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Death

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Death as an Evolutionary Strategy

One of the most fascinating questions about aging and death is this: how can something that is so obviously detrimental to an individual organism have evolved in almost all the species we know of? Evolution is supposed to favor those traits which benefit a species and eliminate those which are deeply harmful. Death, insofar as it is programmed into an organism's lifecycle, seems to be the most harmful trait one could possibly possess. Here I will discuss what Klarsfeld and Revah have to say about the evolution of death and why the vast majority of species seem to have encoded in their genes a process of decay and eventual destruction.

An attractive theory is that death of individuals benefits the species as a whole. This was the theory proposed by Weismann. He postulated that the utility of death was that it eliminated less useful individuals from the species. (14) Imagine a herd of sheep – as any given sheep gets older, it will "suffer wounds and injuries that progressively reduce their capacities…" (15) This will reduce its reproductive efficiency. Thus, programmed death removes the old sheep from the herd so that the limited supply of resources is redirected to sheep with a better chance of reproducing.

Klarsfeld and Revah accuse Weismann of circularity. (15) His theory, they say, assumes what it sets out to explain. Older individuals die because they are damaged and less reproductively efficient. But what is "oldness" but this very lack of health? Thus in the end, they say, Weismann's argument amounts to: "aged organisms die because they are aged." However,

this criticism is not accurate, or at least not based upon Klarsfeld and Revah's own presentation of Weismann's theory. According to their version of Weismann's theory, organisms who have lived longer are *not* weaker because of some inborn genetic process, but rather because of outside damage sustained due to an inherently dangerous environment. They even say that "even animals that are potentially immortal" (14-15) will sustain this damage. Therefore Weismann does not actually assume genetically programmed aging, but merely the fact that the longer an organism exists the more worn it will become. A better criticism might be one that points out that death exists even in solitary animals, whose species will not be benefited by their being removed from the competition for resources.

Regardless of what reasons we choose to accept, Klarsfeld and Revah dismiss this theory as implausible and look to a different one to explain the evolution of death. This one too is Weismann's, and it postulates that rather than being beneficial, death is merely *not harmful enough* to be eliminated by natural selection. Once an organism has reproduced, it becomes superfluous, unnecessary to the evolutionary cycle and the preservation of its genes. Therefore, the function of longevity becomes useless at this point. "The selective value of this function… becomes zero." (76) The theory amounts to this: "Once immortality has become useless, it is doomed…" (78)

How would such a mutation spread throughout a population? Remember that mutations occur all the time and completely at random. Even if there were a species that did not age (and was thus potentially immortal), a single mutation that reduced longevity would spread like wildfire. According to Klarsfeld and Revah this is because natural selection will only eliminate a reduction in longevity that prevents organisms from reproducing. (78-9) As long as they live long enough to reproduce, they can spread their shorter-lived genes throughout the population.

Because “the procreative weight of the ‘old’ individuals decreases with their numbers,” (78) (and these numbers will inevitably decrease as random environmental factors kill off those who have lived longer) genetic code that promotes longevity beyond prime reproductive age will be represented in much smaller proportion with each successive generation. Eventually, all members of the species will become programmed to age and die after they have reproduced, not because this is beneficial – but because it simply doesn’t matter in evolutionary terms.

Works Cited

Klarsfeld, André, and Frédéric Revah. *The Biology of Death: Origins of Mortality*. Ithaca: Comstock Pub. Associtates, 2004. Print.