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**ACTIONS TAKEN AT SPRING MEETING**  
**April 12-17, 1970**

**ELECTIONS** - J. R. Brobeck was elected to the position of President-Elect. R. M. Berne was elected to a full four-year term on Council.

All candidates nominated by Council were elected to membership. (See Newly Elected Members).

**DUES** - Council announced that beginning July 1, 1970 dues for regular members will be \$20 per year. Associate members dues will remain at \$5 per year. Retired members pay no dues. Dues run from July to July.

**PUBLICATIONS** - It was announced that the subscription price for the American Journal of Physiology would be raised to \$60 per year, and that for the Journal of Applied Physiology to \$45 per year beginning January 1, 1970. Subscriptions run from January to January. Members may subscribe to either of these two journals at a 50% discount.

**SOCIETY DIVISIONS** - A straw vote was taken to determine if members were interested in having semi-autonomous divisions within the Society. The straw vote indicated that the majority present at the Business Meeting were not in favor of having divisions at this time.

**NOMINATIONS FOR OFFICERS** - The Society will continue the mail nominations for President-Elect and Councilman. The nominating slate will be made of those receiving 10 or more nominating votes. Motion will be accepted from the floor to vote on all or any number of the candidates receiving the highest number of nominating votes. The names of the nominees for President-Elect, after the election of the President-Elect, will be added to the Councilman slate.

**ABSTRACTS** - The method by which abstracts have been reduced to a reasonable number for oral presentation was discussed with both positive and negative reactions to the system now in use. There was no clear cut evidence of what the majority preferred. Council will mail a short questionnaire on this subject to the full membership in the near future so that a sub-committee may study the possible alternatives to the present system and report at the Fall Meeting. If the lottery system continues (eliminating from oral presentation every  $n^{\text{th}}$  paper to reduce the number to approximately 850) it was agreed that a member's abstract would not be eliminated in 1971 if it had been eliminated in 1970.

## MEMBERSHIP STATUS

April 1, 1970

Active Members	3248
Retired Members	178
Honorary Members	17
Associate Members	297
	<hr/>
	3740

## SUSTAINING ASSOCIATES

Abbott Laboratories, Inc.	Merck Sharp & Dohme Research Laboratories
Ayerst Laboratories	The Norwich Pharmacal Co.
Burroughs Wellcome & Co., Inc.	Chas. Pfizer & Co., Inc.
CIBA Pharmaceutical Products, Inc.	Riker Laboratories, Inc.
E & M Instrument Co., Inc.	A.H. Robins Co., Inc.
Eli Lilly & Co.	Smith Kline and French Laboratories
Gilford Instrument Laboratories	Warner-Lambert Research Institute
Gilson Medical Electronics	Wyeth Laboratories
Harvard Apparatus Company	
Hoffman-LaRoche Laboratories	
Lakeside Laboratories, Inc.	

## DEATHS SINCE FALL MEETING 1969

Richard Ashman - 2/28/70	Robert K. S. Lim - 7/8/69
J. Q. Bliss - 10/23/69	W. S. McCulloch - 9/24/69
Mary E. Collett - 6/28/69	Eric Ponder - 2/6/70
Henry S. Forbes - 8/15/68	Robert W. Ramsey - 4/7/70
L. Willard Freeman - 7/7/69	Leo A. Sapirstein - 11/16/69
Magnus I. Gregersen - 8/26/69	Benjamin H. Schlomovitz - 10/18/69
Addison Gulick - 9/28/69	C. A. Smith - 9/18/69
Ward C. Halstead - 3/25/69	J. Murray Steele - 10/13/69
John B. Hickam - 2/9/70	S. Bernard Wortis - 9/5/69

## 50-YEAR MEMBERS

Walter C. Alvarez	Harold L. Higgins
Samuel Amberg	Paul E. Howe
Joseph C. Aub	Andrew C. Ivy
George A. Baitzell	Dennis E. Jackson
Olaf Bergeim	Merkel H. Jacobs
Harold C. Bradley	Norman M. Keith
Thorne M. Carpenter	Edward C. Kendall
Percy M. Dawson	Benjamin Kramer
Lester M. Dragstedt	Henry Laurens
Herbert M. Evans	Edward Lodholz
Mable P. Fitzgerald	David Marine
Maurice H. Givens	Jesse F. McClendon
Charles M. Gruber	Walter R. Miles
Frank A. Hartman	Frederick R. Miller

Sergius Morgulis  
Eugene L. Opie  
Alfred C. Redfield  
Andrew H. Ryan

Charles D. Snyder  
George H. Whipple  
Rosalind Wulzen

## NEWLY ELECTED MEMBERS

The following, nominated by Council, were elected to membership in the Society at the Spring Meeting, 1970.

ANLIKER, Max: Prof. Biomechanics, Stanford University  
BARRERA, Frank: Assoc. Prof. Physiol., Temple University  
BIGGER, John T., Jr.: Asst. Prof. Med., Columbia Univ., Coll. P & S  
BLOEDEL, James R.: Asst. Prof. Physiol. & Neurosurg., Univ. of Minnesota  
BLOOM, Floyd E.: Acting Chief Neuropharm., St. Elizabeth's Hosp., Washington, D. C.  
BRASHEAR, Richard E.: Assoc. Prof. Med., Indiana Univ. Med. Ctr.  
BUTCHER, Reginald W.: Prof. Physiol., Univ. Massachusetts  
CARRETERO, Oscar A.: Dir. Hypertension Lab., Henry Ford Hosp.  
CECIL, Helene C.: Res. Biol., USDA, Agri. Res. Ctr, Beltsville, Md.  
CHOU, Ching-chung: Assoc. Prof. Physiol., Michigan State Univ.  
COHN, Jay N.: Prof. Med., Georgetown University  
COLEMAN, Henry N. III: Consultant Cardiol. & Physiol., Mayo Clinic  
COLMAN, Robert W.: Asst. Prof. Med., Harvard Medical School  
COOKE, Ian McLean: Asst. Prof. Biol., Harvard Univ.  
DAHL, Nancy A.: Asst. Prof. Physiol., Univ. of Kansas  
DAW, Nigel W.: Asst. Prof. Physiol. & Biophys., Washington Univ.  
DEAMER, David W.: Asst. Prof. Zool., Univ. California, Davis  
DEWEY, Maynard M.: Prof. Anat., Woman's Med. Coll. of Pennsylvania  
DIES, Federico: Asst. Chrmn. Cl. Physiol., Natl. Inst. Nutr., Mexico City  
DONATI, Robert M.: Assoc. Prof. Med., St. Louis University  
FARMANFARMAIAN, Allahverdi: Assoc. Prof. Physiol., Rutgers Univ.  
GILMAN, Sid: Asst. Prof. Neurol., Columbia Univ., Coll. P & S  
GLADFELTER, Wilbert E.: Assoc. Prof. Physiol. & Biophys., West Virginia Univ.  
GLINSMANN, Walter H.: Head, Sect. Physiol., Natl. Inst. Child Health & Human Development  
HEATH, James E.: Assoc. Prof. Physiol., Univ. of Illinois  
HILDEBRANDT, Jacob: Res. Invest., Resp. Physiol., Virginia Mason Res. Ctr., Seattle  
HYMAN, Albert L.: Dir. Surg., Tulane Univ. Sch. of Med.  
JOEL, Darrel D.: Scientist, Brookhaven Natl. Lab., Med. Dept.  
JOHNSON, A. Doyle: Asst. Prof. Animal Science, Univ. of Georgia  
JOHNSON, Leonard R.: Asst. Prof. Physiol., Univ. of Oklahoma  
JONES, Allan W.: Asst. Prof. Physiol., Univ. of Pennsylvania  
KINSON, Gordon A.: Asst. Prof. Physiol., Univ. of Ottawa  
KRAUTHAMER, George G.M.: Asst. Prof. Physiol., Columbia Univ., Coll. of P & S  
LEE, Ping: Asst. Prof. Physiol. & Biophys., West Virginia Univ.  
LIEBERMAN, Melvyn: Asst. Prof. Physiol. Pharmacol., Duke Univ.  
LOPEZ-MAJANO, Vincent: Chief, Pul. Physiol. Lab., VA Hosp., Baltimore

MAKHLOUF, Gabriel M. : Assoc. Prof. Med., Univ. of Alabama  
 MANIS, James: Asst. Prof. Med., Mt. Sinai Sch. Med., New York  
 MARTIN, Paul J. : Res. Bioengineer/Physiol., Mt. Sinai Hospital,  
 Cleveland  
 MEISELMAN, Herbert J. : Res. Fellow, Eng. & Appl. Sci., Calif. Inst.  
 Technology  
 MILLS, Elliott: Prof. Physiol. & Pharmacol., Duke Univ. Med. Ctr.  
 MORAN, Walter H., Jr. : Assoc. Prof. Physiol. & Biophys., West  
 Virginia Univ.  
 NEILL, Jimmy D. : Asst. Prof. Physiol., Emory Univ.  
 NELSON, Nicholas M. : Asst. Prof. Pediat., Harvard Med. School  
 PITT, Bertram: Asst. Prof. Med. (Cardiol.) Johns Hopkins Univ.  
 RAKUSAN, Karel J. : Assoc. Prof. Physiol., Univ. of Ottawa  
 REGEN, David M. : Assoc. Prof. Physiol., Vanderbilt Univ.  
 RUBIO, Rafael: Asst. Prof. Physiol., Univ. of Virginia, Charlottesville  
 SCHUSTER, Marvin M. : Asst. Prof. Med., Johns Hopkins Univ.  
 SEXTON, Alan W. : Asst. Prof. Phys. Med. & Rehab., Univ. of Colorado  
 SHIBATA, Shoji: Assoc. Prof. Pharmacol., Univ. of Hawaii  
 SOBEL, Burton E. : Asst. Prof. Med., Univ. of California, San Diego  
 SUGA, Nobuo: Assoc. Prof. Biol., Washington University  
 THACH, William T., Jr. : Staff Assoc. Physiol., NIMH, NIH  
 TRINER, Lubos: Asst. Prof. Anesthesiol., Columbia Univ., Coll. P & S  
 WELCH, Bruce L. : Sr. Scientist, Univ. of Tennessee Res. Ctr., Knoxville  
 WEST, John B. : Prof. Med. & Bioeng., Univ. of California, San Diego  
 WHITTEN, Bertwell K. : Res. Physiol., USARIEM, Natick Army Labs.  
 WYRWICKA, Wanda: Asst. Res. Anatomist, UCLA

#### ASSOCIATE MEMBERS

BARRETT, Terence W. : Asst. Prof. Psychol., Carnegie Mellon Univ.  
 COSTILL, David L. : Assoc. Prof., Dir. Human Performance Lab.,  
 Ball State University  
 FARBER, Jay P. : Res. Assoc. Physiol., Dartmouth Sch. Med.  
 GONZALEZ, Richard R. : Natl. Sci. Fdn. Fellow, Human Physiol.,  
 Univ. of California, Davis  
 GOODE, Robert C. : Asst. Prof., Res. Inst. Hosp. for Sick Children,  
 Toronto  
 HERD, Paul A. : Doct. Cand. Physiol., Univ. of California, Davis  
 HISTAND, Michael B. : Asst. Prof. Physiol. & Biophys. Colorado State  
 University  
 JACKSON, Daniel B. : Res. Pharmacol., Abbott Labs, North Chicago  
 KATZ, Michael L. : Physiologist, Neurophysiol., Walter Reed Army  
 Med. Ctr.  
 LESH, Thomas A. : Postdoct. Trainee Physiol., Bowman Gray Sch. Med.  
 MASAT, Robert J. : Assoc. Prof. Biol., St. Ambrose Coll., Davenport, Ia.  
 MORITZ, William E. : Biophysicist, Physiol. Sci., Naval Med. Res. Inst.  
 O'ROURKE, Robert A. : Asst. Prof. Med., Univ. of Arizona Coll. Med.  
 PEPELKO, William E. : Res. Physiol., USAF Sch. Aerospace Med.  
 PIWONKA, Robert W. : Postdoct. Res. Assoc., Sterling-Winthrop Res.  
 Inst.  
 PRICE, William M. : Doctoral Candidate Physiol., UCLA  
 ROE, Walter E. : Assoc. Prof. Vet. Physiol., Univ. of Saskatchewan  
 SCHRAMM, Lawrence P. : Grad. Fellow. Physiol., Univ. of Rochester

STRATTEN, Wilford P. : NIH Postdoctoral Fellow Neurol., Univ. of Utah Coll. Med.

WOOD, Jackie D. : USPHS Trainee in Physiol., Univ. of Illinois

WOOLEY, Dorothy F. : Res. Assoc., Barrow Neurol. Inst., St. Joseph's Hospital, Phoenix

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### PROPOSALS FOR MEMBERSHIP

Council has changed the mechanism for submitting proposals for regular as well as associate membership in the Society. The one original proposal (on form supplied by the APS office) must now be accompanied by 7 (seven) photocopies (not carbons). The original letters from the sponsors must also be accompanied by seven photocopies. This enables the office to supply each member of the Membership Committee with a complete set of material pertaining to each proposal. The closing dates for proposals of candidates are July 1 and February 1 in order to be considered for nomination by Council at the subsequent Fall and Spring meetings respectively.

### RULES FOR HONORARY MEMBERSHIP

A member or group of members may propose to Council the name of a well-known foreign physiologist for Honorary Membership in the APS. Some criteria for Honorary Membership are:

1. Stature as a physiologist in his own country.
2. Functioning in America in some degree or by virtue of training people from America.
3. Relationships to International Congresses and receiving honorary degrees from universities in his own country.

The current Honorary Members of APS are:

Adrian, E. D. - England  
Bremer, F. - Belgium  
Eccles, J. C. - formerly of Australia  
Granit, R. - Sweden  
Hess, W. R. - Switzerland  
Hill, A. V. - England  
Hodgkin, A. - England  
Houssay, B. A. - Argentina  
Hurtado, A. - Peru

Kato, G. - Japan  
Kuno, Y. - Japan  
Monge, C. - Peru  
Moruzzi, G. - Italy  
Roughton, F. J. W. - England  
Ussing, H. H. - Denmark  
von Frisch, K. - Germany  
Weber, H. H. - Germany

## 1969 FISCAL REPORTS

The Bylaws of the Society (Article VII) identify the three principal funds which are used for the fiscal management of the Society's affairs. The behavior of these funds during the year 1969 is summarized below.

### SOCIETY OPERATING FUND

This fund is used for direct services to members through arrangement of meetings, programs, etc; the expenses and activities of Council and its committees (other than publications); the generation and distribution of educational materials; and the supervision of the business affairs of the Society.

#### INCOME

Membership Dues	\$47,459	(61%)
Sustaining Associates Contributions	5,803	( 7%)
Reimbursement for services rendered in connection with Fed. Spring Meeting	14,588	(19%)
Interest (on advance monies received)	5,821	( 7%)
Other Income (Sale of educational and other material, etc.)	3,985	( 5%)
Total	<u>\$77,656</u>	

#### EXPENSES

Salaries and Benefits	\$31,742	(40%)
Dues to Fed. and other organizations	20,002	(25%)
Office Rental (from Fed.)	4,660	( 6%)
Travel and Subsistence for officers and committees	5,530	( 7%)
Fall Meeting expenses incurred by Central Office	1,348	( 2%)
Education Committee	745	( 1%)
Bowditch Lecture	500	(0.6%)
Mail, Telephone, Supplies, etc.	5,519	( 7%)
Business Office expenses	8,375	(11%)
Total	<u>\$78,422</u>	

Excess of Expenses over Income (deficit) (\$ 766)

PUBLICATIONS OPERATING FUND

This fund represents the functions of the Society as a publisher of scientific journals.

INCOME

Subscriptions	\$442,335	(65%)
Sale of Reprints (net)	69,960	(10%)
Sale of Back and Single Issues	8,434	( 1%)
Page Charges	123,793	(18%)
Advertising (net)	11,610	( 2%)
Interest (on advance subscriptions, etc.)	20,640	( 3%)
Miscellaneous	7,568	( 1%)
Total	\$684,340	

EXPENSES

Printing and Engraving	\$423,200	(55%)
Salaries and Benefits	141,931	(19%)
Mail, telephone, supplies, etc.	55,208	( 7%)
Office Rental	17,069	( 2%)
Section Editor Expenses & Professional Services	38,567	( 5%)
Travel & Subsistence for Officers, Committees, and Editors	12,278	( 2%)
Business Office Expenses	75,376	(10%)
Total	\$763,629	
Allocation to Handbook Operation	(5,206)	
Allocated Advertising Costs	(7,110)	
Adjusted Total	\$751,313	
Excess of Expenses over Income (deficit)	(\$66,973)	

PUBLICATIONS CONTINGENCY AND RESERVE FUND

This is a reserve fund which the Society has accumulated over many years. Its existence is dictated by prudent business practice, in case of any severe reversals etc. the journals can continue to be published for at least one year following such reversals. The Society has very few tangible, salable assets that could be used as collateral for borrowing money. The fund's size should be from one to two times the annual operating costs of the publication operations, including the Handbooks. It is held in long term investments managed by an investment counselor. Its uses are carefully spelled out in Article VII, Section 3 of the Society Bylaws.

The separate story of the financial history and the future of the Handbook publication activity is reviewed elsewhere in this issue of The Physiologist.

Balance Dec. 31, 1968 (market value)	\$1,124,849
Dividend and Interest paid to APS in 1969	36,477
Balance Dec. 31, 1969 (market value)	1,009,315
Decrease in market value during 1969	115,534



## DOLLARS OVER THE DECADE

A Report from the Finance Committee

JOHN M. BROOKHART

People who are oriented, by inclination and training, toward a dynamic, functional outlook on life and things often find the fiscal report of a single year's activities (see 1969 Fiscal Reports) to be somewhat sterile and unsatisfying. It's like a frozen section of an organ, or a well-preserved cadaver, because the end-of-year summary reflects a miniscule instant frozen in time between midnight PM Dec. 31 and midnight AM Jan. 1. Your Council hoped that a look at your Society's finances over a long enough time interval to reveal trends would give you a better insight into the dynamic character of the operations and some of the policies and philosophies that underlie your Council's guidance of Society affairs. For this reason Council has asked your Finance Committee to prepare an exposition of some of the financial operations of your Society on a ten year time base. The following paragraphs are the result.

Before getting mired in dollars and balances, however, it might be well to speak briefly in more general terms. Your Society is, in many respects, like a business. It sells services to its dues-paying customers and in this respect is a service organization. It also behaves like a publishing house. It takes the input from people who write, and enters into production contracts with other firms which can turn the input into books and journals of a form completely specified by the Society-publisher. It then distributes these manufactured products to the people who buy them. At the same time your Society differs from many businesses in that it has no real property such as factories, buildings, land or machinery. This means that if the Society ever got into financial difficulties it could not go to a bank for a loan because it has no collateral. This is the main reason why your Council considers it important to maintain financial cushions under the larger operations funds.

### THE SOCIETY OPERATING FUND

This is the first of three funds which are identified and described in your Society's Bylaws. The origins of its income and the nature of the expenses charged against it are detailed in the 1969 Fiscal Reports. Figure 1 illustrates the way in which total expenses from this fund have changed over the decade. In the early years of the decade, changes in accounting procedures and allocation of costs were made in an attempt to reflect more realistically the costs of direct services to increasing numbers of members. Prior to 1966, all of your Society's accounts, membership rolls, subscription lists, etc., were handled on a fee-for-service basis by the Business Office of the Federation. For a number of reasons, Council was convinced that your Society would have better control of its own affairs if it would establish its own Business Office in the new quarters in the Lee Building at Beaumont. Plans for this change were laid in 1963-64, and funds to implement the change were

accumulated in reserve. The peak expenditure in 1966 represents the extra cost of this change-over. Sometime prior to 1960, the decision was made to accumulate a reserve fund which would serve to buffer the Society Operating Fund against unforeseen changes in income or expenses. This reserve has gradually risen to the point where it now equals the cost of one year of operations.



Fig.1. Expenditures from the Society Operating Fund over a ten year span (1960-69). In the early portion of the decade, changes in accounting procedures and allocation of costs were made in order to reflect more realistically the cost of direct services to members. In 1966, extra costs were incurred in transferring the Society's activities to new quarters and reorganizing the management of its affairs.

The prospects for 1970 are now clear since the planning budget for this year was completed at Council's February meeting. With the institution of a new home office function in the form of an Educational Research Office (See Prosser, President's Letter to Membership, *The Physiologist*, Vol. 12, Nov. 1969) the costs of operation will increase temporarily. Your Council has decided that this is an important enough venture to justify the utilization of some reserve funds during the formative stages. Consequently, the Society Operating Fund is budgeted to show a deficit of approximately \$12,000 in 1970 which will be covered from reserves. Beyond 1971, other means for financing this new function must be found.

Concerning dues: The Society Operating Fund comes closest to your awareness of Society functions because your dues constitute over 60% of the income to this fund. An attempt has been made in Figure 2 to display the relations between dues income and total membership. You will note that dues were raised from \$10 to \$15 in 1962. Except for the temporary perturbation in 1963, the membership curve and income curve display a generally parallel course. Strict parallelism is broken up by

variability in the amounts derived from Sustaining Associate members each year, and by the changing ratio of Associate members to total members. In 1960, Associate members constituted 5% of the total membership. This ratio held essentially constant until 1965 when it began to grow, reaching 8% in 1969.

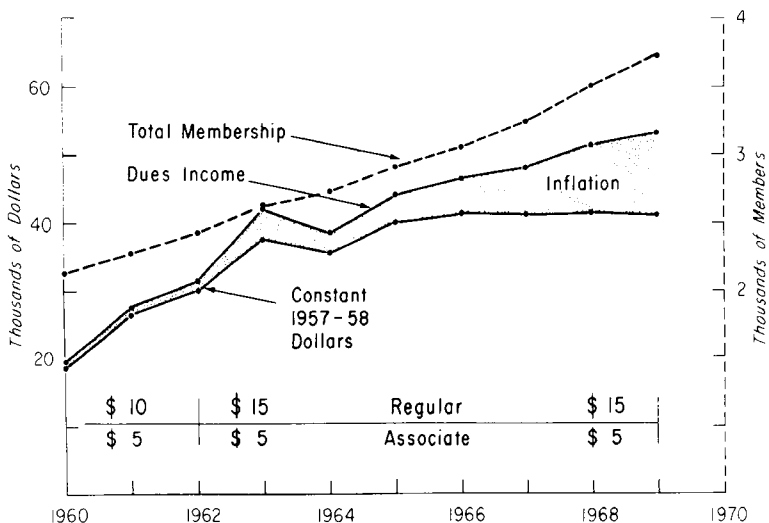


Fig.2. Dues income and membership relations over a ten year span (1960-69). The amount of the annual dues paid by each member is shown at the bottom of the figure. The changes in total membership are shown by the dashed line scaled at the right. Total dues income from regular, associate and sustaining members is shown in actual dollars by the upper solid line. Since the dollar measure is elastic, the actual dollar figures have been corrected, by the application of the U.S. Bureau of Labor Statistics Consumer Price Index, to a constant 1957-58 dollar. Note that, in terms of purchasing power, dues income has been essentially constant since 1965 even though the number of members receiving service has increased steadily.

You are all aware that the dollar has no fixed value; its power lies in its ability to buy goods and services. The Bureau of Labor Statistics provides a measure of this ability to buy goods and services through its Consumer Price Index. When the actual dollar income from dues is corrected by applying this index, it becomes evident that the ability of the dues dollar to provide services to members has not changed essentially since 1965, even though membership continued to grow. Your Council is of the opinion that this is sufficient evidence to justify an increase in dues from \$15 to \$20 per year for regular members leaving the dues for Associate members unchanged.

## THE PUBLICATIONS OPERATING FUND

In its role as a publisher of scientific journals, monographs and handbooks, your Society is serving the needs, not only of its members, but of biological sciences in general and throughout the world. Nevertheless, this service must be conducted in a businesslike fashion within the constraints of laws, customs and traditions which govern the business world. Your Society has fulfilled this role in an increasingly important fashion since 1897 when Professor Porter founded the American Journal of Physiology. Physiological Reviews was first published in 1921, the Journal of Applied Physiology came on the scene in 1948; the Physiologist appeared in 1957; the first volume of the massive Handbook series appeared in 1959 and the Journal of Neurophysiology was purchased in 1961. For many years the publishing business was guided by a Board of Publication Trustees. In 1961, the Board was supplanted by the Publications Committee which now has the same responsibilities as the former Board. Financial control over this business is exerted by your Council and the records of the activity are kept in a constitutionally defined fund called the Publications Operating Fund.

The behavior of the Publications Operating Fund over the past decade is illustrated in Figure 3. The rather startling change in 1961 is due simply to a change in the preparation of the Auditor's reports. At that time, the Publications Contingency and Reserve Fund was created as a separate fund to constitute the reserves for publications. Past 1961, the curves reflect primarily the operations themselves without regard to the reserve fund. The vertical extent of the upper shaded band indicates that the publication activity has involved an increasing turnover during the decade. It started out in 1960 at slightly over \$300,000 per year. This was the decade of extensive federal support of biomedical research with resultant growth in research publications; it was the decade during which your Society issued 15 volumes of the Handbook series; it was the decade during which the total number of pages published increased from a low of 4990 to a high of 9843. On these grounds alone, disregarding inflationary trends, the increasing separation of the two curves in Figure 3 makes sense.

The lower shaded band marked "Cash Float" simply reflects one of the realities of running a business of this size. Part of your own monthly pay check probably goes into a checking account from which (we hope) you pay your bills as they come due. This represents your own "Cash Float". The major income to this fund comes within a relatively short time when subscription renewal orders are placed and paid. This income is principally pre-payment for journals which are manufactured and distributed throughout the year. The bills for this production and distribution come in irregularly. A cash buffer must be maintained if penalties for late payment of bills are to be avoided.

The future of this account is particularly difficult to predict at present. The account was budgeted at the February 1970 meeting of your Council in anticipation of essentially no change in total income, but a substantial increase in expenses due to inflationary trends, including a sizeable increase in printing costs. Your Council expects a

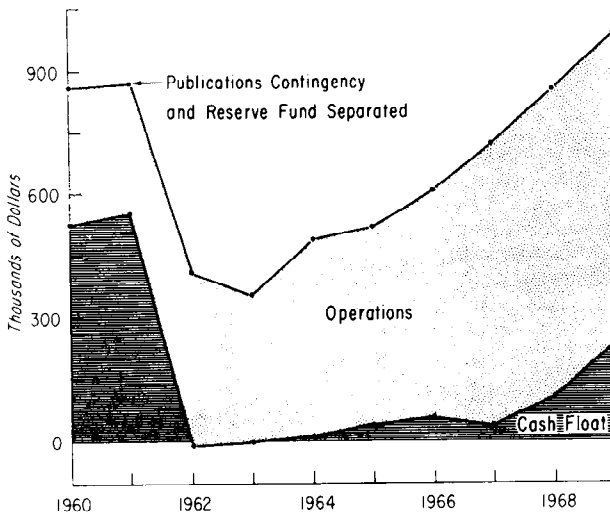


Fig.3. The Publications Operating Fund (1960-69). The lower curve reflects the beginning balance in the fund each year. The upper curve indicates the sum of the beginning balance plus the income for that year. Operating expenses for any year are represented by the vertical distance between the upper curve for one year and the lower curve for the next year. Up until 1961, the reserve for this fund was reported by the auditors as a part of the Publications Operating Fund. In 1961, the then existing Board of Publication Trustees requested a separate accounting of the Publications Contingency and Reserve Fund (See Fig.5). The "Cash Float" indicated constitutes a buffer of quite variable and unpredictable size. It is necessary because income to this fund comes largely at the time of subscription renewals, but printers and other suppliers tender bills throughout the year which must be paid promptly to avoid penalties.

deficit in this account at the end of 1970 in excess of \$100,000. The deficit of almost \$67,000 in 1969, plus the anticipated deficit of more than \$100,000 in 1970 can be taken care of by reducing the amount carried in the fund as a "Cash Float" and by allocations from the Publications Contingency and Reserve Fund. However, this sort of deficit financing cannot proceed indefinitely. For these reasons Council has felt compelled to increase the subscription price of certain journals in 1971

As was the case for the Society Operating Fund, this fund is sensitive to inflationary trends and to volume of production. In Figure 4, an attempt has been made to normalize the total operating expenses for publications to take these two variables into account. Again, the Consumer

Price Index has been used to correct the expenses curve for the effects of inflation. The volume of production seems appropriately measured by the number of pages produced annually. When this correction factor is introduced, the rather jagged curve at the bottom of Figure 4 develops. The three prominent peaks coincides with years in which no handbook volumes were issued. Nevertheless, the costs of production went on, and the curve peaked because the number of pages produced was smaller in those years. If this curve is smoothed by a running average, a steady upward trend of about one dollar per year appears. It is tempting to ascribe this trend to the fact that costs of printing are not included in the Consumer Price Index, yet have gone up dramatically in the last several years. From time to time we have all winced when the bill for page charges for our publications came across our desks. This last curve may provide some perspective on that problem.

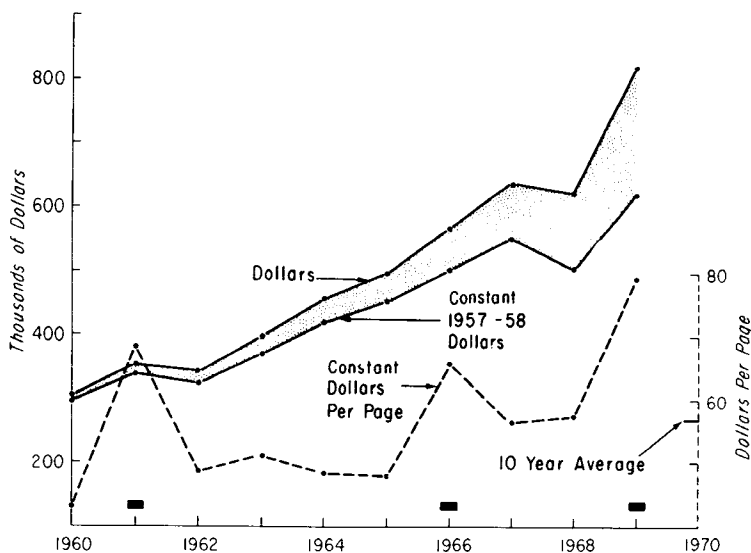


Fig.4. Operating expenses for the publishing business (1960-69). The upper line gives the annual total operating expenses in dollars of variable value. The lower line gives the expenses in constant dollar values. Since the expenses of the business are also influenced by the volume (measured in pages published per year, scaled to the right) an attempt has been made to normalize these figures to dollars per page (broken line). The peaks over the short solid rectangles occurred in years when no handbook volumes were issued, thus the number of pages was smaller for those years. Note the ten year average cost per page (lower right). It deserves to be noted that the printing industry increased its rates by 11% in 1969 and is expected to increase another 10% in 1970.

### THE PUBLICATIONS CONTINGENCY AND RESERVE FUND

This is the third of the constitutionally defined funds which provide records of your Society's operations. A reserve for publications was begun many years ago by the Board of Publications Trustees. It has always been recognized as a protection for the publications activity and as a source of funds for the initiation of new publications ventures. When the Board of Publications Trustees was supplanted by the Publications Committee and the Fund was given separate identity, the purposes and uses of the fund were carefully spelled out in Article VII Section 3 of your Society's Bylaws. It consists of a portfolio of long term investments managed for growth and income by a group of investment counselors. Figure 5 illustrates the year end values of this portfolio as they show on your Society's books. The effects of the "bull market" of the decade are obvious. Nevertheless, the fund still represents only one year's operating expenses (see Figure 4). The figure also indicates how the capital of the fund has been used to finance new publication ventures such as the Journal of Neurophysiology in 1961 and additional Handbook productions in 1962. In accordance with the directives of the Bylaws, the dividend and interest income has been reinvested as often as seemed possible. The total income figures at the lower right do not balance because the income reported in 1969 was not allocated until 1970.

Your Council is naturally concerned about the effect of the investment market changes on this reserve fund. That concern is particularly great at this time because a total of thirteen new handbook volumes are in the preparative stages now. It seems quite probable that capital from this reserve fund will have to be withdrawn to finance this production effort.

### THE HANDBOOKS OF PHYSIOLOGY

You have probably heard the comment from time to time - "Gawd, the Society must be making a pile on those Handbooks!" Fortunately for your Society, this is not true since your Society cherishes its status with the Internal Revenue Service as a tax-exempt non-profit educational and scientific institution. The Handbook publication effort is expressly geared to operate on a break-even basis so that you may say that your Society is rendering a service without reward except that of accomplishment.

The degree to which the dollars reflect these attitudes is displayed in Figure 6. In this figure total costs attributable to Handbook production are compared with total income resulting from sales of Handbooks on a cumulative basis. Over the decade, the costs have totalled slightly in excess of one million dollars. In 1969 sales income exceeded costs by approximately \$30,000 for the first time in the history of the effort.

Figure 7 presents the current picture in a slightly different way. Each section of the Handbook has had its own publication life and history. Three of the six sections have now reached the stage where total sales income exceeds total costs. The last three sections still have some way to go. It would appear that a section must be on the market in toto for from 4 to 6 years before it reaches the break-even point.

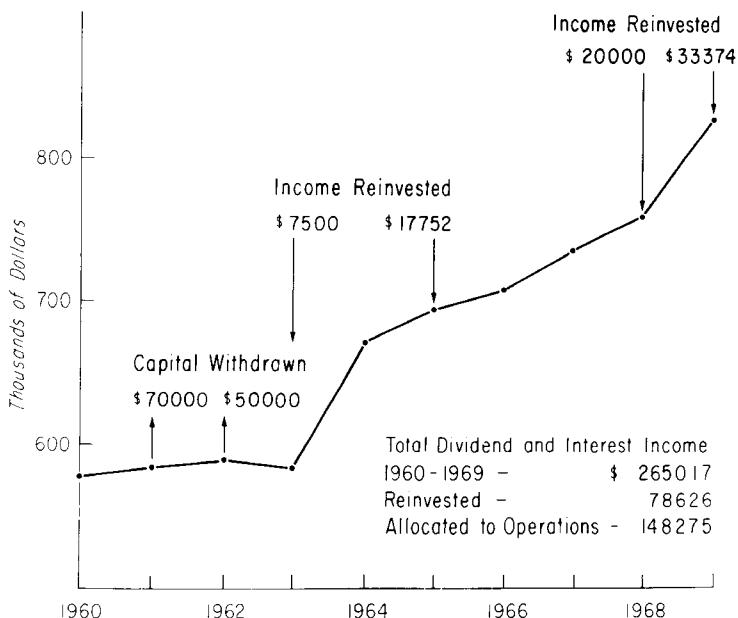


Fig.5. The Publications Contingency and Reserve Fund (1960-69, Book Values) established in the early 1960's by the Board of Publications Trustees. It consists of a portfolio of long term investments managed for both growth and income. Its uses are defined in your Society's Bylaws (Article VII, Section 5). The Capital withdrawals in 1961 and 1962 were used to finance the purchase of the Journal of Neurophysiology and the production of Handbooks. The income which was not reinvested has been allocated in support of Handbooks, the Publications Operating Fund and the Society Operating Fund. Note that the present value of the fund is approximately equal to one year's operating expenses in publications (See Figure 4).

These facts about the Handbook effort must be viewed in relation to the fact that thirteen new handbook volumes are in the planning and preparation phases.

#### THE NEXT DECADE?

Prospects for the next decade seem at present, to offer nothing but confusion and uncertainty. Your guesses about the volume of research publications in physiology are as good as anyone else's. Your Publications Committee is actively exploring more efficient means for information transfer, storage and retrieval than the modes currently used. Your Council looks with great hope toward the capability of your Society to augment its educational services to members and the science as a whole. How these changes will influence the future of your Society's finances cannot be foreseen completely. You may be assured that your Council



will proceed with boldness tempered by caution to improve the service function of your Society.

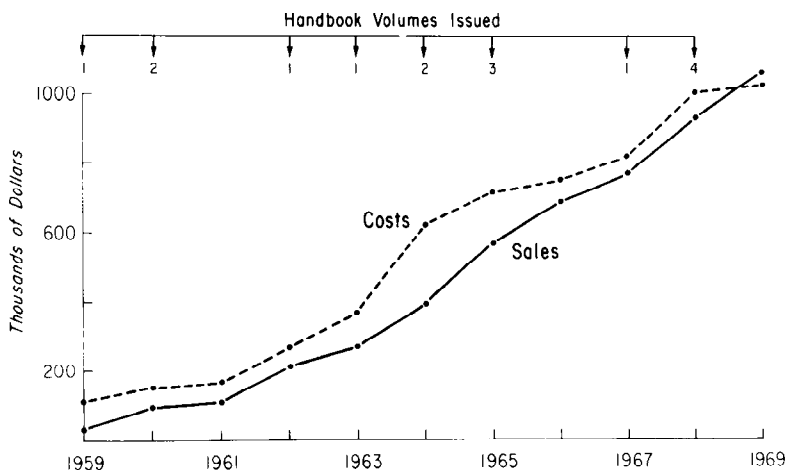


Fig.6. The History of Handbook finances. On a cumulative basis the cost of producing the Handbooks continuously exceeded the returns from sales of Handbooks for the first ten years of the effort. In 1969, after the investment of slightly over 1 million dollars, sales exceeded costs by approximately \$30,000. Thirteen new volumes are in the production and planning stages for issuance during the next five years at an anticipated cost of an additional 1 million dollars. It is certain that these two curves will resume their old relationship in 1970.

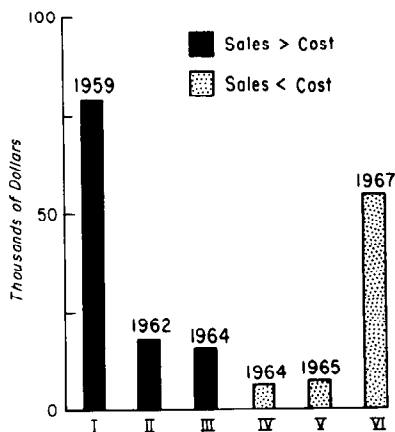


Fig.7. APS Handbooks. Where is the "break-even" point? Each of the bars represents the 1969 relation between costs and sales for one section of the Handbooks, indicated by Roman numerals. The Arabic numerals at the end of each bar indicate the year of issue of the first volume in a section. It appears from the year-by-year summary that a completed section must be on the market for from 4 to 6 years before its cost is returned through sales.

INVITATION TO THE FALL MEETING  
INDIANA UNIVERSITY  
BLOOMINGTON, INDIANA

August 28 to September 3, 1970

The physiologists of Indiana University extend a cordial invitation to all members and friends of the American Physiological Society to attend the 1970 Autumn Meeting to be held in Bloomington.

This year's meeting will be unique in that it will overlap the meetings of the American Institute of Biological Sciences which will be held at Indiana University August 23 to 30. Registrants for either the APS or the AIBS meeting are invited to attend the Scientific Sessions of both Societies. Of special interest to physiologists of both APS and AIBS will be a series of symposia sponsored jointly by the two societies to be held August 28-30. The first of these symposia on August 28 and 29, will be concerned with "Nitrogen Metabolism and the Environment," three symposia on August 30 will include "The Neural Basis of Animal Behavior," "Physiological and Biochemical Adaptation," and "Endocrine Factors in Reproduction."

Because of these joint meetings, the APS Council has voted not to have the traditional Refresher Course at the 1970 Autumn Meeting.

The scientific sessions of the APS will be held August 31 through September 2 on the Bloomington campus of the University, and on September 3 the meeting will be continued at the Indiana University Medical Center at Indianapolis, with symposia on "Control of Antidiuretic Hormone Secretion," and "Transcapillary Exchange."

The Bowditch Lecture will be given by Dr. Donald Kennedy of Stanford University in the University Auditorium at 7:45 PM Monday, August 31. Dr. Kennedy will speak on "Interneurons in Crayfish."

The Society business meeting will be held at 4:00 PM September 2 and will be followed in the evening by the Annual Banquet and an address by President C. Ladd Prosser.

Indiana University President Joseph L. Sutton will welcome members and guests of the Society in the Auditorium at 7:30 PM August 31, preceding the Bowditch Lecture. Following the lecture President Sutton will hold a reception in Bryan House, 9:00 to 10:30 PM.

There will be a Barbecue Picnic at 6:30 PM Tuesday, September 1, and recreational facilities including those for golf, tennis, swimming, etc. will be available throughout the week. Tours of the Bloomington Campus including the Physiology Laboratories, The Center for Neural Sciences and Jordan Hall have been arranged. Tours of the Medical Center Campus and the Eli Lilly Laboratories at Indianapolis are being arranged for September 3.

Events for the ladies will include an informal tea on Monday after-

noon to welcome the wives and guests of the Society members. There will be a trip to scenic Brown County to visit the famous Art Gallery, some of the artists' studios, and the antique and handicraft shops of rustic Nashville, Indiana. A trip to historic Spring Mill State Park and tours of the Bloomington Campus are also being planned for the ladies.

Air conditioned housing will be available on and adjacent to the campus, and at nearby hotels and motels. Meals also will be available on and near the campus.

Registration may be made in advance by mail, or during the meeting, beginning Thursday, August 27 for APS members wishing to attend the joint symposia, and continuing through September 2.

\*\*\*\*\*

#### DEGREES OF APS MEMBERS AND WHERE EMPLOYED

The following is a breakdown of APS Regular Members as of Jan. 1970.

##### DEGREES

	No.	%
Ph. D.	1443	46.2
M. D.	1202	38.5
Ph. D. & M. D.	367	11.8
Ph. D. & Other	56	1.8
Dr.		
Other Dr. *	34	1.1
Non Dr.	20	.6
	<u>3122</u>	

\*Other Dr. include D. Sc., DVM, DDS, DMD, Etc.

##### EMPLOYMENT

Physiology Depts.	866	27.7
Other Preclin. Depts.	377	12.1
Clinical Depts.	711	22.8
Hosp. and/or Adminis- tration	179	5.7
Insts. & Foundations	206	6.6
Undergrad. Depts.	327	10.5
Govt. Agencies	301	9.6
Industry	91	2.9
Private Practice or Inactive	64	2.1
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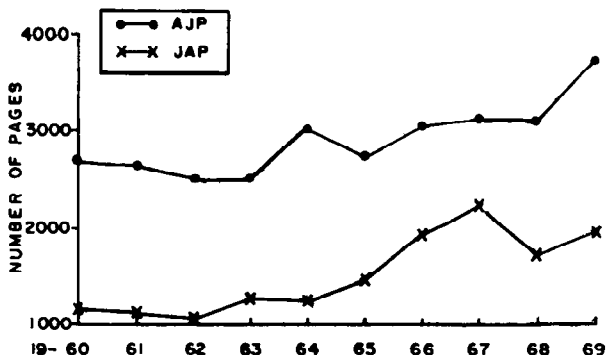
## WHAT HAPPENED TO MANUSCRIPT P249-9?

S. R. Geiger

This report summarizes the fate of manuscripts received by the American Journal of Physiology (AJP) and the Journal of Applied Physiology (JAP) between 1960 and 1969.

There has been less variation in the number of pages printed each year in AJP than in JAP (Fig. 1). Biggest increases in the size of AJP occurred in 1964 and in 1969. (A 10% gain from change in page layout, beginning July 1969, is included in Fig. 1). JAP grew quite rapidly through the 1960's; although there were 400 fewer pages in 1968 than in 1967, in 1969 JAP was up by about 200 pages.

FIG. 1 TEXT PAGES PRINTED

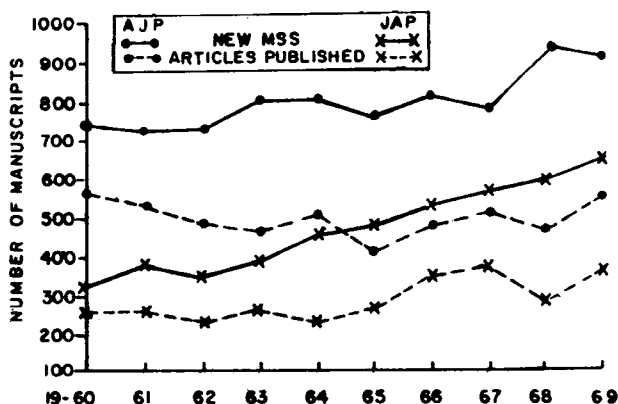


The number of articles published in AJP was highest in 1960, although only slightly more than in 1969 (Fig. 2). The number has fluctuated between 416 and 569 articles per year. The number of articles published in JAP remained steady from 1960 to 1964 and then began to increase. AJP and JAP published fewer articles in 1968 than in the two previous years, but in 1969 the number of articles published in AJP increased by 21% and in JAP by 19%. The ratio of special communications to regular articles in JAP increased from 23% in 1960 to 36% in 1969. The average length of articles also increased in that period.

Records are kept of the number of papers received for each section since 1966. Comparative and general physiology and circulation grew the most rapidly since then. In 1969 most papers were received by circulation, respiration, and environmental physiology and exercise.

The number of manuscripts received by AJP increased gradually between 1960 and 1967 (Fig. 2). In 1968 there was a marked increase of 132 papers (17%) over the previous year and the number remained about the same in 1969. The number of manuscripts received by JAP increased steadily between 1960 and 1969.

FIG. 2 MANUSCRIPTS RECEIVED & PUBLISHED



There has been an increase in the number of manuscripts upon which final action has not been taken at the end of the year (Fig. 3). There was a larger number of such manuscripts for AJP in 1968 compared with 1967, i.e., 368 vs 279; these manuscripts were distributed between the authors (for revision), the reviewers, and section editors. The situation has improved in 1969. A few manuscripts were in the editorial office or in the mail.

The percentage of manuscripts rejected has gone up since 1960 for each journal (Fig. 4). The rate fluctuated more for AJP than for JAP, but since 1964 has been between 35% and 44% for AJP. The rejection rate for JAP climbed steadily, with a high of 47% in 1968.

FIG. 3 DEFERRED MANUSCRIPTS

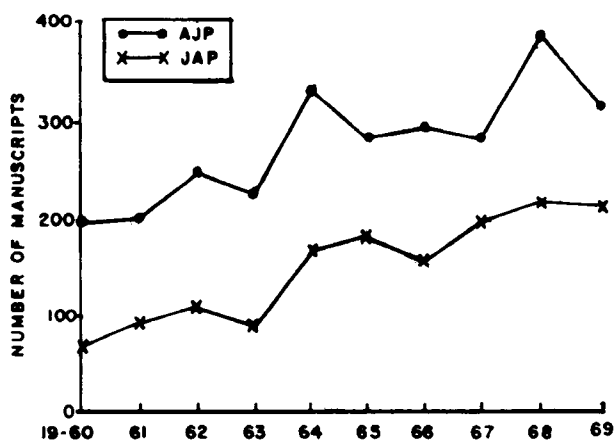
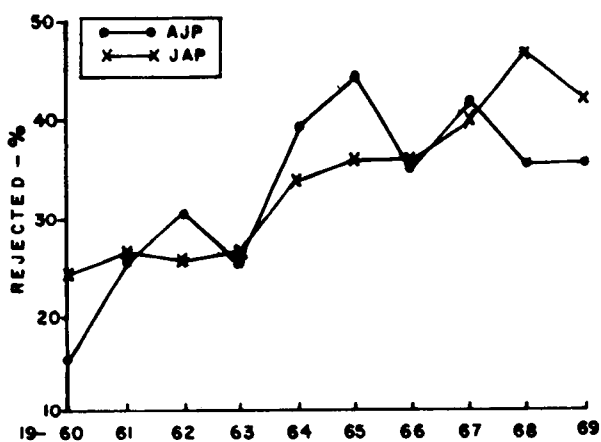


FIG. 4 REJECTION RATE



# A SYMPOSIUM ON NITROGEN METABOLISM AND THE ENVIRONMENT

organized by  
Leon Goldstein, Brown Univ., and James W. Campbell, Rice Univ.

and sponsored by  
The Division of Comparative Physiology & Biochemistry  
(American Society of Zoologists) and  
The American Physiological Society

To be held August 28-29, 1970  
University of Indiana, Bloomington, Indiana

This symposium is one of a series to be held between the fall meetings of the Division of Comparative Physiology & Biochemistry and the American Physiological Society to promote communications between the two societies. Several aspects of nitrogen metabolism will be covered: included will be synthesis and renal handling of the normal end-products of nitrogen metabolism, the acquisition of nitrogenous compounds from the environment and the metabolism and excretion of "foreign compounds."

## Speakers

R. H. Adamson, National Cancer Institute, Bethesda, Maryland  
J. W. Campbell, Rice University, Houston, Texas  
J. J. Corrigan, Tufts University Sch. of Med., Boston, Mass.  
R. P. Forster, Dartmouth College, Hanover, New Hampshire  
L. Goldstein, Brown University, Providence, Rhode Island  
A. D. Goodman, Albany Medical College of Union Univ., Albany, N. Y.  
M. E. Jones, University of North Carolina, Chapel Hill, N. C.  
J. Maetz, Atomic Energy Commission, Villefranche-sur-mer, France  
A. W. Martin, University of Washington, Seattle, Washington  
R. F. Pitts, Cornell University Medical College, New York, N. Y.  
B. Schmidt-Nielsen, Case Western Reserve Univ., Cleveland, Ohio  
G. D. Stephens, University of California, Irvine, California

## REGULATION OF LIPID METABOLISM\*

H. MAURICE GOODMAN  
Harvard Medical School

The past 15 years have witnessed an explosive increase in our understanding of lipid metabolism and its central role in caloric homeostasis. This period of growth has seen the ascendancy of adipose tissue from an ignored, inert repository for excess dietary fat, to the pinnacle of popularity for study of its biochemical virtuosity and its endocrinological promiscuity. In the next 30 minutes, I'd like to consider some aspects of this field, concentrating particularly on the various levels at which control of fat mobilization is exerted.

To put these remarks in context, it will be useful to examine the overall features of lipid metabolism in mammals. A schematic representation is given in figure 1. The fatty acids which are stored in adipose tissue as triglycerides may arise from three sources: dietary fat, de novo synthesis in the liver, or synthesis within the adipose tissue itself from glucose or amino acid precursors. The relative importance of liver and adipose tissue for endogenous synthesis of fatty acids apparently varies widely from species to species, with the liver playing the dominant role in such diverse species as pigeons and man, and the adipose tissue playing the more important role in rats and mice. Regardless of their origin, fatty acids en route to adipose tissue travel in blood esterified with glycerol and in lipoprotein complexes. Some chylomicra formed in the gut reach the adipose tissue directly, but most apparently are re-packaged in the liver as smaller low density lipoprotein molecules. The hepatic production of the protein portion of lipoproteins and the repackaging process will be the subject of several papers presented later this afternoon.

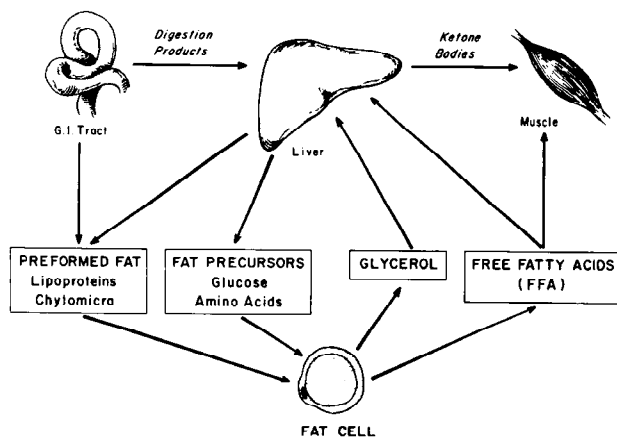


Fig.1. Schematic representation of fat metabolism.

\*Taken from the introductory remarks given at the session on Lipid Transport at the 1970 Federation Meetings.



The bulk of the fatty acids incorporated into adipose tissue triglycerides are first split from their glycerol esters in the lipoprotein by the enzyme lipoprotein lipase. Although a general consensus has not yet been reached as to whether such lipolysis occurs intravascularly, or in the interstitial spaces, or even in pinocytotic vacuoles within the adipocytes themselves, it is reasonably certain that lipoprotein lipase plays an essential role in the uptake of fatty acids. Lipoprotein lipase activity is most abundant in homogenates of adipose tissue obtained from fed subjects, and declines with fasting. There are some data which suggest that insulin may control its synthesis.

In times of increased physiological demand, or in fasting, free fatty acids (FFA) leave the adipose tissue bound to albumin and travel in the blood to muscle, liver, and other sites of oxidative degradation. Liver only partially oxidizes the FFA and converts them to ketone bodies, which are released into the circulation and avidly taken up and consumed by muscle. Fatty acids mobilized in excess of physiological demand may temporarily accumulate in liver, but are eventually repackaged and returned to the adipose tissue in the form of lipoproteins.

The release of FFA from adipose tissue is accompanied by the release of glycerol, the other product of triglyceride hydrolysis. Glycerol released from adipose tissue during fasting provides substrate for gluconeogenesis and may account for as much as 10% of the daily glucose production in fasting man.

Mobilization of fatty acids from adipose tissue is governed by the relative rates of the opposing processes of triglyceride cleavage or lipolysis and fatty acid esterification back to triglyceride. (Figure 2).

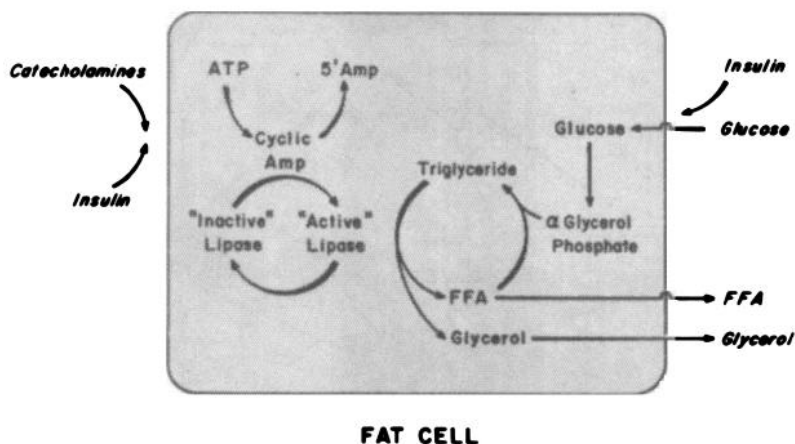


Fig.2. Schematic representation of factors involved in control of FFA release from fat cells.

The rate-limiting reaction in lipolysis appears to be the removal of the first long chain fatty acid from the triglyceride to form a diglyceride. Cleavage of the second and third fatty acids from glycerol occurs rapidly; mono- and diglycerides do not accumulate except when lipolysis is particularly rapid. Triglyceride hydrolysis is an ongoing process even under basal conditions, although net mobilization of fatty acids is kept to a minimum by the process of reesterification which traps essentially all of the FFA as triglycerides and thus prevents them from leaving the adipocyte. Since adipose tissue cannot phosphorylate glycerol to any significant degree, the alpha glycerol phosphate required for the esterification of fatty acids must be made *de novo* from glucose. Thus, the availability of glucose governs the rate of reesterification, and hence the rate of net FFA production. Since the adipocyte membrane is relatively impermeable to glucose in the absence of insulin, insulin becomes an effective regulator of FFA mobilization. The adipocyte is exquisitely sensitive to insulin, and reduces its output of FFA in response to concentrations that are too low to reduce blood glucose levels. Conversely, adrenal glucocorticoids and growth hormone, which inhibit glucose utilization in adipose tissue inhibit reesterification and thus promote FFA mobilization.

Another consequence of the inability of the adipocyte to reutilize the glycerol liberated by lipolysis is that the rate of glycerol production provides us with a means to estimate the actual rate of lipolysis. By monitoring glycerol production under various experimental circumstances, it becomes obvious that the rate of lipolysis is not constant, but is subject to hormonal modification. Available evidence overwhelmingly supports the concept that adipose tissue contains a "hormone-sensitive lipase" which is activated by cyclic AMP. A wide variety of hormones and hormone-like agents can increase lipolysis secondary to their activation of adenylyl cyclase. It is doubtful that any hormones except the catecholamines and possibly glucagon are physiologically important in this regard. Corticotropin, thyrotropin, MSH, secretin, and various pituitary peptides which are potent lipolytic agents when tested *in vitro* probably do not function as physiological activators of fat mobilizations. Growth hormone and glucocorticoids acting in concert produce a delayed increase in lipolysis (1) which may be physiologically important. Although cyclic AMP is probably involved in their activation of lipolysis, their mode of action appears to be different from that of the catecholamines. Growth hormone alone increases plasma levels of FFA when administered *in vivo*, but only when some other stimulus for fat mobilization such as fasting is also present (2). As indicated in the upper left of the figure, insulin antagonizes the lipolytic effects of the catecholamines and decreases cellular levels of cyclic AMP possibly by inhibiting adenylyl cyclase (3). Prostaglandins also inhibit lipolysis, but the physiological significance of this effect cannot yet be evaluated.

Thus hormones directly affect FFA production in two ways: by controlling the hormone-sensitive lipase and by regulating the rate of FFA reesterification. There is yet a third way in which hormones may act on adipose tissue to control FFA mobilization. They may act indirectly as modulators or amplifiers of physiological stimuli for lipolysis. In the absence of the pituitary, or thyroid, or adrenal glands, lipolysis in

response to a variety of stimuli is severely reduced. Figure 3 summarizes the effects of hypophysectomy on lipolysis in response to a wide range of lipolytic stimuli. Hypophysectomy reduced glycerol production by isolated adipose tissue in response to fasting, diabetes, pituitary hormones, and catecholamines. Hypophysectomy also reduced lipolysis in response to theophylline which increases cyclic AMP levels by interfering with the breakdown of spontaneously formed cyclic nucleotide. Attempts at *in vivo* or *in vitro* replacement in hypophysectomized rats reveal that growth hormone and the hormones of the thyroid and adrenal glands are required for optimal sensitivity of adipose tissue to the lipolytic action of catecholamines (4). Superphysiological doses of adrenal cortical and thyroid hormones induced hyperresponsiveness to the lipolytic actions of the catecholamines. It is worthy of note that although the data presented in Figure 3 were obtained with rat adipose tissue *in vitro*, comparable results have been obtained *in vivo* in man, monkeys, and dogs.

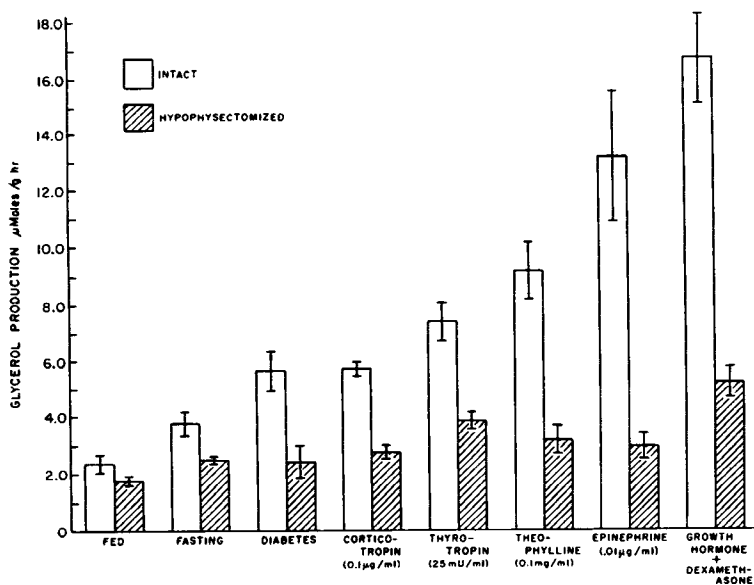


Fig.3. The effects of hypophysectomy on lipolysis in response to various stimuli. Each bar represents the mean production of glycerol by adipose tissue segments from at least 8 rats. The vertical brackets indicate the standard errors. Glycerol production in response to growth hormone and dexamethasone is the total produced during 4 hours of incubation.

The mechanisms by which the modulating hormones influence lipolysis are not yet fully understood. Some data suggest they affect the sensitivity of the adenyl cyclase system and thus increase cyclic AMP production (5).

Other observations suggest that cyclic AMP degradation may be reduced (6). Still other observations suggest that the sensitivity of some intracellular receptor for cyclic AMP may be affected since the lipolytic response of adipose tissue to the dibutyryl analog of cyclic AMP is also reduced by hypophysectomy and heightened by adrenal and thyroid hormones (7). Possible hormonal effects on the synthesis or degradation of the hormone sensitive lipase or on the process of lipase inactivation have not yet been adequately explored.

Thus it seems reasonably clear that at the molecular level, the production of FFA is a highly complex process involving many hormones which may interact at multiple points. Recent studies in our laboratory have uncovered yet another complexity. Till now, the discussion has been limited only to the production of FFA. To be of any use to the organism, however, the FFA so produced must pass out of the adipocyte and get to sites of utilization. The egress of FFA has been thought to occur by passive diffusion across the adipocyte membrane into the interstitial fluid. Occasional *in vitro* experiments, however, gave results for the distribution of FFA between cells and incubation medium which were inconsistent with this idea. To test the possibility that fat cells might participate in some active way in the outward movement of FFA, Dr. Schimmel, in my laboratory, compared the distribution of FFA between tissue and medium in tissues that were incubated in the usual way and in tissues boiled for 3 minutes prior to incubation. The results are given in Figure 4. All of the tissues were preincubated with epinephrine in the absence of albumin to produce high intracellular concentrations of FFA. The tissues denoted by the vertical bar on the left were homogenized in Dole's extraction medium (8) immediately thereafter and their content of FFA measured. The tissues represented by the middle column were reincubated for 1 hour in fresh medium which contained 4% bovine serum albumin and 1 mM quinidine to block further lipolysis. The tissues denoted by the bar on the right were boiled for 3 minutes prior to reincubation. Total recovery of FFA in tissues and medium was unaffected by boiling or incubation. Boiling, however, markedly affected the distribution of the fatty acids. Less than 15% of the FFA escaped from the boiled tissues while the normal tissues yielded up more than 45% of their fatty acid content to the medium during the same period of reincubation. These findings cannot be ascribed to some physical changes in the tissues caused by boiling, since Dr. Schimmel also found that metabolic poisons such as iodoacetate or dinitrophenol are as effective as boiling in blocking the egress of FFA from adipocytes. Furthermore, the dibutyryl analog of cyclic AMP accelerates the release of preformed FFA into the incubation medium. This process, which may now be referred to as FFA secretion, may be of physiological importance. Rodbell (9) has shown that lipolysis is inhibited if FFA are allowed to accumulate within fat cells. Thus acceleration of FFA secretion by cyclic AMP complements its effects on the acceleration of lipolysis.

How the FFA are transferred from the surface of the adipocyte into the bloodstream is still unknown. The presence of albumin in the interstitial fluid bathing the adipocytes is an absolute requirement for the release of FFA from the fat cells but virtually nothing is known of the movement of albumin across the capillary walls into and out of the inter-

stitial space. Lymph flow in adipose tissue appears not to have been studied. Because albumin has a finite capacity for binding FFA, the rate at which fatty acid laden albumin is cleared from the interstitial spaces surrounding the adipocytes may be an important determinant of the rate at which FFA leave the adipose cells, and hence of the rate of lipolysis.

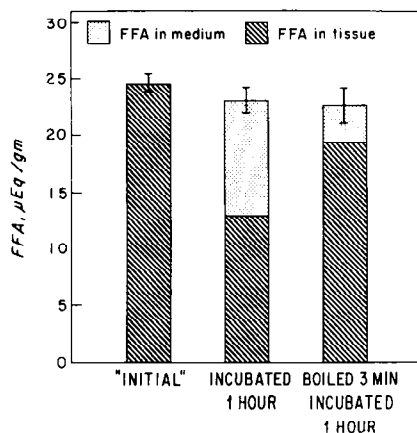


Fig.4. The effects of boiling on the egress of FFA from adipose tissue. Each bar represents the mean of 8 observations. The standard errors are given by the vertical brackets. At the end of incubation, the boiled tissues contained  $19.17 \pm 1.58 \mu\text{Eq/g}$  of FFA compared with  $12.78 \pm 1.21$  for the controls ( $P < .001$ ). The boiled tissues released  $3.42 \pm 0.92 \mu\text{Eq/g}$  of FFA compared with  $10.29 \pm 0.62$  for the controls ( $P < .001$ ).

Data gathered in recent years in collaboration with Dr. J. A. Herd and Miss S. A. Grose indicate that blood flow in adipose tissue is relatively high, and more importantly, perhaps, appears to be subject to physiological regulation. To study blood flow in fat of unanesthetized, unrestrained animals, we injected rats intravenously with minute amounts of tritium-labeled DDT. This material is highly lipid-soluble and is virtually completely cleared from the blood as it passes through adipose tissue. DDT disappears slowly from the blood over a period of many hours. From measurements of the rate of disappearance of label from the blood, and its appearance in adipose tissue, fat blood flow over a two hour transient period was calculated. These studies revealed that blood flow in various fat depots increases with physical activity (10), cold exposure (unpublished) and fasting (11). The effects of fasting on blood flow in various depots of white fat are shown in the next slide (Figure 5). In all depots studied, an overnight fast resulted in a substantial and highly significant increase in blood flow. The data in the slide are given in terms of the wet weight of the tissues, but even when the loss of triglyceride from the tissues of the fasted rats is taken into account, it is clear that fasting increases fat blood flow. Mayerle and Havel have published similar findings obtained with a different method for measuring blood flow (12).

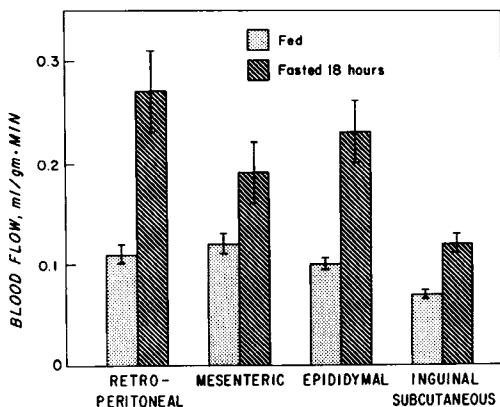


Fig.5. The effects of fasting on blood flow in adipose tissue. Each vertical bar represents the mean of 8 observations. The standard errors are given by the vertical brackets.

We next studied the effects of the autonomic nervous system on fat blood flow. The symmetrical retroperitoneal fat depots are innervated by three branches of the splanchnic outflow of the sympathetic nervous system. The retroperitoneal fat on one side was denervated by severing the three sympathetic nerves. The normally innervated contralateral depot in the same rat served as control. Figure 6 illustrates the effects of denervation on blood flow in retroperitoneal fat in fasting and fed rats. To simplify the interpretation, the data are given in terms of fat-free tissue weight. In fed rats, blood flow was unaffected by denervation. As before, fasting increased blood flow, but only in those tissues whose innervation remained intact. These data suggest that blood flow in fat is under the control of the sympathetic nervous system. These findings are consistent with the existence of a sympathetic vasodilator system in fat. However, the alternate possibility that changes in fat blood flow are secondary to increased metabolic activity cannot be ruled out.

Regardless of the mechanism, blood flow in fat is somehow coordinated with lipolysis, thus ensuring that newly mobilized FFA are carried away from the adipose tissue to sites of metabolic need. How the FFA get out of the circulation and into muscle or liver cells is presently unknown. In view of the findings on the egress of FFA from adipose cells, it will be of interest to determine whether FFA enter cells by passive diffusion or by some active process.

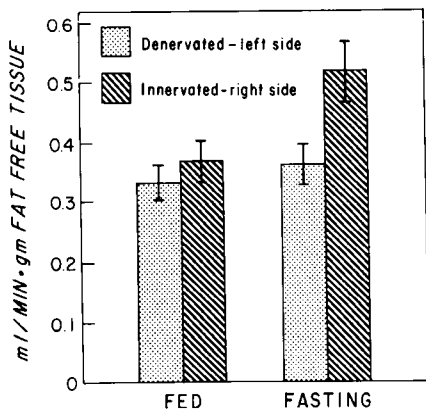


Fig.6. The effects of fasting and denervation on blood flow in retroperitoneal fat. Each vertical bar represents the mean of 8 observations. The standard errors are given by the vertical brackets.

We have thus far discussed the effects of hormones on fat cells and the mechanisms for the production and delivery of FFA. Let us turn now to a brief consideration of the coordination and integration of these processes. Fatty acid mobilization is increased during between-meal periods and decreased following food ingestion. This relationship is illustrated in the next slide (Figure 7) taken from a study made about 10 years ago in collaboration with Dr. Ernst Knobil (13). Plasma FFA, or non-esterified fatty acids, as they were called then, were measured to provide an index of fat mobilization. The subject was a male Rhesus monkey fasted for 16 hours before the first blood sample. Feeding resulted in a sharp decline in plasma fatty acids and a rapid increase in plasma glucose. Fatty acid levels remained low as long as glucose was elevated, but as glucose concentrations returned to baseline the plasma concentration of fatty acids began to rise, and continued to increase even though glucose levels remained stable.

To determine whether the fall in FFA was related to the change in blood glucose or to some physical or emotional consequence of the act of food ingestion, a fasted monkey was given a non-nutritive "meal" consisting of cellulflour flavored with artificial sweeteners and salt (Figure 8). Such a "meal" produced no fall in plasma fatty acids for the next hour. At the second arrow, the monkey was given an apple; blood levels of fatty acids promptly fell. Thus, it would appear to be the nutrients in the food, rather than the act of eating which is responsible for the decrease in plasma fatty acids.

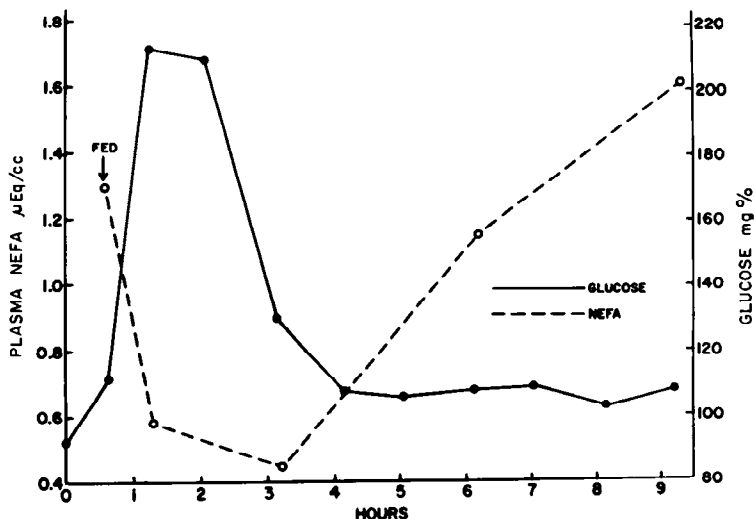


Fig.7. The relationship between plasma fatty acids and blood glucose after feeding in a normal Rhesus monkey. The animal was deprived of food 16 hours prior to zero time.

As mentioned earlier, insulin and glucose can prevent the outflow of FFA from adipose tissue. With this in mind, it is possible to construct a regulatory system whereby FFA mobilization is under the tonic inhibitory influence of insulin. Fluctuations in the rate of FFA mobilization would thus be inversely related to fluctuations in insulin secretion, which is known to be increased by feeding, and decreased by fasting. Ten years ago we proposed this as the mechanism by which animals coordinate FFA mobilization with their nutritional state (13, 14). Because the wealth of data collected in many laboratories in the ensuing years have been largely consistent with this idea, it is still reasonable to conclude that insulin is probably a primary regulator of FFA mobilization. Whether or not insulin is the sole regulator, however, is still open to question. Changes in insulin secretion apparently do not occur rapidly enough to account for the initiation of FFA mobilization in response to food deprivation (Figure 9). These data from a forthcoming publication by Schimmel and Knobil (15) indicate that concentrations of FFA in rat plasma are increased by more than twofold in the first few hours after fasting. During this same period, however, no change in the concentration of immunoreactive insulin was detectable, suggesting that something other than a fall in insulin concentration might initiate FFA mobilization. No firm conclusions can yet be reached, however, since recent findings by Trueheart and Herrera (16) suggest that the sensitivity of adipose tissue to insulin is not constant but diminishes during fasting.



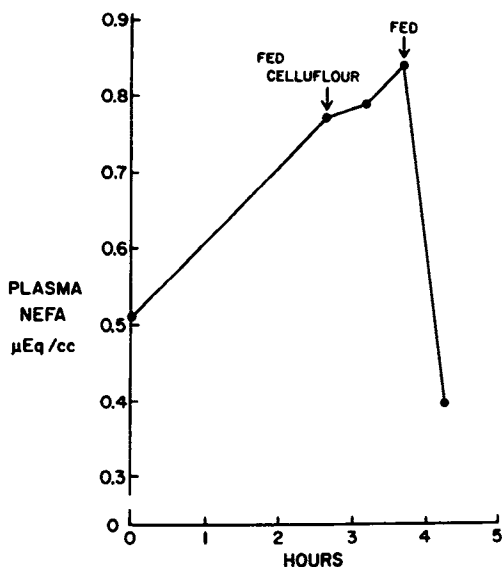


Fig.8. Contrasting effects of caloric and noncaloric "meals" in a normal monkey fasted 16 hours prior to zero time.

As mentioned earlier, a variety of pituitary hormones have lipolytic effects. Many studies have suggested that the pituitary may play a regulatory role in lipid mobilization. Growth hormone, in particular, consistently increases circulating levels of FFA several hours after administration in vivo and in some circumstances may be a factor in the conversion from carbohydrate to fat consumption. It is unlikely, however, that growth hormone is responsible for the increase in fat mobilization during fasting. Direct measurements of growth hormone in blood during fasting have not shown a consistent increase. Furthermore, hypophysectomy does not prevent FFA mobilization in response to fasting (Figure 10). Although fatty acid levels are somewhat lower in fasting hypophysectomized than normal rats, it is clear that the response to fasting nevertheless was present. Differences in the magnitude of the response probably reflect the absence of the modulating effects of adrenal and thyroid hormones secondary to the deficiency of ACTH and TSH.

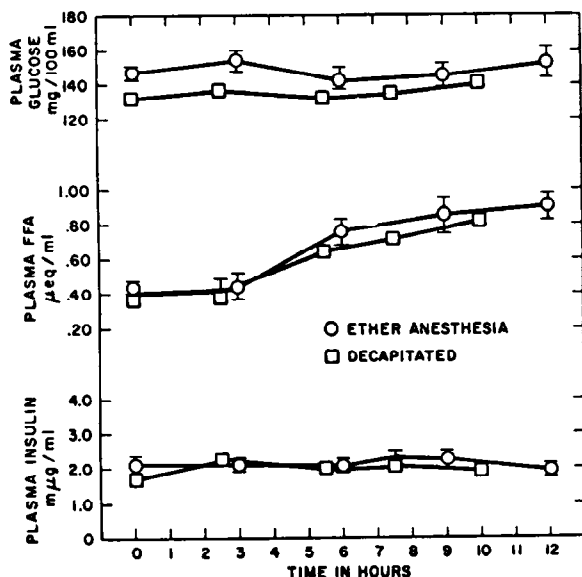


Fig.9. Concentrations of glucose, FFA and insulin in plasma of 150-180 g rats sacrificed by decapitation or exsanguinated under ether anesthesia at various times after food was removed from the cages. Each point represents the mean value obtained in 6 rats. The standard errors are indicated.

We have already seen that catecholamines increase lipolysis and that adipose tissue is innervated by sympathetic fibers. A wealth of evidence can be marshalled to support the hypothesis that the sympathetic nervous system is an important regulator of lipolysis. Adipose tissue contains measurable amounts of catecholamines (17) presumably sequestered in nerve endings. Electrical stimulation of nerves to fat increases FFA release (18). Pharmacological blockade of adrenergic receptors or sympathetic ganglia inhibits fat mobilization (19). Furthermore, denervation of retroperitoneal fat appears to inhibit fat mobilization in fasting rats (20, 21, 22). Such an experiment is illustrated in the next slide (Figure 11). The rats were studied 2 weeks after denervation of the left retroperitoneal fat body and were either allowed free access to food or fasted for 48 hours. The retroperitoneal fat was quantitatively excised and weighed. No consistent effects of denervation were discernible in the fat of fed rats. In rats fasted for 48 hours, however, the denervated fat was always heavier than the normally innervated contralateral depot. In agreement with earlier studies, denervation produced a highly significant diminution in fat mobilization. When compared to the fed controls, however, it is also clear that a large amount of fat was mobilized despite denervation. In fact, denervation reduced fat mobilization by only about 25%. Thus, if we may assume that all of the nerves to the fat depot were

cut, we must conclude that some nonneural stimulus was responsible for the major portion of the fat mobilized. In fact, since denervation prevents the increase in fat blood flow caused by fasting, we may legitimately question whether the observed diminution in fat mobilization in the denervated tissue was attributable to a deficiency of lipid-mobilizing stimuli, or to inadequate removal of FFA by the blood.

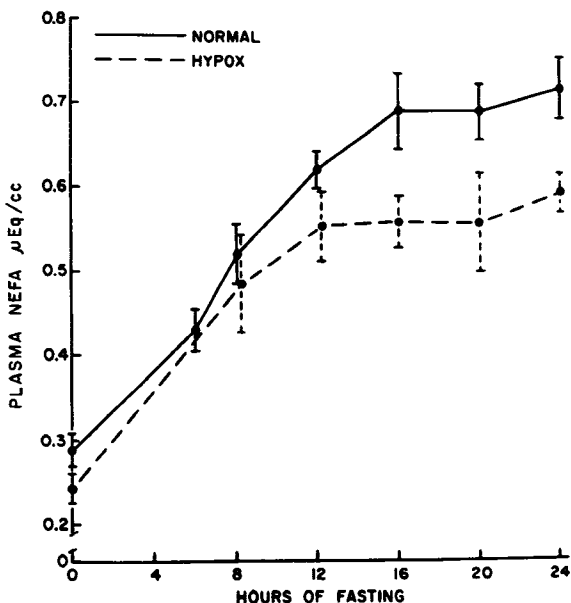


Fig.10. The response of normal and hypophysectomized rats to fasting. Each point represents the mean value obtained for at least 6 rats. The standard errors are indicated by the vertical brackets.

The importance of the sympathetic nervous system for fat mobilization in response to fasting in the rat may also be questioned on other grounds. In both in vivo and in vitro studies with rats, we have consistently failed to inhibit FFA production in response to fasting, even when massive doses of ganglionic or adrenergic blocking drugs were used. This is in contrast with findings in dogs (19). In addition, the increase in FFA production by the rat during fasting is not usually accompanied by an increase in glycerol production (23, and Goodman, unpublished), suggesting that fasting decreases reesterification, without necessarily increasing lipolysis. If sympathetic stimulation were involved to any significant degree, we would expect increased lipolysis and hence increased glycerol production.

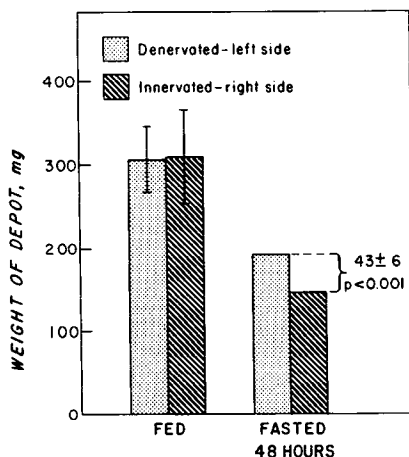


Fig.11. The effects of fasting and denervation on weight loss of retro-peritoneal fat. Each bar represents the mean of 8 observations. The difference in weight between innervated and denervated tissues in fasting rats as determined by paired analysis is indicated.

Although the role of the sympathetic nervous system in fat mobilization induced by fasting may be questioned, its importance in fat mobilization in a variety of emergency states seems firmly established (24). The manner in which catecholamine is delivered to fat cells in such states is unusual and worthy of comment. Histochemical studies of white adipose tissue by Wirsén (25) revealed that nerve endings containing catecholamines do not terminate on fat cells, but are limited in their distribution to the vascular elements of adipose tissue. Physiological experiments give indirect support to the idea that the fat cells are not directly innervated, since we could demonstrate no supersensitivity to catecholamines in denervated adipose tissue (22). Consequently, the increase in lipolysis which follows physiological or experimental nerve stimulation must result from diffusion of norepinephrine from nerve terminals on blood vessels to nearby adipose cells. The physiological value of this arrangement is not apparent. On the contrary, it would seem to interfere with both the sensitivity and the specificity of the fat mobilizing response. Indeed, it appears that any signal that increases sympathetic tone also increases fat mobilization, even sympathetic adjustments to postural change (26).

Characteristic of important regulatory systems, there is a redundancy of mechanisms to control fat mobilization. Stimulatory influences may originate from the pituitary, the adrenal medulla, or the sympathetic nervous system. Inhibitory influences come primarily from the beta cells of the pancreas. Physiological roles for glucagon or the prostaglandins have not been established. Redundancy of regulatory mechanisms provides the potential for compensatory change to overcome experimental

manipulations. Consequently, it is difficult, and perhaps even fruitless to determine which system is primarily important in any given situation. Species differences add further complications. If any generalizations can be made, however, it seems reasonable to conclude that the secretions of the pituitary and its satellites and the decline of effective levels of insulin in the blood are important for slowly developing or sustained fat mobilization, such as occurs in fasting or acclimatization. Rapid increases in fat mobilization such as occurs in exercise or emergency states, are probably in the province of the sympatho-adrenal system.

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## PHYSIOLOGISTS VIEW PHYSIOLOGICAL TEACHING

An account of peer evaluations of videotapes  
and films for physiological teaching

L. M. N. BACH

The fall meetings of the American Physiological Society at Davis, California provided an opportunity to secure evaluations of a number of teaching tapes and films by attending physiologists. The following account describes a pilot experiment by the Subcommittee concerned with these media.

### Materials and Methods

Of the several tapes listed previously (1), only seven were actually available or suitable for the experiment; one additional tape, both suitable and available, gave a total of eight used for this study. Five films from the collection previously described (1) were also secured for viewing. The film ran perhaps twenty to thirty minutes each and were used in their entirety. Most of the tapes ran an hour each; a preliminary editing procedure selected about ten minutes of each tape representing the best or most typical sequence in each case. Each ten minute sequence was then separately retaped. The televised material available for final use consisted of "fourth generation" copies with varying degrees of flawed viewing quality.

The University of California, Davis has a dial access system by which viewers call a central station from remote monitor locations around campus to request a specific tape. Monitoring areas were provided with a brief description for each tape as well as evaluation forms which viewers were requested to complete and leave for later collection.

Teaching films were shown at one afternoon session. Evaluation forms were provided to viewers who, in turn, provided informal discussion about each film after it was shown. This session lasted a good four hours. A final informal session was held on the last meeting day when the utility of tapes and films for teaching was discussed.

### Evaluation Procedure

Any viewer of television or films automatically qualifies as a critic but the features deserving evaluation are inevitably as numerous and varied as the viewers. Originally, we developed a monstrosously long and involved evaluation form designed to capture an opinion about each feature conceivable. To spare the reader, it is only necessary to say that this form, reduced to its essentials, considered four major categories: teaching value, learning effectiveness, scientific validity and production quality. We hoped that some medical student viewers would be available to render opinions on learning values since the meeting registrants were already learned; apparently medical students summer elsewhere.

A compact version was therefore constructed and distributed to viewers who were called on to rate the following characteristics of films and tapes:

1. Thoroughness of treatment
2. Accuracy of scientific content
3. Relevance to current understanding of topic
4. Agreement of content with title
5. Relationship between length and topic treated
6. Logical sequencing of presentation
7. Appropriateness of medium to delivery of topic
8. Technical quality as an audiovisual production
9. Demonstration of procedures and skills
10. Usefulness as an adjunct to other forms of instruction on the topic
11. Usefulness as a substitute for other forms of instruction on the topic
12. Ability of program to initiate problem-solving attitudes
13. Usefulness for examinations on the topic
14. Usefulness in (viewer's) physiology course

In view of the fact that ten-minute tape excerpts were employed after multiple copying, not all the criteria listed were entirely appropriate (e.g., Items 1, 5, 9, 14). Respondents were also requested to indicate the special field of their research and teaching responsibilities.

Titles and author-producers of tapes and films used in the study included the following:

#### A. Tapes

1. Cardiovascular responses. L. Yonce
2. Circulation in the batwing. L. D'Agrosa
3. Decerebrate cat. L. M. N. Bach
4. Decerebrate cat. R. Morse
5. Fibrillation in the heart. A. S. Harris
6.  $I^{131}$  uptake by the thyroid. P. Hyde
7. Myocardial contractility. J. F. Spann
8. Pancreatic secretion. R. Loizzi

#### B. Films

1. Nerve impulse propagation. R. Fitzhugh
2. Ovulation and egg transport. R. J. Blandau
3. Intracellular recording in the mammalian heart. T. C. West
4. Nerve conduction. E. B. Wright
5. Muscular contraction under the microscope. A. F. Huxley

### Results

We had results enough to please the most sanguine. With approximately 1000 registrants at the meeting, about 35 attended the film showings and 170 requests to view the eight available tapes were phoned in over a three day period. However this figure does not give an accurate

picture since we often spotted two or three simultaneous viewers at any one monitor (which counted as one request). On the other hand, an unknown number of curious resident non-registrants also dialled for these tapes.

The findings are presented in the following tables where each tape and film is rated for each category and overall. Ratings are not quantitative because of the relatively few evaluations for each tape or film. Figures cited are approximate means of scores given by evaluators; scores often varied widely for any one category. Whether the vector of evaluator expertise is significantly represented in the scoring is left to the reader's prejudices; a comparison of expert and non-expert ratings is provided in Table 3.

The ratings correspond to: 1 = excellent, 2 = good, 3 = adequate, 4 = poor, 5 = no opinion.

Detailed descriptions and commentaries of each tape and film are provided in the Appendices A and B. Also included in Appendix C is a new listing of films which can be collated with listings published previously (1) for information of readers. These films have not been reviewed or evaluated.

#### Effect of Expertise on Evaluation

Respondents were asked to indicate their special research and teaching interests. In the case of two films and three tapes, the number and proportion of respondents expert in the field were sufficient to permit an interesting comparison. Although the comparisons hold consistently through all criteria evaluated, only the average overall ratings are presented in Table 3.

Tables 1, 2 and 3 follow.



TABLE 1

## VIDEOTAPE EVALUATIONS

TAPE	Cardio-vascular (Yonce)	Batwing (D-Agrose)	Decerebrate cat (Bach) (Morse)	Fibril- lation (Harris)	T131 (Hyde)	Cardiac Contract (Spahn)	Pancre- atic (Loizzzi)	TOTAL
No. of requests to view	23	21	24	18	20	15	20	170
Evaluation forms returned	10	8	11	7	6	8	7	71
Respondent has teaching or research interest	9	5	5	3	1	1	3	
EVALUATION RATINGS: 1 = superior; 2 = good; 3 = adequate; 4 = poor; 5 = no opinion								
APPROXIMATE MEAN RATINGS								
Thoroughness	2	3	2	2	2	4	1	2
Accuracy	2	3	2	2	2	2	1	2
Relevance	2	2	2	2	2	3	1	2
Content and title	2	2	1	2	2	2	1	2
Logical sequence	1	3	2	1	2	3	1	2
Medium approp. for topic	2	2	2	2	1	4	1	3
Technical quality	3	4	3	2	1	2	1	3

Skills and procedures	3	3	3	3	3	1	3	3	3	3	
Adjunct to instruction	2	3	1	2		1	3	2		3	
Substitute for instruction	2	3	4	4		2	3	2		4	
Problem-solving	2	4	4	3		3	4	2		4	
Utility for examination	2	4	3	2		2	3	3		4	
Use in viewer's course	2	4	2	2		2	4	1		4	
OVERALL RATING	2	3	2	2		2	3	1		3	

TABLE 2

FILM EVALUATIONS					
FILM	Nerve Prop. (Fitzhugh)	Ovul. Egg Transport (Blandau)	Cardiac Intracell. (West)	Nerve Conduct. (Wright)	Muscle Contract. (Huxley)
Evaluation* forms returned	12	8	8	7	4
Respondent has teaching or research interest	5	1	7	3	2
EVALUATION RATINGS: 1 = superior; 2 = good; 3 = adequate; 4 = poor; 5 = no opinion					
APPROXIMATE MEAN RATINGS					
Thoroughness	3	1	1	4	3
Accuracy	3	1	1	3	1
Relevance	2	2	1	4	1
Content and Title	2	1	1	2	1
Length and Topic	4	2	1	3	2
Logical Sequence	2	1	1	3	2
Medium approp. for topic	2	1	1	3	1
Technical quality	3	1	1	2	2

Skills and Procedures	4	4	4	1	3	2
Adjunct to instruction	2		2	1	3	1
Substitute for instruction	4		2	1	4	3
Problem-solving	4		3	1	4	3
Utility for examination	4		4	3	4	4
Use in viewer's course	4		2	1	4	3
OVERALL RATING	3		2	1	3	2

\* Films were shown in order from left to right. Reduction in number of forms received may reflect a long afternoon's dwindling audience rather than lack of interest.

TABLE 3  
EXPERT AND NON-EXPERT EVALUATIONS

Author	Fitzhugh-Film		Wright-Film		Bach-Tape		Spann-Tape		D'Agrosa-Tape	
	Non-Expert	Expert	Non-Expert	Expert	Non-Expert	Expert	Non-Expert	Expert	Non-Expert	Expert
No.	12	5	7	3	11	5	14	6	8	5
Overall Rating	3	4	3	4	2	3	1	2	3	4

It is clear that experts in each field consistently rate tapes and films one grade lower than physiologists who neither teach nor do research in the special field. These findings suggest that expert opinions should be employed in judging the adequacy and utility of tapes and films for teaching.

### Discussion

The present study employs the convenience of tapes and films to secure evaluations of physiological teaching by physiologists. Excellent teaching and superb learning experiences emerge rarely but with such elegance that they neither invite nor require the analytical application of criteria. Films and tapes of this quality produce all the familiar signs of viewer pleasure and approval, leaving little doubt about their universal acceptance.

Inadequate teaching and marginal learning experiences both demand and need analysis if they are ever to improve. Poorly rated films and tapes provoke a variety of criticisms and generate many suggestions for future improvement. By extension, excellent teaching programs are rarely threatened by limitations in instructional resources (time, patience of students, qualified personnel, physical resources, etc.) but weak and ineffective programs are likely to be analyzed out of existence. Teaching physiologists are well aware of the need to take prompt and positive steps to achieve instructional criterion lest the discipline crumble from view.

Since teaching, whether live, taped or filmed, is an act of personal creativity, it is inevitable that personal factors such as knowledge, skill, experience, imagination, passion and personality enter into any performance in varying degrees. However, it is beyond the scope of this communication to pursue these elements except by occasional inference.

It is instructive to compare briefly some tapes and films rated "excellent" and "poor." It is clear from viewer responses that the film by West on cardiac intracellular recording and the tape by Spann on myocardial contractility represent excellent teaching exercises. Dr. West, who also produced the Spann tape, commented in discussion that he saw Dr. Spann performing this experiment, decided on the spot that this would make an excellent instructional tape, set up his equipment and recorded the whole procedure, editing and adding narrative afterwards. He certainly did not plan any deliberate satisfaction of specific criteria beforehand but depended upon many of the personal attributes described above, together with some combination of experience and instinct to produce an outstanding contribution. One might argue similarly for the films produced by Wright and by Fitzhugh except that they turned up at the opposite end of the rating scale. In the last two cases, these authors or others, knowing now what aspects are unsatisfactory, can prepare new and improved tapes or films serving more effectively certain specific instructional aims.

It is for these reasons that the tabulated ratings for specific criteria, of little interest to the casual reader, bespeak attention to the purposes served and effectiveness of films and tapes employed for teaching. Such ratings, in a primitive way, can assist would-be producers and viewers to anticipate superior satisfaction of the elements of teaching programs important for their instructional goals.

Experience will eventually reveal whether the criteria employed in

this study are necessary and sufficient determinants of teaching and learning value. One useful categorization of teaching-learning goals includes:

1. Presentation of information (Observations made, data generated and collected).
2. Opportunity for problem sensing (Observations questioned; problems posed).
3. Problem formulation (Hypotheses set forth).
4. Search for information initiated (Tests designed; experiments conducted).
5. Skills and technics taught (Measurements made; comparisons drawn).
6. Problems resolved (Data analyzed, evaluated).
7. Understanding generated (Stimulated to apply knowledge to new situation; recognize new problems).
8. Attitudes created (Interest, curiosity aroused; objectivity, responsibility generated).
9. Appreciation enhanced (Confidence, satisfaction, desire created).

Several, but not all of these features, are subsumed in the criteria utilized in this study. It is important that the goal of any teaching exercise be defined as specifically as possible. One or more of these criteria can be used for this purpose. The most significant consequence is that student and instructor can come to grips successfully with two difficult instructional problems: 1) What is the student responsible for? and 2) How can his acquisition of this responsibility be most effectively evaluated? By building criteria such as these into an instructional program, whether live, taped or filmed performance measured by such parameters can be more readily acquired and evaluated.

### Specific Criteria

1. **Thoroughness.** This concerns both comprehensiveness and depth. Much depends upon the degree to which a single concept is presented. If too repetitive or detailed a coverage is attempted or information about too many items is otherwise imparted, limitations on tape length and student attentiveness will combine to defeat the effort. On the other hand, too limited a treatment will also compromise the effectiveness of the presentation. For example, viewers commented upon the lack of thoroughness in the tape on the batwing circulation where a lot of information on microcirculation was available but was not dispensed in the narration. Lack of comprehensive coverage was also severely criticized in the tape on  $I^{131}$  uptake as was the superficiality of treatment in the two films on the nerve impulse.

2. Accuracy refers to the presentation of correct information. This aspect was rarely criticized in any of the tapes or films, although low ratings were assigned again to both films on nerve conduction and to the tape on batwing circulation. These findings suggest that the physiologists making tapes and films are ordinarily well-informed and that the material is not misrepresented.

3. Relevance to current understanding attempts to measure contemporaneity; how well up on the current literature is the author? The data suggests that most of the tapes and films reviewed are quite contemporaneous except for the Wright film on nerve conduction. This was made some years ago and is a topic area subject to intense flux of theory. This and the Fitzhugh film were both criticized on the grounds of teaching irrelevance, however.

4. Agreement of content with title suggests the degree of adherence to a well-organized and logical plan of concept development. All tapes and films were well-rated in this regard and none were criticized. It can be assumed that, unlike books, tapes and films can be fairly judged by their titles.

5. Relationship between length and topic considers the efficiency of the production; is information imparted efficiently? This feature could not be adequately judged and was not included for the tapes which has been excerpted. Nevertheless some useful comments were offered; one viewer felt that the  $I^{131}$  uptake tape could have been covered in one paragraph of written material with a single illustration. Others viewed the pancreatic secretion tape as intrinsically paced too slowly (except when secretin was acting); one viewer said, "too little happened per unit time." Both films dealing with nerve conduction were again low-rated but several others were also criticized specifically for being too slowly paced, too long in general or for taking too long for an incidental procedure.

6. Logical sequence reiterates item 4 to a large extent; there were no comments offered on this aspect. Most of the ratings for this criterion were similar to those listed for content-title relationship.

7. Appropriateness of medium to delivery of topic. This was generally well-rated and almost never criticized specifically. One exception was the tape on  $I^{131}$  uptake (vide supra). The nerve conduction film by Fitzhugh was criticized for the converse reason that it did not include oscilloscope tracings.

8. Technical quality refers both to television production quality and the quality of the technical procedures used in demonstrations. In some instances this was considered superb, as with the tapes by Harris and Spann and the film by West. In most instances the technical quality did not distract from learning effectiveness and more often contributed to it. Where quality was rated poor in the batwing circulation and pancreatic secretion tapes, this was largely the regrettable effect of multiple copying since the originals were of high viewing quality. The poor ratings assigned the films by Fitzhugh and Wright on nerve conduction undoubtedly arose from discontent with the animation procedures. For all

of their expostulations about theoretical models, teaching physiologists are still by and large intensely practical scientists and resist substitution by models for a real, live experimental preparation.

9. Demonstration of procedures and skills has been the most common use to which tapes and films have been put for physiological teaching. However, none of the films or tapes used in this study were intended for this purpose and techniques were generally minimized in favor of experimental results. Although the original complete tapes frequently contained much in the way of procedure, these features were deliberately edited out for the excerpted versions and this item was excluded in the evaluation analysis. Two films which were rated poorly in this category included the Fitzhugh nerve conduction and the Blandau ovulation presentations, neither of which contained any material on procedure. Perhaps disappointed viewers wanted or expected inclusion of technics in these two cases.

10. Usefulness as an adjunct to other instructional procedures received considerable attention from viewers and discussants since this concerns the use of these media in a larger teaching context. Most films and tapes were well-rated in this category, films being somewhat more highly regarded than tapes. Taken in conjunction with reactions to the next category (11, vide infra), it appears that tapes and films are commonly thought of as additions to an already crowded schedule rather than as replacements for other instructional methods. Some opinions were expressed about specific adjunctive use, such as the complementarity of the Fitzhugh film on nerve conduction to oscillographic recordings or as a means of visualizing a mathematically defined process.

11. Usefulness as a substitute for other instructional methods is a criterion which is certain to provoke intensive reactions. It is a rare instructor who would consider abdicating any part of his personal teaching responsibilities to an artificial medium, especially when this features a physiologist from another reservation. One discussant felt that substituting a tape such as Yonce's for the classical cardiovascular experiment performed in every physiology course would "damage the prestige of the local instructor." Another complaint expressed was that substitution by films or videotapes for real experiments conducted by live instructors would be one more step toward complete "dehumanization of teaching", a trend bitterly resented by students. It is worth noting that reviewers varied in their ratings of films and tapes as substitutes for other teaching methods; the West film was highly regarded in this respect whereas both decerebrate cat tapes were considered poor choices for this purpose.

Discussion brought forth the common question, "what can videotapes provide uniquely that conventional instructional methods do not accomplish as well or better?" Extreme views expressed by some discussants, but heatedly disputed by most participants, were that videotapes could eventually substitute for all textbooks and lectures. Perhaps a more reasonable consideration is that use of these media must be highly individualized according to the instructional purposes best served in the



opinion of the teacher and his students. In many ways, employment of videotape resembles computer use. The unique function served by videotapes may be for those instances when the material must be repeated for several small groups, when it is "classical" (i. e., completely descriptive and rather routine) or when it is quite complex, specialized and time-consuming to set up and conduct.

Many medical schools have organized "core"-elective curricula in which the core represents basic concepts needed by every medical student. It is quite likely that videotape instruction will find its best place in core instruction where repetitive or mass teaching of experimental "classics" (such as the routine cardiovascular experiment with the dog or the decerebrate cat experiment) can no longer be conducted effectively through direct personal experimentation. Ideally, in these programs, the elective coursework, involving small student groups working intensively in special interest areas, can deploy instructors to provide the immediate personalized teacher-student contact which is rapidly becoming less effective in large traditional laboratory classes. These opportunities would enhance the personal contributions each instructor can make to the learning experience of one small group of students through individualized laboratory experiments and tutorials. Appropriate videotape programming for core teaching combined with personal contacts through elective work would reduce the "dehumanization" element and would enhance the "prestige" of the instructor.

Discussion brought out specific examples illustrating some of these possibilities. For example, the film by West was particularly well rated as a substitute for other teaching methods. One discussant stated that he would forego a class demonstration on intracellular cardiac recording, which was being planned, in favor of using this film. Another discussant, who already performed this same demonstration for the class, stated that the film would necessarily and effectively substitute if classes get any larger. The Huxley film, rated as an excellent adjunct for teaching (but not so highly as a substitute) attracted many discussants and evaluators because of its directness and simplicity; viewers were told exactly what to expect and were shown specifically what had been described. The absence of theoretical explanations was much appreciated by some viewers (perhaps because they could indulge in these when using the film as a teaching adjunct).

The tapes by Harris on cardiac fibrillation and the decerebrate cat by Bach were highly rated as adjuncts to teaching by most reviewers. The fibrillation tape represents a clear-cut demonstration of a rather limited effect which few teachers would want to take the time to show repeatedly to small groups of students. The decerebrate cat experiments represent work traditionally handled primarily by neurophysiologists and otherwise too involved to manage effectively with large classes of students. However, it is very important to appreciate the need for direct and personal sensorimotor experience by students in this case since many wish to feel for themselves the changes in muscle tone. However, this could easily be managed by providing preparations for class "feeling" along with the videotaped sequence.

The tape on pancreatic secretion by Loizzi was felt by several to be not intrinsically compelling since all of the data could be obtained from a textbook much more easily. The demonstration seemed satisfactory as far as it went but had little value pedagogically. This tape was rated "poor" as a substitute and "adequate" as an adjunct, suggesting that the whole exercise, no matter how well done, would not add much to teaching programs.

**12. Problem-solving attitudes.** This concerns contributing factors which enhance the ability of students to develop hypotheses and attempt their proof. Practically all of the tapes and films were low-rated in this category and no comments were offered, in any case. Only the film on intracellular cardiac recording was rated excellent; the tapes on myocardial contractility and cardiovascular responses were considered good for this purpose. In these instances, much factual information was presented and the problem-sensing aspects were pronounced. Problem-solving is a frequently enunciated goal and quality of physiological teaching and reasoning. Its natural habitat is within the laboratory experiments and demonstrations. These teaching exercises frequently lose effectiveness in this regard because problem-solving is neither identified nor implemented often enough or with sufficient explicitness. Certainly, if these films and tapes are any criterion, problem-solving experiences in physiological teaching are honored only in the breach.

**13. Utility for examination.** It is revealing that this crucial parameter of teaching and learning effectiveness is almost totally inapplicable to tapes and films. None of these were rated excellent in this regard and only the tapes by Harris, Morse and Yonce were considered "good" for the purpose. The central problem, as always, is to convert exhortation by the teacher into responsibility by the student. A simple but Draconian rule might be "don't use it if the student can't." Perhaps the lack of reaction to this parameter of teaching and learning reflects the prevailing uncertainty about the "Core principles" for which students must be responsible since the composition of a core course in physiology has not yet been clearly enunciated or generally accepted. The absence of information about this criterion is therefore probably not unique to this study but simply illustrates how the characteristics of physiological teaching can often be faithfully reflected in teaching tapes and films.

**14. Utility in the viewer's physiology course.** This is perhaps the acid test of value of tapes and films. The tape by Spann and the film by West were desired by most viewers for their teaching; somewhat less passion was expressed by evaluators for the film by Blandau and the tapes by Harris and by Bach and Morse. In general these seem to be desirable alternatives to reviewers than attempting the procedures themselves. Otherwise reluctance towards employing these materials suggests that physiologists can and will continue to present certain subjects themselves or that certain subject areas are not appropriate for their teaching programs, whatever the medium.

## SUMMARY AND CONCLUSIONS

1. There is wide interest among physiologists about the availability

and use of teaching tapes and films. The physiology department of one newly-authorized large medical school plans to "go all the way" with teaching videotapes. Another developing medical school has inquired about the possibility of a whole library of tapes and films through which all of their physiology would be taught.

2. Whatever use is made of tapes and films for instructional purposes, criteria must be developed, tested and standardized to insure the highest levels of a) teaching value, b) learning effectiveness, c) scientific validity and d) production quality.

3. It seems apparent that evaluation of productions for physiological teaching can be made most realistically by physiologists with teaching or research experience in the relevant field.

4. The criteria employed in this study can be divided into two major groups: a) content and b) application.

a) Content includes such measures as thoroughness, accuracy, relevance, content and title, topic and length, logical organization, appropriateness of medium, technical quality and demonstration of skills and procedures. In general these elements did not cause much concern to evaluators in this study although some special comments are indicated.

1. Some productions may be too superficial for the level of learning required for medical and graduate teaching.

2. There are occasional instances of inefficiency in transferring information because the pace is too slow or because of unnecessary redundancies.

3. Sometimes the medium is not exploited completely by neglecting to incorporate tracings and recordings, for example.

4. The viewing quality can be seriously degraded if more than first or second tape generations are used.

5. There is a distinct interest in and need for tapes and films concerned with concepts in contrast to those which instruct about skills and procedures.

b) Application includes such measures as usefulness: as an adjunct to teaching, as a substitute for certain phases of teaching, as a problem-solving experience, as a source of examination questions, and for the viewer's own course. In contrast to the limited attention given "content-criteria", most evaluators and discussants focussed their concerns upon "application-criteria."

1. Although favorable consideration was often given to employment of suitable tapes and films as adjuncts, less thought was given to how and where these would be crowded into existing tight schedules without displacing some less important exercise. Use of such adjuncts

requires careful planning and close correlation with other aspects of the instructional program if they are to be effective.

2. Tapes and films could be effectively developed and used for "core" teaching programs, particularly where the material is descriptive, necessary for large classes, or too complex or difficult to manage as a class experiment or demonstration. Provision must be made for appropriate sensori-motor experiences (feeling muscle tone, e.g.). Combined with elective learning experiences, there could be real opportunities for highly personalized teacher-student relationships through restructuring of assigned teaching responsibilities.

3. Problem-solving opportunities afforded by tapes and films appear very limited but this may apply to physiological teaching generally, rather than to the media specifically. The unique contribution afforded by experimental physiology in promoting problem-solving experiences may not be exploited as effectively as physiologists fondly believe.

4. Usefulness as a source of examination questions seems to be a poorly rated function of tapes and films. However this problem relates to the general need to specify more exactly what physiological learning students are responsible for, whatever the medium. The means by which their acquisition of this responsibility can be effectively measured also remains in an unsatisfactory state.

5. Physiologists appear willing to use tapes and films in their own course: a) if experimental rather than theoretical material is presented (perhaps so that they might indulge in teaching theory themselves); b) if the experimental procedure is too complex, tedious or uncertain for them to undertake personally; c) if the material is really worth presenting and they wish to provide teaching in this area, and; d) if they do not actually want to carry out the instructional exercise personally.

6. Tape and film productions can make clear the distinctions between excellent and marginal teaching. Many of the personal factors important for superb teaching are not identifiable through the criteria employed in this study. However these criteria can be applied to produce adequate instruction or for the purpose of upgrading inadequate teaching. While their application may never produce superb teaching, these criteria can help to provide specifications for instructional aims. If these are incorporated in the teaching program to clarify student responsibilities for learning, then efficiency of teaching and learning and the evaluation of student performance can be enhanced in physiological instruction.

7. Lack of resources compels an end to further active work on the part of the Subcommittee at this time. Perhaps the proposed Office of Research in Education of the Society will undertake further studies in this area.

## APPENDIX A

Descriptions, commentaries and specific ratings for videotapes

Titles and brief descriptions of evaluated tapes follow. Overall ratings are indicated in parentheses and are derived from Table 1. Commentaries (in quotes by reviewers, without quotes by the author) and unusually high or low ratings are grouped for each tape in accord with the relevant criteria indicated in Table 1.

Tapes containing seven of the excerpts (no. 7 is not included) are available through the Network for Continuing Medical Education or from the author of this paper at cost. However the excerpts are generally of lower viewing quality than the originals because of multiple copying. Interested readers may directly contact the respective author-producers about availability of the original complete tapes.

A word of special gratitude is due the author-producers who so generously loaned their material for critical peer evaluation.

## 1. "Cardiovascular Responses"

Dr. L. Yonce, University of North Carolina

This is a nine minute excerpt from a tape which ran originally for 55 minutes. Material deleted includes description of instrumentation for recording, surgery and attachment of instrumentation, effects of certain drugs. This excerpt shows the effects on the EKG, heart rate and blood pressure and pressure waves of vagal stimulation and section before and after administration of epinephrine with discussion of effects and processes (2).

Logical sequencing was rated very high (1) by most viewers. Usefulness in viewer's physiology course. "Medical and paramedical people can equally gain from this as a cause-effect subject presentation."

The material presented on this tape represents an excellent example of "core" physiology favored in many curricula and exemplifies the most practical application of videotape for teaching this type of physiology.

## 2. "Circulation in the Batwing"

Dr. L. D'Agrosa, St. Louis University

This is a seven minute excerpt of a tape running about 20 minutes originally. It shows the technic employed in mounting the batwing and provides occasional verbal description of various types of blood vessels and shunts visible microscopically (3).

This tape was rated poor (4) by most viewers as a problem-solving presentation although the material lends itself well for this purpose. Its usefulness as a substitute for other instructional methods was regarded as "inferior to (sic) students viewing actual experiment." However

medical students who previously viewed this material stated that it did satisfy their needs; personal viewing through a microscope would not have added significantly. The tape was also rated by most viewers as a poor (4) source of examination material and poor as well for use in courses offered by most viewers. The technical quality of this tape was also rated poor and was considered "better than a read paper but not as good as a color movie"; "16 mm color much better in 1948 film of Nichol and Webb"; "poor in all categories." The original of this tape was of high viewing quality which was regrettably degraded in multiple copying. However, the overall teaching quality of this tape seemed badly compromised by lack of narration.

### 3. "Decerebrate Cat"

Dr. L. M. N. Bach, Tulane University

This is a nine minute excerpt of a tape running 90 minutes originally. We have deleted illustrated lecture on muscle tone, relevant anatomy of the brainstem and cranial nerves, surgical procedures and much of the demonstration on spinal reflex activity. The excerpt shows muscle tone and limb reflexes, head position on limb tone, reciprocal inhibition, the crossed extensor reflex and recruitment (2).

Thoroughness. "Comparison with normal would be helpful"; A fuller demonstration of Sherringtonian properties of temporal and spatial facilitation and inhibition would be desirable."

The relationship of content to title was highly rated (1) for this tape as was its utility as an adjunct to other instructional methods. However, most viewers considered it poorly (4) as a substitute for other instruction nor did it lend itself well to problem-solving exercises.

### 4. "Decerebrate Cat"

Dr. R. Morse, Medical College of Georgia

This is a ten minute excerpt of a one hour tape. The excerpt demonstrates cranial nerve reflexes retained in the decerebrate preparation, resistance to passive movement, patellar reflex. Material deleted includes demonstration of righting and reflex reactions in normal cat, reflexes in decerebrate cat and films on the spinal preparation (chronic) and human clinical material. This tape differs from No. 3 by considering different material presented in a different style (2).

Thoroughness. "A fuller demonstration of Sherringtonian reflex properties would be desirable." Accuracy. "Jaw reflex was not a real reflex." The logical sequencing in this tape was rated highly (1) by most viewers. However its suitability as a substitute for other instruction was rated poor (4). "Demonstration of hypertonia and hyperreflexia better demonstrated if student manipulates the preparation."

This last comment and rating is applicable to both tapes on the decerebrate cat. This view was well exemplified by the comment of

students who reviewed Tape No. 3, stating: "I would rather feel the tone and resistance to passive movement myself." The unqualified sensori-motor experience encountered by students with animal preparations and through patient contacts is an important but largely unknown element in learning.

#### 5. "Fibrillation in the Heart"

Dr. A. S. Harris, Louisiana State University

This is a ten minute excerpt of a tape which originally ran for 41 minutes. The tape features excellent video of the heart, the superficial anatomical features are described, direct stimulation of the heart and vagal stimulation are employed to demonstrate changes in rate and AV ratios (2).

Thoroughness. "Adequate oxygenation of myocardium prior to defibrillation is important and is not mentioned in this (tape)." Most viewers rated the appropriateness of the medium excellent (1) for this topic and gave a similar rating insofar as demonstration of skills and procedures is concerned; however, "Must drape animals and wear proper protective clothes (gloves) to prevent (animal to human) infections." Most viewers also rated this tape as an excellent adjunct to other instruction (1) and equally applauded the technical quality of the tape (1), although "Color would improve tremendously."

The video quality of this tape is unusually good and the visual attractiveness of a beating, quivering heart is always compelling.

#### 6. "<sup>131</sup>I Uptake by the Thyroid"

Dr. P. Hyde, Dept. of Biochemistry, Louisiana State Univ.

This is a six minute excerpt of a tape which ran originally for 30 minutes.

The excerpt demonstrates uptake and mixing of isotope in various structures and regions of the body over a 48 period and shows the final concentration in the thyroid with a body counter (3).

Thoroughness. "Not enough introduction". Length and topic. "Material could have been more efficiently presented in one written paragraph, perhaps with one illustration". Suitability of the medium and problem-solving aspect of the topic were each rated poor (4) by most viewers. Usefulness as a substitute for other instruction. "Not at all comparable to actual demonstration which should not be difficult to carry out". Utility for (viewer's) course was scored poor (4) by most raters.

This tape may well represent a common class of demonstrations which have little educational value.

#### 7. "Myocardial Contractility"

Dr. J. F. Spann, University of California, Davis

Presents an eleven minute demonstration of cardiac muscle mechanics, using both pre-load and after-load techniques in the isolated papillary muscle of the cat. Demonstrates clearly the distinction between isotonic and isometric contraction in cardiac muscle. Shows the change in contractility which occurs in response to a catecholamine, norepinephrine. Demonstrates the change in contractility induced by paired pulse stimulation and by the related phenomenon of extrasystolic contraction. Illustrates the induction of automaticity resulting from the action of norepinephrine (1).

This tape was easily the most highly regarded of the collection reviewed. For thoroughness, ("Would have liked an earlier start of heart (sic) and/or heart beating in situ."), most viewers rated this excellent (1) as they did for accuracy, relevance, content and title, logical sequencing, appropriateness of media, technical quality as well as utility for (viewer's) own course. "Excellent teaching film"; "Superb"; "Excellent quality"; "Best taped or film presentation on this topic that I've seen."

Viewers find in this tape a high degree of satisfaction for most teaching and learning qualities sought through this medium.

#### 8. "Pancreatic Secretion"

Dr. R. Loizzi, University of Illinois

This is an eight minute excerpt of a tape running 58 minutes originally. We have deleted sections dealing with surgical procedures performed by Dr. Ingraham in which the pancreatic duct is catheterized and technical procedures of measurement are described. This excerpt shows the effects upon rate of secretion and alterations in density (solids content) as a result of HCl and secretin administration. Sections dealing with effects of parasympathetic drugs and the summary discussion have been deleted (3).

Length and Topic. "Too little happened per unit time." Most viewers regarded this tape as poor (4) for problem-solving purposes, as a substitute for other instruction, as a source of examination of students and for use in the viewer's own course; "Doubt that this would hold the interest of average student too long"; "Doesn't add any much needed excitement to the classroom presentation of this subject." The technical quality drew comments such as, "Hard to see drop-recording", "Couldn't see records", "technically, far too poor"; "Major problem to produce a tape of film superior to that prepared by Prof. Gregory on pancreatic secretion and distributed by Imperial Chemical Industries."

Gastrointestinal physiology has never been a swiftly-paced laboratory topic which enthalls many students or instructors. This tape, prepared adequately in other respects, perhaps illustrates this deficit too well.



## APPENDIX B

Descriptions, commentaries and specific ratings for films

Although comments were few, films with low ratings attracted the greatest volume.

1. "Nerve impulse propagation." Dr. R. Fitzhugh, NINDB (Ref. 2). The classical phenomena of excitation and impulse propagation in a nerve fiber are presented in the form of two curves plotted against distance, membrane potential and a recovery variable. The two computer animated curves, seen in motion, help one to visualize the changing state of an excitable membrane(3). (Available from the National Medical Audiovisual Center, Atlanta).

Thoroughness. "Very elementary"; "Too immature"; "Too oversimplified for advanced students"; "Needs more discussion of ion movement and more explanation of equations"; "Insufficient discussion of ionic events, membrane properties, events underlying recovery, etc." Accuracy. "Not completely correct." Relevance to current understanding. "Nothing useful to incorporate in teaching"; "Double impulse formation is confusing"; "Formalized treatment and 'V' and 'R' waves are one-sided and artificial." Length relative to content was rated poor by most viewers (4) and a comment was offered that it was "Too slow paced." Appropriateness of medium was considered "Too restricted" and the question was asked "Why not use actual oscilloscope trace?" Most viewers rated poor (4) this tape's relevance to problem solving, skills and procedures, substitute for other instruction and source of examining students. Usefulness as an adjunct to other instruction was cited as "Perhaps example of mathematical visualization of some aspects"; "Best feature is spatial representation of moving impulse; complements oscilloscope picture at one point"; "Combine with live demonstration." Usefulness in (viewer's own) course was rated by most viewers as poor (4) and drew comments, "OK for simple introduction"; "Not suitable for teaching a real and rounded story to students"; "Unrealistic for any teaching"; "Film inadequate for teaching concepts of nerve impulse excitation and propagation." Technical quality was viewed as "Too many diagrams"; "Titles took up too much time compared with presentation."

2. "Ovulation and egg transport in the rat." R. J. Blandau, University of Washington.

The cycle of estrus in the rat is summarized by chart. The rat ovary is shown producing crops of follicles. A follicle rupture in animation prepares for cinemicroscopy of true rupture, observed with four different follicles. The importance of the egg mass within the follicle is demonstrated in relation to the duration of follicle emptying. Additional ovulations are filmed. In a number of ovulations, the supra-vitally-stained egg mass is traced into the fimbriated end of the fallopian tube; the funnelling action of the ciliated membrane is clearly visualized; egg transport outside and inside the oviduct is well observed. The fertilization of eggs by sperm is briefly shown. This excellent research film

makes excitingly clear the principal phenomena of ovulation and transport into the oviducts. Beautiful shots and excellent correlated animation demonstrate the anatomy and physiology of the process in lucid fashion(2), 16 minutes (Ref. 3). (Available from the University of Washington Audiovisual Center, Seattle).

Thoroughness was rated excellent (1) and cited, "Would be good if it discussed fertilization events in more detail." Accuracy and content-title relationship were also both rated excellent (1) but length-topic relationship was cited, "Could be much shorter"; "Could be shortened." Logical sequencing and appropriateness of the medium were both rated excellent by most viewers but was rated poor (4) as a demonstration of skills and procedures. Usefulness as an adjunct to other instruction, "Could be supplemented with experimental comments." Usefulness as a substitute for other instruction, "Probably too specialized for teaching at the elementary level in a physiology course at least as a substitute for other methods." Use in (viewer's) course considered "Very good film for teaching purposes"; "I could use this film, as is, in our courses" but the film was rated poor (4) by viewers as an examination source. Technical quality was rated excellent (1) by most viewers and drew the comments, "Very good"; "Good film; has dramatic impact; 'real life' appeal for students."

3. "Intracellular recording in the mammalian heart." Dr. T. C. West, Univ. of Washington and University of California, Davis. 21 minutes (Ref. 3). Designed to illustrate the recording of single cell electrical activity in the mammalian heart. Technics for preparation and use of glass capillary micro-electrodes are shown. Recordings from pacemaker cells in an isolated rabbit atrium are illustrated before and after administration of epinephrine and acetyl choline. The effect of quinidine on the atrial membrane potential is presented. Simultaneous records of membrane potential and muscle contraction in rabbit atrium are depicted. In situ recordings from the ventricles of an anesthetized dog are made during induced hypothermia and the progressive changes shown, including a sequence of ventricular fibrillation. This film has great teaching value and should be most welcome to all students of cardiac physiology and pharmacology (1). (Available from University of Washington Audiovisual Center, Seattle).

This film was rated excellent (1) in every category and was cited, "All categories excellent"; "This film is really excellent"; "Best as an adjunct to teaching."

4. "Nerve conduction." Dr. E. B. Wright, Jr., University of Florida.

This film describes the dissection of the lobster nerve preparation and then, in animation, depicts the ionic shifts associated with the nerve impulse, including the action of Calcium (3). (Available from Dr. A. B. Otis, Dept. of Physiology, University of Florida, Gainesville).

Thoroughness. "More of the straight forward direct phenomena would have been more valuable." "Incomplete. Need to emphasize that

role of  $\text{Ca}^{++}$  is not understood." "More electrical activity needed in addition to chemical (illustrations)"; rated poor (4) by most viewers. Accuracy of scientific content. " $\text{Ca}^{++}$  involvement not proven as indicated in film". "What I consider to be the severest criticism is that the potential changes were not adequately correlated with animation." Relevance to current understanding. "Rather dogmatic about basis of changes in membrane conductivity (calcium role);" rated poor (4) by most viewers. Most viewers also rated this film poor (4) on such features as problem-solving, use as a substitute for other teaching, source of examination material and use in the viewer's own course. Demonstration of procedures and skills. "The first part showing dissection and responses to stimulation were very good." Technical quality. "The second part on ionic mobility-excitation theory was not bad but the animation did not help clarity very much." "Excellent for holding interest." "Too much animation of  $\text{K}^+$ ,  $\text{Na}^+$ ,  $\text{Cl}^-$  movements; fewer 'balls' would have been desirable". "I thought the animation was very poor and did not portray the events well". "Animation is a little too much". "Frequently not clear, especially with bouncing balls."

5. "Muscular contraction under the microscope." Dr. A. F. Huxley, University College, London. Prof. Huxley presents a lecture demonstration in which he describes and explains the events shown during electrical stimulation of muscle fibers viewed in polarized light under the microscope (2). (Available from Yeshiva University Film Library, Bronx, N.Y.).

Thoroughness. "More historical perspective would have been interesting." Most viewers rated this film excellent (1) in such categories as accuracy, relevance, content-title relationship and appropriateness of the medium. In regard to length and topic, some comments were, "Too long; should be condensed"; "A little long." Usefulness as an adjunct to teaching was rated excellent by most (1) and drew these comments, "As a teaching tool in undergraduate course, film would best be shortened and more use of diagrams utilized." While the film was rated poor(4) by most as a source of examination questions, its usefulness in the viewer's course was cited, "This film is about right for graduate student, muscle seminar, etc." In technical quality, viewers stated, "Presents real experiment"; "Very good in that actual material was visualized."

## APPENDIX C

Physiological teaching films available from the Audiovisual Center, The University of Iowa, Iowa City, Iowa 52240. (Rental charges cited in parentheses).

1. The nerve impulse: use of the cathode ray oscilloscope in physiology. 19 minutes (\$4.00), U-5336. Reviews origin and principles of operation of the oscilloscope and suggests its unique advantages as a research tool in physiology in connection with detection and recording of nerve impulses in various experimental situations.

2. Respiratory gases and the determination of the respiratory

quotient. 19 minutes (\$4.00) U-4579. Replaces an afternoon of individual laboratory work done by students. Includes demonstrations of several instruments including the Haldane Gas Analyzer and shows a sample calculation which may be required of students. A descriptive booklet is also provided.

3. Van Slyke determination of blood gases. 15 minutes (\$2.00) U-5153. A demonstration of the analysis of the total carbon dioxide content and oxygen content of plasma and blood. Details of the method of obtaining total carbon dioxide content of plasma by vacuum extraction is shown by the Van Slyke volumetric method. The more accurate and more complicated manometric method is also described; the usefulness of knowing the carbon dioxide and oxygen content of blood and plasma is explained.

4. Kidney function: factors influencing the rate of formation of urine. 20 minutes (\$4.00) U-6015. A number of procedures separated by control periods are demonstrated on a dog under anesthesia. The results viewed and discussed in terms of drops of urine and volume per minute. Blood pressure and drops of urine are continuously monitored on a polygraph. (Printed copies of script are provided for reference.)

5. The small intestine: motility and vasomotor activity. 18 minutes (\$7.00) U-6703. Animation introduces the motility patterns and the experimental procedures for demonstrating them in the anesthetized living rabbit. Microscopic views show the vasomotor activity that underlies the serosal color changes in the gross views of the small intestine. These effects are demonstrated: 1) parasympathetic: vagus stimulation, acetyl choline injection and pilocarpine injection; 2) sympathetic: reflex following sciatic afferent stimulation and adrenalin injection; and 3) posterior pituitary hormone: injection of vasopressin and injection of oxytocin.

#### Acknowledgements

Particular thanks are due the author-producers of tapes and films generously loaned for this evaluation study by their peers. Financial support provided by the Network for Continuing Medical Education is gratefully acknowledged. The generous assistance of the National Medical Audiovisual Center, Atlanta, was invaluable in preparing tape copies for the purpose of this study. Further technical assistance freely offered by Mr. Gene Wilson of the Biomedical Communications Division of Tulane University is most appreciated. The arrangements and operation of the film and tape viewing systems at the University of California, Davis was efficiently provided through the fine cooperation of Dr. Charles Nearing, Manager of Instructional Media and his very capable staff.

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**"PHYSIOLOGY IN MEDICINE"**  
(A New Publication)

In July 1970 the American Physiological Society will begin to publish "Physiology in Medicine." This monthly series will replace "Physiology for Physicians", edited by Irvine H. Page, which has appeared bimonthly in "The New England Journal of Medicine" since 1967. This means of publication was chosen because of the Journal's prestige and wide circulation of about 120,000.

Alfred P. Fishman, of the University of Pennsylvania School of Medicine, will serve as Editor of the new series. He has invited three Associate Editors (D. S. Fredrickson, A. Gellhorn, and A. S. Relman) and an Executive Editor (S. R. Geiger) to work closely with him in the preparation of manuscripts. Aside from this Editorial Board, an Advisory Board of three members (P. B. Beeson, P. A. Marks, and H. E. Williams) has been formed that will suggest contributors for "Physiology in Medicine." Roger Webb will assist in the preparation of illustrations.

Authors and tentative titles for some of the initial papers include:

Elisha Atkins	The Pathogenesis of Fever
A. C. Barger and J. A. Herd	Renal Circulation
Arthur Benton	Hemispheric Cerebral Dominance
Leland Clark	Oxygenation of Blood Tissues Using Artificial Blood
John Eccles	The Role of the Cerebellum in the Control of Movement
J. Stanton King	Renal Calculi
Rachmiel Levine	Mechanism of Insulin Secretion
Jere Mitchell	Maximal Oxygen Uptake: Its Meaning and Clinical Use
Hermann Rahn	Respiratory Acidosis During Phylogeny and Ontogeny
L. P. Rowland	Cramps
Philip Siekevitz	Functions of Membranes

Dr. Franz J. Ingelfinger, the Editor of "The New England Journal of Medicine", and his staff have been most kind in allowing the Editorial Board freedom to develop the series along broad lines and by providing funds to help with the preparation of manuscripts. The new series, directed toward clinical investigators and scientifically oriented physicians, can become an important means of communication for physiologists. The Editorial Board solicits your reactions to and suggestions concerning the first articles.

## REPLIES FROM SENIOR PHYSIOLOGISTS

Drs. Dill, Davis, Essex, and Landis, members of the Committee on Senior Physiologists, mailed the biennial inquiry to members of this group in January. The replies amply rewarded us; many expressed appreciation for this evidence of the Society's interest in them, others wrote of how much they have enjoyed having news about their friends. We ourselves were glad of this opportunity to communicate with colleagues of our generation. It is our general impression from these replies that physiologists as a class grow old, have good health and keep busy and happy. We believe this record of their activities and philosophy merits the attention of younger members of the Society.

### Born before 1891

K. v. Frisch's reply, translated by Hal Davis reads: "Best thanks for your birthday greetings and for your good wishes. You would like to have some news from me, about myself? There is not much to report from recent times except some quiet work. In November I have received an honorary Doctor's degree which particularly pleases me, from the University of Rostock (DDR). This pleased me particularly because Rostock was the first university to which I was called (1921) and because we spent two particularly enjoyable years there, but I was even more pleased because I have found that it is only the politicians who build walls and that these are ineffective against scholarship,

"Just now at the end of the year I have completed the manuscript of a book that will appear in 1970, 'Selections from my Collected Publications from 1911 to 1969.' They should appeal to a wide readership."

Richard Ashman in the last 25 years has seen Fascism developing in the United States; he gets no replies to most letters written since a visit six years ago from the Secret Service. "I become paranoid, as I see it, dynastic wealth cannot tolerate too many intelligent people or we will become socialist like Sweden.... As I see it the future belongs to Scandinavians, perhaps to Japan and certainly to the Russian bloc."

Errett Albritton will complete his second career on his 80th birthday. He is well but government employment must terminate then.

Mrs. Jacobs writes that Merkel was in the University of Pennsylvania hospital with pneumonia for three weeks a year ago. He had 17 teeth removed then and recently returned to have another removed.

"His deep appreciation for the best music and his love for our woodland give joy and fill a big place in his restricted life. He now is able to walk some - very slowly.

"What a beautiful picture of Beaumont House!"

Paul Howe reviewed his career and added: "My present interests are concerned with the education of 'the average man' in relation to 'balancing his dietary' (a term which I loathe). I soon learned to use

'groups of food available in the community' rather than specific foods and hopefully trust they will be acceptable to the individual or family, and the ability of the individual preparing it."

W. R. Hess, Ascona, Switzerland, professor emeritus of physiology of Zurich University, who will be 89 May 17 added the following to his earlier note: "Since 1966 I am living in Ascona, a resort south of the Alps with a very mild climate and southern vegetation. The bungalow has been my holiday refuge for over 30 years and its garden has never failed to give me the pleasure and relaxation which are indispensable during the years of great professional stress. With my wife as an efficient housekeeper and secretary, with an agreeable flow of correspondence and visitors all around the year, our life here is as quiet as we like it and yet allows us to keep up some contact with the wide world. As some of my colleagues may remember I retired in 1951, at the age of 70. For a university teacher in this country this means that he will as a rule have no more room nor personnel available for any further experimental research work. Of course I missed my personal staff, since there was a great stock of unexploited experimental material and at last plenty of time on hand for myself. The rooming problem was solved however by a very kind offer of two of my colleagues, which enabled me to store my collection of reports, documentary films and large series of brain sections adequately in their Institutes of Anatomy and later of Physiology. Thus they were available for further exploitation by myself as well as by other workers in this field. Here now comes a marginal note: of course one must give the young research workers every possible opportunity and help them in all respects - but I should think in the long run it is a wrong idea if the authorities by the above mentioned regulation completely neglect the potential reserves, the scientific investment which lies on the side of the old, emeriti, who, together with their experience and material might be of great help to younger researchers. I was impressed by the solutions to this problem as seen in Sweden, for instance. After my retirement I tried to keep up more or less the same working routine and concentrated on an edition of my experimental documents concerning the functional organization of the hypothalamus and thalamus. It took me five years to compile this Atlas and to prepare a German and an English version of the text part. All those who know from their own experience how intricate it is to coordinate multiple criteria will understand the effort and long lapse of time if I specify there were about 25,000 data to integrate. While centering my attention on the vegetative stimulation effects I was struck by behavioral items which led to the conclusion that there must be some subjective experience on the part of the animal. This idea initiated a comprehensive monograph. Working and pondering on problems around the manifestations of sleep, fright, attack mood and the vital drives like hunger, thirst, etc., I then quite naturally was led to questions focusing on causality, consciousness and cerebral organization and furthermore on the organization of skilled performance including the role of the cerebellum. As to my attitude towards modern physiology in general, it seems to me that these days very much stress is laid upon analysis, while the more important part of the task lags behind, i.e. the attempt to integrate the innumerable data brought about by research into logical 'greater systems,' to synthesize them, to see the idea behind

things. Another problematic task of the moment seems the attempt to establish links between experimental physiology and the specific behavior of species, which of course implies observation and integration of psychic manifestations as well. If you want to know my attitude to what is going on in that world of ours I would call it twofold: on one hand I am amazed at the incredible progress in several fields of human endeavor. On the other hand I find it hard to understand the growing inability to coordinate individual and collective interests, as is demonstrated by news from all over the world. Unless better insight takes over, we seem to be drifting away from peace and to be nearing annihilation of mankind - be it by decadence as the inevitable result of unmastered drives or by a dangerous concentration of destructive power in the hands of some 'leading' individual. In this respect however my lifelong optimism fails me."

Percy Dawson, who will be 97 on the 19th of May, wrote Gene Landis in part as follows, using his system of spelling: "A few months ago I became possessed by the idea, or shal I say vision, of myself at the age of 100, delivering a lecture to Johns Hopkins alumni in which I shd. present my world view, that is to say, my relation to the cosmos. This fancy was soon impaired by various considerations, 1st, that I mite not live to be 100; 2nd, that tho I mite live to be 100, I mite not be invited by the alumni to do so. I therefore took the description of my world view, had it xeroxed, and am distributing it among my friends and acquaintances. When this distribution was about to begin, yur letter arrived asking for information regarding the lives of the derelicts of the APA. This document I do not send to you in anser to yur letter, but I take this opportunity of showing you an example of what a fisiologist may do in his leisure moments. My real job for the last 10 yrs. or mor has been the riting of an autobiography... My life at the present time is hampered by meny handicaps. I am partially blind and partially deaf and meny of my organs including sum cerebral elements ar defective, but I cannot regard these things as vitally serious, I hav abundance of competent help for this MS and a considerable correspondence. I hav a busy life among appreciative frends. My finances ar excellent. My approaching end can stil be viewed objectively and without either sorrow or irritation. In the erly part of the present century, I used to say that I tot fisiology and also the art of living and the science of things in general. The science of things in general has squeezed out my application to fisiology and my view of things in general is, I think, rational and unusually free from bias and intolerance. My days ar busy with the MS and my correspondence. For these I require assistance. My independent work consists of the care of myself and domestic duties as far as my blindness permits. For exercise I perform short series with dumbells and once a week take a walk of two or mor miles on the naboring hills with a few elderly companions. At the end of this walk we take our picnic lunches. I am in touch with a clinic where I am examined at intervals and dosed with appropriate shots of vitamins and so forth. I hav lived alone until recently and at present hav with me a medical student at Stanford so that I'm not completely isolated in case of accident."

Yas Kuno acknowledged with pleasure the receipt of our birthday greeting in 1969. His 88th birthday is March 30, 1970. In Japan the



77th, 88th and 99th birthdays are occasions for special celebrations. As a tribute to him on his 77th birthday three of his former students, Yoshimura, Ogata and Itoh authored, "Essential Problems in Climatic Physiology."

Dayton Edwards expressed appreciation for the birthday greeting and wrote as follows: "The eighth decade has been generally kind - some things in common with experience of the seventh decade but in other respects quite different. Vision and hearing usable but dulled some more, physical activity definitely slowed - where formerly ambulation was by a good stride, now it's a shuffle ten-inch step. Approximately five years ago I had an acute attack of slipped lumbar disk and it shot to pieces my neuro-muscular control in locomotion. My memory for names has about reached the vanishing point but ordinary affairs I manage to retain somewhat. My principal pastime is reading the journal and special articles and I am duly thankful to have that faculty still useably retained. I do little gardening."

Ben H. Schlomovitz was born in Milwaukee May 18, 1889 and died there January 11, 1969 after 55 years membership in the Society. He graduated at Wisconsin in 1914 and was instructor in pharmacology at Iowa 1914-16 while completing work for an MS; he obtained his MD at Rush in 1917. After tours at Marquette, Wisconsin and with the Chemical Warfare Service he was appointed professor of physiology and director of the department at Marquette in 1920. He then was consultant and director of research at the VA Hospital 1923-46 and was on the staff of the Mount Sinai Hospital, Medical Diagnostic Clinic for 35 years: the hospital awarded him a citation for outstanding service. He held membership in Phi Beta Kappa, Phi Delta Epsilon, the National Medical Fraternity (twice president), Heart Association, Trudeau Society and was a fellow of the American Medical Association. He was an honorary member of the Marquette University Physiological Society; his lifelong attachment to Marquette was evidenced by the gift of his collection of rare and valuable books on physiology to their library. This constitutes a memorial section to him. His fields of research included: specialized tissues of the heart and of cardiac nerves, pulmonary disease as related to poison gas and dust, and red blood cell volume. He was a philanthropist and humanitarian, being active in the "National Conference of Christians and Jews." He is survived by his wife Phyllis and two daughters. Phyllis is a concert harpist, formerly of the Milwaukee Symphony Orchestra, and now teaching and concertizing. She has toured Europe and the United States as a Harp soloist, and has two record albums on the market. She and her younger daughter live at Palo Alto, California.

#### Born in 1891

Esther M. Greisheimer is completing the ninth edition of her textbook, "Physiology and Anatomy." She has retired twice; first from teaching medical students, then as Research Professor of Anesthesia. Since her second retirement she has been teaching nurses and inhalation therapists; has assisted with the preparation of the first and second editions of "Basic Physiology and Anatomy" (Chaffee and Greisheimer) and has published many articles. Her advice to colleagues on retirement is:

"Continue your activity taking part of your free time to do those things you have always wanted to do, but could not as long as you were working full time. Remember: 'Absence of occupation is not rest. A mind quite idle is a mind distressed.' "

Harry Goldblatt has not retired but is active and participating in investigations daily, as always, although Director of the Beaumont Memorial Research Laboratories. Re retirement: "Don't, if you can avoid it."

J. E. Thomas is still working, giving a few lectures to medical and dental students and putting in half-time in research. He receives a token salary only from the university but gets a half-salary from his NIH grant. All this is due to change shortly because he is approaching an age at which he thinks it would be unreasonable to ask for renewal of his grant. He has some hobbies which serve to keep him occupied if he has any time left after cutting the grass and trimming the hedges. He is a rock hound of sorts and has some home made lapidary equipment. Also a home-assembled hi-fi set. "I appreciate your interest in us senior members. I am sure it has been of great value to many of us, the encouragement you've given us."

C. A. Mills is continuing his scientific activities.

Born in 1892

S. W. Britton is hospitalized.

I. T. Zeckwer is not active in scientific affairs.

Percival Bailey is enjoying loafing.

Born in 1893

A. C. Ivy is well, can still run four city blocks, and works around 12 hours a day. He has a very nice laboratory with equipment ample for the cancer research he is doing. His title at the University of Illinois is Distinguished Professor Emeritus of Physiology and at Roosevelt University where he gives lectures, Research Professor in Biochemistry. In May he will receive the Friedenwald Medal of the American Gastroenterological Association and in July will serve as a Chairman of a Nobel Symposium on "Frontiers in Gastroentero-intestinal Hormone Research" which is to be held in Stockholm, Sweden. He and his wife held their 50th anniversary in Hawaii on December 24th and celebrated for a week with their five sons, daughters-in-law, and 18 grandchildren.

R. A. Kehoe, being in good health and spirits, has no intention of retiring, in the sense of abandoning his scientific and personal interests. In emeritus professorial capacity he carries out investigations in the Kettering Laboratory, in the Department of Environmental Health of the College of Medicine of the University of Cincinnati on the metabolism of lead, which he initiated many years ago and which is still far from complete as originally designed. He does some graduate teaching in the

Institute of Environmental Health and attends professional meetings and participates in graduate education in other universities on occasion. He participates in public affairs locally and to a limited extent nationally in areas of his professional experience and competence. "My advice to those approaching retirement is not to retire at all, but merely to cast off the activities which are no longer required or readily carried out, and to continue those, in new setting, if necessary or desirable, which represent one's most useful and pleasurable capacities. These views do not represent any profound results of experience, wisdom or contemplation, but are rather a simple expression of a way of life which I have not been compelled for any reason to alter."

H. E. Essex has retired from scientific activities but has been able to guide a few high school seniors in working out biological problems. They obtain some experience in research methods and the discipline of writing up the results. Since 1942 he has had a farm near Rochester where Holstein cattle are being bred. This activity gives him an opportunity to put his biological training into practical use. His tenant and he work closely together with the result that they have a herd considered outstanding throughout that area. Another interest that he has followed since the 30's is abstract painting. He gave one to the Federation to hang in the Milton O. Lee building at Beaumont. "My advice to those facing retirement, whether soon or late, is that they should prepare for that time by getting a new job lined up or develop a new interest. I can't think of any existence more boring than to face the prospects of nothing to do. If I didn't have things to do I'd make them!"

T. E. Boyd says he is no longer engaged in scientific work. He has a home in the country with 20 acres of land where he spends about three hours a day at physical labor such as gardening, raking leaves, mowing grass and cutting wood.

W. O. Fenn reports that his health is good. He is serving a three-year term as President of IUPS; this takes perhaps a third of his time, including travel to Munich, London and Erevan, Armenia. The rest of his time is spent very happily working on the effects of high pressures in physiology, with special relation to the concomitant volume changes of the reactions involved. This is more or less virgin territory, with plenty of room for new ideas and new techniques.

L. A. Dragstedt appreciates being kept informed of the current activities of our group of senior physiologists. He continues his scientific activities as Research Professor of Surgery and Professor of Physiology at the University of Florida in Gainesville, Florida. He teaches several classes in gastrointestinal physiology, gives a number of lectures in the Department of Surgery and has working with him five postdoctoral fellows from foreign countries including Colombia, Japan, Cuba, Mexico, and Nicaragua. Recently he visited Chicago, where a portrait of him was unveiled in the new lecture room dedicated in the honor of Frank Billings. During the same visit he gave an address at the dedication of a new physiological sciences laboratory in honor of A. J. Carlson. The building is to be called the Carlson Laboratory of Physiological Research or some similar name.

Stuart Mudd became Emeritus Professor of Microbiology in 1959, but continues scientific activities as Chief of the Microbiologic Research Program at the U. S. Veterans Administration Hospital in Philadelphia. He is responsible investigator for a team funded jointly by the USPHS and the U.S. Veterans Administration Central Office Research Service. Their principal preoccupation is with infection with staphylococcus aureus. In addition, he is vice-president and standby president of the World Academy of Art and Science, and as Chairman of the Publication Committee of WAAS edited volumes on "The Population Crisis and the Use of World Resources," 1964, and "Conflict Resolution and World Education," 1966. WAAS Volume 6, "The World Religions Speak on the Relevance of Religion in the Modern World," is now in press with Dr. W. Junk Publishers, 13 van Stolkweg, The Hague, Holland. This is jointly sponsored by the Temple of Understanding, Inc. and WAAS. His wife, Dr. Emily H. Mudd, is Professor Emeritus of Family Study in Psychiatry at the University of Pennsylvania, and has been a leader around the world in Family Counseling.

J. J. Izquierdo, born May 8, 1893, wrote an eight-page letter to Gene Landis in which he commented on world affairs, reviewed the history of physiology in Mexico and described his attempts to inculcate his points of view derived in part from his associations with Cannon and Barcroft. His entire letter and four of his books have been forwarded to the American Physiological Society: it is a valuable historical document. He closes as follows: "Eventually, I hope that the newer generations from a firmer solid basis of medical education with harmonious blending of teaching and research, shall bring to completion the changes needed for correction and improving the present conditions of medical education. In the meantime, I hope to be excused for urging students to keep always in mind and follow in the execution of their tasks, the essentials of the method conveyed in the old message: Observe, Meditate and Observe again."

E. Gellhorn continues his scientific activities sans a laboratory. He has been writing legends, satires and essays, one of which was published in the Fall issue of the Perspectives in Biol. & Med., 1969. Its title is "Divine Humor." He receives requests for reprints for this material from all over the world but he cannot find a publisher. He would be willing to visit a college or university in order to promote scientific work among its graduate students.

#### Born in 1894

While C. P. Richter retired ten years ago he has the same lab, same adequate help and support with experiments that keep him very busy. He usually spends three days a week operating on rats or monkeys; his eyesight is still good and his hands have not yet developed any tremors. The rest of his time goes to finishing a second book on "Biological Clocks."

H. E. Himwich is continuing his scientific activities as Research Director; his research is concerned chiefly with schizophrenia. His group has found three psychogenic indoleamines in the urine of acute

schizophrenic patients about two weeks before the schizophrenic symptoms appear and continuing in the urine until the patients improved again, at which time these psychotic indoleamines disappeared from their urine. These patients were given cysteine and tranylcypromine (Parnate) an MAO inhibitor. Moreover, normal people, under the same chemical challenge, neither had a worsening of behavior nor do these three N, N-dimethylated tryptamines appear in the urine. Patients, during the first acute schizophrenic episode, produce the same substances before they receive any drug treatments but chronic schizophrenics, even without drugs, fail to produce these substances. He believes they have something which is characteristic of schizophrenia and involved in the exacerbation of schizophrenic symptoms. Whether or not there is a qualitative difference between schizophrenics and normals is still to be elucidated.

W. R. Amberson published papers in 1964, 1965 and 1967 and is working on two more. His major concern has been to establish the formation of complexes between glycolytic enzymes and the fibrous proteins of muscle, using electrophoretic technique. Growing out of his experiences he urges colleagues on the verge of retirement not to follow his example and try to get grants, space, etc. for further work, when they need a rest. "It is now ten years since my retirement at Maryland - six of them on NIH grants. They have been strenuous years and have contributed to our field, but I drove too hard. I am moved to this view because on Dec. 28, 1969 I collapsed and was hospitalized for three weeks, returning home on January 21. I have had no angina for two weeks and am well on the way to recovery."

I. S. Ravdin's secretary writes that Dr. Ravdin is too ill to send any personal message.

Erma A. Smith advises those contemplating retirement, "Don't - do some other work."

Ann Minot lends a chemical hand here and there, gives an occasional lecture and attends and participates in various seminar groups at the Medical School. She enjoys the prospect of less work and longer, more varied vacations, and is not interested in any new job or increased responsibilities. "Keep busy, keep in touch, and use the extra leisure to have fun catching up with new interests and activities."

#### Born in 1895

Larry Irving writes in typical style to Gene Landis: "Thanks for your interest in communication among us older physiologists. I have found in Alaska that age and the experience that go along with it are supposed to be useful. I will not question whether courtesy or value has allowed me to continue to participate in activities of my juniors, but the result has been pleasant. I carry on in leisurely manner writing and discussion about physiology as it develops views of adaptation to arctic life. I have no inclination to move or change beyond increasing reduction in hours of nominal work. I would say that long before the decline of vigor is marked it is wise to associate with friends who are

more lively and interesting and to try to keep them in sight. By diligently cultivating luck in forming and maintaining agreeable associations aging becomes interesting and your company is considerably tolerated while you continue to see what is going on."

Ruth E. Conklin enjoys excellent health. Recently she took a trip around the world, visiting former students in England, Czechoslovakia, India and Hong Kong, as well as seeing something of Thailand and Japan. At a meeting of the Physiological Society in Mill Hill, London, Prof. Barcroft gave her letters to physiologists in Prague and Bangkok. She occasionally helps in the Dean's office at Vassar College and is involved in various community activities. "Keep physically and mentally active. There's no excuse for boredom. Look around you and opportunities for usefulness and enjoyment will besiege you!"

D. W. Richards is studying the writings of Hippocrates and is trying to start a program in the History of Medicine at P & S, in which Andre Cournand collaborates.

E. J. Van Liere is still engaged in biological research. He had an article in the Soc. Exptl. Biol. & Med. and has an article coming out in the J. Obstet. & Gynecol. He hopes to continue his research as long as health permits.

E. B. Carmichael has discontinued experimental work but he is continuing to edit the Alabama Journal of Medicine. His work as chairman of the Gorgas Scholarship Foundation, Inc. keeps him in touch with prospective talent. He directs the Alabama Science Talent Search for high school seniors. He continues to investigate the careers of Alabama physicians and publishes two to four biographical sketches each year. He has given up golf for gardening and lawn work. He is an ardent philatelist. His advice is "Start a hobby if you don't have one, and be certain that one of them is physical in nature."

Jane Sands Johnson married Rev. B. M. Johnson after the death of her first husband, Dr. Raab. She is occupied with looking after her husband, traveling, and gardening. They visited Alaska and Mexico last year and are scheduled for a trip to India soon where Reverend Johnson was a missionary for 33 years. Her last book is being translated into Italian and Spanish. Her advice for those approaching retirement is to "change completely and develop entirely different interests."

Hugh Dukes is continuing presentations and "Demonstrations in Living Biology." This "retirement project" has now been seen live by 100,000 young people, mostly of middle school age, in several states. It has been sponsored by Iowa State University and other universities and organizations. A motion picture of the demonstrations has been made. This work has been a very rewarding experience. In addition he has lectured at several universities, judged (for the sixth time) at the International Science Fair, completed (with Iowa State University) 20 short films based on lecture demonstrations given for years to students at Cornell College and Iowa State.

C. A. Dragstedt continues in research, editorial work and in writing creative poetry. Here is one of his recent gems:

#### THE GAS BACILLUS

The Gas Bacillus dwells below,  
Down in the larger bowel;  
It manufactures gas so that  
the nether throat can howl.

The Gas Bacillus dotes on beans,  
On cabbages and nuts;  
It also likes some onion soup,  
Down in those lower guts.

The way it turns those things to wind,  
Is known to but a few;  
But that it does, is known by all  
Who choose such things to chew.

From bashful boy to pompous king,  
From blushing maid to queen;  
They all have felt the breeze which comes  
From onion, nut, and bean.

The Gas Bacillus has a name,  
It's called Bacillus Welch;  
It likes the playful rhyming game,  
Making the rectum belch.

Walter Fleischmann, because of budget cuts, is not continuing his scientific activities but still continues as a consultant to the VA Hospital at Johnson City, Tennessee, thus keeping him in touch with the work going on there in the Department of Pathology. He is enjoying working in his yard, having recently added a small greenhouse, is taking organ lessons and takes his two beagles for walks. He and his wife traveled last year to England, Austria and the Yucatan peninsula of Mexico. "Plan for your retirement. Cultivate your hobbies and plan to travel, if you can. Most important: take a positive mental attitude; there is always something to look forward to."

E. A. Spiegel is busy editing "Progress in Neurology and Psychiatry" and continuing some studies on the basal ganglia, particularly Parkinson's disease.

Edward Adolph reports: "My daily researches in the laboratory seem continuously inviting. Present aim? To trace the ontogenetic development of physiological regulations of such functions as heart-rate, breathing. A wide-open field of study of controls and their activation, and their adaptations under varied environmental factors. The academic atmosphere furnished by colleagues and students seems ideal and indispensable. Where else can one feel more ageless? More ongoing?"

Born in 1896

P. V. Karpovich retired last June. Since then he has had several interesting invitations to lecture and teach but had to refuse because of poor health. He has written a couple of articles but had to stop.

Victor Guillemin's "The Story of Quantum Mechanics" published by Scribner's in October 1968, (A survey of modern physics and its philosophical implications, written for non-physicists) has had some good reviews. He now is working on a book on "Time," but has not yet found a publisher who concurs with him on its contents.

The many friends of Chauncey Leake will want to read his entire letter: "Thanks, dear Bruce, for your early 1970 greeting, and congratulations on the good work you are doing for Senior Physiologists. I know they appreciate it. It is amazing that 66 should still be with us who were born before 1891. I guess physiologists are tough! You certainly will make them all feel good when you send a personal birthday card. In regard to your questions, of course I am continuing my scientific activities. I intend to do so as long as I am able. You will be interested that one of the most successful of my ventures recently has been an open course, that is, open to anyone, but without credit, on philosophy. It is directed to candidates for the degree, Doctor of Philosophy. I'm naive. I believe that anyone who has a Ph.D. degree should know something about philosophy. Actually the course works out well. It's once a week at noon, and I offer coffee and cookies as bait. The attendance has grown from about 40 to 80. It is interesting that many staff members drop in occasionally. What I do is ask the stiff questions: What are we living for? What motivates us? What governs our interpersonal relations? What determines our moods and behavior? The answers are the various ethics. It takes quite a while to point out that there are many! Then I go on to indicate that no matter what our goals or purposes may be, we have a better chance of reaching them if we know something about them. This raises the question - what is the truth about ourselves and our environment, and what is the best way of getting it? Of course there are many answers, and these are the various logics. It is always a surprise when the boys learn that there are many logics. Then we point out that supposing we do have a vast amount of information, and of course, the best is that which is verifiable, then we have the problem of selecting and applying that which is appropriate to the goals and purposes that we have in mind. This calls for judgement. This raises the question of what is fitting, and thus we go into the aesthetics. Thus we have the ethics, the logics, and the aesthetics, and it makes a very worthwhile program. I am also giving occasional talks to various student groups, both here and in other parts of the country. There are many good words of advice for those who are approaching retirement: Be prepared! The point is to get so loaded up with things to do, that when the actual retirement comes, one can go right on with a push to accomplish what one had planned to do. There is always too much to be done! I think it is very foolish for anyone to come to retirement thinking that that is the end of things. Keep going. Always I marvel at the keen way in which you have kept going so well and the inspiration and stimulus that you have given to all who know you.



Here's hoping that you and yours have a very happy, rewarding and satisfying new decade."

R. W. Whitehead is continuing with his scientific activities to some extent in a half-time position at the University of Colorado Medical Center as Executive Secretary of the Alumni Association. The other half of his time is spent in writing, consultation and in attendance at lectures, grand rounds and seminars. He recently completed revision of a chapter for Dill's Pharmacology in Medicine, in collaboration with Dr. R. W. Virtue, anesthesiologist, on the subject of "The Pharmacology of the Non-Volatile Anesthetics." He is writing a "History of Medical Education in Colorado" for the Colorado Medical Society in celebration in 1971 of the one hundredth anniversary of its founding. He would not be averse to considering a change in location. A one to two-year appointment would be of interest. He spent the year of 1964-65 as visiting professor of pharmacology, Trinity College, Dublin, Eire. Advice: Maintain an interest in science and medicine. Look for something to praise every day. As Lawrence Welk says: "Keep a song in your heart."

Hal Davis writes as follows: "I am indeed continuing my scientific activities. I am allowed to continue as a Research Associate at Central Institute for the Deaf full time. I have my laboratory, assistants, and secretary. I give two lectures a week to elementary students and a few more to graduate students. I tell my friends, 'I may be an emeritus but I'm not retired!' How come at age 73? Just lucky I guess, - in respect to both health (mine and my wife's), and to the lack of mandatory retirement rules in a relatively small and young institution. I expect to start a schedule of "phased withdrawal" this year. One incentive to continue so far has been the revision of a textbook "Hearing and Deafness", Third Edition, 1970. Another has been to perfect and to launch into clinical use our method of Electric Response Audiometry in young children. This method represents a final combination of two of my major long-term interests, namely hearing and electroencephalography. In another couple of years we will know whether the method really pays off or not. I also continue with some committee work related to noise problems and particularly the sonic boom - but traveling around the country to committee meetings, society meetings and symposia is no longer the treat it used to be. One of my good intentions is to do less of it."

P. Reznikoff is still practicing internal medicine, mostly hematology, acting as Hematology Consultant for the N. Y. VA Clinic and as Consultant for an insurance carrier involved in medical liability cases. He would consider consulting positions in the New York area of service to the medical or educational profession for which he is qualified. He advises those approaching retirement to become vitally interested in some work so that they really never retire.

H. L. White is busy examining school children.

G. H. Ettinger since retirement from Queen's University in 1962 has been Director of Medical Planning at the Addiction Research Foundation, Toronto. He enjoys work in which many young people seek his help. He plans to retire in May. "Thirty-five years ago, when I was offered

a position at research, without teaching responsibilities, by Sir Frederick Banting, I asked Professor Sharpey-Schafer, under whom I had studied, his advice. He said, 'I do not give advice to young men. But, I have found my best stimulation in the questions asked by students.' So, I say to one about to retire - seek a post compatible with your skills and experience, but not away from contact with youth's questions."

#### Born in 1897

H. H. Cole's activities include Editor, "Biology of Reproduction," the official journal of the Society for the Study of Reproduction; Editor, "Reproduction in Domestic Animals" (H. H. Cole and P. T. Cupps, eds.) 2nd Ed., 1969, Academic Press, New York; Editor, "Introduction to Livestock Production" (H. H. Cole, ed.) W. H. Freeman & Co., San Francisco. (3rd edition in preparation); conducting a research program on Antigonadotropins, supported by the Population Council, New York City and Chairman of an Executive Committee to administer a department at University of California, Davis.

Mary Hardy's interests are in gardening, traveling, opera, theater, "English in action," conversations with foreign students.

L. C. Wyman is carrying on work in anthropology, not in physiology. He spends part of his time on hobbies and traveling. "Quit working for pay and enjoy life; get away from deadlines, committees and bells - really retire and work when, as and if you feel like it; you have done enough already, enjoy living while you still can."

Mrs. Robert K. S. Lim sadly reports that her husband died July 8, 1969. He served the Miles Laboratory as director of the Med. Sci. Res. Laboratory in Elkhart for 16 years until his retirement in 1967. Born an English subject of Chinese parentage in the Crown Colony of Singapore October 15, 1897, Dr. Lim was the son of Dr. Boon-Keng Lim, educator, physiologist and physician who was founder and first president of the University of Amoy. Dr. Lim studied in Scotland, served during World War I in the Indian Army Medical Service before earning the first of four degrees he was later to receive from Edinburgh University. He was a Senior Lecturer in Physiology at this university when he resigned to pursue his studies in the United States. In 1923 he was awarded a Rockefeller Foundation Fellowship to the University of Chicago and a year later became professor of physiology at the Peking Union Medical College. Here Dr. Lim established the first active center for physiological research in his native land. He also instituted a periodical for reporting Chinese contributions to his science, "The Chinese Journal of Physiology." Besides being a pioneer in a land that had neglected scientific methods, Dr. Lim proved himself a devoted citizen and an ardent patriot. Dr. Lim was president of the Chinese Medical Association and was chairman of the North China Council for Rural Reconstruction. In 1937 with the outbreak of war between China and Japan, Dr. Lim organized the first reserve officers training corps for medical officers in North China, founded the Red Cross Medical Relief Commission in North China and served as its field director. In 1942 he was assigned to the Chinese Expeditionary Force in Burma under General J. W. Stilwell. Shortly thereafter, he led

his medical group with miscellaneous allied personnel to safety in a grueling 26-day march through the roadless, Japanese-controlled jungles of Burma to India at the start of the monsoon. For this action he received the U. S. Legion of Merit, Officer Grade, in 1942. At war's end, Dr. Lim, now surgeon General of the Chinese Nationalist Army, organized the National Defense Medical Center, ten general hospitals and initiated a program of postgraduate training of Chinese medical service personnel in the United States. He resigned his post as Surgeon General in 1948, came to the United States a year later and joined Miles Laboratories in 1952. He is remembered for his research on gastroenterology and the central nervous system and for his significant contributions to the understanding of pain and analgesia.

Edward Larson is continuing scientific activities; he enclosed with his reply some recent reprints. He attended the last two meetings of the Federation and with his associates presented a paper at the Florida Academy of Science at Jacksonville, March 1970.

Roberta H. Hafkesbring after 34 years of teaching at the Woman's Medical College of Pennsylvania, retired as chairman of the Department of Physiology in June, 1964. Since then she has made four trips to South Korea and on each visit taught full time in the Medical College of the Woman's University at Seoul. She advises those in good health and facing retirement to find a position to keep active and alert.

H. Necheles wrote Gene Landis that "It is good to hear that we older ones are not forgotten." He retired from his position as Director of Gastroenterology in 1967 but is still in charge of his research laboratory because no successor has been found. He has no budget so he feeds and waters his rats and guinea pigs, passes the stomach tube to give them substances intragastrically, and finally sacrifices them and does a thorough review of stomach and duodenum. He has clinicians working part time with him on peptic ulcer. When his successor is found, he hopes to have a small laboratory to continue his work. "Everybody should have a hobby which has been acquired long before retirement and which he enjoys and which he will be able physically and mentally to continue after retirement. Ideally a man should never retire from scientific research if he still has the mental and physical ability to continue. It is a waste of human material to retire people who are still good in their work."

Charlotte Haywood reports: "Since my retirement, my intellectual interests in scientific research have been shared with those in foreign travel and art history. I have enjoyed them all immensely and am glad to report that the results of my research on the respiratory responses of healthy young women to carbon dioxide inhalation were published in 1969 in the *Journal of Applied Physiology*."

Louis Katz writes: "I have completed my two-year term as Visiting Professor of Physiology at the University of Chicago, where I had charge of Physiology 301, for medical and graduate students on the physiology of circulation, respiration and kidneys. At the moment I am writing a book with Dr. Earl Silber on Heart Disease, which I hope to get finished

within the year. My son and I are considering writing a more physiological book on cardiac muscular contraction. As you may know, he has gone to the Mt. Sinai School of Medicine in New York to take charge of the Cardiovascular Division in the Department of Medicine, and he has tenure as a named Professor of Medicine (Cardiology). I serve as Consultant to the Cardiovascular Institute, and have a small retirement office and a secretary, by virtue of being Director Emeritus of this Institute. I keep 'bankers hours' and enjoy this semi-retirement. Of course I am interested in a position that will permit me to be useful as a Consultant in research or in administration - but of course the offer must be really attractive! The only advice I have for those approaching retirement is not to fight it, but to adjust to it. I have found that people pay as much attention to me as a Consultant - even though they don't have to - as they did when I was the Director. I feel that disuse of the brain and of the body leads to deterioration but, with age, there is a natural biological lowering of physical and mental capabilities. The wise man recognizes and adjusts to this biological fact."

Born in 1898

J. J. Sampson will continue in research but will discontinue teaching in another year. He would consider a position in the Bay area.

W. Goldring is continuing his scientific activities.

Leonard Carmichael gave the Langfeld Lectures two years ago at Princeton University and is now writing them up for publication. The tentative title is "Growth of Mind in Mammals and Men." He is searching all the literature on prenatal behavior in some typical mammal and in man and is especially interested in his old field of experimental study on the onset of sensory control of behavior. He is Vice President for Research and Exploration at the National Geographic Society and administers an extensive grant program. The National Geographic Society finances projects in the fields related to geography broadly considered (field biology, geology, archeology, anthropology, cartography, etc.). "As physiology becomes ever more a part of biochemistry, biophysics and molecular biology, it is a good thing not to forget that there are still some things to be learned that are important even in pure science as well as in medicine at the level of "organ physiology" and the behavior of the total organism."

William Windle writes, "I expect to continue in my present post as Research Professor of Rehabilitation Medicine for another year. At the moment, I am on a 'pseudosabatical' as Visiting Professor of Anatomy at UCLA. I gave up my last administrative post in December, and wish for no more."

K. K. Chen has just completed editing "The First Sixty Years (1908-1969), the American Society for Pharmacology and Experimental Therapeutics." He is writing and polishing four manuscripts based on the results accumulated by his research associates. He gives advice to medical and graduate students. "One should plan ahead where he will make his residence, and what he would like to do. Keep busy and do

things worthwhile. During one's lifetime he should cultivate a habit of saving; Social Security and Medicare are not enough for subsistence."

Eleanor Mason is continuing her activities in England about which she has written previously. A special interest and activity there in London has been meeting and farewelling at airports and boat-trains, friends, former colleagues and former students from India - Indian, American and British (some of them also former physiological guinea pigs), and keeping in close touch with colleagues and alumnae of the Women's Christian College, Madras, who are in London or greater Britain. In June, 1969 she joined about 100 of her classmates for their 50th reunion at Mount Holyoke, very live wires for all their 70-odd years. "Retired? - as the world sees, maybe 'yes' - but for participation with the world in mind and spirit, I don't think there is ever retirement. Almost certainly before midsummer of 1970 I shall be returning to live in the U. S. A., address 15 Craigie St., Cambridge, Mass. 02138."

Ernst Simonsen is as busy as ever working on his monograph on fatigue, research work (vectorcardiograph), and clinical electrocardiography. The manuscript of the first (and largest) volume "Physiology of Fatigue" is now finished; its assembly will take about a month.

E. J. Baldes after leaving the Mayo Clinic Graduate School of Medicine joined the Army Research Office, Life Sciences Division, Scientific Analysis Branch, in Arlington, Virginia. In 1967 he transferred to the U.S. Army Aeromedical Research Laboratory, Fort Rucker, Alabama where he is involved in aviation medical problems. He is chairman of a Symposium on Linear Acceleration of the AGAD-NATO group to be held someplace in Europe in 1971.

O. H. Wangensteen continues his research and is working on some aspects of the history of surgery.

P. B. Armstrong retired last August 31. However he has research space and supplies in the Department of Anatomy and participated in the teaching of gross anatomy this past term with a full schedule. He is investigating two problems, 1) comparative study on pupillary mechanisms in the lower vertebrates and is now preparing a paper on the eel eye, 2) extending work previously published on photic responses in developing fish embryos to determine the role of the labyrinth in these phototactic responses. He retired as Director of the Marine Biological Laboratory in 1967, but still spends summers at the Laboratory developing the above research.

Philip Bard became Professor Emeritus on June 30, 1964. Vernon Mountcastle arranged for him to use the same laboratory he had had since 1959 when they moved into the new building. "With no administrative duties I have gotten more done in these years of retirement than I have in any other 5 years. My work has been on CNS control of body temperature regulation and the central mechanisms involved in pyrogen fever. I am a Trustee of the Rockefeller University and of the Thacker School in California. I serve on the Research Committee which advises on grants in the field of schizophrenia made by the 33<sup>rd</sup> Scottish Rite

Masons of the Northern Jurisdiction. I am the successor of Magnus Gregersen as President of the International Foundation, formerly the Clinic International Foundation. If a physiologist is so addicted to the pleasures of experimental work that he would be unhappy not doing such work, he should take steps to assure being able to continue. It is a pity that more institutions either do not permit this or do not make it easy for the retiring professor."

#### Born in 1899

Hudson Hoagland writes, "My health is very good, I am reasonably well heeled and I still seem to have friends and a job, in the sense that I am doing pretty much what I have always done, the main difference being that I don't get paid for it. I retired as President of the Worcester Foundation a year ago last month and I made every gesture of leaving the premises, but I am happy to say that people didn't seem to want me to go and even twisted my arm to retain my office and secretary. I am continuing my scientific activities in an odd sort of way. I am involved with a group here working on biochemical aspects of psychoses. I have about \$50,000 in grants from private sources which I use to patch holes in our grant structure in the behavioral science division when federal grants for my colleagues don't come through. I am doing some writing and quite a bit of lecturing, mostly on topics of ecology as related to the population problem and I am still active on several boards and committees. I am really enjoying my retirement very much, doing things I want to do instead of things I have to do, but since, perhaps more than anyone else, I was involved in the founding of this institution, I have an abiding interest in its fate and the fate of its people. Anna still is remarkably productive in transcribing textbooks into Braille for blind students, who ask for them through the National Braille Press. She has produced over 200,000 pages of Braille and has been awarded by the Braille Press and other organizations for her remarkable achievement in this field. My belief is that a person over sixty-five ought not to be in a position to control the careers of younger men. He generally doesn't know them well enough nor is he enough abreast of the details of their specific scientific fields."

Herbert S. Wells is studying electronics in his basement lab. His advice for those who are approaching retirement is, "Save your money; develop new activities and interests as far removed from physiology as possible. 'Let the dead past bury its dead.' "

Charlie Best although officially retired keeps his office at the Institute and comes in several times a week. He tries to keep abreast with the literature relating to diabetes and insulin, heparin and thrombosis, and to choline and liver problems. He is on the teaching staff of physiology and lectures from time to time and enjoys interviewing the medical students in order to discuss their problems with them. He is quite often away on lecturing trips but does not undertake as many as formerly.

A. C. DeGraff is continuing his scientific activities, is teaching at the New York University School of Medicine correlating physiology and pharmacology with clinical medicine for 4th year students. He is editor

of the Annual Review of Medicine and president of the United States Pharmacopeia, a position he has held since 1960. "I am enjoying the fact that at the present time I can act as a free agent. Do not retire unless you must; then be sure you have some interesting things to do to take up your time."

Phyllis Bott lives in the woods of the Pennsylvania "Dutch Country", enjoying joint ownership of a house and four acres in the rocky hills near Sumneytown. She keeps up with several scientific journals and dabbles in electronics. Her hands are now adapted to gardening and sawing wood rather than handling capillaries.

F. D. W. Lukens writes: "As a one man anti-retirement league, I am working full time in administration. As Chief of Staff (Acting Chief of Staff since I am 70), the job is liaison between administration and professional staff, ombudsman, and occasional teaching and care of a patient now and then."

M. L. Tainter retired after having been vice-president of Sterling Drug for research and technical matters since 1943, five years beyond their normal retirement age of 65. He was retained as a Consultant in what has turned out to be a full-time activity; he has detected no diminution in the demands on his time. He has resolved, however, to take more time for vacation and personal relaxation, hoping that his consultant assignments will permit this to a greater degree than before. "I suppose sometime before too long I should apply to the Society for emeritus status, but such a semi-public acknowledgement that I no longer am actively interested or participating in science, has been a bitter pill which I have not yet gotten myself to swallow."

Chester Leese reports that his activities since retirement are library research and teaching, a first love. The former has included five years of consultative work with the government in the bio-sciences and out of it has come several classified papers. This contact has now ended at age 70. The latter has included continuation of part-time laboratory teaching at the medical school and a part-time instructorship in biology at the Webster Junior College in Washington. "At the present time I feel quite well occupied. The financial return is a bit skimpy, but the challenge in biology is extensive - I have been away from the basics for so many years. Most folks lay fairly solid plans for retirement these days. This procedure plus staying close to the Society in time of need combine to make the best advice to the nearly retired."

## RETICULOENDOTHELIAL SOCIETY

The Fourth International Meeting of the Reticuloendothelial Society will take place from July 29th to August 1st, 1970 in Freiburg, Germany. The main scientific topics will include experimental and clinical methods of RES research, cellular function and ultrastructure, hematology and the RES, pharmacologic agents affecting the RES, host defense and transplantation immunology, endocrines and the RES, and tumor growth and differentiation.

The Congress Committee extends a cordial invitation to all scientists interested in the reticuloendothelial system and allied topics to attend and participate in this Congress. Further information may be obtained from the Congress chairman, Dr. Kurt Flemming, 7799 Heiligenberg, West Germany, Postfach 3.

## SYMPOSIUM ON BEHAVIORAL TEMPERATURE REGULATION

An international symposium on Behavioral Temperature Regulation sponsored by IUPS is to be held in Lyon, France, Sept. 7-11, 1970.

For details and definitive program please write Dr. J. D. Hardy, Professor of Environmental Physiology, John B. Pierce Foundation Laboratory, 290 Congress Ave., New Haven, Conn. 06519.



## INTERNATIONAL STUDY GROUP FOR RESEARCH IN CARDIAC METABOLISM

The first American Meeting of the Third Annual Meeting of the International Study Group for Research in Cardiac Metabolism will be held in Stowe, Vermont, June 29 to July 1, 1970. The meeting will be concerned with recent advances in research on myocardial metabolism and structure. Some of the major subjects to be discussed include:

1. Fatty Acid Metabolism in Heart
2. Electrolytes and Myocardial Metabolism
3. Hereditary Cardiomyopathies: New Disease Models for Investigative Cardiology
4. Toxic Cardiomyopathies

Dr. Schwartz is the Secretary of the Organizing Committee, and any inquiries may be directed to him at the following address. Division of Myocardial Biology, Baylor College of Medicine, 1200 Moursund Avenue, Houston, Texas 77025.

## GERONTOLOGICAL SOCIETY MEETING

The twenty-third annual meeting of the Society will be held at the Royal York Hotel, Toronto, Canada, October 22-24, 1970. For further information write either The Gerontological Society, #1 Dupont Circle, Washington, D. C. 20036 or Mr. Lawrence Crawford, Fifth Floor, Hepburn Block, Parliament Buildings, Toronto, Canada.