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What's Past Is Prologue

(The Tempest, Act II, Scene I)

A "White Paper" on the Future of Physiology and the Role of the American Physiological Society in It

Long Range Planning Committee

In May of 1945, the Council of the American Physiological Society launched a decade of extraordinary introspective activity by commissioning a series of increasingly comprehensive surveys of physiology in North America. The first of these, chaired by E. F. Adolph, was based in part on the results of a questionnaire sent to nearly 2,000 individuals rather arbitrarily categorized as physiologists, 54% of whom responded. Appended to the report, published in *Federation Proceedings*¹, was an essay on the future of physiology. The second effort, chaired by R. W. Gerard, was initiated the following year because the earlier "venture could not be allowed to end as a reference in some future bibliography." This new committee was charged with making an independent judgment of the status of physiology and exploring the educational dimensions of the field. In Gerard's words, "It was hoped that adequate consideration of the established facts by men of breadth, but with very different interests, would lead to some unanimous judgments and specific recommendations." (It would seem that Council was not entirely satisfied with the earlier labor.) The resulting report was composed of thoughtful essays by leaders in their fields: "The Place of Physiology in the Biological Sciences" by Paul Weiss, the eminent developmental biologist and a professor of zoology; "The Interdependence of Physiology and Medicine" by E. M. Landis, the professor of physiology at Harvard Medical School and a future president of APS; "Education for the Broad Aspects of Physiology" by Laurence Irving, a professor of biology at Swarthmore;

and "The Task of the American Physiological Society" by R. W. Gerard, who was to become president of the Society in 1951. This report, of rather philosophical bent, was published a year after the first.²

In the first year of his presidency, Ralph Gerard catalyzed the initiation of an astonishingly ambitious survey of the physiological sciences that was funded by the National Science Foundation to the tune of \$171,000 a sum that, at the time, was no less than lavish. This multifaceted effort, led by a Central Committee chaired by Gerard with Orr Reynolds, executive director, on leave from his position as Director of the Division of Biological Sciences of the Office of Naval Research, was comprised of a number of committees and task forces as well as by a substantial staff that over a period of 5 years employed the time, effort and devotion of nearly every significant player on the American physiological scene. This survey, also based in part on a massive questionnaire, probed every conceivable aspect of physiology in its broadest dimensions, as well as the professional and personal characteristics of its practitioners. In the process, a vast amount of information was accumulated, more than ever before or since, and far in excess of what could be fully assimilated and analyzed. To give but one example of the 50 or so projects undertaken by the survey, one, chosen at random and entitled "The Application of Physiology to Other Fields," generated no less than 44 essays that are presumably still on file in the archives of the Society. The outcome of these vast labors was a volume authored by

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LRPC REPORT

Ralph Gerard and published in 1958 by the American Physiological Society under the title "Mirror to Physiology" and subtitled "A Self Survey of Physiological Science." This report also incorporated the results of the first two surveys. Despite inevitable flaws this document is, indeed, an exhaustively detailed description of American physiology and contains, with its two predecessors, the sober reflections of the most eminent physiologists of the time, their concerns regarding the development of the field and their predictions of its future. But from the vantage point of 1990 and the task of the present committee charged with developing a "White Paper" on the future of physiology and the role that the APS should play in it, the most remarkable aspect of these surveys is the astonishing similarity of the issues and concerns confronting the leadership of the APS then and now. To be sure, in the intervening four and one-half decades there have been some major changes, but these have been largely in the quantitative domain. The disquietudes that have led to the repeated appointment of investigative and planning groups by successive Councils of the Society have remained

essentially unchanged. It is for this reason that these earlier efforts will be used as backdrops for the execution of the present task, if only to underline the continuity of the undertaking and the extensive foundation on which our present apprehensions and opportunities rest.

The Science of Physiology

The present committee like all its predecessors (understandably but unwisely in retrospect) began its deliberations with the question, What is physiology? It was felt by all these groups that one could hardly discuss the contemporary status of a science, to say nothing of its future, without having its identity clearly in mind. The unproportionally large amount of space devoted to this central issue in the previous reports is indicative of the difficulty encountered in grappling with this seemingly simple matter. In his foreword to the "Mirror to Physiology," Wallace O. Fenn concludes in utter frustration that because, on reflection, physiology is as broad as all of biology, to define it "... has no real importance in itself and is, furthermore, a completely hopeless and meaningless task." Yet, as Gerard rightly points out in the introductory chapter of the same volume, while "In spirit, physiology is not a science or a profession but a point of view ... it is also institutionalized as both so answers must be given." When they are provided in the subsequent paragraphs of that report and in those of all previous writings on the subject, they are of considerable philosophical interest but of little operational value. The reason for all this uncertainty is that physiology, in the singular, does not exist as a scientific entity; there are only physiologies. These individual physiologies are easily identifiable historically as well as contemporaneously in terms of the corpus of knowledge that they encompass and of the notable contributions to it. Small wonder then that the word "physiology" has meant different things to different people and at various times. The readers of this report will all be familiar with the various brands of physiology:

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plant, bacterial, insect, invertebrate, general, comparative, vertebrate, avian, mammalian, human, and the various aspects of mammalian or medical physiology. The subdivisions (or subspecialties) of mammalian physiology are rapidly attaining (and have attained) the status of individual physiologies that are subdividing in their turn. Addressing this matter in the 1947 report, Landis laments increasing specialization as methods have become more complex and factual information more abundant “. . . physiologists in special fields come to know more and more about less and less.” He adds that they tend also to know fewer and fewer of their fellow physiologists. And less and less, it should be noted, about aspects of physiology other than their own. Before a further discussion of this matter, it must be recalled that if there were a time when physiology was a single, encompassable discipline it was probably too primitive to have been called a science in the contemporary sense of the word.

Literally, the word “physiologia” means “knowledge of nature” and was used as such by Aristotle but, according to Rothschild in his “History of Physiology,”³ it was used in a more restrictive sense to mean the “healing power of nature” by Hippocrates and his disciples. From that time on the term has never been far removed from medicine, although before the 18th century its meaning bore little relation to the present definitions of the word. In the 16th century the use of the word physiology became restricted to the vital functions of man as subjects of medical inquiry and eventually formalized as the study of function in contradistinction to structure. In the 18th century Boerhaave in Holland and Haller in Switzerland first institutionalized physiology as a fundamental aspect of medical instruction and wrote textbooks on the subject then entitled “*Institutiones Medicae*.” It was not until a German edition of Boerhaave’s work was published that “physiologia” appeared in the title of the book. But physiology did not really come into its own until the 19th century with the epoch-making contributions of Claude Bernard in Paris and Carl Ludwig in Leipzig and the establishment of their schools.

From its very beginnings, however, the newly institutionalized discipline was marked for subdivision. Claude Bernard, for example, recognized several physiologies: general physiology as the study of the “organic properties of tissues, elements, etc.” (a definition resembling the current one) and specialized aspects of the subject that he identified as human physiology and comparative physiology among others.⁴ It should be recalled, in addition, that while the two wellsprings of modern physiology, one in Paris and the other in Leipzig, certainly knew of each other’s work there was little if any communication between them and what was taught as physiology by one school had but limited resemblance to what was taught under the same name by the other. It appears, therefore, that heterogeneity and fractionation have been an intrinsic property of physiology from its earliest beginnings and the recurring alarms regarding the phenomenon should be viewed in that light.

The oft-repeated notion “that physiology is not a science or a profession but a point of view” deserves additional comment if only because the institutional future of physiology may evolve from this verity. Attempts to distinguish physiology from other biological sciences by simple definition have been generally unsatisfactory. This is especially true since its successive offspring, beginning with biochemistry, became sciences of their own. The terms “dynamic biology” and “functional biology” often used to define physiology in the past now apply equally well to biochemistry, biophysics, and molecular biology among others.

In light of the current ascendancy of molecular approaches to biological processes, Paul Weiss in the 1947 report, put his finger on the issue by pointing out that “function” must be clearly distinguished from “process.” He argues that we can “analyze physical and chemical processes in the cell without bothering about their functional

“physiology is not a science or a profession but a point of view”

significance. But if this is as far as we go—and it may be fully far enough for a particular purpose—we need not call it physiology. Let us simply call it biophysics or biochemistry, as the case may be, and speak of physiology only where there is, in addition, search for functional understanding.” In his view, the use of the word function, meaning anything that is not structural, does not therefore define physiology. What does define it is the intellectual attitude of relating biological processes to the functioning of biological systems. Detailed study of molecular events within cortical neurons, for example, without regard to their significance in the functioning of the brain cannot be viewed as physiology. On the other hand, an investigator motivated by questions regarding the functioning of the brain who studies molecular events within cortical neurons is, indeed, a physiologist.

If one subscribes to the notion that a special point of view distinguishes physiologists from other “functional biologists,” it follows that they cannot be defined by the systems they study nor by the technological armamentarium they utilize in their investigations. Physiologists, characteristically, have been omniverous and opportunistic in the tools that they have employed in their work, from the historical beginnings of their endeavors to the present. This propensity can be expected to continue in the future as new technologies, including those of molecular biology, become available to aid the ever-probing intellects of the seekers of functional understanding. Viewed in this light, William Harvey is the prototypic physiologist who with the sheer power of his intellect as his principal tool,

the others being trivial, elucidated the circulation of the blood and deduced the existence of the capillaries without ever having seen them.

The definition of physiology as a point of view, an approach to biological problems, has seemed unsubstantive if not vacuous to many observers in the past but it may in the future be the one centripetal force that will reunite, under a single banner, currently far-flung physiologists regardless of their societal affiliations.

If we define physiology as that aspect of biology that deals with the elucidation of vital functions at all levels of organismic complexity, it is a science that is thriving and at the center of current biological thought. If, however, it is defined as integrative or systems biology, it is taking a back seat to the reductionists who, armed with astonishingly powerful tools and in ever larger numbers, are creating mountains of information often bereft of physiological significance. If the question is asked at all, physiological significance is relegated to a future effort ("We'll figure out what it all means eventually").

... the next revolution in biology will be in the integrative or organismic domain.

Without question, the unraveling of the genetic code some 40 years ago and its immediate sequelae marked a revolutionary advance in our understanding of biological phenomena. The insights gained by the molecular approach to all aspects of cellular function from the mechanisms of hormone action to the workings of the immune system, and myriads more, have been spectacular to say the least. The probings of cellular activity at the molecular level have been institutionalized as "molecular biology," an exploding endeavor that has captivated recent generations of aspirants to careers in the biological sciences and eclipsed other less popular but no less productive approaches to issues of biological import. Inevitably, however, as with all scientific revolutions the rate of significant discovery using the tools of molecular biology has declined and the newly recruited legions of workers employing this ever growing armamentarium are generating ever-increasing volumes of factual information.

Increasingly, however, attempts are being made to bridge the gap between the discoveries in molecular genetics and the control of cellular processes. Unanswered questions regarding the functioning of complex systems and, indeed, of whole organisms are again coming to the fore as the new frontier in the biological sciences. Unquestionably, the next revolution in biology will be in the integrative or organismic domain.

The awesome challenge of utilizing genetic information in the understanding of how entire organisms function

is already being met by a new breed of physiologists with scientific roots in molecular biology. A case in point is the so-called "Worm Project," an endeavor spearheaded by Sydney Brenner, one of the founders of modern molecular biology, that has as its goal the "complete understanding" of the small roundworm, *Caenorhabditis elegans*. Robert Waterson, who is finishing a map of the entire genome of this nematode, is quoted as having marveled that this simple creature "is a real animal. . . . It has nerves, muscles, intestines, it reproduces. And if you hit it it reacts." The worm project, which is clearly an exercise in physiology, has attracted the efforts of hundreds of investigators, mostly molecular biologists and geneticists.

The ultimate challenge to the physiologists, no matter what label they chose to adopt, is the elucidation of the higher functions of the human brain, including the cognitive processes of thinking, speaking, calculating and the intrinsic aspects of emotional experience and consciousness. This problem in integrative biology, if it can ever be resolved, will be the last frontier in biology, perhaps the last in all of science.

In sum, the golden age of physiology is yet to come and its future is the brightest among all the scientific endeavors that currently can be imagined. It does not necessarily follow, however, that the participants in this endeavor will call themselves physiologists or that they will do their work in departments of physiology. But this is not a scientific issue; it is an institutional one, but no less important for it.

Departments of Physiology

From the first appearance of the word, physiology has been associated with medical instruction and has been preeminently institutionalized in departments of physiology housed, with but a very few exceptions, in schools of medicine. Physiology in this context has been and continues to be the "basic science" central to medicine.

In schools of arts and sciences and in colleges of agriculture, animal physiology in its various nonmedical guises is represented by occasional faculty members in departments of biology, zoology, and animal sciences. Some schools of veterinary medicine have departments of physiology, whereas others have departments of physiology and pharmacology. Occasional physiology departments are also encountered in schools of dentistry and other "health science" schools.

Departments of physiology in American medical schools currently number 126. These and their faculties have recently been surveyed in considerable detail by the Association of Chairmen of Departments of Physiology (ACDP) and for the APS by the Association of American Medical Colleges. In the 1987-88 academic year (when there were 127 schools before the demise of ORU) these departments employed some 2,000 full-time faculty, 79 part-time faculty and over 400 volunteer faculty. Approximately 100 faculty vacancies were reported. In the same

year, they enrolled 1,352 graduate students working for the PhD degree in physiology and some 300 Masters degree students. Over 700 postdoctoral research fellows were also reported to be in training.

As far as can be determined from the earlier surveys, the proportion of full professors, associate professors and assistant professors has not changed dramatically in the past 35 years. Full professors, some 40%, represent the largest group. About 85% of physiology department faculty hold the PhD degree while only 8% are MDs. A little over 5% have both degrees and the remainder have other advanced degrees. Fifty years ago, the equivalent proportions were about 63% PhDs, 18% MDs and 13% with both degrees, a highly significant loss of physicians. In the decade 1978–79 to 1987–88, the full-time physiology faculty in American medical schools has increased from 1,720 to 2,006 while the part-time faculty has decreased slightly. The volunteer faculty, on the other hand, significantly increased. It should be noted, however, that these figures reflect sharp increases in some schools and declines in others, while many did not change. (Stanford went from 8 full-time faculty members to 1 and Harvard from 27 to 16 while the department at the University of Alabama doubled in size.)

About 85% of members of physiology department are white males, women representing but 14% of their staffs. The Gerard report of 1958 lists a total of 466 women physiologists of all varieties, including plant and bacterial physiologists but the number employed by medical school physiology departments is not indicated. One gathers from the 1947 report, however, that they were very poorly represented. Aspirants to careers in physiology are repeatedly referred to as men. This makes slightly startling reading in 1990.

The professoriat of physiology is not aging at an alarming rate, if at all. In 1987–88, 41% were in the 40–49 years of age range with 23% being younger and 36% older. In 1953, the age distribution of “animal physiologists,” not exactly an equivalent group, was 28% in the 40–49 year range with 49% younger and 21% older.

Perhaps the most spectacular change that has occurred in the past several decades has been in the compensation of physiologists but this is largely attributable to an equally steep inflation rate. In 1940 the median annual compensation of medical school physiology department chairmen was \$5,900, that of professors \$4,900, of associate professors \$4,050 and assistant professors \$3,100. Instructors received \$2,150. The last survey of the ACDP for the 1989–90 academic year, which includes institutions other than medical school departments, reports a mean salary for department chairmen of \$97,259 with a range from \$37,076 to \$148,842, a 6.69% increase over the previous year. Professors had a mean salary of \$70,351 ranging to \$142,463, associate professors \$50,997 ranging to \$70,000 and assistant professors \$41,216 ranging to \$76,230. The rank of instructor has practically disappeared from the faculties of physiology departments.

Forty-nine are listed in this survey with a mean salary of \$28,344. The salaries at private schools are generally superior to those at public ones, particularly in the higher faculty ranks. Notably, with the exceptions of instructors, women on average commanded salaries higher than the mean for their rank. No female department chairmen, however, were listed.

In 1955, nearly all “animal physiologists” were doing research, over half of their total effort being so directed, the remainder being devoted to teaching. Approximately two-fifths depended entirely on intramural sources for the funding of their work, one-fifth entirely on outside contracts and grants and the remainder on a combination of

. . . physiology is a subject unambiguously circumscribed by course, content, textbooks large and small, and by national examinations.

both. The median level of research support was \$10,000, and this was considered adequate by most of the physiologists queried. In 1988–89, the level of grant support per physiology department faculty member (not exactly comparable) varied from a maximum of \$392,073 to a minimum of 0.⁶ Total extramural research support per physiology department currently varies from \$3,238,893 in direct costs to nothing, with an average of \$1,616,389 (excluding training grants, which average \$190,156). In the average department these amounts supplement institutional resources of \$1,066,399 and other budget support of \$173,528. The average physiology department has, therefore, total budgetary support of about \$3,000,000 of which about one-third is derived from institutional funds. If one estimates an average indirect cost rate of 50% accruing to the grantees of extramural research and training grant support, then a large proportion of the institutional support of the average physiology department is also derived from its ability to garner extramural funds, a major bargain for the average school. If direct-cost salary support is also added, a well-funded department may cost its institution nothing at all.

Because such a large share of the functions of physiology departments is supported by federal sources, the recent erosion in extramural research support, if continued, poses a major threat to their operations as well as to those of other basic science departments. Even if this downward trend in research funding is arrested, it is unrealistic to expect significant increases in support within the foreseeable future. In public institutions these changes have been paralleled by increasing constraints in state funding of health science enterprises.

In order to successfully compete for declining institutional funds, departments of physiology will have to defend their various programs with increasing alacrity. In schools of medicine, their *raison d'être* is to provide instruction in medical or mammalian physiology to medical students and frequently to students in the other health science schools. Unlike their professors, medical students the world over know exactly what physiology is. It is a subject unambiguously circumscribed by course content, textbooks large and small, and by national examinations. While the education of graduate students and postdoctoral research fellows are important aspects of the missions of medical school physiology departments, this alone does not begin to justify their existence.

. . . the frontiers of physiological research have become increasingly removed from the fundamental corpus of information required for the education of aspiring medical students . . .

But the curricular responsibilities of most departments of physiology are small relative to the size of their staffs and to the total available time, space and other resources. In most reputable schools of medicine the faculty is expected to engage in research and the department is judged in considerable measure by the quality and quantity of this effort. As foreseen by the Gerard report, the frontiers of physiological research have become increasingly removed from the fundamental corpus of information required for the education of aspiring medical students and other health professionals. This movement has primarily been toward the cellular, subcellular and even molecular levels of organization and engages investigators, especially the newly recruited ones, with backgrounds often completely unrelated to the subjects they are required to teach. Many of them have not received their training in departments of physiology, and their acquaintance with the material they are expected to teach can best be described as on-the-job training.

In recent years, a number of physiology departments have changed their names to reflect their research emphases. Thus, we now have a Department of Physiology and Molecular Biophysics (Baylor), a Department of Cellular and Molecular Physiology (Yale), a Department of Physiology and Cell Biology (University of Texas Health Science Center, Houston), etc. Departments of Physiology and Biophysics are remnants of earlier attempts to modernize their image. The Duke University School of Medicine has abolished its Department of Physiology al-

together and is forging a new Department of Cell Biology in its stead. Harvard Medical School has taken the same step albeit only *de facto*. It is noteworthy that Stanford Medical School that for decades had abandoned its Department of Physiology has recently revived it under the name of Molecular and Cellular Physiology. Vigorous research at the "cutting edge" of functional biology is taking place in these enterprises, among others, and new generations of biologists of like mind will join in the effort.

These developments have engendered widespread concerns regarding the source of future teachers of conventional medical physiology. Who will do the job that justified the existence of departments of physiology? Further, who will carry forward the rich history of medical physiology and the "culture" of the field?

Again, these concerns are not new. In the 1947 report, E. M. Landis deplores with Howard Mumford Jones "the increasing tendency to train scientists predominantly as superb research technicians in a narrow field, to the neglect of their broader development as carriers of a flame in a philosophic and pedagogic sense. In physiology particularly, specialization and emphasis on technology must be balanced by recognizing the value of some general philosophy within the science. Otherwise, we may soon lack in this country the personalities and schools of physiology which are needed to continue the traditions of Lusk, Mandel, Howell, Cannon and Carlson." (One may wonder how many current members of physiology departments under the age of 50 know of these personages.)

While reliable data regarding the training of current teachers of medical physiology are not available, one gains the impression that most have not obtained formal instruction in the subject beyond taking the first year medical school course. Extrapolating from the AAMC study, only about half of medical school physiology department faculty members appear to have degrees in physiology (level not specified). The remainder have advanced degrees in other disciplines such as biochemistry, physics, engineering, zoology, etc., a circumstance comparable to that extant in 1945 for all "professional physiologists." In any case, of the past presidents of the APS, most of whom have been chairmen of medical school physiology departments, only about a third seem to have obtained advanced degrees in departments of physiology.

In the 1950s, departments of physiology aspired to be well rounded, to have on their faculties notable representation of the principal branches of medical physiology. The more affluent departments had at least one member of each who gave the lectures on the subject and conducted research in his speciality. But as the specialties multiplied faster than the talent pool and increases in departmental budgets, having a complete set of physiologists, if at all possible, did not ensure distinction. To make their mark departments began to concentrate on specific research areas. This resulted in most positions being filled by investigators of kindred interests with the outcome that most portions of the medical physiology course were

LRPC Recommendations

At the October, 1987, Fall Meeting of the American Physiological Society (APS), the Council charged the Long Range Planning Committee (LRPC) with the following:

1. Develop a "White Paper" on the future of physiology and the ways in which the Society can be useful to the progress of the discipline. This should include a consideration of strategies to foster the use of tools of cellular and molecular biology to solve the important questions of systems physiology.
2. Make recommendations on how APS should relate to FASEB and other societies, e.g., the Society for Neuroscience, the Biophysical Society, the American Society for Cell Biology, and the Endocrine Society.
3. Develop a plan for more active leadership in the development of programs. The Long Range Planning Committee should consider the success of the Publications Committee as a model for what may be possible in the area of program.
4. Make recommendations on how the Society can best serve those Sections which currently have minimal participation in its meetings.
5. Make recommendations about the number and characteristics of the meetings of the Society.

The LRPC has met four times since then to consider these charges and to formulate appropriate responses.

The "White Paper" that follows is the result of multiple and extensive reiterations of an original discussion paper generated by Stanley G. Schultz in August of 1988 dealing with the future of physiology in its various dimensions. To this were added the responses to the additional charges by Council, including the discussion of the relation between APS and FASEB that was originally prepared as a separate report.

The final document reflects the consensus, not only of the members of the LRPC, who last convened at a special meeting held on August 16-17, 1990, but also of many others who were consulted in the course of its preparation. In view of the unprecedented nature of some of its recommendations,

the unanimity of the committee in approving this document is noteworthy. These recommendations may be summarized as follows:

1. That for the first time in its history, the American Physiological Society officially adopt and promulgate a definition of Physiology: "Integrative Biology," the biology of the future.
2. That the APS initiate and generously support a superlative series of meetings to be named "APS Symposia" that should equal its publication efforts in importance and impact.
3. That a new class of membership in the APS be established to recognize distinguished accomplishments in physiological research: The Fellows of the American Physiological Society.
4. That a process be established so that the Section Advisory Committee become the Council of the APS and that a task force on governance be appointed to develop procedures for implementing these recommendations.
5. That Council begin planning as soon as possible for the organization of spring meetings to be held after 1996 with utmost flexibility in mind.
6. That, in view of the unlikelihood that FASEB will attract new societies and may even lose the membership of the ASBMB, Council consider the reorganization of FASEB as an entity devoted solely to the maintenance of the campus and its facilities rather than to scientific matters.
7. That APS representatives to the Council of Academic Societies of the Association of American Medical Colleges be members of the APS Council to maximize the interaction between the two organizations.

The Committee hopes that the outcome of its deliberation will assist Council in its difficult task of placing the American Physiological Society in a position of unambiguous leadership in the newly emerging revolution in the biological sciences: the understanding of complex systems and their functioning—integrative biology.

Ernst Knobil
August 21, 1990

taught by nonspecialists. In the two decades that this trend has been extant, notable declines in the quality of the courses in physiology have not been recorded as long as the department chairpersons maintained high standards for their curricular offerings.

In the future, as in the past, young scientists will continue to be attracted to faculty positions in departments of physiology because their services are wanted there and they view these venues as suitable and supportive of their research activities. As most of their predecessors, they will be introduced to "professional" medical physiology rather late in their training but will be young enough to learn and even to love their new subject. Many, as in the past, will become effective professors of medical physiology to generations of ever interested medical students while in their laboratories probing the frontiers of physiological knowledge, no matter how defined. As long as this tradition endures, the flame will not be extinguished.

. . . this challenge can only be met successfully by the identification of physiology as a unique branch of biology that deals with syntheses and integration and ultimately seeks to understand the functioning of whole organisms.

The greatest threat to the integrity of medical school physiology departments in the future resides in the failure of university administrators, including medical school deans and even physiology department chairpersons, to recognize the distinction of the intellectual approach that defines physiology from the other sciences in their domain. There is a widely held perception that, for the most part, the members of all the "basic science" departments are all doing essentially the same kind of work, all increasingly remote from the requirements of the medical curriculum. This perception, in the face of fiscal constraints but often under the guise of philosophical acumen, has led to the suggestion that the basic science departments be merged into one diminished enterprise manned by a few outstanding scientists working at the cutting edge of molecular biology and that the teaching of the sciences relevant to medicine be taught by members of clinical departments. This view has not yet received wide acceptance but the notion that instruction in the sciences relevant to medicine be relegated to clinical departments, to faculties of arts and sciences, to the undergraduate curriculum or to an immediate post-baccalaureate introduction to medicine has been voiced by various

leaders of academic medicine for decades. It is important to note that these and kindred schemes have been implemented in some institutions around the world without dire consequences.

The preservation of physiology departments in schools of medicine will depend, in addition to the uniqueness of their traditional curricular offerings, on how effectively the uniqueness and relevance of physiology as a science, defined as the synthetic, integrative or systems approach to biological probing, is communicated to faculties of medicine and to their leaders. Attempts to emulate other disciplines perceived as being more fashionable or glamorous, thus reinforcing the view that physiology is passé, are more destructive than salutary. As a first step in the preservation of institutionalized physiology, therefore, the LRPC suggests that medical school departments of physiology retain this designation without qualification and that those that have attempted to convey a more modish image by expanding their titles be encouraged to resume their ancestral name. However, in the last analysis, the perception of physiology departments by their academic communities and their success in attracting new generations of young scientists will depend on the impact of their research efforts and not on that of their labels.

The number of candidates for the PhD degree in physiology departments has remained constant in the past 10 years, and, according to the ACDP report, the number of PhDs awarded has increased slightly from 165 to 185 per year with a dip in mid-decade to 98. This output slightly exceeds the reported number of faculty positions available. A recent report of the National Science Foundation, however, indicates that in the period 1979–1989 there was a reduction in PhDs awarded in animal (including human) physiology from 314 to 271 in the face of an 11% increase in PhDs awarded in biochemistry and a 12% increase in all the biological sciences during the same period.

The challenge will be to attract the best of these students in the biological sciences, including the increasing number in neurobiology, to institutionalized physiology. Short of the unlikely possibility that physiology departments will be able to outbid other departments with space and treasure, this challenge can only be met successfully by the identification of physiology as a unique branch of biology that deals with syntheses and integration and ultimately seeks to understand the functioning of whole organisms. As stated by D. C. Tosteson, "This difficult theoretical and integrative work is at the center of our discipline. Physiology has long attracted individuals with a frame of mind to seek out such labors."⁷

The American Physiological Society

Physiology was first institutionalized in faculties of medicine as a component of medical instruction but its second institutionalization, at least in North America, came with the founding of the American Physiological Society for purposes of scientific exchange among phys-

biologists and for promoting the advancement of physiology. It was the first such society that required publication of original research for election to membership. In the words of Toby Appel, the chronicler of the founding and early history of the APS, "This was a bold step on the part of the founders of the Society, for in 1887 medical schools did not require research of their professors, and many teachers of physiology at medical schools did not, therefore, qualify for membership." Research accomplishment remained the hallmark for election to the APS and such election came to be a coveted honor for the aspiring professional physiologist. During the last quarter century, however, this policy was increasingly viewed as being elitist and was relaxed to the point where essentially anyone with a professional interest in physiology can be admitted to membership. It should be noted that, in this context, the APS followed a general trend among scientific societies, here and abroad, that measured their success by the size of their membership rather than by their scientific distinction.

To subserve its basic function the APS immediately set out to organize scientific meetings. The first, attended by 13 members, was held in the winter of 1888 in Philadelphia. This was the only time that the APS met on its own until the first Fall Meeting in 1948. Initially, the meetings took place with the American Society of Naturalists and other recently formed societies and, triennially, with the Congress of American Physicians and Surgeons. With the exception of the Fall Meetings, the APS has retained the propensity for meeting with other organizations of cognate interests to this day. One may hazard the guess that this historic pattern was engendered by the multifaceted nature of physiology and its ramifications throughout the biological and medical sciences as well as by the difficulty of envisioning the science as a single, easily circumscribable discipline.

The purposes of the nascent society were extended, a decade later, to sponsoring the *American Journal of Physiology (AJP)* that was subsequently edited under contract to the APS by its founder and owner, William T. Porter. The publications of the Society have grown, multiplied and prospered since this early beginning and represent an exemplary undertaking in scientific communication that continues to flourish. In contrast, the subsequent history of its meetings has been marked by uncertainty, if not controversy, that continues to the present.⁸

From its 28 founding members the Society grew to 900 in 1945, to 1,400 in 1955, 2,800 in 1965, 4,700 in 1975, 6,250 in 1985 and increased slowly thereafter to its present membership of 6,800.⁹

Of the current members of APS, 65% are employed in medical schools. Of these, about half are in departments of physiology, and most of the remainder (24% of the total) have appointments in clinical departments. The members outside medical schools, with the exception of a significant concentration (12%) in undergraduate schools, are scattered among health profession schools,

government, commercial institutions and foundations. Two-thirds are PhDs and one-third MDs with 72% engaged in research, a smaller proportion than reported for all physiologists in the 1958 survey ("Mirror to Physiology").

The largest number, 23%, are cardiovascular physiologists. Respiratory physiologists represent the next largest segment, 12%, followed by neurophysiologists 11%, endocrinologists 8%, gastroenterologists 6% and renal and muscle physiologists in equal number. This distribution differs markedly from the composition of faculties in medical school physiology departments where cardiovascular physiology is represented by 17%, respiration by 6% and neurophysiology by 4%. Muscle and exercise physiologists, who make up 6% of the total APS membership, constitute 18% of physiology department faculties. The large discrepancy between the representation of neurophysiology in physiology departments and in the membership of the APS probably represents the establishment of free-standing departments of neurobiology and the transfer of the responsibility for teaching neurophysiology from physiology departments to these new administrative units. If this supposition is correct it underlines the importance of curricular responsibility in the allocation of institutional resources mentioned earlier.

In the 1958 survey, of the 961 primary "animal physiologists" recorded, 16% were in circulation, 14% in endocrinology, 14% in metabolism and nutrition and 14% in neurophysiology, followed by respiration and renal with 7% and 5%, respectively. Only 50% belonged to the APS. No comparable figures are available for the current population of animal physiologists but a recent survey by the ACDP revealed that only 58% of members of medical school physiology departments belong to the APS, the remainder probably adhering to other scientific societies. As noted in the 1958 survey, most physiologists belonged to more than one scientific society and this multiplicity of societal membership has probably increased since then.

The heterogeneity of physiology and its practitioners has been a recurrent subject for discussion from the ruminations of Claude Bernard to the present. This intrinsic property of the science, recognized and accepted by its progenitors, has been exacerbated by the growth of its various branches. Within medical physiology, the principal purview of the APS, the phenomenon has been described, most often with profound alarm, as specialization, subspecialization and splintering. One should recall, however, that most of the "specialties" of animal physiology were clearly extant at the time of the founding of the Society and were reflected in the scientific programs of its earliest meetings.

Much effort was expended by the Society to unify medical physiology and "zoological physiology" including the creation of the American Institute of Biological Sciences, an organization to which the APS still belongs. This, however, has had little if any impact on the unification of medical physiology with the remainder. Further, the

APS began to divide during its tenderest infancy, budding off the biochemists, the pharmacologists, the nutritionists and subsequently the biophysicists, the general physiologists and, most recently, the neurophysiologists. The Society for Neuroscience now has more than 15,000 members, twice that of the APS. Nonetheless, Louis Katz commented as president-elect of the APS in 1957, "I decry the splintering of physiology now going on and hope that the breadth and excitement of dynamic biology will unite all physiologists. . . . We need to de-emphasize system and organ physiology in the American Physiological Society. Splintering, in short, should be slowed down, stopped and reversed."

At the time of the 1958 survey it was reported that the nervous system and the circulatory system had long dominated animal physiology. Gerard commented that, "No one familiar with meetings of the American Physiological Society, both scientific and business sessions, and of the numerous speciality groups that cluster under its wings, can doubt the great influence of the nervous system and circulation members. Some deliberate restraints by these dominant groups, and positive planning by all, may be needed to prevent the Society from becoming binucleate or even dividing along these lines." The neurophysiologists have since departed but most retain their membership in the APS, and the pleas of Katz and many others notwithstanding, the APS has become formally sectionalized along "specialty" lines, the circulation group remaining the largest and most active. In this evolutionary sequence the APS has properly reflected the interests and wishes of its members. When these interests could not be met, either because of the inertia of the organization or by the inexorable dictates of science, "defections" of special interest groups have occurred and new societies created. As concluded by Gerard ". . . when a society does not satisfy the needs of a sector of its presumptive territory, physiologists, whether members or not, seem more inclined to seek or create another group than to attempt to change the one in question. The choice, if indeed there is one, is between malleability and splintering of the established bodies." In the main, there is no choice and in the long run no amount of hand wringing within the executive bodies of scientific societies will change the natural evolution of the scientific endeavor. Rather, successful scientific societies will assist the ever-changing needs of their constituencies as these evolve with their science. The APS has subserved this function admirably in the past but is now at a turning point in its own evolution, facing new opportunities and challenges.

The long and hesitant path toward the sectionalization of the APS has been compellingly recounted by John Cook in the "History" and need not be recalled here. Members of the Society are now identified with "Sections," each with its own governance or with "specialty groups" some with sizeable memberships. The Sections have, to date, had major inputs into the scientific programs of the Spring and Fall Meetings of the Society and

into the selection of editors of the APS journals cognate to their interests.

Not surprisingly, the largest is the Cardiovascular Section with 916 members followed by the Respiratory Section with 600. Endocrinology and Metabolism is next with 494 members, Cell and General Physiology with 453 members, Renal with 347 members and the Nervous System with 318. Combining the Nervous System Section with the Neural Control and Autonomic Regulation Section yields a now impressive grouping of 462 members. If the Water and Electrolyte Section, which, with 80 members, does not meet the requirements of Section status, were to join forces with the Renal Section, a respectable grouping of 427 members could be achieved.

The chairmen and a few other leaders of all the Sections (exclusive of the teaching section) were contacted with a request of their views and critical comments regarding the current and future operation of their organizations. More than half responded in writing and some of them unburdened themselves over the telephone. Recurrent themes included the inroads of competing societies and the representation of Sections in the governance of the Society. The notion that the chairpersons of the Sections be members of council and, in fact, that the Council of APS be made up of Section representatives was often voiced; in other words, that the Section Advisory Committee become the Council of APS. It has been argued that this is too large a group to effectively govern the Society but its size can be reduced by combining Sections of clearly kindred scientific interests and by otherwise limiting the formation of Sections using appropriate criteria of membership size and scientific cogency. The president could then be elected by the membership at large, the Section Advisory Committee (Council) serving as the nominating committee. For this representative form of governance to be effective the Sections must be strong and its officers active participants in the scientific enterprise. Where possible there should be correspondence between the sections of the AJP and the Sections of the Society. It has been suggested that one of the requirements for election to section office be membership on the editorial board of the relevant section of AJP.

One gains the impression that the Society, having acquiesced to the formation of Sections, remains ambivalent about the role that they should play in its governance. As quoted by John Cook in his essay, one APS officer noted that "we have the sections and now we must figure out what to do with them." Sectionalization will be a detriment to the Society if this ambivalence persists. The LRPC agrees in principle that the Section Advisory Committee become the council of the APS and that in order to make such a scheme manageable a more limiting view of the organization and composition of Sections must be taken. It is beyond the purview of this committee to be more specific but it does recommend that Council appoint a task force on governance to deal with the details of implementing such a plan.

The impact of competing specialty societies on the work of the Sections has already been alluded to. While hard data regarding the attendance of Section members at APS meetings are not available, it is to be expected that the representation of Sections whose members have affiliations with vigorous societies devoted to their special interests, with attractive meetings of their own, would be small. While the available evidence suggests that the quality of contributions to the scientific program of Society meetings in terms of symposia and other offerings is more a function of the energy and enthusiasm of the Section leadership than anything else, small audiences can have a disheartening influence on the proceedings. For example, while some stellar programs have been mounted by the Nervous System and Endocrinology Sections at great cost in labor and treasure, the attendance at these events has, on occasion, been embarrassingly small. There is no reason to believe that this circumstance will not continue and the APS has little choice but to let nature take its course.

There is agreement among the officers of these and similarly affected Sections, however, that the sponsorship of free-standing conferences along the lines suggested below (APS Symposia) featuring outstanding speakers from the specialty at large will attract not only members of APS interested in the subject but others as well.

The APS has been preoccupied with the appropriateness of its meetings since its inception (see the History), a preoccupation that has been exacerbated by the passage of time. In the summary of his report 33 years ago ("Mirror to Physiology") Gerard bemoaned the spectacle of "several thousand registrants, who seek and elude one another in corridor tag, presenting an image of Penguin Island or Seal Rock." That the gigantic Spring Meeting with FASEB has outlived its usefulness has finally been accepted and is in the process of change (see below).

At the time of the first organizational meeting of the LRPC the Program Committee was about to recommend to Council that the traditional meetings of the Society be reduced from two to one per year, this singular gathering to be held with FASEB in the spring. While not on its agenda, but part of its charge, the LRPC voted unanimously to support the recommendation of the Program Committee that the Society meet only once a year but reserved judgment whether this single meeting should replace the traditional Fall Meeting or the traditional Spring Meeting with FASEB. This deserved some study because it had been decided by APS Council nearly a decade earlier that a single meeting of the APS, where all its societal affairs would be conducted, was to be held in the fall while multiple "intersociety" meetings devoted to special subjects or themes would be held in the spring, initially with the Federation, when our sister societies would also be meeting. The LRPC requested that Council defer a decision on this issue until it could receive proper study but to no avail.

The APS is committed through 1996 to have its annual

meeting with FASEB in the spring and to mounting "specialty meetings" at other times of the year. Planning for the Spring Meetings beyond 1996 should begin without too much delay. The options available to the APS are clear.

1. To continue as before.
2. To meet alone or to meet with other societies with kindred interests such as the American Society for Cell Biology, the Biophysical Society, The American Society for Pharmacology and Experimental Therapeutics, the biochemists and a number of others in various combination and at different times, the pattern employed by the American Society for Biochemistry and Molecular Biology (ASBMB).
3. Form new, permanent alignments with kindred societies.
4. Not to have an annual meeting, limiting meetings to those of committees and to the specialty conferences (see below), business "meetings" being conducted by mail, electronic and otherwise.

The LRPC strongly and unanimously recommends option 2.

The LRPC also wholeheartedly endorses the plan of the Program Committee to mount an increasing number of "specialty meetings" in lieu of the traditional Fall Meeting. Some of these have already been programmed and others are on the drawing board for implementation by 1992.

It has been argued that the Gordon Conferences, the FASEB conferences and a number of other special symposia and "specialty meetings" already provide ample opportunity for scientists of cognate special interests to convene and that adding to this array would be neither original nor contributory. Viewed in another light, however, such conferences could become as important a vehicle for the APS as its publications.

. . . APS Symposia could become important instruments of physiological communication . . .

One can envisage a series of prominently and widely advertised conferences on important topics of physiological interest addressed by the most prominent speakers in the field. All the conferences would have the same easily recognized title (or logo), such as "APS Symposia," with the topic as the subtitle. The advertisements in widely read journals such as *Science* and *Nature*, as well as journals of the appropriate specialty should be at least one-half page and preferably a full page and presented in eye-catching yet dignified fashion. The venues for these meetings

should be reasonably attractive and suited to the season.

If these APS Symposia are of consistently high quality and address important topics of wide interest (aging, obesity, reproduction, exercise, hypertension, to name a few), they should have a significant impact on name recognition for APS and physiology, increase the attractiveness of the field and stimulate a greater number of young people to enter it. Aside from the public informational aspects of this endeavor they could become important instruments of physiological communication and, in time, turn into significant profit centers for the Society. Publication of the proceedings is an interesting possibility.

The programs for these symposia should originate in the Sections and other formally constituted groupings of the APS but ad hoc groups should not be excluded. In addition to outstanding invited speakers they could include volunteered contributions in the form of poster sessions. To ensure the quality of these offerings they should go through a rigorous review and selection process keeping the objectives of the program clearly in mind. In this context, the Program Committee would function as would the Publications Committee if new journals were to be launched every year. At the same time mechanisms must be devised for evaluating the success of each conference. The Program Committee should be charged with developing instruments for the critical analysis of meeting outcomes using a variety of criteria that are well developed and commonly used in the business world and in continuing medical education.

Some of the symposia will be unitary events. Others dealing with rapidly moving areas might become recurrent (like the Gordon Conferences) and acquire special traditions of their own over the course of several years.

To succeed, the Society must be unstinting in its financial and administrative support of the APS Symposia, including generous travel grants for young investigators in the field. As when new publications are launched, major investments will have to be made initially until these enterprises become self supporting and possibly profitable and be expended with the view of establishing them in the shortest possible time as highly respected, instantly recognized and desirable vehicles for communication in the biomedical sciences.

The LRPC recommends that

1. The APS formally establish a new instrument in scientific communication of the highest quality, the APS Symposia, with the goal of making it internationally recognized and respected.
2. The scientific programs of the APS Symposia will be generated by the Sections and Groups as well as by ad hoc groups of APS members.
3. The proposed APS Symposia be rigorously reviewed and evaluated by a suitably constituted Program Committee to ensure that the highest standards of excellence and the objectives of the program are met.

The publication activities of the Society have been a resounding success. Acceptance of sectionalization of the

American Journal of Physiology into its various component "specialty" journals preceded the sectionalization of the Society as a whole, and the beneficial outcome of this bold departure, feared by many leaders of the Society at the time, was the lubricant that facilitated the later move. The perspicacity and flexibility of the Publications Committee was and continues to be a major factor in the continued viability of this central societal enterprise.

No attempt was made to systematically study the publications of the Society but there is little doubt that this activity is on the right track and should be pursued with alacrity in the future. Some of the Journals are finding special niches in their field despite awesome competition from other publications. A case in point is the *American Journal of Physiology: Endocrinology and Metabolism* that has become the premier vehicle for the publication of the best work in metabolic physiology although it does not otherwise compete favorably with the journals of the Endocrine Society and other endocrinological publications.

The Handbooks continue to be landmark contributions to physiology and should be continued and expanded, recognizing all the while that the traditional subdivisions of physiology will inevitably become blurred and new ones will arise.

One can easily foresee the possibility of exciting new publication ventures associated with the implementation of the world class conferences (APS Symposia) described earlier, the proceedings of which should be widely shared.

Additionally, the Society may wish to be involved in the production of films and videotapes as legitimate and valued activities in the communication and popularization of the physiological sciences.

While foretelling is a risky business, at which our predecessors have not excelled, it may be predicted that 25 years from now the publications of the Society and the projected APS Symposia, if properly launched, will be the major hallmarks of the American Physiological Society.

The APS and FASEB

In 1911, the APS instigated the founding of FASEB in an attempt to maintain scientific continuity between it and its recently spawned offspring, the American Society of Biological Chemists and the American Society for Pharmacology and Experimental Therapeutics. This family group was joined in 1913 by the American Society for Experimental Pathology and in 1940 by the American Institute of Nutrition. The current membership was achieved in 1948, by the addition of the American Association of Immunologists.

The annual Spring Meetings of the Federation were astonishingly successful and, by the 1960s, exceeded the capacity of most meeting places as well as the information processing abilities of most attendees. The Federation became a formidable organization in its own right

that often overshadowed its adherent societies. The relations between FASEB and some of its old parents, notably the ASBC and the APS, became increasingly fractious in the course of the past three decades. The reasons for these societal strains have been multiple, complex and changing with time. The concerns of the sixties have been summarized in the History of the American Physiological Society. The problems of the seventies were addressed by a committee of FASEB, the Select Committee on Priorities and Planning, initially chaired by Roy Vagelos representing the ASBC, as well as by a task force of the APS chaired by F. E. Yates. The latter submitted its report to President Robert M. Berne in 1973. The principal concerns addressed by the Yates committee were the increasing size of the Spring Meetings and the formation of new societies that hold their own meeting thus weakening the scientific programs of interest to members of APS. The new societies cited were the Biophysical Society, the Biomedical Engineering Society and the Society for Neuroscience. In addition, the unsuitability of the few remaining venues able to accommodate the Spring meeting, the "imperious" behavior of the permanent FASEB staff toward the member societies that it was designed to serve and the inequity of the financial arrangements between APS and FASEB were cited as irritants. The task force considered a number of remedial options, including leaving FASEB but recommended that APS remain in FASEB and lead in its reconstitution so "that other societies may join, so that financial distribution be equitable, and so that multiple meetings may be arranged by FASEB each year upon the initiative of program committees of the member societies." In the process a "new union of biological sciences" would be created. The task force further recommended that the "APS should not hesitate to use the threat of leaving FASEB as a means to achieve the restructuring of FASEB" and specified that this action should be taken within four years if its purposes were not fully met.

In reaching its recommendations the Yates Task Force was acutely aware of the decision by the ASBC to periodically hold meetings away from FASEB either by itself or in conjunction with non-member societies. They "attached much importance to these policies of the biochemists, because they have necessarily weakened FASEB and the Spring meetings to such a degree that any similar action of APS will have an amplified effect in undermining the stability of FASEB."

In the succeeding decade, conflicts between the APS and FASEB were never far from a surface that, nonetheless, appeared to some as remarkably untroubled!¹⁰ The assessments levied by FASEB against its members continued to increase and came to represent the single largest item in the APS operating budget (40%). Was it getting its money's worth? The increasingly negative answers to this question were repeatedly mollified by the assertion that since the member societies derived income from the Spring Meeting essentially equivalent to the assessment,

the services and benefits provided by FASEB, whether valued or not, were essentially free. Why look a gift horse in the mouth? It became apparent, however, that if member societies did not have to pay for unneeded or unwanted services, their expenditures would be decreased regardless of the magnitude of the income. But even this began to diminish as biochemists increased the frequency of their own meetings away from FASEB and discontinued participation in the Spring Meeting altogether. The consensus of the Yates task force regarding the scientific content of the Spring Meeting was exacerbated by the evolution of the biological sciences relevant to physiologists who found increasing need to meet with the biophysicists, the neurobiologists and the cell biologists rather than with the remaining FASEB Societies represented at the Spring Meetings. FASEB was increasingly viewed by a segment of the leadership of APS, albeit less so than that of ASBC, as a liability rather than an asset. As rearticulated by the Yates committee in 1973, the recurring refrain since then has been that FASEB had to increase its membership to encompass the majority of the biomedical sciences or lose its effectiveness as a change agent in the increasingly difficult climate for biomedical research. Even in the 1940s Ralph Gerard and others felt that the Federation had too narrow a base and urged that the APS join a stronger national group that represents all of biology.¹¹

. . . FASEB, as currently constituted does not and cannot speak for the biomedical sciences because a number of important societies are excluded from its membership.

In the course of its second meeting on March 22, 1989, the present Committee considered at some length the charge by Council that it "make recommendations on how APS should relate to FASEB and other Societies." It was noted that FASEB was at a crossroad with the impending retirement of Robert Krauss, its executive director, and that this interregnum provided a unique opportunity for APS to readdress its relation to FASEB. The Committee reaffirmed that an umbrella organization that speaks for and serves a group of scientific societies with kindred interests and objectives is a desirable thing but concluded that FASEB, as currently constituted, does not and cannot speak for the biomedical sciences because a number of important societies are excluded from its membership. In the light of these circumstances, the LRPC voted unanimously to "recommend to Council that it formally address the fundamental issue of the future of FASEB by deciding whether to reaffirm the governance of the cur-

rent organization or to dissolve it with the view of reconstituting a new Federation more representative of the relevant sciences." The Committee strongly favored the latter course because all previous attempts to invigorate FASEB by other means had been ineffectual.

At its meeting on the next day, APS Council unanimously adopted the recommendation of the LRPC in its entirety and communicated this to the members of the FASEB Executive Committee and the Presidents of the other FASEB member societies. In his letter of transmittal President Vernon Bishop said that "In preparation for the forthcoming FASEB retreat, I would urge the Councils of each of the constituent societies to consider how best to strengthen the Federation to make it more representative of all of experimental biology. In so doing, we can create a new Federation that will be beneficial to the current member societies and the biomedical community."

... the challenge is to find a descriptor that differentiates physiology from the other biomedical sciences.

The recommendation of the LRPC was again deliberated at length by Council at an ad hoc meeting the following June and retreated somewhat from its previous position by passing the following resolution:

"The American Physiological Society is convinced that the structure of the Federation of American Societies for Experimental Biology (particularly the assessment) limits freedom to organize meetings of the APS and discourages broadening the composition of the FASEB to be more representative of the biomedical community. The APS believes that a federation of biomedical societies is desirable for promotion of biomedical sciences through public affairs and support services and that such a federation must be broadly representative of the biomedical research community

For FASEB to attract additional member societies and to provide the APS with freedom to organize meetings, the assessment must be essentially eliminated. Therefore, the APS requests that the FASEB Board at its 1989 retreat develop a plan to accomplish this by 1994 and communicate the plan to APS prior to the 1990 FASEB Spring meeting. Based on consideration of this plan, a formal decision will then be made by the American Physiological Society whether to remain a member of FASEB.

To essentially eliminate the assessment, the American Physiological Society recommends that:

1. all FASEB support services operate on a cost-recovery basis;

2. the FASEB Journal operate on a paid subscription basis;
3. the FASEB Public Affairs Office reduce its staff and utilize individual society public affairs officers;
4. FASEB establish an endowment fund earmarked for assessment reduction;
5. FASEB use income/dividends from existing reserves for assessment reduction."

It is difficult to escape the resemblance between this resolution and the recommendations of the Yates Task Force made 17 years earlier including the threat to withdraw from the Federation if the wishes of the APS were not met. It is unlikely that it will be any more effective in the recruiting of new organizations to FASEB.

In response to the actions of the APS and the deepening disaffection of the Biochemists, the Articles of Incorporation, Constitution and Bylaws of FASEB were revised effective July 1, 1990. The revised governance of FASEB provides the *potential* for attracting new societies to its membership and for making it more responsive to the wishes of member societies. Membership dues rather than assessments will finance the activities of FASEB that will be expected to operate within their budgets.

In parallel actions the APS joined in a resolution that dues for newly recruited societies be set at \$10 per member (ie, about \$160,000 for the Society for Neuroscience). Current corporate members will continue to support FASEB by a gradual reduction in annual dues from the current \$65 per member to \$15 per member in 1994. At its current membership this would still represent for APS, over \$100,000 per year exclusive of payments for rent and services.

This scenario has been further complicated by the intention of the ASBMB to leave the Federation in any case unless the membership of FASEB is significantly broadened by November of 1991. This is an unlikely possibility, even with the reduced dues structure, because the societies that should be attracted (Neuroscience, Cell Biology, Endocrine Society) have little, if anything, to gain by joining the Federation. Without the biochemists, FASEB cannot play a significant role in national scientific affairs and must merit its support on other grounds.

In light of the foregoing, the LRPC recommends that

1. The APS, having been a signatory to the current agreements, discharge its obligations to FASEB through December 31, 1994.
2. The APS critically reassess the cost-benefit ratio of continued membership in FASEB at an early time before the expiration of the foregoing agreement.
3. That APS consider, as an alternative to continued membership in FASEB as presently constituted, taking leadership in establishing a separate tax-exempt entity (FASEB Foundation or Corporation) that will be composed of the six original members of FASEB as only shareholders. This entity will own

the current FASEB campus and have as its sole responsibility to manage it. All interested societies, including the present members will then be free to join as equals in a new scientific union(s) designed to meet their common objectives or not to do so. The Beaumont campus and its facilities will remain a valuable resource as long as it remains attractive to its tenants. The addition of a conference center could be considered.

4. In the interim, the APS should maximize the efficacy of the only umbrella organization for all the biomedical sciences now extant: The Council of Academic Societies (CAS) of the Association of American Medical Colleges (AAMC). This organization has been uncommonly effective in influencing legislation and other federal support of benefit to the biomedical sciences in the contexts of federal appropriations for research and training, the threat of the animal rights activists and restrictive legislation pertaining to the use of animals in research. To increase the effectiveness of the interaction between the APS and the AAMC it is recommended that members of APS Council be appointed the APS representatives to the CAS.

The Images of Physiology

As already noted repeatedly, the difficulty in defining physiology has frustrated our modern antecedents in their attempts to study and to foretell the future of a science that they perceived as being, in fact, nonexistent. The outcome of their labors, however, was no less voluminous because of this seemingly insurmountable impediment. The reason, of course, is that having admitted defeat on philosophical ground, they proceeded to define physiology operationally in terms of the work that self-professed physiologists do. It was recognized that there exists an array of different physiologies that could be circumscribed, described and analyzed without too much difficulty. It is the allure of these individual physiologies that have continued to attract young people with a great variety of academic backgrounds. The ranks of physiologists have, for the most part, not been replenished by holders of degrees in physiology. Even physicians who have all been formally exposed to a course in mammalian physiology represent but a third of professional physiologists as defined by membership in the American Physiological Society. It is not unreasonable to assume that this process of accretion in the physiological sciences will continue and be as successful in the future as it has been in the past. A few undergraduate and medical students will, in the course of their university experiences, be exposed by stimulating teachers to subjects that they find enthralling and that they are driven to study further as a lifetime career. Where this period of advanced study will take place depends largely on the advice of undergraduate mentors or, in the case of medical students, on that of admired and respected medical school instructors. Not infrequently, the institu-

tion where the student is first exposed to the object of his or her career choice is the one that is chosen for advanced study leading to an academic degree or, in the case of students who have already received the MD degree, a postdoctoral research fellowship.

Difficulties arise, however, in attempting to attract undifferentiated students to the predoctoral training programs offered by physiology departments. Departments of physiology must compete for these students from a declining population of undergraduates contemplating careers in the biomedical sciences and who are all being actively recruited by similar programs in subjects that have unmistakably descriptive and alluring names such as molecular biology, neurobiology, or microbiology. This is when the physiology label is at a disadvantage because undergraduates are generally not exposed to the subject and to many of the uninitiated it represents, if anything at all, the traditional organ physiology that still comprises the curricular offerings of medical school physiology departments and is considered as exciting and current as gross anatomy.

To the public at large, that financially supports the work of physiologists, the meaning of the word physiology is vastly more obscure. This issue was discussed at length in the 1958 report with the suggestion, among others, "that the position of physiologists would be improved if a different term were used to describe this work." Its author goes on to say, however, that "physiologists are overwhelmingly disinterested in the problem of public relations, however alert they become on the matter of public support."

It is only a matter of time before the funding agencies recognize the importance of integrative biology, and the APS should spearhead an educational and informational effort at the federal level to hasten this transformation.

In its preliminary meetings the LRPC seriously contemplated the possibility, utilizing the vast experience of the corporate world, of gradually changing the name of the APS to rectify the incomprehension of the word physiology by the community at large, the confusion of undergraduates and the inability of professional physiologists to come to agreement regarding its meaning. Should a name change, as part of a major public relations effort of the APS, be accepted the choice of the new name is not an easy one. For lay audiences, including high school and, perhaps, college students the traditional term functional biology, to distinguish physiology from anatomy,

may be used as a descriptor. The nature of physiology as a medical science, however, is self evident in such presentations and may, as in the past, merely attract undergraduates to the study of medicine.

At a higher level, the challenge is to find a descriptor that differentiates physiology from the other biomedical sciences. Most of them as currently perceived can also be described as "functional" or "dynamic biology." Regulatory biology has the same problem, molecular genetics for example being the ultimate regulatory biology. If, however, one examines the current diluvial molecular emphasis in the biological sciences, those biologists who are rediscovering the challenges of synthesis and integration are emerging as a new intellectual elite while investigations at the molecular or the subcellular levels without regard to higher functions are becoming an increasingly plebeian activity. The definition of physiology as "integrative biology" thus distinguishes it from the other biomedical sciences and describes the central and long-agreed-upon description of the calling as being, more than anything else, a point of view, an approach to biological problems with the goal of gaining an understanding of vital functions.

... a deep malaise permeates the physiological community regarding the future of the science and of the institutions that represent it.

Viewed in this light, the uniqueness of physiology as the science of integrative biology could, once again, attract those biological scientists of all disciplines interested in the functioning of complex systems who have become disaffected by the ever-growing mountain of factual information emanating from the frenetic laboratories of the molecular biologists. Such disaffection can be found with increasing frequency at the Neuroscience meetings and at the meetings of the Endocrine Society among others. As noted elsewhere, molecular biologists are rediscovering organismic function with vigorous enthusiasm. If the APS and the remainder of institutionalized physiology adopt this image it can be the rallying force for the biology of the future. It is only a matter of time before the funding agencies recognize the importance of integrative biology, and the APS should spearhead an educational and informational effort at the federal level to hasten this transformation.

The public information media have always been more interested in publicizing scientific discoveries that can be incorporated into the sphere of bodily functions accepted as important by the "man on the street." The utility of "science writers seminars" in an attempt to explain the

uniqueness of physiology as a science should be explored in this context.

As recorded earlier, the APS is no longer viewed by nearly half of the members of physiology departments, all professional physiologists by definition, as worth belonging to. There are many reasons for this, but an important one is related to the perception that the APS no longer represents the scientific community most active at the forefront of biological science. Since election to membership of APS has not been a mark of scientific achievement for some decades, young physiology faculty members whose scientific interests are better represented by other societies invest their time, devotion and money in these less amorphous groups. A large number of physiology faculty members do belong to APS as a matter of form but do not attend its meetings or publish in its journals.

The reintroduction of a little elitism in this egalitarian era may rekindle some interest in membership in the Society by those who consider themselves physiologists. It is, therefore, proposed that a new category of membership be established to be named "The Fellows of the American Physiological Society."

Fellowship would be reserved for those scientists in the prime of their careers engaged in physiological research of high distinction and nominated by a special committee that would generate the list of candidates *de novo* and/or in response to nominations from the membership. It is suggested that a limited number of Fellows be elected every year from the most active workers in the field. Candidates for Fellowship need not be members of the APS. Their installation should be accompanied by some fanfare. It can reasonably be expected that the leadership of the Society will be derived from this cadre of Fellows.

Summary and Conclusions

By all objective measures American physiology is thriving. Membership in the American Physiological Society continues to increase, its publications are flourishing, the faculties of medical school physiology departments are growing, their compensations are increasing above the rate of inflation, and the number of pre- and postdoctoral students enrolled in these institutions, if not increasing dramatically, is not declining. Research support of physiology departments continues to be impressive. Yet a deep malaise permeates the physiological community regarding the future of the science and of the institutions that represent it. One important finding of the present study is that this malaise has been extant since the founding of the APS more than a century ago. In consequence, the Society commissioned several major investigations regarding the nature and future of physiology beginning in the mid-1940s. These efforts were catalyzed by the ever-increasing heterogeneity of physiology and its continual propensity to fractionation and to found new divisions that become scientific disciplines in their own right. Because Claude Bernard and all subsequent writers on the subject recognized that physiology was not a unitary science, its heter-

ogeneity may be regarded as an intrinsic property of the subject. This characteristic of physiology has inevitably caused difficulty in attempts to define it, leading to the conclusion that physiology as a science and a profession does not in fact exist. Unlike chemists, for example, modern physiologists cannot be defined by the tools they use, by the systems that they study or by a common scientific heritage. Physiology, it was further concluded is, if anything, a special point of view, a distinctive approach to biological problems guided by a quest for the understanding of organismic functions rather than of mere processes. The recent revolution in the biological sciences initiated by the deciphering of the genetic code has vastly added to the malaise. The view that all frontiers in biology are at the molecular level, to the exclusion of other approaches, has permeated the biomedical community and the thinking of its decision makers in universities, the government and private foundations in the allocation of their resources. Unfortunately, the reaction to this trend by institutionalized physiology has been an attempt to change its current image of organ physiology as taught in medical schools to one that intends to convey that the "cutting edge" of physiological research is also at the sub-cellular and molecular levels. The molecular biologists have made spectacular advances and are currently attempting to map the entire genomes of several species from worms to man. In these efforts, they have entrained a substantial portion of the biomedical community, young aspirants to scientific careers in particular. But, predic-

tably, workers at the molecular levels are increasingly asking physiological questions including the ultimate one, What makes organisms function as organisms?

. . . Physiology may have missed out on the last revolution in biology but it should not miss out on the next . . .

The overwhelming wave of reductionism in biology appears to be cresting, and the swells of integrative biology are reappearing on the horizon. If physiology unambiguously defines itself as integrative biology, it can be the wave of the future. As integrative biology, physiology will be unique among the "basic sciences" in medical schools. The new frontier in the biological sciences will be the functioning of complex systems and will engage growing numbers of biologists. The APS, by representing scientists at the new frontier, can recapture the increasingly disaffected neurobiologists, endocrinologists, biochemists and others with integrative bents who are currently excluded by the molecular emphases in their own societies. To achieve this end the APS should officially adopt and promulgate the definition of physiology as "Integrative Biology."

(continued on p. 180)

Council Actions

The APS Council received the report of the Long Range Planning Committee (LRPC) at a meeting on October 6, 1990 in Orlando, Florida. The report was enthusiastically accepted and the following actions were initiated by Council to implement the recommendations:

1. The Council accepted the concept that APS promulgate a definition of physiology as "Integrative Biology," the biology of the future.
2. The "APS Symposia" concept was accepted with a modification of title to "APS Conferences." The LRPC recommendation was consistent with the Society's efforts to convert the traditional fall meeting format to a series of superlative specialty meetings.
3. The proposal to establish a "Fellows" category of membership was referred to the Membership Committee for consideration and development of criteria for possible implementation.
4. A Task Force on Governance was established to develop procedures by Fall 1991 for the Section Advisory Committee to become Council.
5. A subcommittee was established to develop procedures to plan for the organization of spring meetings after 1996.
6. The recommendation concerning the reorganization of FASEB was tabled until the current efforts are resolved.
7. The Council agreed with the assessment that Council members be our representatives to the AAMC Council of Academic Societies, which will be reflected in the Operational Guide.

High School Teachers Get Hands on 'Real Science'

How did you spend your summer vacation? Instead of going to the beach or staying home to watch TV, three Miami Valley, Ohio high school teachers immersed themselves in research labs at Wright State University, Dayton, Ohio. They came to learn more about the day-to-day processes of science, and they left with renewed conviction to fight a growing threat to America's future—the national decline in scientific literacy.

Recent studies show a drop in interest in the biological sciences among the nation's high school students, and fewer students are choosing these fields for careers. A lack of basic scientific understanding among the American public threatens our ability to make informed decisions about complex issues such as genetic engineering, acid rain, or the greenhouse effect.

To try to reverse these trends, the American Physiological Society launched a program this year to give high school science teachers firsthand experience in working laboratories, so that their excitement and insights about today's science could be transmitted to their students. The APS sponsored summer internships for 12 teachers at biomedical research institutions around the country.

Sensing the value of such an experience, Peter Lauf, distinguished professor and chair of the Department of Physiology and Biophysics, pulled together matching funds at Wright State to support three teacher internships, instead of just one. "Thanks to a terrific team effort, we were the only university in the country to sponsor three teachers," he says. The first internship was sponsored by APS; the second, by the School of Medicine, the College of Science and Mathematics, and the College of Education and Human Services; and the third, by the university administration.

"We need to catalyze the thought process and curiosity of kids about science," Lauf says, "and deflect them from spending their lifetime in front of the television—which is a tough task.

Neil Postman has written that the American teenager spends on average 16,000 hours of his life watching television. That's a problem."

One answer, according to Lauf, is encouraging teachers to use a Socratic method to teach science. "Instead of teaching lots of details and facts that students have to memorize, teachers should be encouraged to work with smaller groups of students at a time, covering fewer examples but doing it more



Belinda Banks and Robert Putnam

thoroughly," he explains. "The teacher then evaluates the students' knowledge of material they've gotten beforehand, asking questions that cannot be answered at once, stimulating students to go back to the library to read more about it."

During the 10-week internship, each teacher was paired with a scientist-mentor in the Department of Physiology and Biophysics. The teachers functioned as graduate research assistants in their mentors' labs, and in addition to work stipends covered by internship sponsors, the teachers received 10 graduate credit hours for the quarter.

Lauf was the mentor for Ruby Bryant, who teaches at Colonel White High

School in Dayton. Lauf's research, which is funded by the National Institutes of Health and a national grant from the American Heart Association, centers on finding a molecular mechanism that could prevent dehydration of blood cells afflicted with sickle cell disease. This disease causes blood cells to change their normal discoid shapes into sickle shapes that clog blood vessels. Finding a way to prevent dehydration of the afflicted cells and thus reduce the sickling could lead to a cure for the disease.

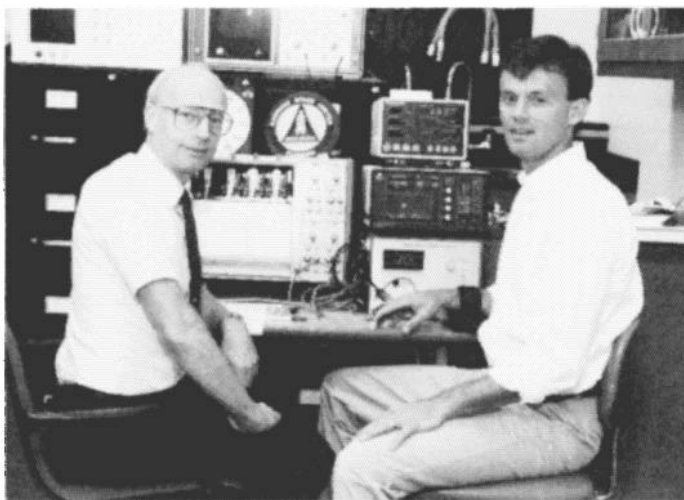
Bryant's first lesson was the time scientists put into their work. She spent up to 12 hours a day in the lab. "Once you get started, you don't stop until the experiment is finished, otherwise you destroy the complete process," she explains.

"We can't duplicate the sophisticated instrumentation in our high school labs, but we can teach our students new ways of looking at scientific data," Bryant says. "During the rigor of the school year, we don't have time to repeat the scientific process, but we can be excited about it and infuse that in our students.

"It's important for teachers to become energized, to keep students current with what's going on around them," she adds. "Our high school students are really our future leaders, and we have to get them ready for the world they'll live in."

Fairborn High School teacher Belinda Banks worked with Robert Putnam, associate professor of physiology and biophysics. Funded by a first award from the National Institutes of Health and a grant from the Ohio Affiliate of the American Heart Association, Putnam's research examines the regulation of acid-base (pH) levels inside smooth muscle cells. These are the type of cells that line blood vessels and cause them to constrict or expand, thus regulating blood pressure. Putnam hopes to find a link between cellular pH regulation and hypertension, or high blood pressure.

"In the lab, you concentrate on what you yourself are doing. It's much different than working with 150 students per



Robert Gotshall (L) and David Farrish (R)



Ruby Bryant and Peter Lauf

day," Banks observes. "There are no guidelines, and you go where experiments take you.

"Every science teacher has to get his or her hands on real science. I think it should be a requirement," she continues. "If our students are going to be the politicians and voters, they need to be scientifically informed."

The summer internship has evolved into a broader project for Putnam and Banks. He will visit her Fairborn classes each week this fall to talk about science from the scientist's perspective. At the project's beginning and conclusion, the students will answer a questionnaire surveying their perceptions about science, so that Putnam and Banks can evaluate the educational impact of their efforts.

"I will talk about what science is today and expose the students to ideas

such as the human genome project, the use of animals in research and funding for scientific research," Putnam explains. "We'll have discussions, and we'll debate topics from a wide variety of points of view."

"I want to make the students realize that not knowing anything about science could be a real detriment to them," Putnam adds. "I want to show them that science is a vital and live process, done by vital and live people."

David Farrish, a Lemon-Monroe High School teacher, worked in the laboratory of Robert Gotshall, professor of physiology and biophysics. Gotshall's research, recently supported by the American Heart Association, examines the cardiovascular system's role in orthostatic hypotension, a medical condition commonly experienced by as-

tronauts as they return to earth from the weightless environment in space. They experience a drop in blood pressure at head level when they stand up, which can cause dizziness and loss of balance. "We are trying to find out why orthostatic hypotension happens, and what to do to counter or prevent it," Gotshall says.

"This program has given me an opportunity to look at how my work can have an impact on the world beyond the lab," Gotshall says. "Working with David has helped me to bridge the communication gap, to think about how to get the message out to the younger generation about the importance of science.

"David has watched me make mistakes, and that brings out the human aspect of science," he adds.

Farrish was a "guinea pig" in one of his own experiments. "Any test you put a human subject through, you should be willing to do yourself," he says. "Being the experimenter and experimentee helped tie the experiences of each together. Working with the information and being the subject, I could visualize the chart of the results in my mind as I participated in the experiment.

"In the classroom, I disseminate information; in the lab, I'm involved in gathering it. It's the beginning step of the whole process of education," Farrish continues. "I'm going to try to get the students to do hands-on work. They will get more of a sense of creation about science. The learning will come from them when they design labs and use the scientific method."

Phillip Messner, associate professor of education, met weekly with the science teachers to discuss how they could translate their laboratory experiences into classroom learning experiences for their students. "The teachers were indoctrinated into a rigorous research methodology and a think process, and it's the thinking process that they'll take back to the classroom," he says.

"They had an opportunity to model the scientific behavior, attitudes and ethical knowledge of their mentors, and now they will be able to show that to their students," Messner concludes. "It's going to make them better teachers. I'm convinced of it."

Heather Darrow and Mark Willis

LRPC REPORT

What's Past Is Prologue

(continued from page 177)

Physiology may have missed out on the last revolution in biology but it should not miss out on the next which, without any doubt, will be in the realm of organismic biology.

A number of recommendations are made in this report that will facilitate, directly and indirectly, the transformation of institutionalized physiology into organizations that will represent the leading biological discipline of the future.

To paraphrase William Milnor,¹² physiology need not be the dinosaur that it is so often accused of resembling but can be the phoenix that rises resplendently, not from the ashes of fiery destruction, but from the undifferentiated cauldron of contemporary biology.

G. H. Giebisch, J. P. Granger, J. E. Greenleaf, R. B. Lydic,
R. H. Mitchell, E. R. Nadel, S. G. Schultz, J. D. Wood,
and E. Knobil, Chairman

Endnotes

1. Fed. Proc. 5:407-436, 1946. This paper is misreferenced in the 1947 report by Gerard and in his final report "Mirror to Physiology."
2. Fed. Proc. 6:522-537, 1947.
3. Robert E. Krieger Publishing Co. Huntington, NY 1973.
4. Le Cahier Rouge In: Claude Bernard and Experimental Medicine. F. Grande and M. B. Visscher (Eds.) Schenkman, Cambridge, 1967.
5. Science 248:1310, 1990.
6. These figures are taken from the ACDP survey that includes physiology departments of non-medical institutions. Those without any research support are not otherwise identified.
7. History of the American Physiological Society. The First Century 1887-1987. J. R. Brobeck, O. E. Reynolds and T. A. Appel (Eds.) The American Physiological Society, 1987.
8. The history of the Society, from the time of its founding through its first 100 years has been faithfully and captivantly recorded in the volume of the same name (loc. cit.) and should be consulted for details by the interested reader.
9. In his essay on the future of physiology in the 1946 report Adolph predicted that by 1995 the population of all physiologists may increase to 4,000!
10. See Chapter 16 of the History.
11. Fed. Proc. 6:522, 1947.
12. Physiology—Dinosaur or Phoenix? Perspectives in Biology and Medicine 30:4, 1987.

High School Science Teachers Research in Physiology Program

\$5,000 Summer Stipend

The American Physiological Society is pleased to announce the continuation of a program aimed at providing high school science teachers with experience in physiology research. The program will be carried out through the awarding of grants on a competitive basis to individual members of the American Physiological Society. The grants will fund the involvement of a high school science teacher in the research program ongoing in the APS member's laboratory. Grants will be made for up to \$5,750, which includes a \$750 allowance for the high school teacher to attend the annual FASEB meeting. Cost sharing of the teacher's stipend or travel award by the APS member's institution is encouraged but not required. The stipend supports full time participation of the high school teacher for up to ten weeks during the summer. In addition to participation and research, it is expected that the high school teacher will take part in a variety of activities at the APS member's institution such as seminars, journal clubs, laboratory rotations, etc. At the FASEB meeting, a special luncheon for the high school teachers and their sponsors will be held so participants can share their experiences.

Grant awards will be based on the overall quality of the program, including: the level of involvement in the research activities of the laboratory; the background and teaching responsibilities of the high school teacher; the quality of the research program as indicated by publication record and financial support of the APS member; plans for other activities in which the high school teacher will take part; plans for continued interaction between the high school teacher and the APS member or the respective institution; and an indication of the expected impact of the high school teacher's participation in his/her own school.

Additional information concerning the High School Teachers Physiology Research Program and application forms can be obtained from:

High School Science Teachers Research in Physiology Program

American Physiological Society
9650 Rockville Pike
Bethesda, Maryland 20814
Phone: (301) 530-7164
FAX: (301) 571-1814

The program encourages the participation of minority groups by making special efforts to include high school science teachers who are members of underrepresented minority groups or who teach significant numbers of minority students.

Application Deadline: January 15, 1991

Hermann Rahn

1912-1990

Hermann Rahn, Distinguished Professor of Physiology at the State University of New York at Buffalo and 36th President of the American Physiological Society, died in Buffalo on June 23, 1990.

After receiving his AB degree from Cornell University in 1933 and his PhD from the University of Rochester in 1938, Hermann Rahn completed his education as a National Research Council Fellow at Harvard. In 1939 he was appointed Instructor in Physiology at the University of Wyoming, and in 1941 he accepted a fellowship in the Department of Physiology at Rochester under Wallace Fenn. He eventually became a member of the Department, rising to the rank of Associate Professor and Vice-Chairman before accepting the Physiology chair at the University of Buffalo (later incorporated into the State University of New York system) in 1956.

Hermann Rahn gained national and international fame as a member of the "Fenn, Otis and Rahn" team which, while assisting in the war effort in 1941-1945, developed some of the fundamental concepts in respiratory physiology. It is during that period that the group described the pressure-volume relationship of the respiratory system, the oxygen-carbon dioxide diagram, alveolar gas composition in a variety of conditions, respiratory effects of low and high pressures, and — simultaneously with but independently of Riley and Courmand — the effects of uneven distribution of ventilation and blood flow in the lung. Although Rahn remained a man of many interests and continued to publish in different fields, environmental physiology and ventilation-perfusion relationships were the two areas that claimed most of his time during the next twenty years and in which he achieved



universal acclaim. In the 60s, Hermann Rahn turned his attention to comparative physiology, dealing successively with acid-base balance, respiration in aquatic species and in animals in transition from water breathing to air breathing, and to the physiology of the avian egg. In each of these, he made stellar contributions.

Hermann Rahn's achievements brought him significant marks of recognition. At his university, he was made a Distinguished Professor and was awarded the Chancellor's medal; in his professional field, he first became President of the American Physiological Society and then Vice President of the International Union of Physiological Sciences. In addition, he was the recipient of four honorary doctorates and was granted a Humboldt Senior Fellowship. Last but not least, he was elected to the National Academy of Sciences and to the Institute of Medicine.

To achieve all this, an individual must

have a number of outstanding qualities. In Hermann Rahn's case, in addition to an energetic nature, a broad interest in life sciences and a fertile imagination, there was a unique ability to apply to physiology concepts and ideas from other fields of science, be it physics, mathematics, or chemical engineering. However, looking only at the scientific attributes of the man would lead one to neglect the humane qualities of someone who was fundamentally interested in nature and in all human beings he encountered, *as individuals*.

The last few months of life were not kind to Hermann Rahn but were unable to decrease his scientific enthusiasm and curiosity: he attended the FASEB meeting in Washington in April and reduced data and revised one more manuscript less than two days before his death. He remained fascinated with everything new he saw in the hospital and insisted on understanding how each of the gadgets worked.

With the death of one of the few remaining giants of the 1940-1945 era, physiology has lost a champion and a role model. The numerous students that Hermann Rahn trained over nearly half a century will consider it their duty to uphold his memory by following his example.

The Department of Physiology at Buffalo, a department that will long bear Hermann's imprint, has set up a Memorial Fund, the proceeds of which will be dedicated to improving scientific communication through lectures, symposia, and visiting professorships. Anyone wishing to contribute should send a tax-deductible contribution to The Hermann Rahn Memorial Fund, Department of Physiology, 124 Sherman Hall, University at Buffalo, Buffalo, NY 14214.

News from Senior Physiologists

Letters to Horace W. Davenport

Francis Dukes-Dobos writes that the letters from retired members of APS published in *The Physiologist* inspired him to continue working after he retired in 1985 from the National Institute of Occupational Health in Cincinnati. When he moved to Florida he met members of the faculty of the College of Public Health of the University of South Florida in Tampa, and he gladly accepted their invitation to join them as adjunct professor of environmental and occupational health.

He believes he made a good choice, for in four years work he and his colleagues have developed methods for measuring clothing ventilation that have enabled them to predict workers' tolerance time when exposed to given climatic conditions and work intensities while wearing impermeable protective garments open at the collar, wrists, or ankles. He has several graduate students as well.

Dukes-Dobos enjoys research and teaching without the stresses of his previous job and he now has time to spend on his hobbies, community service, and his wife, family, and friends.

Robert Doty wrote: "Things are going wonderfully well. Even my retirement dinner was great sport, an astonishingly sizable gathering of students and colleagues. In the week following the festivities I began two new research projects: an effort to quantify the respective projections of the three monoaminergic brain stem systems and the nucleus basalis upon various areas of the neocortex; and, to study the single unit activity of the pontomesencephalic raphe in the split-brain monkey. In other words, I'm committed to several more years in the lab. Alzheimer's, at least presently, seems remote.

About 12 years ago we made one of the best decisions of our lives and built a new home on 90 acres of upper New York countryside. I hunt deer in my "backyard," keep bees, an orchard, and a garden that makes us almost self-

sufficient in food; and, in addition I keep fit chopping our winter's supply of firewood."

Letters to Roy O. Greep

"I stopped all efforts in biomedical science upon retirement (from NIH), except for a few days now and then in the grant review business," writes **W. Glen Moss**, adding, "A fairly massive coronary infarct 11 days after retiring kind of spoiled my eagerness."

Since retirement to Front Royal, VA, he and his wife, Harriet, have spent considerable effort tracking their genealogy, visiting 53 county seats in 13 states. They have found that both their families have been as long as 10 generations on the American continent.

Letters to Steve Horvath

"While I officially retired from the Medical College of Georgia in 1989," writes **Robert C. Little**, "I continue to be active at the school, serving on several committees and spending some time each week at the university. My scientific activities are, however, limited largely to writing and editorial work. Retirement has been a rewarding experience, but it took me several months before I became fully acclimatized."

Mrs. A.T. Miller wrote that three weeks after moving to their retirement home, **Gus Miller** had a stroke. The Millers are living at 2110 Carol Woods, 750 Weaver Dairy Road, Chapel Hill, NC 27514.

Letters to John T. Reeves

"I retired from the Department of Medicine at the University of California, San Diego, in July, but have continued in my appointment as Distinguished Physician of the Department of Veterans Affairs at the VA Medical Center in San Diego," writes **Helem M. Ranney**. She also reported that she is continuing to do some laboratory investigation and writing.

High School Physiology a Hit with Students

When Mike Grim planned his new physiology course last year for Southeastern High School in Richmond Dale, OH, he was pretty sure it would be a success. But he didn't dream how successful it would be, according to an Associated Press account.

"I knew it when I added it (the course), it was a great class," Grim said. But he didn't count on 28 students crowded behind four lab tables and blocking the aisles.

"I'm not saying I am going to make you guys doctors in a year," Grim told the juniors and seniors. "But by the end of the year you will name every single bone in the human body. We'll talk about your head, your shoulders, arms, legs, and toes. You will learn more in this class than any other class you've taken."

No matter how much Southeastern students learn in physiology, they are among fewer than five percent of Ohio students who have the course available, according to the Ohio Department of Education.

Although the curriculum is all science, Grim told the students he will teach them how to learn, preparing them for college classes in any subject. Grim should know. He is only two years out of college himself.

Environmental and Exercise Physiology Section Officers

Elsworth R. Buskirk, Chair and Section Advisory Committee (1991)

Barbara Horwitz, Secretary-Treasurer and Program Advisory Committee (1993)

Frank Booth, Steering Committee (1993)

Jerome A. Dempsey, Steering Committee (1991)

Kent B. Pandolf, Steering Committee (1991)

Charles Tipton, Steering Committee (1992)

Hershel Raff, Hypoxia Group Subsection (1992)

Reproposed Animal Welfare Regulations Do Away with Engineering Standards

The US Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) has proposed to replace engineering standards with performance standards for the handling, care, treatment, and transportation of dogs, cats, and non-human primates.

APHIS originally proposed engineering standards in developing the regulations to implement the amendments to the Animal Welfare Act calling for the exercise of dogs and the psychological well-being of nonhuman primates. The proposed standards were changed to performance standards after the scientific community voiced its concerns.

The change, however, has brought APHIS under fire from animal activists, who have conducted a major letter writing campaign urging the return to engineering standards. The activists also have staged protest demonstrations at the US Department of Agriculture.

In a letter of comment to APHIS, the American Physiological Society said, "The Society is pleased that the revised proposed regulations have replaced the regulations proposed in March 1989, which APS found to be counter to established policies and guidelines of the US Public Health Service for laboratory animal welfare. Moreover, the originally proposed regulations did not significantly improve laboratory animal welfare and would have placed an exorbitant financial burden of an estimated \$1.6 billion upon the nation's research institutions for capital expenditures and an additional \$450 million in annual maintenance costs.

"The Society's 7,000 members applaud the Animal and Plant Health Inspection Service for responding to the concerns of the scientific community regarding the originally proposed regulations and for its courage to replace engineering standards with performance standards and to give the institution the responsibility to prepare its own plan for meeting the new standards. These two changes will enable facility management and scientific staff to develop a workable system which can insure good animal care and accommodate institutional needs and concerns.

The Society is pleased that the revised proposed regulations are consistent with other federal standards for laboratory animal care and that the cost estimates for research institutions to maintain compliance have been lowered to \$158 million for capital investments and to \$39 million for annual operating costs."

The reproposed regulations are expected to become effective in February, a deadline imposed on APHIS by the court.

Last year the Animal Legal Defense Fund filed a suit against the Department of Agriculture to force APHIS to promulgate standards to implement the 1985 amendments to the Animal Welfare Act. The federal district court in the District of Columbia gave APHIS until February 1991 to finalize all regulations pertaining to the amendments. The reproposed regulations are the last of the regulations for implementing the amendments.

W. M. Samuels

(Why People for the Ethical Treatment of Animals headquarters is in Rockville, MD) "But NIH is here. We're also near Congress and the National Library of Medicine. We want to be an albatross around their necks."

- Ingrid Newkirk, national director of PETA, in an interview in *The Potomac Gazette*.

Profile of Animal Activists: Highly Educated, Under-Employed

A two-day research survey of individuals who participated in the March for Animals last June in Washington, DC, indicates that animal activists characteristically are highly educated but often underemployed.

The survey was conducted by representatives from Oregon State University under a grant by the Putting People First Foundation, a Washington-based organization opposing the animal rights movement.

With few exceptions, the survey shows animal activists as being white, middle class with an average household income of between \$20,000 and \$40,000. The researchers were able to find only a few minorities or ethnically distinct activists.

The bulk of the activists are women, and the average age is approximately 30 with more than a third of the sample consisting of people under the age of 30.

The activists interviewed represented a wide variety of occupations with less than half being employed in any kind of professional position. The typical activist was raised and currently lives in an urban environment and gets information about important public issues from a variety of sources. All of the activists appeared to be well informed.

The animal activists interviewed reject hierarchical structures in society and reject the idea that humans have domination over the environment and other creatures. They are critical of people who utilize animals in either agriculture or science but accept having pets, which is contradictory of the animal rights movement.

The activists identify closely with the environmental movement and the feminist movement. They are politically active and have both the time and inclination to be involved in politics and social movements. Politically, they tend to be moderately liberal to liberal and most register as independents or democrats. They are highly motivated and compelled to act.

Institute of Medicine Report Calls for Increased Share of Funds for Training, Facilities

A two-year study conducted by the National Academy of Sciences' Institute of Medicine (IOM) urges that a larger share of funds for biomedical research be made available for training young scientists and improving research facilities.

Investments in these areas have been neglected for a decade, the study report says, because the Congress, the National Institutes of Health (NIH), and the Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA) gave priority to funding at a fixed minimum number of new and competing research projects each year.

The report, entitled "Funding Health Sciences Research: A Strategy to Restore Balance," was prepared by the IOM Committee on Policies for Allocating Health Sciences Research Funds. Floyd E. Bloom, chairman of the department of neuropharmacology at the Research Institute of Scripps Clinic in La Jolla, CA, is chairman of the 18-member committee.

The report states the key to future success in the research system is sustained high levels of support for people, projects, and facilities. Even in years of zero growth, personnel and facilities must not be neglected. The report notes that an increased number of biomedical scientists trained in research will be needed in the 1990s to replace the older scientists who will become eligible for retirement.

The report recommends that Congress, NIH, and ADAMHA employ a priority-setting framework for the allocation of funds to meet both long-term and short-term research needs and to correct and maintain an appropriate over-all balance among individual components of the research establishment. The report outlines six recommendations for the reallocation of funds over the next 10 years among research projects, training, equipment, and facilities, using a variety of growth scenarios.

Copies of the report are available from the National Academy Press, 2101 Constitution Avenue NW, Washington, DC 20418. Telephone (202)-334-3133 or 1-800-624-6242.

Course on Ethical Issues in Animal Research Set for Kennedy Institute

A four-day course on "Ethical Issues of Animal Experimentation" has been set for March 24-28 at the Georgetown University Kennedy Institute of Ethics in Washington, DC.

The course is designed to address the ethical dimensions of animal-based research, convey information, and provide a forum for members of institutional animal care committees, biomedical scientists, philosophers, bioethicists, administrators, and the public for discussion of the issues.

Topics to be discussed include the moral standing of animals, rights and

obligations, "speciesism," animal pain and suffering, and government responsibilities to rights and obligations. Faculty includes Tom Beauchamp, David DeGrazia, Rebecca Dresser, Ruth Faden, R. G. Frey, Franklin Lowe, Charles McCarthy, Barbara Orlans, Edmund Pellegrino, Robert Veatch, Leroy Walters, and Thomas Wolfe.

For additional information contact Michelene Sheehy, course administrator, Kennedy Institute of Ethics, Georgetown University, Washington, DC 20057. Telephone: (202)-687-6766.

Illinois 12th State Enacting Break-In Law

Illinois became the 12th state to enact legislation protecting research facilities from intrusions by animal activists.

The law makes it illegal for an individual to perform or to enter with the intent to perform at a facility engaged in legal scientific research or agriculture production any of the following acts: release, steal, or otherwise intentionally cause the death, injury, or loss of any animal; damage, vandalize, or steal any property; alter, duplicate, or obtain unauthorized possession of records, data, materials, equipment, or animals; by theft or deception knowingly obtain control or to exercise control over records, data, materials, equipment, or animals for the purpose of depriving the rightful owner of these items.

Penalties range from class 1 to class 4 felonies, depending on the amount of damage caused by the intrusion. Persons found guilty also will be ordered to make restitution.

Other states with similar laws are Arizona, Georgia, Idaho, Indiana, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Minnesota, and Utah.

Scientific Meetings and Congresses

The Fibroblast Growth Factor Family, La Jolla, CA, January 16-18, 1991. *Information:* Marketing Department, New York Academy of Sciences, 2 East 63rd Street, New York, NY 10021, Tel: 212-838-0230, Fax: 212-888-2894.

Seventh International Hypoxia Symposium, "High Altitude Physiology and Medicine," Lake Louise, Alberta, February 26-March 2, 1991. *Information:* Ingrid Ellis, Hypoxia '91, Conference Coordinator 1M10, McMaster University, 1200 Main Street West, Hamilton, Ontario, Canada L8N 3Z5. Tel: 416-525-9140, ext 2182.

11th International Symposium on Intensive Care and Emergency Medicine, Brussels, March 19-22, 1991. *Information:* Professor J. L. Vincent, Department of Intensive Care, Erasme University Hospital, Route de Lenik 808, B-1070 Bruxelles, Tel: 32-2-526 33 80, Fax: 32-2-526 45 55.

Ecophysiology of Desert Vertebrates

P. K. Ghosh and Ishwan Prakash (Editors)

Jodhpur, India: Scientific Publishers, 1988, 512 pp., Illus., no index, \$65.00.

It is indeed a truism that biologists need to know more about the way(s) that living creatures utilize and survive in various naturally occurring environments (in this case the deserts that are expanding in area and may expand even more if the forecasts for a warmer Earth are realized). The editors of this volume have also served as editors of *Rodents in Desert Environments 1975*, and the present volume represents an attempt to broaden the perspectives of biologists. Unfortunately, as the editors point out, they met considerable difficulties in cooperation from anticipated contributors, and, consequently, there are limitations in the coverage planned. Nonetheless, the first 7 (of 12) chapters provide an almost overwhelming mass of information that titillates the imagination and urges one to call the authors to find the best and quickest way to do the research so tantalizingly suggested. Some tidbits: It pays (chapter 3) to be the first larvae produced after the rains. Canibalism is an effective survival procedure. In chapter 4, an interesting comparison of rural versus urban environments demonstrates how effectively reptiles have adapted to both their original environment and human's modification of it. The use of reptiles to study the aging process is nicely implied. Their life expectancy is greater than the approximate 3 years for rodents and human's of slightly over 100 years. The sex of lizards is predominantly determined by the incubation temperature of the egg—lower temperatures produce mostly females, while higher incubation temperatures generate almost exclusively males. (The temperatures are not that different.) Is there an implication here for sex determination of other species? The interaction of water (rainfall), plant production, and vertebrates is the underlying theme of these first chapters and provide for a different view on ecology than is usually presented. The role of behavior viz physiological regulation of body temperature is evaluated in several chapters and should stimulate

further research in the developmental factors involved. Are behavioral responses utilized primarily as thermoregulators, while physiological control acts simply as a potential moderator? In several of the chapters there are suggestive comments regarding the use of bladder fluid in body fluid control. How is this done and how is it regulated? (Don't ask the authors.) Of course, you've seen lizards sunning around with various tail lengths (due to various stages of tail regeneration). The loss of the lizard's tail to a predator saves the lizard, but the lizard needs the tail for fundamental movements. Why did he lose it? Maybe it distracted the aggressor or was it that the aggressor took the tail knowing that it was not only the best part of the lizard (a high fat source), but it (the tail) would be available another time. Finding these tidbits may be difficult, but they are worth the effort.

The next five chapters are the typical specialized articles varying from theory to fact. Most interesting was Hopcroft's description of an experimental ranching operation that substituted wild-life for cattle ranching resulting in a return to eco-systems present before cattle inroads on the land and the wildlife. It also appears to be a more profitable venture as wildlife venison brings a better price and wildlife survive droughts, etc. more efficiently than cattle and the plant life is better. The last chapter should stimulate "fiber" physiologists and biochemists to dash to India. Finally, you'll enjoy the chapter on porcupines. I particularly appreciated the author's statement that "he considers his present findings as preliminary." After all he has only devoted nine years to this effort.

There are numerous spelling errors, incomplete sentences, unrelated sections, etc. indicating some editorial problems. Nonetheless the extensive information provided compensates for these minor deviations. The only problem facing the reader is how to assimilate all of the information (observed, laboratory confirmed, speculative) provided. We look forward to the projected follow-up monograph.

Steven M. Horvath
Neuroscience Research Institute

Future Meetings**1991**

FASEB Spring Meeting

April 21-25, Atlanta, GA

APS Conference:

Interactions of the Endocrine and Cardiovascular Systems in Health and Disease

Sept. 29-October 3, San Antonio, TX

1992

FASEB Spring Meeting

April 5-10, Anaheim, CA

APS Conference:

Integrative Biology of Exercise

September 22-26, Colorado Springs, CO

APS Conference:

The Cellular and Molecular Biology of Membrane Transport

November 4-10
Orlando, FL**1993**

FASEB Spring Meeting

March 28-April 1, New Orleans, LA

1994

FASEB Spring Meeting

April 24-29, Anaheim, CA

Richard M. Thorton has moved from the University of Alberta to the Department of Physiology, State University of New York at Buffalo.

Formerly at the University of Maryland, **James W. Fleshman** has accepted a position at the National Library of Medicine, Bethesda, MD.

APS member, **Douglas Larson**, has left Sandoz Corporation for a position in the Department of Surgery, University of Arizona, Tucson.

Nael A. McCarty of the University of Texas has joined the Division of Biology, California Institute of Technology, Pasadena.

Steven F. Lewis has moved from the University of Texas Southwestern Medical Center in Dallas to become Chairman, Department of Health Sciences, Boston University.

Peter Baker Memorial Fund

The Physiological Society, the Company of Biologists Ltd, and the Marine Biological Society of the United Kingdom have launched an appeal for funds to commemorate Peter Baker. A Post Doctoral Research Fellowship in one of the many areas of physiology to which Peter Baker contributed will be presented. Checks should be made payable to the **Peter Baker Memorial Fund** and contributions sent to Peter Baker Memorial Fund, Account Number 0491-09517, Sanwa Bank, California, Los Angeles, Main Office 0049, 600 South Flower Street, Los Angeles, CA 90017.

People and Places notices come almost exclusively from information provided by members and interested institutions. To ensure timely publication, announcements must be received at least *three months* (by the 5th of the month) before the desired publication date. Send all information to Martin Frank, Editor, *The Physiologist*, APS, 9650 Rockville Pike, Bethesda, MD 20814.

Chapter Names Award in Honor of Mary Anne Rokitka



The Great Lakes Chapter of the Undersea and Hyperbaric Medical Society has created an annual award in honor of Mary Anne Rokitka, PhD, faculty member at the State University of New York at Buffalo.

Rokitka, assistant professor of phys-

iology in the UB School of Medicine and Biomedical Sciences, was named first recipient of the award at the chapter's 10th anniversary dinner.

She received an engraved plaque and a crystal statuette of a diver, which also will be presented to subsequent recipients of the Mary Anne Rokitka Award, to be presented to members for outstanding contributions at the chapter and national level.

Author or co-author of 16 articles or abstracts in scientific publications, Rokitka has done research in the areas of cardiovascular deconditioning during and after periods of weightlessness in conjunction with the NASA space shuttle project, inert gas narcosis and oxygen toxicity at elevated pressures, gas exchange across avian eggshells and physiological ecology of terrestrial snails.

Rokitka, who earned master's degrees in natural sciences and biology from UB, has been an APS member since 1977.

BOOKS RECEIVED

Circulatory Physiology. Third Edition. James J. Smith and John P. Kampine. Baltimore, MD: Williams & Wilkins, 1990, 345 pp., illus., index, \$23.95.

A Garland Series: Harvard Dissertations in the History of Science. Owen Gingerich (Editor). *The Thermodynamics of Life and Experimental Physiology, 1770-1880*. Richard L. Kremer. New York, NY: Garland Publishing, Inc., 1990, 512 pp., \$50.00.

The Cerebral Cortex of the Rat. Bryan Kolb and Richard C. Tees (Editors). Cambridge, MA: The MIT Press, 1990, 645 pp., illus., index, \$35.00.

Central Regulation of Autonomic Functions. Arthur D. Loewy and K. Michael Spyer (Editors). New York, NY: Oxford University Press, 1990, 390 pp., illus., index, \$85.00.

Thirst and Sodium Appetite: Physiological Basis. Sebastian P. Grossman. San Diego, CA: Academic Press, Inc., 1990, 289 pp., illus., index, \$59.95.

Visual Search. Proceedings of the First International Conference on Visual Search. University of Durham, England, 1988. David Brogan, Editor. Bristol, PA: Taylor

& Francis Ltd., 1990, 428 pp., illus., index, \$110.00.

Contemporary Ergonomics. Proceedings of the Ergonomics Society's 1990 Annual Conference. Leeds, England, 1990. Bristol, PA: Taylor & Francis Ltd., 1990, 511 pp., illus., index, \$65.00.

The Child's Theory of Mind. Henry M. Wellman. Cambridge, MA: The MIT Press, 1990, 358 pp., illus., index, \$35.00.

Visual Agnosia. Martha J. Farah. Cambridge, MA: The MIT Press, 1990, 184 pp., illus., index, \$25.00.

Neural Monitoring: The Prevention of Intraoperative Injury. Steven K. Salzman (Editor). Clifton, NJ: The Humana Press Inc., 1990, 336 pp., illus., index, \$69.50.

The Organization of Learning. Charles R. Gallistel. Cambridge, MA: The MIT Press, 1990, 648 pp., illus., index, \$45.00.

Neuromethods: 15 Neurophysiological Techniques: Applications to Neural Systems. Alan A. Boulton, Glen B. Baker, and Case H. Vanderwolf (Editors). Clifton, NJ: The Humana Press, Inc., 377 pp., illus., index, \$79.50.

NIH NEWS

The Responsible Conduct of Research in Institutional Training Programs

Administrative guidelines for the National Research Service Award (NRSA) institutional training grant applications submitted to the National Institutes of Health (NIH) and Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA) have been revised "to require that a program in the principles of scientific integrity to be an integral part of the proposed research training effort." This requirement applies to all competing training grant applications received after July 1, 1990. The principal goal of the NRSA grant mechanisms is to train scientists for future careers in biomedical and behavioral research. An important factor in biomedical and behavioral research is the need to maintain the highest levels of integrity in the conduct of research. The research training environment in the university setting provides a powerful context in which to promote responsible research practices.

NIH and ADAMHA recognize that the scientific community is at an early stage of developing information and methods that pertain specifically to training in research ethics for trainees. Not all methods will work in all training situations given the heterogeneity among disciplines and professions. There are no single models or paradigms. Appreciation of the heterogeneity among the biomedical and behavioral research components within the institutions calls for flexibility in approaches to effective education and training models.

Institutions must accept primary responsibility and be allowed to develop their own ways of promoting responsible conduct of research in conjunction with their training programs. Scientific and administrative leaders of the university or from outside (as consultants or speakers) could be a visible part of this effort. Applicants are urged to discuss the development of methods on this important topic with their colleagues and also look to the professional associations for guidance as well as discussions with NIH and ADAMHA staff.

Positions Available

There is a \$25 charge per issue for each position listed. A check or money order payable to the American Physiological Society must accompany the copy. Purchase orders will not be accepted unless accompanied by payment. Ads not prepaid will not be printed. Copy must be typed double-spaced and limited to 150 words. All copy is subject to the editorial policy of *The Physiologist*. EOAAE indicates Equal Opportunity/Affirmative Action Employer and appears only where given on original copy. Copy deadline: copy must reach the APS office before the 15th of the month, 2 months preceding the month of issue (e.g., before February 15 for the April issue). Mail copy to APS, 9650 Rockville Pike, Bethesda, MD 20814.

Aerospace Medical Association Seeks Executive Vice President. Rufus R. Hessberg, Executive Vice President of the Aerospace Medical Association since 1979, plans to retire at the end of 1991. Therefore, the Aerospace Medical Association (AsMA) is seeking applicants for the position of Executive Vice President. The EVP serves as the chief operating officer responsible for all management, administration, and professional activities of the Association. Major responsibilities include membership services, planning and conducting an annual scientific meeting, publishing a scientific journal, and conducting liaison with related national and international organizations. A position description may be obtained by calling (703) 739-2240 or writing to the Chair, Search Committee, Aerospace Medical Association, 320 South Henry Street, Alexandria, VA 22314-3524. The deadline for receipt of applications is March 1, 1991.

Cell or Developmental Biologist. The Department of Biology at the University of Houston is seeking to fill several tenure track positions at the Assistant or Associate Professor level in Cell or Developmental Biology, although excellent candidates who will develop active research and graduate training programs in any area of biology will be considered. The University of Houston is a state supported institution located on an attractive 500 acre campus with an enrollment of 34,000 students and more than \$40 million in extramural research funds annually. Candidates should submit curriculum vitae, statement of research interest and names of three references to: E. H. Bryant, Department of Biology, University of Houston, Houston, TX 77204-5513. Review of applications is expected to begin by December 31, 1990. *The University of Houston is an affirmative action/equal opportunity employer.*

Are You Interested in Space Biology? The advent of the Shuttle Program has produced a new era for space biology that offers exceptional opportunities for research. NASA is offering several Research Associate Awards for scientists to work in laboratories capable of providing scientific advice and facilities relevant to space biology. The awards vary from \$18,000 to \$22,000 based on experience. They are for a 12-month period with the possibility of renewal. Proposals are due February 15. The funding will begin anytime from June 1 to October 1. Eligible are postdoctoral US citizens. *Information:* Dr. X. J. Musacchia, Chairman NASA Award Committee, Dept. of Physiology & Biophysics, School of Medicine, Rm. 1115A, Health Sciences Center, University of Louisville, Louisville, KY 40292, Tel. (502) 588-5564.

**13th Annual Meeting
IUPS Commission on Gravitational Physiology
San Antonio, Texas
September 29-October 3, 1991**

The 13th Annual Meeting of the IUPS Commission on Gravitational Physiology will be held in conjunction with the APS specialty meeting in San Antonio, TX, September 29-October 3, 1991. Symposia, voluntary papers, and poster sessions dealing with the effects on physiological systems of humans, animals, and plants as a result of changes in magnitude or direction of the force environment will be scheduled. Information and Call for Papers may be obtained from The Membership Services Office, American Physiological Society, 9650 Rockville Pike, Bethesda, MD 20814, USA.

Correction

Sheilagh Martin is at the University of Calgary on sabbatical leave from Mt. St. Vincent University, Halifax (*The Physiologist*, 33:5, 1990).

Proposed Amendments to the APS Bylaws

Election of Regular and Corresponding Members

The current practice of electing regular and corresponding members, in accordance with the Bylaws, is to have APS regular members vote at the spring and fall Society Business Meetings on a slate of candidates proposed by the Membership Committee and approved by Council. Since there no longer will be a fall Business Meeting, candidates will be required to wait a year before approval of their membership. To continue to elect members twice a year, the Council recommends the following amendments to the Bylaws:

ARTICLE III. *Membership*

SECTION 10. *Nominations for Membership.* Two regular members....

a. The Membership Committee shall ~~investigate~~ assess the qualifications of proposed regular and corresponding members and recommend nominations to Council. ~~Council shall nominate members for election at a Business Meeting of the Society. A list of nominees shall be posted for consideration by the members attending the meeting two days prior to the Business Meeting at which election occurs.~~

SECTION 11. *Election of Members.* Election of regular, corresponding, and honorary members shall be by secret ballot ~~at a Business Meeting of the Society by members of Council.~~ A two-thirds majority vote of the members present and voting shall be necessary for election.

Student Members

Citizenship (or permanent residency) is required for student membership, as it is for regular and associate members. Since many graduate students in this country are not from the Americas, it is recommended that this citizenship requirement be removed from student members. The Membership Committee proposes that the Bylaws be amended as follows:

ARTICLE III. *Membership*

SECTION 8. *Student Members.* Any student who is actively engaged in physiological work at an institution in The Americas as attested to by two regular members of the Society shall be eligible for proposal for student membership and who is a resident of The Americas. No individual may remain in this category for more than five years, without reapplying.

APS Sustaining Associate Members

The Society gratefully acknowledges the contributions received from Sustaining Associate Members in support of the Society's goals and objectives



Abbott Laboratories
American Medical Association
Beckman Instruments, Inc.
Berlex Laboratories
*Boehringer Ingelheim
Burroughs Wellcome Company
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