Semester	*Second Semester*
Physiology	Physiology
Histology	Pharmacology
Neurology	Anatomy
Embryology	
Elementary Pharmacology	
Second Year	
Pathology	Pathology
Bacteriology	Minor Surgery
Pharmacology	Chemistry
Physical Diagnosis	Anatomy
Chemistry	

Thirteen hours of physiology were required of medical students; it was all given in the first year. Physiological chemistry

was not given until the second year. At the end of the second school year the students had to transfer to a four-year medical school to complete their work for an M.D. degree.

College of Medicine—Curriculum for 1903

First Year

Fall	*Winter*	*Spring*
Chemistry 1	Chemistry 2	Organic Chemistry
Osteology	Pharmacology	Pharmacology
Histology	Anatomy	Anatomy
	Physiology	Physiology
		Neurology

Second Year

Bacteriology	Organic Chemistry	Medical Chemistry
Physiology	Anatomy	Pathology
Embryology	Pathology	Anatomy
		Physical Diagnosis

The curriculum covered two full school years, that is, of nine months each. The work was given in three terms, fall, spring, and winter, as was the custom of the university at that time. It will be noted that physiology was given in three terms, the winter and spring of the first year and the fall of the second year. Today chemistry 1 and 2 and organic chemistry are of course given in premedical work. Students who had completed the above listed courses were eligible to transfer to certain four-year medical schools and complete their M.D. degree.

J. Clifford Stickney, Ph.D.

J. Clifford Stickney was born in Vancouver, Washington, July 15, 1909. He was graduated from Wheaton College, Wheaton, Illinois, with a B.A. degree in 1933 and with an M.S. degree from the University of Washington in 1936, and with a Ph.D. in physiology from the University of Minnesota in 1940. He is, therefore, a well-educated and a well-trained biologist. At the University of Minnesota his doctorate degree was supervised by Dr. Ancil Keys and Dr. Maurice B. Visscher, both outstanding physiologists. He had teaching experience at Wheaton College and at the University of Minnesota, serving as an instructor in zoology for a year at the former school and at the latter a part-time teaching fellowship.

Dr. Stickney came to the School of Medicine of West Virginia University in the late summer of 1940 as an instructor of physiology. In 1945 he became an assistant professor, an associate professor in 1949, and a full professor in 1957. While working at the University of Minnesota his research concerned potassium balance. Shortly after he came to West Virginia University he became interested in gastrointestinal physiology and in hypoxia, and is still working in these fields. He is a good worker, a good research man, possesses a keen analytical and critical mind, and has published many papers in his research fields. In 1963 he was a co-author (with E. J. Van Liere) on a book, *Hypoxia,* published by the University of Chicago Press, and is senior author on a chapter "The Effects of Exercise Upon the Functions of the Gastrointestinal Tract" in *Science and Medicine of Exercise and Sports,* published by Harper and Company, 1971.

Dr. Stickney is a member of the Society of Experimental Biology and Medicine and the American Physiological Society. He has attended meetings of the latter named society regularly for many years and generally presents a paper at the annual meetings. On a number of occasions he has served as chairman of the section which concerns pulmonary physiology. He has also attended two International Physiological Congresses, one at Leiden, Holland, in 1962 and one at Munich, Germany, in 1971.

Dr. Stickney meticulously keeps abreast of the physiological literature and maintains an elaborate card-index file of researches in fields in which he is especially interested. He is a very conscientious teacher and is well regarded by the student body, and has always taken an active part in their social activities. For many years he has served as chairman of the Committee on Loans and Scholarship (now called Committee on Student Welfare) and devotes a great deal of time and energy to this important committee. He is also deeply interested in and takes an ac-

tive part both in church and community affairs. He has served the university well for many years.

J. Earl Thomas, M.D.

In the late summer of 1920 J. Earl Thomas, M.D., assistant professor of physiology at the University of Saint Louis School of Medicine, came to West Virginia University School of Medicine. He was born at Steilacoom, Washington, January 31, 1901. Although a relatively young man, he was a trained physiologist and had had several years of teaching experience. He was awarded an M.D. degree from Saint Louis University in 1918 and had served as a part-time assistant from 1914 to 1918. After he had his M.D. degree, he became an instructor in physiology and served for two years (1918-20) and then was made assistant professor. He resigned his position and came to the School of Medicine of West Virginia University as associate professor of physiology.

At the time the courses in physiology and physiological chemistry were taught in a combined department; Withrow Morse, Ph.D., was in charge and was listed as professor of physiology and professor of physiological chemistry. Academically he outranked Dr. Thomas, but did not interfere and allowed him to take charge of physiology and conduct his researches. In fact, Dr. Thomas was the first full-time member of the department of physiology. This appointment was significant; Dr. Morse could now devote full time to physiological chemistry.

While at West Virginia University, Dr. Thomas's researches had to do with the physiologic action of epinephrine, nicotine and acid fuchsine. So far as I know he did not publish any papers while in residence at West Virginia. He remained only one year and returned to his alma mater.

His subsequent distinguished career is of interest. In 1927 he became chairman of the department of physiology at Jefferson Medical College and served there until 1956, at which time he reached the mandatory age of retirement. He devoted his researches largely to the gastrointestinal tract and became one of the leading students in his field. I had the privilege of doing some

research with him since concerned the effect of hypoxia on the pyloric sphincter. We published our work in 1936. He was a member of various scientific societies.

After he retired from Jefferson, he became chairman of the department of physiology at Loma Linda University, and retired there at the age of seventy-three. He reorganized the department and incorporated in it biophysics. A laboratory was named in his honor. It is noteworthy that Dr. Thomas had the privilege of reorganizing and strengthening physiology departments in three institutions, namely West Virginia University, Jefferson, and Loma Linda University.

In sum, Dr. Thomas, although he taught at West Virginia for only one year, made a distinct contribution to physiology. He was the first individual to devote all his time to teaching and research in the department. West Virginia University department of physiology was fortunate in having had him on its staff.

Edward J. Van Liere, M.D.

In September of 1921 I became chairman and professor of the department of physiology at the School of Medicine of West Virginia University. The year previous I had been acting professor of physiology at the University of South Dakota at Vermillion. At West Virginia University the department of physiology had been combined with the department of biological chemistry; the departments were separated and I was responsible for physiology. The first two years I taught at West Virginia University, since I held an M.D. degree, I was called upon to do considerable clinical work in the university Student Health Service, and was asked also to teach an introductory course in obstetrics. My teaching and clinical duties were rather exacting and I had but little time for research work.

Early in my career as a biology student at the University of Wisconsin I became interested in research, and I was anxious to continue my biological investigations. Although I had a master's degree in physiology from the University of Wisconsin (under J. A. E. Eyster, M.D.) and held an M.D. degree from the Harvard Medical School, I felt that I needed more intensive training in

physiology and in modern research methods. At that time the department of physiology at the University of Chicago under the leadership of Professor A. J. Carlson had an excellent reputation in graduate work and I was advised to get in touch with Professor Carlson. I did so and outlined my desire to work for a Ph.D. degree in physiology under his supervision. He was quite agreeable and suggested that I start an acceptable research program at once, for a certain amount of graduate credit would be allowed in absentia. Dr. Carlson suggested further that I work with J. Frank Pearcy, Ph.D., who had come recently to the department of physiology at West Virginia University, and who had just completed his doctorate degree in Dr. Carlson's department. Under the latter's supervision Dr. Pearcy was working on reflexes from the viscera. This arrangement proved to be quite satisfactory and Dr. Pearcy and I worked together for two years and published two papers in the *American Journal of Physiology*.

In 1926 I was granted a leave of absence from West Virginia University and became a full-time graduate student in physiology at the University of Chicago. I was awarded a Donnelly Fellowship and my graduate work was supervised by Professor A. J. Carlson. He allowed me to choose my own research problem, namely, the effect of hypoxia and my doctorate thesis concerned the effect of chronic hypoxia on the mammalian heart. I received the Ph.D. degree in physiology in 1928.

When I returned to West Virginia University to resume my teaching duties, I continued my studies on the effect of hypoxia on the body (I am still working in this field). I acquired a small low-pressure respiratory chamber which would withstand complete air evacuation and which would hold three small dogs. Later we acquired a large chamber which would accommodate about ten people. These chambers are still in use.

A word might be said about teaching medical students or for that matter any student. As chairman, I tried to attract and keep good conscientious teachers on the staff. Although I promoted research and attempted to set the example, I always insisted that the teaching of medical students both in the classroom and in the

laboratory, was our foremost duty. Parenthetically, it is significant that today some students are becoming critical of the instruction they receive and complain that their professors devote so much time and energy to research that they neglect the undergraduate student. I believe that in some instances they may have a grievance.

Between the years 1935 and 1957 the classes in the medical school were small (thirty-one students), and an earnest effort was made to work closely with the students. I have reason to suppose that they appreciated our efforts to help them. It is hardly necessary to state that working with young, intelligent, and well-motivated students is a great satisfaction. After the Medical Center was completed (1957) the medical classes became much larger, but the faculty of the department was also increased.

I continued as chairman of the department for many years. Because of my responsibilities as dean of the School of Medicine (I became dean in 1935) and because of the work involved in developing the Medical Center, I resigned as chairman of the department in 1955. My colleague of many years, David W. Northup, Ph.D., was made chairman. I continued as professor of physiology and taught until 1966 when I reached the mandatory age of retirement. I was connected with the department of physiology as a teacher from 1921 until 1966, a period of forty-five years.

Myron McDonald Weaver, M.S.

Myron McDonald Weaver was born in Detroit, Michigan, October 19, 1901. He obtained his B.A. degree from the University of Chicago in 1924 and his M.S. in 1926, and came to West Virginia University as assistant professor of physiology in September 1926; the following year he was made associate professor. He remained at West Virginia University for only two years, because he wished to complete work on his doctorate degrees (M.D. and Ph.D.).

Myron was a scholarly individual, a hard worker, and a splendid teacher; moreover he possessed a pleasing personality, and had distinct qualities of leadership. Indeed he was a fine clean

young American. His researches had to do mainly with the pancreas and the action of the barbiturates. He would have made his mark in physiology had he remained in this field, but his main interest lay in internal medicine and medical administration, and had a distinguished career in both fields. His physiologic training doubtless stood him in good stead so far as his work in internal medicine was concerned.

The many responsible positions he held after he left West Virginia (among them were: assistant dean of the University of Minnesota School of Medicine, dean and professor of medicine of the faculty of medicine at the University of British Columbia, and dean of Union College at Albany, New York) and the way he conducted them, attest to his marked ability and his sterling character. West Virginia University School of Medicine was fortunate to have had him on its staff.

Kenneth C. Weber, Ph.D.

Kenneth C. Weber was born in Saint Cloud, Minnesota, November 16, 1937. His early training was in the field of electrical engineering, and in 1957 he obtained the AAS (Associate in Applied Science) from the DeVry Technical Institute in Chicago, Illinois. For several years he served as an electronic technician in various establishments, including the University of Minnesota; in 1963 he received the B.S.E.E. degree from this institution. He, therefore, had splendid training both in applied and academic work in electrical engineering.

While engaged as an electronic technician in the department of physiology and biophysics of the University of Minnesota, he became interested in taking graduate work in this department. In 1968 he obtained a Ph.D. degree in physiology and biophysics. His field of research concerns respiratory physiology and encompasses mechanics of breathing, pulmonary circulation, and lung metabolism. He has published a number of abstracts and papers in this field.

He came to West Virginia University School of Medicine in September 1968 as an assistant professor of physiology and biophysics. In point of fact, he was invited to West Virginia to become senior physiologist in the Appalachian Laboratory for Occupational Respiratory Diseases (ALFORD). Because of his background in electrical engineering and in physiology and biophysics he was exceptionally well trained for this position. He will continue to be an active member of the department of physiology and biophysics of the School of Medicine. Dr. Weber has been at the School of Medicine for only one year.

Michael F. Wilson, M.D.

Michael F. Wilson is a native West Virginian and was born in Morgantown, West Virginia, January 13, 1927. He received a B.A. degree from West Virginia University in 1949 and an M.D. degree in 1953 from the University of Pennsylvania. On the completion of his doctorate degree he took an internship in the Presbyterian Hospital in Philadelphia and a year of residence in internal medicine. He then became a resident in internal medicine at Temple University School of Medicine and served in this capacity for two years, and then became a fellow in cardiology for one year at this institution. From 1958 to 1960 he was a research fellow at the University of Washington School of Medicine in the department of physiology and biophysics. In 1960 he became assistant professor of physiology at the University of Kentucky School of Medicine and in 1963 was promoted to associate professor in the department of physiology and biophysics. He is therefore a widely trained and experienced man not only in physiology and biophysics, but also in internal medicine.

Dr. Wilson came to the School of Medicine of West Virginia University in the summer of 1965 as professor and chairman of the department of physiology. As soon as he became chairman, he began to reorganize the department and brought in personnel who had been trained both in physiology and in biophysics and also acquired considerable pertinent apparatus. In 1966 the department became known as the department of physiology and biophysics. Biophysics, of course, deals with the physics of vital processes. Today in many medical schools in the United

States departments of physiology are now known as departments of physiology and biophysics.

Dr. Wilson is keenly interested in graduate training and has recruited some excellent graduate students, a number of whom have been awarded the Ph.D. degree. Under his capable leadership the department during the past few years has grown in terms of highly qualified personnel, equipment, and financial support. Good teaching is fostered and the courses taught the medical students are accented with clinical correlations.

Dr. Wilson's researches are concerned broadly with cardiovascular physiology and he has published numerous papers in this field. He is a member of many national scientific organizations, among them are: The American Physiological Society, the Biophysics Society, the Aerospace Medical Association, the American Heart Association, the American College of Cardiology, and the Pavolian Society of North America. He attends regularly the annual meeting of the American Physiological Society and often presents a paper before the society. For several years he served as chairman of the curriculum committee of the School of Medicine. He and his committee thoroughly revised the curriculum, especially in regard to changes in the basic science courses, which included their closer correlation with clinical subjects. His committee also revised the elective courses and allowed the students more opportunity in their clinical years of taking a certain amount of their work in hospitals other than the University Hospital.

Dr. Wilson is serving his alma mater well.

ASSOCIATE PROFESSORS WHO HELD DUAL APPOINTMENTS IN PHYSIOLOGY AND PHARMACOLOGY

For three school years (1921-24) two men with an M.D. degree, Charles Royal Kessel (1921-23) and Julius Floyd Morrow (1923-24) taught physiology during the first semester and pharmacology the second semester, that is, they were only part-time teachers in the department of physiology. Both of these men had taken the first two years of medicine at West Virginia University. Neither of them had taken a significant amount of graduate training in the areas they taught. They were, however,

capable and dependable men, good teachers and were respected by the student body. Undoubtedly in their teaching they emphasized the clinical application of physiology. This was not unusual in those days, nearly a half a century ago. Neither man had planned on a teaching or a research career since they were both interested in the practice of medicine.

Charles Royal Kessel, M.D.

Charles Royal Kessel was a native West Virginian and was born in Given, Jackson County, December 16, 1893. He entered West Virginia University and matriculated in the School of Medicine in 1917, after he had had two years of premedical work. He transferred to the Jefferson Medical College in Philadelphia and received his M.D. degree in June 1921.

Dr. Kessel was appointed associate professor of physiology and pharmacology at the School of Medicine of West Virginia University in the spring of 1921. Since he had not taken any graduate training in the basic sciences or had had any experience in research methods he spent a part of the summer of 1921 in the department of physiology of the University of Chicago. Since he had a dual appointment (in physiology and in pharmacology) he assisted in physiology the first semester and in pharmacology in the second. He was a good, dependable, and conscientious teacher and when he lectured he spoke well and convincingly. He did not engage in research, but used his spare time in the practice of medicine. He assisted in the student health service of the university and also did some practice in Morgantown.

Dr. Kessel resigned from the departments of physiology and pharmacology at the end of two years and became full-time physician in charge of the Student Health Service. He served in this capacity until June 1928, and then resigned and practiced medicine in Morgantown.

In June 1930 he moved to Ripley, West Virginia, and in cooperation with his two brothers founded the Kessel Hospital and later the Kessel Clinic. Dr. Kessel suffered a cerebral hemorrhage while working in the clinic and died September 6, 1965, at the age of seventy-one years.

In summary Dr. Kessel taught physiology and pharmacology for two years at the School of Medicine. His main contribution to the university, however, was the fact that he was the first individual to serve as a full-time physician of the Student Health Service.

Julius Floyd Morrow, M.D.

Julius Floyd Morrow was born in 1895 in West Alexandria, Pennsylvania, which lies a few miles east of Wheeling. He entered the School of Medicine of West Virginia University in 1918. After he completed his first two years of medicine in 1920 he served as an assistant in the department of anatomy and histology in the School of Medicine. In 1921 he enrolled in the University of Cincinnati, College of Medicine and was granted the M.D. degree in 1923.

Dr. Morrow returned to West Virginia University in the late summer of 1923 as an associate professor of physiology and of pharmacology. The first semester he served as a full-time teacher in physiology and in the second semester in pharmacology. He had never taken any graduate work in either of the subjects he taught, and presumably never really planned on making teaching or research a career. He was a pleasant and intelligent person and as a teacher dependable and conscientious, and was well regarded by his students. He remained on the teaching staff for only one year and then entered the field of clinical medicine. For many years he has been in the practice of medicine in Knoxville, Tennessee, and so far as I know is still practicing there.

It perhaps should be mentioned that both Dr. Kessel and Dr. Morrow were invited to join the faculty. I was never consulted about their appointment.

PART-TIME TEACHERS IN THE DEPARTMENT OF PHYSIOLOGY AND BIOPHYSICS

A word of explanation is in order concerning part-time teachers in the department of physiology and biophysics. These individuals hold dual appointments; presently there are six in the department. Three of them do not hold the M.D. degree;

one had a Ph.D. degree in physiology, one a D.V.M., and one an M.S.E.E. degree. A short biographic sketch of each of these members follows:

John L. Hankinson, M.S.E.E.

John L. Hankinson was born in Atlanta, Georgia, June 25, 1943. He received his electrical engineering education at Georgia Institute of Technology and obtained a B.S.E.E. degree in 1965 and an M.S.E.E. degree in 1967. After graduation he served as chief of the calibration and standardization unit, Electronic Section, Southwestern Radiological Health Laboratory, Las Vegas, Nevada. He is a member of Electrical and Electronic Engineers.

In August 1968 he became staff engineer of the medical research section of the Appalachian Laboratory for Occupational Respiratory Diseases (ALFORD) at Morgantown, West Virginia. He was also made instructor of physiology and biophysics at the School of Medicine of West Virginia University. His main duties in the latter named department concern medical electronics and instrumentation, and radiation biophysics, work for which he is very well qualified.

Daniel C. Upthegrove, Ph.D.

Daniel C. Upthegrove was born May 7, 1938, in Sacramento, California. He obtained a B.S. degree from Arlington State College (Arlington, Texas) in 1960. He then pursued graduate studies at the University of Texas, Southwestern Medical School at Dallas from 1960 to 1963. He obtained his Ph.D. degree in physiology at Baylor University Graduate Division at Dallas the summer of 1967.

Dr. Upthegrove came as a postdoctoral fellow to the department of physiology and biophysics of the School of Medicine of West Virginia University in September 1967, and the following year became a part-time instructor in the department. He had had some teaching experience in the department of physiology at Baylor University College of Dentistry in Dallas before he

came to West Virginia University. At West Virginia he enrolled as a part-time student in the School of Medicine. His researches deal with microcirculation and cardiovascular physiology, and has published several papers in this field. Dr. Upthegrove is a good and dependable teacher.

Lauralee Sherwood, D.V.M. (Mrs. H. Peter Marshall)

Lauralee Sherwood was born in Shepherd, Michigan, November 26, 1943. She obtained two degrees from Michigan State University, a B.S. in 1964 and D.V.M. in 1966. She was awarded the Borden Veterinary Award for obtaining the highest scholastic average in her class. (She was married to H. Peter Marshall in 1966.)

Dr. Sherwood came to the department of physiology and biophysics of the School of Medicine of West Virginia University in 1966 as a research assistant. The following year she became an instructor in the department and was also a member of the department of preventative medicine and public health; she held therefore a dual appointment.

Her main responsibility in the department of physiology and biophysics was to teach the students enrolled in the School of Nursing. Besides teaching nurses, she also taught physiology to students enrolled in other health sciences, such as medical technology. In the department of preventative medicine and public health she gave some lectures to medical students. (Later she became a full-time member of the department of physiology and biophysics.) Dr. Sherwood is considered as a capable and conscientious teacher and is very well regarded by the students.

She holds membership in several veterinary medical associations, including the West Virginia Veterinary Medical Association. She is also a member of the Monongalia County Health Association. Her research interests are: zoonoses (diseases of animals that may be transmitted to man), meat hygiene and environmental health and has published several papers in her field.

Three of the part-time teachers who have a dual appointment hold the M.D. degree and are all highly trained specialists; one

from each of the following departments: neurology, medicine, and surgery. They were appointed to the department of physiology and biophysics on account of their outstanding performances as clincians and their interest in physiology and basic sciences in general. They are, of course, quite familiar with the physiology of their own areas. They bring to the first year medical students, all of whom are taking basic sciences, timely and important concepts of the correlations and applications of physiology and biophysics to clinical medicine. Their participation in courses is appreciated by the medical students. A short factual biographical sketch is given for each of these three individuals.

Ludwig Gutmann, M.D.

Ludwig Gutmann was born in Frankfurt, Germany, April 7, 1933. He received a B.A. degree from Princeton University in 1955 and an M.D. degree from the College of Physicians and Surgeons, Columbia University in 1959. He took his internship at the University of Wisconsin Medical Center, and also took residency training in neurology there from 1960-63. He obtained a Neurophysiology Fellowship at the Mayo Clinic at Rochester, Minnesota (1965-66). His research interests are concerned with neuromuscular transmission, and clinical neurophysiology; he has published a number of papers in his field.

He came to the School of Medicine of West Virginia University as assistant professor of neurology and director of the electromyograph laboratory in 1966. In 1968 he became assistant professor in the department of physiology and biophysics. He, therefore, holds a dual appointment. He became associate professor and acting chairman of neurology in 1969.

Dr. Gutmann was certified in 1966 by the American Board of Psychiatry and Neurology. He belongs to several scientific societies, among them are: American Academy of Neurology, American Association of Electromyography and Electrodiagnosis; he is also a member of the Medical Advisory Board of the Myasthenia Gravis Foundation.

Robert James Marshall, M.D.

Robert James Marshall was born in Ballymena, North Ireland, May 5, 1926. He received the M.B. and B.Ch. degrees from Queen's University (Belfast) Faculty of Medicine in 1948, and the M.D. degree from that university in 1952. He was awarded the M.R.C.P.I. and the M.R.C.P. (London) in 1952. In 1949 he was an intern in the Royal Victoria Hospital in Belfast. He was an assistant lecturer in the department of physiology and pathology at Queen's University in 1950-51, and served as tutor in the department of medicine in this institution from 1951-57. In the following year he became a research fellow at the Baker Medical Research Institute (Alfred Hospital) and Melbourne University. From 1958-61 he served as a research associate in the section of physiology at the Mayo Clinic and Foundation, Rochester, Minnesota. Dr. Marshall's researches are concerned with regulation of cardiac output, and peripheral and pulmonary circulation. He is the author of several scientific books and of many papers.

Dr. Marshall came to the department of medicine of West Virginia University as an associate professor in 1961, and was promoted to a professorship in 1963. In 1968 he was made a professor in the department of physiology and biophysics, and, therefore, holds a dual appointment. He is a consulting cardiologist of the Bureau of Hearings and Appeals, Social Security Administration, U.S. Department of Health, Education, and Welfare. He is also a member of the Cardiovascular Study Section "B" of the United States Public Health Service. He is a member of the National Regional Research Committee, American Heart Association, and also of the Middle-Atlantic Regional Research Council, American Heart Association.

Dr. Marshall belongs to many scientific societies, among them are: American Physiological Society, Society for Experimental Biology and Medicine, American Society for Clinical Investigation, American Federation for Clinical Research, Association of University Cardiologists, and the British Medical Association.

Walter Harrison Moran, Jr., M.D.

Walter Harrison Moran was born in Grand Forks, North Dakota, November 16, 1930. He obtained a B.A. degree and a B.S. degree from the University of North Dakota in 1952 and 1953 respectively. In 1955 he obtained his M.D. degree from the Harvard Medical School. Dr. Moran took his surgical training at the University of Minnesota hospitals, and is a highly trained surgeon; he was certified by the American Board of Surgery in 1963. His research interests concern neuroendocrines, regulation of electrolyte balance, and computer science. He is the author of many scientific papers.

Dr. Moran came to the School of Medicine of West Virginia University as an instructor of surgery July 1, 1960, was promoted to assistant professor of surgery in 1966, and made full professor in 1968. In the same year he was made associate professor in the department of physiology and biophysics, he holds therefore a dual appointment. He belongs to many scientific organizations, among them are: the Endocrine Society, Association of Computer Machinery, American Board of Surgery, Society of University Surgeons, and is a Fellow of the American College of Surgeons.

ASSISTANTS IN THE DEPARTMENT OF PHYSIOLOGY

For many years it was the custom to select a student who had completed his first two years of the medical curriculum to serve as an assistant in the department of physiology. Up to 1924 such a student aided in physiology the first semester and in physiological chemistry the second semester. After that time they served as full time in physiology. This custom was not peculiar to West Virginia University, for to my knowledge some other two-year medical schools also invited students who had completed their first two years to aid in certain departments.

All these students had two (some had three or four) years of premedical work in college and then two years of medicine. This entitled them to a B.S. degree. They actually were laboratory assistants since they aided in the physiological laboratory and did not give any formal lectures or hold any quiz sections. As a

rule they were kept busy enough, for they were responsible for preparing solutions used in the laboratory, setting out the equipment (often repairing it) and when they had time also aided in research. Some of the students accepted such a position so that they could learn more physiology, but some used it to make a little money to enable them to complete their medical education. Since most of them remained for only one year, they lacked experience and it was necessary to train a new candidate each year.

Be all that as it may, a number of them were able young men and showed a definite aptitude for the work they were called upon to; furthermore, they were industrious and trustworthy.

Below, in chronological order, are the names of the men who served under my supervision and who later earned the M.D. degree. The time they served is also given:

Ray I. Frame, B.S., 1921-22	(Later practiced medicine)
Paul R. Wilson, B.S., 1922-23	(Later practiced medicine)
Norman H. Jolliffe, B.S., 1923-24	(Later became a leading nutritionist in New York City and the author of several books on nutrition)
Harold G. Young, B.S., 1924-25	(Later had a distinguished career in the U.S. Navy and retired as an admiral)
Floyd H. Gaston, B.S., 1927-28	(Later practiced medicine and later became superintendent of St. Luke's Hospital in New York City)
Homer S. Parker, B.S., 1928-29	(Later practiced medicine)
Joseph E. Hall, B.S., 1929-30	(Later practiced medicine)

W. Thurlow Booher, B.S., 1930-31	(Later practiced medicine)
Dennis H. Robinson, B.S., 1931-33	(Later practiced medicine)
Donald H. Lough, B.S., 1933-34	(Later practiced medicine)
Isaiah A. Wiles, M.S., 1934-35	(Later had a distinguished career in the medical corps of the U.S. Army and retired as colonel)
Clark K. Sleeth, B.S., 1935-37	(Later became associated with the University Health Service, taught in the School of Medicine and later became dean of the School of Medicine)

It will be noted that with two exceptions these men remained only one year. Several of them had superior minds. Although none of them worked toward a Ph.D., some of them would have been excellent candidates. It is to be hoped that the time they spent working in the department of physiology proved beneficial to them in later life.

Besides the men who had taken their first two years of medicine at West Virginia University there were others who had taken their training elsewhere who, at one time or another, served as an assistant or as an instructor in the department of physiology. Of the seven, three held a doctorate degree, the remainder either had a B.S. degree or an M.S. degree. In chronological order they were:

Henri Christian Van der Hyde, D.Sc.	Instructor 1920-21
Carl August Johnson, B.S.	Assistant 1925-26
Abel R. Miller, B.S.	Assistant 1926-27
Arthur D. Pickett, M.S.	Instructor 1937-39
William F. Hewitt, M.S.	Instructor 1939-40

Rowland E. Logan, Ph.D.	Instructor 1954-55
Thomas M. Gilfoil, Ph.D.	Instructor 1958-59

These individuals who did not have a Ph.D. degree assisted in the laboratory, but did not lecture to the students or hold formal quiz sections. Several of them, however, did research and published their results. It will be noted that, with one exception, they remained only one year, and then went elsewhere.

Chairmen of the Department of Physiology (1903-1969)

We have seen that when physiology was first taught at West Virginia University it was combined with anatomy and hygiene. Later it was taught with anatomy and this period lasted until 1903. Physiology as a separate department presumably started in the school year 1903-1904, that is the year Dr. John N. Simpson organized the first two years of the medical curriculum. Justin F. Grant, M.D., was secured to teach anatomy (and pathology) and Dr. Simpson continued to teach physiology. He may be regarded as the first chairman of the department of physiology, and held this position until 1920.

In the summer of 1918 Dr. Simpson, who was then dean of the School of Medicine, invited Withrow Morse, Ph.D., to become associate professor of physiology and physiological chemistry. Dr. Simpson withdrew from the department of physiology in 1920 to become professor of medicine. Dr. Morse who had been promoted to professor of physiology and physiological chemistry became chairman of the combined department, and served in this capacity for one year (1920-21).

Edward J. Van Liere, M.D., became chairman and professor of physiology in September 1921. Physiological chemistry was separated from physiology. While Dr. Van Liere was on leave of absence (1926-27) J. Frank Pearcy, Ph.D., became acting chairman of the department for one year. Dr. Van Liere returned to the School of Medicine September 1927, and continued as chairman until 1955. David W. Northup, Ph.D., was appointed chairman of the department July 1955, and served in this capacity until July 1965. He was followed by Michael F. Wilson, M.D. It may be seen that between the years 1903-69

there were five chairmen and one acting chairman in the department.

In chronological order the following men served as chairmen of the department of physiology:

1903-20—John N. Simpson, M.D.

1920-21—Withrow Morse, Ph.D. (was also in charge of biochemistry).

1921-26—Edward J. Van Liere, M.D.

1926-27—J. Frank Pearcy, Ph.D. (acting chairman).

1927-55—Edward J. Van Liere, Ph.D., M.D.

1955-65—David W. Northup, Ph.D.

1965-69—Michael F. Wilson, M.D.

Biographic sketches of the chairmen and the acting chairman are found (in alphabetical order) along with the other teachers.

It is of interest that from 1869-1969, a period of one hundred years, there were only twelve years that the department was not guided by a man who held the M.D. degree. The exceptions were: Withrow Morse, Ph.D. (1920-21); J. Frank Pearcy, Ph.D. (acting chairman 1926-27); and David W. Northup, Ph.D. (1955-65). It is singular indeed that during eighty-eight of the one hundred years of physiology at West Virginia University the courses in physiology were supervised by an individual who held the M.D. degree. In the early years, of course, there were not many candidates available who held the Ph.D. degree.

I do not wish to imply that a man with a Ph.D. degree in physiology is not well qualified to be chairman of a department of medical physiology. Indeed, many of the outstanding physiologists in this country hold the Ph.D. degree. There are a few, of course, who hold both the Ph.D. and the M.D. degrees. In essence, assuming that he has had adequate training in physiology and in research methods, it is the man who counts rather than the degree which he holds.

Attention should be called to the fact that my book, *Early Teachers in West Virginia University School of Medicine 1869-1922*, gives a detailed biographical sketch of the men who taught physiology. These men in chronological order are:

1869—Hugh Workman Brock, M.D.

1882—Benjamin W. Allen, M.D.

1886—Luther Sansome Brock, M.D.

1887—James William Hartigan, M.D.

1901—William A. Caldwell, M.D.

1902—John Nathan Simpson, M.D.

1918—Withrow Morse, Ph.D.

1920—J. Earl Thomas, M.D.

1921—C. Royal Kessel, M.D.

As one peruses the biographic sketches of the personnel who taught physiology at West Virginia University one is impressed with the number of able and well-trained individuals. During the first one hundred years the courses in physiology were guided by a man who held a doctorate degree, and except for one year (1926-27) there was always a man in the department who held the M.D. degree. On this account there was consistently a balanced presentation of basic and clinical viewpoints.

The individuals who taught had taken their doctorate degree (either an M.D. or a Ph.D. degree) from famous universities or colleges. Among them were: Duke University, Jefferson Medical College, Johns Hopkins University School of Medicine, Harvard Medical School, Queen's University (Belfast, Ireland), Northwestern University, Ohio State University, University of Chicago, University of Cincinnati, University of Illinois, University of Minnesota, University of Missouri, University of Pennsylvania, University of Saint Louis, University of Toronto, University of Virginia, University of Washington, and the University of Wisconsin. The fact that the teachers had taken their doctorate degree in so many different colleges and universities is of interest, because the students were exposed to many different viewpoints, which always is salutary.

Many of those who taught were not only excellent teachers, but also productive research scholars. They were well trained in their field, were broadly educated and cultured individuals. Some had traveled widely and had lived for a number of years in great metropolitan centers; because of their educational and cultural background, they helped bring a touch of the outside world not only to the School of Medicine, but also to the university as a whole and to the small city of Morgantown.

Indeed, it is quite surprising that the small School of Medicine of West Virginia University attracted so many capable men. It is to be remembered that for years (up to 1957) the department of physiology was housed in cramped and inadequate quarters. Classes were much too large for the space allowed, and there was little, if any, provision for animal quarters—the latter so vital to physiologic research. Furthermore, the compensation of the teachers was extremely modest. Some of the teachers, of course, remained for only a relatively short period and then moved on to more important teaching posts. On the whole, however, the university administration deserves considerable credit for procuring and maintaining the able teachers and research workers.

DEPARTMENT OF PHYSIOLOGY AND BIOPHYSICS TODAY (1968-1969)

In summary, the department of physiology and biophysics (formerly department of physiology until 1966) has grown substantially. In the school year 1968-69 the staff of the department consists essentially of the following members: a) eight full-time men of professional rank, all of whom have a doctorate degree; b) three men with the M.D. degree, and of professional rank (one each of the department of medicine, neurology, and surgery) who have a dual appointment; c) one full-time instructor and three part-time instructors; d) several full-time technicians, and also some part time; fourteen research graduate assistants, all working toward a doctorate degree in physiology and biophysics; e) several research assistants; and f) two full-time secretaries.

There is a very active research program in progress in many fields, as has been stated elsewhere. Some of the research is on the subcellular and cellular level. There is a liaison with other departments (as has been indicated), such as medicine, neurology, and surgery, and there is also a liaison with certain branches of engineering. There is ample space to work in the department and the physiologic apparatus is modern, and among other things includes a computer.

During the school year of 1968-69 approximately 325 students were taught physiology. This is indeed a far cry from the time physiology was first taught at West Virginia University, when only one man was responsible for teaching the course and there were only a few students enrolled in physiology.

Appendix A

TITLES APPLIED TO MEDICAL CURRICULUM 1868-1969

Between the years of 1868 and 1912, a number of different titles appeared in the university catalogs to designate the medical curriculum. These are most confusing to the casual reader. On this account, it is in order to list chronological these titles together with their dates. They are as follows:

Courses in Anatomy, Zoology and Physiology	1868-1869
Courses in Anatomy, Physiology and Hygiene	1869-1878
The Medical Department	1878-1882
The School of Anatomy, Physiology and Hygiene	1882-1887
A New School of Anatomy, Physiology and Hygiene	1887-1888
The School of Biology	1888-1899
The "A.B." Medical Course	1899-1900
College of Medicine	1900-1901
Anatomy, Physiology, and Hygiene (College of Arts and Sciences)	1901-1902
College of Medicine	1902-1911
Department of Medicine in College of Arts and Sciences	1911-1912
The School of Medicine	1912-

Appendix B

WHY I BECAME A PROFESSIONAL PHYSIOLOGIST

Since this treatise deals with physiology, it might be of interest to outline briefly why I became a professional physiologist. Indeed, people have often asked me why I taught a basic science course, such as physiology since I had an M.D. degree. The answer is that I early became interested in experimental medical physiology and looked forward to a full-time teaching career, and to working with young people.

As an undergraduate student at the University of Wisconsin, my major study was biology since I expected to study medicine. I came under the influence of two able biologists, Michael F. Guyer, Ph.D., and Arthur S. Pearse, Ph.D. I assisted as a part-time instructor in the biological laboratory for two years. Among other laboratory duties, I assisted Dr. Pearse in a course in parasitology, and wrote a paper on human parasitology in 1916 which was published in the *Journal of the American Medical Association*. The paper was commented upon editorially in the last named journal and on the whole was well received, and from then on I became interested in research and in writing scientific articles.

When I was a medical student at the University of Wisconsin (then a two-year medical school), I became keenly interested in medical physiology, and took a master's degree in this subject under the direction of J. A. E. Eyster, M.D., chairman of the department, and Charles R. Bardeen, M.D., professor of anatomy and dean of the School of Medicine. Upon completion of my master's degree I accepted an instructorship in physiology at the Medical School of the University of Southern California, and later I taught in the department of physiology at the University of Chicago.

After I completed my work at the Harvard Medical School, I was asked to be acting professor of physiology at the School of Medicine of the University of South Dakota. I remained there a year and then came to West Virginia University as professor of physiology. After a period of five years of teaching since I had only an M.S. in physiology I felt I needed further training in physiology and in modern research methods. I obtained a leave of absence from West Virginia University and obtained a Ph.D. degree in physiology from the University of Chicago under the direction of Professor A. J. Carlson, Ph.D. I then returned to West Virginia University and continued my teaching duties, which lasted for many years. Thus, it may be seen that I truly am a professional physiologist.

In 1935 the university administration asked me to reorganize the School of Medicine and to become dean of the school. I was still responsible for teaching physiology and was able to pursue my researches. In March 1951, the legislature passed a bill to establish a four-year School of Medicine. The creation of a Medical Center entailed a great amount of work, so there was much less time for teaching and research. In 1966 I reached the mandatory age of retirement. I have never regretted that I made physiology and medical administration my life work.

Appendix C

PHYSIOLOGY AND OBSTETRICS

There are times when an individual who is teaching courses in basic medical sciences, particularly if he has an M.D. degree, is called upon to teach in an area somewhat outside his own interest. This is probably more true in a two-year medical school and presumably was more prevalent years ago than it is now. The first year I taught physiology at West Virginia University School of Medicine (1921-22) I was asked to teach a course in obstetrics to sophomore students in the second semester. I have never, of course, considered myself an obstetrician, and indeed, have delivered only a comparatively few women.

Students in a two-year school have to transfer to a four-year medical school in order to complete their clinical studies. Many of the four-year schools offered a course in obstetrics during the sophomore year, so it became necessary for West Virginia University to offer such a course. When I was called upon to teach this course, I mimeographed my own obstetrical outlines. The sheets were put into a loose-leaf folder and consisted of about sixty-five typewritten pages. These outlines were never bound, for periodically certain pages were rewritten and new data added. They were sold to the student at a nominal cost. The students were not encouraged to purchase an expensive textbook of obstetrics, because several textbooks of obstetrics were available in the medical library. At any rate, the obstetrical outlines appeared to be popular, and I believe were used by some students in two or three other medical schools.

In essence, the subject matter presented in the course of obstetrics was as follows: the anatomy of the female genital tract which included a detailed study of the pelvis (including the measurements); the physiology of menstruation and of pregnancy which included the effects of the endocrines; the physiology of the fetus; the diagnosis of pregnancy; the management of normal pregnancy; the physiology of labor, and the course and mechanism of labor; and the puerperium which included the care of the mother and child. Actually the course concerned only normal obstetrics. Emphasis was laid on the normal physiology of the mother and child. The mechanism of labor was demonstrated on an obstetrical mannequin by means of a proper "doll." The mannequin was left in the lecture room for several weeks so that the students would have access to it.

There are a number of important physiologic changes in the maternal organism during menstruation and during pregnancy, and also during the

puerperium. These changes are concerned with the endocrine glands, especially the gonads, pituitary, and those of the placenta. The thyroid and the adrenal glands are presumably also involved, for both of these glands show hypertrophy during the pregnant state. I did not consider myself an endocrinologist, so I asked David W. Northup, Ph.D., my colleague in physiology, to give two lectures of the role of the endocrine glands in obstetrics. He did an admirable job and the students appreciated it.

I taught the course in obstetrics for nearly forty years (1921-60). In the autumn of 1960 Nicholas W. Fugo, Ph.D., M.D., was appointed the first chairman of the department of obstetrics and gynecology of the School of Medicine. He was a well-trained and an able and experienced teacher. He had taken a Ph.D. degree in biology and, of course, an M.D. degree, and for a number of years had served as associate professor of obstetrics at the University of Chicago. After he came I no longer had to teach obstetrics. Throughout the years I had published a number of papers which concerned the physiology of pregnancy, and Dr. Fugo recommended that I be made professor of experimental obstetrics. I appreciated this honor and held this post until I reached the mandatory age of retirement. Dr. Fugo, furthermore, asked me to continue to make my obstetrical outlines available to the students. I did this but revised them rather thoroughly with the aid of Dr. Fugo and of Dr. Dean Gopelrud, who was then a member of the department of obstetrics and gynecology. These outlines are still available to the students.

In retrospect, I enjoyed teaching obstetrics and believed I was performing a service, for I tried to impress the students with the importance of obstetrics, and especially the importance of considering the welfare of the mother and baby. I had the feeling that the course was well received. A number of my students became obstetricians, but whether my teaching had anything to do with this I am not sure. At any rate some of them were good enough to tell me that I was initially responsible for their interest in obstetrics. In later life some of the students told me that they had enjoyed the course and it had helped them during their clinical years, and also in their state board examinations. This is all most gratifying to a teacher.

Appendix D

THOSE WHO TAUGHT PHYSIOLOGY AT WEST VIRGINIA UNIVERSITY 1869-1969

Hugh Workman Brock, M.D. 1869-1882
Benjamin W. Allen, M.D. 1882-1886
Luther Sansome Brock, M.D. 1886-1887
James William Hartigan, M.D. 1887-1900
William A. Caldwell, M.D. 1901-1902
John Nathan Simpson, M.D. 1902-1917
John Nathan Simpson, M.D. (First Named Chairman of the Department) 1917-1918
Howard T. Phillips, B.S. 1917-1918
John Nathan Simpson, M.D. 1918-1920
Withrow Morse, Ph.D. 1918-1920
Withrow Morse, Ph.D. 1920-1921
J. Earl Thomas, M.D. 1920-1921
Henri Christian Van der Hyde, D.Sc. 1920-1921
Edward J. Van Liere, M.D. 1921-1922
C. Royal Kessel, M.D. 1921-1922
Ray I. Frame, B.S. 1921-1922
Edward J. Van Liere, M.D. 1922-1923
C. Royal Kessel, M.D. 1922-1923
Paul R. Wilson, B.S. 1922-1923
Edward J. Van Liere, M.D. 1923-1924
Julius F. Morrow, M.D. 1923-1924
Norman H. Jolliffe, B.S. 1923-1924
Edward J. Van Liere, M.D. 1924-1925
J. Frank Pearcy, Ph.D. 1924-1925
Harold G. Young, B.S. 1924-1925
Edward J. Van Liere, M.D. 1925-1926
J. Frank Pearcy, Ph.D. 1925-1926
Carl A. Johnson, B.S. 1925-1926
Frank J. Pearcy, Ph.D. 1926-1927
Myron M. Weaver, M.S. 1926-1927
Abel R. Miller, B.S. 1926-1927

Edward J. Van Liere, M.D. 1927-1928
Myron M. Weaver, M.S. 1927-1928
Floyd H. Gaston, B.S. 1927-1928
Edward J. Van Liere, Ph.D., M.D. 1928-1929
George R. Crisler, Ph.D. 1928-1929
Homer S. Parker, B.S. 1928-1929
Edward J. Van Liere, Ph.D., M.D. 1929-1930
George R. Crisler, Ph.D. 1929-1930
Joseph E. Hall, B.S. 1929-1930
Edward J. Van Liere, Ph.D., M.D. 1930-1931
George R. Crisler, Ph.D. 1930-1931
William T. Booher, B.S. 1930-1931
Edward J. Van Liere, Ph.D., M.D. 1931-1933
George R. Crisler, Ph.D. 1931-1933
Dennis H. Robinson, B.S. 1931-1933
Edward J. Van Liere, Ph.D., M.D. 1933-1934
George R. Crisler, Ph.D. 1933-1934
Donald H. Lough, B.S. 1933-1934
Edward J. Van Liere, Ph.D., M.D. 1934-1935
George R. Crisler, Ph.D., M.D. 1934-1935
Isaiah A. Wiles, M.S. 1934-1935
Edward J. Van Liere, Ph.D., M.D. 1935-1937
David W. Northup, Ph.D. 1935-1937
Clark K. Sleeth, B.S. 1935-1937
Edward J. Van Liere, Ph.D., M.D. 1937-1939
David W. Northup, Ph.D. 1937-1939
Arthur D. Pickett, M.S. 1937-1939
Edward J. Van Liere, Ph.D., M.D. 1939-1940
David W. Northup, Ph.D. 1939-1940
William F. Hewitt, M.S. 1939-1940
Edward J. Van Liere, Ph.D., M.D. 1940-1954
David W. Northup, Ph.D. 1940-1954
J. Clifford Stickney, Ph.D. 1940-1954
Edward J. Van Liere, Ph.D., M.D. 1954-1955
David W. Northup, Ph.D. 1954-1955
J. Clifford Stickney, Ph.D. 1954-1955
Rowland E. Logan, Ph.D. 1954-1955
David W. Northup, Ph.D. 1955-1958
Edward J. Van Liere, Ph.D., M.D. 1955-1958
J. Clifford Stickney, Ph.D. 1955-1958
Hugh A. Lindsay, Ph.D. 1955-1958
David W. Northup, Ph.D. 1958-1959
Edward J. Van Liere, Ph.D., M.D. 1958-1959
J. Clifford Stickney, Ph.D. 1958-1959

Hugh A. Lindsay, Ph.D. 1958-1959
Thomas M. Gilfoil, Ph.D. 1958-1959
David W. Northup, Ph.D. 1959-1961
Edward J. Van Liere, Ph.D., M.D. 1959-1961
J. Clifford Stickney, Ph.D. 1959-1961
Hugh A. Lindsay, Ph.D. 1959-1961
Kenneth E. Penrod, Ph.D. 1959-1961
Wilbert E. Gladfelter, Ph.D. 1959-1961
David W. Northup, Ph.D. 1961-1965
Edward J. Van Liere, Ph.D., M.D. 1961-1965
J. Clifford Stickney, Ph.D. 1961-1965
Hugh A. Lindsay, Ph.D. 1961-1965
Kenneth E. Penrod, Ph.D. 1961-1965
Wilbert E. Gladfelter, Ph.D. 1961-1965
Don H. Blount, Ph.D. 1961-1965
Michael F. Wilson, M.D. 1965-1966
David W. Northup, Ph.D. 1965-1966
Edward J. Van Liere, Ph.D., M.D. 1965-1966
J. Clifford Stickney, Ph.D. 1965-1966
Hugh A. Lindsay, Ph.D. 1965-1966
Wilbert E. Gladfelter, Ph.D. 1965-1966
Don H. Blount, Ph.D. 1965-1966
William M. Caldwell, B.S.E.E. 1965-1966
Michael F. Wilson, M.D. 1966-1967
David W. Northup, Ph.D. 1966-1967
J. Clifford Stickney, Ph.D. 1966-1967
Hugh A. Lindsay, Ph.D. 1966-1967
Wilbert E. Gladfelter, Ph.D. 1966-1967
Don H. Blount, Ph.D. 1966-1967
William M. Caldwell, B.S.E.E. 1966-1967
Jacob Hildebrandt, Ph.D. 1966-1967
Judith R. Hildebrandt, Ph.D. 1966-1967
Lauralee Sherwood, D.V.M. (Part Time) 1966-1967
Michael F. Wilson, M.D. 1967-1968
David W. Northup, Ph.D. 1967-1968
J. Clifford Stickney, Ph.D. 1967-1968
Hugh A. Lindsay, Ph.D. 1967-1968
Wilbert E. Gladfelter, Ph.D. 1967-1968
William M. Caldwell, B.S.E.E. 1967-1968
Jacob Hildebrandt, Ph.D. (Resigned Dec. 31, 1967) 1967-1968
Judith R. Hildebrandt, Ph.D. (Resigned Dec. 31, 1967) 1967-1968
Lauralee Sherwood, D.V.M. (Part Time) 1967-1968
Michael F. Wilson, M.D. 1968-1969
David W. Northup, Ph.D. 1968-1969

J. Clifford Stickney, Ph.D. 1968-1969
Hugh A. Lindsay, Ph.D. 1968-1969
Wilbert E. Gladfelter, Ph.D. 1968-1969
William M. Caldwell, B.S.E.E. 1968-1969
Lauralee Sherwood, D.V.M. (Part Time) 1968-1969
Ping Lee, Ph.D. 1968-1969
Guntner N. Franz, Ph.D. 1968-1969
Kenneth C. Weber, Ph.D. 1968-1969
Daniel C. Upthegrove, Ph.D. (Part Time) 1968-1969
John L. Hankinson, B.S.E.E., M.S.E.E. (Part Time) 1968-1969
Ludwig Gutmann, M.D. (Dual Appointment in Neurology) . . . 1968-1969
Robert J. Marshall, M.D. (Dual Appointment in Medicine) 1968-1969
Walter H. Moran, M.D. (Dual Appointment in Surgery) 1968-1969

Appendix E

ABOUT THE AUTHOR

The author was born in Kenosha, Wisconsin, October 30, 1895, and graduated from the Kenosha High School in 1912. He entered the University of Wisconsin and obtained a B.A. degree with a major in biology and a minor in languages, and also obtained an M.S. degree in physiology at the University of Wisconsin School of Medicine. In 1920 he received the M.D. degree from the Harvard Medical School, and in 1928 a Ph.D. degree in physiology from the University of Chicago. In 1949 the Medical College of Virginia granted him a Litt.D. degree because of his interest in medical writing.

His teaching experience before he came to West Virginia University was as follows: biology (part time) at the University of Wisconsin, physiology at the University of Southern California, the University of Chicago, and the University of South Dakota School of Medicine.

He came to West Virginia University School of Medicine in September 1921 as chairman and professor of physiology. He resigned as chairman of the department in 1955, but continued as professor until he reached the mandatory age of retirement in 1966. Besides teaching physiology he also became responsible for teaching a two-hour course in obstetrics to sophomore students, which he continued until 1960.

He served as dean of the School of Medicine from 1935 to 1961. During his deanship the Medical Center was developed (1951-60), and the four-year curriculum of the School of Medicine was inaugurated.

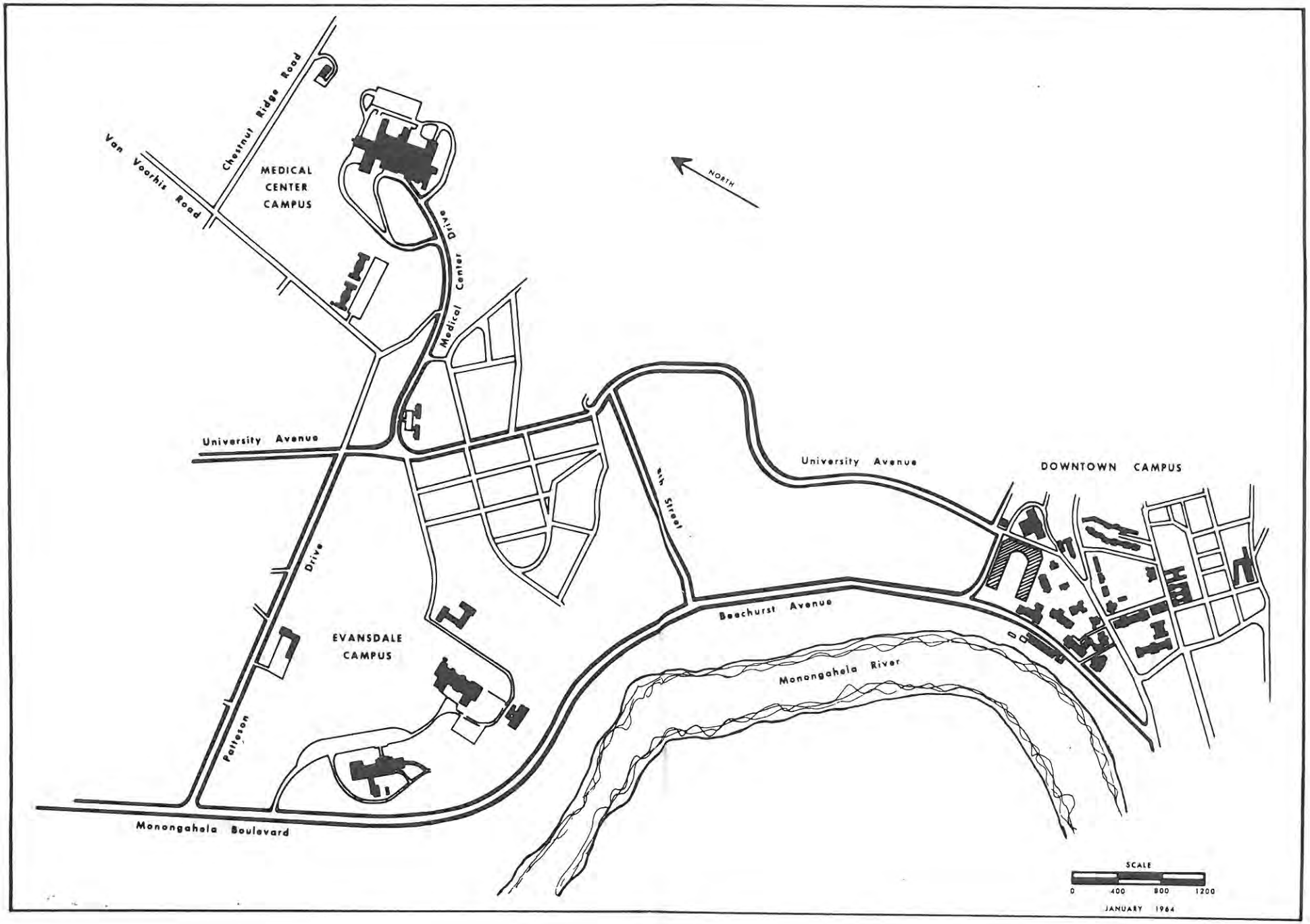
His researches deal with the effect of hypoxia on the body, that is, an oxygen deficiency, such as is experienced at high altitudes. He published many articles in this field, and several reviews including an article on hypoxia in the *Encyclopaedia Britannica*. He has published two monographs on this subject, *Anoxia, Its Effect on the Body*, published in 1942 by the University of Chicago Press, and *Hypoxia* (with Dr. J. C. Stickney, co-author), published by the same press in 1963.

The author, for a number of years, served as expert consultant to the surgeon general of the United States Army relative to the general basic science courses of the Army Medical Research and Graduate School. He is a member of the American Physiological Society, the Society of Experimental Biology and Medicine, the West Virginia State Medical Association, and the American Medical Association. He is an affiliate of the Royal Society of Medicine (London), and a member of Alpha Omega Alpha, Phi Beta Kappa, and Sigma Xi. In May 1968 West Virginia University conferred upon him The Order of Vandalia.

Other books by the author:

Anoxia, Its Effect on the Body
A Doctor Enjoys Sherlock Holmes
Hypoxia (with Dr. J. C. Stickney)
History of Medical Education in West Virginia (with Dr. G. S. Dodds)
100 Editorials
Medical and Other Essays
Early Teachers of West Virginia University School of Medicine, 1869-1969

INDEX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