Haldane's Dilemma has not been solved

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The famous evolutionary geneticist J.B.S. Haldane (1892–1964) was one of the three founders of the field of study known as population genetics. In a seminal paper in 1957, Haldane outlined a serious problem for evolutionary theory—the 'cost of substitution'.[1] When a beneficial mutation occurs in a population, it has to increase in the number of copies for the population to progress evolutionarily (if the mutation remains in one individual, then evolution cannot proceed; this is fairly obvious). In other words, it has to *substitute* for the non-mutated genes in the population. But the rate at which this can happen is limited. A major factor limiting the rate of substitution is the reproduction rate of the species. For a human-like creature with a generation time of about 20 years and low reproduction rate per individual, the rate of growth in numbers of a mutation in a population will be exceedingly slow. This is basically the 'cost of substitution'.

Imagine a population of 100,000 apes, the putative progenitors of humans. Suppose that a male and a female both received a mutation so beneficial that they out-survived everyone else; all the rest of the population died out—all 99,998 of them. And then the surviving pair had enough offspring to replenish the population in one generation. And this repeated every generation (every 20 years) for 10 million years, more than the supposed time since the last common ancestor of humans and apes. That would mean that 500,000 beneficial mutations could be added to the population (i.e. 10,000,000/20). Even with this completely unrealistic scenario, which maximizes evolutionary progress, only about 0.02% of the human genome could be generated. Considering that the difference between the DNA of a human and a chimp, our supposed closest living relative, is greater than 5%,[2] evolution has an obvious problem in explaining the origin of the genetic information in a creature such as a human.

However, with more realistic rates of fitness/selection and population replenishment, the number of beneficial mutations that can be accounted for plummets. Haldane calculated that no more than 1,667 beneficial substitutions could have occurred in the supposed 10 million years since the last common ancestor of apes and humans. This is a mere one substitution per 300 generations, on average. The origin of all that makes us uniquely human has to be explained within this limit.

A substitution is a single mutational event; it can be a gene duplication or a chromosomal inversion, or a single nucleotide substitution. Biologists have found that the vast majority of substitutions are indeed single nucleotides, so Haldane's limit puts a severe constraint on what is possible with evolution, because 1,667 single nucleotide substitutions amount to less than one average-sized gene.

It should also be noted that Haldane made a number of simplifying assumptions that actually optimized the number of substitutions that would be possible. So in reality, the number of substitutions possible is much less than Haldane calculated.

Furthermore, if we accept what the paleontologists say, that the vast majority of a species' existence is spent in stasis, then the problem becomes even more acute: if 90% of the supposed 10 million years is spent in stasis, then that reduces the number to 167 substitutions.

Haldane's Dilemma was discussed a bit in the 1960s, but since then has been largely ignored in evolutionary journals. Genetics and biology texts did not, and do not, discuss the problem. In 1992, the high-profile evolutionary geneticist George C. Williams remarked that 'The time has come for renewed discussion and experimental attack on Haldane's dilemma.'[3] His plea apparently had no effect on his evolutionary colleagues. However, creationist Walter ReMine published a major work in 1993, which treated the issue in detail.[4] He has since worked on the matter, refining the argument and dealing with attempts at obfuscation by evolutionists (mainly anonymous persons on the internet).[5]

Since the publication of ReMine's book, there has been no serious dispute that Haldane's analysis (if correct) places a 1,667 limit, a severe limit, on human evolution. ReMine claims that Haldane's Dilemma has never been

Canada Goose family. The reproductive rate of a species is a major factor limiting the rate of trait substitution.

solved, but has rather been confused, garbled and prematurely brushed aside. The cause of the confusion largely has to do with misunderstanding or misconstruing the core concept, the 'cost of substitution'.

Some of the confusion could have arisen because Haldane was never very clear in his definition of what the cost was in physical terms, although he defined it mathematically. Many evolutionists have interpreted Haldane's cost of substitution in terms of death of individuals that do not have the mutation ('genetic death') and, superficially, this might seem reasonable. However, suppose competition with the mutant form causes lower birth rates for the non-mutant individuals. Then the 'genetic death cost' becomes the number of individuals who would have been born to those who do not have the mutation but were not born because of competition with the mutant form. In other words, it becomes a matter of virtual, or imaginary, deaths. It becomes an exercise in futility to try to model such a thing mathematically. On this basis, some evolutionists have dismissed Haldane's Dilemma as imaginary; as an unreal problem.

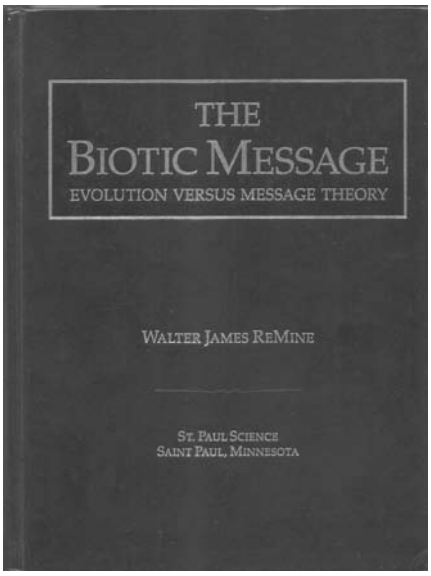
In a paper in this issue (pp. 113–125), ReMine revisits this largely ignored problem for evolutionary theory. He significantly clarifies the nature of 'Haldane's Dilemma', as it has come to be known, by removing confusion over the meaning of the cost of substitution. ReMine redefines and clarifies the cost of substitution such that no imaginary or virtual realities are involved. He puts it on a solid physical *and* theoretical footing.

ReMine originally submitted this paper to mainstream (evolutionary) science journals. The paper has been under review for nearly two and a half years and it would appear that reviewers used every conceivable rationale to reject it. For example, with one journal, two reviewers noted that ReMine's cost concept was different from the traditional view, and claimed it was wrong. After he showed they had misread the paper, and that the paper is correct and makes correct predictions, the reviewers shifted to a different reason to reject it.

With another journal, *four* reviewers (most papers are only reviewed by two other scientists) acknowledged ReMine's paper was correct, but two of them (high-profile evolutionary geneticists) rejected the paper on the grounds that they, and some of their associates, knew of the subject matter in the 1970s—in other words, they claimed the analysis was not original. However, they were unable to cite a single book or paper that contained this material. In other words, the journal had no legitimate grounds for rejecting ReMine's paper. And, just as importantly, this response implicitly acknowledged that the evolutionary workers in this field knowingly allowed confusion and errors to thrive, overwhelmingly, even to the present day.

Haldane was aware his conclusions would 'probably need drastic revision'.[1] ReMine's paper contributes to that revision. Not only does he clarify the concept of cost of substitution and show how Haldane's formulas can be rederived with the more robust concept, but he also generalizes the cost concept. He does this by eliminating the need for constant population size, small selection coefficients, etc. (higher selection coefficients actually make the problem worse for the evolutionists). ReMine also deals with various attempts by confused evolutionists to circumvent Haldane's Dilemma (e.g. that environmental change can alleviate the problem).

The take-home message, which was not spelled out in his paper because it was written to be submitted to mainstream (evolutionary) journals, is: the evolutionary origin of organisms with low reproduction rates and long generation times (many 'higher' animals) is impossible, even given the usual millions of years assigned to the history of species on Earth.



Walter ReMine's book The Biotic Message*, published in 1993, deals with Haldane's Dilemma.*

AGTCGTACC→AGTCATACC

Substitution

A single nucleotide substitution, where a mutation causes the nucleotide G to be replaced with nucleotide A. Although gene duplications or chromosomal inversions can also result in much larger 'substitutions', the vast majority of substitutions involve only single nucleotides.

References

1. Haldane, J.B.S., The cost of natural selection, *J. Genetics* **55**:511–524, 1957.
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3. Williams, G.C., *Natural Selection: Domains, Levels, and Challenges*, Oxford University Press, NY, pp. 143–144, 1992.
4. ReMine, W.J., *The Biotic Message,* St Paul Science, St Paul, MN, 1993.
5. See Haldane's Dilemma webpage by Walter ReMine, <www1.minn.net/~science/Haldane.htm>, 23 February 2005.