

## Biological Aging Theories - A One-Page Summary

Aging theories are critical to medical research because the majority of all deaths in developed countries are caused by highly age-related diseases like cancer, stroke, and heart disease, and understanding aging is therefore essential to understanding and devising ways to treat or prevent these diseases. Aging is a difficult subject for experimental investigation so theorists have produced *evolutionary* theories of aging that attempt to explain *why* human aging exists from an evolutionary viewpoint. We are all familiar with Darwin's natural selection or survival-of-the-fittest idea that explains why different species have their particular designs. There are now *three* different versions of that theory that differ regarding the way the evolution process relates to aging.

Darwin's 1859 idea was that the evolution process *opposes* aging because aging decreases an organism's ability to survive and reproduce. This logically leads to the idea that aging is the result of *fundamental limitations* such as the many laws of physics or chemistry that cannot be overcome by the evolution process. Because it fits with Darwin's theory as generally understood, this idea is still popular with the science-oriented general public.

In the 1950s theorists led by P. Medawar and G. Williams suggested that the evolution process was *neutral* regarding aging. In effect, survival of the fittest only applies to young organisms and nature does not care what happens to old individuals. Consequently, species did not evolve and retain the capability for living longer than a species-specific age. The definition of "old" was very dependent on characteristics of individual species such as age of reproductive maturity. This idea provided a much better fit to the huge variety of species lifespans observed in nature and is favored by a majority of current medical researchers.

Beginning in the 1980s multiple theorists suggested that the evolution process *promoted* the development of biological mechanisms like aging that *purposely limited lifespans* of "old" organisms. These theories are based on the idea that a purposely limited lifespan has *long-term population benefits* such as helping avoid species extinction even though such a limitation was neutral or somewhat adverse from an *individual's* viewpoint. This led to modern *programmed aging theories* in which aging is the manifestation of a biological program or suicide mechanism. Unlike the two earlier concepts, programmed aging suggests the possibility of finding *anti-aging agents* that interfere with the aging program and *generally delay aging*. Observational and experimental evidence is rapidly accumulating suggesting programmed aging is the correct theory. Substantially funded searches for anti-aging agents and protocols are now underway by organizations such as the [NIH/NIA Interventions Testing Program](#) and [Google Calico Aging Research Company](#).

More at: [Aging Info](#) and [Programmed-Aging.org](#).

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