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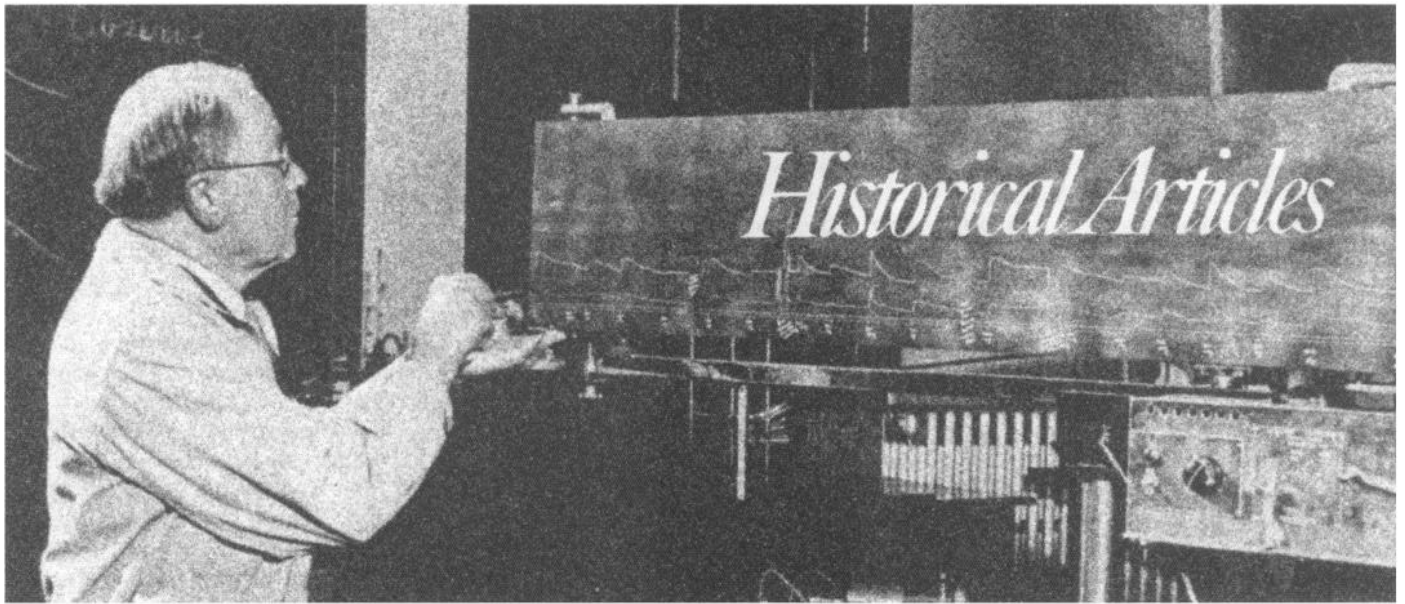
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GEORGE H. WHIPPLE
or
**HOW TO BE A GREAT MAN WITHOUT
KNOWING DIFFERENTIAL EQUATIONS***

HORACE W. DAVENPORT
William Beaumont Professor of Physiology
The University of Michigan

The subtitle of my talk tonight is "How To Be a Great Man Without Knowing Differential Equations." Every year I struggle hard to find a topic for my next talk, and I am already thinking about next year, assuming there will be a next year. I was describing these seminars in Göteborg last spring, and the topic for tonight suddenly occurred to me then. So you see I have been planning it for a long time, and any deficiencies are not for lack of planning.

I am going to tell you about the first American to get the Nobel Prize in Physiology and who got it for work published in the *American Journal of Physiology*.

Who was Whipple? Does anyone know? I could show you some pictures of him in a book by George W. Corner (1), of whom I will speak later. One picture shows him receiving the Prize in company with two other Americans, George Minot and a man named Murphy. The picture also shows another recipient, Luigi Pirandello. Do you know who he was? Playwright; the nature of reality. I mention him, because I managed to get him into the fourth edition of my *Physiology of the Digestive Tract* (2), along with T.S. Eliot. That took some doing.

The work for which Whipple got the Prize is *Blood regeneration in severe anemia. II. Favorable influence of liver, heart and skeletal muscle in the diet.*, by F.S. Robscheit-Robbins and G.H. Whipple, *American Journal of Physiology* 72:408-418, 1925. A question is: Who was F.S. Robscheit-Robbins? I'll talk about that later.

If you studied medicine, you know there is a Whipple's Disease. Whipple was a pathologist by trade, and every pathologist has to have a disease named after him. It is an extremely rare form of malabsorption which gastroenterologists know about but which is of very little importance. If you're a surgeon like my postdoctoral fellow, Gordon Kauffman, you will know there is a Whipple's Procedure, but that is another Whipple altogether. What Whipple showed is in the summary of the paper: feeding beef liver in severe anemia is associated with maximal regeneration of hemoglobin and red blood cells. So, what Whipple showed is that liver is good for blood. I will return to that, but first I want to talk about my connection with Whipple.

There are two connections. The first was in 1939 when I got my Ph.D. in biochemistry at Caltech. The ambience of that will show you why I talk about differential equations. One was supposed to know them and to know thermodynamics. I got my first postdoctoral job in Whipple's Department of Pathology; how and why will be explained later. In my curriculum vitae you will see that I was a Fellow in Pathology. I have actually done an autopsy. I once stated that in the presence of our Professor of Pathology, and he said that is more than some pathologists have done. I won't tell you how I came to make "the usual Y-shaped incision."

I had very little to do with Whipple when I was in Pathology at Rochester. The reason was that I was a very junior person in a very distinguished department, and Whipple wasn't around very much. When he was around he left at noon. Whipple was then very senior, and he was involved in many other things such as salmon fishing. He had a river in Nova Scotia, and he had a farm in South Carolina. He had a lot of other avocations, so that he really wasn't present in the Medical School very much although he was a professor and director of the Department of Pathology.

*Derived from a Seminar on the History of Physiology given for graduate students in the Department of Physiology, The University of Michigan, September 24, 1976.

He was also Dean. He ran that very large and important school in an afternoon a week with the help of a secretary. You can contrast that with the way medical schools are run now, with a large number of office boys, all with the title of Associate Dean.

Another evidence that I had very little to do with Whipple is that he thought my name was Davidson, and I have gone down in the history of Rochester as Dr. Davidson.

I was rather contemptuous of Whipple. I didn't know, and I didn't appreciate, his good qualities. I was young; I had just come from Caltech; but I was really quite ignorant. This is a characteristic of youth. I will point this moral here, because you are all quite young, too, and you may be contemptuous of persons who deserve a little better consideration from you.

I did some good work at Rochester, and I published four papers from there. Two were purely descriptive. Two were theoretical, and both theoretical papers turned out to be absolutely and totally and completely wrong. That didn't stop them from being reasonably good papers. I won't talk about that, for it is another subject altogether. I gave a seminar about my work. It contained some equations, not differential equations, but simple algebraic equations. Whipple was present, and Whipple demonstrated that he didn't understand what I was talking about.

In general, there are two kinds of scientists. One kind is highly abstract and theoretical. These are extraordinarily important for science, as I need not point out. The others are very practical, the plumbers, the ones who work with their hands. They, too, can make important contributions, and one of the speeches I make is how one can do absolutely classical work without having any ideas at all. This is frequently done, and Whipple did it sometimes. I'm not saying that he didn't have ideas; he did have them, but they were not abstract. His kind of person, the kind who doesn't know differential equations, can be remarkable contributors to society, and they are the ones who tend to be academic statesmen. Whipple was very definitely an academic statesman, but you young persons don't realize how important academic statemanship really is. Its success or failure makes your environment what it is.

The other connection is through Corner's biography of Whipple. I bought a copy when it was published, and I have pasted into my copy a letter from Whipple to me as well as one from Corner. When our boy Andy was admitted to the University of Rochester Medical School I sought a copy of the book for him, but I found it was out of print. Half expecting what would happen, I wrote to Corner asking if he knew where I could get a copy. He wrote back: "I just happen to have a copy which your boy can have," and he signed it for Andy. Andy read it, so he knew about Rochester before he got there. Andy was working at the Rockefeller then (and it's great to be able to say all the rest of your life: "When I was at the Rockefeller..."), and he read all of Whipple's papers. When he got to Rochester, Whipple was still in reasonably good shape, and he too signed the book for Andy. Whipple was, of course, very old, and he underwent the inevitable decay. He died at 97, and as he died, Andy was listening to his heart. So there is the second connection.

Whipple was a Vermont Yankee with all that that means. He was a practical man, as I have already said, and like a Vermont Yankee, he was frugal. This shows at Rochester. Those of you who have visited the place know what the older parts look like, and that shows Whipple's frugality.

Whipple went to Yale, and at Yale he was an athlete. There was a story floating around Rochester to the effect that when Whipple was at Yale he played semi-pro baseball in the summer under an assumed name, was caught and was thrown off the

Yale team. I doubt that was true, but Whipple certainly liked athletics. When he built the Medical School at Rochester, he built a gymnasium for staff and students. One looks around other medical schools and has a hard time finding a gymnasium. Among his other ideas, Whipple thought medical students ought to have vacations, and they do at Rochester. Again, one looks at other schools and finds that is not the case.

Whipple went to Hopkins, and he graduated in the class of 1905, the last year that Osler taught there. He became a pathologist, as I have said, and this means that he was a student of William Henry Welch (3). I am not going to talk about Welch, except to say that he was the great man of American Medicine. He was a statesman of enormous importance. As Dean and Professor of Pathology he conducted a stable of future deans and pathologists. When some school needed a dean or a pathologist, the next man on Welch's list got the job. This was common phenomenon. At Harvard, for 30 years, the next man on Cannon's list got the job in physiology. At Yale, the next man got the job in biochemistry.

At Hopkins Whipple found his disease doing an autopsy. He also spent some time in the Canal Zone as a pathologist, but this is of not much importance. Then he went to California. At that time the only medical school of the University of California had its clinical years in San Francisco. There was a foundation, the Hooper Foundation, which provided a research job for a scientist. Whipple took the job as Director of the Hooper Foundation, and there began his work. To help him, he had a technician, a German woman named Frieda Robschheit. She is the F.S. Robschheit-Robbins who appears on the paper that was the genesis of a Nobel Prize.

Whipple became dean of the medical school in San Francisco. The school had its problems, one of which was the separation from the preclinical departments in Berkeley. By that time (1910-1920) the University of California had become one of the really great universities in almost any subject you want to mention: chemistry, physics, psychology, and the rest. Among the great departments were one or two preclinical ones. The department of Anatomy was dominated by a man named Herbert Evans (4). Herbert Evans was a great endocrinologist, and he was also a very peculiar man indeed. That is another story. In his department was a very junior endocrinologist named George Washington Corner, the first primate endocrinologist in the United States. Ovulation in monkeys was his subject then.

Early in the 1920's Whipple was invited to go to Rochester, New York, to found a medical school attached to the University or Rochester. I speak here about medical education in the '20's in this country. We deplore the '20's as the age of frivolity, of F. Scott Fitzgerald, but we forget that among the many accomplishments of the jazz age was the foundation of modern medical education. Contrast that age with the present we are so proud of, an age of the degradation of medical education marked by the deliberate proliferation of inferior schools. In the '20's the opposite process was going on, largely under the influence of Abraham Flexner and backed by Rockefeller money. New schools were founded; Duke was one, and Rochester was another, very good schools indeed. Some of the old ones were enormously improved, Iowa, Minnesota and so on. One object was geographical distribution. Rockefeller money, namely Flexner, thought there should be a good school in upstate New York. Syracuse was inspected and found wanting. Flexner decided instead to try to found a school in Rochester. Now, upstate New York, as some of you know, is a peculiar place in many ways. Parts of it are very beautiful. The city of Rochester is a remarkable

city, first, for Eastman Kodak Company. Eastman had a vast amount of money, and he had already displayed a philanthropic bent by endowing the Eastman School of Music and the Dental Infirmary. He was ripe for being touched for a medical school. But there were many other high-quality industries in Rochester: Bond Clothes, Bausch and Lomb, Taylor Instruments, the manufacturer of ball bearings. It is a high-class industrial city with skilled and intelligent workmen. Flexner had a foundation on which to work, a reasonably good, small private university, the University of Rochester, with a good president. He was Rush Rhees. When you fly into the Rochester airport from the northeast you will just miss the stone wedding cake on the top of the Rush Rhees Library which commemorates him.

This is another story I won't talk about: how good places get going, the necessary combination of outside talent and money with inside talent and money. This is a subject you aren't interested in at present, but if you do go into academic administration you will become interested in why some places are good and some are not.

Whipple began in the early 1920's to build a medical school in Rochester with local money and with Rockefeller money. He bought a farm way out in the country, the Crittenden farm which is why the school is on Crittenden Boulevard. The first thing he built was an animal house. This is very important for two reasons. One is that he needed it for his research, which I will get to. The other is that in the early 1920's animal quarters were sinkholes of creation. You have no idea what animal quarters were like before Ben Cohen and those like him took over. When I was at Penn I couldn't go in to the animal quarters, because I would vomit. They were frightful, and that was a general characteristic of animal quarters. You pay for Ben Cohen's help, but it is worth what you pay. Whipple built what was then a high-quality animal quarters. He moved his faculty into it and then built the school. It was the original building from which the rest grew.

If you have seen Rochester you know that the medical school and the original hospital are one building made up of repeating units. Repeating units meant that forms could be moved from one unit to the next to save money on lumber. There were no traps on the sinks. Whipple managed to get the building code changed (he was skillful at things like that) so that he could save money. When I was at Rochester, the way to kill the man in the lab below was to pour ether down the sink, turn on the hot water and then throw a match down the sink. This was guaranteed to be effective, but I never tried it. Another piece of frugality was that there were no locks on the laboratory doors. Those of you who know my attitude toward locks know how much I appreciated that. If one trusts a person enough to have him work for you, he shouldn't be barred by a lock, and I deprecate the current atmosphere which makes it necessary to lock doors. There were other pieces of frugality such as no paint on the walls of the pre-clinical parts of the building, but I won't enumerate them all.

Whipple assembled a very good small faculty. All the persons he got turned out to have very distinguished careers. The man who ran the hospital was Nathaniel Faxon. That doesn't mean anything to you, but I knew him in his old age. He lived in West Falmouth on Cape Cod, but before that he ran the Massachusetts General Hospital. The bacteriologist was Stanhope Bayne-Jones. Corner was his professor of anatomy. You wouldn't recognize the surgeons and internists. He had, I believe, only eight departments, in contrast to the 57 or whatever it is that Michigan has. There are advantages in having a small number of departments.

Whipple's professor of physiology was Wallace Fenn who was 31 when he was hired. I think you know that when he died he was definitely the premier American physiologist. The last time I saw

Fenn we had dinner together at the Michigan League. He said: "We had nothing else to do but research." This was the days before grants, and Fenn did really distinguished research without Federal grants.

Whipple had many progressive ideas. I've already mentioned the gymnasium and vacations. Another was to provide fellowships for medical students who wanted to drop out for a year to work in one or another department. Most of you are too young to remember that this was a great new idea of the N.I.H. back in the '50's some 30 years after Whipple had it. There were two students in Pathology; the reason was that a man who was Whipple's boy was made. Quite properly. This is one of the reasons that, over the years, Rochester has had such an impact upon American academic medicine.

One of the men who had students working with him was Corner. I knew Corner very slightly, chiefly by having lunch with him in the faculty cafeteria. I have the distinction of having broken his quartz transilluminator. This was the days before the plastic ones. I was trying to see whether the oxyntic cells of a rat's gastric mucosa accumulated a dye. I broke the rod, but he didn't seem to mind. He had a medical student working with him between the freshman and sophomore years, a boy named Willard Allen. At that time it was known that estrogens had something to do with the development of endometrium, but it was obvious there was something else. That something else was progesterone, and it was got out by a student who had stopped to work with Corner. He could do that because Whipple provided the opportunity. Allen became the gynecologist at Washington in St. Louis. He had a very distinguished department. I point out here that you endocrinologists must know the difference between Edgar Allen and Willard Allen. If you don't you have no business being here. (Who was Edgar Allen? He, too, had a connection with St. Louis, but St. Louis University, not Washington in St. Louis. He was professor of anatomy there. Because Papanicolaou had shown that you could tell the stage of the estrous cycle of a rat by vaginal smears, Edgar Allen and the professor of biochemistry, a man named Doisy, went down to the slaughter house to get a bucketfull of pigs' ovaries. What did they get out? It was theelin, wasn't it?)

Let's get on with Whipple's research. Much of it was ephemeral, as, indeed, most research is ephemeral. Most research has absolutely no consequence except being published and then forgotten. The question he asked at the Hooper Foundation was: "What supports the formation of hemoglobin?" The method he used was a very simple one. First, he got chronic dogs. Again, you don't realize how important it is to have chronic animals, because you always have them. In the old days, you didn't. They would all die of some disease before you were finished with them. You only used acute dogs which you could kill the day after you received them. They would smell frightfully, for they hadn't been bathed and perfumed, and they hadn't been immunized. But Whipple did use chronic dogs. He had a kind of hunting dog, and he produced anemia by the simple process of bleeding them twice a week. He would get their hematocrit to some standard level, somewhere near 30% (a dog's hematocrit is normally 50%), and the dog would be anemic. He kept on bleeding the dog to keep the hematocrit at 30%. It's obvious that the law of the conservation of matter applies here: the amount of hemoglobin you take out in a week to keep the hematocrit at 30% is the amount of hemoglobin the dog made the week before. It's a very simple idea, indeed.

Whipple had a kennel of "standardized biological machines." There are stories about these dogs. There was a lot of huntin', shootin', and fishin' around Rochester, and these dogs were

hunting dogs. Someone took one out hunting, a dog with a low hematocrit. He got 5 miles out in the woods, and the dog collapsed and had to be carried all the way back to Rochester.

This very simple method established the requirements for the formation of hemoglobin. You feed the dog something and see how much hemoglobin it makes. You feed it liver. You feed it brain. You feed it skeletal muscle or whatever you want. But first you have to feed it a minimal diet. Whipple worked out what was called a salmon loaf. I'm not sure why it worked, for salmon contains a lot of high-quality protein. He found, for example, that if you mixed the salmon loaf by machine, it was better for hemoglobin than if you mixed it by hand. I think the reason was that the machine was rusty and supplied the dogs a little more iron. I don't think Whipple really ever sorted out all the requirements.

Later, at the time I was in Rochester, the fundamental, pioneer work on radioactive iron was being done in Whipple's department by a man named Paul Hahn, and I recommend that classical work to you (5). It is, by the way, one of the reasons I never put my name on papers of my students or collaborators unless I have done a substantial amount of the work myself. When the papers were written by Paul Hahn, he practically had to hog-tie the old man to read the MS. The authors are Hahn, Ross (a Fellow who was my friend), Bale (who built the counters) and Whipple, but they were cited as "Whipple has shown that ..."

Whipple fed liver to his dogs, and he found liver was best. The dogs made more blood. Now, here is a good question for a preliminary examination: *Why* is liver good for blood? You can tick off the answers yourself, but it took a long time to work them out.

Let me stop at this point to pay a tribute to Frieda Robscheit-Robbins. She was the woman who saw that Whipple's research on blood regeneration was done and done right. She had little formal training; she started out as a technician who knew what she was doing. The University of Rochester gave her a Ph.D., so she was Dr. Robscheit-Robbins. When I was at Rochester I had very little to do with her, for I was very junior and she was very senior indeed. But I did have something to do with her when I was President of the American Physiological Society and she was President of the Society for Experimental Pathology, which is pretty good for a technician without much formal training. The older persons who attended Federation meetings in those days will remember her. She was always beautifully dressed, and her hair was elegantly coiffured. She wore striking hats and real diamonds. She was a lady of considerable presence.

Whipple's demonstration that liver is good for blood was picked up by George Minot. It is perfectly obvious he was a Bostonian, for Minot is one of those names like Cabot (6). Minot was a Harvard hematologist. He was also a very fragile diabetic, and he just made it to 1923. You don't realize that the diagnosis of diabetes was a death sentence before 1923. He was interested in pernicious anemia. Pernicious anemia is called pernicious anemia because you die of it. Your hematocrit keeps going down until you fall over dead.

I did have some relations with Minot as I will show you later. Here is something from him I am saving for my children. I sent him some reprints of my papers, and I got this note from "Dr. George R. Minot, 71 Sears Road, Brookline, Massachusetts. Dear Dr. Davenport, I received at the Thorndike today the copies of your recent papers. I have just read them this evening. They are first rate. Thank you very much for sending them to me. Sincerely yours, George R. Minot. July 1, 1940." I show you this not to point out that my papers were first rate. As a matter of

fact, they turned out to be preposterously wrong. But I point out that a man who was a Harvard professor, a very distinguished hematologist, a man with a Nobel Prize, could take the trouble one evening to go to his desk, pull out a piece of paper and write to a very junior person a note of thanks and appreciation. That's something to remember, that it never does any harm to tell a person what you think, especially if it is something good, as he did here.

Minot, as I have said, was interested in pernicious anemia, an incurable disease. He read Whipple's paper in the *American Journal of Physiology*, and he said: "Aha; if liver is good for dogs, maybe it's good for men. Let's try it on patients with pernicious anemia." He fed them raw liver, at one-half pound a day. I am told that some of the patients, after a while, would rather be dead than eat a half pound of raw liver a day. The end result was this paper: *Treatment of pernicious anemia by a special diet*. George R. Minot, M.D., and William P. Murphy, M.D., Boston. This is the paper in the *J.A.M.A.*, August 14, 1926, which resulted in their getting the Nobel Prize along with Whipple. Murphy got the Prize, whereas Frieda didn't.

The paper (7) has a long and confused introduction on the subject of the dietary treatment of pernicious anemia. You must remember that in 1926 nutrition was just beginning to be an exact science. Minot and Murphy recognized that "The most important recent work concerning the effect of food on blood regeneration has been done by Whipple and Robscheit-Robbins and their associates." So, "Following this diet, all patients showed a prompt and distinct remission of their anemia ... except for pronounced disorders due to spinal cord degeneration."

Now I must explain my association with Whipple and why I was in Pathology. My first independent work in science was the demonstration that carbonic anhydrase is in the parietal cells. As you know, pernicious anemia is associated with atrophy of the acid-secreting part of the stomach. I was interested in acid secretion and the components of the cells secreting acid. I very well remember the Sunday morning in Oxford when I woke up thinking that carbonic anhydrase is not only in the cells secreting acid but in the red blood cells as well. When one has pernicious anemia there are no cells secreting acid in the stomach. Is there a connection?

I don't know whether there is a connection by way of carbon anhydrase. It has never been pursued. But, as I say, I got my degree at Caltech in 1939. There weren't any jobs, and Caltech wasn't very good at getting jobs. So I wrote an abstract of my thesis and sent it to three persons I thought might be interested. One was Ajax Carlson, and I'm very pleased I didn't get a job with him. I sent it to Minot, but of course he didn't have a job for someone who was not an M.D. I sent it to Whipple, and Whipple offered me a postdoctoral fellowship, a Lilly Fellowship, at \$1,800 a year. I was delighted to accept; it was a very good offer. The reason Whipple had the money was that he tested liver extracts for Eli Lilly, and Lilly gave him a sort of drawing account. I think he spent something around \$300,000 in his scientific life.

Whipple was working on other things I won't talk about: the life of red blood cells, the effects of chloroform on the liver - an important topic a long time ago. Another thing he did was to turn his first idea around. He took out blood, centrifuged it, returned the red cells and kept the plasma. This is plasmaphoresis. He asked: What makes plasma proteins? He got good results, and there is a *Physiological Review* on plasma proteins by Madden and Whipple which is still worth reading (8). This was, of course, before the days of electrophoresis, the days before the exact characterization of proteins and the days before metabolic

isotopes. In addition, Whipple had a very good Department of Pathology full of persons doing good physiological research. It was a long time before I caught on to the fact that it was different from the general run of pathology departments.

Whipple had other accomplishments in academic statesmanship, but I won't talk about them. I've talked enough, and it's getting hot. My wife and I will now provide some food and drink for you. Among the things to eat will be some liver, and as you eat the liver, remember Whipple showed that liver is good for blood, and say a silent prayer for the repose of his soul.

REFERENCES

1. Corner, G.W.: *George Hoyt Whipple and His Friends*. Philadelphia; J.B. Lippincott Company, 1963.
2. Davenport, H.W.: *Physiology of the Digestive Tract*. 4th ed. Chicago. Year Book Medical Publishers, 1977, pp. 83, 181.
3. Flexner, S., and Flexner, J.T.: *William Henry Welch and the Heroic Age of American Medicine*. New York: Dover Publications, 1966.
4. Corner, G.W.: Herbert McLean Evans. In: *Biographical Memoirs*. Washington, D.C., National Academy of Sciences, 1974, pp. 153-192.
5. Hahn, P.F., Ross, J.F., Bale, W.F., and Whipple, G.H.: The utilization of iron and the rapidity of hemoglobin formation in anemia due to blood loss, *J. Expt. Med.* 71:731-736, 1940.
6. Castle, W.B.: George Richards Minot. In: *Biological Memoirs*. Washington, D.C., National Academy of Sciences, 1974, pp. 337-383.
7. Minot, G.R., and Murphy, W.P.: Treatment of pernicious anemia by a special diet. *J.A.M.A.* 87:470-476, 1926.
8. Madden, S.C., and Whipple, G.H.: Plasma proteins: their source, production and utilization. *Physiol. Rev.* 20:194-217, 1940.

SYMPOSIUM: BASIC BIOLOGY OF MUSCLES

The Society of General Physiologists will sponsor a symposium "Basic Biology of Muscles: A Comparative Approach" September 10-13, 1981 at Woods Hole, Massachusetts.

The purpose of the symposium will be to examine basic mechanisms of muscle function in a wide variety of muscle types.

Further information can be obtained from Professor Betty M. Twarog, Department of Anatomical Sciences, Health Science Center, S.U.N.Y. at Stony Brook, Stony Brook, N.Y. 11794

CENTENNIAL CELEBRATION

As part of the Centennial Celebration of the American Physiological Society, we have invited the Smithsonian Institution to consider joining in the commemorative activities. To this end, an ad-hoc committee of interested Smithsonian Staff and the Task Force Director, was established in 1979. One of the activities now in planning will be an exhibition during 1986-87, on *A Century of American Physiology - Its Meaning to Man*. The following note is being published to stimulate the loan or gift of physiological equipment to the Smithsonian Institution to enrich the Smithsonian Institution collection.

Recently Sir John Eccles visited the National Museum of American History formerly the Museum of History and Technology to view and reminisce about the machine with which he gathered data on the function of the brain which earned him the Nobel Prize in 1963. The electrical stimulating and recording unit (ESRU) was designed and built by Jack Coombs in New Zealand for Sir John, then brought to Australia where he used it extensively, then to Chicago and on to Buffalo. From Buffalo it was sent to the museum in 1976 where it remains to be preserved for posterity. This reunion of man and machine points up the fact that the museum is collecting significant physiological apparatus or parts thereof to add to its small collection of laboratory pieces. This is a particularly propitious time to search for apparatus which played a role in unique and important experiments since the 100th anniversary of the American Physiological Society is approaching in 1987. Should any reader locate some material which appears to be a likely candidate for preservation in the National Museum please contact Dr. Audrey B. Davis, MAH 5000, Smithsonian Institution, Washington, D.C. 20560.

MIT SUMMER COURSE

Massachusetts Institute of Technology will offer a one-week elementary course in Design and Analysis of Scientific Experiments, June 22-27, 1981. Applications will be made to the physical, chemical, biological, medical, engineering, and industrial sciences, and to experimentation in psychology and economics. The course will be taught by Professors Harold Freeman and Paul Berger. Further particulars may be obtained by writing to the Director of Summer Session, Room E-19-356, Massachusetts Institute of Technology Cambridge, Massachusetts 02139.

NOTES FROM CAPITOL HILL

The *NIH extra mural program* has been maintained in the FY81 and 82 budgets proposed by President Reagan. About 4900 new and competing renewal grants will be funded for both years. This is near the long-range target of 5,000 such grants we have proposed, and achieved, in past years. The increased funding to cover inflation is a modest 7%.

Training Grants are the target for the largest cuts at NIH in both the FY81 and 82; not the number of trainees, but the departmental allowances and institutional overhead. This allowance (for equipment, supplies and faculty salaries) enables departments to enrich the training environment, and many scientists I have talked with think it is very important.

A short letter to your Congressman or Senator giving your views on these programs and one local example would be most useful; particularly if you live in the district and/or states (both House and Senate) of the Appropriations Subcommittee members:

<u>House</u>	<u>Senate</u>
William Natcher (KY)	Harrison Schmitt (NM)
Neal Smith (IA)	Ted Stevens (AK)
David Obey (WI)	Lowell Weicker (CT)
Edward Roybal (CA)	Mark Andrews (ND)
Louis Stokes (OH)	James Abdnor (SD)
Joseph Early (MA)	Warren Rudman (NH)
Bernard Dwyer (NJ)	Arlen Specter (PA)
Jamie Whitten (MS)	Mark Hatfield (OR)
Silvio Conte (MA)	William Proxmire (WI)
George O'Brien (IL)	Robert Byrd (WV)
Carl Purcell (MI)	Ernest Hollings (SC)
Robert Livingston (LA)	Thomas Eagleton (MO)
John Porter (IL)	Lawton Chiles (FL)
	Quentin Burdick (ND)
	Daniel Inouye (HI)

Address: House Office Building
Washington, DC 20515

Senate Office Building
Washington, DC 20510

The basic authority for training grants (National Research Service Awards) is up for renewal. The Administration will try to

remove the mandate that departmental allowances and overhead be paid. Mr. Waxman had introduced HR 2562 extending Training Grant Authority for one year instead of the previous three years. The "probationary" period in which no payback will be required will be extended from three months to one year. Unfortunately, the bill sets a lower authorization than last year's appropriations: there will be a cut in the FY82 funds. The Senate version is S800.

A group of Physiologists will testify supporting authorization extension for three years, raising the authorization limits and *allowing* the payment of departmental allowances and institutional overhead.

Your views would help, particularly if you live in the district and/or states of the following subcommittee members:

<u>House</u>	<u>Senate</u>
Henry Waxman (CA)	Orrin Hatch (UT)
James Scheuer (NY)	Robert Stafford (VT)
Thomas Luken (OH)	Dan Quayle (IN)
Doug Walgren (PA)	Paula Hawkins (FL)
Barbara Mikulski (MD)	Don Nickles (OK)
Ron Wyden (OR)	Lowell Weicker, Jr., (CT)
James Florio (NJ)	Gordon Humphrey (NH)
Anthony Toby Moffett (CT)	Jeremiah Denton (AL)
Richard Shelby (AL)	John East (NC)
Phil Gramm (TX)	Edward Kennedy (MA)
Mickey Leland (TX)	Jennings Randolph (WV)
Edward Madigan (IL)	Harrison Williams, Jr., (NJ)
Clarence Brown (OH)	Claiborne Pell (RI)
William Dannemeyer (CA)	Thomas Eagleton (MO)
Bob Whittaker (KS)	Donald Riegle, Jr. (MI)
Don Ritter (PA)	Howard Metzenbaum (OH)
Cleve Benedict (WV)	
Thomas Bliley, Jr., (VA)	

When writing, an example from the district/state is very helpful. Who knows? It may appear in the Congressional Record. Each letter should be limited to one topic--clearly identified in the first paragraph--and one page.

Brian A. Curtis
Public Affairs Committee

LEGISLATION AND ANIMAL EXPERIMENTATION

PHYSIOLOGISTS: BE AWARE!!!

Earl H. Wood
President, American Physiological Society
and
Helene C. Cecil
Chairman, Animal Care and Experimentation Committee

Nationwide, humane societies and members of the animal rights movement have strongly supported federal legislation proposing alternatives to animal experimentation, as well as state and municipal legislation to repeal the use of pound animals for medical research. A consequence of legislation to reduce or eliminate the use of animals in research would be a reduction in the research capabilities of the biomedical community. All biomedical scientists should be aware of pending legislation affecting the use of animals in research and be willing to voice their opinions to the legislators. In addition each of us should become aware of the objectives of the various segments of the animal rights movement and identify those objectives which pose a threat to the reasonable use of animals for biomedical research in accredited institutions in this country.

ALTERNATIVE METHODS LEGISLATION

"Alternative methods," also known as "alternatives to laboratory animals," are methods which would provide "alternatives" to the use of experimental animals in research and which would replace animals in research. These alternative methods are: tissue culture, *in vitro* techniques, radioimmunoassay, models and dummies, use of computers and refined analytical techniques, and plants and lower organisms. Since the 97th Session of Congress convened, four pieces of alternative methods legislation have been introduced and referred to the Subcommittee on Science, Research and Technology.

H.R. 556 - The Research Modernization Act: The Research Modernization Act was drafted by the United Action for Animals and was originally introduced in the 96th Congress by Congressman Richmond (D-NY) as H.R. 4805. Congressman Robert Roe (D-NJ), as ranking majority member of the Science and Technology Committee, along with Congressmen Hollenbeck (R-NJ) and Richmond, re-introduced it in the current session. H.R. 556 proposes to establish a National Center for Alternative Research which would develop and coordinate alternative methods of research and testing which do not involve the use of live animals. The Center will be composed of representatives from each federal agency which conducts or sponsors research and testing involving the use of live animals. HR 556 states "Effective in fiscal 1982, each agency represented within the Center will direct to the development of alternative methods of research and testing no less than 30% and no more than 50% of all appropriations made available to such Agency for all research and testing programs conducted or sponsored by such Agency involving the use of live animals."

The Research Animal Alliance has estimated that the funding formula of HR 556 could result in the redirection of upwards of \$1 billion from animal research to alternative methods of research; this could have a catastrophic impact on biomedical research. The National Society for Medical Research has analyzed HR 556 and has concluded that:

1. "Redirection of funds is the primary goal of the bill and is a plan to stop animal research by cutting off funds at their source."
2. "The bill ignores the fact that alternative methods have been utilized as soon as they have been demonstrated to be appropriate."
3. "The public is concerned about the validity of safety and efficacy testing to reduce risks to the public. If this can best be established by animal testing, the public accepts it."
4. "A vocal minority will always be opposed to the use of animals in research."

H.R. 220 - The Humane Methods of Research Act: This bill was originally introduced in the 96th Congress by Congressman Robert Drinan (D-MA) as H.R. 282. The bill has been re-introduced in the current session by Congresswoman Geraldine Ferraro (D-NY). H.R. 220 authorizes that \$12 million of *new money* be appropriated each year, for five years, for grants to study and utilize alternative methods. This bill proposes to promote the development of research methods, experimentation, and testing that minimize the use of live animals.

H.R. 930 - Protection of Animals in Research Act: This bill was introduced by Ted Weiss (D/Liberal-NY) in both the 96th (H.R. 4479) and the current session of Congress. It proposes to establish a Commission to study alternative methods to the use of live animals in laboratory research and testing. The Commission would have a life-span of five years and an annual budget not to exceed \$750,000 per year.

H.CON.RES. 38: G. William Whitehurst (R-VA) introduced this concurrent resolution in the last session of Congress (H.Con.Res. 26) and just reintroduced it in the current session. It resolves that the federal government should take appropriate steps to develop new research methods not using live animals. It also states that no federal funds should be provided for research projects using live animals if alternatives exist.

These four pieces of legislation have been referred to the Subcommittee on Science, Research and Technology. If hearings are to be held on any of the above-mentioned legislation, they will most likely be heard in this Subcommittee.

DEMOCRATS

Doug Walgren (PA) - Chairman
(replaced George Brown as Chairman)
George E. Brown, Jr. (CA)
(ranking majority member)
Robert Shmansky (OH)
Mervyn M. Dymally (CA)
Stanley N. Lundine (NY)
Allen E. Ertel (PA)
Ralph M. Hall (TX)
Dave McCurdy (OK)

REPUBLICANS

Margaret M. Heckler (MA)
(ranking minority member)
Vin Weber (MN)
Judd Gregg (NH)
Joe Skeen (NM)
Edwin B. Forsythe (NJ)

Biomedical scientists should read these bills and send their individual views on these bills to their representative and also to the Chairman of the Subcommittee:

The Honorable Doug Walgren, Chairman
Subcommittee on Science, Research and Technology
2319 Rayburn House Office Building
Washington, D.C. 20515

The public expects the biomedical community to alleviate human suffering caused by disease and to make new scientific advances in the cure of diseases. However, there is also a growing public concern for animal welfare and more recently, proposals that "alternatives" be found for experimental animals. Proponents of "alternatives" to experimental animals argue that scientists are insufficiently aware of techniques of tissue culture, etc., which could replace animals in many branches of biomedical research; and that scientists are unlikely to employ and develop alternatives unless forced to do so by legislation. Scientists in academia, government, and industry can reply that they themselves have been entirely responsible for the development of methods which replace animals in research; and scientists do not require further incentive from the public or legislation to continue the development of these methods. The public -- and the lawmakers -- are understandably confused.

Physiologists are, and must be, in the forefront of the battle to maintain rationality in the growing controversy of using live animals in biomedical research. The British Physiological Society has become concerned by the increase in influence of the "Alternative Methods" proponents in their country and is setting up a united front of all biomedical scientists to forestall the passage of Alternative Methods legislation by Parliament. This danger of "alternatives" legislation passing is particularly acute at this time because, within reasonable but crucial limitations, protection of animal rights, and use of alternative methods seem logical and morally correct. Consequently, the adherents of these movements are largely well meaning and respected individuals including scientists who are not antivivisectionists. However, the current leadership of these movements does include some respected but misguided scientists who are at heart antivivisectionists, but disguise their true objectives under the cloak of these highly ethical movements. It is important that the biomedical community be aware of the potential danger of immoral use of these movements for antivivisection purposes because biomedical research can be subverted in the minds of the uninformed public and legislators to provide a platform for the passage of restrictive legislation to biomedical research. Physiologists should be aware of this danger and be willing to make their views, concerns, and scientific expertise available to legislators either at the local or national level.

Pound "access" laws require that impounded animals that have not been claimed within a prescribed period of time be made available for medical and scientific research and training. After that prescribed period of time all unclaimed pound animals can be destroyed. Approximately 13 million pound animals were destroyed last year in the United States, while approximately 200,000 were used in research. Therefore, the central issue is "Should pound animals be made available for research and teaching purposes, or should they all be killed without providing any benefit to mankind or animal kind?" The realization that the use of 20 pound dogs resulted in the discovery of insulin should convince anyone that the restriction of the use of pound animals for research is not in the best interest of man and animals.

Last year New York, Wisconsin, and Orange County (California) voted to restrict the use of pound animals for medical research, and efforts to repeal pound laws continue in many states. The next few paragraphs summarize the actions being taken at state and municipal levels to repeal laws authorizing pound animals for medical research.

California: The Orange County Board of Supervisors voted to close that pound to the release of animals for medical research on November 25, 1980. The City of Los Angeles, the County of Los Angeles, San Bernadino County, and San Diego County are reviewing the use of animals from their pound systems for medical research. The Animals in Research Advisory Committee of the Los Angeles City Board of Animal Regulations, after a year-long study, released a lengthy document in October, 1980, which recommended that pound dogs not be available for use in medical research.

Massachusetts: A variety of bills have been introduced in the Massachusetts legislature to repeal the pound law. House Bill 1245, the most comprehensive of the bills, was drafted by the Massachusetts SPCA. This bill, would repeal Chapter 49A of the General Laws (pound access law), and prohibit giving, selling or turning over of any animal which comes into the custody of a dog officer or municipality to any research facility or animal dealer licensed/registered with the U.S. Department of Agriculture. Another bill, House 3546, which is also in the House Committee on Counties, would absolutely prohibit the sale of animals from pounds to licensed research institutions.

Michigan: A coalition led by the Michigan Humane Society Animal Protection Bureau is being formed to repeal the Michigan pound law.

Minnesota: A bill was proposed to repeal a 1949 state law that requires tax-supported animal pounds to provide dogs and cats to research institutions after a five-day period in which they aren't claimed. The Minnesota House General Legislation and Veterans Affairs Committee heard testimony in February, 1981 and the bill was defeated in committee, but is being reintroduced into the Senate.

New York: The New York state legislature repealed the Metcalf-Hatch Act and thereby repealed the mandate to release unclaimed, unlicensed dogs for medical purposes.

Virginia: In Virginia, an animal welfare group known as "Action 81-Citizens vs Dognapping" has been working actively to prohibit sale of pound dogs to out-of-state dealers. Apparently, Virginia is the source of many dogs used by research institutions in New York, Pennsylvania, New Jersey, and Maryland. Action '81, during testimony before the Virginia legislature, stated that they were not opposed to the use of animals in research; however, they are convinced there is a serious dognapping problem in Virginia. They went on to say that the only way to curb

dognapping was to prohibit the sale of dogs to out-of-state dealers. This bill passed the House by an overwhelming majority. The Senate version of the Bill, 1407, was voted out of the Senate Agriculture Committee and will now be voted on by the full Senate. For the time being, pound dogs will still be available to licensed research institutions located within the state of Virginia.

Wisconsin: In Wisconsin the State Legislature repealed the pound law through an amendment tacked onto a mandatory rabies bill, which changed the wording of the law from " *mandatory disposition* of dogs to medical research facilities" to "having the *option* of releasing dogs to the Medical College of Wisconsin, the University of Wisconsin Medical School, and other state chartered institutions of higher learning." The Wisconsin Humane Society voted 20-1 *not* to supply any dogs for research. This law became effective in January, 1981.

In two cases vigorous work by local scientists overcame the well orchestrated efforts of opponents of research involving animals.

California: Last year the Medical Research Association of California (MRAC) played an important role in testimony against a bill in the state legislature which would have made it a crime to release any animal from a public pound or animal shelter to a research laboratory. The MRAC encouraged scientists to write letters and to testify in opposition. The National Society for Medical Research also encouraged scientists from outside California to express their concerns for the bad precedent the bill represented. The testimony, both pro and con, was heard before the Senate Agriculture and Water Resources Committee, but no motion was made by any of the Committee members to move the bill, thereby the bill was dead.

Minnesota: A similar event occurred in Minnesota in February, when scientists from the University of Minnesota and the Mayo Clinic testified at Committee hearings on a bill to repeal the use of pound animals in Minnesota, and their testimony resulted in the defeat of the bill. Both the local and national humane societies testified at these hearings. Michael Fox, D.V.M., a major spokesman for the Humane Society of the United States, was given headline treatment in a major St. Paul newspaper and a statement from him was read into the legislative hearings on the bill to repeal the Minnesota pound law. The reasons used by the antivivisection elements of animal rights and humane societies are always the same:

1. Pound animals are pets which their owners didn't miss until it was too late.
2. Pound animals are not useful for research anyhow.
3. Dealers can supply all the animals really needed.
4. Animals should not be used in most research anyhow.
5. Alternative methods such as tissue and cell culture or mathematical modelling are adequate and could virtually eliminate the cruel and inhumane animal experimentation that now goes on.

They protest loudly that they are not antivivisectionists, that they only want to humanize animal use. However, they are doing their best to make dogs, for example, so expensive that few, if any, academic laboratories could afford to undertake a research project involving the use of large numbers of such animals.

All of us should be aware of this danger and, whenever the opportunity arises do our best to alert and educate our colleagues and the general public as to the apparently laudable objectives of these movements but which, when misguided, could lead to passage of local and/or federal legislation which would very seriously hamper biomedical research in this country for years to come.

INVITATION TO MEMBERSHIP IN THE NSMR

The National Society for Medical Research for almost 35 years has sought to promote better public understanding of the principles and humanitarian goals of biomedical and behavioral research. Physiologists originally stimulated the founding of NSMR, and the organization continues today to defend the rights of biomedical/behavioral scientists to use animals humanely and judiciously in research for the benefit of human and animal welfare. APS members and other interested persons, are invited to become members and supporters of NSMR. Checks should be made payable to the National Society for Medical Research, and mailed to 1029 Vermont Avenue, N.W., Suite 700, Washington, D.C. 20005.

Categories of membership and contributions are:

Associate (\$15)	A.J. Carlson Club (\$100-\$999)
Active Member (\$25)	Benefactor (\$1,000 or more)
Patron (\$50-\$99)	

UNIVERSITY TEACHING AND ADVANCED RESEARCH
ABROAD

More than 500 Fulbright awards in over 100 countries are now open to application for university teaching and postdoctoral research in 1982-83. Most awards are for 4-9 months, with an increasing number of research openings. Applications are due June 1, 1981 for the American Republics, Australia and New Zealand; and July 1, 1981 for Africa, Asia, Europe and the Middle East. Just off the press and available on request is a booklet listing these opportunities. Prospective applicants should indicate preferred listed opening(s) in requesting application materials. Additional information and award terms will be provided when available.

Several countries have requested Fulbright scholars in the field of BIOLOGICAL SCIENCES. *Australia* : metabolites from Australian marine organisms*; *Austria* : population ecology and genetics or development biology of invertebrates; *Colombia*: ecology or environment; *Egypt*: clinical bacteriology; *Honduras*: marine biology; *Ireland*: bovine physiology/ova freezing or muscle biochemistry/physiology/histochemistry/ultrastructure; *Ivory Coast*: molecular biology and/or animal physiology; *Jordan*: genetics; *Mexico*: marine ecology, botany, or zoology; *Morocco*: biology; *New Zealand*: movement of bacteria through soils and gravels*; *Pakistan*: marine biology; *Philippines*: biology, ecology and environment; *Sri Lanka*: fisheries biology; *Sudan*: marine biology*; plant/environmental physiology; vertebrate pests; *U.S.S.R.*: several specialized fields.

Many of the programs also encourage applications in any or several fields. (An asterisk indicates a research opportunity.) Regionally funded and special programs: Africa research, American Republics research, Indo-U.S. Subcommission research, Near East/South Asian short-term lectureships. Country programs: Argentina*, Austria*, Belgium*, Brazil*, Denmark*, Egypt*, Finland*, France*, Germany*, Greece*, Iceland*, India*, Israel*, Italy*, Korea*, United Kingdom*.

An applicant must be a U.S. citizen and have appropriate academic and experience credentials. Eligible scholars not available for 1982-83 but interested in a later possibility, may qualify to receive major announcements for the next two years by completing a registration form available from the Council for International Exchange of Scholars, Dept. N, Eleven Dupont Circle, N.W., Suite 300, Washington, D.C. 20036. Begun in 1947, largely with U.S. war surplus funds, the Fulbright program has become in many countries a binational, cooperative exchange. Direction of the program is a function of the U.S. International Communication Agency. From the beginning, the principal U.S. administrator for university teaching and advanced research has been the Council for International Exchange of Scholars.

A series of articles was started in *The Physiology Teacher* Section of *The Physiologist*, Vo. 21, No. 6 under the Guest Editorship of Dr. Tidball. As the series developed and some other material appeared in *The Physiology Teacher*, it became clear that issuing a reprint of the collected papers with some additional articles and a glossary of terms relevant to the field was warranted. The volume is the product of the original articles, added matrix material, and some thoughts on the general subject of computers and laboratory teaching.

The collection has also stimulated a plan to consider development of other "reprint series" on various teaching (and historical) subjects. Precedence for reprinting collected papers from *The Physiologist* was made in 1973. Interestingly, the subject was "Computer Assisted Education" and Dr. Tidball played a leading role. This collection of articles initiates a new series which we plan to pursue on the general subject of physiology teaching. It has also stimulated some contemplation on current problems associated with the teaching of physiology to future physiologists who will engage in teaching and research, and to medical students who will a) practice medicine or b) engage in medical research or c) undertake both.

The contents of *Frontiers in the Teaching of Physiology: Computer Literacy and Simulation* include:

- An affirmation of Conventional Physiology Laboratory Exercises - C. S. Tidball
- Coping with Computer Terminology - C. S. Tidball
- An Overview of Computer Hardware - C. S. Tidball
- Doctors, Digits and Disks - C. S. Tidball
- The Analog (Computer) as a Physiology Adjunct; Part 1 - P. A. Stewart
- Teaching Computer Literacy and Physiological Simulation - C. S. Tidball
- The Analog (Computer) as a Physiology Adjunct; Part 2 - P. A. Stewart
- Teaching by Simulation with Personal Computers - J.E. Randall
- A computer Model of the Cardiovascular System for Effective Learning - C. F. Rothe
- Computer Simulation in the Physiology Laboratory - S. Katz, R. G. Hollingsworth, J. G. Blackburn, and H. T. Carter
- A Digital Computer Simulation of Cardiovascular and Renal Physiology - C. S. Tidball
- Physiological Simulation: An Assessment of its Advantages as Well as its Limitations - R. A. Standing and C. S. Tidball
- The volume is edited by Charles S. Tidball and M. C. Shelesnyak.

The format is based on *The Physiologist*. The volume is approximately 64 pages, including an extensive bibliography and an index. It will be available from the American Physiological Society, Education Office, 9650 Rockville Pike, Bethesda, MD 20014 for \$7.50 prepaid.

APS SECTIONS - HOW TO BECOME AFFILIATED

In compliance with the Society's Bylaws, a number of Sections have been organized encompassing various physiological specialty interests. These sections advise the Society on matters of interest to the specialty represented by the section, assist the Society in organizing scientific meetings, and nominate individuals for membership on Society committees.

Membership in the sections is open to all members of the Society. However, the Statement of Organization and Procedures for each section establishes specific requirements for membership. APS members who wish to become affiliated with one or more of the listed sections should comply with the requirements noted following the named Section. The reference shown beneath the name is the issue of *The Physiologist* where that section's Statement of Organization and Procedures has been printed.

<i>Cardiovascular</i> 23, No. 5 (Oct. 1980), p. 5	Send a letter requesting affiliation to the Membership Services Department of APS.
<i>Cellular and General Physiology</i> (Being organized)	Same as Cardiovascular.
<i>Comparative Physiology</i> 20, No. 6 (Dec. 1977), p. 14	Indicate a primary or secondary Interest Area Code #10 on the Membership Records Questionnaire.
<i>Endocrinology and Metabolism</i> 23, No. 5 (Oct. 1980), p. 8	Same as Cardiovascular.
<i>Environmental, Thermal and Exercise</i> 20, No. 6 (Dec. 1977), p. 15	Indicate a primary or secondary Interest Area Code #13 or #14 on the Membership Records Questionnaire.
<i>Gastrointestinal</i> 20, No. 1 (Feb. 1977), p. 5	Same as Cardiovascular.
<i>Nervous System</i> 21, No. 3 (June 1978), p. 25	Indicate a primary or secondary Interest Code #25 on the Membership Records Questionnaire.
<i>Renal</i> 20, No. 2 (Apr. 1977), p. 17	Attend Renal Dinner at the Spring Meeting.
<i>Respiration</i> 23, No. 5 (Oct 1980), p. 6	Indicate as primary or secondary Interest Code #32 on the Membership Records Questionnaire.

MEMBER CONTRIBUTIONS

Contributions to the Society may be made to the General Operating Fund or other designated purpose. The donor may commemorate an event or memorialize an individual.

We gratefully acknowledge the contribution from the following members.

Emeritus:

David I. Abramson	Joseph L. Johnson
Harry F. Adler	Robert A. Kehoe
Edward F. Adolph	Geoffrey Keighley
Fred B. Benjamin	Frederick W. Kinard
Chandler McC. Brooks	Nathaniel Kleitman
Carl A. Bunde	George F. Koepf
Hubert R. Catchpole	Henry D. Lauson
Aurin M. Chase	Aldo A. Luisada
J. Kapp Clark	Eleanor D. Mason
Madeleine F. Crawford	Hugh Montgomery
Phoebe J. Crittenden	Hayden C. Nicholson
Ray G. Daggs	Elizabeth Painter-Marcus
Lewis Dexter	Louis J. Pecora
Robert W. Dougherty	Walter Redisch
Richard W. Eckstein	Emerson A. Reed
Virginia M. Fiske	Richard L. Riley
Louis B. Flexner	Eugene Robillard
Florent E. Franke	Louise P. Roquemore
Anna Goldfeder	Francis O. Schmitt
Ashton Graybiel	Paul Sekelj
Paul O. Greeley	Nathan W. Shock
Henry B. Hale	George W. Stavrakys
John F. Hall, Jr.	J. Clifford Stickney
Chester W. Hampel	Roy L. Swank
Esther Hardenbergh	George W. Thorn
A. Sidney Harris	Marion E. Webster
Charles C. Hassett	Everett G. Weir
Raymond C. Herrin	Richard W. Whitehead
Joseph C. Hinsey	Tsai-Fan Yu
Ernst G. Huf	Anonymous

Other Members:

J. Garrott Allen	Hermann Rahn
Walter Ehrlich	Monica Reynolds
Eric C. Elliot	William D. Ruwe
Mary Anne F. Epstein	M.C. Shelesnyak
Jean R. Gontier	Nicolaas B. Strydom
Arthur C. Guyton	Judith B. Van Liew
Joseph E. Hawkins, Jr.	James Vorosmarti, Jr.
Vojin Popovic	

Others:

The Upjohn Co., Cardiovascular Disease Div. (Symposium support).

SYMPOSIUM ON THE RESPIRATORY SYSTEM: ANALYSES OF FUNCTION AND APPLICATIONS

The special Symposium on the Respiratory System will be held in conjunction with the 34th Annual Conference on Engineering in Medicine and Biology on September 21-23, 1981 at the Shamrock Hilton Hotel, Houston, Texas.

This two and one-half day symposium provides an opportunity for the discussion of a wide variety of pertinent respiratory-related topics by a number of invited experts. Additional papers, to be contributed by others actively engaged in respiratory research, are also solicited. The general objective of the invited papers is to present a critical perspective of current research areas for engineers as well as medical scientists. This perspective will summarize the evolution of theory and experimental techniques, describe our present state of knowledge, pose the questions which are currently important, and point out approaches which may or may not be worthwhile in answering them. Since the invited speakers have research experience from industry, government, medical centers, and universities, a broad spectrum of viewpoints will be presented. For additional information please contact:

John W. Clark
Electrical Engineering Dept.
Rice University
P.O. Box 1892
Houston, Texas 77001

HUMAN FACTORS ASSOCIATION OF CANADA

The Human Factors Association of Canada will hold its 14th Annual Meeting in Toronto on the 1st and 2nd of October, 1981. The theme will be: Man-Machine Systems. Human Factors is concerned with the application of life-science knowledge or techniques for the benefit of human well-being or performance in any setting. Topics could include: systems design, man/machine interface problems, environmental effects, manual materials handling, male/female differences, problems of the disabled, training, job satisfaction, etc.

A student paper competition will be held for the Julien M. Christensen Award. (Cash value \$100.00). A workshop series is planned to outline topical issues for people working in occupational settings. Suggestions for topics from potential contributors are welcomed.

Full papers will be printed in the conference proceedings and must be submitted to the conference secretary by 31 July 1981.

R.D.G. Webb, B.Sc., Ph.D.
Ergonomics Unit
School of Human Biology
University of Guelph
Guelph, Ontario N1G 2W1

ANNOUNCING AN International Satellite Symposium to the Fall Meeting of the American Physiological Society on COMPARATIVE PHYSIOLOGY OF RESPIRATION with emphasis on avian respiratory control October 11 and 12, 1981 to be held at OHIO STATE UNIVERSITY

Original papers on this subject are invited.

Publication of the papers is planned.

Limited funds will be available to assist participants traveling long distances, who would otherwise be unable to attend.

PLEASE USE THE 1981 FALL APS ABSTRACT FORM
AND MAIL TO THE
ADDRESS BELOW. DEADLINE FOR RECEIPT OF
ABSTRACTS IS JUNE 19, 1981.
FOR FURTHER INFORMATION PLEASE CONTACT:

Albert L. Kunz, M.D.
Department of Physiology
Ohio State University
333 West 10th Avenue
Columbus, Ohio 43210
(614)422-1991

EVOKED POTENTIALS SYMPOSIUM

The New York Academy of Sciences will sponsor an evoked potentials symposium on June 16-19, 1981 at the Barbizon-Plaza Hotel in New York City.

This is a multidisciplinary symposium lasting four days concerned with brain wave studies called evoked potentials, which are used in the exploration of the physiology of the human nervous system and as diagnostic tools in various branches of clinical neurology. A distinguished panel of eminent scientists from all over the world engaged either from basic or from clinical viewpoints of studying evoked potentials will give state-of-the-art lectures. Sessions will be devoted to systems analytical methods of data analysis, cranial surface identification, and the relationship of neuronal structures to evoked potentials. In addition, there will be clinical sessions. One day will be devoted to the roundtable sessions where invited experts will focus their discussion on specific "hot" issues of the field.

Dr. Ivan Bodis-Wollner, M.D., Dept. of Neurology, Mt. Sinai Sch. Med., One Gustave Levy Place, New York, N.Y., 10029 will be Chairman of the Symposium.

For further information contact: Conference Department, The New York Academy of Sciences, 2 East 63rd St., New York, N.Y. 10021. (212)838-0230.

NEWS FROM SENIOR PHYSIOLOGISTS

Burr Steinbach to Edward Adolph:

It was great to receive your letter. Indeed I am now 75.

The year I had next to you (1935?) was one of my best and I've always felt most appreciative. Unfortunately, I've now really retired - can't speak any more. Probably have a variety of amyotrophic, lateral sclerosis (ALS). So now I try to get back to writing. I still have working space both at Marine Biological Lab and Woods Hole Oceanographic. Susie and I send our fond regards. It would be great to see you. Aloha.

Woods Hole Oceanographic Inst.
Woods Hole, MA 02543

H. Hugh Dukes to Edward:

Thank you for my birthday greetings on my 85th birthday. It is good of the Society to remember it's old members in this way. I am glad to report that my health is generally good and that of my wife fair to good. We've been in this large retirement center -Scottish Rite Park - for nearly 7 years. We come and go as we wish.

2909 Woodland Avenue
Apt. 501
Des Moines, IA 50312

Jane Sands Johnson to Hallowell Davis:

This year I became 87. I'm still physically "spry" although there are several worn parts - the most difficult to accept is loss of hearing. Eyes are a problem but I can still read and write after a fashion.

In two weeks I will go to California to spend the winter with my son. After that I'll return to this home - a really pleasant place to live.

One of the unexpected bonuses of aging has been to learn that several whom I knew as colleagues in the APS have really been or become friends. Among these were George Fahr and Hiram Essex whose letters I enjoyed much.

Clara Welch Thanksgiving Home
Cooperstown, New York 13326

Joe Wearn to Hal Davis from his winter home in Yamassee, SC 29945:

I'm not very active but still hanging on (now 88 years). I've been out shooting a few times. The only writing I have done was an historical vignette, requested by Earl Wood, and published in *The Physiologist* in October 1980.

Robert Kehoe to Bruce Dill:

Thanks for your letter on my 87th birthday. I have been living quietly at home, am fully retired and though in fairly good shape physically, my vision is such that I can read only things written in over-large type. My wife and I continue with such mutual activities in which we can engage. Life is simple.

Highland Towers, Apt. 1504
1071 Celestial Street
Cincinnati, Ohio 45202

Raymond Herrin to Bruce:

Thanks for your 80th birthday greeting.

I entered Purdue University and S.A.T.C. in September 1918, I got a B.S.A. in June 1922. From July 1922 to August 1924 I tried to teach Voc. Agri. near Dayton, Ohio. I got my Ph.D. in Agri. Chem. in June 1928 and in September became an instructor in the Dept. of Physiology. I got my M.D. from the University of Chicago in December 1933. In July 1970 I retired from the University of Wisconsin. I praise my associate, Conrad A. Elvehjem. He taught me how to do research. We worked on Fe anemia in rabbits. Later he was to discover the role of CH₃ nicotinamide in pellagra. Then he became President of the University of Wisconsin. Harry Steenbock was a very stimulating teacher. He talked much about the problems needing solution. Homer Atkins, a very stimulating teacher of organic chemistry, was one of my professors. Walter J. Meek was wonderful, an effective teacher and stimulating friend. He was born near the hometown of President Eisenhower. He went to college despite his mother's objections. He taught at Penn College in Iowa before coming to Wisconsin; Arthur Tatum was in his classes. He lectured brilliantly on muscle, nerve and CNS to first year medics and graduate students. In World War II he was acting Dean. During this period he came to his classes very tired but you could see him pull himself together and give a very stimulating lecture. The Medical School had the honor system but it did not work. Dr. Meek required all of his teachers to give oral lab and lecture exams. I patterned my lectures and quizzing after Dr. Meek's style. This involved problem questions. The better the student, the more complicated the question. Dr. Meek could not find a question Dave Bradley, son of Dr. Harold Bradley, could not answer. His retirement in his 71st year, 1949, was a terrible loss. He dropped completely out of the picture and I still wonder why. He had diabetes and heart problems in his later years but lived to 1963, dying in Florida.

Univ. of Wisconsin Med. Sch.
Madison, WI 53532

Clinton Woolsey to Hal Davis:

I'm still busy every day at the lab when I'm not somewhere else in the world. At present I am editing for publication some 24 chapters of a book (or books) to be published on "Cortical Sensory Organization: Multiple Somatic, Visual and Auditory Areas," the papers prepared by the participants in a two-day symposium which I arranged for the FASEB Dallas Meeting. I am also editing 50 some abstracts of poster presentations of Chinese colleagues which were shown at an IBRO-UNESCO-NIH-Academia Sinica workshop held in Shanghai October 6-21, 1980. This workshop I organized with my former Hopkins associate Dr. H.-T. Chang on "New Techniques in Analysis of Neuronal Circuitry." This was a very interesting and successful meeting. *enclose a report prepared by Chang on the meeting.* Altogether, these are probably more than you need, but they will demonstrate that we manage to keep busy. On our way back from China we visited colleagues in Kyoto and in Tokyo, where I was invited to address the Tokyo Medical Society.

At present we are working on another IBRO workshop scheduled for November 14-18, 1981 in Algiers in North Africa. In this we seem to have exceeded our assignment as "IBRO Workshop Organizer for East Asia and The Western Hemisphere!"

I am working on the preparation for publication of final reports on several studies which were presented at National meetings, but have not appeared in journals. One of the most important of these I believe are data collected over the years on nine chimpanzees. Forty-five individuals took part in these studies on sen-

sory and motor areas, auditory cortex, visual cortex, cerebellum and dermatomes. Each experiment lasted from five to eight days. I expect to get at this material as soon as my present editing tasks are out of the way.

Clinton Woolsey
Dept. of Neurophysiology
Univ. of Wisconsin Med. Sch.
Madison, WI 53706

REPORT ON THE PROCEEDINGS OF IBRO-UNESCO-NIH-ACADEMIA SINICA WORKSHOP ON NEUROBIOLOGY IN SHANGHAI

H.-T. CHANG

The Shanghai Workshop on Neurobiology was held on October 6-21 in Shanghai Institute of Physiology, Academia Sinica, under the joint sponsorship and financial support of International Brain Research Organization, United Nations Education, Science and Culture Organization, National Institutes of Health of the United States and Academia Sinica. The purpose of this Workshop was to review the recent advances in the field of neurobiology with particular reference to the application of new techniques to the analysis of neuronal circuitry. The invited faculty members to the workshop included 23 scientists, of whom 11 came from the United States, four from China and one each from Algeria, England, France, India, Thailand, West Germany and Hong Kong. There were about 60 registered participants coming from various cities of China. Most of them are research workers and college teachers. In addition, there were about 200 volunteer listeners attending the scientific sessions.

On the 7th of October, 1980, Mr. Li Su, Deputy Secretary General of the Chinese Academy of Sciences announced the opening of the Workshop. Professor Te Pei Feng, the director of the Shanghai Institute of Physiology, Professor Clinton N. Woolsey, Director of the IBRO Workshop Program for Western Hemisphere and East Asia and Professor Hsiang-Tung Chang, Member of the Organizing Committee of the Shanghai Workshop, each made brief opening remarks. After the simple opening ceremony a photograph of the faculty members and participants in the Shanghai Workshop was taken in front of the Physiology Building, where the Workshop was held.

The scientific programme was arranged in such a way that the lectures were presented in the morning sessions and discussions, demonstrations and movies in the afternoons. Among the forty-five lectures given by the faculty members, 14 were on vision, 7 on audition, 12 on somatic motor and sensory systems, 6 on cerebellum and vestibular system and 6 on miscellaneous. An ad hoc session for discussion on recent advances in techniques in neurobiology was held on one afternoon with Dr. Thomas Woolsey and Dr. N. Kotchabhakdi as the principal speakers. There were five general areas encompassed in this session: 1. historical background, 2. axonal transport, 3. fluorescence and biochemical, 4. single neuron methods and 5. local circuit analysis.

Two afternoons were arranged for poster sessions in which 52 posters with illustrations and abstracts of the Chinese research works in the field of neurobiology were displayed in the hall of a nearby building. The works reported in the posters are mainly

those done in the last few years, from which one may get a glimpse of the present status and trend of neuroscience in China, although they are confined only to the works by participants of the present workshop and certainly cannot represent the research activities in neuroscience of the whole country. The faculty members from abroad showed great interest in the poster session of the workshop, because it was the first time in history that the results of the research activities of the Chinese neuroscientists were exhibited *en masse* with the authors present and ready to answer questions raised by the reviewers. For the young Chinese scientists, it has provided a good opportunity to exchange ideas with renowned neuroscientists on subjects of mutual interest.

It should be mentioned that English was used as the working language of the Workshop. Being fully aware of the language difficulties, which might be a serious barrier in communications and discussions between the Chinese participants and the foreign faculty members, the Organizing Committee asked bilingual colleagues to serve as voluntary provisional interpreters, if needed, in each session. Such arrangement proved to be practical and fairly successful.

A business meeting of the faculty members was convened one evening before the conclusion of the Workshop, in which many members expressed the desire that abstracts of both the lectures and the papers shown in the poster session should be published shortly as a supplementary volume of a world known scientific journal and the full-fledged papers presented at the scientific sessions of the Workshop be published in book form as a permanent documentary record of the Workshop. The suggestion was met with a favorable response.

The Chinese participants have undoubtedly benefitted greatly from the Workshop. As is generally admitted, although the Chinese scientists have been fairly well informed about the recent advances in their field of study through current publications and have also done some admirable research work, they have been somewhat handicapped by the lack of interflow of up-to-date conceptual and technical information with their contemporary colleagues. It was very desirable for many of the young Chinese participants to have an opportunity to make direct contact and to exchange ideas *vis-a-vis* with the renowned neuroscientists. This contact has undoubtedly broadened their prospect in scientific research. Most important of all, however, is probably the buildup of friendship through personal contact that will have a far reaching effect on promotion of mutual understanding and collaboration in the future between the scientists of China and many

other countries.

At the final session, Hsiang-Tung Chang, on behalf of the Local Organizing Committee, made a closing speech expressing his gratitude to the faculty members from abroad not only for the services they rendered to the Workshop but also for their contribution to the development of neuroscience in China and to the realization of the Modernization Program of the People's Republic of China. He pointed out that science in China suffered greatly from the devastating effect of "the Cultural Revolution", during which students in neuroscience had lived in almost complete isolation from the science community of the world. It was in those years that great progress has been made in neuroscience.

He emphasized that the Chinese people are now determined to make up what they have lost in the last 10 or 20 years by carrying out a modernization program which includes, *inter alia*, modernization in science and technology. Taking advantage of this international gathering, he finally announced the founding of a new institute, the Shanghai Brain Research Institute, Academia Sinica, as a part of the effort to develop neuroscience in China.

After the conclusion of the Workshop a pleasure excursion was arranged by Academia Sinica to visit the historical city of Hangchow, where the faculty members spent two enjoyable days in the charm and serenity of this famous scenic spot of China for melting away fatigue accumulated during the two exhaustive weeks of hard work.

INTRODUCTION TO SHANGHAI BRAIN RESEARCH INSTITUTE

Editor's Note: Dr. Hsiang-Tung Chang, Director of the Shanghai Brain Research Institute has been a regular member of APS since 1954. He was for several years at the Department of Physiology, Yale University and at the Rockefeller Institute (now University) engaged in neurophysiological research.

During the period 1946-1956 he authored 15 papers in the *Journal of Neurophysiology*.

After his return to China, Dr. Chang's membership in APS has been maintained, and he reports having received *Federation Proceedings* and *The Physiologist* regularly, though delayed, throughout the entire period of interruption of normal communications between the U.S. and China.

Dr. Chang is at present in the U.S. as a Visiting Scientist at NIH.

OER



Shanghai Brain Research Institute, Academia Sinica, is a new Institute established in November 1980. It was founded on the basis of the Brain Research Department of Shanghai Institute of Physiology, Academia Sinica. The Institute is devoted to the basic research in brain function and structure; but emphasis will also be made, on some projects, of clinical significance. It is in China the only Institute of this kind dedicated to the basic research of the brain. At the present stage the scientific staff members of the Institute are around 30. In 3-5 years it is aimed to reach the number of 80. The Institute is directed by Professor Hsiang-Tung Chang.

The policy of the Institute is to encourage international exchange of scientific information and scientists who share our interest in brain research. Some laboratories and research facilities are provided, particularly for visiting scientists from abroad.

At present, the Institute constitutes the following laboratories:

1. *Laboratory of Neurocytology*

Study on the development and distribution of receptors on the membrane of nerve cells during the process of development and growth of the central nervous system *in vitro* and *in vivo*; the mechanisms of the uptake of chemical substances by cultured neurons; the lipofuscin pigment formation in cultured neurons; the growth of dendrites in the culture; co-culture of neurons from different parts of the brain and study of the factors determining the forma-

tion of synapses between different cultured neurons.

2. *Laboratory of Neuroanatomy*

Stereotaxic atlas of some commonly-used Chinese experimental animals; neuroanatomical connections between cerebral cortex and the thalamus, with particular reference to the specific and nonspecific projections from the thalamus; connections between the motor cortex and lower brain centers; the neuronal circuitry of the cerebral cortex.

3. *Laboratory of Developmental Neurology**

Structural and functional changes in aging brain and their inducing factors; the effect of some of these factors such as malnutrition, "use and disuse", active peptides etc. on the development of the central nervous system; reactions of the adult brain tissue to some external interference (for example, damage).

4. *Laboratory of Neurophysiology I*

Functional relationship between cerebral cortex and intralaminar nuclei of thalamus, with special attention to its significance in the genesis and control of pain.

5. *Laboratory of Neurophysiology II*

Mechanisms of cerebral control of fine movements, particularly the functional organization of the motor cortex in relation to fine movements.

6. *Laboratory of Neurophysiology III*
The role of some brain structures and neurotransmitters in pain modulation (especially acupuncture analgesia) and their interactions. These brain structures are nucleus raphe magnus, locus coeruleus, central gray and caudate nucleus etc; their control on spinal neurons; the effect of stimulation of the nucleus raphe magnus and locus coeruleus on visceral afferents; the role of endogenous opioid system in the regulation of autonomic nervous activities.
7. *Laboratory of Neuropharmacology**
Study on the role of neuropeptides in brain function and particularly the neuropharmacological action of endogenous opioid substances.
8. *Laboratory of Neurochemistry*
Isolation, extraction and analysis of the active peptides involved in the normal function and the process of differentiation and development of the brain.
9. *Laboratory of Neurobehavior I*
Mechanisms of learning and memory, particularly the correlative studies between brain development and the ability of learning and memory in rhesus monkeys and albino rats, including the study on the interference of learning and memory and functional and morphological abnormalities induced by damage of the developing brain and its recovery.
10. *Laboratory of Neurobehavior II*
The effect of stimulation or destruction of different parts of the basal ganglia on the pain-escaping behavior and its mechanisms.
11. *Laboratory of Experimental Neurology*
Epileptogenesis and its control, including: the role played by various brain neuronal circuitries, especially the possible role of dendrites of cortical neurons, in the formation and spreading of epileptic waves; the effect of formation of local epileptogenetic focus on the spontaneous EEG rhythms between epileptic attacks, by means of computer analysis of EEG frequency spectrum; and some Chinese herb medicines (such as *Gastrodia*) in chronic experimental epilepsy animal models.
12. *Laboratory of the Ultrastructure of Brain**
13. *The Primates Laboratory**
Some studies on the characteristics of Chinese rhesus monkeys.
14. *Laboratory of Bioelectronics**
Development of new bioelectronic techniques and their application to brain research.

*To be established

33rd Annual Workshops and Scientific Program of the Society for Clinical and Experimental Hypnosis, Inc.

The 33rd Annual Workshops and Scientific Program of The Society for Clinical and Experimental Hypnosis will be held at the Hilton Hotel in Portland, Oregon from October 13th through 18th, 1981. The meeting is being cosponsored by the Department of Oral and Maxillofacial Surgery and the Division of Behavioral Sciences of the School of Dentistry, and the Department of Medical Psychology of the School of Medicine, both at the University of Oregon Health Sciences Center. (These workshops meet the criteria for 30 credit hours in Category 1 of the Physician's Recognition Award of the AMA and the American Psychological Association Continuing Education Sponsor Approval System.)

Workshops being offered include an introductory workshop for psychiatrists and doctoral level psychologists, a special workshop for psychotherapists in training, a research workshop, and introductory and advanced medical workshops, all beginning on the first day of the workshops and continuing through the last day of the workshops (October 13, 14 and 15). Other advanced three-day workshops being offered are Hypnosis in the Control of Pain and in Crisis Intervention, Clinical Use of Hypnosis with Children, and a Workshop on Forensic Uses of Hypnosis. A selection of one-day workshops is being offered, along with the previously mentioned advanced workshops, for those who have had basic training in hypnosis; in this category one workshop must be selected for each day of the workshops so that participants will attend three one-day workshops. These will include the use of hypnosis in terminal illness, treatment of borderline and psychotic patients, treatment of special behavioral problems, experimental approaches to dissociative phenomena, behavior modification and imagery conditioning, psychotherapy, jungian analytical psychology, anesthesia, and hypnosis and research in behavioral medicine, as well as the administration of the standardized hypnotizability scales.

The workshops will be followed by the Scientific Program portion of the meeting on October 16, 17, and 18. For further details and registration forms, write to: Marion Kenn, Administrative Director, S.C.E.H., 129A Kings Park Drive, Liverpool, New York 13088.

March 23, 1981

Dear Colleagues:

It is with great regret that I inform you that W. Doyme Collings, Ph.D., Executive Director of the National Society for Medical Research, died today.

Dr. Collings, who was 67, died in his sleep at his residence in Annandale, VA. He had been the executive director of the Society since January.

In the brief time he had been associated with NSMR he had made an unusually strong and favorable impression, both as an individual and as a professional, upon everyone he came in contact. He was a person of unusually high standards and competence in his chosen field.

Those of us who have known him so briefly will join with his many other friends and colleagues in the mourning of a man of such unusual worth.

Dr. Collings retired last July from Michigan State University as Associate Chairman Emeritus in the Department of Physiology. Prior to his going to Michigan State University in 1949 he served with the physiology faculties at the University of Texas Medical Branch in Galveston and the State University of Iowa.

He was a graduate of DePaul University and earned his doctorate in biology at Princeton University. His research interests were in adrenocortical physiology and the role of kidney and renin in experimental hypertension.

Dr. Collings was a member of the American Physiological Society, the Society for Experimental Biology and Medicine, the Society of Sigma Xi, and Phi Kappa Phi.

Sincerely,
John F. Sherman
President

A W. Doyme Collings Memorial Book Fund has been established in the Department of Physiology, Michigan State University, to honor our departed colleague. All those interested in contributing should make out checks to the Department of Physiology, Michigan State University, East Lansing, MI 48824, and earmarked W. Doyme Collings Memorial Book Fund.

The following letter was written to Dr. Rita Guttman by Dr. Leland C. Wyman in response to a *Biographical Note - Caroline Tum-Suden* in the Women in Physiology section (Physiologist: Vol. 23, No. 6, December 1980).

Dear Dr. Guttman:

I was delighted to see that you honored my former friend and colleague, Caroline tum Suden with the first of the biographical notes on Women in Physiology.

She began her career at Boston University School of Medicine as my research assistant and eventually became an instructor on the faculty.

I would like to point out that my name is Wyman not Hyman as you might have discovered by looking up one of the many papers we published together.

Also she always spelled her name Caroline tum Suden, i.e. with a lower case "t" in tum and no hyphen. She was always very insistent about this. The tum in Dutch corresponds to the von in German.

Caroline had a sparkling, flamboyant personality which was continually the delight of her friends and colleagues. Although I never got all the particulars of her death, my understanding is that after having had one heart attack from which she recovered, she was doing something one day with the furnace in the basement of the little house in the country in which she lived alone in Bel Air, Maryland, when the furnace exploded blowing off the door which hit Caroline in the chest precipitating a terminal heart attack. As I say this was hearsay and I am not sure of the details. One of our colleagues who was part of the "gang" in the old days at B.U. Med., and noted for his sense of humor remarked, "Wasn't it just like Caroline to go out with a flourish."

My wife and I used to stop to see her in Maryland whenever we drove that way going from or to our place in New Mexico. Although badly crippled with arthritis in her later years she was always cheerful, full of fun, and startlingly unpredictable right up to the end.

Leland C. Wyman
5 Furnival Road
Jamica Plain, MA 02130

CLEARANCE SALE

To eliminate further storage of inventory, the following two publications are offered at half price.

World Directory of Physiologists

1980 Edition - Provides names and addresses, and special interests of more than 20,000 scientists around the world.

This directory also lists the officers of the IUPS, and the members of its committees and Commissions. A brief history of the IUPS is also included.

\$3.00/copy

Objectives For a Course in Physiology

A translation of Objectives developed by the University of Aarhus, Denmark. Useful for teachers planning course work and for students as a guide for study and review. 34 pages.

\$1.00/copy

ORDER FORM

Please send me _____ copies of the 1980 World Directory (\$3.00)

_____ copies of Objectives for A Course in Physiology (\$1.00)

I enclose my check for \$ _____
(only prepaid orders accepted)

Please print or type name and complete mailing address

ANNOUNCEMENT OF TRAVEL AWARDS

THIRD ANNUAL MEETING

COMMISSION ON GRAVITATIONAL PHYSIOLOGY

IUPS

The American Physiological Society will administer a travel grant program sponsored by the National Aeronautics & Space Administration to benefit American scientists who could not attend the Third Annual Meeting of the Commission on Gravitational Physiology in Innsbruck, Austria, September 29 - October 2, 1981 without such assistance. A limited number of grants will be available. Those eligible to apply for awards are qualified scientists who are citizens or permanent residents of the United States, and who plan to participate fully in the Meeting. Each applicant will be judged on the merit of his contribution to the Meeting in Innsbruck, considering his training, experience, and potential. Grants will be limited to transportation costs based on the lowest scheduled airline fare from airport of departure and return.

Requests for application forms should be addressed to:

Dr. Orr E. Reynolds
Executive Secretary-Treasurer
American Physiological Society
9650 Rockville Pike
Bethesda, MD 20014

Deadline for receipt of completed applications is June 1, 1981.

Successful applicants will be notified by June 15, 1981.

(Application Form on Reverse)

AMERICAN PHYSIOLOGICAL SOCIETY

9650 Rockville Pike

Bethesda, Maryland 20014

APPLICATION FOR TRAVEL GRANT

THIRD ANNUAL MEETING

COMMISSION ON GRAVITATIONAL PHYSIOLOGY

IUPS

Innsbruck, Austria September 29 - October 2, 1981

1. Name & Degrees: _____ Birth Date _____

2. Institution, Address & Telephone Number _____

3. Title or Position: _____

4. Country of Citizenship: _____ Residence: _____

5. Do you plan to attend the entire meeting in Innsbruck? Yes / ☐ / No / ☐ /

If not, which days will you attend? _____

6. Will you present a paper at the meeting in Innsbruck? Yes / ☐ / No / ☐ /

If so, please indicate the sessions you will address:

_____ Invited Lecture (Title) _____
__________ Symposium Paper (Title : Indicate if Chairman) _____
_____Do you intend to submit a free communication? (Title) _____
_____7. Are you a member of: Am. Physiol. Soc. _____; Soc. Gen. Physiol. _____;
Div. Comp. Physiol. & Biochem., ASZ _____; Soc. Neurosci. _____; Biomed.
Eng. Soc. _____; Other _____

8. Are you employed by the Federal Government more than one-half time? _____

9. Have you attended previous meetings of the Commission on Gravitational Physiology? _____

10. Attach a list of your publications in the last five years and a copy of any
abstract being submitted for the meeting.

INSTRUCTIONS FOR APPLYING FOR APS MEMBERSHIP

CURRENT APPLICATION FORMS

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

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

GENERAL INSTRUCTIONS

FOR ALL CATEGORIES:

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

Alien Residents. Canadian residents should furnish a copy of "Landed Immigrant Status" form. Mexican residents should furnish a copy of their form FM-2.

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

JONES, A.B., and C.D. Smith. Effect of organic ions on the neuromuscular junction in the frog. Am. J. Physiol. 220:110-115, 1974.

DO NOT INCLUDE A CURRICULUM VITAE

Send no reprints.

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

QUALIFICATIONS (Except Students):

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

1. Educational History. Academic degree and postdoctoral training are evaluated and assessed with regard to how closely the applicant's training has been tied to physiology.

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

SPONSORS:

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

Each sponsor should write an independent confidential letter about the candidate using the five categories listed above to evaluate the candidate. Furnish an original and 7 copies to the Membership Secretary.

CHECK LIST:

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

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

SPECIAL INFORMATION AND INSTRUCTIONS

FOR REGULAR MEMBERSHIP

Bylaws of the Society:

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

Duties and Privileges:

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

FOR CORRESPONDING MEMBERSHIP

Bylaws of the Society:

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

Duties and Privileges:

1. Serve on Society Committees, Boards and Task Forces.
2. Serve as one sponsor of new Corresponding Members (One regular member must be sponsor of a new Corresponding Member).

3. Orally present or co-author a contributed paper and sponsor a non-member authored paper at the Fall scientific meeting.
4. Orally present or co-author one contributed scientific paper at the annual Federation meeting or sponsor one paper.
5. Receive The Physiologist.
6. Receive Federation Proceedings, Public Affairs Newsletters and annual Membership Directory.
7. Subscribe to handbooks and periodicals published by the Society at membership rates.
8. Register to attend scientific meetings of the Federation and the APS Fall meeting at member rates.

FOR ASSOCIATE MEMBERSHIP

Bylaws of the Society:

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

Duties and Privileges:

Same as for Regular Members except for the privilege of:

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2. Voting at Society Meetings.
3. Sponsoring New Members.
4. Receiving the Daggs Award.
5. Selection as Bowditch Lecturer.

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

Bylaws of the Society:

Article III, Section 7 - Student Members. Any student who is actively engaged in physiological work as attested to by two regular members of the Society and who is a resident of North America. No individual may remain in this category for more than five years, without reapplying.

Duties and Privileges:

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

Submit original and 7 copies of application and supporting documents.

APPLICANT'S LAST NAME _____

Date _____

THE AMERICAN PHYSIOLOGICAL SOCIETY
9650 Rockville Pike, Bethesda, MD 20014

MEMBERSHIP APPLICATION FOR:

REGULAR ☐
CORRESPONDING ☐
ASSOCIATE ☐
STUDENT ☐

CURRENT MEMBERSHIP
CATEGORY; YEAR ELECTED _____

See Instructions

Name of Applicant: _____
First Middle Last

Mailing _____ Birth Date: _____

Address _____ Citizenship: _____

Country of Permanent Residence: *

Telephone No.: _____

* Alien residents of Canada and Mexico see General Instructions. Alien residents of U.S. enter Alien Registration Receipt Card number _____.

1. EDUCATIONAL HISTORY

<u>Dates</u>	<u>Degree</u>	<u>Institution</u>	<u>Major Field</u>	<u>Advisor</u>
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Doctoral Dissertation Title:
(if any)

Postdoctoral Research Topic:

2. OCCUPATIONAL HISTORY

Present Position:

Prior Positions:

<u>Dates</u>	<u>Title</u>	<u>Institution</u>	<u>Department</u>	<u>Supervisor</u>
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SPONSORS

#1. Name: _____ #2. Name: _____

Mailing Address: _____ Mailing Address: _____

Telephone No.

Zip Code

Telephone No.

Zip Code

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

#1 Signature _____ #2 Signature _____

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

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

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

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

SPRING (FASEB)

<u>Date</u>	<u>Presented</u>	<u>Coauthor</u>
_____	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>

FALL (APS)

<u>Date</u>	<u>Presented</u>	<u>Coauthor</u>
_____	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>

List other scientific societies of which candidate is a member:

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

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

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

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

7. **BIBLIOGRAPHY** – Attach a list of your publications under the following categories:

1. Complete physiological papers, published or accepted for publication.
2. Physiological abstracts (limit to ½ page).
3. Other papers not primarily physiological (limit to ½ page).

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

DO NOT INCLUDE A CURRICULUM VITAE

COUNCIL OF ACADEMIC SOCIETIES BRIEF

ASSOCIATION OF AMERICAN MEDICAL COLLEGES
(202) 828-0400

• 1 DUPONT CIRCLE NW
WINTER, 1981

• WASHINGTON DC
VOL. 6., NO. 2

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

HEALTH BUDGET. Prior to the change of Administrations, President Carter submitted to Congress a budget request for FY 1982 and a request for funds to be rescinded from the current year (FY 1981) budget. A "rescission" is the mechanism provided by the 1974 Budget and Impoundment Control Act that allows a President to appeal to Congress to take back funds already appropriated for use in the current fiscal year. Congress has 45 days in which to approve a rescission request. This year, President Carter asked for a rescission of \$334 million from the HHS budget, all but \$10 million of which would be taken from the Public Health Service. Among other things, the Carter Administration advocated a rescission of: 1) all capitation funds, 2) \$77 million in Alcohol and Drug Abuse formula grants, and 3) \$50 million of the \$126 million increase the NIH was granted for this year. Areas that would be particularly hard hit within NIH if the rescission receives Congressional approval include: research centers, R&D contracts, Basic Research Support Grants, and the intramural program.

The Carter Administration's proposal for next year's budget requests approximately an 8% increase for ADAMHA and a 7% increase for NIH as a whole. Carter Administration priorities that are reflected in the budget are stability in research grant funding and maintenance of the current training effort. Funds are provided in the NIH budget for 5,000 investigator-initiated grants and for training approximately the same number of trainees as were supported last year. Obviously, with a total increase for NIH held considerably below the inflation level, the NIH programs cited above bear the brunt of the budget squeezing anticipated for FY 1982.

Within the next few days, the Reagan Administration will release its budget package for FY 1982. Considering the well-publicized intention of the new Administration to decrease Federal spending and the difficulties inherent in controlling the entitlement programs that comprise 90% of the health budget, it is anticipated that health education and research programs in general may be in serious jeopardy. There are reliable rumors currently circulating that President Reagan will propose sizeable further rescissions in the NIH budget. It is understood that this Administration is also committed to protecting the stability of ROIs and POIs and that research training will, as a consequence, be the target for the additional rescissions. If these rumors are substantiated when the Reagan budget is made public and if the viability of research training is indeed threatened, CAS members will be immediately notified.

AAMC RESPONSE TO THE GMENAC REPORT. The AAMC has distributed its response to the Report of the Graduate Medical Education National Advisory Committee to the Council of Academic Societies, Council of Deans, Council of Teaching Hospitals, and Organization of Student Representatives. The response focuses on the major issues of concern to academicians and their institutions. For a copy of the response, contact Lynn Gumm, Administrative Secretary, AAMC at 202-828-0482.

NRSA RENEWAL. The National Research Service Awards (NRSA) Act, which provides the legislative authority for the NIH research training program, is due to expire in the fall. In order to avoid a hiatus in research training support, the health authorizing committees in the House and Senate must complete their work on the renewal legislation by May 15. Since nearly all research training in the country is supported by NRSA, it is critically important that this legislation is renewed. Congressional staffers who will work on this issue do not presently anticipate major problems with the continuation of NRSA's but warn that all legislation will be closely scrutinized by the budget-conscious new Congress. One of the provisions that may be re-examined during Congressional consideration of the NRSA Act is the controversial payback clause with an eye towards minor modifications that would make this provision less of a deterrent to MDs considering research training.

NEW CONGRESS AND ADMINISTRATION. The new leadership in the Congress and in the Administration is beginning to coalesce. In the new Republican-dominated Senate, two key figures will be Harrison Schmitt from New Mexico as Chairman of the Senate Subcommittee on Labor-HHS Appropriations and Orrin G. Hatch (Utah) as head of the Labor and Human Resources Committee. The health subcommittee that formally was a substructure of the Labor and Human Resources Committee has been abolished, and health issues will be dealt with by the full Committee. Senator Edward Kennedy has become the ranking minority member of this committee. On the House side, Henry Waxman (California) will continue as the Chairman of the Interstate and Foreign Commerce health subcommittee with Edward Madigan (Illinois) replacing Tim Lee Carter who retired last year as the ranking minority member. William Natcher (Kentucky) will continue to chair the House health appropriations subcommittee.

Appointments are being made almost daily to top positions in Secretary Schweiker's Department of Health and Human Services but the precise hierarchy and titles are not yet clear. David Swope will serve as the Department Under Secretary or Deputy Secretary. Formerly director of the California Department of Social Welfare, Swope is currently legislative director for Senator William Armstrong (Colorado). The chief health position in the Department will be filled by Edward Brandt, Jr., MD, PhD who has been the Vice Chancellor for Health Affairs at the University of Texas at San Antonio. Reporting to Dr. Brandt and having responsibility for the health agencies will be Charles Koop, M.D., a pediatric surgeon from the University of Pennsylvania. Carolyn Davis, former dean of the nursing school and now associate vice president for academic affairs at the University of Michigan, is expected to be appointed administrator of the Health Care Financing Administration. Top agency positions such as head of FDA and ADAMHA remain unfilled at the moment.

1980-81 CAS ADMINISTRATIVE BOARD. At the October 1980 Meeting of the Council, Dr. David Brown was elected CAS Chairman-Elect. Dr. Brown is a Professor of Pediatrics and Laboratory Medicine at the University of Minnesota and is a Representative of the Academy of Clinical Laboratory Physicians and Scientists. New Board members also elected at the October meeting are: Dr. William F. Ganong, Chairman of the Department of Physiology at UC-San Francisco and a Representative of the Association of Chairmen of Departments of Physiology; Dr. Brian A. Curtis, Associate Professor of Physiology at the University of Illinois and a Representative of the American Physiological Society; and Dr. John B. Lynch, Chairman of the Department of Plastic Surgery at Vanderbilt University and a Representative of the American Society of Plastic and Reconstructive Surgeons. Re-elected to the Board was Dr. Robert L. Hill, Chairman of the Department of Biochemistry at Duke University and a Representative of the Association of Medical School Departments of Biochemistry.



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PHYSIOLOGY TEACHER

INNOVATIONS IN TEACHING ON AGING: INTEGRATIVE AND INTERVENTIVE APPROACHES

Educational Poster

Paola S. Timiras

At the 31st Annual Fall Meeting of the American Physiological Society (Toronto, Canada; October 12-17, 1980) the fifth Learning Resources Center of the Society featured a poster display comparing methods of teaching on aging at five different universities. Participants to the display, some of whom were present daily at the poster site, were Dr. E.J. Masoro, Dr. Meites, Dr. Timiras, Dr. Vernadakis and Dr. Walker. The poster display offered several examples of courses and programs organized to provide instruction in gerontology for undergraduate, graduate and medical students. One of the challenges for aging education is to provide the student with a sound theoretical and experimental knowledge in gerontology which will open the way to clinical geriatrics or further experimental or professional work in gerontology. In this effort, the basic science departments play a central role in creating new courses or amalgamating into a cohesive program, sporadic lectures in aging offered throughout the curriculum. In these programs, the biology of the aging process is considered in its many facets in an attempt to integrate all factors concerned with aging. Current advances in experimental gerontology and medicine make it possible for some of these courses to focus on interventive measures capable of delaying the aging process and/or strengthening the physiologic competence of the aged.

Some of the programs illustrated are quite new (Dr. Meites), some have been offered for a few years (Masoro, Vernadakis, Walker) and some have been tested for over twenty years (Timiras). Irrespective of age, they are continually being reshaped depending upon progress in the field, needs of the students and commitment of the respective schools. All of the contributors have provided summaries of their programs (reproduced below) and can be contacted directly for further information.

MASORO, E.J., DEPARTMENT OF PHYSIOLOGY, UNIVERSITY OF TEXAS HEALTH SCIENCE CENTER, SAN ANTONIO, TEXAS 78284.

The Department of Physiology at the University of Texas Health Science Center at San Antonio is heavily involved in research on the biology of aging and for that reason has the major

role for the basic science departments in the teaching of gerontology in the Health Science Center.

A course in the Graduate School of Biomedical Sciences on the Biology of Aging is given by the department. This course focuses on physiology, but broadly covers all aspects of the biology of aging as well. Although the course is an elective for graduate students in the basic science, it is open to other interested students, e.g., medical students.

The faculty of the department participates in the many offerings in Geriatrics and Gerontology by our Continuing Education Division. These courses are aimed at physicians or dentists or laymen.

The department also provides instruction on aging to undergraduate dental students in their Community Dentistry course and to postgraduate dental trainees in their Physiology and Nutrition courses.

Finally, plans are now being made to provide an elective in Geriatrics and Gerontology to the senior medical students to be given by the Department of Physiology and several clinical departments (Medicine, Family Practice, Surgery, Psychiatry).

MEITES, J., DEPARTMENT OF PHYSIOLOGY, MICHIGAN STATE UNIVERSITY, EAST LANSING, MICHIGAN 48824.

The Department of Physiology at Michigan State University has organized a course--Physiology of Aging (Topics in Physiology)--to be offered for the first time in Winter, 1981, and staffed by members of this Department as well as from other disciplines.

The course objectives are to provide information and critical analysis of the major physiological and pathological changes that occur with aging in man and animals, with the view of helping to prepare graduate students for a career in the field of gerontology (teaching, research, service, etc.) and others who may wish to broaden their knowledge of this area. The course will be coordinated by Dr. J. Meites, who will also give most of the lectures. In addition to the lectures, there will be discussions, tests, and a term paper assignment.

The course includes primarily biological subjects: theories of aging, cellular changes in aging, organ and tissue changes with relation to specific systems and comparative aspects of aging among different animal species. However, efforts have been made to integrate within the biological material varied information including: vital statistics, historical perspectives, interventional measures to promote life prolongation, evaluation of anthropomorphic and psychometric tests.

TIMIRAS, P.S., DEPARTMENT OF PHYSIOLOGY-ANATOMY, UNIVERSITY OF CALIFORNIA, BERKELEY, CALIFORNIA 94720.

The program on aging consists of undergraduate (upper division) and graduate courses, some of which were initiated in the mid-forties, originally as courses on development including also some lectures on aging. The emphasis on the continuum of physiological events throughout the lifespan persists in the courses created more recently. The major physiology courses include: Physiology of Human Development; Physiology of the Aging Process. The latter, in approximately 30 lectures, presents: theories of aging, cellular and animal models of aging, cellular and molecular aging; aging of systems and aging of populations. Lectures are based on readings of original literature as well as a textbook by Dr. Timiras. In addition, a three-quarter sequence graduate seminar in Development and Aging presents lectures by visiting speakers active in the areas of development and aging with particular emphasis on the neuroendocrine system as well as presentation and evaluation of research in these areas conducted by seminar participants. An integrative approach is illustrated by a graduate course organized by the Health and Medical Sciences Program and intended for graduate and medical students. This course, in a lecture/discussion format, is given throughout the year, and emphasizes, from a developmental perspective, the interrelationships among biological, psychological and social aspects of human development and aging, with particular relevance to clinical work in areas of human health and welfare.

VERNADAKIS, A., DEPARTMENTS OF PSYCHIATRY AND PHARMACOLOGY, UNIVERSITY OF COLORADO MEDICAL CENTER, 4200 EAST NINTH AVENUE, DENVER, COLORADO 80262.

For several years the School of Medicine has offered the second year medical students lectures in Pediatric Pharmacology which are incorporated in their course of Medical Pharmacology. In addition, the Department of Pharmacology is offering an elective course in Developmental Pharmacology which is geared for both graduate and medical students. Thus, in view of the fact that Aging is a continuum to Development, it was considered important to organize an elective course in Geriatric Pharmacology which was formulated in the Spring of 1980.

Geriatric Pharmacology course consists of a series of lectures organized by Dr. Antonia Vernadakis and given by invited guests and faculty in the University of Colorado. The course consists of 20 lectures and includes topics on: (1) Aging of the central nervous system (morphological, biochemical, neurological and psychobehavioral aspects); (2) Neuroendocrine mechanisms of aging (from hormone receptor changes to physiological changes such as menopause); (3) Drug metabolism with age; (4) Cardiovascular and renal function in aging; (5) Osteoporosis; (6) Role of nutrition in aging; (7) Immunological aspects of aging; and (8) Aging at the cellular level (theories of aging).

The class meets twice a week for an hour and a half. There is a midterm and final examination consisting of essay questions. The students receive 3-hour credit. However, this format may change for the following years. In addition to a required text, each lecturer hands out an outline of the lecture and a list of pertinent references. Two to three articles are chosen to be xeroxed and circulated to the students for in-depth reading.

The course in 1980 was attended not only by the students who were taking it for credit but also by residents in Neurology, Psychiatry and Medicine, postdoctoral fellows in Pharmacology and various faculty. Each lecture was announced in the weekly medical bulletin and thus all interested were free to attend.

The course will be offered every other year alternating with Developmental Pharmacology.

WALKER, R.F., SANDERS-BROWN RESEARCH CENTER ON AGING, UNIVERSITY OF KENTUCKY MEDICAL CENTER, LEXINGTON, KENTUCKY 40506.

The University of Kentucky presently offers two graduate-level courses in the biology of aging, originally organized by David R. Wekstein, Ph.D., Associate Professor of Physiology and Biophysics, College of Medicine and Associate Director, Center on Aging, University of Kentucky. The first course, Biology of Aging, is open to all graduate students who are enrolled in any biomedical graduate program in the University. The course is designed to cover the major areas of biogerontology ranging from an understanding of aging at the subcellular level through aging in the whole organism as well as some time devoted to the use of animals in aging research. The course is taught by faculty from the Departments of Anatomy, Biochemistry, Biology, Immunology, and Physiology. The students read the original literature in preparation of each series of lectures. In addition, each student is required to give a formal presentation or write a research paper on the topic of his/her choice. This three-credit course is offered in alternate years.

The second course, Biomedical Aspects of Aging, is aimed at graduate students in a variety of human service-oriented departments such as anthropology, communications, social work, etc. This course is divided into several major areas: normal age-associated changes in biological function; the major medical problems of the older person; and the health care delivery system. The course is taught by one faculty member who is a physiologist. The course uses a lecture format with some audio-visual aids and ample time for discussion. The students read some selected biological literature and give an oral and written presentation on two topics of their choice. This three-credit course is offered once each year.

COMPUTER ASSISTED DATA ANALYSIS IN THE DYE DILUTION TECHNIQUE FOR PLASMA VOLUME MEASUREMENT

Marvin Bishop
Div. of Science and Mathematics
Fordham University at Lincoln Center
New York, NY 10023

and
Gerald D. Robinson
Dept. of Biological Sciences
Towson State University
Towson, MD 21204

INTRODUCTION

The volume of any fluid compartment of the body can be measured effectively by the dye dilution technique. A substance is injected into the vascular system which will become distributed evenly throughout the intended compartment without altering the size of the compartment. The fluid volume can be determined by the extent of dilution of the injected material. The dye employed must be non-toxic, capable of easy dispersion, and it must remain in the circulatory system long enough for measurements to be made. Evan's Blue (T-1824) is a vital dye which is quickly bound to plasma proteins. Consequently, this substance is an ideal indicator for determination of plasma volume by the dye dilution technique.

Experiments involving the measurement of plasma volume by this method are traditionally excluded from the undergraduate physiology laboratory curriculum since the data interpretation can be rather unwieldy. Beginning students should not have to master complicated mathematical and statistical techniques in order to analyze their data. These obstacles are eliminated by the usage of computers. Furthermore, time-sharing capabilities enable students to obtain instant analysis while still in the laboratory. In this note we report on the application to the dye dilution experiment of an interactive data analysis program written in the computer language BASIC.

MATERIALS AND METHODS

Either large laboratory rats (500 g) or turtles may be used for this experiment. Rats are anesthetized with an intraperitoneal injection of pentobarbital Na and immobilized on a rat board. In turtles the required surgery can be performed under local xylocain hydrochloride anesthesia. A common carotid artery and an external jugular vein are exposed and cannulated with intramedic tubing. A control blood sample of 2.0 ml is withdrawn through the carotid cannula into heparinized syringes, centrifuged, and the plasma saved for later measurement. The experiment is initiated by injecting 0.7 ml Evan's Blue (T-1824) (5mg/ml) into the venous cannula with a microburette. To insure complete passage of the dye into the vascular system, the cannula is immediately flushed with 1.0 ml of Ringer's solution. Following a 30 minute equilibration period, blood samples of 1.5 ml are obtained at 15 minute intervals for approximately 2 hours. All blood samples are withdrawn from the indwelling carotid cannula in heparinized syringes and centrifuged to obtain the plasma. A series of dilutions of the stock Evan's Blue dye are prepared for use in converting

optical density measurements into actual concentrations. The optical densities of the control plasma samples, experimental plasma samples, and the standard dilutions of Evan's Blue are measured at 620 $m\mu$ in a spectrophotometer. The optical density of the control plasma is subtracted from the optical densities of the experimental samples. Evan's Blue disappears from the bloodstream at an exponential rate (Gregersen and Rawson, 1943). Consequently, when the logarithm of the optical density of each plasma sample is plotted against time, a straight line should result. The extrapolation of this line to the optical density axis gives the optical density of the plasma at the initial time of dye injection, assuming instantaneous equilibration. A comparison of this plasma optical density with the optical densities of the standard Evan's Blue dilutions provides an estimate of the plasma dye concentration at time zero. The plasma volume can be easily calculated by the following equation:

$$V = \frac{V_i C_i}{C_{pe}}$$

where V_i is the volume of Evan's Blue injected at time zero (ml), C_i is the concentration of the injected dye (mg/ml), C_{pe} is the plasma concentration of dye at time zero (mg/ml), and V is the plasma volume (ml).

COMPUTERIZED DATA ANALYSIS

The dye dilution experiment generates data which theoretically should be described by the equation $y = A \exp(Bx)$. Here y is the optical density, x is time, and A and B are characteristic constants of a given run. This equation is linearized by taking natural logarithms of both sides. The resultant linear equation is fit via the usual least-squares method (Bevington, 1969). However, the fit must be weighted because of the change in scale from an exponential form to a linear form. This fitting procedure has been incorporated into an interactive BASIC program which presently runs in a 4K PDP-8 time-sharing environment.

The program is listed in Figure one. The BASIC string manipulative facilities allow the program to run under the guise of a dialogue using the student's name. The student inputs the number of data points and the values of those points in lines 7 to 18. The dimension statements can be expanded to cases in which more than fifty data points are gathered. The computer checks in line 13 to see if any y values are less than or equal to zero, and if so, exits from the program because such a value is inconsistent with the exponential form of the theory. Line 15 linearizes the equation. Lines 19 to 90 contain the weighted least-square fit calculation of A and B . In addition, the correlation coefficient, C , is obtained in line 57. Lines 800 to 2046 plot the data (Soltzberg, et.

This research was supported in part by the donors of the Petroleum Research Fund of the American Chemical Society and the Fordham University Computer Center.

al., 1975). The ranges of the plot are determined by the maximum and minimum values of the data. The X scale divisions are selected by the student; the y scale divisions are set by the computer. The actual values of the raw data are printed with o's: the fitted equation values are printed with *'s. Note that the y-axis is

printed horizontally on a teletype. This graph cannot be used for quantitative purposes but it enables a student to easily obtain a 'feel' for the quality of the fit. In addition, lines 1061 to 1075 tabulate the actual and fitted data as well as the overall standard deviation.

```

00001 REM FIT AEXP(BX)
00002 DIM X(50),Y(50),Z(50),F(50)
00003 PRINT "PLEASE ENTER YOUR NAME SIX LETTERS MAX"
00004 INPUT N$
00005 PRINT "HELLO "N$
00007 PRINT "HOW MANY DATA POINTS, "JNS;" ?"
00008 INPUT N
00009 PRINT "PLEASE ENTER YOUR DATA AS X,Y"
00010 FOR I=1 TO N
00012 INPUT P,0
00013 IF 0 <= 0 THEN 100
00014 X(I)=P
00015 Z(I)=LOG(0)
00016 Y(I)=0
00018 NEXT I
00019 C=0
00020 S=0
00022 R=0
00024 T=0
00025 U=0
00026 W=0
00027 REM FORM SUMS WITH WEIGHTS Y(I)*Y(I)
00030 FOR I=1 TO N
00031 LET C=C+Z(I)*Z(I)*Y(I)*Y(I)
00032 LET S=S+Z(I)*Y(I)*Y(I)
00034 LET R=R+X(I)*Y(I)*Y(I)
00035 LET T=T+X(I)*Z(I)*Y(I)*Y(I)
00036 LET U=U+X(I)*X(I)*Y(I)*Y(I)
00037 LET W=W+Y(I)*Y(I)
00040 NEXT I
00045 D=W*U-R*R
00050 LET A=(U*S-R*T)/D
00055 LET B=(W*T-S*R)/D
00057 C=B*SQR(D/(W*C-S*S))
00072 LET A=EXP(A)
00080 PRINT "A= "A,"B= "B
00082 PRINT
00087 PRINT "CORRELATION COEFFICIENT",C
00090 PRINT "Y = "A;" * EXP("B;" * X)"
00098 GO TO 810
00100 PRINT "THERE IS AN ERROR IN YOUR DATA. Y CANNOT BE NEGATIVE"
00101 PRINT "OR ZERO"
00105 GO TO 2039
00800 REM GENERAL PLOTTING ROUTINE
00810 REM LIMITS ON INDEPENDENT VARIABLE
00850 LET G=X(1)
00855 LET C=X(1)
00860 FOR I=2 TO N
00862 LET X=X(I)
00865 IF C <= X THEN 875
00872 LET C=X
00875 IF G >= X THEN 877
00876 LET G=X
00877 NEXT I
00890 LET X2=C
00892 LET X3=G
00893 PRINT "XMIN = "X2
00894 PRINT "XMAX = "X3
00898 PRINT "ENTER XINCR"
00900 INPUT X1
00902 REM SCALE DATA BY MAKING EITHER FIT OR ACTUAL DATA THE LIMITS
00905 LET Y=A*EXP(B*X2)
00906 LET C1=Y
00907 LET C1=Y
00909 FOR X=X2 TO X3 STEP X1
00911 LET Y=A*EXP(B*X)
00912 IF C1<=Y THEN 915
00913 LET C1=Y
00915 IF C1>Y THEN 918
00917 LET C1=Y
00918 NEXT X
01002 PRINT
01005 G=Y(1)
01007 C=Y(1)
01009 FOR I = 2 TO N
01011 IF C<= Y(I) THEN 1015
01013 LET C=Y(I)
01015 IF G>= Y(I) THEN 1018
01017 C=Y(I)
01018 NEXT I
01019 LET M1=G1
01020 LET M2=C1
01021 IF G<=G1 THEN 1023
01022 LET M1=G
01023 IF C>=C1 THEN 1025
01024 M2=C
01025 PRINT "YMIN = "M2
01026 PRINT "YMAX = "M1
01027 LET Y2=M2
01028 LET Y3=M1
01029 LET X8=INT(X2/X1+.5)
01030 LET X9=INT(X3/X1+.5)
01040 LET D=(Y3-Y2)/70
01045 PRINT "YINCR = "D
01048 REM INTEGERIZING FUNCTIONS
01050 DEF FNJ(X)=INT(X/X1+.5)
01060 DEF FNJ(Y)=INT((Y-Y2)/D+.5)+1
01061 LET P=0
01062 PRINT "X="TAB(14);"Y OBS="TAB(28);"Y FIT="TAB(42);"DIFFERENCE"
01065 FOR I=1 TO N
01067 LET Z(I)=Y(I)
01069 LET Y(I)=A*EXP(B*X(I))
01070 LET F(I)=Z(I)-Y(I)
01071 PRINT X(I),Z(I),Y(I),F(I)
01072 LET Y(I)=FNJ(Y(I))
01073 LET X(I)=FNJ(X(I))
01074 LET Z(I)=FNJ(Z(I))
01075 LET P=P+F(I)*F(I)/(N-2)
01076 NEXT I
01077 PRINT "OVERALL SIGMA "SQR(P)
01078 PRINT "DATA POINTS ARE O'S, FITTED POINTS ARE *'S"
01079 GOSUB 2041
01080 FOR X=X8 TO X9
01081 PRINT " "
01085 FOR I=1 TO N
01087 REM SCALES AND INTEGERIZES DATA
01088 IF X(I) <> X THEN 2008
01090 REM SCALES AND INTEGERIZES THE DATA POINTS
01091 IF Z(I) < 1 THEN 2008
01092 IF Z(I) > 71 THEN 2008
01093 IF Y(I) > 71 THEN 2006
01094 IF Y(I) < 1 THEN 2008
01095 IF Y(I) <> Z(I) THEN 2000
01096 PRINT TAB(Z(I));"O"
01098 GO TO 2008
02000 IF Y(I) > Z(I) THEN 2006
02002 PRINT TAB(Y(I));"*"TAB(Z(I));"O"
02004 GO TO 2008
02006 PRINT TAB(Z(I));"O"TAB(Y(I));"*"
02008 NEXT I
02010 PRINT
02012 NEXT X
02038 GOSUB 2041
02039 STOP
02041 PRINT " "
02042 FOR I=1 TO 71
02043 PRINT " "
02044 NEXT I
02045 RETURN
02046 END

```

Fig. 1. BASIC interactive data analysis program.

RESULTS

The experiment was performed on a Diamondback Terrapin (*Malaclemys terrapin*) of weight 918.2g. The cannulation was done by the laboratory instructor but students in higher level physiology courses should be able to perform the surgery themselves. A standard curve was prepared by measuring the optical density of a series of dilutions of the stock Evan's Blue dye (5 mg/ml). The data are contained in Table 1 and the resulting curve is given in Figure 2. The 'corrected' optical densities of the experimental plasma samples were obtained by subtracting the optical density of the control sample. The data are contained in Table 2 and the computer results in Figure 3. The intercept of 0.655 for the optical density time curve means a concentration of 0.0705 mg/ml from the standard curve.

TABLE 1

Optical Density of Standard Dilutions of Evan's Blue dye (5 mg/ml)

standard dilution (mg/ml)	optical density
0.00	0.000
0.01	0.110
0.03	0.312
0.05	0.485
0.10	0.915
0.15	1.220

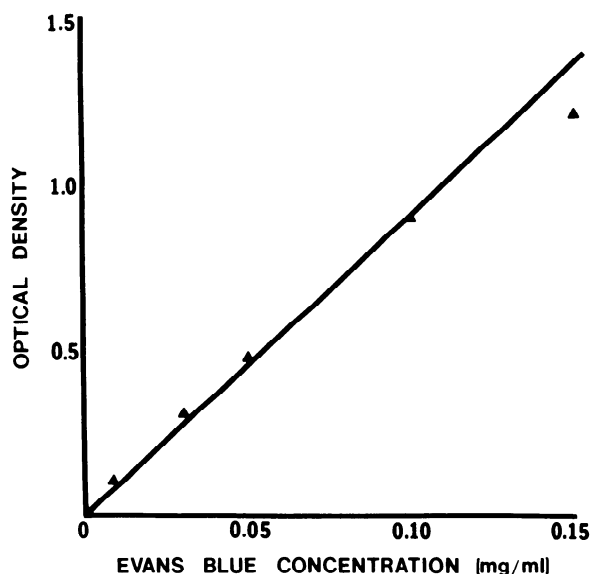


Fig. 2. Standard curve.

TABLE 2

Optical Density vs Time of Experimental Plasma Volumes

time (min)	optical density
30.	0.610
45.	0.565
60.	0.547
75.	0.498
90.	0.495
120.	0.452
150.	0.422

```
PLEASE ENTER YOUR NAME SIX LETTERS MAX
?BOB
HELLO BOB
HOW MANY DATA POINTS, BOB ?
?7
PLEASE ENTER YOUR DATA AS X,Y
?30,.61
?45,.565
?60,.547
?75,.498
?90,.495
?120,.452
?150,.422
A= 0.654817 B= -3.08600E-3

CORRELATION COEFFICIENT -0.984991
Y = 0.654817 * EXP(-3.08600E-3 * X)
XMIN = 30
XMAX = 150
ENTER XINCR ?5

YMIN = 0.412178
YMAX = 0.61
YINCR = 2.82602E-3

X      Y OBS      Y FIT      DIFFERENCE
30      0.61      0.596916      1.30842E-2
45      0.565      0.569914      -1.91440E-3
60      0.547      0.544131      2.86563E-3
75      0.498      0.51952      -2.15205E-2
90      0.495      0.49602      -1.02000E-3
120     0.452      0.45214      -1.60098E-4
150     0.422      0.412178      9.82155E-3

OVERALL SIGMA 1.23630E-2
DATA POINTS ARE O'S, FITTED POINTS ARE *'S
```

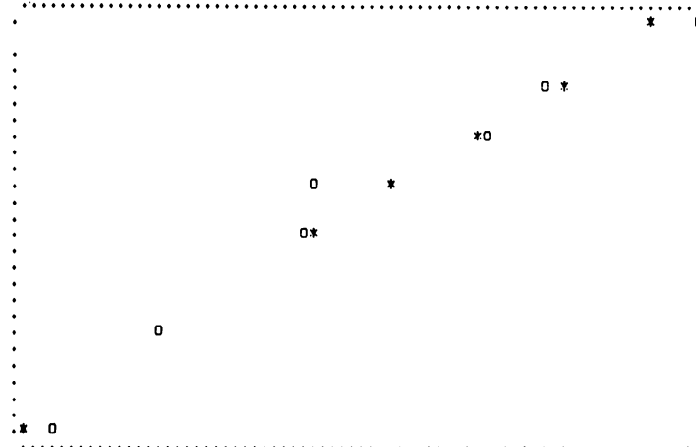


Fig. 3 Results of Computer output.

Then $V = \frac{(.7 \text{ ml}) (5.0 \text{ mg/ml})}{(.0705 \text{ mg/ml})} = 49.6 \text{ ml}$ or 5.4% body weight.

This value is in good agreement with published results for the terrapin $V = (5.8 \pm 1.7)\%$ of the body weight (Robinson and Dunson, 1976). Under laboratory conditions a majority of the students obtain results comparable to those reported above.

CONCLUSIONS

The measurement of plasma volume by the dye dilution technique is a worthwhile addition to the undergraduate physiology laboratory course. This experiment exposes students to a variety of important experimental methods: small animal surgery, collection of biological samples, measurements of optical density, and computer-assisted data analysis. This experiment provides a direct laboratory application of computer usage in biological education.

REFERENCES

- Bevington, P.R. 1969. *Data Reduction and Error Analysis for the Physical Sciences*. McGraw-Hill Co., New York. p. 105.
- Gregersen, M.I. and R.A. Rawson. 1943. The disappearance of T-1824 and structurally related dyes from the blood stream. *Am. J. Physiol.* 138: 698-707.
- Robinson, G.D. and Dunson, W.A. 1976. Water and Sodium Balance in the Estuarine Diamond Back Terrapin (*Malaclemys terrapin*) *J. Comp. Physiol.* 105: 129-152.
- Soltzberg, L., A.A Shah, J.C. Saber, and E.T. Canty. 1975. *BASIC and Chemistry*. Houghton Mifflin Co., Boston. p. 254.

The Pursuit of Nature: Informal Essays on the History of Physiology. Alan Hodgkin et al. Cambridge Univ. Press, 1979. First paperback edition. illus., \$18.50.

Now here is a splendid book, highly recommended to all students of physiology from graduate to emeritus. It consists of a set of essays by six outstanding British physiologists written as part of the centenary of the Physiological Society in 1976 and was first published in 1977. The occasion for the present review is that the collection has been recently published in an inexpensive paperback edition. The six essays deal with the vicissitudes and nonlinearity, sometimes even circularity, in the development of some major current physiological ideas, in each of which the individual authors played a leading role. The essays are all quite different, some fairly formal and some downright chatty, but each has the authentic ring of a master at work. The disparity of tone and revealed personality of the authors is in itself a lesson to anyone who would generalize as to what makes a first-rate scientist. Their insights; their appreciation of their mentors, associates, and environments; the glimpses into their thought processes and even motivations: these are invaluable and absorbing parts of our physiological heritage that we should all be grateful to have so elegantly preserved in a single volume.

Alan Hodgkin writes a charming and highly personal account of his adventures in the electrophysiology of nerve between 1937 and 1952. His subtitle, "Chance and design in electrophysiology," states his theme. Throughout he stresses the contributions of and many delightful associations with his colleagues, e.g. the three Cambridge psychologists who helped him build his prewar equipment, some of which was still in use 25 years later. But those who stand out in addition to Huxley, Katz, and Ruston are the group at the Rockefeller Institute and his sometime collaborator K.S. Cole. The free and generous exchange of unpublished information between them is a tribute to the mutual trust and respect of these investigators. Although he emphasizes the role of "chance" in the development of his hypotheses, this is a clearcut example of the dictum that "chance favors the prepared mind." It is astonishing to read that the work with Huxley and Katz, the principal contributions for which he shared a Nobel prize, he describes as "basically a disappointment." They were looking for molecular mechanisms, but "settled for the more pedestrian aim" of giving the quantitative description of the action potential.

Andrew Huxley gives a critical review of the 19th century literature as well as his own recent work on the light microscopy of skeletal muscle. He shows that in 1873, if the best and most careful work (particularly with respect to an understanding of the optical problems and the selection of biological material) were accepted, the field was ripe for the proposal of a sliding filaments model, although such a model was not in fact proposed in print until 80 years later by H.E. Huxley. He goes on to discuss the factors that led to the loss of influence and virtual disappearance of this early work, and speculates that even if the model had been proposed it might not have survived the first decade of the 20th century. Among these factors were the deaths of some of the rigorous workers just as their results were being questioned, the uncritical application of the principle of the Uniformity of Nature, and the movement of the field (1910-1950) away from microscopy of intact muscle into the biochemistry of contractile, extracted

actomyosin threads. Huxley uses this well-researched historical perspective not to glorify hindsight but to make us more acutely aware of the multiple ways in which fashionable even if well-intended science can lead us astray. He proposes that fewer symposia, with the same recurring speakers, might induce researchers to think more independently and imaginatively and might have very beneficial results.

W. Feldberg subtitles his essay "Reminiscences of an eyewitness" to the early history of synaptic and neuromuscular transmission by acetylcholine. He confines himself to the period 1933-1936 after he had been forced to leave Germany and was working in Sir Henry Dale's laboratory with Gaddum and others. Here was a case of the confluence of the right people at the right time. Feldberg says, "Dale and Gaddum seemed to know what lay behind the doors, but I had the key," the key being the use of eserine to inhibit the endogenous cholinesterases and the use of the eserinated leech muscle as a bioassay for minute amounts of acetylcholine. The productivity of these collaborators is astonishing, and the sense of excitement as well as the personalities of the participants come through clearly. The time was one of the high points of the "soup" versus "spark" controversy, with J.C. Eccles the most formidable protagonist of electrical transmission. In one sense it was not much of a controversy since the two groups, who knew each other well, commonly ignored each other in their publications. But Feldberg readily concedes that Eccles' (and others') opposition had a strong beneficial effect in demanding that the infrastructure of their hypothesis be sound. In 1934 Dale brought G.L. Brown into the laboratory to demonstrate the electrical responses in the neurohumorally excited tissues, and Feldberg considered the case essentially closed. Interestingly, Eccles was to hold out for a number of years before his conversion to and championship of neurohumoral transmission.

W.A.H. Rushton's contribution, "Some memories of visual research in the past 50 years" (the essay, going back further than his memories, covers more like 100 years), is written in the jaunty, flamboyant, and slightly irreverent style that characterized his oral presentations. This essay is the reverse of Feldberg's in that he talks very little about his own work but ranges very widely over the whole field from photochemistry and single-cell electrophysiology to psycho-physical phenomena and color theory, devoting a few paragraphs to each topic. He has an opinion, which he does not hesitate to express, on every subject, and these opinions give illuminating insights into the field as a whole. To be fair to the many outstanding contributors to visual research he cites dozens of names, but woe to the reader who comes across and wishes to pursue an interesting but unfamiliar piece of work: there is no bibliography.

R.A. Gregory's essay, an historical review of "The gastrointestinal hormones," is a masterpiece of the genre. He describes with exceptional clarity the growth of an extraordinarily complex field that has had perhaps more than its share of confusion, contradiction, and ambiguity. Despite the clarity of his presentation he does not leave the reader with the false impression that all is now tidy and resolved. Reading this chapter, I wondered whether Prof. Gregory is a musician since he has organized his subject matter almost like a Haydn sonata, which is

no bad way to achieve clarity. He starts with an introduction giving the status of the field in 1902 which was of course dominated by the nervous-reflex theories of Pavlov. The first theme describes, with quotes from the original sources, the Bayliss-Starling experiments demonstrating secretin activity and Edkins' work (1905), shortly to be brought into serious question, describing gastrin activity; these are now of course two well-established, chemically defined hormones. The second theme deals with the first descriptions of "other hormones," some of which have fallen by the wayside. He then proceeds to develop the ways in which more rigorous criteria were established, how it became known that one hormone may have multiple effects while the same effect might be elicited by several hormones, and how other interlocking questions have either been resolved or at least defined. He recapitulates by relating Bayliss and Starling's concept of target organs to the now very active business of receptor studies that are doing much to define the complex interactions in the heterogeneous tissues of the gastrointestinal tract. As a sort of coda he quotes A.G.E. Pearse in saying "the gastrointestinal tract is proving to be the largest and most complex endocrine gland in the body; and there would seem to be a certain justice in this outcome to the many barren years, since, after all, it was there that it all began." This is marvellously satisfying reading.

R.A. McCance's discussion of "Perinatal physiology" is a relatively straightforward working review of this area. As such it has by far the most extensive bibliography (13 pages following a 22 page text). Although some important observations had been made by Galen, Harvey, Boyle, Jenner, Lavoisier, Cavendish and other well-known scientists, this field did not really get underway until well into the 20th century. Many differences between fetal, newborn, and adult physiology have been catalogued and the exploration of responsible regulatory factors is well underway. This is indeed a pan-physiological field and McCance has been in on much of it. A recurring theme throughout his article, starting with a statement by Claude Bernard in 1865, is the question of ethics in human experimentation. McCance supports his own position, with specific examples, that the judgement of the responsible and ethical physician should be paramount, and he clearly deplores overregulation and a present-day litigious and uncooperative public.

My recommendation of this volume to all physiologists, and not necessarily to all scientists, is in no way a deprecation of its outstanding quality. The Physiological Society's centenary has been described as a "family party" for British physiologists and their close foreign associates. The tone of most of these essays, rather than being globally oriented overviews, is very much that of one colleague describing to another how the present state-of-the-art achieved its status. Thus a reasonable knowledge of current physiological thought is required for understanding what several of the authors are so concerned with. Nevertheless, in each case the current status seems sufficiently well structured that such authoritative and informal histories are not only intensely interesting in 1981 but seem likely to remain so for some time to come. The American Physiological Society would do well to produce a comparable volume at its centenary in 1987.

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Respiratory Physiology. John A. Jacquez. Hemisphere Publication Corp. Washington, D.C., 1979. 433 pp., illus., index, \$24.95.

This book was written for graduate and postgraduate level scientists and clinicians who are interested in respiratory physiology and grew out of the author's experience as an "interested outsider" in teaching this subject at the advanced level over the past decade. The book was intended to fill a void between introductory medical school texts and the extensive reviews found in the *Handbook of Physiology*. Whether a book of this size can achieve this goal is doubtful. Nevertheless, the author has achieved with this book what few others of its size and genre can claim.

This volume differs from other introductory texts of respiratory physiology in three significant aspects. First, the primary emphasis is on basic physiologic mechanisms rather than on clinical applications and relevance. Second, the quantitative orientation of physiology is clearly illustrated by the frequent use of basic mathematical arguments and models. And third, the use of comparative aspects highlights the variety of solutions to physiologic needs that have arisen through evolution. To this reviewer, the latter two are of particular importance and should be a part of any advanced text in respiratory physiology.

The major fault with the book lies in its production--particularly, with regard to the figures. The gray-scale photographs (e.g. electron-micrographs) are poorly reproduced and hence, much of the detail and benefit of their inclusion is lost. Similarly, many of the black and white figures reprinted from other sources are difficult to read. This problem, related in part to the use of nonglossy paper, should be resolved if a second edition is contemplated.

Overall, this book is a well-conceived, well-executed treatise that provides a fairly even-handed coverage of the major areas of respiratory physiology without the usual heavy emphasis on the author's area of research interest. As with any book, some readers will expect more and will be disappointed, and those lacking mathematical training may find the going difficult, but as an introductory text at the graduate level, the book achieves most of its goals. It is a good book that should prove useful to those trying to appreciate the physiology of the respiratory system.

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ASELLI

Gasparo Aselli (1581-1626) Italian anatomist.

Professor of Anatomy and Surgery at Pavia, he is remembered chiefly for his discovery of the lacteal vessels in 1622. Although these curious vessels had been observed earlier, it was Aselli who described and named them in his tract "De Lactibus" which, however, was not published until 1627, the year after his death. This publication is one of the scarcest medical classics and is the first anatomical treatise with coloured illustrations. Later editions had small, uncoloured, copper plates.

Handbook of the Hypothalamus. Peter J. Morgane and Jack Panksepp, Eds. Vol. 1. *Anatomy of the Hypothalamus*. Marcel Dekker, Inc., New York, 1979. 726 pp., illus., index \$145.00.

This is the first volume of a series devoted to the structural, chemical and functional organization of the hypothalamus. The nine chapters, written from various points of view by active investigators, are intended primarily to emphasize organizational principles and ideas. In the Editors' words the central conceptual theme is that "the hypothalamus is a nodal link embedded in major loops of circuitry forming components of the limbic forebrain-limbic midbrain and the limbic-hypothalamic-reticular axis." It "does not simply sit astride these multitudinous circuitries" but participates in their many activities. That theme is expanded by Morgane in Chapter 1, *Historical and Modern Concepts of Hypothalamic Organization and Function*, in which he pleads at length for de-emphasis of the hypothalamus as an aggregation of "centers" in primary control of this and that specific function. There are not, for example, true centers in the lateral hypothalamus for feeding and drinking, as these activities involve many levels of neuraxis. Lesions in the lateral hypothalamus destroy these functions by interrupting many essential circuits. "In terms of systems of neurons forming a functional complex, the loss of any one link of this system immediately affects the end result of activity in that circuit and leads to reorganization of the whole system with the object of restoring the disturbed act."

Development of the Hypothalamus in Mammals, written by A. Keyser, is a treatise based on his 1972 study of the ontogenesis of the hamster diencephalon. Whereas in official usage the term "hypothalamus" applies to the entire diencephalic wall below the ventral diencephalic longitudinal sulcus, from the developmental viewpoint the hypothalamus appears as a number of comparatively independent regions arising from the basal components of a series of neuromeres: optic, postoptic and anterior preencephalic. These segmental regions are later obscured by the longitudinal subthalamic and hypothalamic cell cords. Nevertheless, four divisions tend to show sufficient independence in early phases to warrant separate discussion: the preoptic, supraoptic, postoptic and mamillary regions. With formation of the medial forebrain bundle, the first three become more uniform in appearance; the mamillary region however, retains distinctive features.

A Cytoarchitectonic Atlas of the Hypothalamus and Hypothalamic Third Ventricle of the Rat, by R. Bleier and associates, will be a welcome practical feature for the many neuroendocrinologists who use this species. Representative thioimin-stained sections in frontal, sagittal and horizontal planes are each presented in full-page plates. Reflecting the authors' special interests there are several scanning electron micrographs of supraependymal cells as well as a montage of the third ventricle wall.

O.E. Millhouse contributes *A Golgi Anatomy of the Rodent Hypothalamus* based on hundreds of rat and mouse brains prepared by the rapid Golgi method. Most of the illustrations are camera lucida tracings usually accompanied by low magnification sketches for orientation.

The chapter devoted to *The Blood Supply of the Hypothalamus in the Rat*, by G. Ambach and M. Palkovitz, displays much of the beautiful material assembled by these authors in a series of nine papers since 1974. Not only are there 25 photographs and explanatory three-dimensional drawings in color, but many of these are reproduced in black and white at appropriate points in the text. The vessels of each region and its subdivisions are presented in text-book organization, including

many tabular diagrams of particular regional vascular networks.

Neural Connections of the Hypothalamus, by Palkovitz and Záborszky, is based chiefly on their extensive investigations of the rat brain. The subject matter is systematically presented, including information from other species when appropriate. Several tables list for prominent nuclei the afferent and efferent fibers according to origin and destination, the methods used for demonstrating them, and the appropriate bibliographic references. There is extensive discussion of the several methods, their virtues, failings, and necessary precautions in interpretation.

Specialized consideration of the *Anatomical Organization of Monoamine and Acetylcholinesterase-Containing Systems in the Vertebrate Hypothalamus* is given by A. Parent. The comparative approach is instructive. The recent studies of AChE-containing hypothalamic neurons by the author and his associates receive special attention.

In their chapter on *Limbic and Brainstem Connections of the Hypothalamus*, J. Sutin and R.L. McBride depart from the strictly morphological approaches of the preceding chapters, with emphasis on functional organization of afferent, intrinsic, and efferent systems. The chapter concludes with a section presenting a hypothetical model of hypothalamic networks, based on evidence for considerable interaction among otherwise independent systems.

The Chapter by R.P. Renaud, *Neurophysiology and Neuropharmacology of Medical Hypothalamic Neurons and Their Extrahypothalamic Connections*, reviews recent electrophysiological investigations of the "parvicellular" hypothalamus, with special attention to medial hypothalamic neurons and relationships with amygdala, preoptic region, and midbrain. The neuropharmacology of the region is discussed at length, including that of identified neurons. Finally, a brief review is given of the neurobiology of the several small peptides found in hypothalamic tissue.

The volume contains both author and subject indexes, as well as tables of contents for Volume 2, *Physiology of the Hypothalamus*, and the two parts of Volume 3, *Behavioral Studies of the Hypothalamus*. Bibliographic references are placed at the end of each chapter.

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ALLBUTT

Sir Thomas Clifford Allbutt (1836-1926) English physician.

Generally known as the editor of an extensive "System of Medicine" which first appeared in 1896 and was reprinted 1905-1911.

In addition, he made numerous contributions to medicine including the reduction in size of clinical thermometers (they were formerly about 2 feet long) in 1868; histology of syphilis of cerebral arteries, 1868; visceral neuroses, 1884; a work in two volumes on diseases of the arteries, 1915. He was also known as an authority on medical history and contributed a number of articles on Greek, Roman, Byzantine and medieval medicine.

Sexual Differentiation of the Brain. Robert W. Goy and Bruce S. McEwen. MIT Press, Cambridge, MA, 1980. 223 pp., illus., index, \$17.50.

Sexual Differentiation of the Brain is based upon a work session of the Neurosciences Research Program which was held in May 1977. This book is in the same format as the proceedings of other sessions published in the Neurosciences Research Program Bulletin. It is a summary by Drs. Goy and McEwen of the conversations and presentations of some 20 persons who have worked in the general field of sexual differentiation of the brain.

After a definition of sexual dimorphism (two distinct forms of behavior exhibited in a single species) there is a review of the differences in behavior between males and females in various animals from birds to primates. Many differences are obviously related to reproduction, but many others are not so for example, levels of activity and extent of aggressive behavior. These differences are enumerated and discussed in terms of the effects of castration and hormone treatments in various types of animals.

As implied by the title, a principal concern is the role that the central nervous system plays in sexual differences. In at least some species there is a clear function of specific brain areas in determining sexual differentiation, but it is difficult to separate the portion under direct nervous system control from the portion under hormonal control, especially when hormonal levels are only partially regulated by nervous activity. In primates and most particularly in humans, there is the very important additional question of how much sexual behavior is learned.

While the results of many experimental studies are presented and discussed, the final conclusions are somewhat unsatisfactory. Much of our knowledge of the brain areas mediating sex-specific behavior comes from work on songbirds and fish. These studies, some of which are elegant, document that some specific sex-determined behaviors are controlled by specific sites in the central nervous system. However, it is somewhat difficult to extrapolate from a male canary's song to human sexual differentiation. The study of neural control of sexual differentiation in primates is in its infancy, although Goldman and associates have made some important contributions.

After a brief discussion of some aspects of genetic control, the authors discuss in detail the cellular and molecular aspects of sexual differentiation. Receptors for estrogens and androgens are asymmetrically distributed in the brain with greatest concentration in hypothalamus and limbic structures. In most respects these receptors appear similar to those for the sex steroids in peripheral organs. The receptor is located in the cell cytosol. After the steroid diffuses into the cell and combines with the receptor, the complex binds to nuclear sites and results in stimulation of RNA and protein synthesis. Most of our knowledge of the distribution of receptors comes from radioautographic localization of labeled steroid binding to the nucleus. Nothing is known, however, of the results of activation of such receptors in the brain. The situation is further complicated by the possibility that there are several different receptors for androgens, since testosterone and dihydrotestosterone have different effects.

This book has a considerable amount of information and many references on a variety of aspects of sexual differentiation, particularly as related to behavior. It is also interesting reading, with, for example, reports of fertile chicken hens documented as changing into fertile cocks after pathologic regression of the ovarian cortex. The book has all the advantages and disadvantages of the other proceedings of Neurosciences Research Program work sessions. It contains an enormous amount of information in semi digested form, well organized into appropriate sec-

tions. However, in spite of all the references it is often difficult to identify the source of evidence for a particular statement. Furthermore the original reports do not always say or even imply what is credited to them here.

Sexual differentiation of the central nervous system is a research field that has a long way to go. Unfortunately the results to date are essentially descriptive and not very satisfactory. These considerations limit this book value through no fault of the authors. The results are also somewhat dated, as there has been considerable progress since 1977, when the conference was held. There is not even a mention of plasma membrane receptors for steroids, reflecting the fact that their demonstration is relatively recent. Nevertheless, this book is an excellent review of a large literature in a new and complex area.

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Phosphate and Minerals in Health and Disease. Shaul G. Massry, Eberhard Ritz and Henri Jahn, Eds. Plenum Press, New York, 1980. 675 pp., illus., index, \$59.50.

This book is volume 128 of the continuing series -*Advances in Experimental Medicine and Biology*- and contains the proceedings from the Fourth International Workshop on Phosphate and Other Minerals held in Strasbourg, France, in June 1979.

Recent advances in the area of phosphate and mineral homeostasis are presented by an international panel of scientists in the field. The sixty-six contributions encompass both state-of-the-art analyses and presentations of original experimental information and are arranged in several categories. The major sections are renal handling of phosphate, calcium and magnesium; phosphate homeostasis in health and disease; phosphate depletion, and intestinal absorption of phosphate and calcium. Also included are topics on parathyroid hormone, bone and Vitamin D metabolism, and different aspects relating to nephrolithiasis.

This book serves as a useful reference for those actively engaged in research in this field as well as for those wishing to familiarize themselves with the current investigative effort in the physiological and pathophysiological aspects of phosphate and mineral homeostasis.

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Vertebrate Endocrinology. David O. Norris. Lea and Febiger, Philadelphia, 1980. 524 pp., \$29.50 USA; \$35.50, Canada.

Most science textbooks in use in the United States are limited to communicating factual data in logical sequences for the reader's information. This introductory textbook of vertebrate endocrinology by David O. Norris goes further: it makes reading enjoyable not only because of the stimulating manner in which the facts are presented, but in the overall readability, the clarity of explanation of complex ideas and systems, and the completeness of background information necessary for the understanding of the integrated systems and their evolutionary significance. Dr. Norris' book contains one of the most stimulating presentations of a scientific discipline that has come my way. The book has, in addition, at times, a subtle humor and sensitivity: it is a "gem" for a text. The precision with which the author has checked and rechecked his facts is amazing; he leaves no doubt when there is a question as to the present state of knowledge of the subject. Would that all authors of textbooks in the many aspects of physiology and behavior had the ability to present factual information as well as does Dr. Norris.

The text is organized into three parts. Part I is an introduction to, and an overview of, endocrinology covering endocrine systems, hormones, origin of endocrine cells, mechanism of hormone action, techniques in the study of endocrinology, and one chapter on homeostatic models for endocrine systems presented (and accomplished) for a clear understanding of the subject using well-designed schematics. The final chapter in this section contains a classification and organization of the Phylum Chordata in an evolutionary sense, written concisely and accurately.

Part II contains the "meat" of vertebrate endocrinology with four chapters on the hypothalamic-hypophyseal system, followed by seven chapters detailing the physiology, neurophysiology, biochemistry, and morphology of the major endocrine glands. A final chapter is devoted to a "miscellany of some unusual and some suspected glands and hormones" and includes discussion on erythropoietin, somatomedin, prostaglandins, the thymus, chemical communication, kinins, and the epiphysical complex. It is in Part II, especially, that one realizes that a variety of approaches, according to the needs of the reader and the way one wishes to view vertebrate endocrinology, can be used with this text: examination of the mammalian system and then comparing this with the endocrine system of lower vertebrates, a gland to gland comparison, or an evolutionary and comparative approach.

Part III contains discussion on the physiological and behavioral activities of vertebrates that have some hormonal control for providing a response. This includes a chapter on iono-osmotic balance and regulation in teleosts, both freshwater, and marine, a chapter on regulation of amphibian metamorphosis, and includes material on endocrine factors of neotonic urodeles. Some of this chapter is given in a generalized fashion (mostly due to lack of information available in some groups), as intended for a text, but as the author infers, the bibliography will give a reader the opportunity to go into specifics.

Appendices to the book, cover very briefly an introduction to vertebrate tissues (3 pages), adrenergic receptors (1 page), various types of placentas among the chordates (2 pages), and an excellent bibliography containing a select listing of reviews and books about various subjects covered in the text. The author set out to write a textbook that was factual, timely, and readable. He has succeeded admirably. I recommend strongly this book not only to endocrinology students, but also as collateral reading to

students who are interested in vertebrate physiology and behavior.

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Physiology and Pharmacology of the Brain Stem. Shih-chun Wang, Futura Publ. Co., Mt. Kisco, N.Y., 1980. 305 pp., illus., index, \$29.50.

At first glance the book entitled *Physiology and Pharmacology of the Brainstem* by Shih-Chun Wang looks like another of the books written by scientists at the end of their productive careers that are simply summaries of their own investigations. Such books often are so focused on the authors' points of view that they fail to provide a general and balanced approach to the problem. However, Dr. Wang's book is not this kind, as a result of both the breadth of Dr. Wang's knowledge and the extent of his contribution. Dr. Wang has devoted his life to the study of autonomic functions of the brain stem, especially neural control of the cardiovascular system, respiration, and emesis. These areas of research have not been particularly fashionable in the last 20 years, and much of our present knowledge of brain stem regulation of these functions is a result of work by Dr. Wang and his students and collaborators.

Dr. Wang began his scientific career at the Peking Union Medical College in China, where he worked with Dr. R.K.S. Lim on bulbar cardiovascular regulatory mechanisms. Later he came to the United States, worked with Dr. S.W. Ranson at Northwestern University, and moved to the College of Physicians and Surgeons of Columbia University for the most of his career. He has focused upon the brain stem during the full span of his career, utilizing the techniques of anatomy, microstimulation to determine function at localized sites, and single-unit recording of neuronal activity. At Northwestern Dr. Wang was introduced to the Horsley and Clarke stereotaxic instrument, which allowed rigorous localization and reproducible placement of electrodes in neuronal structures. At that time Professor Ranson's laboratory was the only one in the world that used the stereotaxic approach, and Dr. Wang made valuable use of this procedure for the remainder of his career. A stereotaxic approach to the brain stem is particularly important because of the close and sometimes overlapping representation of so many functions in a small area.

Of the research areas in which Dr. Wang has worked, my own knowledge is greatest on the subject of the central representation of the emetic mechanisms. It is very impressive to consider that the major part of our knowledge of this fundamental process has come from the studies of this one scientist. Dr. Wang and his associates are responsible for the description of the chemosensitive trigger zone (CTZ) in the area postrema, that portion of the nervous system which is outside the blood-brain barrier and which triggers emesis by specific receptors for circulating agents. He and his collaborators, by a series of stimulation and ablation experiments, also are responsible for defining the vomiting center, the motor locus for the vomiting reflex, which can be activated either from afferent inputs from the CTZ or directly from

afferent fibers located principally in the intestinal tract. Dr. Wang in his laboratory has contributed enormously to our understanding of motion sickness, radiation-induced vomiting, and drug-induced vomiting of various sorts. Furthermore he and his collaborators have studied the effects of a great number of antiemetic agents on vomiting induced by various mechanisms. Probably half of what we know of central emetic mechanisms is the product of this one laboratory.

It is not obvious why relatively few laboratories have been interested in these subjects, since they are of both practical importance and intellectual interest. In any case this factor makes the contribution from this laboratory more impressive.

This book is a gold mine of information on the brain stem systems controlling autonomic functions. Although Dr. Wang and his collaborators have made major contributions, other studies are appropriately referenced. Both a sense of history and a consistency are portrayed in this book - a view of an investigator whose goal had its conception in China in the mid-1930s and who never lost sight of this goal throughout a long and productive career. In addition to being an invaluable source of information on brain stem physiology and pharmacology of autonomic function, this book shows the enthusiasm, motivation, and brilliance of a dedicated scientist in a continual search for the mechanisms underlying these fundamental processes.

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Digestive Physiology and Metabolism in Ruminants. Y. Ruckebusch and P. Thivend, Eds. AVI Publ. Co., Westport, CT, 1980. 900 pp., illus., index, \$54.00.

Every five years, a new scientific committee in a different part of the world organizes an international conference on the physiology and metabolism of the sheep and ox. This book consists of the papers invited by a European panel, and presented in September, 1979 at Clermont-Ferrand in the Auvergne. The volume represents compulsory, at times compulsive reading, not only for those directly engaged in the field, but also for many animal scientists who are employed in practical problems of nutrition and production. Rather than preach to the converted, for this review I shall select those parts which might appeal to non-ruminant physiologists.

The comparative gastro-intestinal physiologist is particularly well served. One review relates the gut anatomy and physiology in wild ruminants to their feeding habits, differentiating the grazers from the browsers. Another compares the ability of different desert ruminants to store water in the digestive tract. In two of the articles on microbial digestion, one speculates on evolution of this mode of mammalian alimentation, whereas the other compares the physiology of herbivores specializing in fermentation in the foregut with those that specialized in hindgut fermentation. An exhaustive article describes both the external cycling of digesta by coprophagy and the internal reflux in many non-ruminant species including birds, rodents and carnivores. The review of the control of emptying of the abomasum, the glandular compartment of the stomach, and the chapter on the mechanical and electrical events in the abomasum and small intestine contain much of comparative interest.

Intermediary metabolism, especially as it relates to nutrition and meat, milk and wool production, has always been prominent in ruminant studies. Contributions of general interest include one on hormonal control of amino acid metabolism during growth, and another on the turnover of adipose tissue lipids, with emphasis on the accretion and mobilization of fat. Two chapters are concerned with how the host utilizes the products of fermentation, one on propionate and vitamin B12 and their interrelation, the other comparing the metabolism of D-lactate, which originates solely from microbial activity, with that of L-lactate. One nutritional problem posed at the beginning of this century, namely that of the origin of the heat increment of feeding in the ruminant, still awaits a complete solution.

In the section on behavioral physiology and nutrition, the peripheral metabolites in the portal drainage which initiate and suppress the act of eating are related to energy balance. A second paper discusses the importance of central nervous control of the intake of water and salt, for which the goat has proven such a useful experimental animal.

Ecological interests are served at the microbiological level by discussing the mutual interaction of species of rumen micro-organism with reference to their competition for substrate and the effects of their metabolic products. Simple models relate the growth and dilution rates to the stability of the populations. At the other extreme is a wide ranging review of the role of herbivores in agricultural ecosystems.

An interesting and delightfully written account brings the historical background to digestive studies up to about fifty years ago. The preface contains a fine appreciation of the late Andrew T. Phillipson. His work, started forty years ago and still largely unrecognized outside the discipline, played a major role in furthering the understanding of the physiology of the ruminant.

From the more specialized articles, I would draw attention to one differentiating the bacterial population adhering to the wall of the rumen from those in different phases of the ingesta, and to another describing the physiological changes brought about by infestations of gut parasites. Some two fifths of the papers, mainly those relating to ruminant digestion and digestive adaptation have escaped mention in this review, and are left for the specialists.

The overall impression is of a well edited, worthy successor to the previously published volumes from these conferences. I am disappointed to note a reduction in basic physiology compared to its predecessors. This probably reflects the increasing difficulty throughout the world in funding fundamental research whose practical application is not immediate.

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The sites of the blood-retinal barrier are the retinal pigment epithelium which separates the retina from the choroid and which is analogous to the choroid plexus of the brain, and the retinal blood vessels, which are lined by a continuous layer of endothelial cells that are connected by tight junctions (*zonulae occludentes*) that restrict intercellular diffusion. The retinal blood vessels are analogous to blood vessels of the brain, which also contain a continuous endothelial layer. This monograph, "The Blood-Retinal Barriers" examines new basic and clinical observations on the eye and compares them with similar observations on the blood-brain barrier. It is a well-organized book with some very extensive reviews, and should be a reference source for clinicians and basic scientists interested in the eye.

The first two chapters by P. Carvalho and J.J.P. de Lima, respectively, present mathematics and observations on energy dependent transport, and on water and ionic fluxes across epithelia and cell membranes. K. Dorovini-Zis then reviews recent research on the structure and function of the blood-brain barrier, and on its modification in response to hypertension or hypertonic treatment. She suggests a possible role for astrocytes and their assemblies in transfer processes. I (S.I. Rapoport) summarize physiological studies with osmotic opening of the blood-brain barrier, and relate cerebrovascular permeability of nonelectrolytes to their lipid solubility.

J. Cunha-Vaz summarizes the kinetic relations among the ocular compartments, and regulation by the ocular barriers of aqueous and vitreous humor compositions. He showed that fluorescein is normally transported out of the vitreous across the retina, but that the gradient is reversed when transport is inhibited. Potentially neurotoxic substances are excluded from the retina by the blood-retinal barriers. A. Lajtha summarizes observations on Na^+ -dependent amino acid uptake by brain tissue slices, in relation to cerebrovascular transport, and discusses the effects of altered nutrition and hormones. He emphasizes brain heterogeneity.

L. Bito reviews transport systems of the blood-retinal barrier and concentration distributions of substances among plasma and aqueous and vitreous humors. Retinal transport is examined for prostaglandins, K^+ , Ca^{++} and Mg^{++} . D.M. Maurice presents a unique summary of drug exchange between the blood and the vitreous. With a simple equation, he examines the half-life of substances injected into the vitreous and distinguishes loss into the posterior chamber and aqueous humor as compared to loss through the retina itself. A. Bill discusses water exchange in the eye, and concludes that continuous water flow from vitreous to choroid across the retina tends to prevent retinal detachment. This flow is maintained by hydrostatic and osmotic pressure gradients across the retina. He also discusses aqueous drainage *via* the uvea and Schlemm's canal.

J. Cunha-Vaz shows how the method of the vitreous fluorophotometry has been used to examine leakage of sodium fluorescein from retinal blood vessels or from the pigment epithelium, in the diabetic eye and following photocoagulation or retinal vascular damage. G. Coscas summarizes additional clinical observations with fluorescein angiography, although his presentation is somewhat weakened by the absence of references. M.O.M. Tso presents electronmicroscopic studies on the pathological blood-retinal barrier. Injury activates proliferation of slowly-cycling cells of the vascular endothelium and retinal pigment epithelium, and increases retinal capillary permeability by opening endothelial tight junctions or by stimulating pinocytosis,

The concept of a decompensated endothelial cell which does not lose its semi-permeability properties is introduced, but may be an artifact.

P. Henkind discusses clinical observations which allow him to propose an original model for extracellular-vasogenic retinal edema. His table of retinal vascular diseases summarizes pathogenesis, fluorescein findings and morphological findings. A. Laties indicates that the blood-retinal barrier is less vulnerable to acute hypertension than is the blood-brain barrier. He does not find capillary leakage of fluorescein in streptozotocin-induced diabetic retinopathy in rats, although this retinopathy stimulates proliferation of basal infoldings of the retinal pigment epithelium. D.B. Archer summarizes the morphological changes which occur following experimental branch vein occlusion. The pathological course involves distension of blood vessels, venous stasis and increased permeability. D. Finkelstein refers to rather unsuccessful attempts to find an angiogenic factor that stimulates neovascularization in the retina.

F. Goldberg presents an outstanding review of the pathophysiology of various retinal diseases and the associated alterations in the blood-retinal barrier to fluorescein. A.F. Deutman also reviews pathological changes in the blood-retinal barriers in relation to retinal function.

In summary, this book includes an outstanding series of papers, which summarize recent findings on the blood-retinal barrier in relation to normal and pathological ocular function. By relating these observations to the blood-brain barrier, our understanding of both fields is augmented.

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