Spans the biological and psychosocial aspects of aging, this upper-level undergraduate and graduate text integrates current findings in biology, psychology, and the social sciences to provide comprehensive, multidisciplinary coverage of the aging process. This new edition incorporates the tremendous amount of research that has come to light since the first edition was published. From a physical perspective, the text examines age-related changes and disease-related processes, the demography of the aging population, aging theories, and how to promote optimal aging. Coverage of the psychosocial aspects of aging encompasses mental health, stress and coping, spirituality, and caregiving in later years.

The authors address demographic, theoretical, and methodological issues on aging, including a worldwide overview of aging demographics. The book reviews biological and psychosocial theories and offers much-needed information on longitudinal design and statistics as they relate to aging research. It discusses the aging of the major organ systems, the brain and sensory systems, and the endocrine and immune systems; basic anatomy and physiology; normal, impaired, and optimal aging; and functional health. Psychosocial factors that affect health are addressed, including the interplay between physical health and mental health, stress, coping, and social support. The text also covers current issues in social gerontology, including such promising new trends as gerontechnology and Green Houses, and provides information on health promotion programs.

New to the Second Edition:
- Information involving retirement, volunteer opportunities, housing, and adaptation to health changes
- Coverage of economics and aging, including information on social security and other retirement income, and the future of Medicare and Medicaid
- Significant new information about the regulatory systems
- Revised and updated chapters on death and dying and optimal aging
- Discussions on two models of optimal aging and valuable tips for its promotion
- URLs to relevant websites for additional information
Health, Illness, and Optimal Aging
Carolyn M. Aldwin, PhD, is director of the Gerontology Program and professor in the Department of Human Development and Family Sciences, Oregon State University, Corvallis, Oregon. She received her doctorate from the University of California, San Francisco; was a postdoctoral fellow in the Program of Social Ecology at the University of California, Irvine; and spent 5 years at the Veterans Administration Normative Aging Study in Boston. Dr. Aldwin is a fellow and president-elect of Division 20 (adulthood and aging) and a fellow of Division 38 (health psychology) of the American Psychological Association, and a fellow of the Gerontological Association of America. She was associate editor for the *Journal of Personality and Social Psychology*, was co-editor of *Psychology and Health*, and is currently editor of *Research in Human Development*. She is a consulting reviewer for multiple professional journals, including *Psychology and Aging, Journals of Gerontology: Psychological and Social Sciences, Journal of Stress & Anxiety, Developmental Psychology*, and others. Dr. Aldwin is the author of *Stress, Coping, and Development: An Integrative Approach* (2007); co-editor of *Handbook of Health Psychology and Aging* (2007); co-author of *Health, Illness, and Optimal Aging: Biological and Psychosocial Perspectives*, First Edition (2004); and nearly 100 professional journal articles and book chapters.

Diane Fox Gilmer, PhD, most recently was lecturer and postgraduate researcher in the Department of Human and Community Development at the University of California, Davis, and is now retired. She received a master’s of science in nursing from the University of Portland, Oregon, and a master’s of science in education and a doctorate in human development from the University of California. She is certified as an adult family nurse practitioner and has worked extensively with the elderly. In addition to authoring many professional journal articles, she is the co-author with Dr. Aldwin of *Health, Illness, and Optimal Aging: Biological and Psychosocial Perspectives*, First Edition (2004).
We would like to dedicate this book to our respective spouses, Rick Levenson and Dave Gilmer. More than anything or anyone else, their love and support over several decades have contributed positively to our aging process!
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Foreword

*Health, Illness, and Optimal Aging: Biological and Psychosocial Perspectives*, Second Edition, by Drs. Aldwin and Gilmer provides a broad perspective on human aging. It should provoke new thoughts and encourage research on a subject of growing importance, provide a focus on how and why individuals age the way they do, and how to develop interventions.

The book covers a vast amount of information about contemporary research on aging. Many potential readers can benefit from this book, such as researchers and professionals who are specialized in their careers, for it will open windows to the diversity of influences on human well-being across the life span. It will also encourage the development of new interventions that will improve lives. The book will enable college students to broaden their perspective on human life, and to become aware of the many influences that affect aging in their lives.

Increasingly, age is being recognized as not a cause of effects, but as an index to the accumulating effects of many causes. There is the emerging task of identifying the many causes that lead to accumulated outcomes across the life span that we associate with age and aging. This book takes an integrative view of human life and considers evidence from many sciences. A major purpose of the book is to develop a bridge of understanding across academic disciplines, reflecting the complexity of aging. Understanding aging is one of the most complex issues now facing contemporary science.

The 14 chapters of this book range in topics from theories of aging through issues of the endocrine and immune systems, to the interface between physical and mental health, to the social context of aging involving stress and social support. Processes that accelerate and decelerate aging are discussed. The book ends with the view that retirement is a new stage of life. The authors introduce a model of optimal aging and contrast optimal aging with other models that have been suggested.

This book brings together influences that, in the past, were not often associated with aging. Influences range from religion, culture, family, and health, to personality, stress and others. This will encourage a broader understanding of how humans age. Future research will very likely study the interactions of a broader array of causes and influences.

*James E. Birren, PhD*

*Past President, Gerontological Society of America*

*Founding Dean, University of Southern California, Davis*

*School of Gerontology*
Preface to the Second Edition

Aging is certainly one of the most exciting fields in human development at this point in time. The number of people entering late life is increasing, and many are experiencing better health than previous generations. They have greater expectations of a productive “third age.” Further, there is a growing amount of information about aging. Not only is there a demographic “silver tsunami” that is just starting to impact our societies, but there is a huge wave of information on aging that needs to be integrated and presented in a usable form.

Ten years ago we took on the task of writing a book on optimal aging. A major purpose of the first edition was to fill a gap we found in the gerontology literature. Despite a growing recognition of how intimately intertwined the mind and body are, especially with respect to the aging processes, there was a dearth of information on linking systems together and an underappreciation of the impact they have on one another. We knew that integrating biology with psychology and sociology would help us better understand the complexity of health, illness, and optimal aging. A second major purpose of the book was to develop a common language that could be used to bridge the psychology/sociology and biogerontology gap in terms of factors that can either accelerate or decelerate the aging process. We wanted the book to provide broad insight into normal, age-related changes and illnesses that affect the physical and mental health of the older person. Of further interest is that physical environment, life skills, and experiences help moderate that impact.

Though we are a product of our genetics, environment, socioeconomic status, social connections, and history, chance and choice also impact how we age. We cannot change that we will age, but we have some control over how we age. A simple goal for most people is to live as long as possible in as good health as possible. People can learn how to improve their quality of life, handle adversities, and live a fulfilling and independent life. Our goal was to provide insight into the aging process, providing information on how people can age optimally.

The first edition was recommended for researchers seeking an overview of health psychology and aging as well as biogerontology. It was written for advanced undergraduates and graduates taking classes in the social, behavioral, and health sciences, as well as those in other health professional schools. It proved to be a valuable text for practitioners working with the elderly in fields such as nursing, social work, occupational and physical therapy, day care, nursing home administration, psychology, and rehabilitation.

This second edition has similar goals. We have learned a great deal while researching material for this updated edition. It is amazing how much more informa-
tion has been published in the past 10 years. Nearly all the instances in the first edition where we wrote, “very little is known about ‘x’” were deleted, and the new literature added. Sometimes we found that results that appeared to be firmly established were now understood to be incorrect—or at least incomplete. A good example is hormonal therapy. When we published the first edition of this book, studies had just been released by the Women’s Health Initiative (WHI) showing the adverse effect of hormone replacement therapy (HRT)—far from estrogen supplementation having beneficial effects, as previously thought, HRT was associated with cardiovascular disease, breast cancer, and even dementia! HRT dropped precipitously and breast cancer rates began to fall. However, a spate of research showed that these findings were limited—the women in the WHI were often in their 60s and 70s, older than the norm for HRT, and used a combination of estrogen and progesterone, which we now know to have particularly adverse effects. Limited HRT use in younger women right around menopause with newer compounds may indeed have beneficial effects (see Chapter 8). Similarly, the new understanding 10 years ago that dementia is an inflammatory disease gave rise to much hope that nonsteroidal anti-inflammatory drugs (NSAIDs) might be protective. However, careful research dashed those hopes, and showed that some NSAIDs might actually prove to be risk factors for dementia (see Chapter 7). In other instances, hopeful speculations were borne out—such as the importance of positive attitudes and feelings of usefulness for longevity (see Chapters 10 and 14). At other times, old findings were reinforced and broadened. In the first edition, for example, we recognized that exercise is probably the closest thing we have to a fountain of youth. In the past 10 years, we have learned a great deal about the physiological mechanisms through which exercise protects against aging, and also have learned that it is the best protector for neurological and thus cognitive processes. There is also much exciting research into new areas, such as the possibility that gerontechnology, including the use of robots, might prove useful in caring for frail elders (see Chapter 13).

For this new edition, we have spent the last 2 years carefully reviewing the literature, which has grown enormously. In 2002, when we began this project, a review of PubMed yielded 107,000+ publications—in 2012, that number had grown to over 260,000. Obviously no duo, no matter how diligent, can review all of those publications, and we are very grateful to the many biological and psychosocial gerontologists who have written excellent reviews of their specialty areas. Thus, this book is not meant to be an exhaustive review of all aging research, but rather to provide enough information to construct a bridge between bio- and psychosocial gerontologists. We also wanted this book to be a resource for practitioners such as geriatricians, psychogerontologists, nurses, allied health workers, and social workers who have older clients. Individuals dealing with their own aging—or that of their parents—may also find a wealth of useful information in this book.

NEW TO THIS EDITION

In this second edition we further attempt to understand the factors that affect aging—biological, social, and psychological—and continue to explore the many complex facets of the aging process. An ultimate goal is to help promote optimal aging, with an emphasis on integration of mind and body.
In each of the chapters we have provided substantially updated information and have redrawn many of the illustrations. Much useful information is now on the Web, and we often included URL addresses to helpful websites for individuals who would like further information on particular topics or services. Various federal agencies, such as the Social Security Administration, Agencies on Aging, and the Centers for Disease Control and Prevention, and international agencies, such as the World Health Organization and the Organisation for Economic Co-operation and Development, have created a treasure trove of data on aging, and we have often provided relevant links to those websites.

The growth of knowledge about aging demanded that we add the newest information to our book, and so the book has grown from 12 to 14 chapters. Because of the enormous amount of new information on the regulatory systems, we created two chapters, dividing the original Chapter 7 (Regulatory Systems) into two chapters. The new Chapter 7 covers just the sensory and nervous systems, whereas Chapter 8 now encompasses the endocrine and immune systems.

More information on the practical side of aging has also been added. Section IV is now titled “Practical and Clinical Aspects of Aging.” We have added a new chapter (13), “Aging in the Sociostructural Context.” In it, we provide information about retirement and volunteer activities, including information on Social Security and other types of income sources, as well as a basic description of types of private pension plans—particularly relevant during this economic downturn. A primer on health care systems such as Medicare and Medicaid and their future has been added to this section. It is exciting, as well, to add information about new trends, such as gerontechnology, which allows elders to age in place, and Green Houses, which embody a new, client-centered philosophy of elder care.

We have strengthened our section on death and dying, found in Chapter 14, revisiting Elizabeth Kübler-Ross, hospice care, and the death process. This chapter also reviews theories of optimal aging as a framework for integrating biological and psychosocial factors in aging, and reiterates our conclusion from the first edition—that wisdom is central to optimal aging. Although wisdom is not necessarily correlated with age, we now have a better understanding of the factors that do promote the development of wisdom, and its importance to well-being in later life.

Carolyn M. Aldwin
Diane Fox Gilmer
Acknowledgments

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We would also like to thank two of the first author’s undergraduate students. Kelly Courtain is a former honors student who did a very interesting thesis on pets in an assisted living facility. Kelly was extremely helpful in managing our references for us. The first edition had 95 pages of references; Kelly cheerfully deleted ones that were no longer relevant and added the hundreds of new ones. Courtney Archibeque was also an OSU student who won the OSU Gerontology Student Association photo contest (the theme was intergenerational relations). The picture, Spinal Love, which graces our cover, is of her and her aunt practicing yoga (photography by Michele Barnett). This picture embodies two of the major themes in our book: that physical exercise and close social relations are key to optimal aging!

Finally we would like to thank our editor, Sheri W. Sussman, for her patience with our several missed (overly optimistic) deadlines.

We have known a number of remarkable older people in our lives. From them we have learned about selflessness, toughness, resiliency, perseverance, and wisdom in later years—our models for optimal aging. We would also like to recognize our wonderful families and friends who have been exceedingly patient with us, Dave and Rick for their unending support, and our dogs, Buckley and Oliver Barkley, for companionably sleeping nearby while we wrote.
Introduction and Basic Concepts in Aging

Is second childhood and mere oblivion
Sans teeth, sans eyes, sans taste, sans everything.
—Shakespeare
As You Like It, Act II, Scene VII

Though I look old, yet I am strong and lusty;
For in my youth I never did apply
Hot and rebellious liquors in my blood;
Nor did not with unbashful forehead woo
The means of weakness and debility;
Therefore my age is as a lusty winter,
Frosty, but kindly.
—Shakespeare
As You Like It, Act II, Scene III

From time immemorial, there have been two markedly different views of late life, illustrated nicely by the contrasting images provided by Shakespeare. Although the first, more negative, quote is widely cited, the second is less well known but still apropos of a major focus of this book, namely, optimal aging. What is surprising about the quote is that it presages the modern recognition that aging processes are plastic. To a large extent, how we age and the rate at which we age are balanced between resources to which we have access and our exposure to various toxins, both of which are, in part, reflections of the choices we make.

Psychosocial gerontologists have focused more on describing what happens cognitively, emotionally, and socially as we age, with a view toward identifying factors that promote positive aging or increase the risk of negative aging. The emerging models reflect a dialectic between cumulative resources and vulnerabilities across the life span and the idea of plasticity—that there are turning points through which people can change the trajectories of their life course. Although biogerontologists have focused on describing what happens at the molecular, cellular, and organ system levels, the models emerging in that field emphasize factors that affect the rate of aging. For example, free radicals can accelerate deterioration, but antioxidants may decelerate it. At the same time, the fields of health psychology and behavioral medicine provide clear documentation that psychosocial factors can affect physical health, and we are beginning to understand the pathways through which this occurs. Although the focus has been on psychosocial risk factors, we are beginning to under-
stand that there are protective factors at work as well. Thus, there appears to be an emerging consensus across these three areas of study, despite their differences in language and emphases. A major purpose of this book is to synthesize these views and perspectives under the rubric of optimal aging.

The past decade or so has seen a heightened interest in optimal aging. Scientifically, we are reaping the harvest of long-term longitudinal studies started many decades ago, which have traced individual lives for as long as 80 years. These prospective studies allow us to begin to understand predictors of the rate of change in physical health, cognitive ability, and mental health in late life. From a public policy perspective, nations around the world are graying. The Baby Boom generation is starting to retire and collect pensions and health care benefits. This has forced us to seriously consider how to keep older adults healthy, if for no other reason than preventing them from bankrupting not only our national budget but also those of most other nations. Many of the current global financial battles are directly the result of underfunded pension programs, health programs with double-digit inflation, and other entitlement programs that threaten our financial health at the local, national, and international levels.

There is also overwhelming interest in staving off the ravages of old age from a personal perspective. It is not surprising that cholesterol-lowering agents and Viagra are among the most commonly prescribed medications in this country. In short, there is a growing interest in how the various aging processes respond to behavioral and environmental factors that are at least partially under our control.

Birren, Butler, Greenhouse, and Yarrow (1963) first differentiated between aging per se and disease. Using comprehensive medical examinations, they divided apparently healthy older men into two groups: those with subclinical disease and those who were completely healthy. They then compared members of both groups with younger men. Birren and his colleagues found that nearly all of the deficits generally associated with aging (such as memory problems, decrease in grip strength, and decline in cardiovascular output) were found in the older men with subclinical disease, but not in the optimally healthy men. The one exception was neuronal slowing, which even the healthiest older men manifested. This groundbreaking study opened the door to the recognition that aging is not necessarily associated with unmitigated pain and suffering, and that older adults can enjoy good physical and mental health and be cognitively intact.

The recognition that optimal aging is possible led to longitudinal studies such as the Normative Aging Study (Bossé & Spiro, 1995) and the MacArthur Study of Successful Aging (Rowe & Kahn, 1997), which were undertaken with the explicit goal of understanding healthy aging. Gerontology is unique among the scientific disciplines in that this field has recognized, since its inception, that interdisciplinary endeavors are required for understanding the aging process. Biogerontology has greatly increased our understanding of the genetic and cellular mechanisms of aging, but the disciplines of psychology, sociology, and anthropology are also essential for understanding both the processes and ramifications of aging. We are just beginning to comprehend the transactional nature of health and to detail the interplay among mental, cognitive, and physical health, as well as sociocultural processes. This realization has led to hundreds of intervention studies demonstrating that many of the cognitive and physiological declines associated with normal aging can be reversed. Clinicians are now more successful at treating the chronic illnesses of late life, such
1. INTRODUCTION AND BASIC CONCEPTS IN AGING

as cardiovascular disease and diabetes, leading to rapid demographic increases in the over-85 population.

This explosion in research is extremely exciting, but it is also frustrating, because our understanding is increasingly fragmented. A complex array of different and competing theories has developed. Even more frustrating is that biogerontological findings about the mechanism of aging in one species (or even in one strain) often do not hold up in others. In epidemiology and the social sciences, findings may also vary across time, and accepted results that are true for one cohort may not hold for another. Not only are we fragmented within fields, but we are also becoming fragmented across them. The study of aging has traditionally been interdisciplinary in nature, but as the field becomes more complex, researchers are becoming more specialized, with fewer lines of communication across disciplines. This dual characteristic of the explosion of information and its increasing specialization is exemplified by the separation of the *Journal of Gerontology* into two series: *Biological Sciences and Medical Sciences* and *Psychological Sciences and Social Sciences*.

This disparity in perspectives plays out in the basic assumptions of different types of gerontologists. The first author, in an interview for a telecourse on aging, was asked, “What effect does culture have on the aging process?” The answer was, “Everything!” The producer was startled, because he had just interviewed a biologist whose answer had been an emphatic “Nothing!” When asked to account for the discrepancy, the author answered that, although the biological processes underlying the aging process may be universal, the rate at which we age is largely a function of culture.

Gerontology is not yet at a stage in which a unified theory can be proposed, but we feel that similar themes are emerging in the various disciplines that comprise gerontology. A major purpose of this book is to create a bridge for understanding across disciplinary boundaries. To that end, we propose that many theories and studies of aging can be understood under the rubric of aging accelerators and decelerators—factors that increase and those that decrease the rate at which we age. This theme is central throughout the book and may help to integrate findings across disciplines with a view toward understanding successful aging. Before we explain the structure of the book, however, we feel that a brief section on basic terms is important, especially for those new to gerontology.

**BASIC DEFINITIONS**

Probably the most basic question in gerontology is, when does late life begin? There is often little consistency across studies. Some studies define older populations as 65 and above and others as 60 and above, but some start at ages as young as 50. A consensus is emerging that late life is not at all homogeneous and that one needs to distinguish between “young-old” and “old-old” adults (see Neugarten, 1975). Different cutoff points have been used, but it is most common to define young-old persons as those between the ages of 65 and 79, old-old individuals as those between 80 and 99, and the oldest-old, or centenarians, as those who are age 100 or older.

Although some people experience age-related disability in their 50s or even 40s, young-old individuals are typically relatively healthy and quite functional. As we discuss later in the book, some of the stereotypes associated with impaired aging
that have been proved false in the young-old may actually be characteristic of the old-old, who are more likely to be physically and cognitively frail and in need of support. Centenarians are a class unto themselves, and it is more difficult to make generalizations about them. Some are hardy and as sharp as tacks, but more are extraordinarily frail.

Another important distinction is that among age, cohort, and period. *Age* refers to the number of years a person has been alive, whereas *cohort* refers to a group of people who share the same birth year or sometimes those who shared historical events, such as the World War II generation. *Period* refers to the time at which the measurement or assessment occurred. If a particular phenomenon always changes with age, regardless of cohort or period, then it is an age effect. If the change is specific to a particular cohort but does not occur in any other group, then it is a cohort effect. If all cohorts or ages change at a particular point in time, then it is a period effect.

It is important to understand that a person who was 70 years old in 1950 belonged to a very different cohort from that of a 70-year-old in the year 2000. The 70-year-old in 1950 was born before the turn of the 20th century; witnessed the first cars, telephones, and electric lights; and experienced two World Wars (but was too old for military service in them). The 70-year-old in 2000 was born at the beginning of the Depression but was too young to serve in World War II. She may have served in a MASH (mobile army surgical hospital) unit in Korea, however, and certainly witnessed the civil rights movement and the tumultuous dissension over the Vietnam War. Thus, a cohort may well have experienced a life course that is historically unique, and this experience may not generalize to other cohorts. *It is crucial to recognize that much of what we know about human aging stems from studies of the World War II generation, and we do not know whether this will generalize to the Baby Boomers and other future cohorts of older adults.*

*Period effects* are also extremely important. Sometimes general shifts in the whole culture, or even temporary shifts, may be confused with aging effects. For example, Bradburn and Caplovitz (1965) first demonstrated that historical events may affect the mood of an entire population. They happened to be conducting repeated measures of positive and negative affect when the Cuban missile crisis occurred, and they found that negative affect increased at this time. If they had not been sensitive to the particular events of this period, however, they might have thought that this increase reflected aging rather than a period effect.

Another important distinction is made between life span and life expectancy. *Life span* refers to the absolute length of time a member of a given species may live. In humans, that is currently about 120 years. In contrast, *life expectancy* refers to the length of time an average member of a particular cohort can expect to live. Life expectancy refers to the age at which half of a particular cohort will have died, and demographers estimate that about half of the women born in the year 2006 will survive until after their 80th birthdays, although the comparable figure for men is only 75 (AOA, 2011b). Indeed, in nearly every country, women enjoy higher life expectancies than men. *Age-specific life expectancy* refers to the average number of years that members of a given cohort who have reached a specific age can expect to live. For example, people who survive to age 65 can expect to live another 18 or 20 years, even if the average life expectancy for their cohort is much lower. Remember that life expectancy is estimated starting at age 0, and includes individuals who will
die at all stages of the life span. Thus, people who survive to 65 are particularly hardy and can expect to live longer than the average member of their original cohorts.

Calculating life expectancy involves a number of assumptions and cannot take into account unforeseen historical circumstances. For example, life expectancy in Russia went down when the former USSR broke up. Furthermore, it may also be difficult to accurately project for immigrant groups, especially if information is lacking about their cohort in the country of origin. If older members of the group return to their native country, tracking mortality rates is also difficult.

As gerontology and geriatrics focus so much on health, it is important to understand the distinction among mortality, morbidity, and functional health. Mortality refers to death; morbidity refers to illness. Mortality rates refer to the number of people who die during a given period of time. Epidemiological and biomedical studies may attempt to predict all-cause mortality (the total number of deaths in a population), or they may try to predict specific causes of mortality, such as heart disease or cancer. Morbidity rate refers to the prevalence or total number of cases of a specific disease in a population, whereas the incidence of illness refers to the number of new cases in a year.

Epidemiologists further distinguish between acute and chronic illness. Acute illnesses are often self-limiting and/or can be successfully treated with medicines, but chronic diseases are often incurable, and treatment focus is on the management and the delay of disability rather than cure. Before the advent of antibiotics during World War II, most people died of acute illnesses such as pneumonia, influenza, scarlet fever, smallpox, or cholera, or from complications due to childbirth, and death was much more evenly distributed across the life span. With antibiotics, better sanitation, and better nutrition, however, acute illnesses are less likely to be lethal, and most people develop chronic diseases such as cardiovascular disease (CVD), cancer, arthritis, and diabetes. Nearly 80% of people over the age of 65 have at least one chronic disease (Kramarow, Lentzner, Rooks, Weeks, & Saydah, 1999). Although some diseases such as CVD and cancer are the leading causes of death in late life, others such as arthritis are not fatal but can adversely affect quality of life.

In late life, however, the acute versus chronic distinction can become blurred. For example, people with chronic obstructive pulmonary disease are more susceptible to acute illnesses such as colds, pneumonia, and other viral infections of the lungs. Diabetics are susceptible to a variety of infections, including infections of the skin, bladder, and so on. The presence of a chronic illness may also reduce the ability to recover from an acute incident. Conversely, acute illnesses such as viral infections may give rise to chronic problems, such as viral-triggered hypersensitivity of the lungs and asthma, and it is possible that some forms of diabetes or multiple sclerosis may be triggered by viruses. Although chronic illnesses such as arthritis may not be fatal in and of themselves, they may give rise to a variety of health problems that can have very serious consequences. In other words, acute and chronic illnesses can intertwine to produce a cascade of health problems that can affect the ability to function in social roles and to care for oneself.

Thus, gerontologists and geriatricians often focus on functional health rather than specific illnesses. Functional health refers to the ability to perform daily tasks such as shopping, paying bills, preparing meals, or getting around, called instrumental activities of daily living (IADL), and caring for oneself, such as bathing, dressing, and eating, which are called activities of daily life (ADL). Many older adults have
several chronic illnesses such as hypertension, arthritis, and diabetes but nonetheless are quite capable of living in the community and taking care of themselves (and, very often, taking care of others as well). Once functional health declines, however, older adults are at greater risk for dependency and institutionalization. Most dread the possibility of institutionalization; indeed, it is the negative Shakespearean fate that we all seek to avoid.

When we think of successful aging, the image of the active senior emerges, an image often touted in advertisements for expensive retirement communities. It is tempting to define successful aging in terms of good physical function, cognitive abilities, and mental health. But such a definition also implies that there is only one way to age successfully and ignores the fact that the vast majority of older adults will develop illnesses and limitations (Minkler & Fadem, 2002). Furthermore, as one commentator put it, we appear to be the only culture on Earth that regards death as optional—doing our best to ignore the fact that, barring accidental death, we will all develop fatal illnesses, often involving pain and disability. Thus, we prefer to use the term optimal aging, which allows for the recognition that there may be different ways of aging well, that people begin with different configurations of vulnerabilities and resources that affect how they age, and that this is a process that continually unfolds. Understanding what constitutes and what promotes optimal aging is a primary function of this book, but, as we will see, such understanding is a difficult task, because it entails assumptions that reflect cultural and individual values. Nonetheless, we argue that optimal aging is a multidimensional construct that involves avoiding the accelerating agents that promote premature illness and disability, as well as developing protective factors that delay or decelerate the aging and disease processes to maintain good physical, cognitive, and mental health. At the heart of optimal aging, however, is the concept of wisdom. We propose that the development of wisdom in adulthood allows individuals to assist others (especially those in younger generations), to optimize capacities despite illness and disability, to find meaning and purpose in life, and to face disability and even death with relative equanimity.

The purpose of this book is to provide an interdisciplinary understanding of the factors that affect aging. As mentioned earlier, we feel that the field is becoming increasingly fragmented, yet theories and models are emerging that can help tie together diverse perspectives. Our overall goal is to examine the biological and psychosocial aging literatures to determine whether they can be organized using the aging accelerators and decelerators model, in order to enhance understanding of the many facets of aging and to promote optimal aging.

**ORGANIZATION OF THE BOOK**

To that end, we have organized the book in four sections. Section I provides a general overview of demographic, theoretical, and methodological issues. Chapter 2 provides a detailed examination of various age-related population shifts and their causes and consequences. Much has been written about the graying of America, but the increasing age of the population is a phenomenon seen not only in the United States but also in Europe and in nearly all countries around the world. Drawing on the 2010 census and other national and international data, we discovered some very surprising
facts that challenge long-held assumptions about the demography of aging. Chapter 2 also examines demographic factors that accelerate or decelerate the aging process, including marital status, ethnicity, and socioeconomic status.

Chapter 3 is an overview of theories of aging. The first half focuses on biological theories of aging in humans. Beginning with theories of the genetic regulation of aging, we also review cellular theories, including DNA repair mechanisms and antioxidants, as well as the effects of waste accumulation and dietary restriction. At the systems level, some theories of aging emphasize the effects of wear and tear; others focus on problems with interorgan communication. The second half reviews psychosocial theories of aging, including classic stage theories as well as more modern approaches such as developmental systems theory and positive models of adaptation in late life. We explore whether the construct of aging accelerators and decelerators is broad enough to develop a common language between biological and psychosocial theories of aging and also discuss the interface between the dialectic of cumulative and plastic models.

An overview of methodological issues is presented in Chapter 4. We review different types of longitudinal designs, including cohort, cross-, and time-sequential designs and provide a brief introduction to longitudinal statistics, especially health statistics. Much confusion exists concerning the uses and misuses of longitudinal statistics, and differences in preferred analytical strategies across fields may render interdisciplinary comparisons problematic. By providing a literate, nontechnical review, we hope to increase general understanding of longitudinal designs and statistics that will increase the uniformity of their use across disciplines. Although longitudinal statistics are difficult, understanding them is absolutely crucial for gerontology, given its inherent focus on examining the rate of change in a variety of phenomena.

Section II examines the aging of select biological systems. Much of the book focuses on biological systems, because these tend to be less well understood. For each system, we provide a brief overview of the anatomy and physiology. Following Rowe and Kahn (1998), we describe normal age-related changes, then we focus on diseases and the factors that accelerate the rate at which they occur. Finally, we describe ways of maintaining optimal aging in each system, with an emphasis on aging decelerators.

Chapter 5 reviews changes in the musculoskeletal and integumentary systems. With age, there are systematic changes in overall body composition, including bones and muscles. Skeletal problems also increase with age. Most older adults have some form of arthritis, and osteoporosis is often one of the most painful diseases of later life. Muscle mass also declines with age, although weight-bearing exercise can attenuate that loss. Although not usually life threatening, aging and disease processes in the musculoskeletal system can be extremely painful and debilitating and may be one of the greatest influences on quality of life in late life.

Chapter 6 focuses on the internal organ systems, including the cardiovascular, respiratory, gastrointestinal, renal/urinary, and reproductive systems. In many ways, the functioning of the heart and lungs regulates the rate at which we age. Both systems are crucial in carrying oxygen and other nutrients to every cell in the body, as well as in carrying away waste products. Failure or deficiencies in these systems often underlie damage to other systems. Our knowledge of both normal aging processes and disease processes in these systems has greatly increased in the past two decades. Much of what we know about interventions to delay problems with aging emphasizes the maintenance of the cardiovascular and pulmonary systems.
Relatively few age-related changes occur in the gastrointestinal system, but this system is responsible for overall nutrition needed to maintain the rest of the body, and disruptions can have serious systemic effects. Inadequate nutrition can also result in confusional states, as well as a host of other problems. Weight loss in later life may result in serious risk of mortality. Because the renal system regulates fluids and electrolytes, complications in this area can also lead to a multitude of problems, including hypertension and difficulties in regulating the heart rate, as well as transitory confusional states, often mistaken for dementia. Urinary incontinence in later life, although extremely common, is almost always treatable, but it constitutes one of the biggest barriers to freedom of movement and social interaction and thus quality of life. Finally, age-related changes in the reproductive system are considered.

Chapter 7 addresses two of the regulatory systems, including the sensory and the nervous systems, while Chapter 8 reviews the endocrine and immune systems. In many ways, the functioning of any one system is of less importance than communication among systems in determining the rate at which we age. These four systems work in concert using a variety of electrochemical means of communication to fine tune coordination across systems. An explosion of knowledge has occurred in both biogerontology and in the cognitive neurosciences in the past 10 years. We are much better at understanding the mechanisms of brain aging and the factors that give rise to disorders such as Alzheimer’s disease. We are also much better at treating sensory problems such as glaucoma, cataracts, and hearing loss. The endocrine system is of such importance for aging that for many years the pituitary was considered the master gland that regulated all aging. Finally, we describe our growing understanding of the complexity of the immune system, which, contrary to general belief, does not necessarily decline with age (Miller, 2009).

Chapter 9 reviews Lawton and Nahemow’s (1973) theory of environmental competence as well as functional health. This theory first hypothesized that a person’s level of ability interacted with environmental facilities to create disability. This idea—that environments can be changed to accommodate mobility, sensory, and cognitive problems—resulted in radical changes in housing and facilities for older adults in the last 25 years. Thus, accelerators and decelerators of aging are not necessarily internal, nor do they inevitably affect internal processes. Rather, the configuration of the environment can affect the expression of aging processes on functional health. We discuss ways in which functional health has been conceptualized and how this concept has generally evolved into a study of health-related quality of life in later years.

Section III centers on the psychosocial factors that affect physical health, with a specific view toward understanding psychosocial accelerators and decelerators of the aging process. Dr. Michael Levenson assisted in writing Chapter 10, which addresses the interface between physical and mental health. In it, we review the evidence for and the pathways through which personality processes can affect morbidity and mortality. Most reviews focus on psychological risk factors, but we will discuss evidence for personality processes that can be protective of health, especially in late life. Health behavior habits also can affect the rate of aging. The impact of smoking, exercise, and diet as accelerators and decelerators is addressed in Section II, but the consumption of alcohol has important implications for mental, cognitive, and physical health, albeit in a complex, nonlinear fashion. Furthermore, symptoms of common illnesses may present differently in older adults. For example, in younger adults, the
primary symptom of a urinary tract infection is burning pain on urination. But in older adults, the primary symptom may be a confusional state (Ouslander, 1994). Thus, it may be very hard to distinguish between psychological and physical health problems in late life, as there are often overlapping symptoms. For example, if an older person is listless, sleeping poorly, has little appetite, and appears somewhat confused, this may be due to a number of problems such as depression, hypo- or hyperthyroidism, leukemia, congestive heart failure, pneumonia, alcoholism, or a bladder infection. Proper differentiation of symptoms and diagnoses may require both physical and psychological screening.

The next two chapters focus on other psychosocial processes that may affect health in later life. Chapter 11 addresses the evidence for the effects of stressors on health in late life. We know that older adults are more vulnerable to the physical effects of stress, but it is not clear whether they are also more vulnerable to the psychological effects of stress. How elders cope with problems, especially chronic illness, may well differentiate between those individuals who are able to live in the community and those who become institutionalized.

Chapter 12 reviews social support, which may be one of the most important predictors of health in late life. We discuss the different types of support and theories of age-related change and stability in the amount and type of support. We also review the relationship of social support to morbidity and mortality, as well as the literature on caregiving.

Section IV is now titled “Practical and Clinical Aspects of Aging.” It consists of two chapters. Chapter 13 is titled “Aging in the Sociostructural Context,” and discusses adaptation to retirement, as well as the range of housing types that are available in later life. We focus on exciting new trends such as gerontechnology, which allows elders to age in place, as well as Green Houses, which embody a new, client-centered philosophy of elder care. It also provides basic information on the economics of aging, such as Social Security and other types of income sources in retirement, including a basic description of types of pension plans. We also provide information on health care systems such as Medicare and Medicaid and their future. Finally, Chapter 14 reviews theories of optimal aging as a framework for integrating biological and psychosocial factors in aging, and argues for the centrality of wisdom.

We learned a great deal while researching material for the revision of this book. Knowledge in this field is changing rapidly, and we have done our best to present the most recent information available. More importantly, we hope that this book serves as a bridge between the biological and psychosocial gerontology communities and promotes a more holistic understanding of the aging process.