

Paul B. Baltes

*Facing our limits:  
human dignity in the very old*

An ancient Greek myth captures a dilemma that still faces us today. The goddess of the Dawn, Eos, persuades Zeus to make her earthly lover Tithonus immortal. But she forgets to ask Zeus to preserve the health and vitality of her lover. As a result, though Tithonus lives on and on, his body and mind begin to fail. Finally, and with pain in her heart, Eos moves her former lover into a separate chamber where he lives forever out of sight.

Like Eos in the myth, some scholars now entertain the prospect of an indeterminate, if not 'limitless,' human life span.<sup>1</sup> But should this dream become a reality, still other students of aging fore-

see a growing number of Tithonuses – very old and frail people, bereft of mind, body, and human dignity.

The Janus face of aging becomes apparent when we compare what, pursuant to earlier work by Bernice Neugarten and Peter Laslett, my colleagues and I have called the 'Third' and 'Fourth Age' of the human life span.<sup>2</sup> These are dynamic and heuristic concepts, approximations that change with time and exhibit large individual variations. Currently, in developed countries, the Third Age begins, on average, at about age 60; the Fourth Age generally starts around age 80.

In recent decades, a powerful coalition of gerontological scientists, policymakers, and social-technological advances

*Paul B. Baltes, a Foreign Honorary Member of the American Academy since 1991, is director at the Max Planck Institute for Human Development in Berlin and Distinguished Professor of Psychology at the University of Virginia. He is also vice president of the German Academy of Natural Sciences Leopoldina. Baltes codirected the Berlin Aging Study and coedited the "International Encyclopedia of the Social and Behavioral Sciences" (with Neil Smelser, 2001). He is currently leading the Max Planck International Research Network on Aging.*

© 2006 by the American Academy of Arts & Sciences

1 J. Oeppen and J. W. Vaupel, "Broken Limits to Life Expectancy," *Science* 296 (5570) (May 10, 2002): 1029 – 1031.

2 P. B. Baltes, "On the Incomplete Architecture of Human Ontogeny: Selection, Optimization, and Compensation as Foundation of Developmental Theory," *American Psychologist* 52 (4) (April 1997): 366 – 380; P. B. Baltes and K. U. Mayer, eds., *The Berlin Aging Study: Aging from 70 to 100* (New York: Cambridge University Press, 1999); P. B. Baltes and J. Smith, "New Frontiers in the Future of Aging: From Successful Aging of the Young Old to the Dilemmas of the Fourth Age," *Gerontology* 49 (2) (March/April 2003): 123 – 135.

has contributed to major increases in longevity and improvements in the quality of life for individuals in the Third Age.<sup>3</sup> But theoretical and empirical evidence suggests that further improvement may become more difficult as more and more people reach the Fourth Age. These oldest-old are manifesting a new level of biocultural incompleteness, vulnerability, and unpredictability in their everyday behavior – testing the limits of human functioning as well as of science and policy.

After offering some of the scientific evidence for this contrast between the Third and the Fourth Age, I shall sketch some of its implications, not only for the individual but also for societies. Depending on characteristics such as average age and age distribution, countries will differ in productivity and health costs. Indeed, a population's age distribution may even affect how much money a country has available for international developmental aid.

Thus, it is not surprising that debates over the future of aging differ in marked ways, for instance, in the United States and in Germany. Because a much larger proportion of Germany is elderly, and because of the added problem of lower rates of fertility, German scholars and policymakers have been forced to face some hard questions: How can a society distribute scarce educational and medical resources justly among people at all stages of life? How can a society main-

tain its productivity when a growing proportion of its labor force population, because of its older age, is less fit for innovative labor and productivity?

In industrialized countries over the last century, we have witnessed truly astonishing increases in average life expectancy, from about forty-five years in 1900 to close to eighty years in 2000. Of special importance is new evidence that life expectancy is increasing in the older as well as younger age ranges.<sup>4</sup> Thirty years ago, an 80-year-old would live, on average, another four years; today, an 80-year-old can expect to live longer for double that time. If this upward trend in life expectancy continues more or less linearly, nearly half the people born today – especially women – could theoretically reach an age close to 100.

While certain genes play a key role in determining the life spans of human beings, genetic factors by themselves cannot explain this rapid increase in life expectancy in the twentieth century. Changes in the human genome occur gradually, over much longer periods of time than a century. Rather, better living conditions have been primarily responsible for the recent increase in human life expectancy. These technological, social, and cultural changes have permitted fuller utilization of the plasticity built into the human genome.

As more people live to older ages, they are demonstrating remarkable potential. Researchers at the Max Planck Institute for Human Development have found that people in their sixties and seventies still possess considerable intellectual and cognitive resources. Of course, intelligence is not a single, homogeneous capacity, and not all aspects of intelligence in the elderly show posi-

<sup>3</sup> P. B. Baltes and M. M. Baltes, eds., *Successful Aging: Perspectives from the Behavioral Sciences* (New York: Cambridge University Press, 1990); Baltes and Mayer, eds., *The Berlin Aging Study*; M. W. Riley, R. L. Kahn, and A. Foner, *Age and Structural Lag: Society's Failure to Provide Meaningful Opportunities in Work, Family, and Leisure* (New York: J. Wiley, 1994); J. W. Rowe and R. L. Kahn, "Human Aging: Usual and Successful," *Science* 237 (4811) (July 10, 1987): 143–149.

<sup>4</sup> Oeppen and Vaupel, "Broken Limits."

tive changes – but some do. On one hand, the mechanics of the mind, like computer hardware, dictate the sheer speed and accuracy with which it processes information. This capability – which is also key to learning – grows rapidly during childhood, but begins to wane in early adulthood. On the other hand, intelligence also includes a kind of ‘crystallized’ pragmatics, which, like computer software, reflects culture-specific knowledge such as language, professional skills, and practical reasoning about human affairs.<sup>5</sup>

Older adults can retain and even improve the crystallized pragmatics of the mind, provided they do not suffer from brain disorders. This is especially true for those bodies of pragmatic knowledge that individuals cultivate.<sup>6</sup> Thus, even

5 P. B. Baltes, U. M. Staudinger, and U. Lindenberger, “Lifespan Psychology: Theory and Application to Intellectual Functioning,” *Annual Review of Psychology* 50 (1999): 471–507; R. B. Cattell, *Abilities: Their Structure, Growth, and Action* (Boston: Houghton Mifflin, 1971); F. I. M. Craik and T. A. Salthouse, eds., *The Handbook of Aging and Cognition*, 2nd ed. (Hillsdale, N.J.: Erlbaum, 2000); S.-C. Li et al., “Lifespan Transformations in the Couplings of Mental Abilities and Underlying Cognitive Processes,” *Psychological Science* 15 (3) (2004): 155–163; P. A. Reuter-Lorenz, “New Visions of the Aging Mind and Brain,” *Trends in Cognitive Sciences* 6 (9) (September 1, 2002): 394–400; K. W. Schaie, *Developmental Influences on Adult Intelligence: The Seattle Longitudinal Study* (New York: Oxford University Press, 2005); P. C. Stern and L. L. Carstensen, *The Aging Mind: Opportunities in Cognitive Research* (Washington, D.C.: National Academy Press, 2000).

6 Baltes and Baltes, eds., *Successful Aging*; R. T. Krampe and P. B. Baltes, “Intelligence as Adaptive Resource Development and Resource Allocation: A New Look Through the Lenses of SOC and Expertise,” in R. J. Sternberg and E. L. Grigorenko, eds., *The Psychology of Abilities, Competencies, and Expertise* (New York: Cambridge University Press, 2003), 31–69.

as our minds lose their basic potential for peak performance in the basic mechanics of the mind, we can concentrate our efforts in areas where we have already achieved mastery and where ‘new’ learning is not the most critical component.

In the same vein, many older adults evince heightened emotional intelligence and interpersonal social cognition.<sup>7</sup> Indeed, wisdom, often considered the peak of human excellence in mind and character, is one of the elderly’s most impressive potential characteristics.<sup>8</sup> It goes without saying that simply growing old is not enough to become wise. However, with life experience and the necessary personal qualities and patterns of thought, adults in their sixties and seventies often address problems requiring wisdom extremely well.

The positive aspects of experience are also evident in certain areas of professional expertise. Older composers and conductors, for instance, are often among the best in their fields. As long as an aged person remains professionally active, unaffected by specific age-associated illnesses such as stroke, and works in an area where the pragmatics rather than the mechanics reign, age often has little or no effect on specialized professional knowledge.

7 L. G. Aspinwall and U. M. Staudinger, eds., *A Psychology of Human Strengths: Fundamental Questions and Future Directions for a Positive Psychology* (Washington, D.C.: American Psychological Association, 2003); B. T. Hess and F. Blanchard-Fields, eds., *Social Cognition and Aging* (London: Academic Press, 1999).

8 P. B. Baltes and U. M. Staudinger, “Wisdom: A Metaheuristic (Pragmatic) to Orchestrate Mind and Virtue Toward Excellence,” *American Psychologist* 55 (1) (2000): 122–136; R. J. Sternberg and J. Jordan, eds., *A Handbook of Wisdom: Psychological Perspectives* (New York: Cambridge University Press, 2005).

The elderly are also amazingly well-equipped to adapt and stay positive despite the increasing restrictiveness of their activities and physical abilities. In fact, many older people claim they feel just as healthy as younger people, even though – objectively speaking – they are not. Often, their ability to establish new standards of comparison makes this feeling possible. For example, after people survive a heart attack, they are likely to compare themselves to others who have died.<sup>9</sup>

This ‘adaptive self-plasticity’ has positive effects on well-being. It also corresponds to the theory of selective optimization with compensation, developed at the Max Planck Institute for Human Development.<sup>10</sup> According to this theory, people at all ages of life engage in selection, optimization, and compensation. However, in older people, the mastery of these skills can become a fine art, as in the case of the pianist Arthur Rubinstein.

At 80, Rubinstein was asked how he managed to still give such excellent concerts. Over the course of several interviews, he offered three reasons. First, he played fewer pieces – an example of selection. Second, he practiced these pieces more often – an example of optimization. Finally, he played slow movements more slowly, to make it appear as though he were playing the piano faster

in the fast movements than he was actually able to – an example of compensation. People who apply selection, optimization, and compensation as behavioral strategies feel better about themselves and go further in life, especially when the mechanics of mind and body start to decay, as they inevitably do in old age.

Gerontologists and policymakers are thrilled with these pieces of good news. However, not everyone – particularly not the very old people themselves – share this optimism. After all, why is it that most people don’t want to be old? Why do people always want to be a bit younger than they actually are as they grow older? And why does the discrepancy between actual age and desired age increase dramatically as we reach our seventies, eighties, and nineties? Ninety-year-olds in Berlin, for instance, said they would have liked to stay, on average, between the ages 65 and 70.

Late in his life, the Italian philosopher Norberto Bobbio coined the phrase “happy gerontologists,”<sup>11</sup> suggesting that some aging researchers were so optimistic because they had not yet taken a proper look at the older-old. But since then, a number of gerontologists have in fact shifted their focus from the ‘young-old’ to the ‘oldest-old.’ In the Berlin Aging Study, for example, more than fifty medical experts, psychologists, sociologists, and economists repeatedly assessed over a period of ten years approximately five hundred older people ranging in age from 70 to 100.<sup>12</sup>

The results confirmed what Bobbio had suggested: Although some of the

9 J. Heckhausen and J. Krueger, “Developmental Expectations for the Self and Most Other People: Age Grading in Three Functions of Social Comparison,” *Developmental Psychology* 29 (3) (May 1993): 539 – 548.

10 Baltes and Baltes, eds., *Successful Aging*; A. M. Freund and P. B. Baltes, “Life-Management Strategies of Selection, Optimization, and Compensation: Measurement by Self-Report and Construct Validity,” *Journal of Personality and Social Psychology* 82 (4) (April 2002): 642 – 662.

11 N. Bobbio, *Old Age and Other Essays* (Cambridge: Polity Press, 2001).

12 Baltes and Mayer, eds., *The Berlin Aging Study*.

older-old remain very agile and emotionally well-off, their numbers begin to dwindle as they grow older. Physical and mental capacities increasingly diminish the older someone gets, clearly contradicting the belief that today's elderly are necessarily spared the negative aspects of aging.

Aside from deteriorating health, sensory systems, and bodily strength, one of the first things to decline markedly in the oldest ages is the capacity to learn. Experiments where subjects must learn a new memory enhancement technique demonstrate this: whereas the young-old tend to do very well, many people over 85 are unable to learn the technique unless it is simplified in major ways.<sup>13</sup> In the Fourth Age, even people considered mentally fit for their age have difficulty learning especially if the concepts are complex.

Moreover, people in the Fourth Age have a more fragile self-image than younger-old people. In the oldest-old, self-regulatory adaptability diminishes, largely because the gap between the desired and the real becomes too large in scope and magnitude. When the Fourth Age is reached, indicators of well-being such as life satisfaction, social integration, a positive attitude toward life, and aging satisfaction start to fall as a whole.

When looking at the whole of human functioning, the evidence for sizeable losses in the Fourth Age is impressive.<sup>14</sup>

13 R. Kliegl, J. Smith, and P. B. Baltes, "On the Locus and Process of Magnification of Age Differences During Mnemonic Training," *Developmental Psychology* 26 (6) (1990): 894–904; T. Singer, U. Lindenberger, and P. B. Baltes, "Plasticity of Memory for New Learning in Very Old Age: A Story of Major Loss?" *Psychology and Aging* 18 (2) (June 2003): 306–317.

14 J. Smith et al., "Two-Wave Longitudinal Findings from the Berlin Aging Study: Introduction to a Collection of Articles," *Journal of*

For instance, compared to people in the Third Age, almost five times as many people over 85 suffer from chronic impairments and exhibit low functional scores across a wide range of physical, cognitive, and social indicators.<sup>15</sup> These data confirm that life's journey tends to take a turn for the worse as one reaches, and even exceeds, the biological limits of human adaptability. The fact that the physical and mental capabilities of same-age old people have improved substantially in recent years can at best buffer the negative effects of old age, but not eliminate the basic trend. In other words, the magnitude of the aging effect is much larger than that of historical improvement.

The dramatic increase in dementia makes the losses of the Fourth Age particularly visible. According to the Berlin Aging Study and other studies, less than 5 percent of 70-year-olds suffer from some form of dementia, including Alzheimer's.<sup>16</sup> But this percentage increases to 10 to 15 percent of 80-year-olds and to about 50 percent of 90- to 100-year-olds. Currently, no scientific evidence seems to indicate a 'historical cohort effect' for Alzheimer's-induced dementia – that is, a shift toward later ages.

Dementia, especially Alzheimer's disease, leads to a gradual deterioration in many basic human characteristics, including intentionality, independence, identity, and social integration. These characteristics play a key role in defining human dignity and allowing individuals

*Gerontology: Psychological Sciences* 57 (6) (November 2002): 471–473.

15 Baltes and Smith, "New Frontiers."

16 H. Helmchen et al., "Psychiatric Illnesses in Old Age," in Baltes and Mayer, eds., *The Berlin Aging Study*, 167–196.

to exercise autonomously their 'human rights.'

We are now faced with a new challenge: to conserve human dignity in the later years of life. In the Fourth Age, gerontology's leitmotif, "Add more life to years, not more years to life," seems to have met a new barrier. This barrier has its roots in our evolutionary past.<sup>17</sup>

Up until the present time, biological evolution operated by selecting and optimizing the reproductive abilities of humans during early adulthood. As a consequence of this primary focus on reproductive fitness, there was little opportunity for improving the genome for the older ages of modern times. Not surprisingly, therefore, the self-preserving regulatory mechanisms of the human genome deteriorate with age. These biogenetic losses of human aging are less obvious in the Third Age because culture- and technology-based improvements have been successful in compensating for this evolution-based deficit.

These genome-based deficits, more conspicuous and prevalent in the Fourth Age, limit the countervailing effectiveness of cultural factors, including education and medicine. Older people, in general, need much more practice than young people to achieve similar progress in a cognitive task. Moreover, the number of illnesses increases. Multimorbidity and general losses across the board become hallmarks of the oldest ages.<sup>18</sup>

Is this but a transitory state? Scientists should be careful with predictions. How-

ever, without a doubt, one of the core questions gerontology faces today is to what extent further scientific developments can offer new insights and ways to ameliorate the biological deficits of the Fourth Age. Theoretically, of course, the advent of new forms of biotechnology gives us hope of genetically altering the biogenetically 'incomplete' architecture of the life course to make it more amenable to cultural and psychological influences. However, based on present-day evidence, such speculations also put us on shaky ground – not only because of the unpredictable effects of genetic engineering, but also because of the ethical-religious debate on human nature.

Because of the complexity of the human genome, any attempt to intervene in this system risks producing undesirable side effects. Moreover, a multitude of biogenetic factors, including their interaction with numerous behavioral and environmental parameters, influences the aging process and many of its associated diseases. An increasing number of random effects are also a part of the story. This makes gene therapy more complicated for these diseases than for 'simpler' monogenetic diseases. Though gene therapy currently holds a lot of promise for treating monogenetic diseases, these kinds of diseases are demographically less significant, affecting only 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 biogenetic architecture of the aging process is available. These factors are simply too complex and often differ from individual to individual. Nonetheless, it seems fair to argue that in the long term only biomedicine has a chance of truly trans-

17 Baltes, "On the Incomplete Architecture of Human Ontogeny"; C. E. Finch, *Longevity, Senescence, and the Genome* (Chicago: University of Chicago Press, 1990).

18 Baltes and Mayer, eds., *The Berlin Aging Study*; Baltes and Smith, "New Frontiers."

forming old age into a Belle Époque. Because of the reduced scope of biological potential, improved environmental conditions and age-friendly behavioral strategies alone will not suffice.

For the younger-old, those in the Third Age, the prospects seem bright. With new approaches involving various methods of biocultural co-construction,<sup>19</sup> with systematic efforts at optimizing the strengths of older individuals, with new aging-friendly institutional structures, with innovative efforts at developing conceptions of productivity that extend beyond the narrow sense of economic productivity, modern societies have the potential to create a better future for the younger of the older ages and thereby empower individuals to become 'successful agers.' And because of large individual variability in the genome and culture, it is also likely that we will continue to witness outstanding individual success stories in the oldest ages as well.

For most of the older-old, however, the prospects are not so bright. From my point of view, "Hope with a mourning band" may be the motto best suited to this situation. How to combine longevity with a high quality of life and human dignity in the oldest ages is the new frontier. As demographers celebrate each month gained in the lives of the

oldest-old, researchers focused on improving quality of life worry about the associated increase in the gap between longevity and vitality.

That the situation is not hopeless is illustrated in the "compression of morbidity model" articulated by Fries.<sup>20</sup> It proceeds from the assumption that there is a 'current' biological limit to life span, around eighty-five to ninety years. With that assumption, science and society could take increasing the quality of life rather than the quantity of life more seriously. One way to do so would be by compressing major events of illness into the few years preceding natural 'biological' death. Such a strategy allows people to maintain their human dignity longer without necessarily extending life span.

In my view of the evidence, Fries' vision still seems a realistic alternative. Though only when we move to an average life expectancy of eighty-five to ninety years will we know if it is truly possible. Using this model as a framework along with the newest evidence on the dysfunctional states of the oldest-old, I suggest that we tone down our quest to extend longevity in favor of raising the quality of life within the present frame of life expectancy. And even if there is no maximum biological limit to life, such a limit can still become

19 P. B. Baltes, P. A. Reuter-Lorenz, and F. Rösler, eds., *Lifespan Development and the Brain: The Perspective of Biocultural Co-Constructivism* (New York: Cambridge University Press, forthcoming); E. Jablonka and M. J. Lamb, *Evolution in Four Dimensions: Genetic, Epigenetic, Behavioral, and Symbolic Variation in the History of Life* (Cambridge, Mass.: MIT Press, 2005); S.-C. Li, "Biocultural Orchestration of Developmental Plasticity Across Levels: The Interplay of Biology and Culture in Shaping the Mind and Behavior Across the Lifespan," *Psychological Bulletin* 129 (2003): 171–194; Riley, Kahn, and Foner, *Age and Structural Lag*.

20 J. F. Fries, "Aging, Natural Death, and the Compression of Morbidity," *New England Journal of Medicine* 303 (3) (July 7, 1980): 130–135; J. F. Fries, "The Compression of Morbidity: Near or Far?" *Milbank Memorial Fund Quarterly* 67 (2) (1989): 208–232; J. F. Fries, "Measuring and Monitoring Success in Compressing Morbidity," *Annals of Internal Medicine* 139 (5 [Part 2]) (September 2, 2003): 455–459; J.-M. Robine and J.-P. Michel, "Looking Forward to a General Theory on Population Aging," *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences* 59 (2004): M590–M597.

a part of our decision making as self-directed individuals.

Besides begging the question of more quantity versus better quality of life in the oldest ages, this new frontier will also intensify debate over the meaning of life, forms of death and dying, and the impact that investing scarce resources in increasing life span will have on other sectors of society. Though these are beyond the scope of this essay, it is important to discuss at least the last issue briefly in order to place human aging in a larger societal and global context. Too often aging researchers and policy analysts overlook the implications of individual and population aging for the distribution of resources.

For instance, to what degree does the growing investment into extending and supporting the lives of the elderly limit the resources available for improving the lives of children and youth, or for reducing the gap between the rich and the poor? Also, are we hampering global progress by allocating an increasingly larger share of our resources to keeping the oldest in our own industrialized country alive rather than helping developing countries? For a gerontologist, these are questions that do not win the approval of most of his peers. However, I believe these are the kinds of questions that will increasingly shape scientific and public discourse about individual and population aging in the twenty-first century.

Countries such as Germany – where increasing longevity and low fertility rates will result in a disproportionately older population within the next fifty years – must also consider the effect of population aging on their national productivity and global competitiveness. Such societies are likely to experience a reduction in their potential for innovation, as the average age of workers grows

from about 45 to 55. Experimental aging research on cognitive plasticity clearly demonstrates the considerable negative and rather immutable effects of age on the speed and accuracy of information processing and the potential to learn new skills and knowledge, especially at high levels of expertise. Also, the older we get, the more the body calls on cognitive resources – for instance, when keeping one's balance or thinking while walking on uneven terrain.<sup>21</sup> This 'mortgaging of the mind' by the body leaves less of our mind available for mental activities of the usual kind.

We humans are inherently curious and committed to living long and well, if not for eternity. Yet, even as *homo faber*<sup>22</sup> allows us to grow older and older, we must consider the scientific evidence that indicates a developmental limit to human life in the oldest ages and accept that "less may be more."

Hesiod is said to have expressed a similar thought: "If one chooses the right half, half may be more than the whole."

21 U. Lindenberger, M. Marsiske, and P. B. Baltes, "Memorizing While Walking: Increase in Dual-Task Costs from Young Adulthood to Old Age," *Psychology and Aging* 15 (3) (September 2000): 417 – 436.

22 J. Mittelstraß, "Science and Culture," *European Review* 4 (1996): 293 – 300.