THE AMERICAN PHYSIOLOGICAL SOCIETY

Founded in 1887 for the purpose of promoting the increase of physiological knowledge and its utilization.

Publications

American Journal of Physiology: Cell Physiology
American Journal of Physiology: Endocrinology, Metabolism and Gastrointestinal Physiology
American Journal of Physiology: Heart and Circulatory Physiology
American Journal of Physiology: Regulatory, Integrative and Comparative Physiology
American Journal of Physiology: Renal, Fluid and Electrolyte Physiology
American Journal of Physiology (Consolidated)
Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology
Journal of Neurophysiology
Physiological Reviews
The Physiologist
Handbooks of Physiology
The Physiology Teacher

THE PHYSIOLOGIST is published bimonthly by the American Physiological Society at 9650 Rockville Pike, Bethesda, Maryland 20014. Address all correspondence to this address.

Subscriptions: Distributed with The Physiology Teacher to members as a part of their membership. Non-members and institutions, $12.00 per year in the United States; Canada, $12.50; Foreign and Postal Union, $13.00. The American Physiological Society assumes no responsibility for the statements and opinions advanced by contributors to THE PHYSIOLOGIST.

The Physiologist

A Publication for Physiologists and Physiology
Orr E. Reynolds, Editor

TABLE OF CONTENTS

Please Note: Society Business and Notices are on gray-edged paper.

AMERICAN PHYSIOLOGICAL SOCIETY ENDOWMENT FUND

Established in 1977 to

Support programs for the development of physiologists and physiology

Encourage communication with other disciplines of science and the public

Foster scientific and cultural relations with other parts of the world

The following individuals have been honored with contributions.

The illustration above is a miniature reproduction of a bronze plaque being cast to hang in the APS Bethesda Office. Not shown are the individual shingles at the bottom of the plaque bearing the name of each living or deceased physiologist or other individual in whose memory the Endowment Fund is maintained. To date, the names of John F. Perkins, Jr. and Caroline tum-Suden have been so honored.

The APS Endowment Fund was established to encourage tax deductible contributions or bequests to the Society at any time and in any amount, for specific or general purposes. Upon request, the Society will provide to a donor or institution contributing a memorial gift a replica of the plaque bearing the name of the individual living or deceased in whose honor the gift was made. The family of, or the individual being honored by a donation to the fund will be advised formally of the donors name, unless the contributor specifically requests that the donation be anonymous.

Donations to the APS Endowment Fund or queries should be addressed to the fund at 9650 Rockville Pike, Bethesda, Maryland 20014.

In April contributions to the Endowment Fund were received as follows:

In memory of John F. Perkins, Jr. by an anonymous donor.

In memory of William Townsend Porter by the Harvard Apparatus Foundation.

CARL J. WIGGERS, President APS, 1949-1950

Carl John Wiggers was born on May 24, 1883 in Davenport, Iowa, to Anna M. and Jürgen Wiggers, immigrants from the Duchy of Holstein which later became a part of Germany. As a young man, his father worked as a farmer in Dithmarschen, but signed on as a sailor and worked his way to New York in 1876, from whence he moved westward, eventually to settle among other Germans in the rich corn belt of Iowa. Here he met Anna Kundel whose family had also immigrated from Holstein, and they were married in 1882. Writing in his Reminiscences, Carl stated "I was reared in the good old philosophy that frugality, economy and thrift are virtues", and those who knew him as a mature physiologist recognize this as characteristic of the way in which he managed his life, his department, and all of his research endeavors. In an elementary course in bookkeeping, he conceived the notion that it would be fun to keep an account of income and expenditures and continued the practice throughout his life. He states that his parents discouraged laziness and required that assigned tasks be performed well and expeditiously. Again, all who knew him recognized, and were profoundly influenced by, his reverence for a work ethic which ruled nearly every aspect of his existence.

As a young man, he encountered uninspiring teachers and reported that as a schoolboy "I spent as little time as possible on courses in English composition and literature, for I was certain that I would never do any writing". He further described an early course in physiology presented in didactic fashion with meaningless memorization that left little understanding of structure and function. He recalled learning that the mitral valves are on the left side of the heart from a cliché attributed to Huxley, "They resemble a bishop's mitre and the bishop is never in the right". However, in later high school courses, he came under the influence of more inspiring teachers, one a well-trained chemist and physicist, who directed his interest toward a career in pharmacy. With further work under a good zoology teacher, he finally proceeded into his senior year in high school with the resolve to become a physician. He matriculated at the University of Michigan School of Medicine where he came under the important influence of the anatomist J. P. McMurrich, the histologist G. C. Huber, bacteriologist F. G. Novy, the pharmacologist Arthur R. Cushing, and, most importantly, the distinguished physiologist Warren P. Lombard. In his medical course, C. J. found "to his astonishment" that physiology was not dull; on the contrary, it proved fascinating. The seed of interest in research was planted during his first contact with exercise physiology. The seed sprouted during the latter two weeks in Professor Lombard's course when C. J.'s laboratory group was assigned a question as to whether the knee jerk is a reflex or whether it may be caused by direct stimulation of the tonically contracted quadriceps muscle. He pursued the question independently evenings and weekends when he came to know "the real Professor Lombard, helpful, stimulating, resourceful and meticulous".

At the beginning of his junior year in Medical School, he accepted appointment as Assistant in Physiology, and while teaching in the laboratory, found time to start his own research on the innervation of the cerebral blood vessels. His ability to read German made him familiar with the experiments of Bowditch, Englemann, Hering, Langendorff, Wenckebach and the old German masters. He later acquired reading knowledge of French and Spanish and personally subscribed to the belief that without such knowledge, an investigator has a greatly restricted horizon, "much scientific information being hidden from him behind a curtain of ignorance". He presented his first paper before the Annual Meeting of the American Physiological Society in Ann Arbor in 1905, demonstrating that epinephrine constricts the cerebral arteries of a perfused dog's head. He recounts an embarrassing incident during his demonstration by pointing out, "in stronger language than necessary" that an earlier report by L. Hill and J. R. Macleod could be explained by their use of inadequate criteria for cerebral vasomotion. At the conclusion of the demonstration, Dr. Macleod complimented him upon the experiment and introduced himself as Professor of Physiology at Western Reserve University. Little did he realize that he would later succeed Dr. Macleod as Professor and Chairman of Physiology at that distinguished institution.

Fig. 1. Portrait of Carl J. Wiggers in his office at the time of his retirement from five years editorship of Circulation Research in 1958. The occasion also honored his seventy-fifth birthday. (Reproduced with permission from the American Heart Association with original publication in *Circulation Research 6:* facing page 547, 1958)

Dr. Wiggers remained in Ann Arbor after he graduated having been appointed instructor in Physiology at $900 per year. In 1907, he married Minerva E. Berry who was also a medical student at Michigan. He held major responsibility for the laboratory course and instruction of dental students. He was deeply impressed by Lombard's philosophy of research, particularly as it had been influenced by Lombard's indoctrination in the laboratories of Karl Ludwig in Leipzig, Germany. He also acquired important administrative experience while serving as acting head of the department

when Lombard was on sabbatical leave in 1910. His success in both teaching and research soon attracted attention and he began to receive offers to head departments. Showing such an offer to Professor Novy, he was advised, "you are too young to be sitting in a chair; wire back and ask whether they have any laboratory stools".

It was during this period that Dr. Wiggers became interested in the hemodynamics of hemorrhage and he learned that Otto Frank had devised a new type of manometer in Munich. Dr. Wiggers was then invited to join Graham Lusk's department at Cornell and here he, J. R. Murlin and Professor Lusk divided the teaching loads so that no more than three months were devoted to class work each year. Research was regarded as a duty rather than a hobby. While he developed his interests and expertise in circulation research, he observed that "one cannot live in an atmosphere surcharged with research in metabolism for seven years without absorbing a good many calories of information".

At Cornell he managed to acquire access to a machine shop, which he always considered the "backbone of the Physiology laboratory", and he was able to implement many of his early basic hemodynamic studies. It was during this period that he became friendly with Eugene DuBois, who later became Professor of Physiology at Cornell, retiring as emeritus professor in 1950. DuBois impressed upon him the philosophy that "it is not the title that makes the physiologist, it is the point of view, the mode of thought".

Soon after arriving at Cornell, Professor Lusk arranged for C. J. to spend a cherished spring and summer in Otto Frank's laboratory in Munich while continuing to receive his full salary from Cornell. He found Frank to be a brilliant theoretician, mathematician, and instrument designer, but one not so keen on the actual performance of animal experiments. They actually performed only a limited number of experiments together. While Professor Frank was almost reclusive in his performance of research, sufficient interaction was permitted for C. J. to become acquainted with the technical application of optical manometers and capsules to animal studies. This first direct experience with optically recording instruments greatly influenced his research career and he later repeatedly modified Frank's instrumentation design for the solution of both animal experimental and clinical problems. His optical recordings of dynamic events within the cardiovascular system dramatically altered understanding of the circulation, and laid the foundation for his early monographs entitled Pressure Pulses in the Cardiovascular System, Circulatory Dynamics, Circulation in Health and Disease, and ultimately in his excellent text, Physiology in Health and Diseases. While in Frank's laboratory he acquired his initial insights into the transformation of the venous pulse in its propagation from the right atrium to the veins in the neck although he published these data much later in his book, Pressure Pulses in the Cardiovacular System.

During the early years in New York, living upon the relatively small salary of an Assistant Professor raised serious economic questions for his family, and he considered the alternatives of defecting to commercial fields or to medical practice. Professor Lusk's advice was "Hold off until forty, then if not in a favorable academic position with tenure for life, consider such a change carefully".

In 1918, Dr. Wiggers accepted a call to Cleveland to join a distinguished faculty including G. N. Stewart, T. H. Sollman, H. T. Karsner, G. W. Crile, and P. J. Hanzlik. He was 35 years old at the time of his appointment. Dr. Sollman, then a noted Pharmacologist observed "We sought for a man of ideas and ideals, and with ability to carry them out". At Reserve he actively pursued his penetrating studies of electroshock resuscitation, heart sounds, hemorrhagic shock, pulse contours, atrial dynamics, and the cardiodynamics of valvular lesions. He vigorously pursued his three-part objective: To offer students the broadest training in the application of physiological principles in medicine, to contribute actively and regularly to the advance of physiological knowledge, and to develop physiologists of the future from the junior staff.

He offered his young faculty equal consecutive periods for research and teaching. In order to broaden their outlook on physiology, he asked them to teach a different physiologic subject each year in order to gain acquaintance with current aspects of every segment of physiology. The scheme also included progressive advancement in rank and salary until each was called to other institutions. Dr. Wiggers suspected that Professor William Howell of Johns Hopkins had been favorably impressed by his own presentation of papers before the American Physiological Society, and had thereby recommended him for the appointment at Cornell. He observed repeatedly that "Youngsters may be reminded that it is still common practice to select and promote physiologists on the basis of their public performances at scientific meetings". It is remarkable that thirty-seven of those who worked with him went on to become department chairmen or research directors in other Medical Centers. Many outstanding cardiovascular laboratories today may trace their origins to crucial experiences under Wiggers' incisive tutelage. One of his fellows, the late Corneille Heymans, began his work at Reserve on the carotid sinus reflexes which ultimately led to the Nobel Laureate.

All who entered Carl Wiggers' laboratory quickly recognized a mystique which probably defies explanation. Bob Alexander suggests that a key ingredient was his variation of the work ethic, "Organize your life so that you can work like the devil but have fun doing it". Everyone on his team tackled their assignments with rare intensity, but truly found it "fun". Dr. Alexander also tells of discussing his proffered appointment at Cleveland with a colleague who had known C. J. during the Cornell days and who stated: "You know, there is something about Wiggers that I do not profess to understand, but everyone who has ever worked in his laboratory positively loves the man". I am reasonably certain that this characterization applies to all who worked with him during the Reserve days as well. Gordon Moe relates that he had been trained in cardiac dynamics before joining Wiggers' laboratory, but had never used an electrocardiograph before going to Reserve. He spent only ten months in Wiggers' department, but these studies of the "sparks" aspect of cardiac physiology "made such a lasting impression on me that I have done nothing else for the last twenty-five years". In like manner, Bob Berne arrived in the Department having been fully trained in medicine and intent upon a career in Cardiology. He originally wished to have one year of experience in cardiovascular physiology. Within one year he became so excited by the experience that he decided to spend another year, and before long he accepted permanent appointment in

the Department for he realized that he belonged in Physiology.

One of the stimulating things about Dr. Wiggers was his ability to keep one under constant challenge as to the validity of what one was doing. Matt Levy tells of approaching the Chief (as he was affectionately called by his staff) with a new idea or technique. His first reaction was to systematically list all the potential difficulties and to imply that the procedure could not possibly succeed. Then the twinkle would appear in his eye, and he would later delight in relating previous examples where he had insisted something was impossible, only to have a gloriously successful experiment evolve.

Dave Opdyke recalls that C. J. had a reputation for being a tough person with whom to get along, but notes that those who knew him well recognized that he was only tough when matters of accomplishment and scientific judgment were involved. He actually hated to be a disciplinarian about petty matters, but he would wait until he had an attack of gout (which he did not like to admit), and then proceeded to chew out each of the staff in turn about everything that annoyed him. He would come into the lab in the morning limping on his cane, and go down the hall, lining out each staffer in turn. If necessary, he would emphasize his point by giving the desk top a smart rap with the cane. Bob Berne probably remembers being told off for spending scarce money on a fluorescent lamp. But he never carried over or stored up his displeasure even to the next day. When feeling better, he would chuckle and remark that "the time to get the unpleasantness over with was when he was feeling badly so that we could get on with more important things". However, Sid Harris recalls that he could become quite angry, as demonstrated once, when the staff had made "a significant revision in the student laboratory experiment without consulting him. He came into the laboratory in the middle of the experiment. We were caught, called out of the laboratory and properly roasted".

Of his outstanding accomplishments including publication of seven important books, almost 400 compelling scientific papers, and his direct communication with thousands of medical students, I suspect his greatest personal satisfaction was wrapped up in those highly successful young proteges in cardiovascular physiology. Each and every one of the latter will clearly remember the framed sign prominently displayed in the corridor to the Department reading, "Observe, Describe, Reflect, Deduct, Verify"—his motto.

It is sometimes generalized that the dedicated researcher is unsuccessful as a teacher but such pronouncement fails totally to characterize Dr. Wiggers. Despite his profound knowledge of physiology, he invariably prepared assiduously for every lecture. He captured the beginning medical student's interest by painting a picture of "every disease as an experiment of nature, its signs and symptoms being manifestations of abnormal function". Students did not go to sleep in his lectures. He also had a genius for keeping on top of everything in his department without offending his faculty. He did not intimidate his junior staff by attending their lectures, yet it was evident that he was aware of what went on in the lecture hall. One day Bob Alexander discovered his secret; C. J. timed a ride in the elevator with a carload of students as they left the Physiology lecture, and from their comments put together an astute critique of that lecture.

A major contribution during the Western Reserve period was the textbook, Physiology in Health and Disease (1931 through the 5th Edition, 1949). Realizing that much lecture

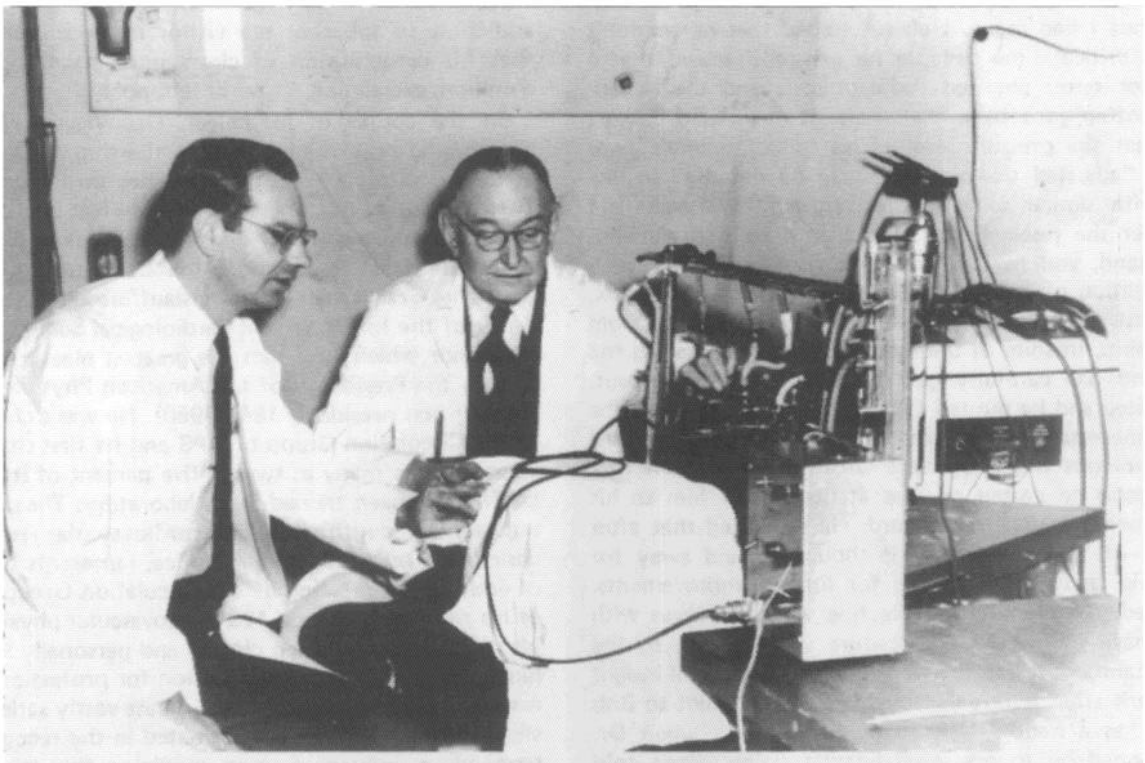

Fig. 2. Dr. Wiggers in the laboratory with Dr. David Opdyke in 1948. The optical manometers on the rack were modifications designed by Dr. Donald Gregg. (From Dr. Opdyke's collection)

time could be saved by availability of a book taking a basic biophysical, biochemical and quantitative approach, he decided to write one. He did so "under the delusion that it would not be too difficult to write out his lectures after their delivery". He learned by sad experience that this was not true, and after an initial abortive attempt he found it necessary to restudy each phase of physiology thoroughly, select the references, rewrite each section repeatedly in fewer and better words, submit the results for constructive criticisms, and recast each section several times. While his students sometimes complained about the complexities of the text, it enjoyed an exceptional reputation among professional physiologists. To this day I often find his succinct and comprehensive presentations to be the best available. Many current investigators may find that their most recent "laboratory discoveries" were beautifully described or referenced in this textbook.

In describing annual progress reports on grants-in-aid he recounts the arguments advanced that time required to compose such is taken away from laboratory time thus retarding productivity, that such requirement implies lack of trust, or that the reports are generally overstatements of accomplishments or euphemisms that confuse and bewilder the grantors. He felt there may be something to such objections, "but not much". On the contrary, he believed writing helps to "make an exact man" and a more appropriate criticism of progress reports is that "too many are not frank, thoughtful, honest expositions".

My introduction to cardiovascular research occurred in Dr. Wiggers' laboratory and involved the electrocardiographic changes during the progressive development of anoxemic anoxia. I was allowed to work independently but could regularly expect the Chief to come by each day to learn what progress I had made. I always hoped that he wouldn't come at a critical time because he generally found that a galvanometer setup required "adjustment", and the experiment was often gone from that moment on. Ewald Selkurt tells me that the pressure level of his "shock animals" was frequently "adjusted down to precisely 35 mm Hg" in like manner, with similar experimental results. Dr. Wiggers did not consider the research completed until he had a manuscript in hand, and in due time, I turned mine over with high expectation of quick approval. It ultimately came back, totally recast and rewritten. His name had been deleted from the authorship, in spite of the fact that he had suggested the problem and had carefully guided its progress throughout. I remonstrated and he quoted Ludwig, "No, my name on the paper is unnecessary, for unless you produce further papers, every physiologist will know who wrote this one". Another valuable lesson he passed on was attributed by him to his association with Professor Lombard. He suggested that after completion of the manuscript, it should be laid away for several weeks and then reviewed for further improvements. He remarked, "A manuscript, like fine wine, improves with aging". I have followed his procedure with respect to the "aging of manuscripts" to this very day. An additional insight into his work ethic is revealed by his admonishment to Bob Little who, as a Fellow, was sitting at his desk when Dr. Wiggers stopped by to ask what he was doing. When told that he was writing a paper, he responded, "Get back in the lab—you write papers at night".

In 1943, Dr. Wiggers received a call from Dr. Alrick Hertzman, Chairman of Physiology at St. Louis University School of Medicine, inquiring as to the availability of a young cardiovascular physiologist. Dr. Wiggers mentioned the query and since such faculty appointment was attractive, I asked his candid opinion of the opportunity. It happened that he had recently spent considerable time in St. Louis as a Visiting Professor in Dr. Joseph Erlanger's Department at Washington University, and while there had visited the Department at St. Louis University. He mused aloud that "Hertzman has a nice optical recording system in his laboratory; yes, I think it would be a good opportunity".

The president of Western Reserve asked Dr. Wiggers to serve as Dean of the Medical School during a period of intensive research on shock, and after reluctantly agreeing to serve temporarily, he was greatly relieved to learn of the administrative decision to appoint a three-man governing board instead. He stated in his Reminiscences, "I rejoiced in my escape from being Dean for even a year. This permitted renewed concentration in research that led to my designation as Dean of Physiologists in the citation accompanying the Lasker Award in 1955".

Dr. Wiggers' great productivity as an investigator and as a writer resulted from a fertile mind plus complete dedication and an enormous capacity for work. Sid Harris recalls a time when C. J. had opened a new box (50) of big cigars when he arrived at the office in the morning and started again to push the revision of his textbook. After thirteen hours of almost continuous absorption in the book, he decided to go home (at 11:00 P.M.). He reached for another cigar but when he noted that only two were left, he told himself there must be a limit; 48 were enough. This account is amplified by an anecdote in which he described a conversation with a renowned visiting clinician from Germany. While discussing C. J.'s addiction to tobacco, the visitor made a quick calculation that his consumption of cigars must have approached half a million, exclaiming, "Und Er lebt noch!"

In the course of his career, Dr. Wiggers received many honors and was elected to membership, either regular or honorary, in many scientific societies throughout the world. These included membership in the National Academy of Science, the Gold Heart and Albert Lasker Awards of the American Heart Association, the Carl Ludwig Medal of the Deutsche Gesellschaft für Kreislaufforschung, and the Presidency of the Interamerican Cardiological Society. But perhaps the honor which gave him the greatest pleasure was his election to the Presidency of the American Physiological Society (twenty-first president, 1949-1950). He was a charter member of the Circulation Group of APS and its first chairman. Some years later as many as twenty-five percent of its active membership had been trained in his laboratory. The selection of an outstanding contributor in cardiovascular research, with designation as the Wiggers Awardee, represents the high point of each annual meeting of the Circulation Group. At the time of his retirement at least 123 cardiovascular physiologists were identified as having been closely and personally influenced by him in preparation and inspiration for professional careers in research, teaching, and practice. These vastly satisfying experiences during his lifetime culminated in the recognition of his tremendous influences upon medicine through his demonstration of a direct and continuing relationship between research and clinical practice.

Of particular gratification was the preeminent success of

his physiologist son Harold who served on the faculties at Harvard, Columbia, Western Reserve, University of Illinois, and at Albany. He recently retired from 22 years as Dean of Medicine at Albany Medical College of Union University. Hal has provided an intimate, family insight that so accurately characterizes his father: "I recall the prodigious amount of time he put into preparation for the undertaking of all tasks; his pride in a project well done; his readiness to compliment those who had achieved, his unyielding integrity, his propensity for uttering candid but non-malicious criticisms of papers presented at meetings, regardless of the fame of the target speaker". One of C. J.'s most distinguished students, the late Louis N. Katz summed his feelings by stating, "I know that all of his students agree that of many rich experiences, none has been so satisfying as that of working with Dr. Wiggers".

Dr. Wiggers was deeply interested in the founding of the American Heart Journal in 1925 and he served as a member of its original Advisory Editorial Board until 1937. He published many of his important observations in that journal and served as the Association's Vice President in 1947. In an important address before the Heart Association he emphasized the need for shuttling problems under clinical study back to the laboratories of basic science. Such an attempt at "scientific evangelism" appeared timely, for he pointed out that "laboratory and clinical investigators were tending to compete, not as runners in a race, but as opposing football teams. Relations were friendly and sportsmanlike, but each team was intent on touching goal and incidentally garnering a larger share of the research funds available". He organized a course for cardiovascular investigators under the joint sponsorship of the American Heart Association and the USPHS which continued from 1949 to 1952, during which time 21 Fellows achieved training, research and publication experience in Cardiovascular Physiology.

With the close of the academic year in 1953, Dr. Wiggers' faculty career came to an end through retirement at Western Reserve. Thousands of students, faculty colleagues, and fellows paid tribute to this intellectual and inspirational giant in the field of cardiovascular physiology. But his retirement at Western Reserve only marked the beginning of a new and highly significant career. The American Heart Association again turned to him for the founding Editorship of its new journal, Circulation Research, and he proceeded to build it into one of the world's most important in basic scientific literature. His high standards permitted acceptance only of papers having real, basic importance. He took his editorship seriously, and authors experienced profound gratitude and appreciation for his reviews and constructive criticisms of their manuscripts. This journal stands today as a monument to his ideals of excellence in cardiovascular research.

It has been pointed out that an important source of his personal warmth and charm was the fact that he considered the Wiggers name to be "pleural". Mrs. Wiggers, a medical scientist in her own right, took great personal interest in the families, particularly the children, of each member of the staff. As C. J. provided a scientific father image, Mrs. Wiggers supplied an equally unique mother image. They gave wonderful parties in their lovely home for faculty families, and always were the perfect host and hostess. Her long and newsy handwritten notes at Christmas time continued to Minerva's last days, always reflecting her's and Carl's deep and genuine friendship.

The Chief was a mighty scientist who became a legend within his own time. The man and the legend were real. He passed away in his home in Cleveland on April 29, 1963.

Walter C. Randall

Additional glimpses of Dr. Wiggers' philosophy and attitude about the crucial role of Physiology in medicine and in the biomedical sciences can be found in the following:

Wiggers, Carl J., Reminiscences and Adventures in Circulation Research, 404 pages, Grune and Stratton, New York, 1958. (This book includes references to all of his books, condensations of his scientific contributions, names of his professional Staffs, Fellows, and Trainees, and a more complete history of his origin and maturation as a cardiovascular physiologist.)

Katz, Louis N., Carl J. Wiggers, M.D., An Appreciation, *Circulation Research 6*:547, 1958

Feil, Harold and James W. McCubbin, Carl J. Wiggers, M.D. A Biographical Sketch, *Circulation Research 6*:548-553, 1958

Schmidt, Carl F., Editorial on Changing Editors, *Circulation Research 6:*1-3, 1958

Fenn, Wallace O., History of the American Physiological Society. The Third Quarter Century, 1937-1962, pp. 18-20, American Physiological Society, Washington, D.C., 1963

Wiggers, Carl J., Physiology from 1900 to 1920: Incidents, Accidents, and Advances, *Annual Rev. Physiol.* 13:547-556, 1951

The author is indebted to Drs. Robert Alexander, Robert Berne, A. Sidney Harris, Matt Levy, Robert Little, Gordon Moe, David Opdyke, and Ewald Selkurt for sharing their remembrances and experiences in Dr. Wiggers' laboratory.

1978 BERNSTEIN AWARD

The Medical Society of the State of New York is accepting nominations for the 1978 ALBION O. BERNSTEIN, M.D. AWARD.

This national award is given to a physician, surgeon, or scientist who has recently made a beneficial scientific discovery in medicine. Recent winners include Rosalyn S. Yalow, Ph.D., Solomon A. Berson, M.D., Baruch S. Blumberg, M.D., Ph.D., Manfred M. Mayer, Ph.D., Joseph L. Goldstein, M.D. and Michael S. Brown, M.D.

The $2,000 award and appropriate scroll will be presented at the annual convention of the Medical Society of the State of New York, October 22-26, 1978. This award was endowed by the late Morris J. Bernstein in memory of his son, a physician who died in an accident while answering a hospital call in November 1940.

Nominators are asked to submit on an official nomination form, available on request, the name or names of those who, in their opinion, are eligible for this award. Information submitted must include the nominee's curriculum vitae, a brief synopsis of the significance of the achievement and a list of publications or other contributions. The deadline for nominations is *August 7, 1978.* Please submit your nomination to:

Bernstein Awards Committee
Medical Society of the State of New York
420 Lakesville Road
Lake Success, New York 11040

MEMBERSHIP STATUS

March 15, 1978

Regular Members	4,094
Retired	422
Honorary	9
Associate	605
Retired Associate	6
Corresponding	17
Student	10
	5,163

SUSTAINING ASSOCIATES

Abbott Laboratories
Burroughs Wellcome Co.
CIBA Geigy Corp.
Grass Instrument Co.
Hoechst Pharmaceutical Co.
Hoffman-LaRoche, Inc.
Eli Lilly and Co.
Merck Sharp & Dohme Res. Labs.
Norwich Pharmaceutical Co.
Pfizer, Inc.
A.H. Robins Co., Inc.
Smith, Kline & French Labs.
Warner-Lambert Research Inst.
Williams & Wilkins Co.
Wyeth Laboratories, Inc.

DEATHS REPORTED SINCE THE 1977 FALL MEETING

Harlow W. Ades – 10-12-77 – Univ. of Illinois, Urbana
Edgar A. Blair (R) – 12-77 – Univ. of Texas, Galveston
Ernest L. Dobson – – Napa, California
A. C. Ivy (R) – 2-7-78 – Oak Park, Illinois
Hardin B. Jones – 3-17-78 – Univ. of California, Berkeley
Yas Yuno (H) – 12-30-77 – Nishijin, Kyoto, Japan
Thomas W. Lamb – 8-77 – Chapel Hill, North Carolina
Chauncey D. Leake (R) – 1-11-78 – Univ. of California, San Francisco
James C. Peskin – – Univ. of Rochester, Rochester, N.Y.
M. H. Seevers (R) – 4-22-77 – Univ. of Michigan, Ann Arbor
Bernard Shore – 1-16-78 – Lawrence Livermore Lab., Livermore, California
John R. Smith – – St. Louis, Missouri
Richard A. Theye (R) – 11-21-77 – Mayo Clinic, Rochester, Minnesota
David B. Tyler (R) – 11-25-77 – Tampa, Florida
Gertrude Van Wagenen – 2-9-78 – Yale Univ., New Haven, Connecticut
H. L. White (R) – 10-1-77 – St. Louis, Missouri
Kenneth M. Wilson – 2-9-78 – Towson, Maryland

50 YEAR MEMBERS

Adolph, Edward F.
Alvarez, Walter C.
Andrus, E. Cowles
Bergeim, Olaf
Bing, Richard J.
Bourquin, Helen
Boyd, T. E.
Brooks, Matilda
Cattell, McKeen
Davis, Hallowell
Dragstedt, Carl A.
Gemmill, Chalmers L.
Gilson, Arthur S.
Greisheimer, Esther M.
Grollman, Arthur
Gross, Erwin G.
Hayman, Joseph M., Jr.
Hastings, Albert B.
Hertzman, Alrick B.
Higgins, Harold L.
Hinrichs, Marie A.
Hitchcock, Fred A.
Irving, Laurence
Jackson, Dennis E.
Johnson, Jane Sands Robb
Kleitman, Nathaniel
Koppanyi, Theodore
Landis, Eugene M.
Lee, Milton O.
Magath, Thomas B.
Mayerson, H. S.
McCouch, Grayson P.
Miles, Walter R.
Miller, Frederick R.
Minot, Ann S.
Pond, Samuel E.
Rapport, David
Redfield, Alfred C.
Reznikoff, Paul
Richter, Curt P.
Ryan, Andrew H.
Smith, Erma A.
Still, Eugene U.
Van Liere, Edward J.
Visscher, Maurice B.
Wearn, Joseph T.
Wulzen, Rosalind
Wyman, Leland C.

NEWLY ELECTED MEMBERS

The following, nominated by Council, were elected to membership in the Society at the Spring Meeting, 1978.

REGULAR MEMBERS

ANDERSON, Gary L.: Sch. of Biol., Georgia Inst. Technol., Atlanta
BAKER, Thomas B.: Dept. Physiol. & Bioeng., Eastern Virginia Med. Sch., Norfolk
BAKSI, Samarendra B.: Dept. Pharmacol., Texas Tech Univ., Lubbock
BERTRAND, Helen A.: Dept. Physiol., Univ. Texas Hlth. Sci. Ctr., San Antonio
BLACKBURN, John G.: Dept. Physiol., Medical Univ. of S.C., Charleston
BLIGH, John: Inst. Arctic Biol., Univ. of Alaska, Fairbanks
BLIX, Arnoldus S.: Inst. Arctic Biol., Univ. of Alaska, Fairbanks
BONDI, Kenneth R.: Naval Submarine Med. Res. Lab., Groton, CT
BRENGELMANN, George L.: Dept. Physiol. & Biophys., Univ. of Washington, Seattle
BROSNIHAN, Kathleen B.: Cleveland Clinic Fndn., Cleveland, OH
BUTLER, Thomas M.: Dept. Physiol., Thomas Jefferson Univ., Philadelphia
CALA, Peter M.: Dept. Human Physiol., Univ. of California, Davis
CALVIN, William H.: Dept. Neurol. Surg., Univ. of Washington, Seattle
CAMPORESI, Enrico M.: Durham, NC
CHILGREN, John D.: Dept. Zool., Oregon State Univ., Corvallis
CHUNG, Raphael S-K.: Dept. Surg., VA Hosp., Iowa City
CONNETT, Richard J.: Dept. Physiol., Univ. of Rochester, Rochester, NY
CRONIN, Michael J.: Dept. OB/GYN. Univ. of California, San Francisco
DAVIS, Brian: Cardio-Res. Inst., Univ. of California, San Francisco
DECLUE, James W.: Dept. Biomed. Sci., Southern Illinois Univ., Edwardsville

DIMINO, Micahel J.: Dept. Res., Sinai Hosp. of Detroit
DRAKE, Robert E.: Dept. of Anesthesiol., Univ. of Texas, Galveston
DRIEDZIC, William R.: Biol. Dept., Mt. Allison Univ., Sackville, Canada
DUMAN, John G.: Biol. Dept., Notre Dame Univ., Notre Dame, IN
DURAN, Walter N.: Dept. Physiol., New Jersey Med. Sch., Newark
ELY, Daniel L.: Dept. Biol., Univ. of Akron, Akron, OH
FELDMAN, David: Stanford Univ. Med. Ctr., Stanford, CA
FELDMAN, Jack L.: Dept. Physiol., Albert Einstein Coll. Med., Bronx, NY
FLETCHER, John R.: Div. Exptl. Surg., Naval Med. Res. Inst., Bethesda, MD
FLOWERS, Nancy C.: Sect. Cardiol., Univ. of Louisville, Louisville, KY
FLYNN, John T.: Dept. Physiol., Thomas Jefferson Univ., Philadelphia
FRIEDMAN, Kenneth J.: Dept. Physiol., New Jersey Med. Sch., Newark
FULLER, Ellen O.: Dept. Physiol., Emory Univ. Sch. Med., Atlanta
GARRETT, Ruby J. B.: Coll. Pharmacy, Univ. of Kentucky, Louisville
GATZ, Randall N.: Dept. Anat. & Physiol., Kansas State Univ., Manhattan
GELLES, Jeremiah M.: Downstate Med. Ctr., Brooklyn, NY
GERICH, John E.: Mayo Clinic, Rochester, MN
GOODMAN, Frank R.: Dow Chem. Res. Ctr., Indianapolis, IN
GRANGER, Daniel N.: Dept. Physiol., Univ. of South Alabama, Mobile
GREENBERG, Stanley: Dept. Pharmacol., Univ. of South Alabama, Mobile
GROSS, Joseph F.: Dept. Chem. Engr., Univ. of Arizona, Tucson
GRUBB, Barbara R.: Dept. Zool., Duke Univ., Durham, NC
GURLL, Nelson J.: Dept. Surg., Univ. of Iowa, Iowa City
HANSEN, Barbara W.: Dept. Physiol., Univ. of Michigan, Ann Arbor
HANSON, Peter G.: Biodynamics Lab., Univ. of Wisconsin, Madison
HARRISON, Timothy S.: Dept. Surg., Hershey Med. Ctr., Hershey, PA
HIGHSMITH, Robert F.: Dept. Physiol., Univ. of Cincinnati, Cincinnati, OH
HODSON, William A.: Dept. Pediat., Univ. of Washington, Seattle
HOLT, John A.: Dept. OB/GYN., Albany Med. Coll., Albany, NY
HONN, Kenneth V.: Dept. Radiol., Wayne State Univ., Detroit
HOPE, Ronald R.: VA Hosp., Miami, FL
HORACKOVA, Magda: Dept. Physiol. & Biophys., Dalhousie Univ., Halifax, N.S., Canada
HUMES, John L.: Merck Inst. Therap. Res., Rahway, NJ
INGELS, Neil B. Jr.: Palo Alto Res. Fndn., Palo Alto, CA
IVEY, Kevin J.: Dept. Med., Univ. of Missouri, Columbia
JALIFE, Jose: Masonic Med. Res. Lab., Utica, NY
JOHNSON, John M.: Dept. Physiol., Univ. Texas Hlth. Sci. Ctr., San Antonio
JONES, Douglas L.: Dept. Physiol., Univ. Western Ontario, London, Ont., Canada
KALU, Dike N.: Dept. Physiol., Univ. of Texas Hlth. Sci. Ctr., San Antonio
KANAREK, David J.: Pulmonary Unit, Massachusetts Gen. Hosp., Boston
KAPLAN, John E.: Dept. Physiol., Albany Med. Coll., Albany, NY
KATONA, Peter G.: Biomed. Engr. Dept., Case Western Reserve Univ., Clevaland
KIEN, Craig L.: Milwaukee, WI
LALLEY, Peter M.: Dept. Physiol., Univ. of Wisconsin, Madison
LEW, Gloria M.: Dept. Anat., Michigan State Univ., East Lansing
LEWIS, Stephen L.: Naval Regional Med. Ctr., Oakland, CA
LOWENSOHN, Howard S.: Silver Spring, MD
LUNDGREN, Hyperbaric Res. Lab., State Univ. N.Y., Buffalo
MARIN, Matthew G.: Pulmonary Unit, Univ. of Rochester, Rochester, NY
McNAMARA, Mary C.: Dept. Psychol., Miami Univ., Oxford, OH
MERRILL, Gary F.: Dept. Physiol., Rutgers, State Univ., New Brunswick, NJ
MICHELS, Lester D.: Bloomington, MN
MILLER, Sheldon S.: Univ. of California, Berkeley
MOLE, Paul A.: Dept. Phys. Ed., Univ. of California, Davis
MOUDGIL, Virinder K.: Dept. Biol. Sci., Oakland Univ., Rochester, MI
MUSEY, Paul I.: Emory Univ. Sch. Med., Atlanta
OGLE, Thomas F.: Dept. Physiol., Med. Coll. of Georgia, Augusta
OSBORNE, Jerry L.: McGaw Labs., Santa Ana, CA
PANG, Chung-Ning: Los Angeles, CA
PARDRIDGE, William M.: Dept. Med., UCLA Sch. Med., Los Angeles
PATTON, Gloria S.: Rochester, MN
QUINTON, Paul M.: Dept. Physiol., UCLA Med. Sch., Los Angeles
REDDY, Y. S.: Dept. Surg., Univ. of Texas, Houston
RINK, Richard D.: Dept. Anat., Univ. Louisville Sch. Med., Louisville, KY
ROBINSON, Norman E.: Dept. Physiol., Michigan State Univ., East Lansing
ROSENBERG, Irwin: Univ. of Chicago Hosps., Chicago, IL
ROSENKRANTZ, Harris: Mason Res. Inst., Worcester, MA
SARGENT, William Q.: Alcohol Res. Ctr., Univ. Tennessee, Memphis
SCHAUB, Robert G.: Coll. Vet. Med., Univ. of Tennessee, Knoxville
SCHULZE, Konrad S.: Dept. Int. Med., Univ. of Iowa, Iowa City
SHAFFER, Thomas H.: Dept. Physiol., Univ. of Pennsylvania, Philadelphia
SHARP, Geoffrey W.: Massachusetts Gen. Hosp., Boston
SHEPARD, Raymond E.: Brown Univ., Providence, RI
SMITH, Thomas W.: Cardiovasc. Div., Peter Bent Brigham Hosp., Boston
SNAPE, William J., Jr.: Hosp. of Univ. of Pennsylvania, Philadelphia
STEINER, Robert A.: Reg. Primate Res. Ctr., Univ. of Washington, Seattle
STONER, Larry C.: Dept. Physiol., SUNY, Upstate Med. Ctr., Syracuse
STOWE, David F.: Dept. Physiol., Med. Coll. of Wisconsin, Milwaukee
SZWED, James J.: Wishard Memorial Hosp., Indianapolis
THAMES, Marc D.: Univ. of Iowa Hosp. & Clinics, Iowa City

TUCKETT, Robert P.: Dept. Physiol., Research Park, Salt Lake City
TYNER, Carl F.: Dept. Med. Neurosci., Walter Reed Army Inst. Res., Washington, DC
WALTHER, Bernt T.: Dept. Anat. Sci., State Univ. of New York, Stony Brook
WATKINS, Barry E.: Dept. Physiol., Marshall Univ., Huntington, WVA
WINDER, William W.: Dept. Preventive Med., Washington Univ., St. Louis
WINET, Howard: Physiol. Dept., Southern Illinois Univ., Carbondale
YUN, John C-H.: Dept. Physiol., & Biophys., Howard Univ., Washington, DC
ZAPOLSKI, Edward J.: Dept. Physiol. & Biophys., Georgetown Univ., Washington, DC

CORRESPONDING MEMBERS

ANNUNZIATO, Lucio: Naples, Italy
FUENMAYOR, Nilio: Catedral de Physiol., Maracaibo, Venezuela
GRANT, Brydon J. B.: San Diego, CA
HERMANSEN, Lars A.: Inst. of Work Physiol., Oslo Norway
MONGE, Carlos: Lab. de Biofis., Univ. Peruana Cayetano Heredia, Lima, Peru
RETTORI, Ovidio: Dept. Fisiol., Univ. de Oriente, Ciudad Bolivar, Venezuela
ZEBALLOS, R. Jorge: Arequipa, Peru

ASSOCIATE MEMBERS

BACHRACH, Arthur J.: Germantown, MD
BARNES, Stephen: Sch. Life & Hlth. Sci., Univ. of Delaware, Newark
BEALL, Paula T.: Dept. Pediat., Baylor Coll. Med., Houston
CAREY, Rita: Dept. Med., Temple Univ. Hlth. Sci. Ctr., Philadelphia
CERNY, Frank J.: Lung Ctr., Children's Hosp., Buffalo, NY
DANTZKER, Dept. Int. Med., Univ. Hosp., Ann Arbor, MI
DEAVERS, Daniel R.: Dalton Res. Ctr., Univ. of Missouri, Columbia
DINNO, Memtaz: Dept. Pharmacol., Univ. of Louisville, Louisville, KY
DURKOT, Michael J.: Shriners Burns Inst., Boston
EISMAN, Martin M.: Seattle, WA
FARRAR, David J.: Dept. Physiol., Univ. of Louisville, Louisville, KY
FITZPATRICK, Thomas M.: Dept. Physiol. & Biophys., Georgetown Univ., Washington, DC
GAY, Carol: Pennsylvania State Univ., University Park
GEELHOED, Glenn W.: George Washington Univ. Med. Ctr., Washington, DC
GWIRTZ, Patricia A.: Dept. of Physiol. & Biophys., Univ. of Oklahoma, Oklahoma City
HAACK, David W.: Dept. Anat., Univ. of Michigan, Ann Arbor
HOLLEY, Daniel C.: Dept. Physiol., Louisiana State Univ., New Orleans
IDELL-WENGER, Jane: Dept. Physiol., Pennsylvania State Univ., Hershey
JURRUS, Eric R.: Adelphi, MD
KOSTREVA, David R.: Res. Service, VA Ctr., Wood, WI
LAMBERT, Charles R.: Dept. Physiol., Univ. of Florida, Gainesville
LEDWITZ-RIGBY, Florence: Dept. Biol. Sci., Northern Illinois Univ., DeKalb
LINEHAN, John H.: VA Ctr., Wood, WI
MACCHIA, Donald D.: Dept. Med., Univ. of Chicago, Chicago, IL
MARTIN, Bruce J.: CVP Res. Lab., Denver, CO
MARTIN, Sheilagh: Biol. Dept., Mt. St. Vincent Univ., Halifax, N.S., Canada
MILLER, David: Dept. Physiol., Med. Coll. of Georgia, Augusta
PEREZ, Guido O.: Miami, FL
PERSON, Robert J.: Dept. Physiol. & Biophys., Univ. Oklahoma, Oklahoma City
PETERSON, Thomas V.: Dept. Physiol. & Biophys., Univ. of Nebraska, Omaha
REAVES, Troy A.: Dept. Neurol., Univ. of North Carolina, Chapel Hill
ROLOFF, Marston V.: Frederick, MD
SCHIFF, Joel D.: Dept. Physiol., New York Univ. Dental Ctr., NY
SOULSBY, Michael: Dept. Physiol. & Biphys., Univ. of Arkansas, Little Rock
SULZMAN, Frank: Dept. Physiol., Harvard Med. Sch., Boston
TIFFERT, J. Teresa: Dept. Physiol., Univ. Maryland Sch. Med., Baltimore
VILLEMAIRE, Alfred, Jr.: Fac. Sci., Univ. of Sherbrooke, P.Q., Canada
WALSH, James P.: Dept. Physiol., Univ. of Vermont, Burlington
WEHNER, A.P.: Biol. Dept., Battelle Pacific Northwest Labs., Richland, WA
WEISSMAN, Mark L.: Harbor Gen. Hosp., Torrance, CA
WHITELAW, W.: Hlth. Sci., Ctr., Univ. of Calgary, Calgary, Alta., Canada
WILKINSON, Harld L.: Dept. Physiol., Univ. of Kansas Med. Ctr., Kansas City
WRIGHT, Kristina: Dept. OB/GYN., Yale Sch. Med., New Haven, CT
ZEIDLER, Robert: Dept. Physiol., Univ. of Arizona, Tucson
ZIEGLER, Thomas: Div. Nephrol., VA Hosp., San Diego, CA

STUDENT MEMBERS

ANDRESEN, Michael C.: Dept. Physiol. & Biophys., Univ. of Texas, Galveston
ANDREWS, William W.: Dept. Physiol., Univ. Texas Hlth. Sci. Ctr., Dallas
BOLTON, Mary G.: Baltimore, MD
BRICKMAN, Andrew L.: Dept. Physiol., Univ. Western Ontario, London, Ont., Canada
BRITTON, Steven L.: Dept. Physiol. & Biophys., Mayo Clinic, Rochester, MN
BURT, Janis M.: Dept. Develop. & Cell Biol., Univ. of California, Irvine
CHILIAN, William M.: Dept. Physiol., University of Missouri, Columbia
CHURCHHILL, Susanne E.: Cohasset, MA
CIRIELLO, John: Dept. Physiol., Univ. Western Ontario, London, Ont., Canada
CONRAD, Edward E., Jr.: Physiol. Dept., Univ. of Oregon, Portland

DIETZ, John R.: Dept. Physiol., Univ. of Nebraska, Omaha
DILLON, Patrick F.: Dept. Physiol., Univ. of Virginia, Charlottesville
DUBYAK, George R.: Dept. Physiol., Univ. of Pennsylvania, Philadelphia
EDELMAN, Sidney: Res. Asst., Univ. of Southern California, Los Angeles
FRIEDMAN, Larry S.: Arlington, VA
GARTHWAITE, Susan M.: Columbia, MO
HADBAVNY, Angela M.: Dept. Physiol., Loyola Univ. Med. Ctr., Maywood, IL
JACKSON, William F.: Dept. Physiol., Michigan State Univ., East Lansing
LAFUZE, John E.: Hagerstown, IN
LAKE, DAVID A.: Dept. Physiol., Texas Tech Univ., Lubbock
LASH, Jeffrey A.: Los Angeles, CA
MACINTOSH, Brian R.: Dept. Physiol., Univ. of Florida, Gainesville
MELTON, Larry B.: Dept. Physiol., Univ. Texas Hlth. Sci. Ctr., Dallas
MIRKA, Alar: Dept. Physiol., Univ. of Oregon Hlth. Sci. Ctr., Portland
MITCHELL, Gordon S.: Dept. Physiol., Univ. of California, Irvine
MITCHELL, Mark A.: Dept. Physiol., Univ. of North Dakota, Grand Forks
MORZORATI, Sandra L.: Inst. Psychiat. Res., Indiana Univ., Indianapolis
MULLIGAN, Eileen M.: Dept. Physiol., Univ. of Pennsylvania, Philadelphia
MULLIN, James M.: Dept. Physiol., Univ. of Pennsylvania, Philadelphia
NELSON, Karl M.: Dept. Physiol., Stritch Sch. Med., Maywood, IL
O'BRASKY, James E.: Philadelphia, PA
O'NEILL, John T.: Dept. Environ. Hlth. Sci., Johns Hopkins Univ., Baltimore
ORDWAY, George A.: Dept. Physiol. & Biophys., Univ. of Kentucky, Lexington
PINDOK, Marie: Dept. Physiol. & Biophys., Chicago Med. Sch., Chicago, IL
REINKING, Larry N.: Dept. Zool., Univ. of Montana, Missoula
ROBERTSON, Douglas D.: Fairfax, VA
SCHADT, James C.: Dept. Physiol., Texas Tech Univ., Lubbock
SINTETOS, Anthony L.: Rockville, MD
STEFFEN, Joseph M.: Dept. Biol., Univ. of New Mexico, Albuquerque
STEIN, Robert B.: Duke Medical Ctr., Durham, NC
TALLMAN, Richard D.: Dept. Physiol., Ohio State Univ., Columbus
VANROLLINS, Mike: Gaithersburg, MD
VEGA, Gloria L.: Louisiana Univ. Med. Ctr., New Orleans
VEIGL, Victoria L.: Indianapolis, IN
VICK, Giles W. III: Duke Hospital, Durham, NC
WALTER, Anne: Marine Lab., Duke Univ., Beaufort, NC
WEISS, Roy E.: Dept. Biol., Univ. of South Carolina, Columbia
WILLIAMSON, Andrew M.: Bethesda, MD
WONG, Brendan S.: Carbondale, IL

RAY G. DAGGS AWARD

The 5th Daggs Award was presented to Dr. Hermann Rahn by Dr. Ganong at the Spring Meeting in Atlantic City.

"The Daggs Award is given by the American Physiological Society to recognize distinguished service to the Society in honor of Ray G. Daggs, who was Executive Secretary-Treasurer, 1956-1972. The recipient this year is Hermann Rahn, Distinguished Professor of Physiology at the State University of New York at Buffalo.

"Hermann Rahn has a very long history of service to the American Physiological Society. He was appointed to the Board of Publication Trustees in 1959 on which he served until this institution came to an end in 1961. He was on the original Editorial Committee for the Handbook of Physiology which originated this highly successful series, and was co-editor with Wallace O. Fenn, of the section on Respiration. He became the first Section Editor in Respiration for the new Publication Committee in 1962.

"Hermann was elected to Council in 1960 and became President in 1963. He made his councilmanic barnstorming tour with John Pappenheimer and they stimulated great interest in the Society in areas of zoology and veterinary medicine, bringing new interests to the membership. He led the Society in its celebration of its 75th anniversary in Miami. In 1962 he was highly instrumental in having the Society invited to hold its Fall Meeting in Buffalo and was Chairman of the hard-working Committee that ran it.

"One important consideration in this selection is his status as a physiologist. He is internationally known at least for the O_2-CO_2 diagram, ventilation/perfusion ratios and breathing through eggshells. Hermann has been extremely active in international physiology, is always seen at an international physiological Congress and was a member of Council for the period 1965-1974; Vice President during 1971-1974; member of the Nominating Committee for Officers and Councillors, 1974-1977; and Chairman of that Committee, 1977-1980.

"Hermann Rahn is still pursuing the ventilation/perfusion ratio, unusual respirators and amah all over the globe. He is certainly a fitting recipient of the 5th Daggs Award. May his science continue to flourish and may he continue to reflect great credit on the American Physiological Society."

In a letter to Dr. Ganong, Dr. Rahn wrote:

> "As you must know, I am very embarrassed about receiving the Ray G. Daggs Award. I am also very pleased and proud to have been the recipient of this recognition and would like to express my deep appreciation.
>
> "This pleasure was greatly enhanced by the presence of Ray Daggs, whom I had not seen for many years, and I wish to express my appreciation of that also."

AMERICAN PHYSIOLOGICAL SOCIETY
119th BUSINESS MEETING

TIME: 4:30 p.m., April 11, 1978
PLACE: Convention Hall, Atlantic City, New Jersey

I. CALL TO ORDER

Dr. W. F. Ganong, President, called the meeting to order and welcomed the members to the 119th Business Meeting. The Ballot for Election of New Members, statistics on APS members, and an apportionment of Regular Member dues income were distributed along with a reprint from *The Physiologist* on the Endowment Fund.

II. REPORT ON MEMBERSHIP

Dr. David Bohr, President-Elect, reported on the membership status and deaths since the last meeting.

A. *Membership Status*

The membership in the Society continues to grow. In the last report, there were 5,032 members. Since then, there have been 53 retirements, 8 resignations, 17 deaths, and 165 new members. As of this report, there are 4,094 Regular members, 422 Retired members, 9 Honorary members, 605 Associate members, 6 Retired Associates, 17 Corresponding, and 10 Student members, for a total of 5,163 members.

B. *Deaths Reported Since Last Meeting*

Dr. Bohr read the names of those members whose deaths have been reported since the last meeting and asked the members to stand for a minute of silence in tribute to their memory. (page 6)

III. ELECTION OF MEMBERS

A. *Appointment of Tellers*

Dr. Ganong appointed Drs. Marian Kafka, L. S. Jefferson, Leonard Share, and Wilbur Sawyer as Tellers and requested that they collect the Ballots for Election of New Members.

B. *Election of New Members*

Dr. Ganong announced that all candidates on the Ballot for Election of New Members were elected. (page 6)

IV. ELECTION OF OFFICERS

As a result of the Election of Officers by mail ballot, Dr. Reynolds reported that the new President-Elect is Dr. Ernst Knobil and the new Councillor to serve a four-year term is Dr. Paul C. Johnson. The total number of ballots cast were 1,471 for President-Elect and 1,386 for Councillor which represents more than one third of the voting members. Dr. Reynolds was pleased to report that the number of ballots invalid due to improper marking has decreased from previous years.

V. DAGGS AWARD

Dr. Ganong announced that one of the pleasant duties of the President is the annual presentation of the Daggs Award. This is a special year because Dr. Daggs is in the audience, and Dr. Ganong welcomed him back to Atlantic City.

The Daggs Award is given by the American Physiological Society to recognize distinguished service to the Society and the Science of Physiology in honor of Ray G. Daggs, who was Executive Secretary-Treasurer, 1956-1972. The recipient this year is Dr. Hermann Rahn, Distinguished Professor of Physiology at the State University of New York at Buffalo. (p. 9)

VI. AMENDMENT TO BYLAWS

Status of Tabled Proposal for Amendment of Bylaws, Article III, Section 7, Dealing with Student Membership

Dr. Ganong reported that the proposal to amend the Bylaws, Article III, Section 7, related to Student membership was tabled at the 1977 Spring Business Meeting. There was some uncertainty and feeling among some members that the category of Student membership should be broadened. With the able assistance of the Membership Advisory Committee, Council is working on this item and will present a report at the next Business Meeting.

VII. REPORTS

A. *Actions of Council and Committee Reports*

Valuing the input from members of the Society, Dr. Ganong said his Report of Council's actions would, again, be a dialogue and welcomed comments and questions from the audience.

Dr. Ganong referred to the reprint from the December 1977 issue of *The Physiologist* announcing the Endowment Fund and highlighting opportunities for contributions which was distributed with the ballot. He emphasized the importance of this activity to the Society in order to advance Society programs and avoid a dues increase.

The second handout to which Dr. Ganong referred was a Statistical Analysis of the APS Membership and an Apportionment of Regular Membership Dues (April 1978 issue). It was pointed out that Regular Members are paying $50 for services amounting to $72. Of the $72 cost per member, the $22 Federation assessment is offset by the annual meeting income. Therefore, the activities of the Federation are at no cost to the members. The remaining $50 are distributed among the APS activities, and the various committee reports relate to them.

Centennial Celebration

Council is in the process of appointing a Committee for the APS Centennial occurring in 1987. This committee, chaired by a member of Council, will have a historical component and centennial activities subcommittees. There is a possibility of the International Physiological Congress being held in North America in 1986. Therefore, it is anticipated that celebration of the Centennial will begin with the Congress in 1986 and terminate with the 1987 Fall Society Meeting which probably will be held in Washington, D. C. With the organization and planning required for such an event, Dr. Ganong called upon members for ideas and mentioned the need for volunteers.

Public Affairs

Although there is no breakdown in APS dues for public affairs activities, Dr. Ganong stated that the APS has a very strong Public Affairs Committee with Brian Curtis as Chairman. In addition, Dr. Ganong has taken a more active role in public affairs activites. During the past year, the American Physiological Society and the Canadian Physiological Society issue a joint statement on the importance of basic research. This statement was sent to President Carter and Prime Minister Trudeau in February. However, three weeks prior, President Carter announced a substantial increase in basic research support. Dr. Ganong indicated the need to continually remind Congress of the importance of supporting basic research as opposed to applied research. It is unfortunate that the increase in funding for basic research will not be accompanied by a corresponding increase in support of other categories of research in the total NIH budget. There is a severe shortage of training money again this year.

Another public affairs matter of concern is that the number of grants submitted to NIH for review has increased 216% since 1969, and yet, because of restrictions on federal employment ceilings, the total number of staff dealing with the grants has decreased from 425 to 392. Furthermore, the number of study sections has increased by only two. This creates a problem of obvious magnitude because the study sections are overloaded and quality suffers. Dr. Ganong reported that he has discussed the matter with Dr. Frederickson, who feels that some relief is forthcoming. Also, Senator Kennedy, in a speech at NIH recently, said he was aware of the problem and predicted Congressional pressure to bring about some resolution to the problem.

Related to the taxability of fellowships. Dr. Ganong said that both the House and Senate Finance Committees have approved an amendment to the law. However, neither the House nor Senate has passed this amendment and no action will be taken until after voting on the Panama Canal scheduled for April 18. In the long run, it looks as if non-taxable status of Fellowship stipends will be reinstituted, but not before the income tax returns are due.

Dr. Brian Curtis stated that the individuals with whom he has discussed the taxation law indicate it will pass both the House and Senate shortly after the Panama Canal Treaty is resolved. It was suggested that members may wish to advise their pre and post doctoral students to file for extensions of their income tax anticipating the law will be passed within two months. However, it was pointed out that should it not pass, interest must be paid if taxes are due.

Dr. Curtis will testify before Senator Flood's Committee for the FASEB Public Affairs Committee, and he believes there is very good evidence of a significant increase in the President's budget for NIH. He reiterated that letters from constituents are very important and were extremely helpful in Senator Kennedy's decision to withdraw his DNA bill.

An important responsibility of the FASEB Public Information Committee is the feature service provided to the newspapers. Members of the Committee sort through many abstracts to identify newsworthy material. It is very important when preparing abstracts for the news media that they be written with the lay public in mind.

Committee on Committees

Related to membership services, Dr. Ganong announced that the Committee on Committees requested names of volunteers, and in particular young people, to serve on various APS committees. The response was overwhelming with the receipt of over 300 names and 200 letters. In addition, a postal card was inserted in *The Physiologist* asking for suggestions. These are still being returned. Dr. Ganong expressed appreciation for the response and interest shown by the membership. With the number of excellent nominations, it was difficult for the Committee on Committees to make selections.

Task Force on Physiological Chemistry

Dr. Ganong reported that with increasing frequency, the American Society of Biological Chemists is now meeting separately. Not until 1982 will the biochemists and the physiologists meet jointly. The Spring 1979 Meeting is in the "stretch" configuration, and the biochemists will meet immediately preceding the APS. The opportunity for interdisciplinary communication with our biochemical colleagues is an important feature of the Spring meeting and their absence creates a significant void. Therefore, Council has approved the appointment of a Task Force on Physiological Chemistry under the Chairmanship of Dr. Robert Fellows. The Task Force is charged with analyzing the problems created by the absence of the biochemists and providing recommendations to Council for ways to maintain interdisciplinary communication with the biochemical community and particularly with those biochemists interested in physiological aspects of their science. A question the Task Force will consider is whether a Section on Physiological Chemistry should be established. One member expressed the opinion that establishment of a section should not be the answer.

Specialty Group Sectionalization

The organization of specialty groups within the Society has been encouraged by Council, and Dr. Ganong was pleased to announce Council's approval of the Statement of Organization and Procedures for a Section on the Nervous System (p. 25)

FASEB Governance and Equity

Dr. Ganong reported that Council is kept informed of Federation activities through its representatives on the various FASEB committees. Recently, a proposed revision of the Federation Constitution and Bylaws dealing with governance and equity was published in *The Physiologist.* The changes would eliminate the veto power and thereby ease the admission of new societies to membership in FASEB. Another aspect of the revision is the share of assets a member society would receive should it withdraw from membership. The Constitutional amendments, which are subject to ratification by the member societies, were adopted by the Federation Board in November 1977. Council adopted the proposed Constitutional changes as have three other member societies with the two remaining societies voting in June. The Bylaw changes which Council has also approved, will be considered by the Federation Board at its Fall Meeting.

B. *Membership Committee*

The Chairman, Dr. Beverly Bishop, thanked the Committee (Elizabeth W. Stephenson, Gilbert A. Castro, Jerry S. Scott, Mary F. Dallman, and John S. Cook) for a conscientious and thorough job. Dr. Bishop, who will be completing a three-year term, indicated there would be a 50% turnover in the Committee with the three women leaving. Special recognition was given to Beth Stephenson for perfect attendance at each meeting and sincere dedication. During her three-year tenure, Dr. Stephenson reviewed over 1,250 applications and read 2,500 letters from sponsors which is no small task.

Prior to the meeting, the Membership Committee individually reviewed and evaluated 183 applications and 366 letters from sponsors. These applications are then reviewed by the group and recommendations made to Council which votes on each application. Over the past several years, changes have evolved in the valuation procedure, applications, and categories of membership. It is important for the membership to keep abreast of these changes. *The Physiologist* carries a membership application in the "center fold" of each issue. One application serves all categories of membership and previous application forms are not acceptable. Dr. Bishop urged that sponsoring members study the guidelines so as to properly advise their candidates in making application for the category appropriate for their qualifications. There are four categories of membership — Regular, Corresponding, Associate and Student. In response to a question from the audience, Dr. Bishop stated that Associate members have the same duties and privileges as Regular members except holding office, voting, and sponsoring new members.

As a result of the distribution of the Student membership poster, there are now 53 Student members. Dr. Bishop hoped members would continue to encourage their graduate students to apply for membership. Student members are eligible to present papers at the Fall Meeting with the endorsement of a Regular member. The Membership Committee is preparing a Bylaw change for the Student membership category. It is hoped to broaden the category to include more than just the graduate student in traditional physiology departments. The Commitee has made excellent progress, but Council voted to table the item in order to provide for more leisurely detailed consideration. In response to a question from the floor, Dr. Bishop indicated that Student membership may be retained for five years at the end of which time, the individual must apply for Associate or Regular membership or be dropped from the records. A member suggested the possibility of changing the name "Student" to "Training" since individuals in that category are truly in training.

Dr. Ganong publicly thanked Dr. Bishop, who has taken her job as Chairman very seriously and commended her for an excellent job. The Society is greatly in her debt.

C. *Education Committee*

Dr. L. S. Jefferson, Chairman of the Education Committee, acknowledged members of his committee (Gene Renkin, Fred White, Betty Twarog, Ralph Kellogg, Patricia Fransworth, Sidney Ochs, and Stanley Schultz) and indicated that a full report of the Committee's activities will appear in a forthcoming issue of *The Physiologist.* (see p. 14 of this issue) Very briefly, Dr. Jefferson summarized the Committee's responsibilities and activities included in this report.

D. *Publications Committee*

Dr. Ganong was pleased to announce that Dr. Fishman has accepted another three-year term as Chairman of the Publications Committee. Dr. Fishman reported that the Committee and Publications staff have just completed a frightening year of restructuring the *American Journal of Physiology.* The design was to retain AJP and at the same time, make available individual specialty publications. This seems to be working very well with libraries purchasing the complete set and individuals purchasing the specialty journals. Also, the number and quality of manuscripts being submitted have improved enormously, and Dr. Fishman is optimistic they will continue to grow. Other members of the Publications Committee include Drs. Berne and Berliner, and they would be remiss if they did not say it could not have been accomplished without Mr. Geiger and his staff.

Pressure is heavy at the moment to modify one or two other journals in order to meet specialty needs. The *Journal of Applied Physiology* and the *Journal of Neurophysiology* are doing well. *Physiological Reviews* is about to have a new editor, and *The Physiologist* is in the process of being reshaped. The Handbooks are well oriented and seem to satisfy people. Two new Handbooks have been published: *Reactions to Environmental Agents,* which goes beyond physiology and approaches a new audience, and volume I of the revision of the Neurophysiology Handbook, *Cellular Biology of Neurons,* have been extremely well received. The Renal Handbook sales have matched expenses. The second book in the Society's Clinical Physiology Series, Disturbances in Lipid and Lipoprotein Metabolism, was on display at the Meeting.

Dr. Fishman was pleased to report that at the moment, there are no immediate problems, and he would welcome advice as to the next steps to be taken.

E. *Program Committee*

Continuing the monetary theme, Dr. Ganong indicated that the program activities use a major portion of the dues dollars. He pointed out that based on recommendations of numerous members, Council approved the increase in programming activities and a related increase in the use of membership dollars.

Dr. Goodman, Chairman of the Program Committee, reported that $13 represent a major component of the dues. This also represents a major increase over previous years spending for programming activities. The increase principally reflects the increased number of symposia scheduled and the recognition of some related costs that go with symposia. In the past, members and non-members were invited to participate in symposia without reimbursement for transportation or living expenses. The Federation policy opposes reimbursement to society members for lodging, travel, or registration for symposia participants. This year, a policy was initiated of offering complimentary registration to society members, and reimbursement of travel and one day's per diem was offered to non-members participating in symposia. Further, the expansion of symposia is a reflection of the new organization of the

programming effort of the Society. Approximately a year ago, the Society instituted the new three-person Program Executive Committee consisting of Drs. Knox and Fregly and himself and a broad-based Program Advisory Committee consisting of individuals nominated by the Society's eleven special interest groups. It has become the responsibility of the Program Advisory Committee to not only program the abstracts of contributed papers, but also to find from their constituents who is doing the "hot" work in the field. Members of the Committee also schedule symposia that are relevant to new and exciting areas in one's own field, select the chairpersons for the various sessions, and select the 30-minute introductory speakers. The program activity now reflects more of the interest and activities of the Society's membership-at-large. The Program Committees have also made an effort to "woo" back some of our colleagues who are now attending specialty meetings rather than society meetings. One attempt has been made to counter this by allowing an increase in the number of symposia scheduled in a particular discipline. For example, at this meeting six symposia in neurophysiology have been scheduled. This expansion has also been reflected in a number of other specialty groups. The new programming procedure has resulted in the receipt of 450 more abstracts this year over previous years. Of course, the increase in program activity has increased expenses. The Program Committee recognizes it has a responsibility to meet this obligation, and hopes to submit a proposal to the Finance Committee and Council to raise funds to underwrite some of the symposia costs. Another item of interest is the publication of symposia in the *Federation Proceedings.* Dr. Robert Fellows has been appointed liaison officer between the Federation Proceedings Editorial Board and the APS Program Committee. Editorial review of symposia has been arranged through Dr. Fellows for publication in *Federation Proceedings.*

F. *Finance Committee*

Dr. Guyton, Chairman of the Finance Committee, stated that most of his report has already been presented. He said that some members wonder about the dues paid to FASEB, but as is shown in the dues breakdown, the $22 is returned to the Society from annual meeting income. Therefore, members received the abstract publication, Federation Directory, and the *Federation Proceedings* at no cost to the member.

Society finances are in very good shape, but the Society is budgeting a deficit this year. Dr. Guyton then briefly summarized the Finance Committee's Report. (p. 18). As has been previously reported, Council did not accept the Finance Committee's recommendation to increase dues. Instead, Council is calling for voluntary contributions. If this approach is not successful, Dr. Guyton believes an adjustment in dues will be necessary.

In closing, Dr. Ganong acknowledged the APS Sustaining Members and expressed appreciation for their support of the Society through donations. He reported that Council is exploring mechanisms of seeking other institutional support. He reiterated that the membership dues bill will have a line for voluntary contributions, and he hopes members will contribute to the Society's programs.

There being no further business, the meeting was adjourned at 6:00 p.m., April 11, 1978.

NEW EDITION OF COUNCIL OF BIOLOGY EDITORS STYLE MANUAL

The new fourth edition of the *Council of Biology Editors Style Manual* is now available. For several years the members of the CBE Style Manual Committee that prepared the book have worked with members of subcommittees and consultants to ensure that this book is current and an improvement over the previous editions. As a member of the Style Manual Committee it would be improper for me to review the volume, however, I do wish to direct your attention to several features of the new edition.

Chapters 1 through 3 discuss the preparation of research articles for publication in journals. Inexperienced authors, who are submitting manuscripts to one of the journals of the American Physiological Society, should benefit from reading these chapters. More experienced writers and editors should also find points of value in this section.

Chapter 4 on the editorial review of manuscripts should be of interest to editors, authors, and reviewers. The chapter includes a checklist for reviewers. This list should be most important for the inexperienced to read, but should be of value even to the most experienced reviewer.

Chapters 5 through 11 are on typographic style, proof correction, indexing, and style conventions and thus will be of greatest value to editors and copy editors. Authors should use these chapters for guidance in punctuation, acceptable symbols and abbreviations, and word usage.

Of special interest to physiologists is Chapter 9, "Style in Special Fields." It includes conventions published by international and national scientific associations. A few of these conventions do not have international sanction, but are structurally coherent systems that are widely used. Most symbols and abbreviations used in physiology have been developed informally, but have gained wide acceptance. Authoritative textbooks and monographs, including the *Handbook of Physiology,* have become authoritative sources for such usage. Formally proposed and published lists for thermal and respiratory physiology are included in Chapter 9. References are also provided to information on pulmonary nomenclature, cardiovascular physiology, and thyroid physiology.

The number of fields of physiology for which formal lists of symbols and abbreviations exists is limited. Impetus for formalizing accepted practices must come from physiologists themselves. Past experiences teach that an individual or a small group of concerned scientists is the critical ingredient for such a project. Members of the Society have been active in such work in the past; it is hoped others will assume similar roles in the future.

Chapter 12 is an annotated bibliography. It includes publications on style; on writing, prose style, and word usage; on illustrations; on metric and other units; on national and international standards; and scientific dictionaries.

The Manual may be purchased from the American Institute of Biological Sciences, 1401 Wilson Boulevard, Arlington, VA 22209. Please send any comments on this edition or suggestions for the next edition to me at Society headquarters.

Stephen R. Geiger
Publications Manager
and Executive Editor

REPORT FROM THE EDUCATION COMMITTEE
March 1978

I. *Slide-Tape Project*

In 1972, the Society embarked on a major effort to evaluate existing audiovisual materials in the field of physiology and to prepare new materials in areas lacking adequate coverage. Contracts from the National Medical Audiovisual Center funded the initial review of existing materials and the early production of slide-tapes in the areas of renal, acid-base, and cardiac physiology. With the expectation that the slide-tape production program would grow into a self-paying endeavor, Council voted in March 1976 to continue to support the program with Society funds until September 1978 (with a maximum financial support of $150,000). Although the program has not yet achieved a self-paying status, the prospects for it doing so in the reasonably near future are encouraging.

Figure 1 shows the number of units sold in each program for the years 1975 through 1977, and the projected sales for 1978 and 1979. Sales projections at this time are difficult since only two programs, Renal Physiology and Cardiac Mechanics, have been on the market for two full years. Sales of the Renal program were nearly identical for each of the two years, while sales of the Cardiac Mechanics program appeared to decline somewhat in the second year compared to the first. However, a backlog of 1975 orders for this program were filled in early 1976, producing an artificially high level of sales for the year of 1976. Taking this factor into account, the Cardiac Mechanics program also had a steady rate of sales for the years of 1976 and 1977. Assessing the sales of all units on a monthly basis reveals a reasonably constant pattern with no apparent trends, other than a peak of sales in the July-August period each year. Therefore, at this time, it seems reasonable to make projections on the basis of sales of existing units holding their own and new units reaching approximately the same level of sales as the earlier productions. The projections in Figure 1 for 1978 and 1979 are based on these assumptions in conjunction with an anticipated level of productivity.

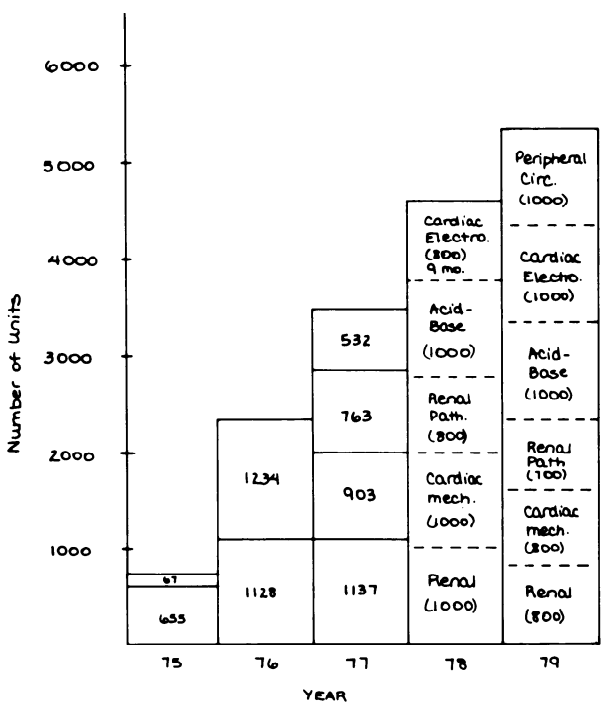

Fig. 1

Income, based on the actual and projected sales shown in Figure 1, is presented in Figure 2. The total income (royalties on gross sales) was $6,042 in 1975, $23,032 in 1976, and $42,327 in 1977. The projected income for the years of 1978 and 1979 is $69,642 and $95,000, respectively. The projected income assumes that the price of each unit will remain constant and that we will continue to receive from Herlitz 25% of the gross sales.

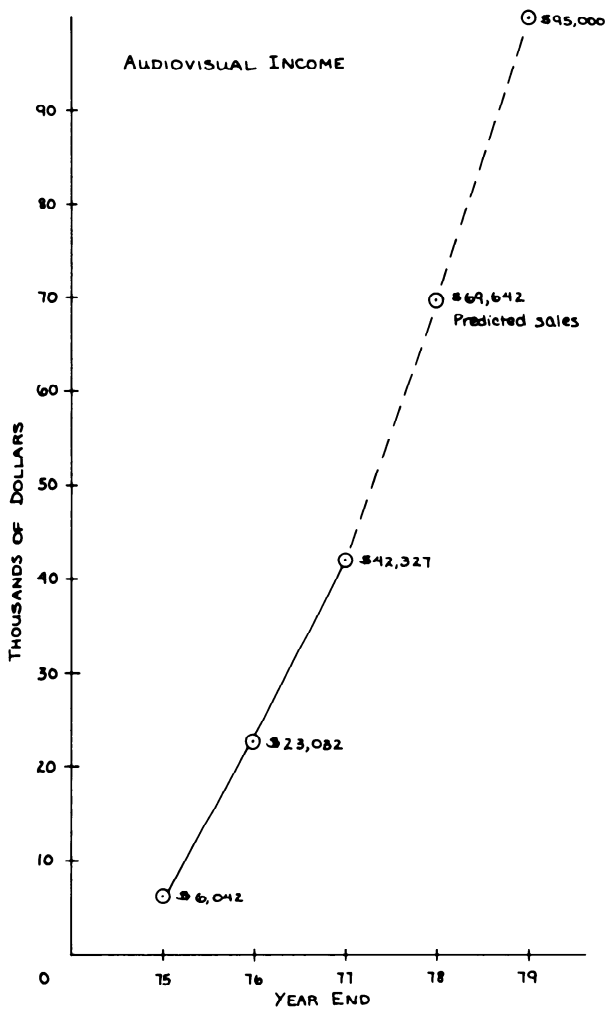

Fig. 2

The total expenses incurred in the production of the slide-tape programs is shown in Figure 3. Total costs in 1975 were $13,032; in 1976, $43,710; and in 1977, $74,554. The projected costs for 1978 and 1979 are $77,549 and $80,000, respectively.

The accumulated deficit at the end of 1977 was $59,942. Based on the figures presented above, the deficit would increase to approximately $68,000 by the end of 1978, and would begin to decrease in 1979 when income is expected to exceed expenses by about $15,000. Therefore, the maximum deficit anticipated is less than one half of that approved by Council in 1976.

Actually, there are reasons to expect that this project may do better than the data presented above indicate. A number of problems in development, production and manu-

facturing appear to have been solved, resulting in an operation which is functioning more smoothly and efficiently at the present than at any time in the past. Furthermore, the foreign market, which we expected to be large, just started to have a major impact on sales this past year when it represented approximately one third of the total. In addition, sales are expected to increase as a critical mass of material develops.

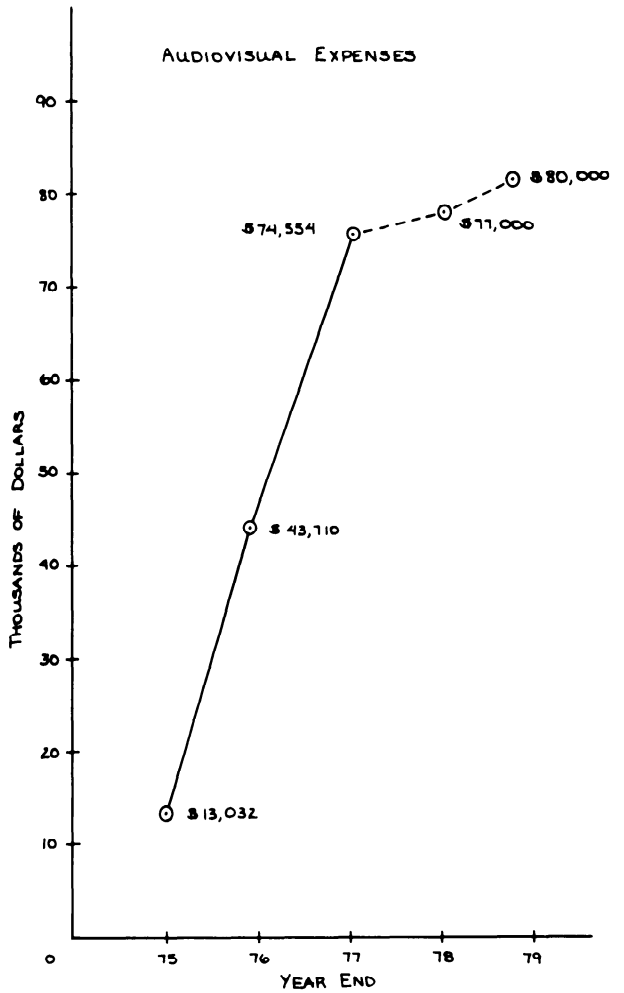

Fig. 3

As can be seen in Table 1, approximately 50 units have been produced or are under development at this time. We expect that the availability of more units will result in more sales in general.

In the preceding discussion, I have attempted to present to you a realistic appraisal of the current status and the anticipated future of the slide-tape production program. For the program to continue, it must have the continued support of the Society for at least one more year. Therefore, the Education Committee requests that the Council consider extending support for another year with the maximum financial support not to exceed the previously determined ceiling of $150,000. If our projections are accurate, the program will approach a self-supporting status in 1978, and become a profit making endeavor in 1979. At that time, the Society will begin to recover its investment in the program.

Table 1

SLIDE/TAPES PRODUCED AND UNDER DEVELOPMENT 1977-1978

Series 500 Acid/Base Physiology

501 Buffer Chemistry: Physiological Applications
502 The Role of Respiration in Hydrogen Ion Metabolism
503 The Role of Hemoglobin in Hydrogen Ion Metabolism
504 Renal Regulation of Hydrogen Ion Metabolism
505 Disturbances of Hydrogen Ion Regulation

Series 600 Cardiac Physiology

601 The Cardiac Pump: Structure and Mechanism
602 Regulation of Myocardial Performance
603 Heart Muscle Mechanics
604 Mechanics of the Intact Heart
605 Cardiac Contractility: The Ventricular Function Curve
606 Indices of Performance: Clinical Application

Series 800 Renal Physiology

801 Body Fluids I: Fluid Compartments and the Countercurrent Multiplier
802 Body Fluids II: Urinary Concentration and Dilution
803 Body Fluids III: Urea Excretion, Antidiuretic Hormone and Thirst
804 The Kidney and Sodium Balance
805 Understanding Renal Hemodynamics I
806 Understanding Renal Hemodynamics II
807 Renal Clearance I
808 Renal Clearance II
809 Regulation of Renal Potassium Excretion
810 (to be developed) Renal Handling of Calcium, Magnesium, and Phosphate

Series 900 Renal Pathophysiology

901 Metabolic Acidosis
902 Hyponatremia
903 Edema
904 Disorders of Potassium Balance

Series 1100 Cardiac Electrophysiology

1101 Basic Membrane Physiology Part 1
1102 Basic Membrane Physiology Part 2
1103 Cardiac Cellular Electrophysiology
1104 Electrical Anatomy of the Heart Part 1
1105 Electrical Anatomy of the Heart Part 2
1106 Disorders of Cardiac Rhythm Part 1
1107 Disorders of Cardiac Rhythm Part 2
1108 Electrocardiography: Fundamental Theory Part 1
1109 Electrocardiography: Fundamental Theory Part 2
1110 Electrocardiography: Applied Theory Part 1
1111 Electrocardiography: Applied Theory Part 2

Series 1200 Peripheral Circulation

Hemodynamics
Arterial and Venour Systems
Exchange
Local Control
Neural Control
Humoral Control

Integrative Aspects of the Circulation (to be assessed)

Series 1300 Gastrointestinal Physiology

II. *The Physiology Teacher*

Changes in format which included publication of *The Physiology Teacher* in combination with *The Physiologist,* became effective in January, 1977. In conjunction with this change, subscriptions for *The Physiology Teacher* declined from a level of about 1,030 in 1976 to 451 in 1977. Consequently, publication of the newsletter in 1977 resulted in a budget deficit of $4,053. In addition to the budgetary problem, *The Physiology Teacher* is in jeopardy because of inadequate material received for publication.

At the January 1978 meeting of the Education Committee, the possibility was considered that *The Physiology Teacher* be discontinued. Dr. Reynolds had solicited the opinion of Dr. Fellows and Dr. Greenberg, the Associate Editors, and while Dr. Fellows suggested termination, Dr. Greenberg was strongly in favor of an attempt to broaden the scope of the publication and increase submissions and subscriptions. Some members of the Committee were also of the opinion that more interest could be aroused by broadening the base of coverage to include a wide-range of teaching materials such as problems and other approaches used to encourage the learning of Physiology. The Committee recommended that publication of *The Physiology Teacher* should be continued and that a major effort should be made by the editors to increase its scope.

Several actions are being taken to increase the numbers of submissions and subscriptions for *The Physiology Teacher.* Both Dr. Greenberg and Dr. Fellows have indicated that they will undertake renewed efforts to increase the number of manuscripts submitted. Dr. Renkin of the Education Committee has also agreed to submit material as well as solicit materials from others. A promotional effort is also being initiated. A four-page brochure describing the publication will be sent to 10,000 IUPS members in 47 countries and to 6,000 biology teachers (AIBS subscribers to *The Biology Teacher*). The brochure is currently being printed and will be sent out immediately, providing Council recommends continuation of the newsletter.*

III. *Spring 1978 Meeting-Teaching Session*

Seven poster/table presentations have been received for a "Teaching in Physiology" display which was planned for the exhibit hall. Due to a shortage of space in the exhibit hall, however, these presentations have been programmed as regular poster sessions. Abstracts of these poster sessions will be identified as "Sponsored by the Education Committee of the APS." As discussed subsequently, future plans call for the establishment of a "Learning Resource Center" which will provide for the presentation of innovative teaching aids and methods.

*Council decided at its March 1978 meeting to discontinue the *Physiology Teacher* as a separate publication, and to carry such material as a special section of *The Physiologist.*

IV. *Fall 1978 Meeting-Refresher Course*

At its January 1978 meeting, the Education Committee recommended that Dr. Ralph Kellogg be asked to organize a Refresher Course on "The Neural Control of Respiration." After consulting with leaders in this area, Dr. Kellogg decided that the topic was premature at this time since recent advances in the field are not to the stage where they are uniformly accepted. Consequently, another recommendation of the Committee, "Smooth Muscle Physiology," will be the topic of this year's Refresher Course. Dr. Frederic Fay of the Department of Physiology at the University of Massachusetts Medical school has agreed to organize the course. Dr. Fay understands that the Refresher Course is not a research symposium and that its purpose is to "educate" all physiologists on this particular topic so that they will understand where to start in preparing lectures in this area. The Refresher Course is scheduled for two sessions, on Wednesday afternoon and evening, the same as it was last year.

V. *Fall 1978 Meeting-Tutorial Lectures*

Tutorial lectures were first presented in the Fall of 1975 and, upon recommendation of Council, again in the Fall of 1977. Tutorial Lectures will again be presented at the Fall Meeting this year. They are to be scheduled periodically throughout the entire meeting and the speakers are to be introduced by representatives of the local organizing committee.

VI. *Fall 1978 Meeting-Learning Resource Center*

The Education Committee has experimented for several years in ways of giving members of APS an opportunity to exchange information of education matters at the Society's meetings. One experiment, first made at the International Physiological Congress in Paris, 1977, involved providing space in the exhibit hall for individual educational exhibits. This was quite successful in attracting interest and stimulating discussion. Encouraged by this experience the Education Committee is sponsoring a "Learning Resources Center" at Spring and Fall meetings of the Society starting with the Fall of 1978 in St. Louis, Missouri.

The following facilities will be made available for presentation as alternatives, or if necessary, in combination:

1. Poster boards - scheduled as in regular poster sessions but set up in the exhibit hall area.
2. Table space - nominally a table 3' x 6' for three-dimensional displays; books, models or special projection equipment.
3. Telephonic connections for a computer terminal.
4. A library of video tapes (3/4 inch cassettes) and video cassette players (1 or more depending on volume of use).
5. A library of slide tape units and several caramate display units.

Members wishing to avail themselves of an opportunity to present educational papers or materials may specify the "Teaching of Physiology" topic in the topic category list, provide an abstract on the regular abstract form for publication, and write an accompanying letter describing the requirements for presentation from the options given in the preceding paragraph. (Motion pictures must be provided in video tape form for inclusion in the library or the presenter must arrange for his own table size projection equipment).

Presentation of an abstract in the "Teaching of Physiology" category will not constitute use of a franchise for submitting abstracts for research papers for slide or poster sessions.

Organizational plans for the Learning Resource Center will be based on an evaluation of the Spring Teaching Session. A letter describing the Center will accompany the call for abstracts for the Fall Meeting.

VII. *Educational Objectives*

During the past two or three years, the Education Committee has been responsible for the translation, review, and revision of the University of Aarhus "Objectives in Physiology." These objectives differ from the previous ones published by the Education Office in that they are written in behavior terms rather than just being a list of topics. The objectives received a favorable review by the Educational Materials Review Board (there were about twice as many positive evaluations as negative ones), and we now plan to publish them as an issue of *The Physiology Teacher.** The Committee recognizes that these Danish objectives are not uniform in quality and are not complete. Nonetheless, we feel that they will provide a valuable information base for physiology departments undertaking the development of their own sets of objectives.

VIII. *Career Literature*

The Education Committee is currently considering revisions for the "Careers in Physiology" booklet. This publication, which was prepared by the Education Committee a few years ago, needs reprinting since we are rapidly depleting our stock. The booklet will be revised and up-dated before it is reissued.

The Education Office has just established a referral service, cross-referenced by geographical area and speciality, to assist in directing students who request career guidance from the Society.

IX. *Educational Materials Review Board*

The Education Committee wishes to acknowledge the contributions of the APS members who have served on the Educational Materials Review Board. At the present time, there are 103 members serving on this Board. These members represent a spectrum of areas in physiology as indicated by the following table:

EDUCATIONAL MATERIALS REVIEW BOARD

Specialty	Members with Primary *Specialty*	Members with Secondary *Specialty*
Circulation	15	3
Endocrinology and Metabolism	13	4
Environmental and Exercise	14	5
Gastrointestinal	5	3
Membrane Transport	9	1
Muscle	5	2
Neurophysiology	16	1
Renal	10	2
Reproduction	2	2
Respiration	14	3

*Present plans are for publication in, or as a supplement to, the October issue of *The Physiologist*

The Board provides continuing reviews of audiovisual productions as well as reviews of articles, textbooks, laboratory experiments, etc. Each year the Board abstracts material from published papers that may be useful in teaching physiology. These abstracts are published in the Spring issue of The *Physiology Teacher.* Last year 99 articles were abstracted.

The Committee has just adopted a reappointment system to establish a turnover of Board members. One-third of the current membership will be given a one year reappointment, one-third a two year reappointment, and one-third a three year reappointment. All terms are to begin and expire in July of each year.

XI. *AAMC/NLM AVLINE*

The education Office has been attempting to establish with AAMC a mechanism by which APS can provide review expertise for items in Physiology being considered for citation in AVLINE. The following procedure for reviews has recently been agreed upon by Dr. Reynolds and Dr. Emanuel Suter, Director of the Division of Educational Resources and Programs of AAMC:

1. A collaborative effort will be made by APS and AAMC for peer review of educational materials in physiology, which have been cataloged for AVLINE.
2. AAMC will notify APS of materials ready for review.
3. Upon notification, APS will advise AAMC of appropriate reviewers (from the Educational Materials Review Board).
4. After AAMC has made the necessary assignments, and the reviewers have completed their tasks, APS will advise AAMC of the acceptability of the critical review submitted for publication in THE PHYSIOLOGY TEACHER. This authorizes AAMC to prepare its final review report and submit a critical abstract to NLM.
5. Direct payment will be made by AAMC to the critical review writer at the rate of $25.00 per item.

The Education Committee agreed to this limited arrangement, and will attempt to evaluate on the basis of this experience the desirability of future interactions with AAMC in this capacity.

Other members of the Education Committee include:

Eugene Renkin
Fred White
Ralph Kellogg
Betty Twarog
Patricia Farnsworth
Stanley Schultz
Sidney Ochs

Leonard S. Jefferson, Ph.D.
Chairman, APS Education Committee

* * * *

FINANCE COMMITTEE REPORT TO COUNCIL
March 1, 1978

A major share of the discussion of this Finance Committee meeting was a rehash of discussions already held at the last Finance Committee meeting in August of 1977. Principally, the preliminary budget that was developed at the August meeting had been brought up to date and was discussed in further detail.

Because most of the discussions of the August meeting already reflect the views and recommendations of the Finance Committee, the minutes of this present meeting will emphasize the points of special import for further discussion by the Council at its meeting on March 6 and 7, 1978.

BUDGET

PUBLICATIONS BUDGET.

In 1977, the Publications General Fund had an income over expenses of $236,618, representing sizeable excess income. However, the number of subscriptions is declining and, as usual, the expenses are inflating. Therefore, a conservative budget has been proposed for 1978 showing instead of a net income a net loss of $134,801. It has been the recommendation of the Publications Committee that we accept this deficit budget for the following year, based on the fact that it has been preplanned to make enough money in the last three years to justify several years of operation of the new journal system before making further changes. The Finance Committee has accepted this judgement of the Publications Committee and therefore recommends the Publications General Fund budget as it stands . However, it is expected that the prices of the journals will have to be increased within the next year or so.

The Publications Special Projects Fund, which includes specifically publication of the handbooks and monographs, seems to be in excellent shape. At the end of 1977, the costs of the handbooks over income stood at $198,363. This represents the cumulative costs minus income received from sales throughout the entire history of the handbook series. On the positive side of the ledger, we now hold an inventory of handbooks valued at $652,873, which represents the cost of this inventory and not the eventual sale value. Thus, the cumulative cost of this handbook series seems to be balanced by enough inventory to completely defray these costs should the series be stopped. Council has given permission for the cumulative costs to rise to as high as $250,000. Thus far, this value has not been reached, and it is probably a safe value for the next 2 or 3 years at least unless the rate of publication of handbooks is increased considerably. Both the Publications Committee and the Finance Committee are satisfied with this limit.

Most of the costs of publishing the first monograph in our new monograph series have already been recovered. If the same success can be achieved with the successive monographs, this should be an easily self-sustaining operation. The Finance Committee is well satisfied with the healthy financial situation of the monograph series.

SOCIETY OPERATING FUND BUDGET:

The Society Operating Fund Budget has increased approximately $100,000 between 1977 and 1978. However, this is an illusory increase for two reasons. First, FASEB has developed a new procedure for disbursing funds from the annual FASEB Spring meeting. All of the excess income of this meeting are now dispersed to the Societies instead of only a portion of the income. In turn, FASEB extracts a much higher dues assessment from each Society for its membership than previously. This actually represents only an accounting change, but it does increase both the Society Operating Fund income budget, and expense budget.

The second illusory item of the increase in the Society Operating Budget is the increase in associate member dues. In turn, the extra dues that have been collected are paid to FASEB so that associate members can be FASEB members as well as APS members.

Aside from the illusory changes in the Society Operating Fund budget, the increase is approximately in line with usual inflation costs. The budget does not represent any new activities of the Society. Only two items in the budget show substantial increases within the past year. These are the costs for development of programs at the Spring and Fall meetings and an increase in the cost of *The Physiologist.*

The Education Office of the American Physiological Society is budgeted separately from the remaining Society operation expenses. The Education office is budgeted to have an income of approximately $11,000 during the following year and total expenses of $52,000, making a net deficit of $41,316. The Finance Committee discussed the factors that make up the Education Office expenses and attempted to balance these against the products of the Education Office. However, the judgement concerning whether the products of this office justify the costs must be made by Council. Three of the major products of this office are 1) the review of audiovisual materials and appropriate reports of these reviews in *The Physiologist,* 2) the development of appropriate career brochures, and 3) publication of *The Physiology Teacher.* A major amount of mailing and answering of letters goes into all of these activities. The development of the slide tape programs is a separate budget aside from the subsidized Educational Office expenditures.

It is to be noted that many of the activities of the Education Office would have to be supported in other sections of the Society's office if this office itself should be closed. Therefore, closure of the office would not remove the entire deficit incurred by this office.

The Audiovisual Production Program, for producing slide tapes is a separate budget and is considered to be a capital investment rather than an Annual expense, at least for the present. A total of $150,000 investment was authorized by Council at the outset of this program. To date the cost minus income has accumulated to a value of approximately $60,000. It is hoped that there will be an almost break even situation throughout the 1978 budget year, and hopefully a net income thereafter. However, in the discussions of the Finance Committee, it was clear that the members of this Committee hold a relatively high degree of skepticism that this program will indeed become self-sustaining in the near future. However, this program was begun with full knowledge of its risks, and it was expected to be reviewed in depth at the end of a three year trial period.

The cost/over income for 1977 was approximately $32,000. A cost/over income of $6,500 has been budgeted for 1978.

BUSINESS OFFICE BUDGET:

The Business Office budget represents 9 per cent of the total operating costs of both the Publications operation and the Society business operation. This is approximately in line, if not slightly less than, the usual Business Office costs for other similar societies or for any other similar organization. The costs of the Business Office are allocated to the respective individual Society budgets.

SPECIAL CONCERN OF THE FINANCE COMMITTEE ABOUT DEFICITS IN 1978 BUDGET:

The budget of the Society as it has been prepared for 1978 has a significant deficit in each of the two major operations, the Publications operation and the Society operation. The deficit in the Publications operation is budgeted to be approximately $135,000 and that for the Society operations approximately $25,000, making a total deficit of $160,000 for the year. In addition to this, there will still be small excess cost of the Audiovisual Production program over cost even if the sales rise to the level that is expected.

All the members of the Finance Committee are deeply concerned about the deficit. There are several ways to eliminate the deficit. In the Publication operation it is presumed that an increase in subscription price will soon be necessary. In the case of the Society Operating Fund, there are three possibilities: (1) increase in dues, (2) decrease in some of the costs of the Society by reducing some of its activities, and (3) subsidizing of part of the costs of the Society operations using income from invested monies. Since these invested monies were derived originally primarily from publications, there is a question of policy concerning use of these funds for subsidizing Society operation.

Specific items that the Finance Committee has picked out for consideration regarding possible reduction of costs, include the following:

(1) The costs of the two Fall meetings in cities has been a cumulative amount of approximately $20,000. This is in contract to a slight profit usually on the Fall meetings held on Society campuses. Therefore, this possibility of reducing costs of about $10,000 annually should be considered unless the future city meetings prove to be different.

(2) The publication of the *Physiology Teacher* costs the Society approximately $9,000 excess over income each year. This is based on approximately $5,000 extra cost per year for this portion of *The Physiologist* that goes to the Society members, and an excess subsidy of an additional $4,000 for other costs of the *Physiology Teacher.* Therefore, since there are only 300 members of the Society who work in colleges and universities as distinct from medical schools and other activities and since it is believed that these are the persons to whom the *Physiology Teacher* is mainly addressed, the Finance Committee questions the advisability of continuing this publication. This is particularly true since it also requires a considerable amount of extra effort within the offices of the American Physiological Society which are not necessarily budgeted against the *Physiology Teacher per se.*

(3) The printing costs of *The Physiologist* using the new format have increased about $10,000 in addition to the actual cost of providing the *Physiology Teacher* with *The Physiologist.* FASEB headquarters is installing new equipment for publications of this type which may reduce this within the next year. If this does not materialize, we might consider returning to a publication format that is somewhat less expensive.

(4) A few years ago the total cost of program development was only $1,000 to $2,000 per annum. This has increased to a budgeted cost of approximately $25,000 for 1978. This is in addition to the losses that have been incurred from the Fall meetings. Most of this extra cost has gone for the support of symposia, and a large share of this has gone for support of foreign speakers. One particular in this support of symposia that has caused the Finance Committee special concern is the decision of the Program Committee to provide free registration at the FASEB meeting for all symposium speakers. This amounts to a cost of over $4,000 in the 1978 budget. The Finance Committee has taken no action on this increasing cost of program development but does report it to Council as a matter of policy consideration.

ACTION ON THE BUDGET:

The budget was approved by the Finance Committee with a vote of 2 for approval and 1 for disapproval. The disapproval was cast by the Chairman of the Finance Committee based on the belief that the Society Operating budget should be self-sustaining and not dependent on income from funds generated through the publication operation or on funds generated from investments which originated from monies derived from the publications. The other two members of the Committee also have considerable concern about this, and all members believe that this is a matter for considerable policy discussion by both the Finance Committee and Council. It is noted that the Finance Committee recommended a $3.00 increase in dues for the following year which was not accepted by Council at its Fall meeting. With an appropriate increase in dues, the Chairman of the Finance Committee would be in full compliance with the other two members of the Committee for acceptance of the 1978 proposed budget.

THE AUDIT REPORT OF THE SOCIETY

The audit of the Society by Coopers and Lybrand, certified public accountants, was given to the members of the Finance Committee at its meeting. It was not studied in detail at the meeting, but most of the items in the audit had already been covered in the budget. The members of the Finance Committee will continue to study this audit and bring up any points of concern with the Business Office should these arise. It is noted that Coopers and Lybrand are satisfied with the financial treatment and presentation of the financial position of the American Physiological Society as represented by the balance sheets of the Business Office.

(continued)

THE INVESTMENT PORTFOLIO OF THE SOCIETY AND POSSIBILITY OF TRANSFER OF FUNDS FROM ONE FINANCIAL MANAGEMENT FIRM TO ANOTHER FIRM

For over 20 years, most of the invested funds of the American Physiological Society have been managed by the firm of Woods, Struthers, and Winthrop. However, there has been a major amount of reorganization within this company during the past few years, which has created a certain amount of instability and lack of complete faith by the business managers of our own Society in the future security of our funds. Therefore, a portion of our investment funds has been placed with another organization, Prescott, Ball, and Turben, for the past two years. Funds managed by the second management company have had considerably greater percentage income return than has been true of the funds that have been continued with Woods, Struthers, and Winthrop. In addition, the person from Woods, Struthers, and Winthrop who had previously managed our account within that company has moved to Prescott, Ball, and Turben. The business managers of our Society, Mr. Walter Sonnenberg and Dr. Orr Reynolds, have investigated the two organizations very thoroughly, and Dr. E. B. Brown, the previous Chairman of the Finance Committee, also went into this deeply. Discussions have been held about the advisability of transfer of the remainder of our funds to Prescott, Ball, and Turben over the past two and one-half years. Thus far, the track record has been considerably better with Prescott, Ball, and Turben during this period of time, and there appears to be considerable more faith in the future of our funds with Prescott, Ball, and Turben than with Woods, Struthers, and Winthrop. Therefore, the Finance Committee voted unanimously to shift these funds to the new company, presuming that the costs will not be increased and contingent upon one additional investigation by Dr. Dan Tosteson, a member of our Finance Committee, with the Financial Advisor of Harvard University about the relative merits of the two firms. Assuming favorable information regarding these two matters, these funds will be transferred.

ERNEST D. GARDNER MEMORIAL FUND

In memory of the late Professor Ernest D. Gardner, a memorial fund has been established for the Carnegie Embryological Collection, in which Professor Gardner had a very great interest and of which he was Associate Director. Contributions may be made to the Ernest D. Gardner Memorial Fund, Carnegie Embryological Collection, and sent to the Carnegie Laboratories of Embryology, University of California, Davis, California 95616. All contributions will be acknowledged.

NOTES FROM CAPITOL HILL

B. A. Curtis

Chairman, Committee on Public Affairs
and Public Information

As this issue goes to press, the NIH appropriations bills are coming out of subcommittee. I testified before the House Subcommittee in April and stressed the importance of investigator initiated research. I followed the Coalition for Health Funding guidelines which would add sufficient funds to increase the percent of approved grants funded from 28 to 50%. The House Subcommittee has added 305 million to the NIH budget, an increase of 11.4%. The figures from the Senate are not so high, unfortunately, but some real growth can be expected.

The Bill (HR-9251) containing the provision to return NRSA predoctoral fellowships to a tax-free status and postdoctorals to a $300/mos exemption passed the Senate. It has now returned to the House so that differences in the versions passed by House and Senate can be worked out. A staff member to one of the conferees told me there did not appear to be any significant differences between the two bills and rapid passage could be expected.

I will keep Departments of Physiology informed.

News from IUPS

The forthcoming issue of the IUPS Newsletter will bring information about a generous gift to the IUPS in memory of Wallace O. Fenn. This fund has been set up by the IUPS Council as an endowment carrying Dr. Fenn's name. It has also decided that the income from the fund will be used as a prize, at each IUPS Congress, for the outstanding communication presented by a young physiologist. The mechanism for making this selection will be activated at the time of the Congress in Budapest in 1980. The Newsletter will carry further details.

Members should be reminded that the IUPS is incorporated in the District of Columbia and is recognized as a tax-exempt organization under the terms of 503(c)3 of the Internal Revenue Code. Gifts to the IUPS for purposes consistent with its mission will be most gratefully received and may be considered tax-deductible.

The author, Chairman of the Department of Physiology at the University of Michigan Medical School was appointed William Beaumont Professor of Physiology by University of Michigan Regents at their meeting April 21, 1978.

INSTRUCTIONS FOR APPLYING FOR APS MEMBERSHIP

At the April 1977 business meeting the proposed Bylaws Amendment for creating a new membership category for Students was passed. This Bylaw Amendment appears under Section 7 of Article III of the Constitution, printed below.

CURRENT APPLICATION FORMS

Published in each issue, the Physiologist shall routinely carry one copy of the current application form (following). This form will serve for all categories of membership. Any member desiring to sponsor more than one applicant may use a Xerox copy of this form. Any application submitted on an out-dated form will be returned to the sponsor to be redone on the acceptable form.

One application form serves all membership categories. There are, however, specific sets of instructions for each category. Therefore it is essential that sponsors and applicants carefully attend to those instructions specific to their desired category.

GENERAL INSTRUCTIONS

FOR ALL CATEGORIES:

Use only the current application form. Check the box indicating the category of membership for which you are applying. Use the SPECIAL INSTRUCTIONS for that category when filling out the form. Type the Application. Fill out all applicable spaces. Only completed applications will be reviewed.

The Bibliography must be submitted in the form found in the Society's journals. An example of the correct form is:

JONES, A.B., and C.D. Smith. Effect of organic ions on the neuromuscular junction in the frog. Am. J. Physiol. 220:110, 1970.

Send no reprints.

Deadline Dates: Completed applications received between February 1 and July 1 are considered for nomination by the Council at the Fall Meeting. Applications received between July 1 and February 1 are considered for nomination by the Council at the Spring Meeting. Applications are not complete until all materials, including sponsor's letters, are received.

QUALIFICATIONS (Except Students):

The Membership Advisory Committee uses the following 5 categories in evaluating an application:

1. Educational History. Academic degree and postdoctoral training are evaluated and assessed with regard to how closely the applicant's training has been tied to physiology.
2. Occupational History. Particular emphasis is given to those applicants who have a full time position in a department of physiology, or are responsible for physiology in another department. Relatively high ratings are given to people with positions in clinical departments and to people functioning as independent investigators in commercial or government laboratories.
3. Contributions to the Physiological Literature. This category is of major importance. The applicant's bibliography is evaluated on the basis of publications in major, refereed journals which are concerned with problems judged to be primarily physiological in nature. Emphasis is given to papers published as the result of independent research. Special note is taken of publications on which the applicant is sole author or first author.
4. Interest in and Commitment to Teaching Physiology. This evaluation is based on: (1) the fraction of the applicant's time devoted to teaching, (2) publications related to activities as a teacher including production of educational materials, and (3) special awards or other recognition the applicant has received for outstanding teaching effectiveness.
5. Special Considerations. This category permits the Membership Advisory Committee to acknowledge unique accomplishments of an applicant. These might be excellence in a specific area, or unusual contributions to Physiology resulting from talents, interest or a background substantially different from the average.

SPONSORS:

Primary responsibility for membership rests with the two sponsors who must be regular members of the Society. Sponsors should discuss the appropriateness of the selected category of membership in this Society with prospective applicants.

Each sponsor should write an independent confidential letter about the candidate using the five categories listed above to evaluate the candidate.

CHECK LIST:

1. Original copy of application signed by both sponsors.
2. Application on a current form, including the bibliography (1 original and 7 copies).
3. Mail the original, which has been signed by the two sponsors, plus 7 copies to:

Executive Secretary
American Physiological Society
9650 Rockville Pike
Bethesda, Maryland 20014

SPECIAL INFORMATION AND INSTRUCTIONS

FOR REGULAR MEMBERSHIP

Bylaws of the Society:

Article III, Section 2 - Regular Members. Any person who had conducted and published meritorious original research in physiology, who is presently engaged in physiological work, and who is a resident of North America shall be eligible for proposal for regular membership in the Society.

IF ALIEN: Please attach a letter and 7 copies stating visa status and type of passport and giving evidence of intent to stay in North America.

Duties and Privileges:

1. Hold Elective Office.
2. Vote at Society Meetings.
3. Serve on Committees, Boards and task forces.
4. Serve on Federation Boards and Committees.
5. Sponsor New Members.
6. Orally present or co-author a contributed paper and sponsor a non-member authored paper at the Fall scientific meeting.
7. Orally present or co-author one contributed scientific paper at the annual Federation meeting or sponsor one paper.
8. Receive The Physiologist.
9. Receive Federation Proceedings, Public Affairs Newsletters and annual Membership Directory.
10. Subscribe to handbooks and periodicals published by the Society at membership rates.
11. Register to attend scientific meetings of the Federation and the APS Fall meeting at membership rates.
12. Participate in FASEB Member's Life Insurance Program, Disability Program and in Hospital Protection Plan. (For Residents of the United States, its territories or possessions).
13. Eligible to receive the Daggs Award.
14. Eligible to be selected as Bowditch Lecturer (members under 40 years of age).

FOR CORRESPONDING MEMBERSHIP

Bylaws of the Society:

Article III, Section 3 - Corresponding Members. Any person who has conducted and published meritorious research in physiology, who is presently engaged in physiological work and who resides outside of North America shall be eligible for proposal for corresponding membership in the Society.

Duties and Privileges:

1. Serve on Society Committees, Boards and Task Forces.
2. Serve as one sponsor of new Corresponding Members (One regular member must be sponsor of a new Corresponding Member).
3. Orally present or co-author a contributed paper and sponsor a non-member authored paper at the Fall scientific meeting.
4. Orally present or co-author one contributed scientific paper at the annual Federation meeting or sponsor one paper.
5. Receive The Physiologist.
6. Receive Federation Proceedings, Public Affairs Newsletters and annual Membership Directory.
7. Subscribe to handbooks and periodicals published by the Society at membership rates.
8. Register to attend scientific meetings of the Federation and the APS Fall meeting at member rates.

FOR ASSOCIATE MEMBERSHIP

Bylaws of the Society:

Article III, Section 5 - Associate Members. Persons who are engaged in research in physiology or related fields and/or teaching physiology shall be eligible for proposal for associate membership in the Society provided they are residents of North America. Associate members may later be proposed for regular membership.

Duties and Privileges:

Same as for Regular Members except for the privilege of:

1. Holding Executive Office, or membership on certain committees.
2. Voting at Society Meetings.
3. Sponsoring New Members.
4. Receiving the Daggs Award.
5. Selection as Bowditch Lecturer.

FOR STUDENT MEMBERSHIP

Not all questions on the application form may be appropriate — Please place NA next to any such question.

Bylaws of the Society:

Article III, Section 7 - Student Members. Graduate students in physiology who have completed their preliminary examinations for the doctoral degree provided they are residents of North America. No individual may remain in this category for more than five years.

Duties and Privileges:

1. Present one contributed paper at the Fall Scientific meeting with the endorsement of the student's advisor.
2. Receive The Physiologist.
3. Subscribe to Handbooks and Periodicals at member rates.
4. Register to attend scientific meetings of the Federation and the APS Fall meeting at student rates.

Submit original and 7 copies of application and supporting documents.

This Form is Valid Only for 1978

APPLICANT'S LAST NAME _____

Date _____

THE AMERICAN PHYSIOLOGICAL SOCIETY

9650 Rockville Pike, Bethesda, MD 20014

MEMBERSHIP APPLICATION FOR:

- ☐ REGULAR
- ☐ CORRESPONDING
- ☐ ASSOCIATE
- ☐ STUDENT

CURRENT MEMBERSHIP CATEGORY; YEAR ELECTED _____

See Instructions

Name of Applicant: _____
First Middle Last

Mailing _____ Birth Date: _____

Address _____ Citizenship: _____

_____ Country of Permanent Residence:* _____

_____ Telephone No.: _____

*Alien residents of North America attach 8 copies of Alien Registration Card or other evidence of intent to remain in North America.

1. **EDUCATIONAL HISTORY** (Predoctoral students indicate date preliminary examination was passed.)

Dates	Degree	Institution	Major Field	Advisor

Doctoral Dissertation Title: (if any)

Postdoctoral Research Topic:

2. **OCCUPATIONAL HISTORY**

Present Position:

Prior Positions:

Dates	Title	Institution	Department	Supervisor

SPONSORS

#1. Name: _____

Mailing Address: _____

_____

_____

_____

Telephone No. Zip Code

#2. Name: _____

Mailing Address: _____

_____

_____

_____

Telephone No. Zip Code

I have read the guidelines for applicants and sponsors and this application and attest that the applicant is qualified for membership.

#1 Signature _____ #2 Signature _____

Each sponsor must submit an original and 7 copies of a confidential letter of recommendation to the Society, under separate cover.

APPLICANT'S LAST NAME_____

3. **DESCRIBE YOUR PHYSIOLOGICAL TEACHING** – What percent of your time/effort is spent in teaching Physiology?_____

Describe in the space provided your teaching of physiology including course descriptions (content, format); supervision of pre-doctoral and post-doctoral students; special contributions (films, textbooks, etc.).

4. **INTEREST IN THE SOCIETY** – List any APS Meetings attended by date and check the appropriate box for any papers.

SPRING (FASEB)			FALL (APS)		
Date	Presented	Coauthor	Date	Presented	Coauthor
_____	☐	☐	_____	☐	☐
_____	☐	☐	_____	☐	☐
_____	☐	☐	_____	☐	☐
_____	☐	☐	_____	☐	☐
_____	☐	☐	_____	☐	☐

List other scientific societies of which candidate is a member:

In the space provided state your interest in wanting to join the Society:

5. **SPECIAL CONSIDERATION** – Include any other contributions (Administrative, university, national service, awards and honors) that may be important to physiology.

6. **DESCRIBE YOUR RESEARCH** – What percent of your time/effort is spent in research?_____

Describe the fundamental physiologic questions in your research and how you have answered these questions. Limit the paragraph to the space provided.

7. **BIBLIOGRAPHY** – Attach a list of your publications under the following categories:
   1. Complete physiological papers, published or accepted for publication.
   2. Physiological abstracts (limit to ½ page).
   3. Other papers not primarily physiological (limit to ½ page).

The entire bibliography should not exceed 2 pages. Give complete titles and journal references with inclusive pagination. Use the bibliographic form found in the Society's journals. List authors in the order in which they appear in the publication.

CHARTER FOR THE SECTION ON THE NERVOUS SYSTEM

(Approved by Council April 1978)

ARTICLE I. *Name*

The name of this organization is the Section on The Nervous System of the American Physiological Society.

ARTICLE II. *Purpose*

The responsibilities of the Section on The Nervous System are:

1. To advise the American Physiological Society on matters of interest to neurophysiologists;
2. To coordinate activities with physiologists working primarily in other organ systems concerning nervous control of such systems;
3. To assist the Program Committee of the American Physiological Society on organizing and presenting scientific sessions, symposia and other programs of interest to neurophysiologists.

ARTICLE III. *Membership*

Membership in the Section on The Nervous System is automatic for any member of the American Physiological Society who has indicated neurophysiology as a primary or secondary interest.

ARTICLE IV. *Officers*

Section 1. Steering Committee. The Section on The Nervous System will be directed by a Steering Committee elected from the members of the Section. The Steering Committee shall be composed of at least nine but not more than 10 elected members. Each member shall serve a term of three years. Three new members shall be elected each year for terms to begin 1 October. Nominations for election to the Steering Committee will be made by the Steering Committee of the previous year, which will consider recommendations for nomination from members of the Section and will also attempt to balance the nominations in terms of subdisciplines within neurophysiology. Six nominations will be submitted to the membership by mailed ballots each year for three positions on the Committee. In addition, the representatives of other Sections within the American Physiological Society which are concerned with the nervous control of other organ systems, as identified by the Nervous System Steering Committee, may be invited to participate as full members of the Steering Committee. The participation of such representatives will be reviewed annually by the elected members of the Committee.

Section 2. Chairman and Vice-Chairman. The members of the Steering Committee shall elect a Chairman at a Fall meeting of the Committee to serve for a term of three years. The Chairman shall be the Section's representative on the Program Advisory Committee of the American Physiological Society and will be responsible for the assignment of duties related to organization of programs and symposia to other members of the Steering Committee as necessary. If a Chairman is elected whose term is due to expire before three years, he shall serve a full three-year term as Chairman but with the election of three additional members to the Committee as scheduled. A Vice-Chairman will be elected annually by members of the Steering Committee at their Fall meeting.

Section 3. Quorum for Conducting Business. The Steering Committee of the Section on The Nervous System will conduct business only when at least four of its regular members are in attendance.

Section 4. Meetings of the Steering Committee. The Steering Committee of the Section on The Nervous System will meet twice yearly at the annual Spring meeting of FASEB and at the Fall meeting of the Society for Neuroscience. Other business will be conducted through the efforts of the Chairman by telephone or mail.

ARTICLE V. *Other Committees*

The Chairman may appoint committees that are necessary for the proper conduct of the affairs of this section.

ARTICLE VI. Dues will not be assessed.

ARTICLE VII. *Modification of Charter*

Amendments for change of this charter will be proposed by two-thirds of the members of the Steering Committee and will be instituted upon approval by the APS Council.

ARTICLE VIII: Nothing in this statement of organization shall be construed as contrary to the Constitution and Bylaws or operational guidelines of the American Physiological Society.

APS NERVOUS SYSTEM SECTION SYMPOSIA CONTRIBUTIONS

Organizers of Spring Meeting neurophysiology symposia obtained a number of donations to partially support the six APS Nervous System Section-sponsored symposia. These donors were cited in the printed program. However, one contribution was received too late for publication and the Section wishes to publicly thank the officers of Polysystems, Inc. for their support of the Symposium – Neural Antigens, Potential Probes for Neurophysiology, chaired by W. G. Shain, Jr.

SPECIALTY INTEREST GROUPS

Council has encouraged specialty groups to organize as Sections within the Society. It was felt that the establishment of Sections is most logical since the Society represents an important umbrella under which these small groups can interact at the APS meetings. If a Section has not been formally organized, the Council may appoint a Task Force to temporarily represent the special interest area.

Organized special interest Sections and Task Forces are currently chaired by the following individuals:

Task Force on Cardiac Mechanics
Karl T. Weber
Cardiovascular-Pulmonary Div.
Dept. of Medicine
Hospital of the Univ. of Pennsylvania
3400 Spruce St.
Philadelphia, PA 19104

Task Force on Cell Physiology
Robert E. Forster
Dept. of Physiology, G-4
University of Pennsylvania
School of Medicine
Philadelphia, PA 19174

Section on Physiology in Clinical Sciences
Thomas E. Andreoli
University of Alabama
School of Medicine
University Station
Birmingham, AL 35294

Comparative Physiology Section
Frank Conte
Dept. of Zoology
Oregon State University
Corvallis, OR 97331

Environmental, Thermal and Exercise Physiology (ETEP) Section
Ethan R. Nadel
John B. Pierce Fndn. Lab.
290 Congress Ave.
New Haven, CT 06519

Gastrointestinal Section
James F. Long (Secy/Treas.)
Dept. of Pharmacology
Schering Corporation
Bloomfield, NJ 07003

Nervous System Section
David O. Carpenter (Chmn., Steering Committee)
Neurobiology Dept.
Armed Forces Radiobiology Res. Inst.
Bethesda, MD 20014

Renal Section
Sidney Solomon (Chmn., Steering Committee)
Dept. of Physiology
School of Medicine
University of New Mexico
Albuquerque, NM 87131

Task Force on Respiratory Physiology
Norman Staub
Dept. of Physiology
Cardiovascular Research Inst.
University of California Sch. Med.
San Francisco, CA 94143

Task Force on Physiological Chemistry
Robert E. Fellows
Dept. of Physiology & Biophysics
University of Iowa Coll. Med.
Iowa City, IA 52242

GUIDING PRINCIPLES IN THE CARE AND USE OF ANIMALS

The accompanying statement of Guiding Principles in the Care and Use of Animals has recently been modified by Council on the recommendation of Dr. Kermit A. Gaar, Jr., Chairman of the Committee on Guiding Principles on the Care and Use of Animals.

This statement is routinely sent to all new members of the Society for their use, either as personal information or for posting in locations where research animals are housed or used in laboratory work for the information of staff members.

SIXTH INTERNATIONAL CONGRESS OF ENDOCRINOLOGY

The Congress will be held in Melbourne from February 10th to 16th, 1980. Various satellite symposia will be held, and the International Thyroid Conference will be held in Sydney, February 5th to 9th, 1980.

The First Circular was distributed to national Endocrine Societies in May, 1978. Further information and copies of the First Circular may be obtained from:—

Professor D. M. deKretser,
The Secretary,
Sixth International Congress of Endocrinology,
Box 611E, G.P.O.,
MELBOURNE. 3001
Australia.

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 federal, 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. Muscle relaxants or paralytics are not anesthetics and they should not be used alone for surgical restraint. They may be used for surgery in conjunction with drugs known to produce adequate analgesia. 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.

_____

Director of Laboratory

PLEASE POST

PLEASE POST

29th ANNUAL FALL MEETING
of the

AMERICAN PHYSIOLOGICAL SOCIETY

in conjunction with

AMERICAN SOCIETY OF ZOOLOGISTS

(Division of Comparative Physiology and Biochemistry)

Guest Society: UNDERSEA MEDICAL SOCIETY

October 22-27, 1978

Chase-Park Plaza Hotel
St. Louis, Missouri

Information can be obtained from:

1978 Fall Meeting Office

9650 Rockville Pike

Bethesda, MARYLAND 20014

SPECIAL TRAVEL ARRANGEMENTS FOR FALL MEETING

CHEVY CHASE TRAVEL, INC.

4715 CORDELL AVENUE, BETHESDA, MARYLAND 20014 U.S.A. Telephone 301—656-2021

Headquarters for
World-Wide Congress and Group Arrangements

TRAVEL PLANS TO: APS / ASZ (DCPB)/ UMS - FALL MEETING ST. LOUIS 1978

Group space has been reserved on the following regular scheduled flights. All fares and schedules are current as of March 1, 1978 and are subject to change.

All groups are based on a minimum of 10 persons, except for San Francisco and Los Angeles which require a minimum number of 40 persons. Anyone is eligible for these flights - BUT, YOU MUST TRAVEL TOGETHER IN BOTH DIRECTIONS - you cannot originate with one group and return with another.

A deposit of $50.00 per person is required to secure reservations. You will be billed for the balance 45 days prior to departure and payment will be due on receipt of the bill. Tickets will be mailed to you approximately three weeks prior to departure PROVIDED YOUR PAYMENT HAS BEEN RECEIVED. All tickets must be written 21 days prior to departure and reservations will be accepted on a "first come-first served" basis - SO PLEASE GET YOUR RESERVATIONS IN EARLY.

WE CANNOT ACCEPT CREDIT CARD PAYMENTS ON GROUP FLIGHTS.

Please Note: Although there are excursion fares which can be booked individually and are not much higher than the group fares, they do have to be booked 7 days in advance and require a minimum stay of either a Saturday night or 6 nights, whereas the group flights are tailored to fit the times of the Meeting. The same applies to the "Super Saver" fare, which requires a 30 day advance booking and a minimum stay of 7 days.

CANCELLATION: Full refund will be made up to 21 days prior to departure after which time a 10% penalty will be charged. If after 15 days your cancellation causes the group to drop below the required minimum number of passengers, there will be no refund.

THE GROUP FLIGHTS ARE LISTED ON THE REVERSE SIDE:

Return to:
Chevy Chase Travel, Inc.
4715 Cordell Avenue
Bethesda, MD 20014 301-656-2021

RESERVATION FORM

APS/ASZ(DCPB)/UMS St. Louis 1978

Please reserve _____ seats for me on Group Flight #_____. My check in the amount of $_____ ($50.00 per person) is enclosed.

Name(s)_____

Address:_____

City:_____ State:_____ Zip Code:_____

Telephone: Office:_____ Home:_____

I understand the terms and conditions regarding deposit, final payment and cancellation and agree to same and accept on behalf of above listed persons.

_____Signature _____Date

GROUP FLIGHTS

GROUP	FROM	TO	DATE	DEPART	ARRIVE	MEALS
#1	Boston	St. Louis	Oct. 22	12.30PM	2.18PM	Lunch
	St. Louis	Boston	Oct.27	4.40PM	7.58PM	Dinner
VIA TWA	GROUP FARE: $174.00		REGULAR FARE: $218.00			
#2	New York	St. Louis	Oct.22	11.00AM	12.34PM	Lunch
	St. Louis	New York-LGA	Oct. 27	5.30PM	8.35PM	Dinner
VIA TWA	GROUP FARE: $155.00		REGULAR FARE: $194.00			
#3	Washington, D.C.	St. Louis	Oct.22	11.10AM	12.18PM	Lunch
	St. Louis	Washington, D.C.	Oct.27	5.15PM	7.58PM	Dinner
VIA TWA	GROUP FARE: $134.00		REGULAR FARE: $168.00			
#4	Philadelphia	St. Louis	Oct.22	11.00AM	12.17PM	Lunch
	St. Louis	Philadelphia	Oct. 27	6.40PM	9.32PM	Dinner
VIA TWA	GROUP FARE: $147.00		REGULAR FARE: $184.00			
#5	Pittsburgh	St. Louis	Oct.22	12.50PM	1.25PM	Snack
	St. Louis	Pittsburgh	Oct.27	7.10 PM	9.32PM	Dinner
VIA ALLEGHENY	GROUP FARE: $115.00		REGULAR FARE: $144.00			
#6	New Orleans	St. Louis	Oct.22	1.50PM	3.19PM	Snack
	St. Louis	New Orleans	Oct.27	6.10PM	7.37PM	Dinner
VIA DELTA	GROUP FARE: $122.00		REGULAR FARE: $152.00			
#7	Detroit	St. Louis	Oct.22	12Noon	12.23PM	Snack
	St. Louis	Detroit	Oct.27	7.00PM	9.14PM	Snack
VIA TWA	GROUP FARE: $99.00		REGULAR FARE: $124.00			
#8	Denver	St. Louis	Oct.22	1.25PM	4.15PM	Lunch
	St. Louis	Denver	Oct.27	6.35PM	7.42PM	Dinner
VIA TWA	GROUP FARE: $142.00		REGULAR FARE: $178.00			
#9 *	San Francisco	St. Louis	Oct.22	7.40AM	1.12PM	Breakfast
	St. Louis	San Francisco	Oct.27	6.30PM	8.35PM	Dinner
VIA TWA	GROUP FARE: $208.00		REGULAR FARE: $320.00			
#10 *	Los Angeles	St. Louis	Oct.22	9.15AM	2.41PM	Breakfast
	St. Louis	Los Angeles	Oct.27	6.30PM	8.22PM	Dinner
VIA TWA	GROUP FARE: $189.00		REGULAR FARE: $298.00			

* If there are not sufficient participants to operate two West Coast flights, they will be combined - using whichever city is more popular.

SPECIAL SESSION AT APS FALL MEETING

Results of US Biological Studies Associated With The Spaceflight of USSR Cosmos 936

The United States and the Soviet Union have established a cooperative program to investigate the effects of spaceflight on man, animals, and other biological specimens. In November 1975, the unmanned Soviet spacecraft Cosmos 782 was launched containing a variety of biological materials to support eleven studies in which US investigators participated. On August 3, 1977, a second unmanned Soviet satellite containing US biological materials was launched and remained in orbit 18.5 days. The spacecraft, Cosmos 936, contained twenty young male Wistar SPF rats which were exposed to hypogravity throughout the mission. An additional ten rats were subjected to centrifugation (I x g) throughout the flight and presented scientists with the opportunity to study the effectiveness of artificial gravity in spaceflight. Also aboard the Cosmos 936 were other biological specimens, including *Drosophila melanogaster* and higher and lower plants.

The Wistar rats flown on Cosmos 936 were utilized primarily to study the effects of spaceflight on: bone growth and structure; red blood cell hemolysis and life span; the conversion of carbohydrates to lipids in the liver; and, the structure of muscle. Other studies focused on the aging process in *Drosophila melanogaster* during spaceflight; damage due to cosmic radiation in rat retinal tissue; and, the measurement and characterization of the radiation environment within the spacecraft.

Through the cooperation of the National Aeronautics and Space Administration's Ames Research Center, results of the US studies associated with Cosmos 936 will be presented at the APS Fall Meeting as a special session of invited papers. A description of the overall mission and a discussion of potential future life sciences missions will also be presented.

CURRENT SCHEDULE OF FUTURE MEETINGS

1978 Fall – St. Louis, Missouri – October 22-27
1979 Spring – Dallas, Texas – April 6-10 (Total FASEB meeting 1-10)
1979 Fall – Campus Specialty Meeting – Michigan State Univ., August 22-24, "Regulation of Anterior Pituitary Function by Hypothalamic Neurotransmitters."
Organizer: Joseph Meites
1979 Fall – New Orleans, Louisiana – October 14-19
1980 Spring – Anaheim, California – April 13-18
1980 Fall – Toronto, Canada – October 12-17
1981 Spring – Atlanta, Georgia – April 12-17
1981 Fall – Boston, Massachusetts – November 1-6
1982 Spring – New Orelans, Louisiana – April 18-23
1982 Fall – San Diego, California – October 10-15

PROGRAM ADVISORY COMMITTEE

Members of the Program Advisory Committee are responsible for representing APS special interest areas. These individuals are responsible for establishing topic categories for the Spring and Fall Meetings as well as the programming of contributed abstracts into slide and poster sessions. They also recommend topics and organizers for special sessions and symposia. The following are the current members of the Advisory Committee for the indicated specialty areas (the Chairman is H. Maurice Goodman, the Chairman of the Program Executive Committee):

Circulatory Physiology (Peripheral), Brian Duling
Circulatory Physiology (Heart), Eugene Morkin
Comparative Physiology, A. E. Kammer
Environmental Physiology (ETEP), X. J. Musacchia
G.I. Physiology, Michael J. Jackson
Membrane and Transport, S. I. Helman
Muscle Physiology, M. J. Kushmerick
Neural Control of Circulation, J. W. Manning
Neuroendocrinology, Joseph Meites
Neurophysiology, David Carpenter
Renal Physiology, L. P. Sullivan
Respiratory Physiology, N. C. Staub
General Endocrinology & Reproduction, H. M. Goodman

NOTICE OF FIRST ANNUAL AWARD FOR EXCELLENCE IN RENAL RESEARCH

Beginning this year an award will be presented to young investigators for outstanding work presented at the Fall Meetings of the American Physiological Society. Each renal session will be attended by members of the award committee. In addition, each chairperson may nominate one or more individuals. Four major criteria will be used in assessing the papers.

1. Does the paper present new information in an area in which data are lacking? This may be done by use of new methodology or a new or unique use of existing methods to obtain data which are not currently available.
2. Does the paper present significant data which justify rejection or acceptance of an hypothesis of major significance?
3. Does the paper present evidence which justifies presentation of a new hypothesis?
4. Is the quality of presentation sufficiently good to merit an award?

Presentation of the award will be made at the renal dinner at the Spring FASEB meeting.

COUNCIL OF ACADEMIC SOCIETIES BRIEF

ASSOCIATION OF AMERICAN MEDICAL COLLEGES • 1 DUPONT CIRCLE NW • WASHINGTON DC
(202) 466-5100 SPRING, 1978 VOL. 3, NO. 3

The CAS Brief is prepared by the staff of the AAMC's Council of Academic Societies and is distributed through the auspices of your member society.

REVIEW OF THE STATUS OF THE FEDERAL RESEARCH BUDGET. At the end of the Congressional Easter recess, the 1978 legislative year took a hopeful turn. The echoes from President Carter's 1977 recommitment to basic research had hardly died when the NIH budget was unveiled. Despite the President's words, the $2.885 billion budget proposed for NIH for FY 1979 contained an increase of only $59.6 million (2.1%) over FY 1978, far less than the amount needed simply to keep pace with inflation. ADAMHA was to be held to an increase of $69 million (6.8%) over its $1.010 billion 1978 budget. However, research and research training in ADAMHA were slated to receive a sizeable increase of $37 million (+21%).

The NIH budget presentation was disheartening because NIH proposed to increase spending for basic biomedical research by $93 million in keeping with the President's commitment. But NIH proposed to accomplish this increase in basic research by reallocating funds within the budget. As a result, the Administration's proposal would mean that research training, the Biomedical Research Support Program, and applied research (e.g., clinical trials and research contracts) would be the losers of approximately $52 million.

Some observers were hopeful that the Congress would run "true to form" and adjust the President's budget to higher levels with more funds for clinical and applied research in areas where it was hoped that immediate practical results could be obtained. To some extent, this appears to be true and the Congressional committees have now called for an increase in the budget ceiling for NIH. The House Interstate and Foreign Commerce Committee has recommended increases of $249 million over the President's budget (specifically for the Cancer and the Heart, Lung and Blood Institutes and for research training). Senate Committees have recommended a $357 million increase in the budget ceiling to make funds available for all the programs of NIH except the Director's office, the Library of Medicine, and the Fogarty Center. Time will tell how much of these recommended funds the economy-minded budget committees will accept, but the picture is cautiously hopeful.

FACULTY SOLICITATION BY FOREIGN MEDICAL SCHOOLS CATERING TO U.S. STUDENTS. A number of schools of questionable quality have been established in foreign countries and in Puerto Rico, apparently for the purpose of attracting disappointed American students who have not gained admission to a U.S. school accredited by the Liaison Committee on Medical Education. Characteristically, these schools or agencies representing them in this country recruit students by advertising in U.S. newspapers and distributing posters and brochures to premedical advisers. These advertisements build credibility for the school by implying various forms of official recognition--listing in the WHO World Directory of Medical Schools, eligibility for COTRANS, receipt of a charter from the local government--although none of these official-sounding facts stands for accreditation or any other form of review or recognition of educational quality.

Some of these schools are now seeking to add to their credibility by soliciting "visiting professors" from among the faculty of U.S. medical schools. These professorships may consist of nothing more than a few lectures during an all-expenses-paid vacation and the use of the faculty member's name for advertising purposes. U.S. teaching hospitals may also be asked to provide clinical clerkships for students of these schools, either through formal agreement or by informal arrangement with members of the medical staff. In this way, these schools can advertise that they are staffed by U.S. medical school faculty members and that their students can complete their medical education in the United States.

In assessing solicitations from foreign schools or unaccredited domestic schools, U.S. medical faculty and teaching hospitals should exercise due caution. Before lending their names, services, or facilities to these institutions, U.S. faculty members and teaching hospitals should become thoroughly familiar with the quality of the educational experience offered at the foreign institution. They should not allow their names to be used in any scheme to raise false expectations or otherwise exploit American students.

For further information, contact James R. Schofield, M.D., Director, Division of Accreditation, AAMC.

RESEARCH BILLS PROGRESS IN CONGRESS. Both Houses of Congress held hearings on two bills (H.R. 10908 and S. 2450) that would modify the Public Health Service Act with respect to the Cancer and the Heart, Lung and Blood Institutes and research training programs. The Cancer Board will very likely be changed so that its members are appointed--like the other advisory councils of NIH--by the Secretary of HEW rather than by the President. This will strengthen the authority of the NIH Director and draw the Cancer Institute closer to the NIH. The bills also increase the level of authorized funding for the Heart, Lung and Blood Institute.

These bills amend and extend for three years the National Research Service Awards Act (NRSA), the only authority under which research training may now be conducted by NIH and ADAMHA. The Office of Management and Budget (OMB) continues to oppose federal support of research training, particularly institutional training grants. As recently as January 1978, OMB proposed to phase out the institutional training grant programs beginning in FY 1979. AAMC has opposed this action vigorously and, with the support of many academic societies, has persuaded both the House and the Senate to accept the principle that at least 50% of training awards made by NIH and ADAMHA must be made as institutional training grants. Such a requirement has now been written into the law, thus effectively countering the OMB position for at least three years.

In other changes, payback for those Ph.D.s unable to find research or teaching positions after graduation has been made more equitable, and cost-of-living stipend increases have been mandated.

On the subject of taxability of research training grants, the Tax Treatment Extension Act (H.R. 9251) has been amended in the Senate to provide relief for calendar years 1974-1979. However, this measure has been stalled pending the conclusion of the Panama Canal treaty debate. Thus, although it appears that no legislation will be enacted until after April 17, the outlook for final approval remains hopeful.

For further information, contact Thomas E. Morgan, M.D., Director, Division of Biomedical Research, AAMC.

EXCHANGE OF LETTERS WITH PAST-PRESIDENTS

The following letter is an extension of earlier replies (April 1978 issue) in response to a letter sent to Past-Presidents of APS.

Hymen S. Mayerson:

I have just re-read the Past-President's Address which I gave in Miami on the occasion of the 75th birthday of the Society. I entitled it "Physiology and Physiologists in the Gay Nineties." I reviewed the first volume of the American Journal of Physiology and then went on to discuss the material, particularly as to the elaborate set-ups used to obtain and record data. It was fun.

But things are different now. The kymograph is gone, so is the inductorium and the nice levers we all were accustomed to use. It wouldn't be near as much fun to do now and I don't know what the equipment will be like in 1987. But the old equipment served its purpose—we were in the descriptive phase of physiology then—we progressed to the analytic phase and new approaches and new vocabularies. And this continues apace, the march from the general to the specific and then back to the general, only this time, it's a new ball game or rather a number of new ball games. And there will, naturally, be more new societies as we begin to burrow for new gold "in them thar hills." Physiology was exciting in 1887—in 1962—and it will always be so! We shall continue—tongue in cheek—to moan about the "good old days" but really be excited with all the marvelous new facts and concepts that have and will continue to be elucidated.

LETTER TO THE EDITOR

The following letter was addressed to Dr. William C. Gibson:

"A physiologist friend has called my attention to the interesting paragraph about my father-in-law, the late Dr. Otto Loewi, in your article "Physiological Progress," The Physiologist, Vol. 21, No. 1, p. 17 (1978).

"This paragraph gives due prominence to the lifelong friendship between Otto Loewi and Sir Henry Dale, and to the invaluable help given by Sir Henry when my father-in-law came to England and later to this country as a refugee. It is also perfectly true that the Nazis in 1938 robbed Otto Loewi of his half of the Nobel prize awarded in 1936 (and of all his other possessions). However, in the interest of historical fact I have to tell you that the story at the end of your paragraph, however much in Sir Henry's character, is a pleasant but unfounded legend: that Loewi, on his arrival in England, was presented by Sir Henry with his own half of the prize. In fact, my father-in-law's Nobel money was never replaced or restituted."

Yours sincerely,

Ulrich Weiss
Laboratory of Chemical Physics
National Institute of Arthritis
Metabolism and Digestive Diseases

ST. LOUIS AND THE AMERICAN PHYSIOLOGICAL SOCIETY

The American Physiological Society and American physiology have many roots in St. Louis, Missouri.

If it can be said that the Society was born in 1887 in New York City, it equally holds that APS "came of age" in St. Louis in 1923.

The incorporation of the Society in Missouri came about in that year, the incorporation meeting being held in the Chase Hotel, the ancestor of the Chase Park Plaza, the site of our 1978 Fall Meeting.

Missourians have made many contributions to American physiology, and William Beaumont, considered by many to be the first native American physiologist, is buried there.

Dr. Beaumont's grave is located in Bellefontaine Cemetery in St. Louis, where it is the scene of an annual ceremony. The St. Louis Medical Society places a wreath on his grave on each anniversary of Beaumont's birthdate, November 21, 1785. Dr. Beaumont lived in St. Louis from 1834, first as an Army Surgeon, then in private practice until his death in 1853. He was one of the founders of the Medical School of St. Louis University, serving as Chairman of Surgery, beginning in 1837.

WHAT HAPPENED TO THE THIRD BOTTLE OF ST. MARTIN'S GASTRIC JUICE?

Horace W. Davenport
William Beaumont Professor of Physiology,
The University of Michigan

The author, Chairman of the Department of Physiology at the University of Michigan Medical School was appointed William Beaumont Professor of Physiology by University of Michigan Regents at their meeting April 21, 1978.

For many years the Department of Physiology of The University of Michigan has had a monthly History of Physiology Seminar in which members of the faculty tell graduate students and anyone else who wants to attend about historical topics which interest them. Since 1966 the talks by Horace W. Davenport have been recorded, transcribed, edited and duplicated. They have been received with sufficient favor to encourage the belief that some of them might be of interest to members of the Society. Accordingly, Davenport has revised an early one for publication in *The Physiologist.* In making the revision, he has removed extraneous material, local references and a certain amount of libel, but he has attempted to retain something of the informality appropriate to a convivial occasion in his home.

Acid in the stomach has always received more attention than it deserves. I, for one, wasted 20 years of my life trying to discover how it is secreted, and all I accomplished was to turn up the odd fact that the stomach will secrete hydrobromic acid or even hydroiodic acid (1,2) if it is given a chance. My interest in acid made me look up something of its history, and I will tell you part of the story of how we know the stomach secretes acid.

Before we have acid in the stomach we must have chemical digestion. Réaumur is usually credited with having established the fact of chemical digestion, because he published in 1752 an enormous memoir on digestion in birds (3). I looked it up in our library, and I was impressed by the fact that the book I was holding was published when Louis XV was King of France and Madame de Pompadour was saying "Let them eat cake." Réaumur described at great length in elegant French his experiment of putting a perforated metal tube containing meat in the stomach of a kite. The kite regurgitated the tube, and the meat was found to be dissolved. Réaumur found that juice squeezed from a sponge swallowed by the bird could digest meat. He also found that gastric juice of a bird turned blue litmus paper red.

If you follow the trail of chemical digestion past John Hunter and the inevitable Lazzaro Spallanzani, you will encounter the name of Edward Stevens who is said to have flourished *circa* 1770. Fulton and Young (4) called him "an obscure Edinburgh student whose dates have never been ascertained beyond that of his thesis which was defended and published in 1777." Fulton and Young reproduced a brief extract of the thesis by Stevens which had been published by Spallanzani in 1784.

Well, Stevens' dates, and almost everything else about him have been ascertained. Awhile back I was wandering through our library with no particular object when my eyes lighted on a book on Stevens written by Stacey B. Day (5). Day, a physician, poet, novelist and playwright, had traced Stevens with the same semi-mad enthusiasm that I displayed in my quest for Albert Moser, Cannon's disappearing collaborator (6), and consequently I was delighted to read about Stevens and to make Day's acquaintance. Stevens actually was an American, born in the West Indies, and he quite possibly may have been Alexander Hamilton's legitimate half-brother. Day found all the documents describing Stevens' later career as, among other things, American Consul General in Santo Domingo during the time of Toussaint Loverture, who will be familiar to you, at least, through Wordsworth's sonnet. Stevens studied medicine in Edinburgh, and for graduation he presented the thesis: *De Alimentorum Concoctione* to the medical faculty. Day has published a translation of the thesis for the benefit of degenerate modern physiologists who can't read Latin.

Stevens' first ten experiments were "made at Edinburgh upon an Hussar, a man of weak understanding, who gained a miserable livelihood, by swallowing stones for the amusement of the common people." Stevens had the Hussar swallow a perforated silver sphere containing four and a half scruples of raw meat. The sphere was voided in twenty-one hours, and the meat was found to have lost one and a half scruples. Similar experiments with cooked meat and with vegetables and seeds were terminated when the Hussar left Edinburgh, and Stevens "was obliged to have recourse to dogs and ruminating animals." After doing essentially similar experiments on these, Stevens killed a fasting dog to obtain gastric juice, and with this he demonstrated that the juice dissolved mutton, veal, lamb and vegetable substances without fermentation. In fact, gastric juice stopped the putrifaction of mutton. Stevens concluded that "a powerful solvent, secreted by the coats of the stomach, . . . converts the aliment into a fluid, resembling the blood."

In Stevens' day, medical education, when it was not simply an apprenticeship to a "respectable physician," consisted of attending a brief course of university lectures, enlivened by occasional demonstrations. The medical faculty, then as now, said: "We must teach them to think"; them being the medical students. To teach students to think, the faculty required a thesis. The Medical School of the University of Pennsylvania did this, and on June 8, 1803, John Richardson Young presented *"An Experimental Inquiry into the Principles of Nutrition and the Digestive Process"* to the faculty at Penn.

I was at Penn, long, long ago, and I know about Young. There was a plaque on the wall of the Physiology Department, giving his dates, 1782-1804. I was extremely hard up, and my way of passing my free time was to roam the stacks of the library. I ran into the medical theses. There are shelves and shelves of them. I took out the 1803 volume, and I read Young's thesis. In fact, I read all the theses in the same volume, and I wish I had taken notes. They are chiefly materia medica. Each is prefaced by a beautiful hand-colored engraving of some native American plant, and the thesis describes what

happens when one eats three ounces of the dried leaves. The pulse increases and becomes thready. Here is the ghost of William Whithering wandering around America. There is also a demonstration of Hegelian logic: thesis and antithesis, for one thesis shows that digestion is *not* a chemical process.

You too can read Young's thesis without going to Penn, for William Rose has published a facsimile edition of it (7). Mendel at Yale gave a seminar on Young and got Rose interested in him. Then the history of Young was uncovered by Howard Kelly who read a paper on Young to the Johns Hopkins Historical Club on April 8, 1918. This has been published (8), and you can look it up to find all that is known about Young. I won't tell you who Rose and Mendel and Kelly were, but you ought to know they were good men who did important work in their day.

What Young did in a very short time was to do away with theories of innate heat and vital spirits in the process of digestion. He disproved that putrifaction and fermentation were part of digestion, and he showed the presence of acid in gastric secretion. He did well-thought-out experiments on animals and on himself. He got gastric juice *in vitro* and studied its properties. He showed that it digested meat and that it prevented putrifaction.

Here are pages 40 to 42 from his thesis:

"The following experiments satisfied us to what this acid was to be referred — A piece of fresh veal was introduced into the empty stomach of one of the large frogs. In two hours it was examined — the surface was a little tender; upon being touched with litmus paper, it was turned red. Here digestion was progressing quite regular, yet an acid was present. It appeared impossible at the time to conceive, the meat could become sour, in so very short a time, and at so very low a temperature; it was therefore conjectured, the acid was to be referred not to the meat, but to the gastric juice; which the following experiments confirmed us in. [No modern Graduate School would let Young get away with such punctuation.] A frog was kept starving for two days: a piece of litmus paper was then forced into its empty stomach, by means of a pair of forceps; upon being drawn out, it was covered with gastric juice, and the litmus turned red. The naked gastric juice was afterwards, often examined, by bringing it out of their stomachs with a tea spoon, and constantly found to be slightly acid. Being thus fully persuaded the acid, in the digested food of frogs, did not arise from a fermentation, but was to be referred to their gastric juice, we were lead by analogy to suppose, the acid of our own stomachs was to be attributed to the same origin. But this analogical reasoning might be called mere probability: the following experiment was therefore performed. Early in the morning my stomach being empty, I irritated my fauces, with a view of throwing up some gastric juice: though many efforts were made, none could be vomited. The following day, I took some meat on an empty stomach: in half an hour afterwards, by irritating my fauces, the meat was thrown up, and with it some gastric fluid: Upon being tested, an acid was very evidently present. Here no one can suppose the acid was to be referred to the meat. We have little hesitation, therefore, in saying, that the acid so constantly found in the stomach of man, and almost (probably) all animals, is to be referred to their gastric fluid.

"HAVING thus, we hope, traced the acid of the stomach to its proper origin, we next attempted to ascertain its nature by chemical tests. Mr. Mitchell being in good health, and having the power to ruminate, frequently threw up the contents of his stomach for me; which being filtered a transparent and acid fluid was obtained: on this fluid the following experiments were performed.

"I. To a portion of the fluid, acetate of lead was added, a white precipitation immediately took place: this being washed, muriatic acid was added, which decomposed it, a very white powder remaining at the bottom, and a fluid above.

"COMPARATIVE precipitation of urine and this fluid, by the above agents, were in every respect the same. The explanation of urine treated in this manner is, that phosphoric acid of this fluid, decomposes the acetate of lead, forming an insoluble phosphate of lead; this being washed, by the addition of muriatic acid it is decomposed, Plumbum cornuum or a muriate of lead formed, while the phosphoric acid remains in a liquid state above, which by disoxygenation affords phosphorus.

"THOUGH great accuracy, many and varied experiments are required to ascertain certainly, the presence of an unknown acid, yet we are disposed to believe that any person who had witnessed the great similarity in the comparative precipitations just mentioned, would have pronounced the same explanation was to be applied to both, or that the acid in the filtered fluid was the phosphoric."

This is the first attempt, a successful one, to demonstrate acid, its origin and its nature. He got phosphoric acid in his chemical analysis, and he added muriatic acid, which is hydrochloric acid, to his precipitate.

Young died a year later, apparently of tuberculosis, and his thesis had no influence at all. This raises the question of the value of obscure work. Did Leonardo da Vinci contribute anything to science?

The man who gets the credit for discovering the secretion of hydrochloric acid is William Prout, F.R.S., who lived from 1783 to 1850 and who was a practicing physician. Let me point out to the anti-medical group that constitutes graduate students in a medical school that this discovery and many more were made by M.D.'s who were hard at work taking care of patients. Prout published a short note in the Philosophical Transactions of the Royal Society (9).

"The contents of the stomach of a rabbit, fed on its natural food, were removed immediately after death, and repeatedly digested in cold distilled water till they ceased to impart any thing to that fluid. The whole of these different portions of fluid, which always exhibited strong and decided marks of acidity, were then intimately mixed together, and after being allowed to settle, were divided into four equal portions.

1. The first of these portions was evaporated to dryness in its natural state, and the residuum burnt in a platinum vessel; the saline matter left was then dissolved in distilled water, and the quantity of muriatic acid present determined by nitrate of silver in the usual manner; the proportion of muriatic acid, in union with a *fixed* alkali, was thus determined. [Once more, punctuation trouble!]

2. Another portion of the original fluid was super-saturated with potash, then evaporated to dryness, and burnt, and the muriatic acid contained in the saline residuum determined as before. In this manner the *total* quantity of muriatic acid present in the fluid was ascertained. 3. A third portion was exactly neutralised with a solution of potash of known strength, and the quantity required for that purpose accurately noticed. This gave the proportion of *free* acid present; and by adding to this the quantity in union with a fixed alkali, as determined above, and subtracting the sum from the *total* quantity of muriatic acid present, the proportion of acid in union with *ammonia,* was estimated. But as a check to this result, the third neutralised portion abovementioned was evaporated to dryness, and the muriate of ammonia expelled by heat, and collected. The quantity of muriatic acid this contained was then determined as before, and was always found to represent nearly the quantity of muriate of ammonia as before estimated; thus proving the general accuracy of the whole experiments beyond a doubt."

And so forth.

"The same is the case in the stomach of the hare, the horse, the calf, and the dog. I have also uniformly found free muriatic acid in great abundance in the acid fluid ejected from the human stomach in severe cases of dyspepsia, as the following examples show."

Then he has tables demonstrating that the analyses all came out right.

I was somewhat startled when I reread this to remember my final examination at Oxford. I had only four written examinations but six practical examinations as well. In practical physiological chemistry I was given three samples of material which had been treated exactly as Prout describes them, and I was told to determine the amount of free acid and fixed acid in the gastric juice samples. I suppose they are still using that method in England, but there really aren't any such things as free and combined acid. The law of solutions actually does apply to gastric juice (10).

This is 1823, and at the same time the great Michigan physiological observations of William Beaumont on Alexis St. Martin are beginning. As you well know, on the 6th of June, 1822, St. Martin, a French-Canadian voyageur (not to be confused with a voyeur, though he may have been both) was shot in the side on Mackinac Island. There are two eyewitness accounts, one being Beaumont's own (11). The other is by Gurdon Saltonstall Hubbard who became mayor of Chicago (12). One says St. Martin was shot with a rifle, the other says with a shotgun. One says Beaumont took three minutes to get there, the other says thirty minutes. We can sympathise with a historian trying to get his facts right.

We all know what Beaumont did, but now I am interested in his attempts to have gastric juice analysed. He said: "The gastric juice has been submitted to chemical examination and analysis, with various results. Perhaps in the present state of the science of chemistry it will not be practicable to ascertain its exact chemical character." He is writing in 1833, and enzymes didn't exist yet. There was great confusion between organic and inorganic chemistry. Synthesis of urea had just occurred. So what he says is quite sensible.

"The parcels hitherto submitted to analysis, have been very impure; but the result of even these partial examinations, has been to show that this fluid contained a portion of free muriatic acid, combined with the acetic, and some salts. In the winter of 1832-33, I submitted a quantity of gastric juice, with no other admixture, except a small proportion of the mucus of the stomach, to Professor DUNGLISON, for examination . . ."

This is Robley Dunglison, 1778-1869. You remember that Thomas Jefferson said he wanted his tombstone to record three accomplishments: that he was author of the Declaration of Independence, that he was author of the Virginia Statute of Religious Toleration, and that he was founder of the University of Virginia. When he founded the University he put a medical school in it, and he looked for the best Professor of Medicine he could find. He found Robley Dunglison in Edinburgh and brought him to Virginia. Dunglison became Professor at Jefferson Medical School in Philadelphia, and he was a compulsive textbook writer. He was the man who closed Jefferson's eyes when Jefferson died on July 4, 1826.

Beaumont sent the juice to Dunglison "for examination, who, with the assistance of the professor of chemistry of the University of Virginia, effected the following analysis, and was kind enough to communicate the result to me by letter."

University of Virginia,
Feb. 6th, 1833.

"MY DEAR SIR,

"Since I last wrote you, my friend and colleague, Professor Emmett, and myself have examined the bottle of gastric fluid which I brought with me from Washington, and we have found it to contain free *Muriatic* and *Acetic* acid, *Phosphates* and *Muriates,* with bases of *Potassa, Soda, Magnesia* and *Lime,* and an *animal matter, soluble in cold water, but insoluble in hot.* We were satisfied, you recollect, in Washington, that free muriatic acid was present, but I had no conception it existed to the amount met with in our experiments here. We distilled the gastric fluid, when the free acid passed over; the salts and the animal matter remaining in the retort. The quantity of Chloride of Silver thrown down on the addition of Nitrate of Silver, was astonishing."

Then in April of 1833 a parcel was submitted to Benjamin Silliman, M.D., Professor of Chemistry in Yale College. This is Benjamin Silliman, Sr., and those of you who are from Yale know about him.

"Professional engagements prevented his examination of the fluid until the 2nd of August, when he sent me the following result." Then comes a long letter which gives the analysis, the specific gravity and so forth and demonstrates that there is hydrochloric acid present. That's the second bottle.

Now for the third one. Beaumont said: "At the instance of Professor SILLIMAN, I committed to the care of Mr. GAHN, Consul of his Swedish Majesty in New York, a bottle, containing one pint, of gastric juice, to be transmitted by him to Professor BERZELIUS, of Stockholm, one of the most eminent chemists of the age, with a request that he would favour me with an analysis. Some unavoidable delay was experienced in forwarding the bottle; and no returns have yet been received. It is hoped, however, that they will arrive in time to be attached in an appendix to this volume." Then the last entry before the errata on page 278 is "I regret, exceedingly,

that I have not been able to obtain returns from Professor BERZELIUS, to whom I transmitted, about seven months ago, a bottle of gastric juice for chemical examination." So the question is "What happened to the third bottle?"

You all know about Berzelius. He's quoted on everything. He discovered and isolated 13 elements. He got lactic acid out of muscle. He discovered pyruvic acid. He wrote the standard textbook of chemistry. He was the teacher of Wohler who synthesized urea. He was chiefly responsible for the great fame of Swedish chemistry. In 1810 he became disgusted with the unreliability of organic analysis, and he swore he would quit. But he never did.

Some time ago the Swedish Information Service sent me a little book with a note saying it was with the compliments of Professor Jorpes. Erik Jorpes was then an old man, Emeritus Professor of Physiological Chemistry at the Karolinska. You will remember that with Viktor Mutt he purified and analysed cholecystokinin. In his old age he wrote the book, *Jacob Berzelius, His Life and Work* (13), a semi-popular account digested from a monumental Swedish biography.

As soon as I got the book I looked to see what I could find about the third bottle. This is all I found: "From Canada Dr. Beaumont sent [That's wrong; he didn't send it from Canada] him *gastric juice from the Canadian trapper, Martin,* who had recovered from an abdominal shotgun wound with a large gastric fistula, through which his gastric secretion could be collected for study. Berzelius noted that the gastric juice was not decomposed, although it had been in transit during two hot summer months, an accurate observation of the bactericidal action of hydrochloric acid in the stomach." And that is all.

The book contains beautiful photographs of the collection of minerals left by Berzelius: his collection of selenium compounds; his vanadium compounds. I always had in the back of my mind the thought that in some attic in Sweden there would be the third bottle of gastric juice just as there was the collection of Berzelius' compounds. That is not so silly, for it was in a stable in London that all Thudichum's stuff was found. But that is another story (14).

So I immediately wrote to Jorpes. Is the bottle still there? What do you know about it? Jorpes wrote back: "Dear Doctor Davenport, I thank you for your interest in the Berzelius biography. Because of your discussion about Beaumont I send you a photocopy of a publication by Erik Widmark, former professor of biochemistry at the University of Lund, Sweden [15]. It is in Swedish but from the correspondence at the end I hope you can find out something. There is certainly nothing left of the sample. It was also a less gratifying task to analyze samples like this."

There you have the standard problem. Somebody does something that interests him, and he goes to someone else who hasn't the faintest interest in it. "Won't you help me out? Won't you calculate chi square? Won't you work out the physics of this? Won't you do the elemental analysis?" And the other man thinks: "Oh, my God!" *"It was also a less gratifying task to analyse samples like this."*

This is an English translation of an extract from a letter from Berzelius to Silliman, dated Stockholm, July 19, 1834:

> "My Dear Sir.— I had the honor of receiving, some time since, the present which you had the goodness to make me, of three bottles (vials) filled with gastric juice, drawn from a man — into whose stomach there was aperture through the abdominal integuments. I am very grateful for the confidence you have had in me, in wishing me to engage in making an analysis of it, and I regret deeply that for the following reasons, I am not able to answer your expectations.
>
> "First, the gastric juice sent in April, did not arrive at Stockholm, till towards the close of the month of August. It had not become putrescent — but how was it possible to be assured that the animal matters dissolved in it, after an exposure to the elevated temperature of the months of July and August, were still identical with those of fresh gastric juice. [The answer is: they were. Pepsin would still be there. But pepsin didn't exist for some years yet.]
>
> "But this circumstance apart, I could not make this analysis with any hope of success.
>
> "I assure you that I commenced, but the difficulties immediately arrested me. On testing the gastric juice with litmus paper, I found it strongly acid. The acids are for the most part volatile.
>
> "To obtain them, recourse must be had to distillation — but the operation of boiling would change the animal substances in the residuum. The quantity of gastric juice being only 266.76 grammes [That's a lot; that's a pint], I felt I ought to sacrifice none of it, and therefore removing the volatile acids, I evaporated the whole in a vacuum at the temperature of the room [Which is exactly the wrong thing to do].
>
> "I had a residuum of 3.385 grammes, filled with crystals of chloride of sodium.
>
> "Now it was necessary to make a plan of the analysis [Why hadn't he done that before he started?] — but how could I make a plan, the nature of the substances to be separated being unknown.
>
> "A single mistake in the plan would destroy the whole [He had already made the mistake], as I had no more of the matter to recommence.
>
> "On recalling to myself how many times I have been obliged to recommence the analysis of blood, bile, and urine, and because I found it necessary, time and again, to alter the plan, it was evident that I could not now attain the object with the gastric juice, of which I possessed only 3 1/3 grammes of dry residuum. I have therefore put alcohol, sp. gr. 0.833, upon it and enclosed it in a vial well stopped, where it awaits whatever may happen. [That is the end of the bottle; the vial must be somewhere, and I wish I knew where it is.]
>
> "A great number of experiments, chemical and physiological, ought to precede the analysis. These experiments would demand almost daily to renew the supply of gastric juice — e.g. Tis said that the gastric juice dissolves the aliments swallowed; but what is this solution?
>
> "Does it not consist in this, that certain parts are dissolved entirely, and that others insoluble, but in a very divided state, are diluted in the form of a thick bouillie? What are the substances dissolved, and what the part insoluble, but diluted? The fibrine of muscle is very soluble, even out of the stomach, in very dilute acids.
>
> "I inquire next, is it by the free acid of the gastric juice, that this solution is made in the stomach?

"Would gastric juice, rendered perfectly neutral, lose the power of dissolving muscular fibre?

"If not, it must contain another substance which is the true minstruum. This substance ought to be isolated and studied apart, before we have any means of determining its quantity.

"This we could not do without being able to renew the experiment with fresh gastric juice. It would be necessary even to examine with fresh gastric juice, the most of the aliments which the man used, each by itself, and by proceeding thus, we should obtain probably some sure and numerous data, that would give a glimpse of what should be sought in the analysis, for that which is unsought, is rarely found. You see then, my dear sir, how much previous knowledge I need, for entering upon this analysis with hope of success.

I request you to make the proper explanations and apology to Dr. Beaumont."

Well, this agrees with the experience we all have had. When one sets out to do a job like this, one has to change as one goes along. One has to have a constant renewal of the supply of cimetidine or prostaglandins or whatever. I am struck by the thought that had Berzelius and Beaumont been able to collaborate, physiological chemistry would have gone ahead by fifty years. Beaumont didn't know chemistry, but he was a physiologist. The analysis Berzelius outlined could have been done.

REFERENCES

1. Davenport, H.W., and Fisher, R.B. The mechanism of the secretion of acid by the gastric mucosa. *Am. J. Physiol.* 131:165-175, 1940.
2. Davenport, H.W. The secretion of iodide by the gastric mucosa. *Gastroenterology* 1:1055-1061, 1943.
3. Réaumur, R.A.F. de. Sur la digestion des oiseaux. Mem. Acad. roy. sci., Paris, 1752, pp. 266-307.
4. Fulton, J.F., and Wilson, L.G. (eds.) *Selected Readings in the History of Physiology,* 2nd ed., Springfield: Charles C Thomas, 1966, p. 173.
5. Day, S.B. (ed.) *Edward Stevens, Gastric Physiologist, Physician and American Statesman,* Montreal: Cultural and Educational Productions, 1969.
6. Davenport, H.W. *An Eagle-feather: The Short Life of Albert Moser, M.D. A Footnote to the Life of Walter B. Cannon,* Boston: The Countway Library of Medicine, 1975.
7. Rose, W.C. (ed.). *Young, J.R.: An Experimental Inquiry into the Principles of Nutrition and the Digestive Process,* Urbana: University of Illinois Press, 1959.
8. Kelly, H.A. John R. Young, Pioneer American physiologist. Johns Hopkins Hosp. Bull. 29:186-191, 1918.
9. Prout, W. On the nature of the acid and saline matters usually existing in the stomach of animals. *Phil. Trans. Roy. Soc., London* 114:45-49, 1824.
10. Moore, E.W., and Scarlata, R.W. The determination of gastric acidity by the glass electrode. *Gastroenterology* 49:178-188, 1965.
11. Beaumont, W. *Experiments and Observations on the Gastric Juice and the Physiology of Digestion,* facsimile reprint, New York: Dover Publications, 1959.
12. Hubbard, G.S. *The Autobiography of Gurdon Saltonstall Hubbard,* Chicago: The Lakeside Press, 1911.
13. Jorpes, J.E. *Jac. Berzelius, His Life and Work* (B. Steele, trans.), Stockholm, Almqvist & Wiksell, 1966.
14. Drabkin, D.L. *Thudichum, Chemist of the Brain,* Philadelphia: University of Pennsylvania Press, 1958.
15. Widmark, E.M.P. William Beaumont och Jons Jacob Berzelius, in *Lynchnos,* Uppsala och Stockholm: Almqvist & Wicksell, 1941, pp. 102-116.

LEUKEMIA SOCIETY FUNDING AVAILABLE FOR CLINICIANS, BASIC RESEARCHERS

Applications are now being accepted by the Leukemia Society of America, Inc. for grants designed to give financial support to clinicians and basic researchers whose work is aimed at finding a cure or control of leukemia and allied diseases of the blood-forming organs.

The awards are available in three categories, according to Dr. Rose Ruth Ellison, the national health agency's Vice President for Medical and Scientific Affairs. The physician, Professor of Medicine and Chairman, Cancer Education Committee, State University of New York at Buffalo and Chief of Oncology, E. J. Meyer Memorial Hospital, heads a 20 member group of specialists who volunteer their time each year to evaluate and review all applications on a competitive basis.

A five-year scholarship for $100,000 is the most prestigious of the Society's grants. It is presented to highly qualified individuals who have demonstrated their ability to conduct original scientific research bearing on leukemia and related disorders, but who have not yet attained the tenured rank of Associate Professor. Two year special fellowships and fellowships for $31,000 and $25,000 respectively are intended for those in the intermediate and beginning stages of career development. Regardless of category, all grantees must hold doctoral degrees and are required to concentrate on research relevant to leukemia or lymphoma. There are no restrictions as to age, race, religion or sex and candidates need not be American citizens to be eligible. Application forms may be obtained from Dr. Rose Ruth Ellison, Leukemia Society of America, Inc., 211 East 43 Street, New York, N.Y. 10017. Deadline for completed applications is October 1, 1978 with grants effective in July, 1979.

NEWS FROM SENIOR PHYSIOLOGISTS

Ray Daggs to Hal Davis:

I am still enjoying retirement. Mary and I keep busy with various hobbies and all the paper work that seems to go with retirement. It seems there is more red tape, forms to fill out, etc. after retirement than before. We like our place here in the village and don't care to do much traveling. We've had that, and now enjoy a quiet life and our children, grandchildren, and one great-grandchild who live nearby. With many hobbies there is always something to do and we never get bored.

We hope to go to the Federation meetings in April since they are being held not too far away in Atlantic City. Perhaps we will see you and other old friends there.

Victor Hall to Hal:

Things go well for me, even though a recent accident has forced me to use a wheelchair outside of our home. I am making good progress in writing with Jack Field a history of American medical education—which turns out to be a huge job. And one of my daughters persuaded me to write an autobiography for family consumption. These keep me fairly busy. But I still find time for my hobbies—recorded classical music and reading history.

Jim Pinkston to Hal:

I am now "in retirement" residing in Staunton, Virginia, in the heart of the Shenandoah Valley, devoting much time and energy to the growing and exhibition of flowering plants, especially gisneriads and miniature orchids. At the same time, as a consequence of my wife's connection with Mary Baldwin College, I participate unofficially in the counseling of pre-medical students.

The above-mentioned activities along with frequent nature-study hikes, in the National Park areas, the Shenandoah Valley, leave little opportunity to become bored with retirement.

Robert Morison to Hal:

Not much change. Still working part time at M.I.T. and on various panels, mostly concerned with interactions between science and society. Anyone interested in an administrative position at my age and in these times should have his head carefully examined. Cheers.

Curt P. Richter to Hal:

Many thanks for your birthday greetings. It pleased me that someone knows that I am still alive.

Ruth Conklin to Hal:

Life continues to be very interesting, though a bit slowed down. I am still living in my own house, where I especially enjoy being able to have guests, and I like working in my garden. My scientific pursuits are nil, but there are daughters of my former students at Vassar, and several of my former Master's students have attained modest eminence in research, medicine and teaching. My own outside activities center largely on volunteer work, chiefly Meals on Wheels and Blood Bank. I enjoy The Physiologist very much and pass it on with its helpful section on teaching to my successor at Vassar.

Walter Redisch to Hal:

It is good for an old man to feel some contact, even in a routine way. I shall try to answer the questions as well as I can. I am continuing with some scientific activities, by writing and lecturing; the latter especially in Europe, where I am invited quite frequently. Last summer, among other things, I received the "Ratschow Gedaechtnismedaille" (Angiology) in Karlsruhe.

As often repeated, I would be ready to be more active than I am here since retiring from New York University. I am a Visiting Professor here at Valhalla. Very recently, I received an unexpected uplift in (egotistic) spirit, by being elected by my peers as a Fellow of the New York Academy of Sciences, an organization for which I have great respect.

Leon J. Saul to Hal:

Responding to the questions, despite various ideas we are in our usual happy routine. I am continuing the private practice of what is probably best described as psychoanalytic psychiatry, with my office very fortunately in the home, which spares me the drive to the city and back. I continue scientific activities but it would be more proper to call them only "professional" because they are not experimental but using my clinical observations as the basis for a series of books on "the childhood emotional pattern" and its application, which I write evenings.

We still live on the old farm and are happy here, especially with the good fortune of having two of our daughters and their families in the area. The idea of doing "something other" is appealing in some ways but we are happy to go on as is. I still enjoy private practice better than anything else and also writing articles and books. My angina is well controlled by propanolol and I may be able to resume golf in the Spring.

S. Howard Bartley to Hal:

Thanks for your letter and for good old APS. Since I retired at Michigan State, I have been here at Memphis State University where I was made a Distinguished Research Professor. Really the research I do is between the covers of Journals and Books. I am now revising my second edition, *Principles of Perception.* The new edition will have a little different title, *Introduction to Perception.* It keeps me busy, but it is fun.

Of all the scientific organizations of which I am a member, the American Physiological Society has my greatest respect.

I have written a couple of book-length manuscripts, one being, strangely enough, an autobiography. What made me write it? I wanted it to contain a lesson or two as well as to entertain. But who am I, I'm neither famous nor a well-known crook, so that manuscript may never see daylight. I am delighted to see that you are still in the harness, writing the rest of us to find out how we are doing.

Herbert Jasper to Hal:

Thank you for your friendly note. I am pleased to report that I am recovering very well from a sub-total laryngectomy and can now speak again, though my voice is not strong and never will be. However, I gave a one-hour lecture to students the other day with success—they had to pay close attention!

Margaret is fairly well, though trouble walking keeps us close to home. We may try a trip to Europe next Spring to see many old friends before too many leave us.

Paul Reznikoff to Hal:

I retired from active work July 1, 1976 and moved from Pelham, NY and we are now Cape Codders.

Woods Hole, as you know, is an excellent place for retirement. The Marine Biological Laboratory, where I worked many years ago, the Oceanographic Institute, the Bureau of Fisheries, the summer headquarters of the National Academy of Sciences and many of my former friends keep me pretty busy. We have an historical society which is very active. My wife and I are on the Board of Directors and find the activities most interesting and in line with our interests in history which we pursued for several years. We are also continuing our study of the history of the New York Hospital from copies of the minutes of the Board of Governors, starting in 1771.

Alfred Redfield lives here and one of the buildings of the Oceanographic Institute is named the Redfield Building.

Morris B. Bender to Hal:

Although I have no duties as a department chairman for the past four years, I am keeping myself busy as ever in teaching and research. I have weekly conferences with medical students and residents in neurology every Saturday morning, known as phenomenology rounds at the Mount Sinai School of Medicine. My research interests in the oculomotor system are still maintained, but my role as an active participant has diminished.

A. Baird Hastings to Hal:

Your letter arrived just before my 82nd birthday. As my life winds down, I am kicking all the way. I had every intention of retiring in fact, as well as theory, on July 1st and shipped my remaining books and journals to the Hastings Medical Science Library which I started in 1966 at Pahlavi University Medical School in Shiraz, Iran. All my papers and correspondence were shipped off to the National Library of Medicine in Bethesda, Maryland, where it will be catalogued and preserved. So no longer encumbered by evidence of the past, I anticipated a rocking chair existence at home for the days still allotted me. But at the last moment Professor Fred White, who has succeeded Pete Scholander in the Physiological Research Lab at S.I.O., invited me to move from Sverdrup Hall, where I have been since 1966, to a room on the 3rd floor of P.R.L. That's where I am now, with no past records and very little future, but oh what a present!

Technically, I am still a Research Associate in Neurosciences at University of California, San Diego, living among the Marine Biology community of S.I.O., a stimulating environment. If there is such a thing as having the best of all possible worlds, I am certainly having it.

Horsley Gantt to Hal:

Your greetings on my 85th birthday are much appreciated. As to my activities, research has been reduced to four days and graduate student help, a drastic cut, and secretarial help 2½ days a week. My health is holding up. This summer I participated in the Paris International Congress and the VI World Congress of Psychiatry in Hawaii.

Harold H. Cole to Hal:

In my last letter, I stated that Dr. Perry T. Cupps and I were in the final stages of editing the 3rd edition of Reproduction in Domestic Animals. This book came off the press in April of this year. With Dr. William N. Garrett, I am now in the process of editing the second edition of Animal Agriculture to be published by W. H. Freeman and Company of San Francisco. I have just completed an interesting assignment as a witness in opposition to the banning of the use of diethyl stilbestrol (DES) as a growth promotant in cattle at a hearing in Washington, D.C. In my view, the proposal for the banning of this use of DES is based upon considerations other than scientific evidence. I am in the process of completing a research paper. Because of my activities here, I am not interested in moving elsewhere with the possible exception of very short assignments.

In spite of a hip replacement two years ago, I am able to play golf, but my score is unmentionable.

A. Van Harreveld to Hal:

I have your perannually returning letter of good cheer to us retired people. Unfortunately, I have no great deeds to report. I am still working on some unfinished problems, I believe with some success. With some consulting and visiting, this keeps me rather busy. Best regards.

Chandler Brooks to Hal:

I received your October letter and in a few hours I start for Japan and Taiwan. I am giving a lecture at the International Congress of the Society of Neurovegetative Research in Tokyo and others in Toyama and Nigata. It will be nice to see my Japanese and Chinese friends. We are engaged in planning and preparing for U.S.-Japan and U.S.-Rep. of China Cooperative Science Program Symposia and research. I am still actively cooperating with my old friends in Cordoba, Argentina.

I hope I can retain my energy and interest long enough to attain a few more objectives. I miss Phil Bard very much. In the Spring I am host to an International Symposium on the Autonomic Nervous System. I believe we will be able to do something commemorative of his interest in that field. I rather like to talk about projects I am working on such as the contributions of the Nestorians to science and medicine but working at it is harder than talking about it. I am still studying control of the heart and pacemaker action.

Don Lindsley to Hal:

The enclosed BRI Bulletin tells of the celebration they had for me just before the Society for Neuroscience meeting at Anaheim. Some 40 of my past Ph.D's and postdocs presented papers, and there were a number of special speakers such as Ted Bullock, Mollie Brazier, Richard Thompson, Lorrin Riggs, etc. I believe there were at least 200 at the banquet. They even had Lee Travis and the wife of my first professor, Martin Reymert. There were five of my postdocs who came from abroad, from Helsinki, Paris, Vienna and Mexico City. I was overwhelmed by it all and although I am sure I didn't deserve it, I was tremendously pleased and honored and proud of the presentations made.

Although my official retirement began July 1, I still go to my office and labs each day and I still have postdocs and a couple of graduate students. I seem to be just as busy as before, I do not have to teach now and I thought I would get

out of committee assignments but they seem to put me on anyway. The other change is that I no longer have a salary, but either by my wisdom or the grace of God we seem to have a pretty adequate annuity arrangement. I guess growing up in depression era taught us to look out for a rainy day!

Francis O. Schmitt to Hal:

I very much enjoy reading what old friends are doing as published in *The Physiologist.*

I was retired from MIT at age 65 but continued as Chairman of the Neurosciences Research Program (NRP) and became Institute Professor Emeritus, MIT. At age 70 (1973), full retirement from MIT was obligatory. However, having brought on Dr. Frederic G. Worden as Executive Director of NRP, I assumed the title of Foundation Scientist and Dr. Worden became Director of NRP. When NRP was founded in 1962, I also organized the Neurosciences Research Foundation, Inc., a tax-free foundation which exists solely for the support of the activities of NRP. I became Chairman of the Board of Trustees at its founding and remain so now.

In 1976, with two colleagues I published a paper in *Science* which suggested new concepts of higher brain function based on "neuronal local circuit theory." This was made the subject of a two-week-long Intensive Study Program (ISP) at Boulder, Colorado, last June. This was the fourth ISP, each of which has resulted in a large volume indicating the status of neuroscience (a term that was originated with NRP). Some 135 scientists, including 50 carefully-selected post-docs, attended last summer's ISP, the first and last papers of which were given by Vernon Mountcastle and Gerald Edelman, respectively, introducing a new selectionistic theory of brain function that is being made the subject of a special publication this Spring by the MIT press.

Neuroscience has indeed come of age; and highly fruitful new ways of viewing brain function are coming to light. Axonology, which had such a productive half century, is now being superseded by dendritology, local circuit theory, central core regulatory systems, and all sorts of other new ideas. The challenge is very great, and I am enjoying it up to the hilt.

Most regretfully, Barbara, my life partner, passed away two years ago, but I remain in our home in Weston.

Heinrich Necheles to Maurice Visscher:

I am writing my biography now and I am thinking of finished and unfinished work. One problem I would love to finish is regeneration of the vagus nerves. We demonstrated beyond doubt that this occurs in the dog. Following this we tried to obtain the cooperation of our pathologist at Michael Reese Hospital to follow this up in man, following vagotomy. He asked for an assistant, but I did not have the funds for that. All we needed was to be called to the autopsy room, when they had such a case, and we would have done the dissection and the taking of the specimen. The histology would have been done free by the associates in other laboratories. But this was to no avail. If this work has not been done in the meantime, I want to encourage somebody to take it up, because I feel it is important.

I am in fairly good health, reading medical and general literature. I just had my 80th birthday and enjoy living in California. Warmest greetings to all my old colleagues.

Joseph C. Hinsey to Maurice:

I no longer carry on any professional activity and have no desire or intentions of undertaking any. A laminectomy performed in 1964 for a mid-line disc at four lumbar has left me dependent on canes for ambulation and my activities are more circumscribed than I would desire. Since I closed my office in 1969, we continue to live quiet but interesting lives here in Scarsdale. I continue to follow the events in the medical arena and maintain contacts with many old friends and students and am called on for advice from time to time. However, I have tried my best not to interfere in any manner with the work of my successors. As one who was deeply involved in obtaining the legislation for federal support of medical research and medical education, I take a dim view of the intrusions of the bureaucrats into the operations of our institutions. I am also concerned with certain deteriorations in the basic sciences and with the amount of expansion that has been promulgated. The delivery of medical care faces difficult problems in the years ahead that are bound to influence our educational activities at all levels.

With recent developments in the Far East, the work of the China Medical Board of New York takes on real significance. What was done at the Peking Union Medical Center had lasting values in relation to the health care in that part of the world. The contributions of the CMB subsequent to the Communist takeover at Peking have helped greatly to improve the quality of health care in that part of the world. At present, the CMB is deeply involved in the development of endowments in several of the medical centers there.

Recently there are three new Nobel Laureates who have been recognized for their chemistry of the substances elaborated in the hypothalamus and which activate the anterior lobe of the hypophysis. These are transported by a mechanism whose description for the first time is attributed to the late Joseph Markee and myself in 1933. You may remember that I was one of those who promulgated the concept of humoral transmission of nervous activity when it wasn't very popular. All of us old guys are grateful for the work of your Committee.

Arnold Lieberman to Dr. Adolph:

I am retired (disabled) and I still do some scribbling. My spouse has passed. My progeny visit me with their offspring. Sei alle Gesund!

Samuel Leonard to Dr. Adolph:

Nothing really new. I've been doing the same thing, enjoying myself as I wrote previously.

I did call on Dr. Sydney Asdell in October. Did you know he received the "Marshall" Award in Dublin, Ireland last July for his outstanding work in the field of reproductive physiology. Marshall was a great one, his book helped stimulate me to go into the field of research. Asdell was one of the few men he trained years ago. Perhaps Dr. Asdell can give you more details. He is a very modest person and I enjoyed him as a colleague at Cornell for 30+ years.

I sometimes feel guilty of not trying to continue some active research and I sure admire you for keeping it up. Hope salamanders are plentiful this Spring. Perhaps another time I'll have some newsworthy items.

Sydney Asdell to Hy Mayerson:

Judging by the letters you publish in *The Physiologist,* we are a long-lived group on the whole. Perhaps this is because we have been doing work that we enjoy all our lives.

My eightieth year saw the publication of a research paper on longevity, also a chapter in the new edition of Cole and

Cupps, "Reproduction in Domestic Animals." The highpoint of the year was the trip my daughter and I took to Ireland. In Dublin we were guests of the Society for the Study of Fertility in Trinity College during their annual meeting. The occasion was the presentation to me of their Marshall Medal, an honor that I appreciate, especially as I was the first of his graduate students to qualify for the Ph.D. degree.

Simon Dworkin died in Montreal on March 25, 1978: he had been in poor health for several years. Born in Russia in 1899, Dworkin came to Montreal in childhood and graduated from McGill University in Dentistry and Medicine. While still a student, he worked in the Physiology Department on temperature regulation in hibernating mammals. During 1928-30, he was at Harvard University, working in Cannon's lab on the influence of the sympathetic on carbohydrate metabolism. Returning to McGill, he was a full-time member of the Physiology Department for 18 years, and thereafter spent most of his time as a medical practitioner but continued to teach Physiology on a part-time basis until his retirement with the rank of Associate Professor in 1964. His other research interests included the conditioning of auditory and autonomic reflexes. He became a member of the APS in 1931.

CHARLES HERBERT BEST
(1899-1978)

The field of diabetes can boast of two epoch-making research findings achieved by individuals during their student years. In 1869, Paul Langerhans working in Virchow's laboratory discovered "cell heaps" within the body of the exocrine pancreas – the islets now bearing his name, as suggested by Laguesse in 1893. Langerhans, at the time of his discovery, was a medical student at the University of Berlin (1). In the decade between 1890 and 1900 it was firmly established that the pancreatic islets were a gland of internal secretion, and in 1909 de Meyer suggested that the then hypothetical antidiabetic factor be called "insulin". Many unsuccessful or partially successful attempts at obtaining a therapeutically effective material were made during the first two decades of this century. It was during the summer of 1921 that an imaginative surgeon – Frederick Banting – and a graduating student of the Honours course in Physiology and Biochemistry at the University of Toronto succeeded in this quest. The student was Charles Herbert Best, aged 22.

Best was born in Pembroke, Maine, close to the borders of New Brunswick, in 1899. His forebears came from England and Northern Ireland to the Annapolis Valley in Nova Scotia in 1749. His father started medical training at Dalhousie University and completed it in New York. A locum tenens position opened in Pembroke and the older Bests moved there, expecting to stay only one or two years. However, the senior Dr. Best became *the* physician in the Pembroke area for over forty years. Young Charles was introduced early in life to the practical aspects of medicine and the rigors of a country practice. When he was 15 his father's sister, a nurse at Massachusetts General Hospital, developed severe diabetes and was treated by Elliott Joslin, with the then customary undernutrition regimen. She came to stay with the Bests at Pembroke, and died in diabetic coma in 1918. This tragic episode kindled his interest in diabetes, and he resolved to devote himself to medical research. As an undergraduate at the University of Toronto, Best served in the Canadian artillery in World War I. Upon his return from overseas he registered in Physiology and Biochemistry.

In 1920 he worked on the delineation of the pathway of nerve impulses set up by Claude Bernards piqure of the IV ventricle. This lesion produces moderate to severe glycosuria lasting for about ten days. For this research he learned to estimate sugar, ketones and nitrogen in blood and urine, and to determine the R.Q. – the very procedures which were vitally necessary for assaying the degree of metabolic disturbances of experimental diabetes and of any putative, active pancreatic extract. In the autumn of 1920 he met Banting – "and we talked about the work which he wished to initiate. I was eager to join him if he obtained permission. This meeting was a great stimulus, and certainly no other student was as interested as I in the lectures on experimental diabetes which Professor Macleod gave. The Professor had failed to find an active antidiabetic substance himself and had forced retraction from others who had published positive findings. He was not enthusiastic about Banting's working hypothesis, and he discussed the negative results of others who had utilized it.

Permission was finally given to use the laboratory where I had worked all year – this was in April 1921 – with the condition that Banting should have a partner who had knowledge and experience in the procedures and methods of studying experimental diabetes. It was arranged that I would join him as soon as my final examinations were over. There were a few problems. We had no appointments, no stipends or

technical assistants. We worked alone. We kept careful records, but had no reports to write" (2).

In the five papers published by the Banting and Best group in 1922, it was established that their extract normalized the various diabetic metabolic deviations in depancreatized animals (3, 4, 5, 6, 7). Between 1922 and 1925, Best, Collip, Scott and Fisher, in cooperation with G.H.A. Clowes of Eli Lilly, perfected the methods of insulin production, purification, crystallization, etc., on the scale necessary for its clinical use. Best decided to complete his medical studies, while at the same time he was engaged in research on insulin purification in the Connaught Laboratories. In 1924 he was married to Margaret Mahon. In 1925 he received his M.D. degree and embarked on a European postgraduate two years (London, Freiburg and Copenhagen). It was in the laboratory of Henry Dale that Best (with Hoet and Marks) did pioneer work on insulin action, demonstrating the hormone's effects on the disposal of glucose by storage and oxidation (8, 9). He received the D.Sc. degree from University College. In Dale's laboratory he also studied the pharmacological effects of histamine and of choline, work which led him later in Toronto to develop in his own laboratory, researches into heparin and the effects of lipotropic substances.

On returning to Toronto, Best became Head of the Department of Physiological Hygiene in 1927, and succeeded J.J.R. Macleod as Chairman of Physiology in 1929.

From 1929 on Best devoted himself to the creation of a strong and soon renowned department of Physiology. Three major areas of research were: heparin action (with Jacques); the lipotropic effects of choline (with Lucas and Ridout); and the hormonal control of metabolism by insulin and the pituitary gland (with Haist, Campbell, Salter and Gorman).

During World War II, he joined the Canadian Navy as the Director of Medical Research. The work focused on traumatic shock, on the preparation of dried human blood serum and other military medical problems. Sir Frederick Banting died in an air crash in 1941, and in his memory an Institute for biomedical research was built. Best had to add the directorship of the Banting and Best Institute to his regular university duties. The group of workers in diabetes and metabolism in general, was augmented by Canadians (Wrenshall, Hartoft), and by a growing number of European scientists for whom Best provided the opportunity to pursue their work (Hetenyi, Vranic, Rappaport, Sirek, and others). The research efforts were broad in outline and concerned, a) the concentration of insulin in human pancreas in health and in the various forms of diabetes; b) the effects of lipotropic agents and the genesis of hepatic cirrhosis; c) hypophyseal diabetes; d) the role of insulin and growth hormone in protein synthesis; and many other cognate areas.

Charles Best retired from his posts at the University in 1967. He was succeeded in Physiology by Reginald Haist. The directorship of the Banting and Best Institute was assumed by Irving Fritz.

This is not the place to list the almost endless number of medals and awards, society memberships, honorary doctorates, name lectureships and other forms of official recognition given to Best from around the world. He valued above all his relationship with the various national Diabetes Associations and the International Diabetes Federation; and the scientific stimulus afforded by the Lilly Insulin Conferences which he helped to initiate.

Charles H. Best died on March 30, 1978, just three days after the sudden death of his son. He is survived by another son and by his beloved wife Margaret. Her own involvement in the story of insulin began when she helped her fiancé in the accurate record-keeping of the crucial experiments in the summer of 1921.

A good insight into the story of insulin is afforded by Best's Banting Lecture in 1952 (10). The breadth of his scientific interests is evident in the Festschrift issued in 1968.

It is difficult to summarize the significance of as noted a figure in experimental medicine as Charles H. Best. This was best done by O. M. Solandt when he was Chancellor of the University of Toronto:

"Most scientists who make discoveries, even ones that lead to important end products, have little contact with those whom they help. Probably all of us have benefitted greatly from the work of Einstein, but I doubt if he was often stopped on the street by people who wanted to thank him personally for the great effect that the theory of general relativity had on their lives. The discovery of insulin was different. Literally millions of diabetics all over the world feel personally indebted to Banting and Best. As with Dr. Banting, wherever Dr. Best has gone, he has been engulfed by an intense personal recognition of himself and his work. He has received quite exceptional public as well as professional acclaim for his achievements. I am deeply convinced that this assessment of the importance of this work will not change with time. Historians of the future will recognize the discovery of insulin as the greatest contribution to science in Canada's first hundred years. They will also see the tremendous personal influence that Dr. Best has had on the development of science in general and physiology in particular in the University of Toronto, in Canada, and throughout the world."

—Rachmiel Levine

References:

1. Langerhans, P., *Mediz. Dissertation,* Berlin, 1869.
2. Best, C. H., *Adv. Metab. Disorders* 7: 147, 1974.
3. Banting, F. G. & Best, C. H. (1922a) *J. Lab. Clin. Med.* 7, 251.
4. Banting, F. G. & Best, C. H. (1922b) *J. Lab. Clin. Med.* 7, 464.
5. Banting, F. G. & Best, C. H. (1922c) *Trans. Acad. Med. Toronto,* 1920-1922, vol. 3.
6. Banting, F. G., Best, C. H., Collip, J. B., Campbell, W. R. & Fletcher, A. A. (1922) *Canad. Med. Ass. J.* 12, 141.
7. Banting, F. G., Best, C. H., Collip, J. B., Hepburn, J., Macleod, J. J. R. & Noble, E. C. (1922) *Trans. roy. Soc. Can.,* sect. V, 16, 27.
8. Best, C. H., Hoet, J. P. & Marks, H. P. (1926) *Proc. roy. Soc. B.,* 100, 32.
9. Best, C. H., Dale, H. H., Hoet, J. P. & Marks, H. P. (1926) *Proc. roy. Soc. B.,* 100, 55.
10. Best, C. H. (1952) *Diabetes* 1, 257.

OBJECTIVES FOR A COURSE IN PHYSIOLOGY

The issue of "Educational Objectives in Physiology," published in 1973 by the American Physiological Society as a Supplement to The Physiology Teacher, was largely inspired by a set of objectives developed in 1969 by Dr. Naeraa and his colleagues at the University of Aarhus, Denmark. In 1974, the original set of objectives was extensively revised and extended by a committee of members of the Physiology Department at Aarhus University and reflects the intent and interest of the Danish authors. A translation has been undertaken by The Education Committee of the American Physiological Society to demonstrate an example of behaviorally stated objectives which can be used by teachers as aids in planning course work and by students as a guide in studying. This translated issue of "Objectives for a Course in Physiology" is being published as a supplement to The Physiologist and will be available in August of this year. An excerpt and an order blank appear below.

31. CIRCULATORY REGULATION

31.10 Conditions of clinical relevance (see 33.10)

31.20 General aspects

1) state the principle causes of increased and decreased mean arterial blood pressure based upon 1.54.
2) state that the circulatory regulation partly comprises
   a) central nervous mechanisms which regulate
      1. arterial blood pressure
      2. magnitude of distribution of the cardiac output
   b) local peripheral mechanisms which influence the blood supply to the individual organs and tissues.
3) state that the regulation is obtained by changes in
   a) the diameter of the resistance vessels
   b) the diameter of the capacitance vessels
   c) the cardiac output through changes in pulse rate and stroke volume
4) state that in general vaso-dilatation and vaso-constriction mean changes in resistance vessels while the corresponding changes in the veins specifically are veno-dilatation and veno-constriction.
5) give an account of the conditions necessary for vaso-dilatation in a tissue to cause an increase in the blood flow to that area.
6) define and give examples of the term autoregulation.

31.30 Central nervous mechanism

1) state that the regulatory function of the medulla oblongata on the circulation can be ascribed to
   a) the vasomotor center
   b) the cardioinhibitory center (dorsal motor nucleus of the
5) give an account of the axon reflex as a local neural mechanism.

32. CIRCULATION THROUGH SPECIAL REGIONS

32.10 Conditions of clinical relevance (see 33.10)

32.20 Blood flow to skeletal muscles

1) state the proportion of cardiac output that flows through skeletal muscle at rest and explain the measurement of blood flow through an extremity by plethysmography.
2) give an account of how the increased cardiac output is distributed during muscle work and give a quantitative estimate of the redistribution compared to the resting condition.
3) explain the possible mechanisms for the decrease in the vascular resistance in the muscles during exercise.
4) give an account of the intermittent blood flow through the muscle capillaries at rest and during maximal work and explain how this influences the oxygen supply to the muscle fibers.
5) define the term oxygen debt, explain this phenomenon, and make a proposal of how to determine the magnitude of the oxygen debt.

32.30 Coronary circulation

1) state the magnitude of the blood flow and oxygen consumption per minute of the heart muscle at rest and during work of known intensity.
2) describe the intermittent coronary blood flow in left and right ventricles during a cardiac cycle.
3) account for the factors which determine the coronary blood.

THE PHYSIOLOGY TEACHER

SUPPLEMENT TO THE PHYSIOLOGIST

ABSTRACTS of Educational Materials in Physiology

FOREWORD

This is the third annual collection of abstracts of educational material presented by the Educational Materials Review Board of the American Physiological Society under the direction of the Education Committee. Board members have submitted abstracts of review articles, papers, textbooks, books, manuals, handbooks and symposia which they have found valuable in teaching physiology. Selection of items is wholly at the discretion of members and where more than one member chooses to abstract the same material, each abstract is presented. We hope you continue to find this collection useful in teaching physiology.

Orr E. Reynolds
Editor

CONTENTS

CELL PHYSIOLOGY

1 EPITHELIAL TRANSPORT OF POTASSIUM. Macknight, A.D.C. Kidney International 11:391-414, 1977.

This review critically discerns the role of K transport across epithelia in potassium homeostasis of the body. After an introduction to the factors determining K transport and the regulation of cell K, the author presents a comprehensive survey of K transport across epithelia in tissues ranging from the exocrine glands to the G.I. tract and kidney. The review concludes with a short discussion of the relationship between the transport of Na and K. This neglected topic is well reviewed and should prove to be informative to those interested in the physiology of epithelial cells as well as those concerned with the K homeostasis.

E.M. Wright

2 HOW CELLS COMMUNICATE: THE SYSTEM USED BY SLIME MOLD. Newell, P.C. In: Endeavour. New Series 1(2), pp. 63-38. 1977.

The manner in which cells in multicellular organisms transfer information among themselves is clouded in mystery. The author of this article found that slime moulds, during the aggregation phase gives a model system which is readily studies. A number of interesting results, having comparatively widespread implications, were obtained by the experimental studies described in this paper. For example, if these ameboid-like organisms become deficient in nutrients, certain cells in the aggregate send out "rhythmic pulses of cyclic adenosine monophosphate." These signals are sent to all the other ameboid forms within range. The result is a patterned migration of the amebae toward the center. The pulsating rate apparently is not tied to an internal clock mechanism; rather it seems to be tied to external conditions by a special sensory system. The actual sensing mechanism for picking up the presence of cAMP is not known altho theories are on record. How widespread this form of intercellular communication and coordination occurs is not known. The paper is well written and superbly illustrated. Figure 10 is especially valuable in summarizing simply and clearly "the mechanism of pulsatile signal generation, relay, chemotaxis, and triggering of development. There are 42 references at the end of the paper. I recommend it strongly.

Charles G. Wilber

3 INTRACELLULAR IONIC ACTIVITY MEASUREMENTS IN NERVE AND MUSCLE. Walker, J.W. and H. Mack Brown. Physiol. Rev. 57:729-778, 1977.

This is very timely authoritative review by two pioneers on the measurement of intracellular ion activities using microelectrodes. Following an introduction of the principles involved in these measurements the authors consider in turn a discussion of practical aspects of electrode design and the application of the electrodes to skeletal and cardiac muscles, axons and nerve cells. Ions considered include Cl, K, H, and Na, together with short discussion of the recent development of Lithium and Calcium electrodes. The primary emphasis of the review is the use of ion selective electrodes to measure equilibrium potentials, but there is some reference to their application to flux determinations. This review provides a useful starting point for students and researchers who are interested in the application of this extremely powerful technique to problems of cell biology.

E.M. Wright

4 MEMBRANE TRANSPORT PROCESSES. Vol. 1. Ed. J.F. Hoffman. Raven Press, New York, 1977.

This volume contains 21 chapters dedicated to the memory of Peter Curran, who in his short career made so many original contributions to the field of transport biology. The contributors include many former colleagues, students, and friends who were profoundly influenced by this outstanding scientist. Topics covered include: thermodynamics of ion transport, sodium-coupled transport processes; mechanisms of ion transport across epithelia; and models for solute coupled water transport. Each chapter presents an accurate status report, and many signal future trends in these areas. The volume is of interest to those who followed Peter Curran's career, and to those students looking for an exciting introduction into the realm of membrane transport processes.

E.M. Wright

5 REGULATION OF CELLULAR VOLUME. Macknight, A.D.C. and A. Leaf. Physiol. Review 57:510-573, 1977.

This review focuses attention on the largely neglected problem of the control of cellular volume. The current concepts invoked to explain how mammalian cells maintain their volume are presented in a critical fashion. Methods commonly used to measure cell volume are discussed and then the classical Gibbs-Donnan and pump-leak theories are examined. Recent observations incompatible with the pump-leak theory are summarized, and the review concludes with a discussion of the possible relations between cell volume and transepithelial sodium transport, and cell volume regulation in vivo. This review is provocative and it should generate much discussion and work from cell biologists. Highly recommended for advanced students and researchers in the field.

E.M. Wright

DEVELOPEMENT AND AGING

6 THE HANDBOOK OF THE BIOLOGY OF AGING. Caleb E. Finch and Leonard Hayflick, Eds. Van Nostrand Reinhold Co., New York, 1977.

This handbook represents an excellent up-to-date reference text of current research material in the fast growing field of gerontology. Its extensive and informational chapters, dealing with theoretical, experimental, and, to a limited extent, clinical material, are written by world respected experts in their particular areas; they present carefully documented and well annotated discussions of the physiological, morphological and biochemical aspects of aging, such as the evolution of senescence, disease and aging, cancer, nutritional aspects of gerontology, and the prolongation of the life span.

Many interesting and informative tables summarize data relating to the aging of various biological parameters. The book is well balanced as a whole, and adequately reflects the viewpoint of those working in the cellular and molecular biology of aging, as well as those working at the organ and whole organism level. It is very complete in its scope, and should be of great value to the advanced student, teacher or researcher.

P. S. Timiras

7 HANDBOOK OF THE BIOLOGY OF AGING. Finch, C.E. and Hayflick, L., editors. Van Nostrand Reinhold Co., New York, 771 pp., 1977.

This handbook is an extensive review of the basic biology of aging and reflects the great increase in gerontological research over the past decade. Aging is covered from the comparative and evolutionary point of view with emphasis on humans and other mammals. The relevance of animal models to studies of human aging is carefully considered. Changes with age are considered at the cellular level with information on molecular genetics, metabolism, cell division, and cell longevity in vivo, at the tissue and organ level with information on alterations in the anatomy, composition and physiology of connective tissue, muscle, lung, and skin and of the nervous, cardiovascular, reproductive, endocrine, immune, gastrointestinal, excretory and skeletal-dental systems, and at the whole animal level with chapters on pathobiology, abnormal cell growth, nutrition, life table modification and life prolongation, and systems integration. This very useful book will be of interest to all who do research on the biology of aging.

D.E. Buetow

8 TIME, CELLS AND AGING. Bernard L. Strehler. Academic Press, New York, 1977.

This second edition of Time, Cells and Aging is a sophisticated analysis of the cellular mechanisms underlying the aging process. The work focuses on the wealth of gerontological information acquired over the fifteen years since the release of the first edition in 1962 and reflects the recent advances in theoretical gerontology that have been achieved in the last one and one-half decades, nurtured along the way by the creative ability, dedication and genius of scientists such as the author himself.

Strehler, a leading authority in the field of gerontology, not only employs rigorous thinking in his analysis of the difficult problems associated with this complex discipline, but also introduces his own original ideas and perceptions along the way. The process of aging is considered with regard to the various levels of biological organization, within a phylogenetic perspective and with focus on particular functional aspects of the brain and nervous system. The role of evolution as a determinant in aging and longevity is discussed. Particularly useful to research workers in gerontology is an elucidation of some unexplored avenues in the field of cellular aging, along with a tabulation of key biomedical research goals. An excellent and extensive bibliography and a description of the current and future roles of several large governmental agencies and other institutions in support of research in gerontology are also included.

P. S. Timiras

ENVIRONMENTAL AND EXERCISE PHYSIOLOGY

9 BODY FAT AND PHYSICAL FITNESS. Pařizková, J., M. Nijhoff, The Hague, 1977, 279 pp.

Individuals interested in body composition, growth and development, obesity, training, lipid metabolism, cardiac necrosis, aging and ontogenesis will find this text to be a valuable reference. It contains twelve chapters devoted to the topics listed above and two chapters concerned with conclusions and perspectives. The subject matter is documented with more than 700 references and there are 92 figures and 61 tables to emphasize the points being made. Most of the illustrative data are from experiments conducted by the author. Two salient features of the text are the longitudinal growth data and the experimental results pertaining to exercise and ontogenesis. Since this latter topic is virtually ignored in exercise physiology texts, her discussions should stimulate investigators to consider conducting research in this area. Although the text is too advanced for most undergraduates, it is recommended for researchers and for graduate students in exercise physiology.

C.M. Tipton

10 EXPOSURE TO POLLUTANTS IN ENCLOSED "LIVING SPACES". Sterling, T.D., and Diana M. Kobayashi. In: Environmental Research. 13, 1-35. 1977.

In times of elevated air pollution index the public is often warned to stay indoors if at all possible. This paper reviews in a competent and comprohensive manner the facts of the matter. A clearly stated conclusion may startle some: "A building does not protect its inhabitants from pollution. To the contrary. The body burden of toxic vapors and dusts in the 'inside' may very well exceed the burden of pollution in the 'outside'." Various pollutants are considered in appropriate detail: carbon monoxide, hydrocarbons nitrogen oxides, and even human products exuded into the environment. Various types of buildings are evaluated: domestic premises, public buildings, transportation connected enclosures. The home is a remarkably hazardous environment with respect to dangerous vapors, gases, and particulates. The role of tobacco-related poisons looms enormous in all buildings. Public buildings are particularly of concern because of the lack of effective means for removing poisonous pollutants once they get inside. The hazard is compounded by the curtailment of ventilation (e.g. slowing down exhaust fans) in the name of energy conservation. Environmental physiologists should share this valuable document with their students.

Charles G. Wilber

11 A MATHEMATICAL MODEL OF CADMIUM TRANSPORT IN A BIOLOGICAL SYSTEM. Shank, K. E., R. J. Vetter, and P. L. Ziemer. In: Environmental Research, 13, 209-214. 1977.

Environmental physiologists are always concerned about the flux of environmental contaminants through the ecosystem and eventually through any target organism. This paper is based on experimental research using cadmium 109 in the mouse as the experimental organism. A nine compartment model was used in order to explain where cadmium went throughout the mouse body as a biological system illustrating the transport of cadmium through a living organism. The model was developed to serve as a tool in evaluating the uptake and the dissemination of cadmium in all biological systems after an exposure to cadmium in the environment. Although the model was developed using the mouse as the experimental animal the predictive value of the model was tested against observational data obtained by others in dogs, goats, and sheep. The values predicted by the model developed in this paper are in satisfactory agreement with the observed values. Environmental physiologists will find this a useful paper. Figure 1 gives the schematic outline of the model used in the present study. The authors maintain that the model they produced has the potential for revealing an approximation with respect to what one can expect for the transport of cadmium in all mammals, including man, that happen to have been exposed to that heavy metal.

Charles G. Wilber

12 METABOLISM OF TOXIC HEAVY METALS IN GROWING ORGANISMS: A REVIEW. Jugo, S. In: Environmental Research, 13, 36-46. 1977.

The metabolism of heavy metals is still not well understood as a problem in physiology. This paper reviews the available information concerning the metabolism of non-essential heavy metals especially in relation to the growing mammal. From the data available, it seems that the absorption of these metals is magnified during the suckling. Presumably, the milk diet acting in conjunction with a greater non-selective permeability of the intestinal membrane in the growing animal may explain this situation. Of grav concern is the fact that poisonous heavy metals such as lead and inorganic mercury collect in the brain of immature rats in amounts significantly greater than in adult rats, a fact which suggests that for a given uptake the growing organism would be more severely damaged than would the adult. The excretion of heavy metals seems to be lower in the growing mammal than in the adult. In some way heavy metals are tied more tightly to the body tissues of the growing organism. The intrinsic toxicity of the heavy metals is less for young than for adult mammals. The author maintains, nevertheless, that "the lower toxicity of heavy metals in the young mammal is greatly overwhelmed by a much higher absorption rate, lower excretion, and special unfavorable distribution in the immature organism."

Charles G. Wilber

13 NEUROTOXIC EFFECTS OF MERCURY -- A REVIEW. Chang, L.W. In: Environmental Research, 14, p. 329-373. 1977.

This paper reviews in a competent and critical way the important literature which deals with the poisoning effect of mercury on the nervous system. Biochemical, physiological, and morphological information are included in this well written review. A number of interesting and important points are brought out; for example, it seems clear that mercury does penetrate and damage rapidly the blood-brain barrier. This rapid poisoning action essentially disables the blood-brain barrier system. Inside the cell mercury seems to be bound to such organelles as the mitochondria, the endoplasmic reticulum, Golgi complex, nuclear envelopes and lysosomes. In animals poisoned with mercury, there is a severe decrease of RNA in the neurones; protein synthesis in the neurones is also drastically reduced. In all probability, these reductions eventuate in neuronal deaths. Electrophysiological studies indicate that abnormal excitation spokes occur in mercury poisoned nerve cells. The author proposes lucid and competent pathogenic mechanisms for mercury damage to the nervous system. It is a two-part affair which includes first of all a disruption of cellular metabolism leading eventually to cell death, and secondly, a direct destruction of cellular constituents. The theory is beautifully illustrated in a flow diagram on the last page of the article. All environmental physiologists will find this a valuable paper for information and teaching.

Charles G. Wilber

14 NITROGEN - AN ESSENTIAL LIFE FACTOR AND A GROWING ENVIRONMENTAL HAZARD. Bolin, B., and E. Arrhenius. In: Ambio 6 (2-3), pp. 96-105. 1977.

This paper gives a useful, well illustrated explanation of the biology of nitrogen and its potential as an undesirable contaminant in man's surroundings. The nitrogen cycle is discussed and illustrated with an excellent block diagram. Next the global flow of nitrogen among the terrestrial, marine, and atmospheric reservoirs is described. The impact of various agricultural strategies on the global nitrogen flow is explained. The authors then summarize the role of nitrogen in eutrophication of waters, the various toxic effects of nitrogen compounds, and the interactions of environmenta and economic considerations as exemplified by nitrogen. A long list of strategic moves for the future with respect to nitrogen brings up the end of the paper. All the suggestions may not be acceptable or realistic; all, however, show much serious thought. A bibliography of 48 items is included.

Charles G. Wilber

15 OXIDES OF NITROGEN IN THE ATMOSPHERE: ORIGIN, FATE AND PUBLIC HEALTH IMPLICATIONS. Knelson, J. H., and R. E. Lee. In: Ambio 6 (2-3), pp. 126-130. 1977.

The oxides of nitrogen are key components of photochemical smog. They are significant air pollutants. Our present fund of evidence indicates that short-term exposure to these oxides brings about different results to human health, for the same dose, than does a long-term exposure. After explaining the NO_2 photolytic cycle in the atmosphere the authors move on to discussions of NO_x measurements, the concentrations of NO_x in man's surroundings, and the implications for human health of the nitrogen oxides. It is admitted that our knowledge of these matters is not adequate. Despite effective methodology for monitoring atmospheric NO_2 the establishment of satisfactory dose-response relations with human health in mind is primitive. Sixty references are listed.

Charles G. Wilber

16 **PROBLEMS WITH TEMPERATURE REGULATION DURING EXERCISE. Nadel, E. R. (Ed.) Academic Press Inc., New York, 1977.**

This book represents a compilation of papers related to temperature regulation during exercise. These papers were presented at a symposium held in conjunction with the American College of Sports Medicine in Anaheim, California, May 1976. The papers were selected to approach the problems of control and regulation in a relatively mechanistic way. Chapters include: energy exchanges during exercise, control of sweating rate and skin blood flow during exercise, changes in thermoregulatory and cardiovascular function with heat acclimation, thermal and energetic exchange during swimming. Both a brief introductory overview and summary were prepared by the editor. It is a small book of 141 pages but one which should provide provocative reading for those interested in temperature regulation in exercising man.

E. R. Buskirk

17 **SYMPOSIUM ON EXPERIMENTAL PREPARATIONS TO STUDY THE EFFECTS OF TRAINING ON THE CARDIOVASCULAR SYSTEM.** Tipton, C. M. and J. Scheuer (Eds.). In: Med. Sci. Sports 9:219–267, 1977.

The proceedings of the symposium have been published as part of a regular journal issue. The symposium was held in conjunction with the 24th annual meeting of the American College of Sports Medicine, Chicago, Ill. May 1977. The titles of the published papers are: The use of the Langendorff preparation to study the bradycardia of training, the advantages and disadvantages of the isolated perfused working rat heart, the role of isolated cardiac muscle preparations in the study of training effects on the heart, experimental preparations to understand the cardiovascular effect of training, the unanesthetized evaluation of exercise in humans, and invasive and noninvasive evaluation of exercise in humans. An introduction to the symposium was prepared by the editors. Thus, cardiac or central mechanisms are dealt with whereas peripheral mechanisms are not. A list of future directions was prepared. The several papers and the future directions should prove useful to any investigator working in this area.

E. R. Buskirk

18 TEXTBOOK IN WORK PHYSIOLOGY: PHYSIOLOGICAL BASIS OF EXERCISE. Astrand, P.O. and K. Rodahl. 2nd ed., McGraw-Hill, N.Y.,1977, 681 pp

The scholarly character of this textbook has been maintained and improved with its 2nd edition. Approximately 14% of its more than 1,000 references were published in 1975 and thereafter. The text contains 17 chapters of which the first 8 pertain to basic concepts concerning nerve, muscle, metabolism, circulation, body fluids, respiration and the CNS. The remaining chapters are more applied and discuss topics related to testing, physical work capacity, body dimensions, sports physiology, nutrition, temperature regulation, altitude, age, sex and related subjects. Included within this series is a useful chapter on physical training which summarized the "state of the art" in tabular form for sixty or more parameters. The text contains numerous tables and figures which are useful in conveying the intent of the authors. Also included are discussions on hormones and controversial issues such as blood doping, anabolic steroids, changes in fiber types and problems of weight control. However, notably absent is a section on the advantages and disadvantages of the anaerobic threshold. Since the intent of the authors was to make each chapter "... a fairly complete entity..." (XVIII), certain topics are mentioned several times in different ways. The views of the authors and background materials are listed in small print throughout the text. Generally, these inserts are distracting as they divert the reader from the main point being emphasized. However, these minor criticisms should not deter instructors, graduate students, or interested practitioners from adding this important text to their professional library.

C.M. Tipton

19 WATER. Falkenmark, M., editor. In: Ambio. 6 (1), pp. 3-90. 1977.

This entire issue is devoted to water. It is a gold mine of information on the relationship of Homo Sapiens to water, the global water cycle, groundwater, water chemistry and quality, water and food, health implications. The various articles are well illustrated and carefully documented. For an up-to-date summary of man and water, this issue of Ambio deserves attention.

Charles G. Wilber

GASTROINTESTINAL PHYSIOLOGY

20 GASTROINTESTINAL CIRCULATION. Svanik, J., and Lundgren, O. In: MTP International Review of Science: Gastrointestinal Physiology, Series II, pp. 1-34. University Park Press, Baltimore, 1977.

This review is written primarily for those who have special interests in the splanchnic circulation. Most of the references are recent. Major topics covered include the functional anatomy of the gastrointestinal microcirculation, methods for investigating gastrointestinal hemodynamics and microcirculation, and consideration of the physiology of the circulations of several gastrointestinal organs -- stomach, small intestine, colon and pancreas. This article would be of major value to graduate students, fellows and faculty interested in acquiring some of the concepts and newer information in an emerging field.

E.D. Jacobson

21 GASTROINTESTINAL HORMONES. Bloom, S.R. In: MTP International Review of Science: Gastrointestinal Physiology, Series II, pp. 71-104, University Park Press, Baltimore, 1977.

This review is written for individuals who would like an update on the fastest moving area of gastrointestinal physiology today. The chapter is written in a manner which provides both a general explanation of the subtopics and some of the more recent developments. Subjects covered are: methodology including radioimmunoassay, and 10 sections devoted one each to the numerous hormones and would be hormones of the gut. For each hormone the chemistry, pharmacology, cell source, release, physiology and pathology are addressed, information permitting. This article will be of major value to graduate students, fellows in either gastrointestinal physiology or clinical gastroenterology, and to gastrointestinal physiologists. It is sufficiently well presented that physiologists from other fields would find the work informative and coherent.

E.D. Jacobson

22 GASTROINTESTINAL MOTILITY. Atanassova, E. and Papasova, M. In: MTP International Review of Science: Gastrointestinal Physiology, Series II, pp. 35-70, University Park Press, Baltimore, 1977.

This review is addressed primarily to the specialists in visceral smooth muscle physiology and gastrointestinal motility. The chapter has sections devoted to motor activity of the esophagus, stomach, small and large bowel and the biliary tree. The cited references are numerous and of recent vintage. Emphases in the review are on control mechanisms and electrophysiological correlates of mechanical activity. This piece will best serve investigators and scholars of the subject who need an ample reference source.

E.D. Jacobson

23 GASTROINTESTINAL PHYSIOLOGY. Johnson, L.R., editor. Mosby, St. Louis, 1977.

This is a medical student texbook in paperback. It is intended for either a standard course in human physiology or for a course on the gastrointestinal system. Chapters are devoted to gastrointestinal hormones, motility of the separate hollow organs, secretion of the stomach and pancreas, absorption of water and lipid soluble substances, and the gastrointestinal circulation. Each chapter emphasizes clinical correlates without sacrificing the essential principles of the physiology. There are numerous new illustrations which would be useful for lecture purposes. This volume will be most valuable to medical students, to clinical fellows in gastroenterology and to gastroenterologists or surgeons wishing to review the subject.

E.D. Jacobson

24 GASTROINTESTINAL PHYSIOLOGY. Johnson, L.R. The C.V. Mosby Company, 164 p., Saint Louis, 1977.

Despite its brevity, GASTROINTESTINAL PHYSIOLOGY makes a rather comprehensive compendium of the current concepts in its field. The authors, a group of physiologists primarily from the University of Texas Medical School, have in their work created "a practical outline", which its editor rightly recommends for introducing medical students and beginning graduate students to gastrointestinal physiology. The books' contents are quite complete and presented in a systematic manner. The chapter on gastrointestinal hormones is an excellent presentation of rather difficult material - typical of the manner in which most of the topics are handled. Concluding each chapter is a short bibliography usually listing references as current as 1976. The organization of the chapters lends conceptual continuity to the text, but each chapter is complete enough in itself so that it may be read with minimal reference to the others. Because of these assets, GASTROINTESTINAL PHYSIOLOGY becomes a useful tool for both graduate students and teachers of gastrointestinal physiology.

M.F. Tansy

25 NERVES AND THE GUT. Brooks, F.P. and P.W. Evers (Eds). Charles B. Slack, 541 p., New Jersey, 1977.

Most of the 35 papers in this collection from the American Physiological Society Satellite Symposium on Nerves and the Gut held in Philadelphia in August 1976 are reports on experimental work from a variety of disciplines carried out in the contributors laboratories. While the table of contents appears to be a shotgun approach, a more detailed examination reveals that the topics considered are those in which marked research advances have been made in recent years. Papers are grouped under four headings: 1) Nerves and Secretion; 2) Nerves and Motor Activity; 3) Afferent Nerves of the Gut; 4) Mind-Gut Interactions. Individual presentations are followed by brief but incisive and often challenging comments by members of the audience - thus creating a contribution much more valuable than review articles alone. This work is not for the uninitiated but should prove valuable to advanced students, teachers, and research specialists in gastrointestinal physiology, as it includes recent advances and problems confronting workers in this field as well as 914 citations. Although the text varies both at the level and nature of its subject matter, it handles the technical details effectively. There are few typographical errors and the figures and tables are generally of high quality. The book as a whole is a credit to the Editors and organizing committee of the symposium.

M.F. Tansy

26 SYMPOSIUM ON "EXCITABLE JUNCTIONS IN SMOOTH MUSCLE CELLS", SPRING MEETING OF THE AMERICAN PHYSIOLOGICAL SOCIETY. In: Federation Proc. 36: No. 10, pp. 2433-2461, September, 1977.

This collection of research papers is the edited proceedings of a symposium held in Anaheim, CA, April 1976, at which a multidisciplinary group presented and discussed the subject from many different angles but with a common thread. The proceedings of this conference is divided into six sections: Introductory remarks (Szurszewski); Cholinergic, adrenergic, and purinergic neuromuscular transmission (Burnstock); Some functional consequences of variation in adrenergic synaptic cleft width and in nerve density and distribution (Bevan); Cholinergic inhibition of adrenergic transmission (Vanhoutte); Modulation of smooth muscle activity by catecholamines (Marshal); Modulation of smooth muscle by nervous activity: a review and a hypothesis (Szurszewski). This assemblage is an excellent review of the subjects, giving the basis for and the current direction of research. The papers are well referenced and edited to conform to a uniform format for logical sequence of presentation. The main value of the proceedings is that it represents the state of the art at a given time, as such, it does its job well. This offering should prove valuable to advanced readers in this area of research. It is not recommended to newcomers to the field.

M.F. Tansy

27 TUBES. F.J. Ingelfinger. Gastroenterology 74:310-318, 1978.

The monologue "Tubes" with its conspicuously terse title and delivered in a delightfully unorthodox but all the more effective manner, as befitting its distinguished author is adapted from his talk given at the 23rd Annual Dinner Meeting of the Gastrointestinal Section of the American Physiological Society. The subject matter of the presentation is divided into seven sections: Gastric Analysis, Duodenal Drainage, Intestinal Tubes, Motility, Measuring Intraluminal Pressure, Unpublished Shenanigans, and Recent Developments. In successful efforts both to edify and entertain, the author scavenges anecdotes from his own years in the field of gastrointestinal tubes to discuss the names and personalities who brought said tubes to light. In general, "Tubes" is a very useful addition to the gastrointestinal literature. Many anecdotes enliven this well-written account. This historical profile is highly recommended to all interested in gastrointestinal physiology.

M.F. Tansy

MUSCLE PHYSIOLOGY

28 THE SLIDING FILAMENT MODEL OF MUSCLE CONTRACTION. I. Quantum Mechanical Journalism. Gray, B.F. and I. Gonda. In: J. theor. Biol. 69, 167-185. 1977.

II. THE ENERGETIC AND DYNAMICAL PREDICTIONS OF A QUANTUM MECHANICAL TRANSDUCER MODEL. Ibid. 69, 187-230.

These two papers should appeal to physiologists who are mathematically inclined. Teachers should find them useful in putting together an overall, integrated discussion of how muscle works. The authors begin with a clear definition of work and the implications of the definition for contracting striated muscle. How such a mechanism is controlled is considered. The authors, for example, emphasize that quantal processes involving single molecules and quanta are not necessarily reversible. They lay out their views in a stimulating discussion of the irreversible change of potential energy into work. The second paper carries the discussion into a model of muscle contraction machinery. The predictive effect of the devised model diverges from the presently accepted model. The two papers make demanding reading but they effectively drive one to re-examine in an orderly way current theoretical models of striated muscle contraction.

Charles G. Wilber

NEUROBIOLOGY

29 EXPERIMENTAL NEUROLOGY, A LABORATORY MANUAL. Oakley, B., and Schafer, R., University of Michigan Press, Ann Arbor, Michigan, 1978.

Neurobiology has long needed a manual such as this. The neurobiology experiments included have two major strengths, great diversity and complete protocol. The book has general chapters on terminology, instrumentation, surgery and stereotaxic techniques. It ends with a chapter on laboratory organization including sources of animals and equipment. In between these general chapters are the actual experiments including chapters on neuroanatomy, bioelectric activity, synaptic transmission and effector processes, receptor processes, central processes and behavior. Each chapter has half a dozen or so experiments, each complete with rationale, procedure, experiments, pitfalls, materials, instructor helps and references. As stated in the preface the experiments were selected to 1. work 2. utilize no highly specialized equipment and 3. balance technical and conceptual content. The students are assumed to have the normal year of biology, chemistry and physics. In addition the experiments are coded for the level of difficulty, allowing students from juniors to advanced graduates to find challenging experiments. The variety of organisms ought to please any biologist. They include not just the frog, but rat, turtle, fish, cockroach, coelenterate and sensitive plant. Oakley and Schafer have produced a delightful book which should find wide acceptance.

N. A. Dahl

30 MOTOR NERVE SPROUTING AND ACETYLCHOLINE RECEPTORS. Pestronk, A. and D. B. Drachman. Science, 199:1223-1225, 1978.

This paper will be exciting if you are interested in mechanisms underlying reinnervation of denervated muscle. Although axonal sprouting is presumed important for reinnervation, factors evoking sprouting are not known. Results of the beautifully designed experiments reported in this paper provide evidence suggesting that extrajunctional ACh receptors which increase in denervated muscle, play a role in eliciting sprouting. The soleus muscle in rats was functionally denervated 1) by presynaptic blockage of ACh release produced by injecting botulinum toxin into the muscle, 2) by eliminating nerve impulses by subperineurial injections of tetrodotoxin (TTX) and 3) by irreversibly blocking ACh receptors with repeated intramuscular injections of α-bungarotoxin (α-BuTx). At the end of a week, muscles failing to respond to motor nerve stimulation were prepared for histological examination. Axonal sprouting was quantitatively assessed by counting nerve terminal branch points within each end-plate area and measuring the length of each end-plate. Extrajunctional ACh receptors were measured by the α-BuTx method. If ACh receptors were blocked with α-BuTx no significant sprouting occurred. Otherwise the degree of sprouting and the measured level of extrajunctional receptors were closely correlated. Additional experiments revealed that α-BuTx inhibits sprouting and this inhibition is the result of the irreversible block of ACh receptors rather than the direct action of the poison on the nerve.

B. Bishop

31 THE OCULAR AND CEREBROSPINAL FLUIDS. Eds. L.Z. Bito, H. Davson, and J.D. Fenstermacher. Experimental Eye Research 25(Supplement). Academic Press, New York, 1977.

This volume, dedicated to Dr. Hugh Davson, may be considered as a review of the progress made in the physiology of the ocular and cerebrospinal fluids since the publications of Davson's monograph in 1956. The morphology, physiology, and pathology of these special fluids are discussed by leading authorities in each field. Consequently it is destined to be a much utilized reference work for active researchers, teachers, and students interested in the chemical environment of the central nervous system. No longer can these subjects be referred to as the "backwater of physiology".

E.M. Wright

32 SECONDARY BRAIN CHANGES FOLLOWING LESIONS: A NEW PARADIGM FOR LESION EXPERIMENTATION. A Theoretical Review. Schoenfeld, T. A. and L. W. Hamilton. Physiol. & Behavior 18:951-967, 1977.

This review article is a well-documented and detailed summary of the primary and secondary changes which occur in the CNS following brain lesions. The time sequence of direct morphological changes occurring at the site of the lesion as well as proximally and distally to it are specified. Secondary changes which result from the primary lesion include transneural degeneration, regeneration, axonal sprouting, neurochemical depletion, denervation supersensitivity and its opposite, diaschisis. The implications of these secondary changes for altered brain function are discussed. The authors forcibly make the point that these secondary changes may comprise the more significant neurological changes which underlie behavioral alterations following brain lesions and, therefore, should be correlated with behavioral changes in all future lesion experiments. Obviously our classical concepts of localization of functions in brain must be continually updated in keeping with new information.

B. Bishop

33 THE VENTROMEDIAL HYPOTHALAMIC SYNDROME, SATIETY, AND A CEPHALIC PHASE HYPOTHESIS. Powley, T.L. Psychol. Rev. 84:89-126, 1977

A selective, critical review of experimental literature describing a group of apparently related behavioral (hyperphagia; finickiness, reduced performance of food-rewarded instrumental responses) and physiological (obesity, hyperinsulinimia, disordered fat metabolism) consequences of lesions in the ventromedial hypothalamus. The author briefly reviews traditional behavioral and physiological explanations of the 'ventromedial lesion syndrome' and then offers an alternative which suggests that the syndrome is the direct consequences of increased (presumably disinhibited) phasic autonomic and endocrine responses to oropharyngeal contact with food. Particularly in conjunction with another fairly recent proposal for increased consideration of peripheral(i.e. metabolic) influences on hunger and satiety (Friedman, M.I. & E.M. Stricker, Psychol. Rev. 83:409-431, 1976), the review offers a novel perspective on a controversial topic that has not been resolved in spite of several decades on intensive research. Suitable for medical and graduate students as well as investigators in related fields who want to broaden their understanding of (a) hypothalamic functions; (b) the interaction of central and peripheral mechanisms in the control of food intake and energy balance

S.P. Grossman

RENAL AND ELECTROLYTE PHYSIOLOGY

34 ADVANCES IN OUR KNOWLEDGE OF THE RENIN-ANGIOTENSIN SYSTEM. Davis, J.O. (ed.) Fed. Proc. 36: 1753-1787, 1977.

This symposium summarizes recent research advances in our understanding of the renin-angiotensin system, from basic biochemistry to clinical medicine. The individual contributions are written by leading authorities and present the status of this field up until April 1976. The topics discussed are (1) the chemistry of renin, (2) the angiotensin I converting enzyme, (3) the function of [des-Asp^1]-angiotensin II, (4) the relation of the renin-angiotensin system to the central nervous system, (5) the comparative physiology of the renin-angiotensin system, and (6) the effect of blockade of the renin-angiotensin system (with propranalol, saralasin, or converting enzyme inhibitor) in patients with hypertension. Among the many exciting new developments presented are the following: (1) There are several inactive forms of renin in plasma, amniotic fluid, and kidney. (2) [Des-Asp^1]-angiotensin II may act as a mediator of the renin-angiotensin system, especially as a stimulus to aldosterone secretion. (3) On the basis of studies with a nonapeptide converting enzyme inhibitor, it appears that renin is actively involved in the maintenance of elevated blood pressure in a majority of patients with hypertension. This symposium will be particularly valuable to researchers and teachers who want to keep up with this rapidly developing field.

G.A. Tanner

35 CARDIOVASCULAR AND RENAL EFFECTS OF HEAD-OUT WATER IMMERSION IN MAN. APPLICATION OF THE MODEL IN THE ASSESSMENT OF VOLUME HOMEOSTASIS. Epstein, M. Circ. Res. 39: 619-628, 1976.

This review discusses the effects of water immersion in man. This procedure leads to a redistribution of the blood volume with a relative increase in central blood volume, an increase in central venous pressure, and increases in stroke volume and cardiac output. The kidney responds with an increase in excretion of salt and water, which is the proper response to an expanded central blood volume. Experimental evidence on the mechanisms involved is critically reviewed. Specific topics considered are (1) mechanism of increase of central blood volume, (2) mechanism of altered renal sodium and water handling (role of a circulating natriuretic factor, aldosterone, renal nerves, and antidiuretic hormone), (3) changes in plasma renin activity and aldosterone in the water immersion model, (4) other experimental maneuvers that induce central hypervolemia, and (5) possible usefulness of water immersion in the study of disease states (e.g. hypertension, diseases associated with edema). The article contains lots of excellent physiology, and would be attractive reading for medical and graduate students. Certainly it gives one lots to think about while one is relaxing in the pool this summer.

G.A. Tanner

36 Feedback Regulation of Glomerular Filtration Rate. Wright, F.S. and J.P. Briggs. Am. J. Physiol. 233 (1): F1-F7, 1977.

This is a review of evidence implicating tubular feedback control of glomerular function at the single nephron level. Such evidence includes: injection of sodium salts into the distal tubule resulting in collapse of the proximal tubule, while injection of sodium free salts were usually ineffective; perfusion of the loop of Henle at different flow rates resulted in the highest SNGFR at the lowest perfusion rate and the lowest SNGFR at highest rates of perfusion.

The sensitivity of the feedback mechanism at low ranges of loop flow is enhanced by salt depletion, and by hemorrhage indicating that salt intake and volume are involved in modulating feedback response. The precise signal that may elicit the feedback response appears to be chloride transport via the macula densa. The effector mechanism has been postulated to be the formation of angiotensin II, which would cause constriction of the afferent arterioles of the glomerulus in question. The authors hypothesize that this feedback mechanism may be an important renal mechanism for regulating fluid volume. This review should be of value to graduate students, medical students and faculty who wish to develop a clearer understanding of the juxtaglomerular apparatus and its role in tubuloglomerular feedback and a possible role this mechanism has in fluid volume regulation.

H.M. Randall

37 NEURAL CONTROL OF RENAL FUNCTION: CONTRIBUTION OF CARDIOPULMONARY BARORECEPTORS TO THE CONTROL OF THE KIDNEY. Thames, M.D. Fed. Proc. 37:1209-1213, 1977.

In the third article from the symposium on Neural Control of Renal Function, Dr. M.D. Thames presents a short review on the relationship between the cardiopulmonary receptors which are thought to sense "fullness" of the circulation and renal function. These receptors, whose afferents travel through the vagus, appear to play a role in the tonic inhibition of renal nerve activity. Thus, increases in blood volume lead to an increase in activity of these vagal afferents which ultimately lead to a decrease in renal nerve activity. Evidence was presented indicating that these receptors are capable of stimulating, via renal sympathetic nerves, the release of renin by the kidney. This increase in renin release appears to be independent of alterations in hemodynamics. It is emphasized that further studies are needed to determine the physiological importance of the cardiopulmonary receptors in the regulation of renal function. This article is recommended for investigators and students interested in cardiovascular control mechanisms, the renin-angiotensin system and regulation of body fluid volume.

P.D. Bell and L.G. Navar

38 NEURAL CONTROL OF RENAL FUNCTION: INNERVATION OF THE RENAL CORTEX. Barajas, L. Fed. Proc. 37:1192-1201, 1977.

This is the first of five articles from a symposium on Neural Control of Renal Function chaired by Dr. G. F. DiBona. In this article, Dr. Barajas discusses recent evidence for nervous innervation of rat and monkey renal cortical structures. Using fluorescence histochemical techniques and electron microscopy, evidence for adrenergic innervation of both vascular and tubular structures was obtained. Single axons were sometimes observed to innervate both arteriolar and tubular cells, especially in the area of the juxtaglomerular apparatus. A rich innervation of both afferent and efferent arterioles was demonstrated. Using a thiocholine method, acetylcholinesterase containing nerves were identified. However, no other evidence was suggestive of distinct cholinergic innervation. Thus, the results were interpreted to indicate adrenergic nerves contain acetylcholinesterase. Differences between the results obtained in the rat and the monkey appear to be that of degree, with the renal cortex of the monkey more heavily innervated. This article includes several interesting new findings on the innervation of the kidney and is recommended for investigators and students interested in the topic.

P.D. Bell and L.G. Navar

39 NEURAL CONTROL OF RENAL FUNCTION: NEURAL CONTROL OF RENAL TUBULAR SODIUM REABSORPTION IN THE DOG. DiBona, G.F. Fed. Proc. 37:1214-1217, 1977.

In the fourth article from the symposium on Neural Control of Renal Function, Dr. DiBona summarizes results obtained in his laboratory concerning the role of renal nerve activity in controlling urinary sodium excretion rates. The purpose for these studies was to establish whether alterations in renal hemodynamics could account for these changes. Increases in renal nerve activity was accomplished by stimulation of the renal nerves and by perfusion of isolated carotid sinus while maintaining renal perfusion pressure constant. Activation of cardiopulmonary receptors and stimulation of the Stellate ganglion was used to decrease renal nerve activity. In each of these studies the urine flow and sodium excretion responses could not be attributed to alterations in renal hemodynamics. Additional studies with blocking agents excluded the involvement of the renin-angiotensin and prostaglandin systems. Thus, a strong case is made for direct tubular effects of subtle changes in renal nerve activity. The article should be of interest to investigators and students interested in the influence of renal nerves on tubular reabsorptive mechanisms.

P.D. Bell and L.G. Navar

40 NEURAL CONTROL OF RENAL FUNCTION: NEURAL CONTROL OF RENAL TUBULAR SODIUM REABSORPTION IN THE RAT: SINGLE NEPHRON ANALYSIS. Colindres, R.E., AND C.W. Gottschalk. Fed. Proc. 37:1218-1221, 1977.

In the fifth article from the symposium on Neural Control of Renal Function, Drs. Colindres and Gottschalk describe micropuncture experiments from their laboratory which were designed to identify where the alterations in tubular reabsorption occur with changes in renal nerve activity, and to determine if the effects of renal denervation persist over extended periods of time. With acute renal denervation they consistently found a fall in proximal tubule fractional fluid reabsorption. However it was not possible to determine conclusively whether reabsorption rates in later segments of the nephron were also inhibited. In other studies, it was shown that in the presence of volume expansion, denervation resulted in increased excretion rates even though control values were high. Also, there was a compensatory decrease in excretion rate in the contralateral innervated kidney, such that the sum of excretory rates of both kidneys remained the same. With denervation of the kidney 1 to 2 weeks prior to the experiment, similar results were obtained indicating that this effect can occur over an extended period of time. It appeared that the tubular effects are probably mediated by slowly conducting unmyelinated C fibers. This paper should be helpful to investigators interested in the influence of renal nerves on tubular reabsorptive mechanisms.

P.D. Bell and L.G. Navar

41 NEURAL CONTROL OF RENAL FUNCTION: NEUROGENIC CONTROL OF THE RENAL CIRCULATION IN HYPERTENSION. Fink, G.D., and M.J. Brody. Fed. Proc. 37:1202-1208, 1977.

In the second article from a symposium on Neural Control of Renal Function, Drs. Fink and Brody review current concepts of the role of renal nerves in hypertension. Using several different models for studying hypertension, a diminished renal norepinephrine content was found which persisted for a variable length of time after the onset of hypertension. In addition, vasoconstrictor responses to renal nerve stimulation were significantly depressed in renal hypertensive kidneys. However, renal vascular responses to norepinephrine injections were not attenuated. The authors conclude that increased renal sympathetic nervous function is an unlikely factor in the etiology of renal hypertension. Also the organism may be protected from additional increases in blood pressure by the attenuation of vasoconstrictor and renin-releasing effects of renal sympathetic nerves. This article should be of interest to individuals interested in the possible involvement of the kidney and specifically of renal nerves in hypertensive mechanisms.

P.D. Bell and L.G. Navar

42 Neurogenic Regulation of Renal Tubular Sodium and Reabsorption. Dibona, G.F. Am. J. Physiology 233 (2): F73-F81, 1977.

This review demonstrates the significance of adrenergic renal nerves on tubular control of sodium reabsorption. Fluorescent and electron microscopy techniques have demonstrated contact of adrenergic nerve terminals with the basement membrane of proximal and distal tubules in monkey, rat and dog kidneys. Electrical stimulation of renal adrenergic nerves, such that no hemodynamic changes are initiated, resulted in decreased rates of sodium excretion while filtered loads of sodium were unchanged. These responses could be blocked by phenoxybenzamine and guanethedine, two adrenergic blocking agents. Micropuncture studies revealed that the major site of increased tubular reabsorption was the proximal tubule and reabsorption was controlled by the activity of slowly conducting unmyelinated c fibers. Further physiological evidence of this mechanism utilized the baroreceptor reflex system: a decrease in systemic blood pressure resulted in an increase in tubular sodium reabsorption mediated by renal adrenergic nerves. Although the effects of sympathetic neural activity on tubular reabsorption of sodium are rather modest (1-2% of fractional reabsorption) this controlling mediator can have a significant effect on body sodium and the resulting fluid volume regulation. This review can be of value to faculty, medical and graduate students who are interested in the role of the renal nerves in controlling body sodium and fluid volume.

H.M. Randall

43 PROXIMAL TUBULAR REABSORPTION AND ITS REGULATION. Jacobson, H.R., and D.W. Seldin. Ann. Rev. Pharmacol. Toxicol. 17: 623-646, 1977.

This review examines the anatomic and physiologic features which influence salt and water reabsorption by the proximal tubule. The problem of nephron heterogeneity is discussed first. This has two aspects: (1) transport properties of early and late proximal tubules differ, and (2) transport characteristics of superficial and deep nephrons are different. The proximal tubule is a leaky epithelium. Most of this review concerns itself with the significance of the low resistance paracellular pathway in salt and water transport. Net reabsorption of salt and water are discussed in terms of (1) outward transport (movement of salt and water from the lumen into the paracellular space) and (2) passive back-leak into the lumen. The evidence for active and passive components to outward transport is discussed; the quantitative importance of passive reabsorption is controversial. Back-leak of reabsorbate into the lumen and the factors which affect this movement are considered. Peritubular capillary Starling forces and leakiness of the tight junction appear to regulate back-leak. The article includes two figures which emphasize the role of the paracellular pathway. The problem of proximal reabsorption of salt and water is discussed with considerable insight and perspective. This review is highly recommended for teachers, researchers, and graduate students interested in kidney function and epithelial transport.

G.A. Tanner

44 Relationship of Renal Sodium and Water Transport to Hydrogen Ion Secretion. Arruda, J.A.L. and N.A. Kurtzman. Ann. Rev. Physiol. 40: 43-66, 1978.

This review relates the process which controls H^+ secretion in both proximal and distal tubules with fluid volume regulation in the whole organism. The problem is examined by considering those factors effecting bicarbonate reabsorption and acidification of the urine followed by a discussion on metabolic alkalosis, an example of an abnormal increase in bicarbonate retention or loss of nonvolatile acid from the extracellular fluid. Expansion or contraction of blood volume influences the rate of bicarbonate reabsorption by an as yet undefined mechanism. This relationship may be explained in part by changes in GFR (there is glomerular tubular balance for bicarbonate), adrenal hormones, body stores of K^+ and extracellular PCO_2. Other parameters which may also partially explain this relationship include parathryoid hormone, and phosphate depletion both of which depress bicarbonate reabsorption and glucose infusion which enhance its reabsorption. Contraction and expansion of the extracellular fluid volume can influence metabolic alkalosis. This review can be of significance to both medical and graduate students as well as faculty who are interested in understanding the relationship between the acidification process and fluid volume regulation. This review also helps to bring together a series of isolated regulatory concepts into an integrated concept of volume regulation.

H.M. Randall

RESPIRATION

45 BIOENGINEERING ASPECTS OF THE LUNG. West, J. B. (Editor). Marcel Dekker, Inc., New York, 1977.

This volume, the third in a series on lung biology in health and disease, is a collection of chapters each prepared by outstanding investigators. The result is a remarkably broad overview, in engineering and biophysical parlance, of the behavior of lungs. Chapter 1 deals with quantitative morphology, certainly important as a basis for what follows. The next 3 chapters apply methods of solid and fluid mechanics to static and dynamic analysis of lung tissue, airflow and blood flow. Chapters 5 and 6 consider gas exchange, and in the final chapter, control system methodology is applied to regulation of breathing. The result is a successful blending of physics, engineering and biology. While a modest background in undergraduate physics and mathematics is indeed helpful, biologists less comfortable in those fields should not be dissuaded from using this text, for only in rare instances would one be handicapped. More often, one would gain insight into the biological system and some of its properties. This book is recommended to students and faculty in bioengineering and pulmonary physiology.

Thomas C. Lloyd, Jr.

46 DIFFUSION AND CHEMICAL REACTION IN PULMONARY GAS EXCHANGE. Wagner, P. D. Physiol. Rev. 57: 257 - 312, 1977.

This excellent review is a compendium of established concepts and new material which has been added to this field since Forster's review in the same journal in 1957. The subject is constrained to diffusion across the blood-gas barrier and the associated chemical reactions in blood, and does not cover diffusive movement in the gas phase nor does it importantly consider carbon monoxide. The text begins with a theoretical analysis based on inert gases and then develops the concept of the effects of non-linear tension-content relationships, leading to an understanding of the temporal kinetics of O_2 and CO_2 changes in capillaries. The concept of the diffusion/perfusion ratio is discussed, as is the interaction between simultaneous movements of O_2 and CO_2. The author has taken a traditionally difficult subject in which important new concepts have recently appeared and has written a well-organized unusually assimilable review, highly recommended for use by graduate students and teachers of pulmonary physiology.

Thomas C. Lloyd, Jr.

47 LUNG WATER AND SOLUTE EXCHANGE. Staub, N. C. (Editor). Marcel Dekker, New York, 1978.

There have recently been a number of reviews of the physiology and pathophysiology of pulmonary edema but, nevertheless, this book is a useful contribution to the literature. It is divided into three sections. Part 1 is titled "Anatomy of Lung Water and Solutes" and concerns the structural basis of extravascular water movement. Surprisingly, there is relatively little on recent important work on the structural basis for differences between the permeabilities of the capillary endothelium and the alveolar epithelium. Part 2 is concerned with the physiology of transvascular exchange of fluid, and Part 3 deals with the pathophysiology of several types of pulmonary edema. Generally, the coverage is somewhat patchy but there are many interesting chapters. Oddly enough, the editor's own contribution is very short and is mainly an overview of the plan of the book. Nevertheless, the books is a useful reference text and can be recommended for those who have an interest in this rapidly developing and critically important area.

J. B. West

48 THE PHYSIOLOGY OF BREATHING. Arend Bouhuys. Grune and Stratton, New York, 1977.

This book fills the void between most of the newer texts in respiratory physiology - geared to a shortened "core" presentation - and a Handbook. It provides information at the level required by the interested medical student, the graduate student in respiration, and the postdoctoral fellow who needs a refresher course. Some areas, such as respiratory gas exchange equations, and tissue gas exchange could perhaps have been expanded somewhat; nevertheless the balance is generally very good, with some sections, such as development of the breathing apparatus and environmental aspects, complementing the more standard chapters on mechanics, blood gas transport, control, etc... An obvious effort has been made to present not only classical findings, but also topics of current research interest, e.g. the question of stratified inhomogeneity. The illustrations are clear and usually uncrowded, and the list of references is more than adequate as a starting point for a literature search. In summary, an excellent addition to one's library.

L. E. Farhi

49 RESPIRATORY DEFENSE MECHANISMS. Brain, J. D., D. F. Proctor and L. M. Reid (Editors). Marcel Dekker, New York, 1977.

These two volumes (Parts I and II) provide a very extensive review of the lung's defense systems. The two volumes are divided into five sections, including (1) the role of the upper airways in conditioning inspired gas, (2) cilia and airways secretions, (3) mucociliary clearance mechanisms, (4) pulmonary clearance of inhaled materials, and (5) the role of pulmonary macrophages. Up-to-date accounts of a large number of topics are given under these five headings and they include all that most physiologists will want to know about respiratory defense mechanisms, and perhaps a little more besides. There is, inevitably, some overlap in a multi-authored compendium of this type, but the coverage is extensive and authoritative. A minor quibble is that, as in all these volumes on "Lung Biology in Health and Disease," executive editor Claude Lenfant, the references at the end of each chapter are not in alphabetical order. In practice, this substantially reduces the value of these texts as a means of finding dimly remembered articles. However, these two volumes can be strongly recommended as reference books for graduate students and their teachers for this somewhat neglected area of pulmonary physiology.

J. B. West

50 RETROSPECTROSCOPE. Comroe, J. H. Von Gehr, Menlo Park, CA., 1977.

This volume is a collection of essays that originally appeared singly in the American Review of Respiratory Diseases. They represent a thoughtful look at the development of scientific discovery, especially pulmonary science, and point out the importance of basic research, the often unanticipated discoveries that have arisen from it and some neglected important contributions. Each essay treats a single general topic, and the range of topics is wide. In addition to providing insight into the philosophy of science and the personalities of scientists, these essays also provide explanations of concepts and methods, making them useful as introductory scientific reviews. The writing style is that of personal reflection, filled with good humour and notable for its insight and lucidity. These retrospective looks could be read by all physiologists and their students, as well as by many scientifically trained non-physiologists, not only for their scientific information but also to gain an appreciation of the importance of basic science and of the often curious course of discovery and the application of knowledge.

Thomas C. Lloyd, Jr.

51 REGULATION OF RESPIRATION. Berger, A. J., R. A. Mitchell, and J. W. Severinghaus. New Eng. J. Med. 297: 92 - 97, 138 - 143, 194 - 201, 1977.

The purpose of these articles is to provide an integrative review of respiratory control. The first article considers central and peripheral receptor mechanisms, the second considers the central nervous system, and the third is an integrated overview in terms of responses to CO_2, O_2, metabolic disturbances and altitude. The authors have, by design, concentrated upon material published within the past six years. Two hundred and twelve references are cited, and the attention given to each is necessarily brief in this review primarily prepared for a general medical readership. In a field filled with controversy no review would be satisfactory if discrepancies were not apparent. Many are presented here, and the authors have prudently added their own interpretations. This review is recommended for use in graduate courses in respiratory physiology and for supplemental reading by medical students. Suitable preparation for reading them would be provided by the usual introduction given in freshman medical physiology courses.

Thomas C. Lloyd, Jr.

52 VENTILATION-PERFUSION RELATIONSHIPS. West, J.B. Amer. Rev. Resp. Dis. 116:919-943, 1977.

This review starts with a summary of O_2 and CO_2 exchange in single lung units as influenced by the ventilation-perfusion ratio and by the composition of inspired air and mixed venous blood. It then progresses to a consideration of the effects of ventilation-perfusion mismatching on arterial blood gases using lung models with small numbers of compartments. The remainder of the review is devoted to an excellent summary of recent analyses of pulmonary gas exchange in terms of continuous distributions of ventilation and blood flow. Estimation of these distributions by means of the multiple inert gas technique, the characteristics of the distributions in normal subjects and the effects of age and several types of cardiopulmonary disease are briefly described, with references to the original sources. The entire review is well written and illustrated. It will be useful both for those interested in physiological mechanisms and for physicians concerned with the evaluation and management of patients with cardiopulmonary disease.

D. Bartlett, Jr.

TECHNOLOGY IN TEACHING PHYSIOLOGY

53 CASE STUDIES IN MEDICAL PHYSIOLOGY. Alexander, Robert S. Little, Brown and Company, Boston, 1977.

This is a collection of 44 cases selected from a file of case histories that the author esteems for their physiological interest. They are grouped along organ system lines in order to emphasize their appropriate relation. Each case has a set of appended questions which encourages the student to work through an independent analysis prior to "accepting the crutch" then offered by the author. The overall goal of the book is to take the student to the bedside and challenge him to identify the normal and abnormal physiology encountered there. A major benefit of this collection is that they have obviously been student-tested over many years and are, therefore, free of pitfalls and ambiguities. The collection serves as a valuable adjunct to standard text readings and in a unique way emphasizes the physiologic rationale for the assessment, treatment, and understanding of disease.

James P. Filkins

54 RETROSPECTROSCOPE - - INSIGHTS INTO MEDICAL DISCOVERY. Comroe, Julius H., Jr. Von Gehr Press, Menlo Park, 1977.

This is a collection of essays dealing with a backward look in many directions to find the seeds and roots of major medical discoveries. By use of his "retrospectroscope" the author reveals the exciting world of medical discovery and explodes numerous myths regarding the simple or royal road to success. No student of physiology should be denied the opportunity to read these essays. The collection provides real insights into the process of research, the folly of disassociating medical miracles from their scientific roots, and the evolution of seemingly absurd 'physiologica esoterica' into clinical reality. Medical students and beginning graduate students, in particular, should be required to read the essay entitled "Out of the Mouth of Babes" in order to appreciate the value of the fresh outlook in problem solving. No physiologist's bookshelf will be complete without this unique essay collection.

James P. Filkins

AUTHOR INDEX