

## From Aquatic Biology to Weismannism: Science versus Ideology

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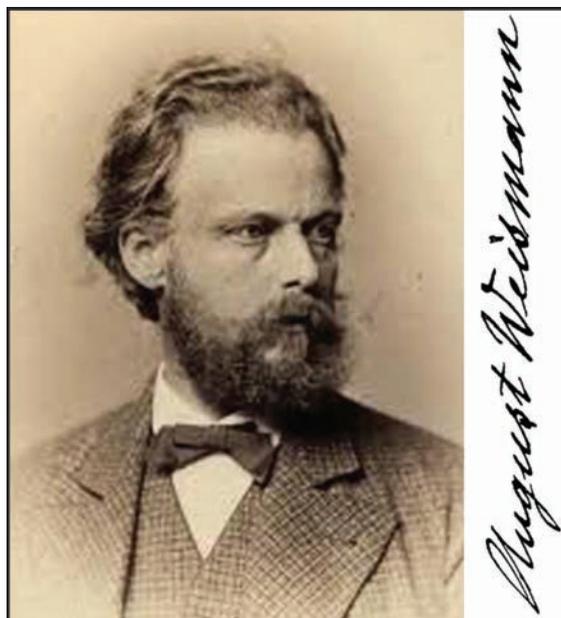
### Abstract

The German zoologist August Weismann (1834 – 1914) is well known as the founder of the Neo-Darwinian theory of biological evolution, the concept of the continuity of the germ line, and, with respect to aging, the idea of a cell division limit. However, the experimentalist and theorist started his career with publications on the salt content of sea water and the biology of aquatic invertebrates, such as daphnids. Accordingly, he is regarded by historians of science as one of the “fathers of Limnology”. In this article, which marks the 100th anniversary of Weismann’s death (Nov. 5, 1914), I summarize his open-minded way of thinking. Then, I describe two recent examples of anti-scientific (dogmatic) views that were uncritically discussed in a leading journal (i.e., the ideology of “Darwinian feminism”).

August Weismann (1834–1914) was one of the most influential experimental biologists and theorists of the 19th century (Figure 1). Although he is best known today as the founder of the Neo-Darwinian theory of biological evolution (Weismannism) [1], the refutation of Lamarck’s idea of an “inheritance of acquired characteristics”, the concept of the mortal soma versus the potentially immortal germ line, the role of sexual reproduction with respect to the generation of variability, and the hypothesis of a “cell division limit” [2,3], his work is also relevant for marine scientists and limnologists. During his long career as a Professor at the University of Freiburg i. Br., Germany, Weismann repeatedly corrected his theories to accommodate new facts and data. Hence, he was an open-minded, non-dogmatic thinker, as well as a philosopher of science.

Weismann’s earliest papers dealt with chemical analyses of the salt content of sea water [4], and in numerous subsequent articles/monographs he studied aquatic life with a focus on developmental biology of crustaceans, such as daphnids [5]. In recognition of his outstanding contributions to aquatic biology he was invited to write the introductory Essay-1908 to the then newly established journal *Internationale Revue der Gesamten Hydrobiologie* [6]. This periodical still exists today under the title *International Review of Hydrobiology – Aquatic ecosystems: freshwater and marine environments and their management*. Accordingly, Weismann is regarded by historians of biology as one of the founders of Limnology. In this *Editorial*, which marks the 100th anniversary of Weismann’s death (November 5, 2014), I will focus on his unique way of carrying out research and interpret some conclusions of this eminent biologist in the light of recent scientific discussions.

In a book devoted to the work of Weismann entitled *Against Dogma*, the major conclusions of the German biologist were summarized in the following words: “As Natural Selection accounts for all the effects previously attributed by Lamarck to use and disuse, or the inheritance of acquired qualities, it only needed Weismann’s later verification of ‘The continuity of the germ-plasm’ to give the final blow to the Lamarckian theory which science has now discarded” [7]. With respect to the theory of germ-plasm, Weismann’s conclusions have been summarized as follows: “A small portion of the ... germ, the germ-plasm, remains unchanged during the development ... germ-plasm serves a foundation from which the germ cells ... are produced”. Weismann’s theory of Life and Death can be reduced to the following statement: “Natural death occurs only among multicellular beings; not among unicellular organisms”. Finally, the author of this classical book on *Weismannism* stated that “Science, unlike Dogma, is quite ready to renounce her most highly-prized convictions so soon as facts disprove



**Figure 1:** The German Zoologist and evolutionary biologist August Weismann (1834–1914) was, together with Alfred Russel Wallace (1823–1913), the founder of the Neo-Darwinian theory of biological evolution. Throughout his long career as an independent, creative thinker he modified his theories to accommodate newly discovered facts.

them ... Weismann’s theory is based on these facts” [7].

Two recent publications in *Nature* document that, 100 years after Weismann’s death, dogmatic (non-scientific) views are still well and alive. In accordance with Darwin’s 1859 conclusion that “all animals

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and plants have descended from someone prototype”, Weismann argued that “Life is continuous ... ever since its first appearance on earth, in the lowest organisms, it has continued without break; every individual alive today is to be derived in an unbroken line from the first and lowest forms” [2,7]. However, neither Darwin, in all six editions of his *Origin of Species*, nor Weismann claimed that this last universal common ancestor was an animal-like hermaphrodite, equipped with both male and female gonads.

Based on this erroneous premise, the ideology of “Darwinian feminism” has been deduced. For instance, in Kimberly Hamlin’s book *From Eve to Evolution* (Chicago, 2014) it is argued that our “hermaphroditic past ... opened up a new world of gendered possibilities”. The journal *Nature* published a positive review of this book, without any criticism of the alleged “hermaphroditic ancestor” of all forms of life [8]. In the 6<sup>th</sup> and definitive edition of the *Origin*, published in 1872, Darwin proposed that from a “low and intermediate form” between the “animal and vegetable kingdoms” ... “both animals and plants may have been developed”. This hypothetical Darwinian primordial form, or common ancestor, was meant to be a “lower algae” capable of growing both in the presence or absence of light, such as the eukaryotic protist *Euglena*. It is obvious that this Darwinian “proto-algae-hypothesis” is not correct (the earliest form of life were prokaryotic microbes) [3]. However, it should be noted that in the book *The Descent of Man* (1871) Darwin wrote that “Some remote progenitor of the whole vertebrate kingdom appears to have been hermaphroditic or androgynous”. Again, there is no evidence in support of this Darwinian speculation [3].

In another book review published in *Nature* dealing with David Wolpert’s *Why Can’t a Women Be More Like a Man?* (New York, 2014), Virginia Valian argued that nurture is more important than nature when it comes to explaining gender differences in human behaviour. She concludes that “What keeps the sexes from being more alike has more to do with social structure and beliefs about gender differences than with bare biology” [9]. In this popular “(Darwinian) feminist” view, the differential costs of sexual reproduction, a process that creates variable offspring for natural selection to act upon, as proposed originally by August Weismann [2], is ignored. The German biologist interpreted reproductive strategies of males vs. females from an “evolutionary point of view”, with reference to his concept of a “potential immortal germ-line” [10].

Weismann recognized that, in non-civilized men, the cost of reproduction, via spermatogenesis and insemination, is small, whereas for the egg-producing sex (i.e., woman) it is high [2]. However, after pregnancy, assisted birth and lactation, mothers with children depend on, and accept, the help of others, whereas men, who never experience the strong, emphatic baby-bonding of breast-feeding woman, largely remain outsiders of these intimate relationships. In mammals, male involvement in parenting is rare. This may be explained by the fact

that internal fertilization ensures maternity, but it does not guarantee male reproductive success (paternity) [11]. More recent research has shown that, due to the high germ-line mutation rate in men, sperm-producers function primarily as “generators of variability” within human populations, as detailed in the well-supported theory of “male-driven evolution”. Caring mothers, on the other hand, fulfill all the key roles necessary for growth and survival of the next generation. Hence, typical masculine behaviours, such as non-cooperative self-reliance, the tendency to take over risky, challenging jobs, or the drive to devote one’s life to hard, creative work, may be attributable to the sub-ordinate role of males in sexual reproduction, rather than to social factors, as suggested by Valian [9].

These and other examples [12] document that, one century after Weismann’s death, dogmatic, non-scientific views are still discussed and taken seriously in the scientific literature. In this context, the term “Darwinian feminism” has been used, which is, like “creation science”, an oxymoron. As a private person, Charles Darwin was a conservative member of the Victorian society. It was natural selection’s co-discoverer, the socialist/free-thinker Alfred Russel Wallace [1], and not Darwin, who championed woman’s rights, at a time when female members of the British society were still regarded as second-class citizens [8].

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