In industrialized countries, we witnessed truly astonishing increases in life expectancy during the 20th century, which rose from about 45 years in 1900 to about 75 years in the year 2000. This phenomenal increase in average length of life was also accompanied by a substantial improvement in the quality of life for the elderly. Knowledge gained in basic research on aging, as well as ongoing advances in medicine, cultural studies, psychology, and economics, has contributed to this development. Will this historical trend continue as the population reaches higher and higher ages, as more and more people live to be 90 or even 100 years old? In recent studies, it has been shown that as people reach the older ages, they exhibit larger losses in physical, mental, and social functioning than those observed for the young-old. In fact, there is reason to ask whether the resulting state of affairs challenges our basic conception of what it means to live and die in dignity.

The Janus face of aging becomes apparent when we compare what are called the “Third” and “Fourth” Ages of life. The Third Age begins at about 60. The Fourth Age commences when half the original “birth cohort” is no longer alive. In developed countries, this is generally around the age of 80. Recent advances in gerontological scientific research have centered on the Third Age and its potential or plasticity. In contrast, the Fourth Age makes explicit the biological shortcomings of the human organism - and based on current evidence there is little hope of the oldest ages becoming the veritable “golden age.” Under today’s conditions, the Fourth Age promises to create major problems for our society and to pose great challenges for research in the future.

Of special importance is new evidence that the increase in life expectancy also applies to the oldest ages and is not restricted to the younger age ranges. Today, 80-year-olds have a statistical life expectancy of another...
er eight years. This is twice as much as those decades ago, when the age at which life expectancy was com-
and scientific research have confirmed that our ability to con-
tinue more or less linearly, nearly half the people born today could theoretically reach an age close to 100 years. Although a linear prediction of this type is com-
monplace, the "sharpenedness" of the present trend has not been explained in terms of the shifting body mass index or the increasing prevalence of chronic disease. Nonetheless, the trend remains, and it is clear that the older population is growing at a faster rate than the younger population.

Mental capacities that are particularly pronounced in the elderly include emotional intelligence and wisdom. Emotional intelligence is the ability to understand the causes of feelings such as hatred, love, and fear. It is al-
so the ability to develop strategies to avoid emotional conflicts or to deal with them in an effective way. Older people are usually endowed with more emotional in-
telligence than younger people.

Wisdom and Experience - Strengths of the Aged

Within the context of aging, intelligence should not be over-
estimated. Older composers and conductors, for instance, are often among the best in their fields. Specialized pro-
fessional knowledge is also unaf/fected by age, as long as the aging person remains professionally active. A few examples include the "method of loci" show. Whereas the young-old tend to do very well, many people over 85 are no longer able to apply selection, optimization, and compensation as they did in earlier times.

Another strength of the elderly is their ability to maintain their self-image and a satisfying life. Older adults possess an exceptional ability to adapt their lives in such a way as to feel healthy and happy. For example, the philosopher Bobbio had suggested: This optimism about becoming old needs to be more closely scrutinized. Although some people remain very agile and emotionally well-off in their old age, their numbers begin to dwindle as age increases. Physical and mental capacities increasingly diminish the older person's ability to do happy days.
we need a constant increase in cultural development. And precisely here lies the crux of the problem. Cultural support mechanisms lose their effect as our biological potential decreases in old age. This is especially true for the oldest-old, for whom more and more cultural intervention is required. For instance, older people need much more practice than young people to achieve similar progress in a cognitive task. Furthermore, the ability to acquire new knowledge and thought patterns is severely limited in very old age.

Today, one of the core questions faced by gerontology is to what extent further scientific developments can offer new insights and ways to ameliorate the conditions of the Fourth Age. Biomedical research would have us believe we can improve the Fourth Age, just like we improved the Third Age. Unfortunately, this optimism must be met with skepticism. As theoretical arguments and recent research suggest, plasticity is fundamentally limited in very old age. It is unpredictable and less readily influenced by internal and external factors.

More Research is Our Only Hope

Theoretically, there is hope of genetically altering the biogenetic architecture of the life course to make it more susceptible to cultural and psychological influences. However, such speculations put us on extremely shaky ground – not only in terms of research, but also in terms of the ethical-religious debate on human nature. From a purely scientific standpoint, any kind of genetic engineering involves a number of unknowns due to the complexity of the human genome. Any attempt to intervene in this highly intricate system risks producing unpredictable side effects. Moreover, the aging process and many of its associated diseases are based on a multitude of biogenetic factors, including their interaction with numerous behavioral and environmental parameters. This makes things more complicated than with “simpler” monogenetic diseases for which gene therapy currently seems to harbor a small fraction of the aging population. Many biomedical scientists agree that knowing the genetic factors involved in the aging process does not automatically mean that a quick and standardized means of "artificially" perfecting the biocultural architecture of the aging process is available. These factors are simply too complex and differ too greatly from individual to individual. Nonetheless, one can argue that in the long term only biomedicine has a chance of truly transforming old age into a “belles epoque” of life. Improved environmental conditions and age-friendly behavioral strategies alone will not suffice.

Our future lies in old age. For societal reasons, it is thus of utmost importance to pursue gerontology as a cornerstone of science in the 21st century. The United States has already recognized this fact: almost $2 billion in public spending is directed to gerontological research each year. The private sector contributes close to another $1 billion. This total of close to $3 billion spent on gerontology each year amounts to more than the entire research budget of the Deutsche Forschungsgemeinschaft (German Research Foundation) or of the Max Planck Society.

Notwithstanding a few excellent research groups, Germany has a great deal to do in the field of gerontology. This is a matter of top priority. In the future, the contributions of science to the general welfare of the nation will also be judged by whether they benefit the state of people in old age. Research will be expected to provide its share of solutions to optimizing the Third Age and reducing the “unhappy days” of the Fourth Age.

What type of gerontological research is most promising? This question is currently the subject of intensive international debate. It will be important to address not only the positive potential of the Third Age, but also the vulnerability and obstinacy of the Fourth Age: “Hope with a mourning band” may be the motto best suited to this situation.

Age and aging encompass biogenetic-medical, psychological, social, and technological issues and, thus, require interdisciplinary research. Furthermore, gerontology makes a distinction between normal, optimal, and pathological aging. This results in two different research approaches. The first focuses on the normal aging process and how it might benefit from improvements in medicine, psychology, technology, and social conditions and support. It is based on the promising news of the potential of the Third Age and the idea that it is more important to improve the quality of life than to extend it even further.

The second approach focuses on finding remedies to the accompanying pathological and otherwise debilitating effects of aging. The aim is to develop preventive and corrective treatments to at least lessen the maladies of the Fourth Age, even if it is not possible to eliminate them completely. Thus, we urgently need, for instance, to find ways of treating the various forms of dementia and morbidity that are increasingly common in old age. James Fries, professor of medicine at Stanford University, developed an interesting model called “compression of morbidity.” He suggested that, assuming the human life span is biologically predetermined, we should try to delay the occurrence and extent of all diseases and ailments associated with age to a point in time beyond the “natural” time of death. With such a strategy, it may be possible to “compress” diseases into a short time window in the last years of life. Although the final evidence is not in, this vision is plausible and promising.

The economic sector can also be expected to be supportive of more gerontological research. There are two key economic incentives – apart from the fact that economic leaders would probably appreciate a longer, happier life themselves. The first incentive is that old people represent a significant economic factor in a service-oriented knowledge-oriented society. They not only have needs, but on average also the resources to pay for the services to address those needs. In this spirit, and similar to considering the glass half full, rather than half empty, old age can be a catalyst for development and progress, rather than only a burden. As already demonstrated in some countries, the gerontological service sector can be a driving force of cultural evolution.

The second economic incentive is the human capital of the young-old, which is presently virtually untapped. As the young generation increasingly shrinks in size, the human capital of the Third Age could experience a boom, also in economic terms. However, it will not suffice simply to extend the working age – say to 67. Although this might make economic sense, it can only be effective if an “old-age work culture” is developed at the same time. Such a culture requires old-age work is unlikely to be established through repairs of the existing system. What is needed is fundamental reform, developed through interdisciplinary efforts, including gerontogenetic disease research.

Healthier and more active aging are the hallmarks of the recent past. The path from the Third to the Fourth Age is difficult. However, it also offers new opportunities and challenges for innovation. More research is needed to identify and seize these new opportunities. Without change, the dilemmas of the Fourth Age will become amplified and affect us all, both old and young.