AMERICAN PHYSIOLOGICAL SOCIETY

OFFICERS, 1958-1959

President—Hallowell Davis, Central Institute for the Deaf, St. Louis, Missouri.

President-Elect (Secretary)—R. F. Pitts, Cornell University Medical College, New York City.

Past-President—L. N. Katz, Michael Reese Hospital, Chicago, Illinois.

Council—Hallowell Davis, R. F. Pitts, L. N. Katz, T. C. Ruch (1959), James Daniel Hardy (1960), H. S. Mayerson (1961), J. H. Comroe, Jr. (1962).

Executive Secretary-Treasurer—R. G. Daggs, 9650 Wisconsin Avenue, Washington 14, D. C.

Administrative Advisor—M. O. Lee, 9650 Wisconsin Avenue, Washington 14, D. C.

STANDING COMMITTEES

Membership Advisory—T. C. Ruch (1959), Chairman; and Members of the Council.

Educational Matters—H. W. Davenport (1960), Chairman; C. L. Prosser (1959), E. F. Adolph (1961), A. W. Martin, Jr. (1961), Hermann Rahn (1962).

Use and Care of Animals—R. F. Pitts (1959), Chairman; H. W. Davenport (1959), A. B. Otis (1961).

Placement of Senior Physiologists—D. B. Dill (1962), Chairman; W. O. Fenn (1961), W. F. Hamilton (1960), E. M. Landis (1962).

Porter Fellowship—R. F. Pitts (1959), Chairman; Hermann Rahn (1960), J. M. Brookhart (1961).

Program Advisory—J. H. Comroe, Jr. (1960), Chairman.

Committee on International Physiology of the American Physiological Society—W. O. Fenn (1959), Chairman; R. W. Gerard (1961), M. B. Visscher (1963).

Historian—John Field, II.

REPRESENTATIVES TO OTHER ORGANIZATIONS

APS Members of Federation Board—L. N. Katz (1959), Hallowell Davis (1960), R. F. Pitts (1961).

American Association for the Advancement of Science—F. A. Hitchcock (1960), R. G. Daggs.

American Documentation Institute—M. O. Lee (1961).

American Institute of Biological Sciences—W. O. Fenn (1959).

National Research Council—Division of Biology and Agriculture, J. O. Hutchens (1961); Division of Medical Sciences, R. W. Gerard (1961).

Council on Medical Education and Hospitals, A.M.A.—J. S. Gray (1961).

APS Members of the United States National Committee for the International Union of Physiological Sciences—W. O. Fenn (1959), R. W. Gerard (1961), M. B. Visscher (1963), E. M. Landis (alternate).

Council for Coordination of International Congresses—M. B. Visscher.

Council of International Organizations in Medical Sciences—M. B. Visscher.

APS Representative on Joint Symposium Committee on Neuropharmacology—H. E. Himwich (1961), T. C. Ruch (1961).

EDITORIAL BOARDS

Board of Publication Trustees—M. B. Visscher (1959), Chairman; W. F. Hamilton (1960), Philip Bard (1961).

Managing Editor—M. O. Lee.

Associate Editor—R. G. Daggs.

Secretary of Publications—Sara F. Leslie.

American Journal of Physiology and Journal of Applied Physiology—W. D. Armstrong (1960), R. S. Alexander (1961), E. J. Baldes (1959), S. B. Barker (1961), R. W. Berliner (1959), A. F. Cournand (1959), R. C. De Bodo (1960), Philip Dow (1960), W. S. Fowler (1959), R. Galambos (1959), R. Gaunt (1959), A. S. Gilson, Jr. (1960), H. D. Green (1960), E. G. Gross (1959), A. C. Guyton (1961), H. K. Hartline (1959), A. B. Hastings (1959), H. E. Himwich (1959), A. Hollaender (1960), L. B. Jacques (1961), F. H. Johnson (1961), R. E. Johnson (1961), A. Keys (1960), W. J. Kolff (1961), N. Lifson (1960), G. K. Moe (1959), W. F. H. M. Mommaerts (1960), H. M. Patt (1960), H. Rahn (1960), R. L. Riley (1959), S. Roberts (1959), J. Russell (1960), P. F. Salisbury (1961), S. J. Sarnoff (1961), O. H. Schmitt (1960), W. H. Seegers (1959), E. E. Selkurt (1960), H. L. White (1960), E. H. Wood (1960), W. B. Youmans (1960).

Physiological Reviews—H. S. Mayerson (1961), Chairman; H. J. Curtis (1959), C. F. Code (1960), I. H. Page (1960), E. M. Landis (1960), Vernon Mountcastle (1960), A. B. Otis (1961), R. M. Reinecke (1961); *Appointees of the Society of General Physiologists*—K. Thimann (1959), D. R. Griffin (1960); *Appointees of the Society of Biological Chemists*—Emil L. Smith (1960), John M. Buchanan (1960), *European Editorial Committee*—G. Kahlson (1959), Chairman; H. Barcroft (1959), A. Fessard (1959), E. Lundsgaard (1959), R. H. S. Thompson (1959).

Annual Review of Physiology—John Field II (1960), Chairman; J. M. Brookhart (1960), H. W. Davenport (1960), G. K. Moe (1960).

PAST OFFICERS

Presidents—1888 H. P. Bowditch. 1889-1890 S. Weir Mitchell. 1891-1895 H. P. Bowditch. 1896-1904 R. H. Crittenden. 1905-1910 W. H. Howell. 1911-1913 S. J. Meltzer. 1914-1916 W. B. Cannon. 1917-1918 F. S. Lee. 1919-1920 W. P. Lombard. 1921-1922 J. J. R. Macleod. 1923-1925 A. J. Carlson. 1926-1929 J. Erlanger. 1930-1932 W. J. Meek. 1933-1934 A. B. Luckhardt. 1935 Charles W. Greene. 1936-1937 F. C. Mann. 1938-1939 W. E. Garrey. 1938 W. T. Porter, Honorary President. 1940-1941 A. C. Ivy. 1942-1946 P. Bard. 1947 W. O. Fenn. 1948 M. B. Visscher. 1949 C. J. Wiggers. 1950 H. C. Bazett (April to July); D. B. Dill. 1951 R. W. Gerard. 1952 E. M. Landis. 1953 E. F. Adolph. 1954 H. E. Essex. 1955 W. F. Hamilton. 1956 A. C. Burton. 1957 L. N. Katz.

Secretaries—1888-1892 H. N. Martin. 1893-1894 W. P. Lombard. 1895-1903 F. S. Lee. 1904 W. T. Porter. 1905-1907 L. B. Mendel. 1908-1909 R. Hunt. 1910-1914 A. J. Carlson. 1915-1923 C. W. Greene. 1924-1929 W. J. Meek. 1930 A. C. Redfield. 1931-1932 A. B. Luckhardt. 1933-1935 F. C. Mann. 1936-1939 A. C. Ivy.

1940-1941 Philip Bard. 1942 C. J. Wiggers. 1943-1946 W. O. Fenn. 1947 M. B. Visscher.

Treasurers—1888-1892 H. N. Martin. 1893-1894 W. P. Lombard. 1895-1903 F. S. Lee. 1904 W. T. Porter. 1905-1912 W. B. Cannon. 1913-1923 J. Erlanger. 1924-1926 C. K. Drinker. 1927-1936 Alexander Forbes. 1937-1940 W. O. Fenn. 1941 C. J. Wiggers. 1942-1946 Hallowell Davis. 1947 D. B. Dill.

Executive Secretary-Treasurer—1948-1956 M. O. Lee.

BYLAWS

(Amended April 1958)

ARTICLE I. Membership

Section 1. The Society shall consist of members, honorary members and associate members.

Section 2. *Members.* Any person who has conducted and published meritorious original research in physiology and/or biophysics and who is a resident of North America shall be eligible for membership in the Society.

Section 3. *Honorary Members.* Distinguished scientists of any country who have contributed to the advance of physiology shall be eligible for proposal as honorary members of the Society.

Section 4. *Associate Members.* Advanced graduate students in physiology at a pre-doctoral level, teachers of physiology, and investigators who have not yet had the opportunity or time to satisfy the requirements for full membership shall be eligible for associate membership in the Society provided they are residents of North America.

ARTICLE II. Officers

Section 1. The management of the Society shall be vested in a Council consisting of the President, the President-Elect, the Past President for the previous year, and four other members. The terms of the four additional Councilors shall be four years each and they shall not be eligible for immediate reelection except those who have served for two years or less in filling interim vacancies. A person may serve only one term as President, except that if the President-Elect becomes President after September 30 he shall continue as President for the year beginning the next July 1st.

Section 2. Nomination and election of a President-Elect and Councilor(s) shall be by ballot at the Spring meeting of the Society. They shall assume office on July 1 following their election.

Section 3. The President-Elect shall serve as Vice-President and Secretary. Should he have to function as President prematurely, the Council shall select from among its own members a Secretary.

Section 4. The Council shall be empowered to appoint and compensate an Executive Secretary-Treasurer who shall assist it in carrying on the functions of the Society, including the receipt and disbursement of funds under the direction of the Council.

Section 5. The Council may fill any interim vacancies in its membership or vacancies on any Board or Committee of the Society, unless otherwise provided.

ARTICLE III. Dues

Section 1. The annual assessment on members and on associate members shall be determined by the Council and shall be due in advance on July 1.

Section 2. A member whose dues are two years in arrears shall cease to be a member of the Society, unless after payment of his dues in arrears and application to the Council, he shall be reinstated at the next Spring meeting by special vote of the Council. It shall be the duty of the Secretary to notify the delinquent of his right to request reinstatement.

Section 3. A member who has retired from employment because of illness or age may, upon application to the Council, be relieved from the payment of the annual member assessment.

ARTICLE IV. Meetings

Section 1. A meeting of the Society for transacting business, electing officers and members, presenting communications, and related activities, shall be held in the Spring of each year, with other member Societies of the Federation of American Societies for Experimental Biology, except that under exceptional circumstances the Council may cancel such a meeting.

Section 2. A Fall meeting of the Society shall be held at a time and place determined by the Council, for presenting communications and for transacting business except the election of officers.

Section 3. Special meetings of the Society or of the Council may be held at such times and places as the Council may determine.

Section 4. Regional meetings of the Society, for the purpose of presenting scientific communications, may be authorized by the Council.

ARTICLE V. Publications

Section 1. The official organs of the Society shall be the *American Journal of Physiology*, the *Journal of Applied Physiology*, *Physiological Reviews* and such other publications as the Society may own.

Section 2. A Board of Publication Trustees, composed of three members of the Society and appointed by the Council, shall be vested with the full power of the Society to control and manage, both editorially and financially, all of the publications of the Society; to appoint editorial boards; to appoint and compensate a Managing Editor; and to control all publication funds, none of which, however, may be diverted from support of the publications of the Society except by consent of the Council. The term of each member of the Board shall be three years; a member may not serve more than two consecutive terms. The Council shall designate the Chairman of the Board, and shall receive an annual report on the finances, publications and policies. A summary of this report shall be presented to the Society of the Spring meeting.

The Chairman of the Board of Publication Trustees shall be a member ex-officio of the Council but shall have no vote.

ARTICLE VI. Committees and Representatives

The Council may appoint such special and standing committees as it deems necessary or that are voted by the Society.

The Council may name members of the Society as representatives to other organizations whenever it deems such action desirable.

ARTICLE VII. Standing Rules

1. *Election to Membership.* Two members of the Society must join in proposing a person for membership, in writing and with a statement of his qualifications. The Council may, from the persons so proposed, nominate candidates for election to membership. Nominations shall be presented at Spring and Fall meetings; a two-thirds majority vote of the members present and voting at the next following Fall or Spring meeting shall be necessary for election.

If a Spring or Fall meeting of the Society is not held, the procedures of nomination and/or election of new members may be effected by mail.

The names of the candidates nominated by the Council for membership and statements of their qualifications signed by their proposers shall be available for inspection by members during the Society meetings at which their election is considered.

2. *Election to Honorary Membership.* The proposal of an honorary member shall be made by two members of the Society to the Council in writing. The Council may, from the candidates so proposed, make nominations to the Society at a Spring meeting. A two-thirds majority vote of the members present shall be necessary for election.

Honorary members shall have the privilege of attending business sessions of the Society but shall have no vote. They shall pay no membership fees.

3. *Election to Associate Membership.* Associate members shall be proposed, nominated and elected in the same manner as full members.

Associate members shall have the privilege of attending business sessions of the Society but shall have no vote. Associate members may be nominated for full membership.

4. *Presentation of Papers.* At a Spring meeting of the Society, held in conjunction with the Federation meetings, a member or honorary member may present orally or by title, be co-author of, or introduce not more than one scientific paper, except upon invitation of the Council. An associate member or a non-member may present orally one scientific paper only if sponsored by a full member of the Society. At a Fall meeting, a member, honorary member, or associate member may present orally not more than one paper, except upon invitation of the Council.

Upon invitation by the Council, a member may contribute papers to specially designated sessions of the Society without forfeit of his privilege of presenting a regular scientific communication.

5. There shall be a Committee on Membership appointed by and advisory to the Council.

6. There shall be a Program Advisory Committee appointed by the Council.

ARTICLE VIII. General

Section 1. *Amendments.* These Bylaws, except Article VII, may be amended at any Spring meeting of the Society by a three-fourths majority vote of the members present.

The Standing Rules of Article VII may be amended by a majority vote of the members present at either a Spring or Fall meeting of the Society.

Section 2. *Quorum.* At all business meetings of the Society fifty members shall constitute a quorum.

Section 3. *Parliamentary Authority.* The rules contained in Roberts Rules of Order shall govern the conduct of the business meetings of the Society in all cases to which they are applicable and in which they are not inconsistent with the Bylaws or special rules of order of the Society.

HENRY PICKERING BOWDITCH

An Intimate Memoir

MANFRED BOWDITCH

In a biographical sketch by C. S. Minot, Henry P. Bowditch is credited with having created and equipped "the first modern laboratory for instruction and research in the medical sciences to be founded in America." Though no book-length biography has been written, this and similar memoirs by W. B. Cannon, F. W. Ellis and others adequately portray the scientific activities and achievements of a pioneer in physiology. When, as a son of Dr. Bowditch, I was invited to write of him in a more intimate vein, I had hoped to be able to do so without recourse to the first person singular. But this has proved a task beyond my limited powers of composition, and I must unashamedly cast the purpose aside. Supplementing this introduction, let me ask further indulgence in that, fifty years my father's junior and his youngest child, I came to really know him only in his later years.

Dr. Bowditch's demeanor has been described as stern, even as austere. He most certainly had an innate dignity, but he was essentially a friendly and kindly man, and to his intimates displayed a warmth and jollity quite the reverse of austerity. Free rein to these engaging facets of his character could be given, first, in the family home in the Boston suburb of Jamaica Plain, and secondly at the Adirondack camp to which he found his way year after year. I shall try to picture some part of his contribution to the atmosphere of both.

Let us start with the camp. More than eighty years ago, a group of young men from Boston, on a walking trip in the Adirondacks, came to the head of Keene Valley, beautifully situated among the region's highest peaks, and, since the road went no further, availed themselves of the hospitality of a primitive boarding house providentially awaiting them there. Enamoured of their surroundings, four of their number, William James, Charles and James Putnam and my father, returned to buy the property and to establish the camp which, in the tradition of easy hospitality they initiated, still beckons to many of us who knew and loved it in our childhood.

Here, in the well-equipped workshop brought into being by him and our saintly 'Cousin Charley,' my father could and did exercise the ingenuity, the inventiveness and the manual skill for which his laboratory work was noted, and the end product ranged from the remarkably comfortable 'Bowditch chair' to a device which, propelled by a water-driven paddle wheel, drew endless yards of silk from a large and good-natured species of spider to be found thereabouts. Much of the camp's early equipment came from this shop, and, as may be imagined, it was a busy place. But its two chief craftsmen were never too preoccupied to give advice, or lend a hand if need be, to the youngster bent on fashioning a boat to sail the waters of the nearby brook, or some other bit of juvenile carpentry.

And at the camp, no less than elsewhere, was displayed the catholicity of Dr. Bowditch's interests. Here, as at his home, emerged from the darkroom the products of his photographic skill, including some pioneering and successful examples of telephotography, and later generations are in his debt for a wealth of pictorial records of the doings of his day. Keenly alive to the implications of aviation, he built and flew in the mountains a series of huge kites, one of which was said to have lifted him momentarily from the ground; and while he never flew himself, he followed with great interest the exploits of Lillienthal and other pioneers, and lived to be taken in his last year to an aviation meet at Squantum, near Boston, my chief memory of which is the Roe triplane, a sort of aerial club sandwich which started bravely down the field, only to turn over on its nose. An active woodsman and climber in his day, Dr. Bowditch combined these pursuits with surveying expeditions over the mountain property, using the instruments of that calling with all but professional skill.

Those were the days before the movies and other forms of canned entertainment had robbed us of the capacity to amuse ourselves, and the camp was thus the scene of an endless variety of doings of a histrionic nature, entered into with an enthusiasm seldom evinced by young or old today. Two such events, in which my father participated, come to mind.

Each of the several structures comprising the camp bore a name. When a small single-room house was erected at a point somewhat higher than the rest, it was decided to christen it 'The Ark.' This obviously called for some ceremony, and a procession was formed, led by my parents as Mr. and Mrs. Noah, who were followed, two by two, by the rest of us, dressed as animals, and with two of the smallest tots impersonating browntail moths, then the object of some concern, bringing up the rear.

Among the many colleagues brought to the camp as his guests was my father's friend Angelo Mosso of Turin, physiologist and early investigator of the effects of high altitudes on the human metabolism. Climbing one day on a nearby mountainside, a group from the camp came upon a ledge of rock commanding a wide view of the valley and its surrounding peaks. What was the name of this lovely spot, Mosso asked. Told that it was nameless, he expressed surprise, and assured his companions that, in Italy, any such outlook would bear an appropriate name. Some days later, there was a second expedition to the ledge, to christen it, with due ceremony, 'Mosso's Ledge,' by which designation it is known today. Dr. Mosso, quite overcome, obviously felt himself highly honored, and impulsively kissed my quite embarrassed father on both cheeks.

Important to life at the Adirondack camp have always been the evening campfires, featured by group singing and, in the old days, solo performances by many of the participants. Dr. Bowditch's, called for and enthusiastically applauded year after year, was the impersonation of an organ grinder, in which he hopped about on one foot, holding the other in one hand, ground out 'tunes' (he was quite tone-deaf) and, with a tattered felt hat held out to his listeners, demanded 'baksheesh.' Austere ?

Dr. Pappenheimer, in the first of the Bowditch lectures, ventured the thought that Sir Michael Foster, in leisurely conversations at the

camp, probably learned more about American physiology than he would have from a series of rapid visits to widely separated laboratories. This may well have been so, for he and Mosso were by no means the only ones of their ilk to come there as guests. Other physiologists were Gaskell and Waller of England, and Kronecker of Switzerland, while Osler, Brunton of England, as well as Charles Minot and Oliver Wadsworth of Boston, were among the many other medical visitors. Yet all of these were welcomed as friends and companions, quite as much as for their professional attributes, and it would be a mistake to think that the callings of the four original owners (William James, who later withdrew, to continue as a frequent visitor, was both medical man and philosopher) imparted any noticeable Aesculapian flavor to the camp. Such diverse spirits as Professor Edward S. Morse, leading American authority on Japanese pottery, and Sir James Bryce, also found their way there, and the debates on psychical research, with James Putnam, William James and my father in warm yet friendly dispute, probably outnumbered those on topics of purely medical interest.

So much for the camp. Of the family home, and of their father as a parent, the five survivors of his seven children cherish the warmest memories. Always ready to help us with our studies, as with our personal problems, he took an interest in the details of our upbringing quite remarkable in a man so busied with outside concerns. Lest undue leisure lead to mischief, reading assignments were meted out during summer holidays, with such old stand-bys as 'Horatius at the Bridge' to be learned by heart. Promptness was a virtue to be stressed. Our interest in nature was stimulated in Sunday walks through the nearby woods, with the characteristics of trees and of rock formations, of land snails and of polly-wogs, patiently explained. To tell us something of the circulation of the blood, my father invented the story of 'Globby' and his travels through the body, of how he changed in color, how he rushed through the heart, and how, when Tommy cut his finger, Globby came out in a drop of blood, shrank onto a handkerchief, expanded in the laundry and burst.

Less didactic, but highly stimulative of the risibilities of the very young, still small enough to climb into bed with him of a Sunday morning, were a song, rendered quite off key, about Toodle-de-Doo, a cock robin whose vain glory brought him to an untimely end, and the designation of the five toes, each tweeked in turn, as Peedy Weedy, Pally Ludy, Lady Whistle, Lody Whostle and Great Odomondod. The origins of these two gems appear lost in antiquity. In letters to his older children, my father occasionally used to append to his signature the degrees of M.D., D.Sc., LL.D. and P.O.D., the latter to be interpreted as 'Poor Old Dad.' Even with well-deserved verbal chastisement was there sometimes an admixture of humor. To the young miscreant who was his youngest he once exploded, "You are either a knave or a fool, and I would hate to think that you are a fool."

A founder of the triennial international physiological congresses, Dr. Bowditch attended them regularly thereafter, throughout his active life, and as invariably took my mother and some of us children with him on these trips to Europe. I was fortunate in being one of those to accompany him to Brussels, I believe in 1903, where the Belgian industrialist Ernest Solvay gave an elaborate evening reception to the visiting physiologists. A feature of this occasion, in a huge tent erected on the lawn,

was a lantern-slide lecture delivered by Dr. Mosso, in the course of which he threw on the screen the picture of a little mountain lake near his laboratory on Monte Rosa, announcing that it had been named "Lago di Bowditch." Mosso's Ledge had been repaid in kind.

To be counted on to emerge from the parental baggage on his return from Europe was at least one example of my father's love of gadgets. Two which I particularly remember were a sort of binocular periscope, by Zeiss, by means of which one could look over a wall or from behind a tree without being exposed, and half a dozen tumblers of reputedly unbreakable glass, each of which flew into fragments when he undertook to demonstrate their toughness. Other illustrations of this flair were his keen pleasure in hearing his voice and those of his friends reproduced by an early Edison cylinder phonograph which he had secured, and the little glass swans which a skilled glass blower had produced for the amusement of the small fry. Filled with water and seemingly designed to squirt it through the beak when held in the mouth by the tail, they instead delivered it in a sharp stream between the blower's eyes.

Though he held membership in a variety of scientific organizations and was unstinting in his support of those closest to his interest, Dr. Bowditch was never a 'joiner' and was the antithesis of the clubman in the accepted sense. His few clubs were those affording intellectual stimulus or participation in an atmosphere of restrained Bohemianism, rather than any purely social prestige, among them being the Thursday Evening Club and the Grub Club, the latter a group of twelve physicians who met monthly to dine, in turn, at each other's homes; and in later life there were the Saturday Club and the Bowditch Club, formed to do him honor and since disbanded. But it was in the conviviality of the Tavern Club that he found the keenest enjoyment, and it was of the jolly doings within its walls that we children heard the most. Outstanding among these was a contest in which a number of the members, seated before mirrors, painted their own portraits. My father's product, in oils supplied by an artist friend, was notable both for its proof of his lack of skill with the brush, and for the evidences of his red-and-green color blindness. One of the most atrocious attempts at portraiture ever to be placed on canvas, it was awarded honorable mention by the Art Committee as 'chaste, tender and self-restrained.'

No memoir of Dr. Bowditch would be complete without some mention of his high sense of civic obligation. Early in life, it led him to enlist in the Union Army on graduation from college in 1861, and though he saw service throughout the war, he almost never referred to his military experience in after life, and steadfastly rejected membership in the G.A.R. Despite the burdens of his professorship and, for ten years, of directing, as dean, the destinies of the Harvard Medical School, he found time to serve as a trustee of the Boston Public Library, as a member of the Boston School Committee, as president of both the Boston Children's Aid Society and the Massachusetts Infant Asylum, and as a member of the Committee of Fifty to investigate the liquor problem. In this connection it may be noted that, though there was always a decanter of Canary Malmsey on the table at Sunday dinner, my father had no personal interest in stronger drink. Despite this, in some handwritten pages of his lecture notes which have survived, he refers to many statements of the temperance writers as 'unproved, unprovable or untrue.' The castigation accorded him by the W.C.T.U. is a matter of record.

There could hardly be a more fitting conclusion to an account such as this than the words of his lifelong friend, colleague and Adirondack companion James J. Putnam, who wrote of my father:

"Strong as was his sense of public obligation and of public trust, he had a side of gaiety and lightness, without knowing which it was impossible to know him. Whether as host at his own table or as a guest at a friend's; on every occasion (and many were found) when his hearty laugh had an excuse for making itself heard; as kite-flyer, mountain climber, inventor, photographer, furniture maker and repairer; - in all these capacities and many more, he showed a humor, kindliness and charm which made him a delightful and most genial friend and comrade, though each pleasant toil was marked with the never wanting stamp of fidelity, thoroughness and honesty.

"It was in the thoroughly free life of the Adirondack camp, to which through 30 years he looked forward with such pleasant longing from one summer to the next, that these qualities came most strongly to the front. No one could have entered with more zest than he into the varied pleasures of that enchanted spot. There reserve and formality could be laid aside, and free play allowed to the instincts of hospitality, sociability and the playfulness of boyhood at its best."

APS MEMBERSHIP STATUS

Status as of 1 November, 1958

Active regular members	1629
Retired members	118
Honorary members	12
Total membership	1759

There are no Associate Members at present but several have been nominated by Council and will be up for election at the Spring Meeting.

NEWLY ELECTED MEMBERS

The following people, nominated by Council, were elected to full membership at the 1958 Fall Meeting, London, Ontario:

ALDEMAN, William J., Jr.: Asst. Prof. Physiol., Univ. of Buffalo Sch. of Med.
ALPERT, Norman R.: Asst. Prof. Physiol., Univ. of Ill. Coll. of Med.
BAKER, Carleton H.: Asst. Prof. Physiol., Med. Coll. of Georgia.
BALCHUM, Oscar J.: Instr. Med., Vanderbilt Univ. Sch. of Med.
BARNHART, Marion I.: Assoc. Prof. Physiol. and Pharm., Wayne Univ. Coll. of Med.
BATES, David V.: Assoc. Prof. Med., McGill Univ.
BROWN, Kenneth T.: Asst. Prof. Physiol. Optics, Johns Hopkins Med. Sch.
CAMPBELL, Gilbert S.: Asst. Prof. Surg., Univ. of Minn.
CHAET, Alfred B.: Asst. Prof. Physiol., Boston Univ. Sch. of Med.
CHAPMAN, Carleton B.: Prof. Med., Univ. of Texas Southwestern Med. Sch.
CLEMENTS, John A.: Asst. Chief, Clinical Invest. Br., Directorate of Med. Research, U. S. Army Chemical Warfare Labs., Army Chemical Center.
DEANE, Norman: Asst. Prof. Med., N.Y. Univ. Post-Grad. Med. Sch.
EGDAHL, Richard H.: Dir. Surg. Research Lab., Med. Coll. of Va.
EPSTEIN, Franklin H.: Asst. Prof. Med., Yale Univ. Sch. of Med.
FRANK, George B.: Asst. Prof. Pharm. and Ther., Univ. of Manitoba Faculty of Med.
FRENCH, Arthur B.: Asst. Prof. Int. Med., Univ. of Mich. Med. Sch.
FRY, Donald L.: Chief, Cardiopulmonary Physiol. Unit, Natl. Heart Inst., NIH.
GILMORE, Joseph P.: Head, Dept. Physiol., Naval Med. Field Research Lab., Camp Lejeune, N. C.
GRIMM, Eugene D.: Asst. Prof. Physiol., Univ. of Minn.
HAJDU, Stephen: Physiologist, Natl. Insts. of Health.
HAMMEL, Harold T.: Asst. Prof. Physiol., Univ. of Penna. Sch. of Med.
HARPER, Paul V.: Assoc. Prof. Surg., Univ. of Chicago.
HOFFMAN, Joseph F.: Physiologist, Natl. Heart Inst., NIH.
HOSHIKO, Tom: Instr. Physiol., Western Reserve Univ. Sch. of Med.

JONES, Dave C.: Supervisory Physiologist, U. S. Naval Radiological Defense Lab., San Francisco.
KARE, Morley R.: Simon H. Gage Fellow, N. Y. Veterinary College, Cornell Univ., Ithaca, N. Y.
KREUZER, Ferdinand: Asst. Prof. Physiol., Dartmouth Med. Sch.
LANG, Stanley: Asst. Prof. Physiol., Wash. Univ., St. Louis.
LEONARD, Samuel L.: Prof. Zool., Cornell Univ., Ithaca, N. Y.
LIPNER, Harry J.: Asst. Prof. Physiol., Fla. State Univ., Tallahassee.
LOEWENFELD, Irene E.: Research Worker, Dept. Ophthalmol., Columbia Univ.
METZ, Bernard: Asst. Prof. Physiol., Med. Coll. of South Carolina.
NGAI, Shih-hsun: Asst. Prof. Anesthesiol., Columbia Univ.
NICHOLSON, Thomas F.: Assoc. Prof. Path. Chem., Univ. of Toronto.
OCHS, Sidney: Asst. Prof. Physiol., Univ. of Texas, Med. Br., Galveston.
OLDS, James: Assoc. Prof. Psychol.,Univ. of Mich.
PEARCE, James W.: Prof. Physiol., Univ. of Alberta, Edmonton, Canada.
PIEPER, Heinz P.: Asst. Prof. Physiol., Ohio State Univ.
RIECK, Alvin F.: Asst. Prof. Physiol., Marquette Univ. Sch. of Med.
ROBBINS, Jacob: Sr. Investigator, Natl. Inst. Arth. and Met. Dis., NIH.
RUTLEDGE, Lester T.: Sr. Research Fellow in Physiol., Univ. of Mich.
SALGADO, Ernesto D.: Endocrinologist, Pfizer Ther. Inst., Maywood, N. J.
SCHOTTELIUS, Byron A.: Asst. Prof. Physiol., State Univ. of Iowa.
SEARLE, Gilbert L.: Chief Scientist, V. A. Hosp., San Francisco.
SHEPHERD, John T.: Assoc. Prof. Physiol., Mayo Fndn.
SPECTOR, Harry: Chief, Nutrition Br., Quartermaster Food and Container Inst. for the Armed Forces, Chicago.
SULLIVAN, Bernard J.: Assoc. Prof. Physiol., Boston College.
SUN, David C. H.: Assoc. in Med., Temple Univ. Sch. of Med.
TOSTESON, Daniel C.: Research Physiologist, Natl. Heart Inst., NIH.
WEINER, Murray: Asst. Prof. Clin. Med., N. Y. U. Coll. of Med.
WHEDON, George D.: Asst. Dir., Natl. Inst. Arth. and Met. Dis., NIH.
WHITNEY, Rae: Asst. Res. Prof. Biol., Boston Univ. Grad. Sch.

DECEASED MEMBERS

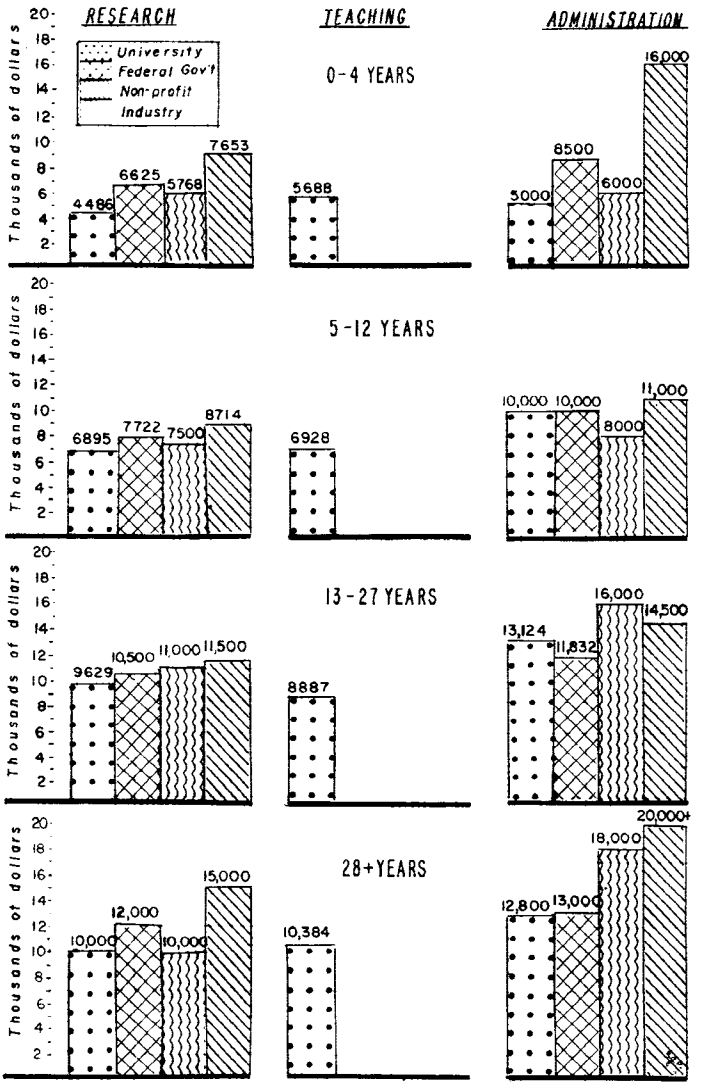
The American Physiological Society received notices during 1958 of the deaths of the following members. The Society expressed its sorrow and extended sympathy to the families.

J. M. Beazell - Colorado Springs, Colorado
Alfred E. Cohn (R) - Rockefeller Institute
Dean A. Collins - Prof. Pharmacology, Temple
J. O. Crider (R) - Prof. Emeritus, Jefferson
F. E. Emory - Prof. Physiology and Pharmacology, Arkansas
E. T. Engle - Prof. Anatomy, Columbia
Heinrich G. Kobrak - Clarkston, Michigan
L. Lapique (Hon.) - The Sorbonne, Paris
Arno Luckhardt - Prof. Emeritus, Chicago
Albert P. Mathews (R) - Prof. Emeritus, Cincinnati
Winifred B. Stewart - Prof. Neurology, Woman's Medical College
Craig L. Taylor - Prof. Engineering and Physiology, California
Abby Turner (R) - Prof. Emeritus, Mount Holyoke

MEAN SALARIES OF PHYSIOLOGISTS AT POST-DOCTORAL LEVEL

COMPARISON BY EMPLOYER, PRIMARY FUNCTION, AND YEARS' EXPERIENCE

Prepared by
National Register of Scientific and Technical Personnel—FASEB Register



Non-profit organizations include Foundations, non-academic institutions, hospitals

All data taken from 1956-1957 National Questionnaire

FUTURE MEETINGS

April 13-17, 1959, Atlantic City, N.J. The APS will meet as is customary as a part of the Federation. Announcements will be mailed to APS members sometime this fall.

August 9-15, 1959, XXI International Congress of Physiological Sciences, Buenos Aires, Argentina. Detailed announcements are being mailed to all Federation members.

September 8-11, 1959, Urbana, Ill. The Society of General Physiologists will meet just prior to the APS Fall Meeting, starting September 7.

April 11-15, 1960 (tentative), Chicago, Ill. As a part of the Federation.

August 23-26, 1960 (tentative), San Francisco Bay Area (Palo Alto and San Francisco), Fall Meeting.

THE WILLIAM T. PORTER FELLOWSHIP IN PHYSIOLOGY

The Porter Fellowship was started in 1921 with funds supplied by William T. Porter of Harvard. The grants started by Dr. Porter have continued from the Harvard Apparatus Company. One fellowship is awarded each year.

Applications are invited from predoctoral and postdoctoral students for research and training in physiology. Preference is given to students entering their final year of doctoral training. The Fellow may continue in his present location or in another laboratory. The new annual stipend is $3600 paid in 12 monthly installments. Acquiring teaching experience in physiology may be included up to 40 per cent of the Fellowship year.

Applications must be made on or before January 10 of each year for the following academic year beginning July 1 or September 1. Announcement of the award is made by April 1 of each year. Application forms may be obtained from the Executive Secretary, American Physiological Society, 9650 Wisconsin Avenue, Washington 14, D. C.

A list of Porter Fellows, their present degrees, and where they are now located, in so far as the information is available, is shown in the table.

PORTER FELLOWS

YEAR	NAME	DEGREES	CHOICE OF UNIVERSITY	SUPERVISOR	PRESENT LOCATION
1921	John Hepburn	M.D. Toronto	Toronto	John J. R. MacLeod	Deceased Mar. 30, 1956
1922	Florence B. Seibert	Ph.D. Yale	Yale	Lafayette B. Mendel	Henry Phipps Inst., Philadelphia, Pa.
1923	Florence B. Seibert		Chicago	H. Gideon Wells	Prof. Biochem.
1924	Howard H. Beard	Ph.D. Yale	Yale	Lafayette B. Mendel	Harris Cancer Res. Clinic, Sherman Oaks, Cal. Clin. Biochemist.

PORTER FELLOWS (Continued)

YEAR	NAME	DEGREES	CHOICE OF UNIVERSITY	SUPERVISOR	PRESENT LOCATION
1925	W. H. Finney		McGill	John Tait	
1926	Charles Stuky	Ph.D. Yale	Yale	Lafayette B. Mendel	Deceased, Dec. 26, 1938.
1927	Dea B. Calvin	Ph.D. Yale	Yale	Lafayette B. Mendel	Univ. of Texas, Med. Br., Galveston. Prof. Biochem. & Dean of Student Affairs.
1928	Donald E. Gregg	Ph.D. and M.D. Rochester	Rochester	John R. Murlin	Walter Reed Army Inst. of Res., Walter Reed
1929	Donald E. Gregg		Rochester	John R. Murlin	Med. Ctr., Washington, D.C. Chief Dept. Cardiorespir. Diseases.
1930	Herbert Silvette	Ph.D. Virginia	Virginia	Sidney W. Britton	Med. Coll. of Virginia, Richmond. Visiting
1931	Herbert Silvette		Virginia	Sidney W. Britton	Prof. Theoretical Pharm.
1932	Abraham White	Ph.D. Michigan	Yale	Arthur H. Smith	Albert Einstein Coll. of Med.,Yeshiva Univ., N.Y. City. Prof. Biochem. & Assoc. Dean.
1933	Nathan Rakieten	Ph.D. Yale	Yale	John Fulton	South Shore Analytical & Res.Lab., Islip, L.I., N.Y. Pharmacologist.
1934	Edward H. Kemp		Clark	Walter S. Hunter	
1935	Ellen Robinson	M.A. Radcliffe	Harvard	Alfred C. Redfield	Grass Instrument Co., Quincy, Mass.
1936	H. C. Wiggers	Ph.D. Western Reserve	Harvard	Hallowell Davis	Albany Med.Coll., Union Univ., Albany, N.Y. Dean & Prof. Physiol.
1937	Jane A. Russell	Ph.D. California	California	Herbert M. Evans	Emory Univ., Atlanta, Ga. Assoc. Prof. Biochem.
1938	Earl R. Loew	Ph.D. North-western	Northwestern	A. C. Ivy	Boston Univ.Sch. of Med., Boston, Mass. Prof. Physiol.
1939	N. S. R. Maluf	Ph.D. Cornell M.D. Harvard	Washington	H. L. White	V.A. Hosp., Houston, Tex. Chief Urology.
1940	Gordon K. Moe	Ph.D. Minnesota M.D. Harvard	Western Reserve	C. J. Wiggers	State Univ. of N.Y. Sch. of Med., Syracuse. Prof. Physiol.
1940	J. H. Wills	Ph.D. Rochester	Harvard	W. B. Cannon	Directorate of Med. Res., Chem. Warfare Labs., Army Chem.Ctr., Md. Asst. Chief, Physiol. Div.
1941	Milton J. Schiffrin	Ph.D. McGill	Northwestern	A. C. Ivy	Hoffmann-LaRoche Inc., Chicago, Ill. Asst. Dir.Dept.of Clin.Res.
1942-1945	Fellowships temporarily suspended.				
1946	E. L. Chambers	M.D. New York	California	S. C. Brooks	Univ. of Miami Sch. of Med., Coral Gables, Fla. Assoc. Prof. Physiology.
1947	Arthur F. Battista	M.D. McGill	Harvard	Alexander Forbes	N.Y.Univ.Post Grad. Med.Sch.,N.Y.City. Instr. in Neurolog. Surgery.

PORTER FELLOWS (Continued)

YEAR	NAME	DEGREES	CHOICE OF UNIVERSITY	SUPERVISOR	PRESENT LOCATION
1948	Raymond F. Kline	Ph.D.	Maryland	W. R. Amberson	Aero Med.Lab.,Wright Air Devel.Ctr.,Wright-Patterson AFB. Research Physiol.
1949	Philip W. Hall III		Western Reserve	C. J. Wiggers	
1950	Irving L. Schwartz	M.D. New York	Rockefeller Inst.	V. P. Dole	Rockefeller Inst.for Med.Res.,N.Y.City. Assoc. Physician.
1951	Gertrude Falk	Ph.D. Washington	Chicago	R. W. Gerard	Univ.of Wash.Sch.of Med.,Seattle. Asst. Prof. Pharm.
1952	No award made				
1952	No award made				
1953	Donald M. Maynard	Ph.D. UCLA	UCLA and Woods Hole	T. H. Bullock	Univ.of Mich., Ann Arbor. Asst.Prof.Zool.
1954	A. Brodish	Ph.D. Yale	Yale	C. N. H. Long	Yale Univ.Sch.of Med., New Haven, Conn. Instr. in Physiol.
1955	R. L. Malvin	Ph.D. Cincinnati	Cincinnati	W. D. Lotspeich	Univ.of Mich., Ann Arbor. Instr. in Physiol.
1956	Elizabeth Carlsen	Ph.D. Penn.	Pennsylvania	J. H. Comroe, Jr.	Cornell Univ.Med. Coll., N.Y.City. Instr. in Physiol.
1957	David T. Armstrong		Cornell	W. Hansel	Cornell Univ., Ithaca, N.Y.
1958	S. K. Roberts		Princeton	C. S. Pittendrigh	Princeton Univ., Princeton, N.J.

PHYSIOLOGY AND PHYSIOLOGISTS
A SWAN SONG

LOUIS N. KATZ, M.D.

Past-President, American Physiological Society

An address given on September 4, 1958 at the Fall Meeting of the Society, London, Ontario

Tradition is a good thing. Our Society needs more of it. One tradition is for the Past-President to 'sing a swan song' at this time. He is supposed to 'view with alarm', 'point with pride', and 'preach from on high'. He must be witty, whimsical, philosophical and oblique. His chidings must give no offense. My predecessors have exceeded our expectations in all these qualities. Their wisdom was obvious, their wit amusing, their words arresting, their sermons wholly worthy and welcome. In fact, they have said everything which needed saying—they have even presented every good pun and joke! There is nothing left for me. Were I wise, I would now sit down. But tradition must be upheld! So you must put up with me, bearing in mind that I have neither the profundity nor the fluency to compete with them.

During the three-year tour of duty in the top command of the Society, it is natural that one's thoughts turn to the broad aspects of physiology, biology, science, teaching and research. Like my predecessors have, and my successors will, I too have thought a great deal about these matters—and I would like to use this occasion to tell you about a few of my conclusions. Instinctively, I prefer to deal with broad principles and philosophies rather than with commonplace matters such as programs, publications and types of meetings.

We are physiologists and belong to a Society of physiologists. Have we thought through what physiology is? As I see it, it is dynamic biology—the study of living things in action and the mechanisms by which such actions are accomplished. Our Society limits itself primarily to animal physiology, both normal and abnormal. Regrettably we are dominated by medical physiology and have given less prominence to general physiology and biophysics. Physiologists from university departments of biology and from colleges do not feel entirely at home among us. This needs to be remedied since they have much to contribute to us and much to learn from us. Animal physiology is not a dichotomy; it is a unity of all aspects of animal life. Its application to medicine is only one limited area of its activity—though an important one. Biophysicists, of whatever type, and general physiologists, ecologists and geneticists must be brought into our midst, if physiology is to continue to flourish. I am happy that positive steps are now being taken by our Society in this direction. I hope they will continue.

There is—as I see it—too much emphasis on organ system physiology and, as a consequence, the broad aspects of physiology are being

somewhat pushed to one side. This is doubtlessly due—among other things—to the mass of detail being published, to the development of a language of short-hand symbolism by each group of organ-system specialists—which others, unfortunately, can understand only with great effort—and to the complicated instrumentation which has grown up in the exploration of the mysteries of organ system functions. Ours is an age of super-specialization. One wonders sometimes whether the plethora of tiny bits of information which is causing such a diarrhea of words is not leading to a constipation of thought!

What we need in physiology are broad unifying concepts, not so much detail. We need laws that apply to all cells, laws that unravel the mysteries of cell integration, laws that reveal the manner of growth, development and heredity, laws that make clear the influence of environment on living things. Too few of us are concerned with these broad aspects. This is where the general physiologists and the biophysicists can be of help—unless they too become too concerned with detail, polemic and trivia.

It is my firm conviction that the future of dynamic biology lies in two divergent areas. The first is the study of cellular physiology which should reveal how all types of cells operate biologically as far as cell membrane, cell cytoplasm, nuclei, chromosomes, mitochondria, etc., are concerned. This path ultimately should get down to first causes, the physiology of molecules in organic compounds and of molecules organized into cells. Were I a young man, this is the area I would enter.

The second is the field of biological regulation. This involves, first of all, the role of hormones and the central nervous system in integrating bodily function in organisms of various complexity, ranging from the lowly invertebrates up to man. It also deals with genetics and ecology, the interplay of organisms and their environment—the influence of climate and of radiation on living things, and the like. The importance of all this is obvious in our modern age where no clime is sacred to man from the torrid tropics to the icy polar areas, and from the depths of the sea and mines to the limits of our atmosphere and beyond. It is clear that biology, not physics nor chemistry, will cause the bottlenecks in the conquest of these new horizons of man's exploration and settlement.

As I have thought about other broad aspects of physiology in this philosophical vein, I have become concerned about the interrelationship between teaching and research.

Our Society has constantly emphasized research. The quality—and quantity—of publications is a measure of a candidate's acceptability as a member. Our meetings are primarily for the purpose of presenting results of research, and so are our publications. Only latterly have we become concerned about the teaching of physiology and the recruitment of new physiologists. Physiologists have a major role to play in the teaching of physiology, and this aspect of our activities must grow in extent as an affirmed Society endeavor.

It is necessary to train many persons in biology who will never be investigators nor even biology teachers. Science is becoming a more and more important aspect of our civilization. All citizens, consequently,

must be properly indoctrinated in the philosophy of science and its broad perspectives. A proper and early understanding of life processes is essential. This understanding must begin in the high school and continue in the college. To meet this goal, more teachers trained in the philosophy and substance of dynamic biology, rather than more of those trained in home economics or physical education, must be turned out for this purpose. The mood of our communities must be turned away somewhat from vocational training, from the substitution of the school for the home, and from the over-emphasis on the methodology of teaching. Instead, the mood must favor substantive teaching by well-informed and inspired, and—incidentally—well-paid, teachers of biology. Our communities must also favor the diligent and brilliant student rather than the slacker and stupid one—or even the average one. Learning must be accepted in our communities and looked up to, as in other civilizations, and not just tolerated or even viewed with suspicion. An evil inherent in democracy is the intolerance of the unusual person, of anyone that is different. This evil must be faced squarely and anti-intellectualism must be eliminated. Democracy can, if it will, develop in this direction! Great advances, after all, come from the unusual person and not from the ordinary one.

Scientists should get out of the ivory tower and enter into community life—especially on the local scene. We must explain our role as scientists to our community, accept our obligations and responsibility to our community, and help to establish the environmental climate by which scientific discoveries will be used for good and not for evil. Being, by and large, rational and not emotional persons, and understanding the rigid rules of good research, we scientists are in an excellent position to mold our neighbors into a mood of reasonableness, tolerance, and freedom from irrational prejudice. These things we must do. For as Pericles (1) in the golden age of Athens said, according to Thucydides, "The private citizen, while engaged in professional business, has competent knowledge on public affairs; for we stand alone in regarding the man who keeps aloof from these latter, not as harmless but as useless."

We biologists must act as citizens not only as individuals, but as a group. In this connection, I favor a public relations program on the part of biologists. Among other things this will help with our recruitment program. It will assist in getting the message across to the public as to what biology really is. Physiological endeavors and discoveries are too often labeled medical, surgical, chemical, physical, etc. because the public knows about these other areas, while physiology is less widely appreciated. How many ordinary citizens in the United States or Canada know what physiology is?

The low state of our biologists—and other scientists—compared to industry, labor, agriculture, politics, engineering and medicine is dependent on a lack of information on the part of the public. The ultimate responsibility for this rests with the public. To act, the public must know. To know, it must be informed. Public relations is a profession which serves to inform the public. We biologists through our special societies must see that the public is informed through a dignified public relations program. After all, we physiologists are the servants of the public, just like every other group, and this is one of our civic duties.

The question next arises as to how this can be best accomplished. Obviously, it must be through an organization of biologists. I doubt if

the Physiological Society is that organization. What we need is an 'umbrella' organization for all biologists, for all who deal with the life sciences—for this broad purpose and others like it. I mean an organization like the 'umbrella' organization of the physicists, of the chemists or of the psychologists. Perhaps, as a first step, we will need to establish three 'umbrella' societies—one for general biologists, one for basic medical biologists and one for clinical biologists. Once these subsidiary 'umbrella' groups are organized, they could unite to form an overall organization to speak on public matters for all biologists. If such an organization structure is accomplished, it will help to neutralize the centrifugal forces which split up biologists, and help bring about the idea of a unity among all biologists regardless of which speck of the biological universe they are concerned with.

Many biologists, I know, are uninterested in this movement and others are so 'isolationist' and 'stand-pattish' as to be opposed to it. They may say: These activities are undignified and unrelated to our scientific and academic role in our communities. But I put it to you that one cannot escape from the realities of life by letting others uphold our position, maintain our opportunities, and take over our moral obligations. Perhaps we have become too dependent upon others—we scientists; too ready to let 'George do it'—George being our Dean, our University President, our University governing bodies, and our other friends and neighbors. This I believe is unrealistic—no one can explain things biological better than we ourselves. So for everyone's good—the public's as well as our own—we must assert ourselves in an orderly fashion.

As I said earlier, one of the chief results which will come from this diversion of our activity into the public domain is to recruit new biologists who can become the teachers and investigators of the future. We are all keenly aware that the mysteries of biology will not be solved in our lifetime. Surely, it will take many generations before the life processes are completely solved. This being so, it follows that our undue concentration on research with the resulting neglect of good teaching is short-sighted. Not every good investigator is necessarily an inspiring teacher; nor, contrariwise, is every good teacher a brilliant investigator. When both qualities are combined in one person, the result is ideal in inspiring young talent. But such a combination occurs much too seldom to enable us to use only investigators as teachers to help fill the ranks of future research scientists, let alone enable adequate teaching of the applied scientists, technicians and general public. We must, therefore, have many teachers whose research talent is of a lower order, provided they teach well and are inspiring.

It follows from what I have just said that the teaching of biology must be upgraded and teaching must be placed on a par with research. Regrettably, this is not true at present. One way to accomplish this equalization, I believe, is to establish some prestige for teaching as such by means of awards and special recognition, in much the same way as is now done in research—including the title and extra privileges of a class to be known as <u>career</u> teachers for those in the first rank. The selection of such persons will not be as easy as the selection of career investigators but this is no reason to drop the idea. Is not the task of glorifying the teaching of physiology, difficult though it is, a most important one?

My own life, these last 40 years, has been concentrated upon research—and only incidentally upon the training of scientific apprentices. The evolution of research in these four decades has been startling to me not only in terms of scientific advances attained but in the evolution of biological research from a field dominated by 'rugged individualism' to the trend for it now to become 'big business'. With this evolution has come a greater emphasis on teams rather than individuals, on big buildings and elaborate equipment rather than magnificent ideas! One gets the feeling that the role of creative minds today is being placed somewhat in the background. I need not tell you—for you know—that it is brains that we need today more than all else. Sir William Osler (2), the great physician, aptly put it this way in 'Aequanimitas': "The great possession of any University is its great names. It is not the 'pride, pomp and circumstance' of an institution which brings honor, nor its wealth, nor the number of its schools, nor the students who throng its halls, but the men who have trodden in its service the thorny road through toil . . . to the serene abode of Fame".

Research has had a great impact upon medicine. This was predicted by Claude Bernard (3), the father of physiology, who wrote: "During its advance through the centuries . . . medicine has always been driven into action and from numberless ventures in the realm of empiricism has gained useful information. Though furrowed and overturned by all manner of systems . . . it has none the less carried on research, acquired ideas and piled up precious materials which in due time will find their place and meaning in scientific medicine. . . . Thanks to the great development and powerful support of the physicochemical sciences, study of the phenomena of life, both normal and pathological, has made progress which continues with surprising rapidity".

Claude Bernard was clear also in his views on the role of instruments, for he said: "Only within very narrow boundaries can man observe the phenomena which surround him; most of them naturally escape his senses, and mere observation is not enough. To extend his knowledge, he has had to increase the power of his organs by means of special appliances; at the same time he has equipped himself with various instruments enabling him to penetrate inside of bodies, to dissociate them and to study their hidden parts. . . . Investigation, now simple, again equipped and perfected, is therefore destined to make us discover and note the more or less hidden phenomena which surround us".

He summed up the difference between observation of nature and experiment in one pithy sentence (4): "In the philosophic sense, observation shows, and experiment teaches".

Today there is too little appreciation of the continuity of research—of the dependence of our work upon that of our predecessors. The life stream of research was clearly recognized as far back as three centuries ago by Harvey, the father of experimental medicine, whose Tercentenary was celebrated last year. In the first English edition of his classical work, published in 1653 (5), he appended a communication to one of his critics which showed his appreciation of the continuity of research. I quote: "There is no science which has not its beginning from foregoing knowledge".

Too often we lose sight of such old sayings, and of the scientific contributions of our predecessors—even those of the present century. Too many facts are rediscovered. Literally, there is too much re-search! Too often, also, we become the slaves of tools, instead of their masters. Organization, buildings and elaborate equipment are taken too often as the sine qua non of research, and it is forgotten that it is creative minds that we need—not just elaborate cibernetic machinery. With the recent increase in opportunities for full-time positions in universities and elsewhere, the feeling has grown that all persons in full-time positions should do research. Production in research is becoming one of the most common measures of a man's ability to advance up the academic ladder. Sometimes this measure is actually weighed merely by the number of papers written, without regard to their quality. Governing boards, benefactors and the public are impressed by such output. Does it not lead to bigger institutions, larger budgets and increased endowments? Bigness in research is becoming confused with goodness.

One result of all this is a plethora of publications, meetings, conferences, symposia, abstracts and reviews in which the few shining pearls of great wisdom are buried in masses of clinging mud. How can any serious student, even in a restricted area of scientific knowledge, hope to keep his head above this deluge of unimportant facts? And the flood has not yet crested! What can we do about it? In this continent of ours, we tend to discourage speculation and scholarly synthesis of thought in physiology. This trend must be reversed. We must strive to have each communication be a major opus. Minor bits of trivial progress notes must be discouraged.

Research today, worse still, is carried out in a fish bowl. Reports are picked up by the mass media—the lay press, radio, television and magazines—sometimes even before the results are presented to a scientific body or printed in a scientific journal! It is tempting, of course, to 'hit the headlines', and regrettably some succumb. More often, the scientists are helpless victims of publicity because of the misguided activity of institutional or voluntary agency press releases. This is a natural result deriving from the millions of dollars being invested in research by governmental and private agencies. The product being sold by the misguided effort of such publicity stunts is the serious work of the defenseless investigators.

Research is a dignified profession to be pursued only by the consecrated and inspired, in quietude, at a leisurely pace, and away from prying eyes. It cannot be placed on a business footing where one new fact is to be turned out for each quantum of dollars invested. Great discoveries are not produced on the assembly line. Only duplicates can be so manufactured. The original must come about through the activity of a creative mind, and a creative mind works best away from artifices and prodding. Great discoveries evolve—they are not delivered on call.

One of the hazards of expanding knowledge is specialization in research. More and more becomes known by each investigator about an ever-constricting field of knowledge. Ultimately, the horizon becomes so constricted that the perspective is lost. There is need of interdisciplinary cross-fertilization to overcome this trend. Departmental

barriers should be easily passed. A serious research should be followed wheresoever it leads, regardless of the disciplines or the tools employed.

Research, I believe, should either advance a fundamental concept, or have an obvious practical value and early applicability. It should not be gadgeteering per se, nor need it follow the fashion of research of the moment.

The background of all great advances, whether planned or arising from serendipity, is basic research. This can start anywhere, in the strangest and most exotic places—not necessarily, as too many of us imply, only in a university department. This is so because unusual minds create, and not all such minds are in the universities. At present too much of our effort is in research which seems to offer immediate answers. This is short-sighted. Great advances do not come so obviously. If we knew the methods of getting answers quickly, the important problems would have been solved a long time ago. Since we do not know how to get useful and practical answers, it is our task to encourage the most creative minds to undertake research, and to do their work in any area which intrigues them. It is not the place or field that counts in research, as much as it is the perspective. It is the original creative mind asking a question and designing an experiment that counts. Obviously, research should not be pebble-picking—it should be the building of magnificent castles.

These thoughts on research have been troubling me for some years. There have been other occasions when I have expressed similar views in addresses and writings (cf.6). I have taken the liberty of re-expressing them here since they are problems we must face constantly.

It is now time to close. I have imposed on your patience long enough. If in this address I have accomplished only one thing, I shall be satisfied—and that is to convince you that biologists should plan—and in a big way. It is in the broad vistas that investigators, like artists, get their greatest pleasure. There is beauty in truth, and the large panoramas of truth are the ones that are most exhilarating. This is perhaps best expressed in a re-arrangement of the words of Christopher La Farge (7), who toward the end of his book, Beauty for Ashes says:

"So fly up now, up . . . above, above, high . . .
Soon from on high . . . see it differently, the topographical pattern . . .
laid out below . . . distant . . .
Seen from this height, down looking, steep, you fit
them to the pattern . . .
that's your geography . . .
Remember them . . . but not as ants that crawled painfully
and small . . .
down infinite steeps of grass, not as the germs
that brilliance and clever glasses made manifest,
but as the echo . . . of the thing you lent
when, in participation, you descended to witness and
to know".

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3. Bernard, C. Introduction to the Study of Experimental Medicine. New York: Macmillan, 1927, p. 1.

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5. Harvey, W. The Anatomical Exercises Concerning the Motion of the Heart and Blood. London: F. Leach, 1653.

6. Katz, L. N. Harvey and Medical Research. J.A.M.A. 160: 1137, 1956.
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SUMMER TRAINING PROGRAM FOR COLLEGE TEACHERS OF PHYSIOLOGY

COMMITTEE ON EDUCATION, AMERICAN PHYSIOLOGICAL SOCIETY

The program of summer traineeships in research laboratories will continue in 1959. Trainee awards are made to qualified teachers of physiology or dynamic biology in arts and science colleges. Support for this program is provided by the National Science Foundation and the National Heart Institute.

The program was started in 1956 and has been operating each summer. The Education Committee feels that the present program of research experience for teachers will not only serve to stimulate the college teachers but it should strengthen our profession in years to come. It is the purpose of the program to revitalize interest in the biological sciences which, if done, will surely stimulate some college students to choose careers in the biological sciences and to increase the number of graduate students. The educational aspects of the program are most important - training of teachers and in turn their training of college students.

The training awards range from $500 to $1800, averaging about $1200. These funds cover travel, extra maintenance costs, and stipends. Each teacher is asked to submit a budget based upon the principle that in undertaking this training he would suffer no undue financial loss but would be able to maintain his usual standard of living. The period of training runs for two to three months. In several cases a second summer is approved. Some teachers desire to continue, at their own institution, work initiated during the summer. Even though the teacher's time for research there is limited in most cases, the utilization of students as assistants in whatever projects they undertake is proving to be a mutually stimulating experience. Initial support for such research in several instances is currently being given by small grants directly to the teachers from the National Institutes of Health and it is hoped such grants will continue to be available.

It is the hope of the Committee, and of the Council, that all members of the Society will take an interest in this effort to bring college teachers of our subject into closer relationship with research. To this end the Committee invites members as well as non-members situated in research laboratories to act as hosts for the college teachers. Those willing to accept one or more teachers in their laboratories for the summer of 1959 should communicate with Dr. Ray Daggs, 9650 Wisconsin Avenue, Washington, D. C., soon so that proposals can be formulated before November 30. Each year the Committee circulates a list of such proposals, together with application forms, to the Biology Departments of 700 colleges and in addition to approximately 800 individual biologists.

The Committee has agreed that the following principles should be accepted by prospective host laboratories:

1. In the usual case teachers should have the opportunity to join a research director or group in active participation in research already in progress. Participation in a well-organized course at the graduate level is acceptable, for at least part of the work, if such a course is designed to train for later research work.

2. The research director or a member of his research group able to direct the work and training of the teacher should be present throughout the traineeship period, or at least until such time that the teacher has demonstrated his ability to continue on an independent basis.

3. The teacher should be considered as a co-worker and colleague rather than a research assistant or technician. If his work leads to significant results, worthy of publication, he should be granted co-authorship with his research director or group.

4. Proposals in any subdivision of our science may be considered, be it cellular, general, comparative, mammalian or medical physiology. Proposals to serve as hosts from Society members who work in college departments of physiology or biology are particularly invited. It will be very helpful if a description of the proposed research project, or graduate course, be sufficiently detailed so that the resulting abstracted list of proposals sent to the college teachers gives a clear picture of the nature of the work and opportunity for the teacher to make a wise selection, in keeping with his interests and previous training.

MEDICAL SCHOOL REQUIREMENTS AND COLLEGE BIOLOGY

JULIUS COMROE, JR.

At the same time that the American Physiological Society is attempting to strengthen and extend the teaching of dynamic biology in liberal arts colleges, there is reason to believe some medical schools, through their published 'premedical requirements', have unwittingly exerted a constricting effect on the teaching of college biology. This has come about in two ways. First has been the repeated admonition to the would-be medical student to take more and more 'cultural' courses in college and fewer scientific courses. Second has been the explicit instruction that college courses should not be taken which anticipate medical school courses. In a survey of medical school bulletins, numerous references were found recommending that physiology should not be included in the college curriculum. Typical statements follow:

> "Courses in . . . physiology are disadvised for credit". "Inclusion of courses in . . . physiology in the premedical curriculum is really a waste of time since all of these courses are included in the medical school curriculum". "Physiology is not accepted as part of required hours and is not a useful elective".

Let us analyze first this specific premedical proscription of physiology. What is <u>really</u> meant is that a premedical student should not take an elaborate course in <u>human</u> physiology that in fact comes close to duplicating a medical school course in physiology—and this makes good

sense. However physiology and the 'physiological sciences' include much more than the study of human physiology. They include, for example, cellular and general physiology, comparative physiology, developmental physiology, plant physiology and genetics. In fact, broadly considered, they include all of biology which deals with the dynamics of living things and exclude only the strictly morphological aspects. Rightly or wrongly, the college deans, and probably college students as well, interpret the interdiction of 'physiology' to mean all types of physiology. The result has often been a reduction in the number of courses offered in all types of dynamic biology, a reduction in the budgets of biology departments (since number of students and budgets are often closely related) and a general retarding effect on the development of active college faculties concerned with dynamic biology.

Dr. William Amberson of the Committee on Education of the American Physiological Society, as part of a 'teaching tour' of liberal arts colleges, discussed this question with many teachers of college biology. He summarized a large number of conversations as follows:

> "It appears that American medical schools exercise a very considerable influence upon the organization of biology teaching at the college level. In particular the teaching of physiology is being modified or even, in extreme cases, suppressed. Some medical schools appear to be satisfied with a single introductory course in General Zoology or Biology, with some physiological discussion. There seems to be a widespread opinion that mammalian physiology should not be given in the colleges, although textbooks of this type are often used, with little or no related laboratory work. Medical schools often recommend courses in general or cellular physiology, or at least accept them as part of the science requirement. On occasion the advice is given that no physiology should be taught at all.
>
> "This influence is not an organized effort on the part of the Association of American Medical Colleges or any other official body. The pressure arises less directly in conferences between medical deans or admission officers and prospective students, in comments voiced at scientific meetings, or in allusions incorporated in correspondence with college teachers. The problem is therefore difficult to describe and assess. Nevertheless it is a prominent factor in the thinking of many college teachers. It deserves further study by our Committee, to the end that our Society, after fuller consultation, may make recommendations".

If medical schools reversed their negative attitude and took a positive stand requiring the inclusion in the premedical curriculum of a course in dynamic biology, it would force the expansion of college biology departments. The greatest gain would not be to the student who has already decided upon a medical career; it would be to the student taking a liberal arts course, for it might make available to him or her an exciting new experience which could eventuate in a career in dynamic biology or in one of the 'physiological sciences' and this would strengthen all of biology as compared to the physical sciences, engineering and the humanities.

Let us now go back to the first requirement of medical school catalogs—that the student should address himself particularly to the cultural subjects and not to the scientific ones. This really puts the medical schools in the position of saying that science is not a cultural subject. Webster defines culture as the "concepts, habits, skills, arts, instruments and institutions of a given people in a given period". If we accept this, then science is in fact a very important part of our present culture and this includes the biological as well as the physical sciences. Thorstein Veblen has stated:

> "In creative art, as well as in critical taste, the faltering talent of Christendom can at the best follow the lead of the ancient Greeks and the Chinese. In myth-making, folklore, and occult symbolism many of the lower barbarians have achieved things beyond what the latter-day priests and poets know how to propose. In political finesse, as well as in unreasoning, brute loyalty, more than one of the ancient peoples give evidence of a capacity to which no modern civilized nation may aspire.
>
> "To modern civilized men, especially in their intervals of sober reflection, all these things that distinguish the barbarian civilizations seem of dubious value . . . futile in comparison with the achievements of science. They dwindle in men's esteem as time passes. This is the one secure holding-ground of latter-day conviction, that the increase and diffusion of knowledge among men is indefeasibly right and good. When seen in such perspective as will clear it of the trivial perplexities of work day life, this proposition is not questioned within the horizon of western culture, and no other cultural ideal holds a similar unquestioned place in the convictions of civilized mankind."

More recently (April 1-4, 1957) the National Research Council's Committee on Education Policies held a four-day conference on "Undergraduate Curricula in the Biological Sciences."* They agreed unanimously "that the biological sciences are an important component of our culture, which should be represented in the background of every well educated person . . . . The nature of the world as it appears to biological scholars, the history of scientific thought in this area, methods of investigation used, current conclusions and their applications and implications are essential aspects of a liberal education and necessary foundations for other curricular areas. Such knowledge can be obtained only through a study of biology. Once mastered, it has essential interconnections with aspects of the physical sciences, the social sciences, philosophy, medicine and agriculture, esthetics and other humanistic disciplines. Every educated person should obtain a sound knowledge and appreciation of the biological sciences. . . . Biologists should make every effort to maximize opportunity and motivation for young people to acquire. . . understanding of biology."

With respect to premedical education, the Conference concluded:

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*Publication 578 National Academy of Sciences - National Research Council, 1958.

"Students who plan to make a career of medicine or medical sciences should include in their curriculum the material suggested for all biologists under the introductory and core programs. Their program might also include additional experience in depth in areas of dynamic biology.

"Even more important is that the future medical scientist or physicians have experience in the design and execution of experiments. At present many medical school curricula provide little opportunity for this kind of experience. This type of activity should therefore be encouraged during the undergraduate years.

"The group recognizes that there is unnecessarily wide divergence among American medical schools in their admission requirements. Moreover, there is little relationship between the printed philosophy, as it appears in medical school catalogs, and the actual demands of medical faculties. This results in confusion in counseling students. The rigidity of the printed requirements has also tended to have a constraining effect on undergraduate biology teaching.

"In recent years there has been a notable effort, through conferences and special studies, to emphasize the importance of a broad liberal education as preparation for the study of medicine. This we also consider to be sound philosophy and a healthy reaction against the excessively narrow requirements of past decades. The pendulum may have swung too far, however. We believe that the curriculum recommended in this report, for example, would meet both the desire to give premedical students a liberal education and their need for substantial basic work in the biological sciences, chemistry, physics and mathematics.

"We therefore recommend that a conference be called to bring college and medical educators together for an exchange of views that might lead to a more nearly uniform philosophy of premedical education. This we believe would benefit both biology and medical education."

Is it not time to reconsider the requirements for premedical education and whether these should be positive rather than negative with respect to acquiring an understanding of the biological sciences at the college level—not only with a thought to the education of a physician but with much more consideration for the education of college men and women as a whole?

EXCERPTS FROM "MIRROR TO PHYSIOLOGY"

A Self-Survey of Physiological Sciences*

WHAT IS PHYSIOLOGY?

In spirit, physiology is not a science or a profession but a point of view; yet it is also institutionalized as both, so answers must be given. Briefly, and in an elementary way, here are some provided by the Survey.

All fields of knowledge and human interest are embraced by classifications, such as the librarian's decimal system, or the average college catalogue of courses. Within such an all-embracing system it is customary to distinguish the natural sciences as comprising about one-tenth of the categories. Within the sciences, the custom today is to distinguish all those ways of studying living or once-living things as constituting biology. Within biology, the study of dynamic or the active events in living beings is the subject matter of physiology. The same subject matter is often given other names; the term physiology is also used to include various other dimly related subject matter.

Physiology is, and is more than, the study of the physical and chemical processes in living units. This is, in essence, a paraphrase of one definition by a founder of modern physiology, Claude Bernard, as "the science whose object it is to study the phenomena of living things and to determine the material conditions in which they appear". As such, physiology pervades the life sciences; it is a way of looking at life processes and understanding them. Physiology has also been called the science concerned with the organization of energy and matter in living systems and their likenesses to and differences from non-living systems.

Physiologists therefore study the physical and chemical processes in all living matter - from the single bacterium to flowering plants, from amoeba to caterpillar, shark, eagle, mouse, and man. Although most people regard physiology as a science primarily ancillary to medicine, this is not so. To be sure, much of its activity today is in the medical field because human physiology is not only the oldest branch of physiological science, but is also the one of most immediate concern to humanity and therefore best supported. The real scope is as broad as all living beings, plant and animal.

Physiology is thus functional biology - using the word function in its scientific rather than in its pragmatic connotation. To those seeking to learn how organisms function, how life goes on, physiological science provides an approach which cuts across the lines of traditional biological disciplines. Generations of schoolteachers, abetted by the public press, have taught physiology only as it relates to human health, as practically synonymous with anatomy as immutably 'tied to the tail of the medical disease kite'. Yet as functional biology, physiological science

*The material, with minor changes, is taken from Gerard, R. W. Mirror to Physiology - A Self Survey of Physiological Sciences. Washington: American Physiological Society, 1958. Additional excerpts will appear in future issues of THE PHYSIOLOGIST.

seeks a broader and more basic understanding of all life processes. Until this fundamental nature of the science of physiology is made widely clear by the agents of mass communication, physiology will remain in the public mind and to the public pocketbook merely as 'having something to do with the body'.

WHO ARE PHYSIOLOGISTS?

A questionnaire was sent to some 7000 individuals and usable replies received from 4571 who regard themselves as physiologists, either primarily or secondarily. These respondents were estimated to be 79.5% of the total number. The exact figures depend, of course, on how 'physiologist' was defined.

There are about 1900 'central' or primary physiologists; that is, scientists who identify themselves with some branch of physiology (animal, plant, or bacteria) before they identify themselves with any other discipline. About double this number, 3850, are 'peripheral' physiologists, in that they first identify themselves with some other field of biology and only secondarily with physiology. Using categories which cut across both these groups, there are close to 3660 animal physiologists, 1230 plant physiologists and 700 bacterial physiologists, and an additional 160 in unspecified fields.

Physiologists are characteristically dispersed through many branches of biological science. The extent to which this permeation affects the thinking and methods of other disciplines, the Survey hoped to find out; but further investigation would be needed for the answer. The extent of potential interaction, however, is indicated by the considerable number of peripheral physiologists with primary interests in other fields, and of central physiologists secondarily identified with varied disciplines.

Most physiologists have the Ph.D. (or Sc.D.) degree, and some, mainly animal physiologists, have the M.D. degree, alone or in addition to the Ph.D. In the forty years, 1915 to 1954 inclusive, 1704 doctoral degrees in physiology have been granted by universities and colleges in the United States. This, however, is not a true measure of the growth of physiology, since physiologists obtain their doctorates in a wide variety of fields, such as: biochemistry, zoology, bacteriology, botany, biology, psychology, physics, chemistry, and agriculture and its related fields. Actually, only 32% of the Survey respondents, about the proportion of central physiologists, had taken their doctorates in physiology.

WHAT DO PHYSIOLOGISTS DO?

The major functional activities of scientists are research, teaching, and administration. From a study of the distribution of time spent by physiologists in each of these functions, the Survey calculates that approximately 54% of the physiologists' professional effort is used in research, 26% in teaching, 17% in administration, and 3% in such other activities as consulting.

Two-thirds of the physiological profession are employed whole or part-time in academic institutions, one-seventh in government, one-tenth

in industry, and a twentieth in clinical, private, or other employment. (Including multiple employment, seven-tenths have academic positions.) Of those in academic positions, three-fourths have some professional rank; but only one-fifth of the physiologists active in teaching - and practically all of these animal physiologists - hold teaching appointments in Departments of Physiology. Even among central animal physiologists only 60% hold teaching appointments in Departments of Physiology; and for peripheral physiologists the figure drops to 8%. This suggests that the teaching of physiology is both tightly compartmented and also diffused through many academic departments.

Physiologists, like other scientists, are generally engaged in those research activities which seem most important to them. Only a few hundred physiologists are not doing some research, about 12% of all employed physiologists do nothing else but research, and another third give more than 60% of their time to research. There is evidence that eminent research scientists are likely to possess certain personality traits, and it may be that eminence in teaching and administration results from different trait combinations. The Survey made a statistical study of eminent physiologists and a less eminent control group without finding significant differences.

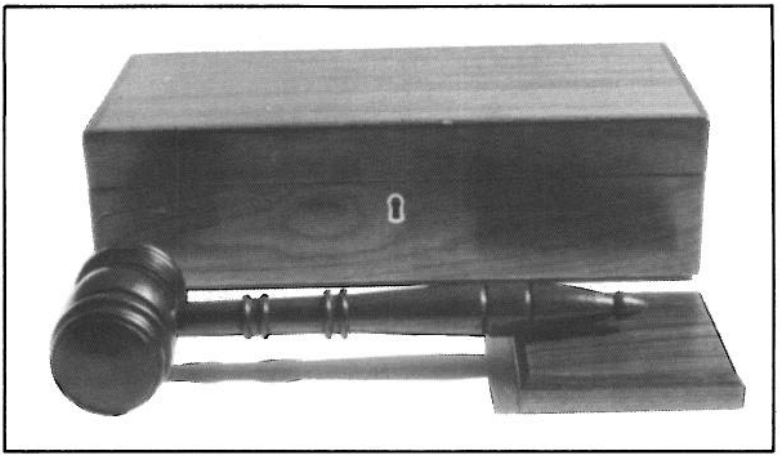
WHERE DO PHYSIOLOGISTS GET THEIR TRAINING?

The institutions which have consistently granted the most Ph.D. degrees, in physiology or in other departments for Ph.D. theses of a physiological nature are: University of California; University of Minnesota; University of Wisconsin; Northwestern University; University of Chicago; University of Illinois; University of Rochester; Cornell University; Columbia University; and Harvard University.

WHAT ARE THE NEEDS?

The Survey has defined the populations of concern and amassed much information about the science and profession of physiology. The animal and plant areas are widely divided, perhaps too far to bridge, and core animal physiology is concentrated in the neural and circulation specialties. Analysis of present and future needs for men of industry, academia, and government, and of expected supplies indicate a satisfactory balance of biologists at the lower training levels, a serious deficit in Ph.D.'s. In physiological science 200 will be produced a year to 700 needed; in physiology 100 produced to 200 needed.

With able men at a premium, improved teaching, at least down to high school, is essential to recruit and train them. Dynamic teaching of dynamic biology will be enhanced as high school and college teachers (and their students) have contact with and are made welcome by professional physiologists.



THE APS GAVEL AND ITS CASE

In general, the business meetings of the American Physiological Society are noteworthy for their restraint. Evidence is weighed judicially after temperate exposition of carefully considered views. But there are also those rare occasions when, so to speak, a certain turbulence develops. Then the President's tapping on a water glass is apt to be inaudible and ineffectual. These emergencies seem to need a gavel loud enough to be heard and, if possible, sacred enough to induce order.

To prepare a gavel requires a certain minimum number of cubic inches of wood in the form of 'turning blocks' for shaping on a lathe. Explorations in the library and museum of the Harvard Medical School provided two pieces of mahogany each presenting a suitable history. The first and thinner piece was gently extracted from the posterior surface of the case used by Professor Henry Pickering Bowditch to file his Physiology lecture notes. This gives the gavel an association with both the first President of the American Physiological Society and the first George Higginson Professor of Physiology at Harvard. The second and thicker piece came from the X-ray machine used by Professor Walter Bradford Cannon in carrying out his classic roentgenographic studies of gastric movements begun in 1896 and first published in detail in the American Journal of Physiology, volume 1, pp. 359-82, 1898. Thus is added in the gavel an association with the sixth President of the American Physiological Society and the second George Higginson Professor of Physiology at Harvard. Collectively these two fragments supplied more than ample historic significance and enough cubic inches but still not the necessary dimensions.

The turning block for the handle was made by glueing together two pieces of the thicker wood. Thus the handle is all Cannon. For the head of the gavel it was necessary to build up a thicker block consisting of three central laminae of Bowditch mahogany, glued with grain at right angles for strength, and enclosed in two external laminae of Cannon mahogany. With considerable liberality of interpretation to make allowance for one or two amateurish slips of the chisel, the design worked

by lathe into the head consists of a few Treppe followed by a more expanded systole, extrasystole and compensatory pause. If a moral can be mentioned, this may suggest that in parliamentary debate, as in cardiac function, a compensatory pause has its advantages.

This gavel was constructed by Professor Eugene Markley Landis, third George Higginson Professor of Physiology at Harvard and the 25th President of the American Physiological Society, during his term as President. It was presented to the Society at the Spring Meeting of Council in April, 1953 in Chicago, Illinois.

It soon became apparent that this historic gavel needed to be protected by a rugged case. Such a box obviously needed wood identified with two rugged physiologists from the Mid-West. The choice was easy. It was apparent that the men to be selected were Professors Carlson and Wiggers.

Professor Anton Julius Carlson, a stalwart of the Society for many years and its 10th President, was the Frank P. Hixon Distinguished Professor of Physiology at the University of Chicago and Chairman of the Department. His work on gastrointestinal physiology is classical.

Professor Carl John Wiggers was Professor of Physiology at Western Reserve University and Chairman of the Department, and the 21st President of the American Physiological Society. He is Dean of American Cardiovascular Physiologists. Interestingly enough Western Reserve University is named for the western reserve set aside in the early days of America as a frontier for expansion of New England.

It seemed symbolically appropriate that the gavel made in part from wood associated with Cannon should be protected in a case of wood obtained in part from that aspect of Carlson's life that represented tranquility and repose. It also seemed symbolically appropriate that a gavel made from wood associated with Bowditch and delineating the phenomenon of Treppe and other cardiac chronotropic and inotropic properties, should be enclosed in a case of wood obtained in part from the more peaceful aspects in the life of Wiggers. The help of Mrs. Carlson and Mrs. Wiggers was readily obtained in procuring the wood for the case. Mrs. Carlson sent the head board of the old four poster mahogany bed in which Carlson had slept for about forty-five years and which was then in his summer house in Michigan. Mrs. Wiggers sent the top of a walnut bureau associated for many years with the home life of Wiggers.

With the aid of a skilled cabinet maker these two pieces of wood were made into a case, the walls being from Carlson mahogany, the top and bottom from Wiggers walnut.

Finally, recalling the ringing debates between Cannon and Carlson, that enlivened the Society's meetings in earlier days, an anvil of Carlson wood was made upon which future Presidents could bang the gavel of Cannon, and the noise so created would, as in the old days, quiet down all other debate and thus keep the meeting orderly, under the control of the man wielding such a gavel on such an anvil.

The gavel case was designed and its construction carried out at the behest of Dr. Louis Nelson Katz, Director of the Cardiovascular Department, Medical Research Institute, Michael Reese Hospital, pupil of Wiggers and member of Carlson's department, and the 30th President of the American Physiological Society, during his presidency. It was presented to the Society at the Spring Meeting of Council in April 1958 in Philadelphia, Pennsylvania.

CARLSON'S FORCEPS

The central office of the Society receives many interesting things for deposit with archival material. One of the oddest has been a pair of forceps sent to us by Dr. Ralph Gerard; however, the following note that accompanied the forceps made it of unique interest and value.

April 23, 1953

> This is the forceps used when I tried to remove the gray streak in the median line on the dorsal surface of the exposed heart of Limulus Polyphemus at the Marine Biological Laboratory, Woods Hole, Mass., June, 1904. I assumed that the gray streak was a blood clot. When I pulled on this gray streak with the forceps the heart went into irregular fibrillation. The gray streak proved to be a local nerve cell-nerve fibre structure. This led to the experimental proof that in the adult Limulus the origin of the heart beat is in the local ganglion. (Amer. Jour. of Physiology, Vol. 12, page 67, September, 1904).
>
> A. J. Carlson

This certainly proves the worth and power of keen observation in research and as Dr. Gerard states - "he lifted up the 'clot' on a Limulus heart and so set off his own career and the neurogenic theory of the heart beat."

WALTER BRADFORD CANNON

Born October 19, 1871, died October 1, 1945

GORDON C. RING

Everyone, especially those interested in research and teaching, should read The Way of an Investigator (1). This is Cannon's autobiography and includes much sound advice for the young scientist. It pictures a very busy life, and for those who find the work of a physiologist in itself quite demanding, it is almost impossible to conceive of how he managed to find time to devote to his broad social interests. Yet with all the pressure of the many demands made on his time, Cannon's students never felt hurried while discussing with him either scientific or personal problems.

Cannon was born in 1871 at Prairie du Chien, a place well known for the studies of gastric physiology carried on there some fifty years earlier by Beaumont. The year of Cannon's birth marked the beginning of teaching of physiology in medical schools in the United States. To be sure, anatomists had given perhaps five or six lectures a year which might have been called physiology, but in 1871 Bowditch was selected as the first full-time physiologist in the United States. Even in 1897 when Cannon reached Harvard Medical School, physiology was not far advanced and the American Physiological Society was only ten years old.

As a first-year medical student, Cannon plunged into research. With the newly discovered Roentgen rays, he began his extensive studies on movements of the gastrointestinal tract - work which led not only to the rapid advances of our knowledge in this field, but to the almost immediate use of the X-ray in the diagnosis of diseases of this tract.

Cannon's research and that of the students who worked with him may be divided into five broad categories. These were studies of the gastrointestinal system, autonomic nervous system and its neuro-effector system, homeostasis, traumatic shock, and finally, supersensitivity of denervated structures. With the exception of the work on traumatic shock, which began on the battlefields of France, each of these programs of research led naturally into the next. When Cannon was occasionally unable to observe gastrointestinal movement in animals, he asked the

usual question 'why' and found that activity was inhibited when the animals became excited. This led to the demonstration of the relationship between excitement and sympathico-adrenal activity. Then, when these studies were criticized, he developed more and better methods for measuring adrenal activity; namely, through the use of sensitized denervated structures. This was followed by the important observations on supersensitivity of denervated parts - work which was carried forward with Rosenblueth (2) and published four years after Cannon's death.

During the First World War Cannon left the laboratory to work in France on traumatic shock. In the succeeding years his interest continued in the problems related to shock so that in the spring of 1940 it was natural that he should be made Chairman of the National Research Council's Committee on Transfusions.

Important scientific advances usually occur when there is a clash of ideas. It is said that very stimulating arguments between Cannon and Carlson were common at the meetings of the Physiological Society when both were studying digestive problems. Sometime later the observations of the group at the Fatigue Laboratory at Harvard on the work of sympathectomized dogs were found to differ from those Cannon had previously made on cats. As Dill puts it, "In typical fashion Cannon agreed to join forces with Brouha and myself. The findings published in the J. of Physiol., vol. 87, 1936, cleared up the disagreement and shed new light on the mechanism of cardiac acceleration." But not all differences were settled as satisfactorily. The unfortunate polemic which dragged on for years between Cannon and the group working at Cleveland on the functions of the adrenal medulla wasted much valuable time and energy which ought to have been used more profitably. It did, however, leave us with such a large body of evidence regarding the activities of the adrenal medulla that everyone today accepts Cannon's theory of the Emergency Function of the Sympathico-Adrenal Mechanism. It should be emphasized that in these discussions and all others in which he was involved, Cannon was far more concerned with the accuracy of the facts presented than with the theory developed to fit those facts. He believed that arguments were beneficial when they resulted in endeavors to find the truth through new techniques and more careful deductions.

Cannon did so many things well that he could have been a success in almost any profession. His mind was teeming with problems and with simple methods for obtaining their solution. His ingenuity is well shown by his early experiments on thirst. These were carried out during the First World War in a hotel room in London with nothing more than tasteless gum, a watch, and a glass for estimating the changes in the volume of saliva secreted during a period of dehydration. A few years later he wanted to find out whether repeated sympathetic stimulation would elevate the thyroid secretion. Today we would probably devise some costly piece of electronic equipment to provide the stimuli but in his typical fashion he anastomosed one phrenic nerve to a cervical sympathetic. A successful operation was indicated by dilation of the iris with each respiration. Again when he wished to determine how the level of adrenin changed in the blood of cats during excitement, cold, etc., he completely denervated the heart and used heart rate as a measure of adrenal medullary activity. In China, with little more than a watch and camera, he studied sensitization of the iris to acetylcholine after parasympathetic denervation.

Cannon's manual dexterity made many operations appear quite simple. While watching him, one did not realize how difficult were some which he performed; for example, the removal of the intact, almost microscopic sympathetic chain in a kitten, or the complete denervation of the heart without injury to the nerve supply of the gastrointestinal tract.

During later years when he was told that he must relax, his skill was again shown when he turned to modeling in clay. The bust of his daughter Helen received wide acclaim.

Cannon wrote clearly, building one step in the argument carefully and logically before proceeding to the next. Because his papers were so easy and delightful to read it is not surprising that his experimental work became well known, not only to the physiologists but also to those working in the related scientific fields of psychology and gastroenterology. In 1907 he was made a member of the American Gastroenterological Association and joined the American Psychological Association in 1912. Even though Cannon wrote apparently without effort, one can hardly conceive of how he could have had the time to prepare some four hundred scientific reports in addition to writing six books. This is even more amazing when we note how carefully he must have searched the literature for every scrap of information on the subject he was studying. His bibliographies occasionally refer to articles published a hundred years before and often taken from a science quite remote from physiology, such as the report of a geologist regarding his sensations of thirst while working in a desert. In addition to preparing his own papers for publication, he spent endless hours helping the younger men in his department revise their papers so as to make them more concise and accurate, though he always refused to allow his name to appear on these papers as one of the authors.

Although Cannon did not like administrative work and refused a deanship when this was offered to him, he took care of his duties as chairman of the physiology department with meticulous care. The funds available for this department were never wasted. In regard to electricity, he often remarked that if we lived in an age when it was necessary to strike a match in order to provide light from a candle, then there might be some excuse for not extinguishing the light when one left the room, but when the flip of a switch was all that was necessary, then this waste was inexcusable. During his fluoroscopic studies on gastrointestinal movements, he never bothered to obtain tracing paper for he found that toilet paper was perfectly satisfactory for outlining the stomach. Some of these records are preserved in the Beaumont Museum at Prairie du Chien. Most of Cannon's notes were written on the unused pages taken from the backs of examination books. Ligatures for his operations had to be cut a certain length not only because they were easier to tie, but also because longer ligatures wasted thread.

Emphasis on the prevention of waste did not mean keeping the incomes for student instructors at starvation levels. On the contrary, Cannon saw to it that they obtained reasonable compensation. Frequently, if the University was unable to make adequate provision, he would find jobs elsewhere to help them defray expenses. Increases in salary were often forthcoming without requests from the recipients. Furthermore,

whenever a student felt that a research project required expensive equipment, Cannon would always listen to these requests and if there were no simpler solution to an important problem would find ways of obtaining the equipment needed.

Cannon enjoyed teaching as much as doing research. One of his students once pointed out to him the discrepancy in the salaries paid by medical schools to the preclinical and the clinical professors. Cannon's reply was revealing: "I would gladly pay for the opportunity to do the work I am doing". When he received an offer of an appointment at the Mayo Foundation with a salary several times what he was receiving at Harvard, he turned this down for, as he said, he needed the stimulation which comes from teaching students. Their fresh ideas helped to direct his thoughts to new concepts and new approaches to old problems. The preparation of lectures was not a chore for he felt it helped him organize his thinking on his current research problems, even when the topics he was presenting were quite remote from his research.

Cannon was without ostentation. For many years he rode a bicycle. Then he finally bought a Model T Ford which could be seen in the parking lot of the Medical School every weekday morning before most people arrived. When parts were no longer available, he purchased a Model A! Many a student found him so easy to reach that he never suspected Cannon had an international reputation. Foreign students were especially impressed by his modesty. Rosenblueth writes, "The day I came to Boston he drove me to the station to collect my bags and to a boarding house that he found for me. The contrast with the formal attitude of my European professors was overwhelming". One faculty member remarked, "He was always approachable and never gave the impression 'I am very busy being a great man'." In 1931, after twenty-five years as George Higginson Professor of Physiology, funds were raised for his portrait, and he insisted that this be painted showing him at work wearing a plain tan laboratory coat.

The physiological laboratories at Harvard were always a stimulating place in which to work, not only because of the research going on but because of the endless number of famous physiologists who came to lecture, to visit, or to work; Von Muralt, Einthoven, Sherrington, Lapicque, Barcroft, Loewi, Hopkins, Heymans, Kato, Adrian, Houssay, Hill, and Pavlov, to mention only a few. During this period some fifty foreign students from seventeen different countries worked in these laboratories. And they felt quite at home there for Cannon usually addressed each in his native tongue. With the different backgrounds represented one can imagine that tea time, between five and six-thirty, was a very important part of the day's schedule. Although this was a time for relaxation, there were often lively arguments on physiological problems which ended only when plans for testing opposing hypotheses had been devised.

Cannon lectured so many times both in this country and abroad that we must limit this report to include only a few of these honors. He was Croonian Lecturer in 1918, a Linacre Lecturer in 1930. He became exchange professor at the Sorbonne in 1929 and was at Peiping Medical College in 1935. During his return to the United States, he crossed Siberia and attended the International Congress in Moscow. While in Russia he tried to make an objective evaluation of the Soviet experiment

in government. Wherever he observed improvements over the Czarist regime he was careful to point these out. But he, like many others, was happy to leave Russia and get back to his native land. Because of Cannon's international reputation, he was made Foreign Secretary of the National Academy of Sciences at a crucial time in our history—1942.

Cannon was concerned with the problems of physiologists the world over. Early in the Russian Revolution he heard that Pavlov was without adequate food and succeeded in collecting $2000 to tide him over this difficult period. When Hitler took over Austria, Cannon worked with others to arrange Loewi's escape from his native land.

During the thirties Cannon watched the situation in Spain with increasing concern. In 1936, when the elections brought the liberal element into power, we all remember how Franco, supported by Hitler and Mussolini, opposed the legitimate government. There seemed little that any groups of individuals could do. But when Cannon learned that Negrin, the professor of physiology at Madrid, had become the premier of the new government, he went to President Roosevelt with the hope that the United States would support the Republic. Later, when little else could be done, he accepted the appointment as National Chairman of the Medical Bureau to Aid Spanish Democracy and worked tirelessly at this. His active contribution to the Spanish Republic was deeply appreciated. When he went to Mexico in 1945 to spend some months working at the Cardiology Institute, the Spanish refugees organized a banquet to honor him and to convey their deep appreciation for his help during their war.

In the early days of the Spanish Republic less than 10% of the members of parliament were communists. After the defeat of the Republic, however, communist elements crept into the refugee camps set up in France. When Cannon learned that American aid was being used to further the communist cause rather than to support helpless and suffering people, he withdrew from this work.

Cannon felt that something should be done to help China after she was invaded by Japan and he lent his support to the American Bureau for Medical Aid to China and the United States Relief. Some wondered why he accepted the Presidency of the American-Soviet Medical Society. To those who knew him well, it was obvious that he did this because of his high regard for Pavlov and for other scientists he knew in Leningrad and Moscow, and not because he had any communist leanings. His hope was that in this small way he might bring about some improvement in relations between Russia and the United States.

Cannon was interested in all people and their problems. In his book, The Wisdom of the Body (3), he points out how some problems which afflict people everywhere might be solved by using mechanisms similar to those at work in nature. For example, he suggested that the economic cycles might be smoothed out if the homeostatic mechanisms of the body were used as a guide in developing suitable controls. His philosophy, in part, is suggested by these words, "Just as social stabilization would foster the stability, both physical and mental, of the members of the social organism, so likewise, it would foster their higher freedom, giving them serenity and leisure, which are the primary conditions for wholesome recreation, for the discovery of a satisfactory

and invigorating social milieu and for the discipline and enjoyment of individual aptitudes".

During the last fourteen years of his life, Cannon was afflicted with mycosis fungoides (4). Since little was known of the disease, he suggested that repeated biopsies be made in order to better understand it. He also experimented with new agents which he thought might prove beneficial. Yet, during all of this period many of his associates knew little of his impaired health because he continued his usual heavy schedule of research, teaching and committee meetings both at the local and national levels.

At a Commemorative Dinner for Cannon, Carlson once remarked that it didn't take many men to make a university great but it did take a few and that Cannon had made a contribution to the greatness of his university. Might it not also be added that Cannon made a contribution to the greatness of his country?

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THE APS AND THE AAAS

FRED A. HITCHCOCK
APS Representative to AAAS

I have often wondered if scientific societies were not in danger of becoming over organized. It was on account of this fear of over-organization that, when in 1951 Ralph Gerard, President of APS that year, asked me to accept appointment as the representative of the APS on the Council of the American Association for the Advancement of Science, I at first refused. It was my opinion that there was no longer any reason for the affiliation of the APS with the AAAS and that if we were to remain associated with this larger organization we should at once take steps to make this affiliation functional. This could, to some extent, be accomplished by taking an active part in the annual meetings of the AAAS. Dr. Gerard then suggested that I should accept this appointment for three years and that during that time I should make a study of the relationships between the two organizations and then make definite recommendations to the APS Council. Considering the rather strong feelings that I had on the subject I felt that I could not refuse such an assignment.

Younger members of the Society probably do not know that in the old days the Federation occasionally met with the AAAS. If my memory serves me right the last such meeting was in December of 1924 and was held in Washington, D.C. At this time both of these organizations were so large that joint meetings were almost impossible. In 1927 the Federation began having its annual meetings in the Spring, and from then on the APS has had almost no association with the AAAS. When I accepted the assignment of APS representative it had been a number of years since I had attended a meeting of the AAAS, but since 1951 I have not missed a meeting. I have attended in a critical mood, attempting to determine the desirability of the APS taking part in these meetings and I have been convinced of this desirability and have so recommended to the APS Council. This recommendation stems from these facts. The membership of the AAAS is made up of the largest and most heterogeneous group of scientists in the country. More than half of these scientists are biologists of one sort or another. It seems to me that at the AAAS meetings the APS might be able to meet and influence a group of biologists with whom they would never come in contact at Federation meetings. In this connection let me say that it is my opinion that physiologists should never lose sight of the fact that they are biologists and that future physiologists will of necessity be recruited from the field of biology. Therefore the recruitment and training of biologists is a matter of major importance to all of us. Let me add to this that it has long been my conviction that biology is a subject with which every intelligent person should be acquainted. In my opinion it is impossible for anyone to have a sane and workable philosophy of life without a knowledge of the fundamentals of biology. Therefore we should strive to modify our educational system so that it would include more and better training in the biological sciences.

Now in recent years the APS has been undergoing a metamorphosis. It has been emerging from a select society of distinguished research workers into one which includes all persons who can truly be called professional physiologists and one which recognizes its obligations to biology in particular and to society in general. In view of these changes in the membership and ideals of the Society it would seem that we are under obligation to take advantage of every opportunity to extend our influence to improve and extend the teaching of biological sciences and to impress upon society the importance of dynamic biology. It is therefore my considered opinion that the APS is under obligation to take a more active part in the activities of the AAAS. Since 1952 the APS has each year been represented in one way or another on the program of the AAAS. We have co-sponsored programs of the American Psychiatric Association, with Section N of the AAAS, with the Association of High School Science Teachers and with other groups. The Council of the APS has been cooperative in this association with the AAAS to the extent of giving me the green light, approving of programs that I have suggested, and encouraging me to go ahead with plans for future programs. In spite of this encouragement I have begun to feel that these programs we have sponsored or co-sponsored do not represent any true cooperation between the APS and the AAAS. Very few members of the Physiological Society have attended the AAAS meetings and even the speakers have as a rule not been members of the APS. In short these programs have in reality been Fred Hitchcock programs and not APS programs at all.

I feel that it is time that some of these things should be changed. As now constituted it seems likely that the cooperation between the APS and the AAAS would terminate if I resigned as representative of the Society on the Council of the AAAS. This is not the sort of relationship we should have. If the members of the APS feel that it is worthwhile to have a closer cooperation between the APS and the AAAS then there should be some expression of this feeling - perhaps the formation of a committee to plan for such cooperation. Perhaps it is time to consider the desirability of having a program of ten-minute research reports at the AAAS meeting. This would be in line with the suggestion made by Alan Burton that meetings of the APS be held more frequently. The membership of the Society should give these matters serious consideration. It is my recommendation that the cooperation between the APS and the AAAS be increased and strengthened.

The AAAS meeting this year is to be held in Washington, D.C. The APS is sponsoring a symposium on Physiological Problems in Space Travel, with Colonel Paul Campbell, Chief of the Space Medicine Branch of the School of Aviation Medicine, as Chairman. The symposium will probably include two sessions, one the afternoon of December 30 and the other the morning of December 31. It is hoped that APS members will show their interest by attending.

WORKSHOPS FOR COLLEGE TEACHERS OF PHYSIOLOGY

C. LADD PROSSER

In 1955 the Education Committee of the APS reached the opinion that the small-college teacher is the forgotten man in American science. University scientists receive extensive support for research and have societies to facilitate their continuing education; high school teachers are provided with summer institutes, have state and national associations and other supporting organizations. Teachers in small colleges have little opportunity for research, have heavy teaching loads and lack society aids which keep them up-to-date and provide a sense of professional unity.

A workshop was conducted in August 1955 with National Science Foundation support at the University of Connecticut. It was attended by about 25 teacher members from all parts of the country and some 8 discussion leaders who remained for varying portions of the 2-week session. The distinction between members and leaders was not sharp and some members soon demonstrated qualities of leadership. The response from the teachers and, to a less extent from the leaders, was so favorable that the Education Committee initiated annual workshops to serve different areas of the country. The geographic localization tends to reduce travel costs and improves communication among physiologists in a given region.

Workshops in college physiology teaching have now been held under NSF support as follows:

Year	Place	Director
1955	University of Connecticut	C. Ladd Prosser
1956	University of Wisconsin	R. R. Ronkin
1957	University of Oregon	Bradley Scheer
1957	Guilford College, N. C.	Peter Morrison
1958	Bucknell University	Samuel Tipton

It is hoped to hold a workshop in the Southwest in 1959.

At Madison only one-third of those who applied could be accepted; at the other workshops the excess of applications has been less. The number of members has been kept between 25 and 30. Most members come from liberal arts colleges and State 4-year colleges, a few from junior colleges and universities. Discussion leaders are from university departments and are persons who are teaching or have taught undergraduates.

The general plan of operation has been similar in all the workshops, although some have emphasized certain features. Three types of sessions are held: (1) lecture-discussions to present modern subject matter;

(2) demonstrations and work sessions for developing and extending experiments for teaching laboratories; and (3) discussions of general education topics. Lectures are usually in the morning, laboratories in the afternoon and general education discussions in the evening. Members and discussion leaders live together in a dormitory and there is ample opportunity for informal discussions.

The subject matter presentations stress general physiology and often include some plant as well as animal material. The emphasis is on general principles, not on medical applications. Teaching methods are included. The laboratory sessions vary in their pattern. Many members and leaders bring their own outstanding and unique experiments to the workshop. Practical hints concerning commercial sources of inexpensive equipment, particularly electronic devices, are most welcome. Lists of available motion pictures have sometimes been presented although no great effort has been devoted to searching out visual aids.

The discussion sessions on topics of common interest in the educational field have proven very popular. The same topics come up year after year and similar recommendations emerge, often to the surprise of leaders who think they are finding something new. University members discover that college teachers have problems unknown in research-oriented departments; medical school members discover that college physiology must be very different from that taught to medical students; and college teachers discover how outmoded are some of their courses. Some of the subjects debated follow:

1. Is the teaching of dynamic biology to college freshmen better done as part of a general biology course or as a separate course in physiology? This is part of the old debate over breadth versus depth; it concerns the place of general education courses in our colleges. The interpolation of physiology into introductory biology courses is widely favored. Other institutions, particularly women's colleges and some large universities, favor separate introductory courses in zoology, botany and physiology.

2. What are the relative merits of different kinds of physiology courses at the junior-senior level? The term 'general physiology' has a different meaning for each institution, but it is usually agreed that where only one course is offered, this should deal with principles of dynamic biology. In some large institutions, separate courses in cellular, comparative, plant and mammalian physiology are offered. Several workshop groups have listed topics which might well be included in a 'principles' course. Prerequisites are much discussed, particularly mathematics and physical sciences.

3. What is the place of physiology in premedical education?

4. What is the place of courses for special curricula, e.g. physical education, optometry, physical therapy, nursing? These are often a combination of human anatomy and physiology. Teaching such courses is commonly considered unrewarding.

5. Can a good teacher of physiology be trained without experimental research and can one continue as a good teacher without some

maintained research experience? Strong differences of opinion exist on this question, but the consensus usually is that the interaction between research and teaching makes for better teaching. Largely as a result of discussion of this topic, the Education Committee embarked on its program of summer research traineeships.

6. Should courses in education be included in the graduate training of prospective college teachers? Sentiment against formal education courses is usually strong but the desirability of some supervised teaching experience and instruction in testing procedures is recognized.

7. How can teachers be kept up-to-date in a wide variety of fields? It is felt that Annual Reviews and Physiological Reviews are written for specialists, that Scientific American is too popular. Partly to fill the need, the Education Committee is accumulating a collection of monographs which are on display at the workshops. Need for a 'college level physiological reviews' has been expressed.

8. How can scientific societies, specifically the APS, help college teachers? Programs at Society meetings are not of much interest to college teachers, and many teachers hardly know of the existence of the APS. The Eugene workshop made strong recommendations for the establishment of associate membership on the grounds that it would have prestige value for the teachers.

9. Can organized scientists bring pressures to improve high school teaching of biology toward the end of recruiting the better students? The Bucknell workshop issued a resolution concerning accreditation of high school teachers. This topic deserves much more study by the Society.

10. What can be done to raise the status of college teachers and to reduce teaching loads? Many college teachers of physiology have 15-25 contact hours per week in 3 or 4 courses. Salaries are often lower than in good high schools. The plea has often been made in workshops that scientific societies make efforts to raise the status and morale of college teachers, but practical approaches by the APS have not been suggested.

Since many college teachers of physiology also teach other biological subjects, it has been suggested that a program of successive workshops on such subjects as embryology, bacteriology, ecology, genetics, cytology and physiology might be useful. The American Botanical Society has sponsored an 8-week teaching institute and the American Society of Zoologists a 6-week one. At present it appears better that each society conduct its own teacher training program, and 2 weeks has been a favored length for physiology.

The Education Committee considers that its workshops are upgrading college courses in physiology over the country as a whole. Conversely, the research-oriented physiologists at the workshops have themselves learned much from the college teachers; the differences between college and medical school physiology are striking. A number of resolutions from the workshops have led to other activities of the Committee, such as the summer research traineeships, the preparation of laboratory manuals in general and human physiology, the traveling collection of

monographs, and the establishment of an associate membership in the Society. Other resolutions provide subjects for further study. There is ample evidence that the need for the workshops will continue for a number of years and efforts should be made to improve them.

THE PRESIDENT'S MESSAGE

HALLOWELL DAVIS

Some Problems of the APS and the Federation

On his President-Elect Tour a year ago your President talked with many of you and with members of other societies of the Federation of American Societies for Experimental Biology. Among the problems he discussed were the strong points and the weak points of the Federation meetings and the attitude of the members toward these meetings and their programs. A little later your President served as a member of the Federation Board and, by accident of rotation of chairmanships among the six societies, as chairman of its Committee of Secretaries. This Committee is responsible for practical decisions concerning the meeting, the program and Federation Proceedings. Thus your President had opportunity to learn by first-hand experience of the problems of the Federation as well as of the American Physiological Society. Since then he has devoted some time to wondering just how and why certain problems arose, to what extent they are inevitable, and what the direction of long-term trends and developments may be. Here are some of his thoughts. He shares them with you as his personal views to help us all think more clearly about the long-term as well as the short-term problems that face us in Society business meetings and in Council meetings. He does not pretend to have the answers as to what should be done about it all. Many compromises of conflicting interests must be made along the way and experimental changes of procedure must be evaluated. Nevertheless, the first step toward rational and reasonable solutions is systematic analysis of the problems, an appraisal of objectives, and a consideration of possible alternatives.

Size and Finances

The APS and the Federation both face two interrelated sets of problems that are common to both organizations and to many other scientific societies as well. One set of problems is the increasing complexity of our organization and the difficulty of finding satisfactory meeting places and of planning the programs of the Federation. Related to these specific problems is the increasing difficulty we all have individually in keeping up with the scientific literature and of retrieval of scientific information in general. These problems form a set because they are the inevitable consequences of sheer increase in the number of members in our societies and of the overall increase in scientific output the world over. The other set of problems is financial: how to balance our budgets. Here it is useful, at least in our thinking, to separate publication budgets from the budgets for meetings and for the general operation of our societies. The present pressures on our budgets actually are due in part to inflation, in part to the disproportionate increase in labor costs, and in part to direct and indirect effects of the increase in size of our own organizations.

Many members of our Society may wonder why as the APS and the Federation grow our dues must continually increase. It would seem offhand that if the small dues that were adequate to operate the APS and provide a small margin to build up a reserve fund when we were small were simply continued at the same level, then, as the membership increases, the reserve fund should grow more and more rapidly as the number of members increases. But there are three or four reasons why this does not and cannot occur. We have already mentioned inflation and also the increase of labor costs which affect such items as expenses of publication and secretarial services. From inflation alone we should expect to be paying twice as many dollars per year for the same activity as we paid in 1940.

With increase in size of a society, however, a critical point is reached where the sheer volume of correspondence, of accounting, and of administrative activities generally that are required of the treasurer and of the secretary, surpasses what can be handled on a volunteer, amateur basis. Not long ago greater and greater sacrifices were being expected of our elected secretaries from year to year, both in terms of the time which they had to devote to the job and of the expense, direct or indirect, to their institutions. Finally first the Federation and then the American Physiological Society reached the point where a full-time secretary and a central office staff were absolutely essential. This change to a permanent secretariat was a very important step, because salaries must now be paid for work that was previously done on a volunteer basis. The necessity for a salaried secretariat is the reason why, at a critical stage in the growth of an organization, the dues per member must suddenly increase rather considerably and remain thereafter at this higher level.

We must note also that the load of work for the secretariat does not increase merely in direct proportion to the number of members, but rather in proportion to the number of interactions among members. In a society in which the members participate individually to the extent that ours do, particularly in our giving of papers and attendance at meetings, the number of interactions increases considerably more rapidly than the number of individuals. The effect of this non-linear increase in the activity of the central organization is still felt even though our secretariat has been placed on a professional basis.

Another general law of the way in which scientific organizations seem to behave is that when they get large they become socially conscious and start 'doing good'. The good may be good for membership or for the scientific discipline that the society represents and is usually undertaken in this spirit. Often it is undertaken as additional justification for the existence of the organization (as if holding good meetings and sponsoring good scientific publications were not enough). Committees are formed to promote various interests, to spread the good word to others, to recruit students to the profession, or to provide smaller and more intimate meetings for special groups, either separately or in conjunction with meetings of the society as a whole. This kind of committee activity may be self-limited if it remains at the volunteer or amateur level, but sometimes these functions are taken over by the central professional organization, and the membership may then be asked to pay for it. The Placement Service of the Federation is an excellent

example of one such activity, for which a dollar of our annual dues is earmarked, and the Committee of Education of the American Physiological Society is already on a semi-professional basis, although here the financial load is being carried by government grants which include some overhead for operating expenses.

The Federation

The problems of the Federation are particularly acute, both because of its absolute size and also because it is a second-order organization, a federation of smaller societies. Its larger size increases the strength of the disruptive forces within it and its remoteness from the individual scientists weakens the cohesive forces which hold the organization together in spite of practical difficulties. Let us consider some of these forces in detail.

Disruptive forces. The most powerful disruptive force now at work in the Federation is obviously the growing dissatisfaction with the physical crowding and the general congestion and inconvenience at the Annual Meetings. There are more and more overlapping, competing sessions. The meeting places are scattered over wider and wider areas, and the crowds of strangers through which each of us must make his way to meetings and to exhibits is becoming denser every year. We lose time and energy in the simple procedure of registration. No enthusiasm was evident for the physical arrangements at Philadelphia, with the wide separation between meeting places and the hotels, and it seems to be generally agreed that only Atlantic City and perhaps Chicago will be able to provide adequate and reasonable satisfactory facilities in the future. The question is now being asked by some members in all seriousness whether the annual Federation meetings can and should be continued; yet the Federation meetings are the chief justification for the very existence of the Federation. This raises the question as to whether the Federation, in order to survive by having effective meetings, may not be forced to call a halt and limit somehow the size of its meetings. It seems fairly clear that the difficulties of pressure on available facilities stem primarily from the increasing number of ten-minute papers. Already the principle is accepted that a member of the Federation may be responsible for not more than one paper on the program, except by special invitation; but it now appears that even this limit may not be sufficiently strict.

Another disruptive force is our increasing specialization of interests. This specialization, forced upon us by the very volume of scientific information that flows past us, is strongly felt even within the individual societies. Certain groups find that the programs offer relatively little of interest to them and that their group of friends is seriously diluted by the large crowd of others who attend the meetings. They would prefer smaller and more intimate gatherings; and who can blame them?

A weakness of the Federation is the remoteness of individual responsibility for the operation of the Federation and the solution of its problems. Each of us is separated from the Federation organization by our own APS organization. Control of Federation policies is indirect and 'The Federation' seems very nebulous and remote. In this situation

many members are not enthusiastic about paying dues to the Federation, whether directly or indirectly, because very seldom do they identify with the Federation. This is an inherent weakness in all second-order societies such as the Federation, the AIBS and the AAAS. This remoteness can be overcome, at least in part, by an effective 'house organ' that communicates directly with the members, deals with problems of policy and procedure, carries plenty of personal news items, and is not merely a glorified program or another scientific archival journal for abstracts and symposia. But to the extent that members must be taxed by dues payments to support a house organ it becomes a potential disruptive force.

Missed opportunities. A weakness, or perhaps a 'missed opportunity', is the small number of general Federation sessions. These are now confined to one evening symposium and the motion picture exhibits. This criticism is not quite fair, however, because the inter-society sessions are a very powerful cohesive force. What is obviously missing is a business meeting of the Federation as a whole, corresponding to the business meetings of the Societies, and any direct voting by the membership for the officers of the Federation. But this is the nature of a second-order organization and your President does not advocate changing the present procedures. He simply points out that the Federation lacks a cohesive force that is very important for the individual societies such as APS.

A clear 'missed opportunity' is the absence of any effective public relations or 'political' activity on the part of the Federation. Such activity could give the Federation character, make it alive and real and useful in the eyes of the membership, and thus strengthen it greatly. The Federation might perhaps have become a broad umbrella society for much of biology and have taken the lead in improving the public relations of biology and its status with and availability to various departments of the Government, in promoting better teaching of biology in our schools, and so on. Now in the broad field of biology the American Institute of Biological Societies has successfully taken just such leadership, but perhaps a corresponding or supplementary opportunity still exists for the Federation in the more restricted area of medical sciences. Your President does not undertake to pass judgment on the course actually taken by the Federation. It may prove to have been very wise indeed for the Federation to have concentrated, as it has, on its annual meeting and on Federation Proceedings. But the Federation nevertheless does not have the benefit of the cohesive force of public relations and public service that some other organizations do have.

Cohesive forces. The strongest positive cohesive force of the Federation is its annual meeting. The strength is due to the prestige of the Federation and the consequent prestige to a member of giving a paper at one of its meetings. He feels that he talks to an important audience and this in turn makes him feel important. Another source of strength is the breadth of personal contact that the Federation meetings offer, including the opportunity of meeting interesting and important people or at least of hearing them in action. This point was often made to the President-Elect on his tour. It is now a legitimate question, however, whether some of the individual societies, including the American Physiological Society, may not have grown to such a size that they can unassisted fulfill our needs of and for prestige.

A third cohesive force, not generally recognized, is the commercial exhibits. These are one of the strong reasons why many members attend the annual meeting, and the exhibits are a Federation activity. No individual society could get as many and as valuable and useful commercial exhibits as the Federation now attracts.

The really unique feature of the Federation, for which there is no substitute, is its inter-society sessions and its symposia. Of course an individual society can invite outsiders to participate in its programs, but in the Federation the whole thing is arranged easily and spontaneously. This feature seems to be understood and appreciated by our membership, even by those who do not habitually 'cross over' and attend sessions of other societies.

Still another cohesive force is the Federation abstracts and certain other features of Federation Proceedings. To some extent the Proceedings serve as an archival journal and our members value it for this purpose, particularly as a place in which each one may publish promptly his own brief abstract. It will be interesting to see whether competition from THE PHYSIOLOGIST will weaken the appeal of Federation Proceedings to the membership of the American Physiological Society. Certain other features of Federation Proceedings, particularly the directory of members, are much appreciated, although directories issued separately by the individual societies could be substituted.

A real cohesive force felt by those responsible for the administration of Federation affairs, but hardly sensed by its membership as a whole, is the ownership of property. Beaumont House is both an asset and a responsibility and can be counted on to prevent any rash or unconsidered moves in the direction of dissolution of the Federation.

The Federation Placement Service is a feature of which every member of the Federation may well be proud, but not many members are fully aware of the extent or of the importance of this activity.

Can we limit the size of Federation meetings? The most urgent practical question facing the Federation as a whole is whether to or how to limit the size of its annual meeting so that the congestion will not be increased and so that it will not be necessary to spread the meeting places over a wider geographical area.

One possibility is to increase the number of days devoted to scientific sessions, or to use evenings for sessions of this sort. The ultimate upper limit is probably six days, starting Monday morning and finishing Saturday afternoon. This will be too much for individual human endurance, but it might help the crowding somewhat if a definite sequence of interests could be developed. Some evenings might be used for symposia, but some opportunity to relax should be preserved and also some opportunity for small informal organizations or subgroups to hold activities of their own at times when they are not in direct competition with scheduled Federation activities.

An obvious method of limitation would be to select, on the basis of merit judged from the abstracts, the papers to be read at the meeting. This is, however, probably impractical and almost certainly it would be

unacceptable to our membership. Considerable time would be required to do the selecting, and it would be extremely difficult to find any individual or committee that would be willing to take the responsibility for making the judgment. Time would be short and the job would be done hastily. To our membership any such selection immediately suggests 'censorship' and censorship our membership will not tolerate.

An alternate method, more probably acceptable, is to ration the right to read or introduce a paper to twice in three years, or perhaps to alternate years. It would require some additional overhead expense to administer this rule, but this need not be very large. This is probably an innovation that should be adopted by the individual societies that feel the pressure most severely rather than as an action by the Federation as a whole.

Quite a different mechanism for limitation of papers would be taxation. A rather high page charge for abstracts might be established. As a matter of fact a moderate page charge seems to your President to be highly desirable for quite different reasons. It is probable, however, that unless the charge were made unreasonably high it would not have very much effect on the total number of papers submitted. Authors seem to value the abstracts and would probably gladly pay $10.00 or $15.00 for the privilege of having their abstracts printed.

Sometimes the suggestion is made that members who give or who sponsor papers that are presented poorly, without adequate rehearsal or with unintelligible diction, should be denied the right of presentation the following year. Obviously such a rule would be difficult to apply and, although it might raise the standard of presentation of papers, it certainly could not be counted upon to solve the problem of numbers.

The final method seems to be a simple appeal to our membership to exercise self-restraint! This certainly is worth a try. Your President urges the members of the American Physiological Society to use our Fall Meetings for the presentation of our own papers as well as for the introduction of junior colleagues. Let all of us refrain from the presentation of unfinished business and wait until we have something really good before putting it on, particularly at the Federation meeting. Of course it is human nature for us to like to get up and have the stage at the Federation meeting, particularly if this performance makes it easier to obtain travel funds to go to the meeting! The giving of a paper may even be used to justify to ourselves the interruption of research or teaching at home that is involved in making the long trip to a week of Federation meetings. But in the interest of survival of the Federation let us make our presentations there better but less frequent.

American Physiological Society

The American Physiological Society requires a general fund for the operation of its central office. This operation is now on a professional basis and requires an assured income of considerable amount. Furthermore, ordinary prudence requires some operating reserve. In such situations a good general rule is that the operating reserve should approximately equal one year's budget. The only really solid and

assured base for operating expenses is our membership dues. Certain other sources of income, such as overhead on government contracts for various activities, may assist from time to time but should be regarded as special gifts and not become the basis of fiscal policy.

In regard to dues, every scientific society is now faced with increasing competition for the dues dollar because it is becoming more and more necessary and also more and more fashionable for each scientist to join more than one society. In your President's opinion this tendency is both inevitable and desirable; but it certainly increases our individual outlay for dues to scientific societies.

Your President believes that the members of the American Physiological Society would pay considerably higher dues than they do at present if necessary, but he knows very well that they would not enjoy doing so. The dues of the American Physiological Society are small compared to those of many other societies but the tradition, established by A. J. Carlson, is very strong in our Society that we are all of us poor and that dues must be kept down to the level at which the youngest and lowest-paid instructor can still afford to join. The establishment of associate membership has weakened the force of this argument, but nevertheless the psychological hurdle is still there and the large lump sum required to pay dues (and simultaneously subscribe to a journal) is very real. There is serious competition for the dues dollar not only from societies outside the Federation, such as the Biophysical Society, but also from the Federation itself. It may surprise some of you to know that as much of our dues money goes to the Federation and other activities as goes to the operation of the Physiological Society itself, even if you know that part is earmarked for particular activities, such as the Federation Placement Service. Another part of our dues goes to the American Institute for Biological Sciences.

Nevertheless your President says in conclusion that he believes that the dues we pay to the American Physiological Society, including our contribution to the Federation and to AIBS, represents one of the best bargains in the scientific market. With the increase in number of scientists, whether physiologists or not, our organizations are more and more necessary to maintain our channels of scientific communications, whether through meetings or through the sponsorship of publications. In this and in other ways our societies are more and more professional necessities for us, and our dues are necessary professional expenses. Let us never forget that the APS has grown up and no longer operates entirely on the unpaid volunteer services of its officers. We still take turns individually at doing much of the work, notably those of you who are hosts to a Fall Meeting or who serve on one of our more active committees, but let us not grudge our financial support if, or rather when, the spiral of inflation and the further increase in our own size requires another upward step in our annual dues.

NEW INSTRUMENTS FOR PHYSIOLOGISTS

ALFRED HENLEY

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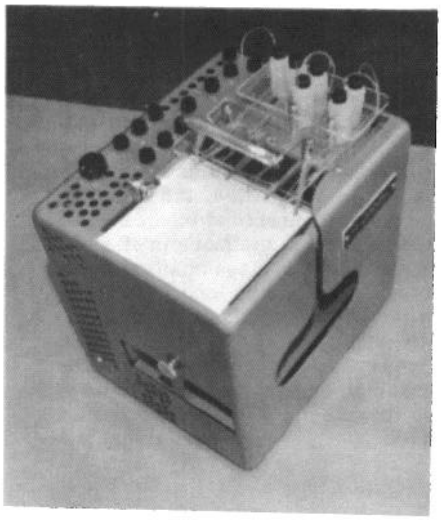
Washington, D.C.

Dual-purpose instruments for teaching and research. The departments of physiology in the nation's medical schools are now in the process of overhauling and modernizing all the instruments and apparatus in their laboratories. In the course of discussions with department heads the writer was struck by the fact that teaching equipment in physiology, which could also double as tools for research by the faculty, was almost non-existent. To some degree these two requirements are contradictory—instruments which illustrate basic principles and are simple to use, which can stand the punishment of student operators, which are portable, easily repaired, etc., to mention only a few virtues of instructional apparatus, do not seem compatible with the complexity, high precision and specialized design often built into instruments used in original research.

Such double-function instruments do exist, although they are not usually so intended by the manufacturer. One may recognize an apparatus suited for teaching and also for serious research by a few simple criteria: it must have a good instruction manual, well illustrated with photos, circuit diagrams and schematics showing the principles of operation; accessories should be available by which the unit is made more versatile, or by which a visual result can be converted to a written record; the manufacturer must be cooperative and responsive in dealing with problems encountered in the performance of his instrument.



Micro-polygraph

Among new pieces of equipment the following instruments are good examples of such criteria. There are others, some of which were listed in previous issues of THE PHYSIOLOGIST. If sufficient interest is shown in the problem, a special compilation will be made of the major apparatus of interest to physiologists in medical schools.

Micro-polygraph. This complete self-contained 39 lb. portable polygraph is simple enough for student use, yet has high accuracy for scientific work. No external power supplies, preamplifiers, etc., are needed. Statham transducers plug in directly. Calibration is by means of a standard cell.

The unit will record EEG, ECG and two pressures. (Alternately, a model is available which has ECG and 3 pressure channels, as is also a smaller 2-channel model with ECG or EEG and one pressure channel.)

Simplicity of operation has been emphasized throughout the design. Only two controls are necessary for recording pressure: zero setting and sensitivity. Recording is an ink trace in rectilinear coordinates. The elimination of curvilinear distortion permits correlation of events in time without corrections for the arc produced by the pen. The inking system is non-plugging, with no curved metal tubes in the line of flow. Each unit has six speeds, the rotary form of the continuously meshed gears providing instantaneous speed-changing. Of special interest to teachers is the easy connection which can be made to an oscilloscope for showing the trace to several observers.

Rectilinear recorder. Produced by a large company which has made a notable effort to extend its industrial products to physiological use, this instrument will interest labs which require a rugged and versatile recorder for separate connection to other equipment. This unit is probably the first galvanometer-actuated recorder with true straight-line motion. It inscribes a signal in its true shape on a rectilinear chart in a form that can be measured with a ruler along its 4-1/2 inches of active width. Almost every feature which should distinguish a good recorder seems to have been foreseen and provided for: mountings and front plug-in connections for additional marker pens; a changer for instant selection of five basic speeds; easy ink filling; fast chart reloading; and even a desk-type platform on which the chart paper travels, permitting the operator to make notations while the unit is recording.

Sphygmograph system. In this indirect blood pressure measuring apparatus arterial sounds and pulse waves are visualized on an oscilloscope screen. An extensive variety of accessories makes the instrument particularly useful for physiological monitoring of both humans and animals, as well as for teaching. The oscilloscope, integral with the unit, is operated by a single control, while a permanent record may be made with any ECG while monitoring. Obviously, the system affords more objectivity than the auscultation technique and for small animals its high sensitivity makes possible the detection and study of sounds arising from various organs. Among the many accessories is a completely automatic digital pressure transducer, designed for periodic inflation, deflation and venting of the cuff, control of the recorder motor and a number of safety features.

Single breath analyzer. A simple method of evaluating three important lung functions, i.e. vital capacity, maximum breathing capacity and timed vital capacity, is now incorporated in a well-designed and inexpensive instrument. These three measurements are determined directly from a single breath, a built-in nomograph showing the relationship of maximum expiratory flow rate to a maximum breathing capacity. Elementary principles of respiratory physiology are clearly evident to the student in using the apparatus, although it was designed as a tool for clinical research. The unit is twice the size of a typewriter and is easily carried from one location to another. It is supplied with an 8-liter capacity bell, an electric timer for 1/2, 1, and 1-1/2 seconds, and a single wide-bore rubber tubing with fittings and mouthpieces.

Infra-red recording CO_2 analyzer. This infra-red carbon dioxide analyzer offers, in addition to its relatively low price tag, a high degree of accuracy, an extremely fast responsive time, and a scale calibrated in CO_2 per cent. Although one model, housed in a mobile cabinet, is particularly suitable for routine clinical use, the laboratory model would probably be preferred for medical schools, since the component units, the analyzer, amplifier and recorder are separated for greater versatility of application, as well as for easier servicing and repair. A unique feature of the instrument is a three-way switch for checking the calibration circuit quickly during patient measurement.

Katapherometer. Differing in function from the above instrument in that, in addition to analyzing carbon dioxide by the thermal conductivity method, it also determines the extent of unequal pulmonary ventilation. The apparatus does not use the closed circuit system, in which mixing in the spirometer and airways is always incomplete. Instead, after equilibrating the alveolar air with a mixture of 20% helium and 20.9% oxygen, the subject is allowed to breathe room air and to wash out the helium-oxygen mixture. The analysis of the expired air is recorded during this process and a complete picture of intra-pulmonary mixing efficiency is obtained. The exceptionally rapid response time of the Katapherometer is achieved by the use of low pressure in the analyzing chamber. The apparatus is calibrated in two ranges, 0-10% and 0-3% helium and carbon dioxide. An output for recording is available.

Address a post card to New Instruments for Physiologists, American Physiological Society, 9650 Wisconsin Avenue, Washington 14, D.C., for further information about any item described above.