

# Re: Digital Genetics and Evolution Theory

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- *From:* Bioteach <bioteach48@xxxxxxxx>
  - *Date:* Wed, 14 Feb 2007 13:49:12 -0500 (EST)
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Tim Tyler <seemysig@xxxxxxxxxxxxxxxx> wrote in  
[news:eggfs8\\$dql\\$1@xxxxxxxxxxxxxxxxxxxxxx](news:eggfs8$dql$1@xxxxxxxxxxxxxxxxxxxxxx):

Bioteach wrote:

Perplexed wrote:

The idea that senescence and death exist in sexual organisms for the \*purpose\* of allowing the variant young to compete among themselves (without the older generation siphoning off all of the resources) is hardly an original one. I've seen enough modeling to convince me that this may be part of the story, but it is not the full story. The other part is the sheer difficulty of keeping large complex organisms from simply wearing out. Some plants (trees, mostly) are designed so that new generations of tissue can make productive use of the older, worn-out generations of tissue. Animals (and especially animal central nervous systems) just can't work that way.

Although everybody recognizes that there is wear or other unreparable damage that could accumulate in an organism, it seems to be pretty clear that wear cannot be the main explanation for observed life span characteristics. This is because very similar organisms with very similar cell biology have grossly different life spans. (e.g. mouse and human, crow and parrot, many other examples)

## Re: Digital Genetics and Evolution Theory

The idea is that lifespan characteristics can be explained primarily by selection on repair and maintenance mechanisms.

Relatively short-lived creatures allocate more resources to short-term reproduction at the expense of repair and maintenance mechanisms. Those that live longer allocate more resources to repair and maintenance – perhaps because growth is resource limited, because they have a more plastic developmental process, or because they provide more parental care.

There are also organisms possessing biological suicide mechanisms that clearly are not accumulative (e.g. bamboo, octopus).

Can you be more specific? There are plenty of causes of death that are not cumulative – but they need not be suicidal.

Bamboo evidently reproduce by essentially cloning, like grass. Occasionally they flower and seed. When they flower, they die. Death is programmed to accompany blooming and clearly not a maintenance issue. Programmed death is apparently to prevent cloning from dominating sexual reproduction.

Octopi females stop eating after reproduction and die of self starvation. Some Polish biologist whose name I do not remember determined that surgically removing the eyes eliminates this behavior. No obvious way to make this into a maintenance issue.

Salmon die of old age after mating.

Also, suicide is actually /expected/ in some plants – where the parents live near the offspring, compete for resources with them, or act as a parasite reservoir that could infect them.

In such cases, individual death can be adaptively favoured by kin selection.

Finally, there are organisms that do not have any measurable aging (e.g. Pacific rockfish) even at 150 years old when similar organisms

## Re: Digital Genetics and Evolution Theory

have much shorter life spans.

I am not sure how negligible senescence bears on the issues of group selection or adaptive death. An organism with negligible senescence simply has good repair and maintenance mechanisms.

Indeed, one might ask, if senescence is supposedly adaptively favoured, why these organisms do not exhibit it.

Yes the very few organisms that do not appear to age could have really good repair mechanisms (maintenance, Darwinian, aging is not a benefit view) or could have lost their ability to age (aging is an evolved beneficial feature, group selection view). The existence of negligible senescence doesn't prove anything one way or another, except that SOME organisms have apparently escaped aging and that it is therefore possible.

I think there are bigger problems with the maintenance theories:

If an organism can build itself from essentially nothing, how come repair is such a problem? Replacing a cell shouldn't be very much different from growing it in the first place. Many cells, (skin, blood) are replaced often.

Why do things like exercise and other forms of stress seem to extend life span if maintenance is the issue? This seems the opposite of what one would expect.

The currently most respected "main line" aging theories ignore group selection, adhere to Darwinian theory, and propose that aging is an unavoidable adverse side-effect of some beneficial function. If you assume the beneficial function is reproduction related, this then fits better with the observations than wear. However, the book describes what appear to be several major logical flaws in the main line theories.

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FROM Tyler:

## Re: Digital Genetics and Evolution Theory

The idea that variation-producing characteristics were able to evolve despite fitness disadvantage because they convey an improvement in the capacity for evolution – is widely regarded as not the correct explanation.

In fact there are other, more direct short-term fitness advantages to diversity-producing traits – such as sexual recombination.

That this is the case can be seen by consideration of organisms that exhibit facultative parthenogenesis. These organisms can clone themselves – but often choose not to do so.

Similarly, the idea that variation considered as an evolved design feature is itself incompatible with Darwinian evolution is equally incorrect :-(

In fact, clones are often regarded unfavourably by natural selection – primarily since groups of genetically identical organisms can easily be exploited by pathogens.

There are other defenses against pathogens besides adaptations that promote diversity: immune systems, being rare, and very rapid dispersal, with no parental care.

Immune systems allow some of the advantages of cloning without using diversity as a defense. However the strategy is typically only effective in the short term.

Diversity is a simple and reasonably effective defense against pathogens – it is not surprising to find adaptations that promote it.

This is an argument for how one of the discrepancies (variation producing features) might be resolved without violating orthodox Darwinism and embracing some form of group selection. It seems somewhat implausible that sexual reproduction and all the other complexity evolved just for this one function, but possible. (Wouldn't there have been an easier way?)

## Re: Digital Genetics and Evolution Theory

It is not the hypothesis that parasites are /solely/ responsible for the origin and maintenance of sexual recombination. There is at least one other important theory of the origin and maintenance of sex: the gene repair theory. Sex weeds out deleterious mutations by concentrating them in single bodies, and which then die or fail to reproduce. However, pressure from parasites is an important reason for the continued existence of sexuality – and explains much of its ecological variation.

Sex may seem like a bizarre anti-parasite adaptation, but the answer to the question of whether there was an easier way appears to be 'no'.

Life /may/ find other ways of coping with parasites in the future. It may generate diversity by other means than sexual recombination, and it may combat pathogens directly, with medical technology, and a global immune system. If these approaches to eliminating pathogens are successful, a question mark may appear over the utility of sexual reproduction in nature.

However, so far human attempts at pathogen control have been pretty feeble. Viruses and worms cause billions of dollars of loss in artificial ecosystems created by humans – in computer networks. Modern computer systems couldn't be more insecure if the NSA had designed them itself.

If human beings are really /this/ incompetent or indifferent to pathogens, perhaps there is little hope of progress in combating them.

Still, I attribute the current screw-up to copyright law – which has created a near monopoly one area. The monopolist has proved themselves either incompetent or failing to have the best interests of the people at heart – resulting in the current pathogen problem.

IMO, there are signs that this type of management screw-up will have a limited lifespan under the current political system – too many voters want their MP3s decriminalised, and – according to current political thought – their wishes outweigh those of the mega corporations, who want to continue to screw them out of their dollars.

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Those who do not believe in group selection think that the individual benefits of sexual reproduction (e.g. pathogen resistance) outweigh the seemingly major individual disadvantages allowing the major complexities of sexual reproduction to evolve. Those who do believe in group selection think that the major group benefits (essentially enabling the evolution process in complex organisms) outweigh the individual disadvantages. There is no way that either side can prove their case to the satisfaction of the other.

My limited experience suggests that once formed, beliefs about group selection are very deeply held. Someone is about as likely to change their beliefs about group selection as they are likely to change their religious beliefs.