Biogerontology and the Intellectual Virtues

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The case for prioritizing the study of the biology of aging can be persuasively made by making explicit its connection to the exercise of the intellectual virtues needed to realize well-ordered science. These intellectual virtues include a range of attitudes and dispositions integral to all areas of science (e.g., sensitivity to details, adaptability of intellect, the detective’s virtues), but the so-called “teaching virtues” are especially important for biogerontology. Without the foresight to anticipate how their audience will likely respond, biogerontologists risk marginalizing the field’s importance to well-ordered science as the general public are likely to dismiss, or underestimate, the health and economic benefits of an intervention that retards the rate of biological aging.

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The pursuit of science in a society is well ordered when the research effort is efficiently directed toward the questions that are most significant (1). But determining which questions are the most significant questions to study today is not easy nor is it self-evident. Most research and funding in the medical sciences are invested in answering the general question—“what causes pathology?” However, this disease-specific approach to promoting human health may not be the most efficient way to promote the health prospects of today’s aging populations. Despite large public investments, which in the United States total billions of dollars each year, in cancer research, research on stroke and heart disease, Alzheimer’s disease, etc., no single chronic disease of aging has been eliminated nor does it seem likely that any will be eliminated in the foreseeable future.

Biogerontologists who study the biology of aging believe that one of the most significant questions to study is—“why are old cells more vulnerable to disease than are young cells?” (2). A better understanding of aging itself might lead to the development of novel interventions that modulate the rate of aging, thus delaying (and possibly compressing) many of the afflictions and diseases of late life. But the applied or clinical significance of a novel aging intervention is not intuitive. And this means that research on the biology of aging runs the risk of being perceived, by the general public, funding agencies, and policy makers, as a mere intellectual curiosity rather than as an important applied science that is constitutive of well-ordered science.

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This means that the teaching virtues are especially important for biogerontology and the realization of well-ordered science in today’s aging societies. In this Perspective article, I expand upon the link between the study of the biology of aging and the exercise of intellectual virtue, in the hopes of making a compelling case for the conjecture that the biology of aging is a constitutive element of well-ordered science.

The Intellectual Virtues

A partial list of the intellectual virtues include the following—the ability to recognize the salient facts; sensitivity to details; open-mindedness in collecting and appraising evidence; intellectual humility; intellectual perseverance, diligence, care and thoroughness; adaptability of intellect; the detective’s virtues: thinking of coherent explanations of the facts; and the teaching virtues: the social virtues of being communicative, including intellectual candor and knowing your audience and how they respond (3).

Each of these virtues come into play in the field of biogerontology. For example, researchers who study the biology of aging recognize the complex array of factors (e.g., the force of natural selection, oxidation, telomere shortening, and other types of DNA damage, etc.) at play in the aging process. And research in comparative biology (4) cultivates a sensitivity to details, as different species, from short-lived
species like yeast and fruit flies to long-lived mammals like the naked mole-rat (5) and bowhead whale, experience life at different time scales.

Understanding a complex process like aging also requires perseverance, diligence, and thoroughness. Environmental factors like diet (eg, caloric restriction) as well as genetics can influence life span and aging. Experimental gerontologists who study how the rate of aging can be modulated by different kinds of interventions must thus be patient (aging takes time!) and must have an adaptive intellect. Interventions that appear to modulate aging in one kind of species (6) may not easily translate into safe and effective interventions that modulate aging in more complex species (like humans) (7,8).

Biomedical gerontologists must thus have an open mind about the forms of interventions that may prove to be the most safe and effective in terms of retarding human aging. These interventions might include lifestyle (eg, exercise or diet), the development of nutriceuticals that mimic the effects of caloric restriction, or new drugs that activate the “longevity genes” or modulate telomere biology, etc. Biogerontology also requires the exercise of the “detective’s virtues”—if we can solve the mystery of why some, rare, individuals can live over a hundred years of disease-free life, we may be able to expand the health opportunities of the 2 billion people worldwide who are expected to be over age 60 by the middle of this century. So the imperative to solve the mystery of aging, and develop interventions that delay the onset of chronic disease, is among the most pressing challenges facing humanity today.

The Importance of the Teaching Virtues

In order for biogerontology to achieve its rightful prominent place among the fields of inquiry considered constitutive of well-ordered science great attention must be given to the teaching virtues. Consider, for instance, the social virtue of being communicative. Researchers working on specific diseases can easily communicate to the general public what the value and importance of research on the genetics of cancer, for example, is. Such research might help lead to an intervention that treats, perhaps even cures, cancer. But how does a researcher communicate the significance of sequencing the genome of long-lived animals, studying the effects of caloric restriction in mice and monkeys, or expanding the life span of fruit flies by delaying the age of reproduction? The rationale for funding and supporting such research is not immediately self-evident. And thus, scientists working on aging must give great care and attention to how they communicate the significance of their research to the general public. For example, by highlighting the fact that humans share many of their genes with the fruit flies, monkeys, and the other species in aging experiments.

What is the goal of biogerontology? What do we hope a better understanding of the biological processes of aging will, eventually, lead to? Much care and attention must be given to these questions so that the general public does not mistakenly presume the goal is to extend the life span itself, which might be interpreted as keeping people alive longer in a frail and diseased state. This can lead to what Richard Miller calls “gerontologiphobia,”—the irrational fear that aging research is a public menace bound to produce a world filled with nonproductive, chronically disabled, unhappy senior citizens consuming more resources than they produce (9).

The goal of biogerontology is to increase the healthspan, not life span, of human beings. The aging “ideal” can thus be defined as follows: “to retard the rate of molecular and cellular decline that humans experience in adulthood so that adults can remain as healthy and vigorous as possible.”

Because of the challenges that biogerontologists face with respect to the teaching virtues, many might prefer not to promote their scientific findings in the media for fear of headlines reading “Would You Want to Live Forever?”. The media wants a sensationalist headline or sound bite, and thus, scientists working on the biology of aging will no doubt be apprehensive about promoting their findings for fear of having their work exploited for such purposes. But the realization of well-ordered science requires the social virtues be exercised. Without public exposure and public debate, biogerontology risks remaining a marginalized, and marginally funded, area of scientific inquiry.

The teaching virtues instruct one to know their audience and to anticipate how they will react. As such fostering and inculcating these virtues can help scientists bridge the gap between the research they need to conduct in the laboratory and their ability to successfully campaign to funding bodies and governments for greater support and funding. These audiences are moved by appeals to the human and economic tolls of disease, for example. The National Cancer Institute estimates that the projected cost of cancer in the United States in 2020 will be $158 billion (in 2010 dollars) (10). The primary cause of this staggering figure of the costs of cancer is the aging of the American population. Thus, it is imperative that the direct link between aging and disease (not only cancer but also heart disease, stroke, arthritis, Alzheimer’s disease, etc.) be emphasized.

Conclusions

Biogerontology will rise in prominence among the fields of scientific research when the health and economic dividends of a potential aging intervention are effectively communicated to policy makers and the general public. The advocates of the Longevity Dividend, for example, provide an exemplar example of this communication effort by setting a realistic target (eg, slowing aging by just seven years) and arguing that this would yield a health and economic dividend larger than a cure for cancer (11). The latter is estimated to only increase life expectancy at birth by approximately 3 years (12). The increase is more modest than most people expect because the majority of people who would have died of cancer
(ie, those over age 60) are also highly susceptible to one of the other diseases of aging. So one of these afflictions would soon fill the gap created by eliminating cancer as a cause of death. However, a reduction of aging by just 7 years is estimated to reduce the age-specific risk of death, frailty, and disability by approximately half at every age (11). This benefit is significantly larger than the health dividend a cure for all 200+ types of cancer could yield. To realize well-ordered science in an aging world, the benefits of modulating the biological clocks we have inherited from our Darwinian history must be explicitly highlighted and contrasted with the proposed benefits of eliminating any one specific disease of aging as the cause of death for aging populations.

References