

Re: The "fuel" of evolution

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Catherine Woodgold wrote:

> *"EKurtz" (NoJunk@ForgetIt.com) writes:*

>

>> *Consider the case of a sexual species into which a parthenogenic female is*

>> *introduced by mutation. Assuming that she and her immediate offspring*

>> *survive, and that the population size is constant, her offspring will*

>> *effectively displace the sexual type in a few dozen generations.*

>

>

> *Even if the parthenogenetic individuals average only 1.5*

> *fertile offspring each, they will tend to take over the whole*

> *population. The sexual ones could be declining while*

> *averaging 1.8 offspring each, while the parthenogenetic ones*

> *grow exponentially at 1.5 offspring each.*

Exactly. The effect of the displacement of one type by the other will be compounded as the number of males declines, since males will presumably not be able to distinguish sexual from non-sexual females, and thus will mate unproductively with the non-sexual type more and more as the proportion of the sexual type dwindles.

Unless of course the mutation that causes parthenogenesis simultaneously causes the affected females to reject males. This seems unlikely. In one case the females actually mate with each other!

[animaldiversity.ummz.umich.edu/accounts/cnemidophorus/c._sonorae\\$narrative.html](http://animaldiversity.ummz.umich.edu/accounts/cnemidophorus/c._sonorae$narrative.html)

"*Cnemidophorus sonorae* [the sonoran spotted whiptail lizard] is a unisexual, all-female species that breeds by parthenogenesis (Goldberg et al. 1997, Routman and Hulse 1984, Porter et al. 1994). Ovulation is often stimulated by "pseudocourtship" among the females; the unfertilized eggs develop into hatchlings that are genetically identical to their mothers."

> *So number of*

> *fertile offspring is not a very useful definition of "fitness".*

I would suggest that the correct term to describe it is "useless".

The "number of fertile offspring" also fails in the case of a species that contains one type of female that produces a large number of weak but fertile offspring and another than produces a small number of strong and fertile offspring. A sufficiently large proportion of the strong type could survive and ultimately displace the "fitter" weak type.

It fails also in the case where the "fitter" type produces, say, 8 offspring every year and the "less fit" type produces 6 offspring every 6 months.

The success or failure of a genetic alteration, such as a mutation, is a consequence, not of a unary measure of fitness, but of the entire situation of the organism in which the alteration takes place. This includes not only the effect of the environment on the organism, but the organism's effect on its environment (which is usually neglected in discussions of fitness). It is also a function of time, as the example of parthenogenesis shows, since initially adaptive changes can later become fatally maladaptive.

- > *I hypothesize that sexual species alive today have characteristics*
- > *that make it difficult for parthenogenesis to occur, as a result*
- > *of billions of years of evolution in which species after species*
- > *was taken over by parthenogenesis and then succumbed to*
- > *changes in the environment better handled by sexual species.*

Indeed. Sexuality survives by default. Could this be the explanation of all the extinctions we see in the fossil record?

- > *It would not be an elaborate mechanism to prevent parthenogenesis;*
- > *that could easily be mutated away. It would have to be a more*
- > *subtle near-inability to mutate to parthenogenesis -- for example,*
- > *a chemical in sperm without which eggs cannot begin dividing,*
- > *not simply because the eggs respond to a "signal" -- the instruction*
- > *to wait for a signal could mutate away -- but because the chemical*
- > *is absolutely essential to cell division and the genome does*
- > *not specify the manufacture of this chemical in eggs.*
- > *Or something like that. Something that makes the sudden*
- > *appearance of parthenogenesis almost as unlikely as the*
- > *appearance of eyes in sightless species.*
- >
- > *Sometimes an inability is an asset, as Pinker*
- > *explains in "How the Mind Works."*

One of Pinker's assets is the confidence to produce a work of that name when he in fact has no idea "How the Mind Works", and neither does anyone else.

- > --
- > *Cathy*
- >