

W

William Donald Hamilton



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Synonyms

[W.D. Hamilton](#)

Definition

William Donald Hamilton (1936–2000) was a British evolutionary biologist famous for his work explaining social behavior through the framework of evolution by natural selection.

William Donald Hamilton (1936–2000), commonly referred to as W.D. Hamilton, was a British evolutionary biologist famous for his work explaining social behavior through the framework of evolution by natural selection. He is widely recognized as one of the most distinguished evolutionary theorists since Charles Darwin (Dawkins, 2000; Trivers, 2000). William Donald Hamilton was born on August 1, 1936 in Cairo, Egypt, to Archibald Milne Hamilton, an engineer, and B.M. Hamilton, a medical doctor (“W.-D. Hamilton,” 2020). As a child, he was interested in natural history and was introduced to the principles of evolution by natural selection and genetics by E.B. Ford’s *Butterflies* (1945) which would

serve as inspiration for his later work (“W.-D. Hamilton,” 2020). He went to Tonbridge School in Kent, England, before attending University of Cambridge for his undergraduate education (Dawkins, 2000). Hamilton was jointly enrolled at University College London and London School of Economics as a doctoral student (Dawkins, 2000). He married Christine Freiss in 1966 and they had three daughters before amicably separating 26 years later (“W.-D. Hamilton,” 2020).

W.D. Hamilton presented his mathematical model for inclusive fitness when he was still a doctoral student in 1964 in two citation classic papers (Dawkins, 2000). He published the papers entitled “The Genetical Evolution of Social Behaviors I” and “The Genetical Evolution of Social Behaviors II” in the *Journal of Theoretical Biology*, presenting the concept now known as Hamilton’s rule (Hamilton, 1964a; 1964b). Hamilton’s rule posits that a gene for altruistic behavior will propagate if it satisfies an inequality. The inequality is $rB > C$, where r is the relatedness between the actor and recipient, B is the benefit to the recipient, and C is the cost to the actor. If the cost to the individual performing the altruistic act is less than the additional reproductive benefit to the recipient of the altruistic act multiplied by the genetic relatedness of the recipient and the actor, the gene for altruism will increase in frequency. Hamilton’s rule is a significant contribution to the study of altruism and

provides a mathematical basis for inclusive fitness.

Although Hamilton's rule was not globally recognized until decades after it was first published, Hamilton secured prestigious positions at Imperial College London, Harvard University, University of Michigan, and University of Oxford (Dawkins, 2000). While at Imperial College London, he published another citation classic entitled "Extraordinary Sex Ratios: A Sex-Ratio Theory for Sex Linkage and Inbreeding has New Implications in Cytogenetics and Entomology," in which he introduced the concept of an unbeatable strategy (Hamilton, 1967). Hamilton's unbeatable strategy served as inspiration for Smith and Price's concept of evolutionary stable strategy, a strategy or set of strategies that cannot be replaced by an alternative competing strategy when adopted by a population in a specific environment (Smith & Price, 1973). In collaboration with Robert Axelrod, Hamilton expanded the concept of evolutionary stable strategy to explain the evolution of cooperation among unrelated individuals as a result of reciprocity (Axelrod & Hamilton, 1981). Hamilton's work was instrumental in establishing the genetic basis of altruistic cooperation among related and unrelated individuals. His work was also foundational in advances in evolutionary perspectives of sex ratio, senescence, social insects, and dimorphic males (Trivers, 2000).

W.D. Hamilton's later work focused on parasites (Dawkins, 2000). He was an early proponent of the Red Queen hypothesis, arguing that parasites play a key role in the evolution of sexual reproduction in their hosts since sexual recombination provides a defense against rapidly and antagonistically coevolving parasites (Trivers, 2000). In collaboration with Marlene Zuk, Hamilton reported that healthier individuals of species of birds with higher loads of blood parasites have more colorful feathers and more complex song (Hamilton & Zuk, 1982). This finding demonstrates that parasite-rich environments foster preference for these traits and, therefore, that parasites play a pivotal role in mate choice and sexual selection. Hamilton was a skilled field researcher; he joined an expedition to the Democratic

Republic of the Congo in 2000 to investigate the theory that the oral polio vaccine was the origin of the HIV virus in humans (Dawkins, 2000). While in the Congo jungle, Hamilton contracted malaria and was transported to London where he died on March 7, 2000 ("W.D. Hamilton," 2020). During his lifetime, Hamilton was awarded Fellowship of the Royal Society, the Kyoto Prize, the Fyssen Prize, the Newcomb Cleveland Prize, the Linnean Medal, the Sewall Wright Award, the Wander prize, and the Crafoord Prize (Dawkins, 2000; "W.D. Hamilton," 2020).

Cross-References

- ▶ Altruism
- ▶ Cooperation
- ▶ Darwinian Puzzle
- ▶ Endoparasite
- ▶ Evolutionarily Stable Strategies
- ▶ Host
- ▶ Human Cooperation
- ▶ Inclusive Fitness
- ▶ Kin Selection
- ▶ Kinship
- ▶ Mating
- ▶ Natural Selection
- ▶ Operational Sex Ratio (OSR)
- ▶ Ormentation
- ▶ Parasitism
- ▶ Peacemaking
- ▶ Reciprocity
- ▶ Richard Dawkins
- ▶ Robert Trivers
- ▶ Senescence
- ▶ Sex Ratio
- ▶ Sexual Dimorphism
- ▶ Sexual Selection
- ▶ The Red Queen Effect

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