Courses in biological aging are becoming increasingly common and necessary in college curricula for several reasons. At the same time, there is a lack of guidance for instructors regarding necessary content in such a course, which is in part perpetuated by uncertainty about the background of students who need this instruction and a lack of consistency in the content and style of human aging textbooks. In this article, the authors, as instructors who have taught undergraduate level human biological aging courses for many years, describe the areas of study and needs of students likely to enroll in such a course and also detail strategies and organizational methods found to be advantageous in teaching this material in a coherent and understandable manner to a largely nonscience major student cohort. Strategies discussed include alteration of course content, decompartmentalization of topics, relation of biological topics to social science reference points, and contrasting "universal" and pathological age-related changes. Also included is an outline of the content and order of subjects that the authors have found through experience to be successful in the instruction of a biological aging course.

College courses on the biological aspects of human aging are essential in the current academic setting for several reasons. First, as the mean life expectancy in our society increases, so does the size of the elderly population. This in turn increases efforts and commitments of segments of society to deal with this large demographic group in areas such as health care, social policy, recreation, housing, and caregiver issues. It is reasonable to assume, therefore, that higher education will devote more programs designed toward preparing students for careers involved in one of these areas. Also, societal trends drive increases in enrollment in specialized certificate programs, which often have as a requirement a course in the biology of aging.

There have been several notable efforts with the aim of having the curriculum of higher education to focus on gerontology. The first of these was the Foundations Project, collaboratively sponsored by the Association for Gerontology in Higher Education (AGHE) and The Gerontological...
Society of America in the late 1970s (Johnson, Britton, Lang, et al., 1980). Another was the 1985 to 1986 national survey (Enhancing the Quality of Gerontology Instruction) conducted by the AGHE in cooperation with faculty at the Universities of Southern California, Oregon, and Utah (Peterson, Douglass, Bolton, Connelly, & Bergstone, 1987). A third effort was embodied as part of a project, funded by the Administration on Aging, that intended to begin a dialog between leaders of higher education and aging communities (Gerontological Society of America, 1989).

The collective results of these efforts have been to introduce, on a fairly wide scale, gerontological curricula at universities and colleges nationwide. The sixth edition of the National Directory of Education Programs in Gerontology and Geriatrics (Lobenstein, Wendt, & Peterson, 1994), for example, contains information on 1,010 gerontology programs at 507 institutions of higher education.

The rapid expansion of gerontology courses throughout higher education has presented educators with opportunities to use varied didactic approaches. Importantly, these opportunities also raise questions regarding what should be taught and how it should be taught (Birren & Hirschfield, 1979; McCluskey, 1979). Curriculum and instruction are inseparable, and concepts of introducing gerontological information into higher education must incorporate both.

A critical element of a gerontology curriculum is the extent to which there exists in a program a core of gerontological content representing different disciplinary perspectives. Data from both the AGHE Foundations Project and the AGHE/University of Southern California national survey indicated that there was no specific content area that was required of students in all programs and at all levels. Introduction to Social Gerontology was the most frequently reported, being required in 56% of the programs. Psychology of Aging (46%) was second, with Biology/Physiology of Aging (42%) and Sociology of Aging (41%) following.

At Colorado State University, an undergraduate gerontology core curriculum that approximated these four areas was adopted in 1980. Specifically, students enrolled in the Gerontology Interdisciplinary Studies Program take 20 to 21 credits representing four core courses: Perspectives in Gerontology, Middle Age and Aging, Social Gerontology and Biological Aspects of Aging. The emphasis portrayed in most of these courses—namely, a focus on the social and behavioral sciences—in many ways defines the type of student who enrolls in the gerontology program, that is, most students are from majors represented by the social and behavioral sciences (sociology, social work, psychology, human development, and family studies). The purpose of this article is to share how we have configured the Biological Aspects of Aging course so that it benefits nonscience and biological science majors.
It must be understood that offering a course on the biology of aging through standard biology departments with several prerequisite courses (i.e., cell biology, genetics, anatomy and physiology) has the effect of eliminating a large share of the potential students who would be interested in and need such a course. From personal experiences teaching an aging course for several years (in both biology and human development departments), we have found a highly mixed student cohort, with students from such diverse fields as human development, psychology, social work, occupational therapy, pre-veterinary medicine, environmental health, technical journalism, and biology. The mix of students from so many diverse areas with such varying degrees of scientific background necessitates unique and creative ways of organizing and presenting material. The only prerequisite for the present course is one semester of introductory biology. Also, information indicates that there is a lack of understanding of facts concerning human aging by the average undergraduate student (science or nonscience major). For several years, we used the Facts of Aging Quiz developed by Palmore (1988) at the first class meetings to determine aging preconceptions. The present class score, averaged over 5 years, was 69.16, which is similar to Palmore’s own findings of 64 to 68 among college students but much lower than his average score of 83 for gerontology students.

TEACHING STRATEGIES

An essential aspect of teaching a technically demanding subject to a student population with mixed backgrounds is to develop appropriate instructional strategies that promote understanding in those with minimal background in the core field, while avoiding reducing the course to an exercise in tedium for those with more experience. Several strategies that have been found to be effective in this area are discussed here.

Alteration of Content Order

A review of biology textbooks and course syllabi reveals that there is a consistent order with which subject matter in this field is taught. This order usually begins with a discussion of cellular and subcellular principles and functions, sometimes including chemical and biochemical mechanisms. This is often followed by a discussion of genetics (classical, molecular, or both), and finally anatomy and physiology of organ systems. We have found that this ordering and compartmentalization of subjects often causes students problems, especially if the student is a nonscience major. By beginning with topics concerning microscopic elements of biology, the student often begins the course feeling there is little relevance to their course
of study and often does not properly understand the link to functioning of the organism as a whole.

With this in mind, we often have reordered biology courses, whereby discussions of development and anatomy and physiology of organ systems and the organism as a whole in part precede explorations of the principles of cell biology and genetics that drive the formation and function of the organ system and organism. An example is, the topic of cellular respiration. This is often an overwhelming topic for beginning students, and by the time one gets to the Krebs cycle and electron transport chain, many students have lost all ability to see this process as relevant to their own biological functioning and view the lectures only as exercises in chemistry and rote memorization. If, however, the student already has an understanding of the evolutionary significance of and anatomical and physiological nature of the human respiratory and cardiovascular systems and their relationships to all of the cells of the body, the ability to demonstrate the relevance of cellular respiration is greatly enhanced. If this understanding is then immediately coupled with topics such as changes in respiratory and cardiovascular functions with age, changes in muscle performance and lactic acid retention with age, and cellular effects of pharmaceuticals and poisons in the cellular respiratory chain, then the student has gained an appreciation for the full physiological nature of respiration at all levels of complexity and in relation to time and does not see all of the topics as isolated events.

**Decompartmentalization of Topics**

As mentioned in the previous section, treating specific topics in biology as isolated foci often results in the student losing site of the relevance. In any discussion of biological mechanisms, it must be realized that there is no logical start point from which all other information can be assimilated. Every concept requires some level of understanding of other concepts; this is one of the conditions that makes scientific instruction to inexperienced students so challenging. It also affords the opportunity, however, to make bridges of comprehension among what at first glance appear to be very different areas.

Consider the study of Alzheimer’s disease. If one scans for articles in the scientific literature for research pertaining to Alzheimer’s disease, a high degree of compartmentalization usually is found, with articles on the molecular genetics of the disease in very different journals from articles on brain deterioration leading to anomalies of memory in patients with Alzheimer’s or different yet from journals discussing the problems that behavioral changes in these individuals present to caregivers. This compartmentalization in the scientific community is to be expected and is appropriate, as
researchers need to focus on limited aspects of the disease and to have quick access to the work of other researchers in their immediate area of interest to conduct their studies effectively.

This narrow view, however, does not work well in the classroom, where the net result is that students see these issues as unrelated topics. One could argue that it might not be necessary to interrelate all aspects of study of one subject, such as Alzheimer’s disease, in a single course, as the student might well take several other courses during their college experience that discuss other aspects of the subject. If one is considering biological instruction to nonscience majors, however, this may not be a viable argument, as discussion in a purely scientific framework without linkage to points of reference more comfortable to the student will likely produce disinterest and alienation.

If instead, again using Alzheimer’s disease as an example, the disease is discussed in a logical progression of topics, the student is more likely to develop an appreciation for the relevance of biological knowledge to their areas of interest. The general subject could begin with a genetic discussion of, for example, the allelic differences of the apolipoprotein gene and their resulting risks of inheritance. This is closely followed by a discussion of the relationships between the different alleles and neurofibrillary tangle and plaque formation and the resulting effects on involved interneurons. Next follow a discussion of how eventual neuronal degeneration affects brain structure, which portions of the brain are most severely affected, and what is known of normal functions and responsibilities for those portions of the brain. Subsequently, the progression of behavioral changes in a typical Alzheimer’s patient would be presented and related to the brain’s structural changes. After this, although it does not have to be a focal point of a biology of aging course, a discussion recognizing some of the problems and demands that the Alzheimer’s patient’s evolving condition produces in families and for primary caregivers and some basic strategies for dealing with the situation helps the student to see relevance to the discussion. Finally, a discussion of advancing theories for areas of treatment or prevention in the future allows the student to understand the importance of learning about Alzheimer’s disease on as many levels as possible.

Relating Biological Topics to Social Science Reference Points

Some examples of this already have been demonstrated, but the importance of this concept should be reiterated. Most students in an interdisciplinary gerontology studies program (a major target group for a biology of aging course) are from nonscience backgrounds and often begin a biology course without understanding its relevance to their field of study. A
Continual effort to demonstrate this throughout the semester increases student interest and, if done properly, does not dilute the biological content. Several additional examples are presented here.

Discussion of principles of molecular genetics is essential for a biology of aging class, as proper knowledge of structure and function of DNA, RNA, and proteins is necessary for understanding current theories of cellular aging. Student interest and appreciation of molecular genetics often is enhanced if its principles are periodically related to visible examples. When discussing mechanisms of single gene mutations, using the tumor suppressor gene p53 as an example for the ways environmental agents can alter DNA and reviewing the resulting health effects (cancer causation in this case) can pull students into the lecture. When dealing with the effects of abnormal proteins, showing altered quaternary structure of the hemoglobin protein that causes sickle-cell anemia and then tying this to the characteristics of the disease help students relate microscopic functions to health and well-being. When focusing on the principles of inheritance, infusing the discussion with the cause of late-age onset diseases such as Huntington's disease or familial forms of Alzheimer's disease helps the student to appreciate that which genes one inherits does not affect only the individual's prenatal development and childhood growth but also is an important factor throughout the lifespan.

A knowledge of the principles of cell biology is essential in understanding current theories of cellular aging. It also can be made more relevant to the social science student if it is related to specific characteristics of aging to which most people readily identify. Examples are correlating the collagen cross-linkage theory of cellular aging to the loss of elasticity in the skin's epidermal layer and showing the links between the free radical theory and cancer incidence rates.

Understanding the basics of physiological principles and parameters also can be made easier by using the strategy just discussed. Relating discussions of age-related changes in cardiovascular and respiratory functions to lifestyle changes often common in the elderly helps to link biology and social structure in the student's mind. Melding the topics of the reproductive system and related endocrine changes, with not only the topics of fertility and sexuality but also other biological and cognitive effects that these changes can produce in the elderly, allows the student to integrate more fully.

**Contrasting "Universal" and Pathological Age-Related Changes**

This is one of the most important concepts that a biology of aging course must convey, but it is also one of the most difficult. The source of the difficulty is multifaceted. First, in many areas of age-related changes, we simply do not know enough to be able to say with certainty whether something is invariable or due to a disease condition. Second, genetic makeup may predispose certain individuals to specific conditions regardless of environ-
ment or lifestyle. A clear example of this is breast cancer. Therefore, what may be defined as a preventable disease condition in one subpopulation may be a virtual certain result of aging in another subpopulation. Additionally, what seems to be a universal consequence of aging in one culture may be very rare in another culture. Some degree of high-frequency hearing loss is accepted as an almost certain consequence of aging in Western, industrialized societies; however, recent studies of elderly individuals in rural, tribal cultures not exposed to frequent high-intensity noise sources call into question the assumption of the certainty of this hearing loss. Also, benign prostatic hypertrophy is regarded by many as a natural consequence of aging in men in Western society, but it is relatively rare in cultures with diets lower in fat and higher in fiber.

Thus, trying to differentiate between normal and pathological aging conditions in the classroom is not always easy, but it is an important aspect of education for the student. College-age individuals (and many other sectors of the population for that matter) have preconceived notions of what biological aging entails, and many of those notions include debilitating disease conditions. If students can be educated about the fact that most diseases in the elderly, although more common than in younger segments of the population, are not invariate outcomes of the aging process for most individuals, then these students may view aging more positively and may not view the later stages of life as a time of physical and intellectual disability.

Thus, altering content order, decompartmentalizing topics, relating biological topics to areas more familiar to the student, and distinguishing normal aging from pathological conditions are four strategies we have found to be very helpful in clarifying the subject matter and increasing students’ perceptions of relevance of the material to their own areas of interest.

CONTENT STRUCTURE

We present here a list of the subjects we have included in our biological aging classes and the order in which they are presented.

Week 1

Demographics of Aging

In this section, discussion of the increasing aging of society, comparisons among different societies in relation to percentage of population older than 65 years and life expectancy, and differences in male and female aging statistics in various societies are included. This topic is a good introduction to the class and is an appropriate setting for discussing some of the common misconceptions regarding aging and its effects on society.
Principles of Biological Aging

Here students are taught the differences between chronological aging and senescence and between life span and life expectancy. Some mechanisms by which genetics and environment might control aging are discussed, along with what is known of evolutionary changes in human life span and recent (posthistorical) changes in life expectancy.

Aging in Lower Life Forms

This section is intended to give students a perspective on the universality of aging and to link human biological and genetic mechanisms to those of other organisms. Covered here are effects on life span and life expectancy in nonmammals from factors such as mating cycles and rates of juvenile maturation, environmental conditions such as temperature, light, and nutrition, and dormancy periods. Laboratory studies of lower mammals (particularly rodents) also are discussed to show the effects of specific genes on life expectancy, particularly in the case of fixed genes in inbred strains that produce high rates of life-shortening diseases, and to illustrate some similarities and differences in the ways that humans and other mammals age.

Week 2

The Human Cell, Tissues, and Organs

Here students are exposed to cell structure and function (the process of cellular respiration is emphasized) and how cells integrate into tissue groups and organ systems. The concept of cell differentiation also is developed. The rudiments of some organ system functions are discussed at this time, although most is saved for an interegation with aging of particular organ systems.

Cellular Life Cycle and Cell Divisions

The stages of interphase and cell division are defined and their differences among tissue types and relationships to normal and disease conditions are discussed. The processes of mitosis and meiosis are examined, with some of these topics being deferred until discussion of the subjects of cancer and aging of the reproductive systems, respectively.

Week 3

Genetic Principles

The basics of Mendelian genetics, sex linkage, multifactorial traits, and environmental interactions with the genome are discussed. Principles and probabilities of various schemes of inheritance are outlined, with
numerous examples given of known human traits and genetic diseases. The categorization of human chromosomes also is described.

**Principles of Molecular Genetics**

This section begins with the structure of DNA and the basics of DNA replication. The central dogma of genetics is then discussed, followed by an overview of the creation of RNA and protein from DNA information via transcription and translation. Knowledge in this area is essential for understanding mechanisms of genetic diseases and current theories of cellular aging.

**Week 4**

**Protein Structure and Function**

The levels of protein structure and their relationships to the information contained in the gene are described. Also, the correlations between protein structure and function are examined, with examples given of abnormal structure (such as hemoglobin variants) and the resulting phenotypic effects on health.

**Mutations**

Various categories of single-gene and chromosomal mutations are described in this section, with discussions of specific diseases and effects of mutagens, carcinogens, and teratogens, included. Parental age relationships to mutation rates and the aging effects of genetic diseases (such as Down syndrome and progeria) are deferred until later in the semester.

**Gene Regulation**

The concept of gene regulation, including relationships to cell differentiation and evolution, is discussed. Numerous eukaryotic mechanisms of regulation are examined, with special attention paid to mRNA splicing and antibody generation via chromosomal rearrangement.

**Week 5**

**Aging at the Cellular Level**

Once this background material has been covered, the student is prepared to begin an exploration of the biological phenomena associated with chronological aging. Here the current knowledge pertaining to changes in cellular structure, function, and gene regulation are discussed, with attention paid to differences between different human cell types and to analyses of how these cellular changes can affect organ system function and health of the individual.
Theories of Cellular Aging

This section takes the information previously detailed and examines current theories of cellular aging listed in the textbook (different aging textbooks vary slightly regarding the theories listed). The student has the knowledge base at this point to understand the pros and cons of each theory and to realize that some theories apply better to certain tissue types than other theories.

Week 6

Human Cancer Demographics

Here the prevalences of different kinds of cancers are examined, with particular emphasis on correlations with age and gender. Also, cancer rates for different countries are compared to show the possible effects of lifestyle and environment.

Cancer at the Cellular Level

In this section, the genetic mechanisms and cellular properties thought to influence and drive the proliferation of cancers, by affecting cell growth and differentiation, are explored. Topics include oncogenes and protooncogenes, tumor suppressor genes (with particular attention paid to the gene p53 and evidence for mutations in it caused by cigarette smoke and radon), and chromosomal translocations common in specific types of leukemias and lymphomas.

Week 7

Structure and Function of the Nervous System

For the topics of aging of specific organ systems, we have chosen to preface the discussions with overviews of structure and function of the organ systems. The discussion begins with the nervous system because it is the system above all others that is referred to as containing the essence of humanness, because age-related problems here are one of the first things people think of and fear when considering aging and because it is the topic to which the most time is devoted. This section includes a review of types and functions of neurons and synapses, structure and function of the peripheral nervous system (with particular attention paid to the interactions of motor and sensory neurons and the spinal cord), and structure and function of the central nervous system. Discussion of the central nervous system includes portions and functions of the brain stem, lobes of the cerebrum and their various tasks, functions of the cerebellum, and
communications between the brain and spinal cord. The topics of memory storage and retrieval and plasticity of the nervous system also are discussed.

Aging of the Nervous System
Here an attempt is made to distinguish as much as possible between “normal” age-related changes and pathological conditions. Changes in cerebral mass and density, alterations in synaptic connections, and declines in neuronal conduction are discussed. The accommodations that are made regarding different parts of the brain sharing functions and increases in dendritic branching are stressed, with the goal of demonstrating that age-related changes do not mean that senility or dramatic loss of function is a universal outcome.

Week 8
Senile Dementias
A beginning discussion here examines the differences between primary and secondary dementias, the characteristics that many dementias share, an overview of multiinfarct dementia and some other less common forms of dementia, and an outline of the three most common dementias (Alzheimer’s, Parkinson’s, and Huntington’s) which are discussed in the subsequent class sessions.

Alzheimer’s, Parkinson’s, and Huntington’s Diseases
Quite a bit of class time is devoted to these diseases, as they are the most common forms of human dementias. They demonstrate varying degrees of genetic and environmental involvement, and they offer contrasts in intellectual versus physical nervous system impairment. For each disorder, the major characteristics are discussed, including cognitive decline and physical, motor, and sensory degeneration, and changes in brain and neuronal structure responsible for these declines are examined. The genetic characteristics, inheritance patterns, and environmental contributions, of each disease as currently understood, also are explored.

Week 9
Structure and Function of the Auditory System
Here the student is given an overview of the components and function of the outer, middle, and inner ears, with particular attention given to cochlear function and auditory communication with the brain. Conductive and sensorineural hearing losses are compared.
Aging of the Auditory System
Age-related changes of the cochlea (including hair cell loss) and middle ear are discussed, and the incidences of presbycusis in Western and rural cultures are examined.

Structure and Function of the Optic System
Components of the eye and their functions are discussed here, including optic nerve communication to the brain. The principles of myopia and hyperopia also are described.

Aging of the Optic System
Age-related changes of eye structures are covered, and diseases with higher incidences in the elderly, such as cataracts, glaucoma, and macular degeneration, are discussed (characteristics and treatments are emphasized).

Week 10
Structure and Function of the Digestive and Urinary System
This section includes discussion of the organs and components of the digestive and urinary systems, including items that affect their health (e.g., fiber content, salt levels).

Aging of the Digestive and Urinary Systems
Aspects of normal aging changes and disease conditions are discussed, including cancers and dysfunction due to secondary causes (such as prostatic enlargement).

Nutrition and Medication in the Elderly
Changes in nutritional needs due to physiological alterations and digestive absorption capabilities are discussed. Also, the issues of drug interactions and polypharmacy are dealt with here, as these are some of the most common causes of health problems in the elderly and because drug absorption and metabolism are altered as individuals age.

Week 11
Diabetes
A section is devoted to differentiating between type I and type II forms of diabetes, including risk factors and treatments. Secondary outcomes of the disease (e.g., blindness, extremity atrophy, and renal and cardiovascular diseases) also are covered.
Osteoporosis
As in the previous section, this disease is discussed from the point of view of characteristics, risk factors, and treatments. Prevention also is emphasized, as are links between early-onset osteoporosis and alterations of endocrine cycles.

Week 12
Structure and Function of the Respiratory and Circulatory Systems
Discussion of these organ systems are combined because so many of their functions are interrelated and because it helps the student to tie them in to the concepts of cellular respiration discussed earlier. The topic of blood flow through the chambers of the heart and pulmonary system is emphasized, with structure of the alveoli and function of arteries and veins also being covered.

Aging of the Respiratory and Circulatory Systems
The distinction between normal aging and pathological conditions is emphasized here. Universal alterations in resting and maximum heart rate, changes in heart and arterial structure, reductions in maximal and residual lung volume, and effects of thoracic muscle atrophy on respiration are discussed. This is followed by a review of diseases of these systems, including coronary occlusion, pacemaker dysfunction, congestive heart failure and pulmonary edema, lung cancer, and chronic obstructive pulmonary disease resulting in emphysema are described. In addition to characteristics of these diseases, prevention and treatments are explored.

Week 13
Structure and Function of the Reproductive Systems
Male and female anatomy and physiology are discussed, including functions of organs and a comparison between the processes of oogenesis and spermatogenesis at the cellular and genetic levels.

Aging of the Reproductive Systems
Here again the sexes are discussed separately. The topic of menopause is explored first, with discussion of primary effects on the reproductive tract and hormone production, secondary effects on other parts of the body (menopause symptoms), and ancillary effects of hormonal changes (e.g., osteoporosis, coronary disease, prevalence and nature of female reproductive system cancers and their changes in postmenopausal women). The
male system discussion centers on changes in the prostate gland, the nature and incidence rates of benign prostatic hypertrophy and prostate cancer, and testicular cancer. Possible causes and incidence rates for impotence also are discussed.

Birth Defects Due to Parental Aging

This section centers on how the differences between oogenesis and spermatogenesis contribute to increased risks of genetic abnormalities in children born to aging parents. Incidence rates for chromosomal trisomic births by maternal age and the nature of these disorders are covered. Incidence rates for single-gene dominant mutations in children born to aging fathers and the nature of these diseases also are discussed. This section allows the student to understand that biological aging can affect subsequent generations and that the process of biological aging does not wait until after 65 years of age to begin.

Week 14

Function and Aging of the Immune System

Basic categories and functions of immune system cells are described in this section. The effects of aging on declining vigor of the immune system and the nature and prevalence of autoimmune diseases (rheumatoid arthritis is covered in detail) are discussed. Also, the relationship between declining immune function and cancer incidence is explored.

Structure, Function, and Aging of the Integument

Structural layers of the skin and their functions are discussed in this section, along with the effects of aging due to chronological time and environmental insult (ultraviolet radiation and skin cancer in particular) on the skin. These changes are put into the context of the theories of cellular aging discussed earlier in the semester.

Week 15

Genetic Diseases and Accelerated Aging

As a final component of the course, genetic diseases that cause features of accelerated aging are discussed. The genetic nature, inheritance patterns, and characteristics of progeria, Werner's syndrome, Cockayne syndrome, and Down syndrome are covered. Placing this topic at the end of the semester allows the student to see that many of the attributes of aging are genetically driven and not due to simply the passing of time. It also affords a chance to discuss theories of slowing the aging process.
The preceding outline details curricular construction based on a semester system. Such a plan can be converted to a quarter system in several ways, depending on time constraints and other courses available on campus. If there is a human genetics/cell biology course offered on campus that does not have numerous prerequisites, it can be made as a prerequisite to the biological aspects of aging course. In this case, the course could be reduced to one quarter, and the material introducing classical/molecular genetic principles and cell function could be eliminated, concentrating solely on biological and physiological aging principles. If a human genetics/cell biology course is not available, then we recommend a prerequisite of one quarter of general biology and expansion of the biological aspects of aging course to two quarters. In this case, more remedial biology, especially in the area of anatomy and physiology, may need to be added to the curriculum.

TEXTBOOK CRITERIA

A textbook is an important part of the class experience for any undergraduate course. When selecting an appropriate text for a biological aspects of aging course, there are a few salient points to keep in mind. One is that most students taking such a course in most programs are non-science majors, and many of them enter the class with apprehension of or disinterest toward the subject. Another problem is that many students have taken the introductory biology prerequisite years previously and probably not have retained a great deal in the areas of basic biological and genetic principles. Third, most of these students are looking for relevance of the principles and mechanisms discussed in class and in the text to their own fields of human interest.

Thus, an appropriate textbook must cover subjects in a few specific ways to be effective. First, the book cannot be written exclusively for upper division biology majors but must cover subjects in a way that is understandable for those without a great deal of scientific background and must cover basic principles without assuming that the student is already familiar with these subjects. This does not mean that the text should water down the material but rather that biological principles and their relationships to aging must be covered in a progressive manner, starting with rudimentary subjects and proceeding in a stepwise manner to greater complexity. Second, a book in this field should not treat biological aging as a field separate from other aging disciplines but rather should attempt to integrate topics with examples of how aging changes can affect and be affected by other areas such as social interaction, cognitive and psychological parameters, fitness and its effects on human contact, and family dynamics.
In the time we have taught Biological Aspects of Aging, we have used several texts in an attempt to find one which satisfies all of these criteria. Unfortunately, although texts have been found that fulfill some of these areas, none have covered all of these parameters. Thus, we have found it helpful to supplement the official class text with outside readings and visual materials to give the students a more complete and well-rounded view of the field of biological aging.

SUMMARY

In the preceding material, we discuss the strategies and topical organizations found to be effective in the instruction of courses in biological aging, which tend to be populated by students of diverse interests who are usually nonscience majors. These students need to be involved in medical and scientific discussions in ways that allow them to readily understand the material and to see its relevance to their own areas of interest, which are often in a type of human service field. At the same time, it is important for the instructor to maintain the currency of the lectures, as biological aging is a rapidly changing and expanding field, and also to be sure that the material is presented with sufficient complexity and detail. This last point is important not only so that interest among those students with a biological background can be maintained but also so that the instructor’s own interest in the topic and its instruction can be maintained. We believe that the instruction of biological aging on college campuses is of extreme importance and will become even more essential in the years to come as knowledge in the areas of the nature of aging and medical ways to treat associated problems increases.

REFERENCES


