Re: Is there any reason for the evolution to be one way

Source: http://sci.tech−archive.net/Archive/sci.bio.evolution/2007−03/msg00158.html

- *From*: "Shaktyai" <Fabrice.Allais@xxxxxxxxx>
- *Date*: Tue, 27 Mar 2007 12:24:43 −0500 (EST)

On Mar 27, 7:01 am, "Perplexed in Peoria" <jimmene...@xxxxxxxxxxxxx>
wrote:

> "Shaktyai" <Fabrice.All...@xxxxxxxxx> wrote in
> messagenews:eu7l0b$1rlj$1@xxxxxxxxxxxxxxxxxxxxxxx
>
> > Random walk with p=q=0.5 have a zero mean deviation: ie no evolution.
> > That goes for a model where a mutation of a gene is modeled in a 1D
> > space. One step on the right or one step for each mutation from state
> > A to B, from B to C, etc...
> > Such a model can not reproduce the experimental facts: evolution =
> > there is a non zero mean deviation = there is a drift in the random
> > walk.
>
> Yes, such a model can reproduce the experimental facts. Evolution happens
> without a mutation bias, due to selection. Evolution can also happen with
> neither a mutation nor a selection bias, in which case it is called drift.
> Less well known and less important than either of these is evolution due
> to a mutation bias. If you want to know about this, I have suggested that
> you Google on
> mutation pressure G+C
> But you need to know that this has nothing to do with why most evolution
> takes place.
>
> > I have in mind the 1D model (and I may be wrong there !), so the
> > only solution is to assume that in general: p(A−>B) is different from
> > p(B−>A).
> > To justify this I was thinking about the thermodynamics of a mutation.
> > In my point of view, the two probability can be equal if E(A)=E(B).
> > If the free energy of the initial and final state are different then
> > the system will always spontaneously evolve toward the lower energy
> > state and the two probability should be different. Of course there is
> > always the possibity to bridge the energy gap with either a chemical
> > catalyst, a photoabsortion, or an electronic colisionnal excitation
> > (electron beam).
> > I might be all wrong but is there a systematic study of the energy

> > required for a mutation to spontaneously happen ?

> > There is a lot of talk about Hamiltonian of Darwin's systems.

> Not among biologists, there isn't.

> > To write
> > down a satisfactory theory, one must have a density probability whose integral is always one. In kinetics, this very fundamental point is induced by the hamiltonian structure that induces Liouville's theorem.

> There is nothing corresponding to Lioville's theorem in biology. Biology does not involve any useful conservation laws. The basic units in biology *reproduce*. That doesn't happen in chemistry or physics.

> > In information theory, the probility space is constant and well defined. But in biology it is far from obvious.

> You need to learn something about biology before you try to apply your physicist's intuitions to the subject. You will no doubt learn that biology is far more difficult and almost as sophisticated mathematically. Since you will probably want a mathematically oriented treatment of evolution, I would suggest that you start your education with Sean Rice's book "Evolutionary Theory: Mathematical and Conceptual Foundations". Also, read the chapters on mutation in the Alberts textbook on Molecular Biology.

Thank you for your time and comments. We may disagree on a few points but I appreciate any open minded exchange.
Concerning the Liouville operator I am afraid that you might be wrong there. There are already a couple of Hamiltonian candidates on the market and from there it is a matter of 5 mn to construct the Liouville operator. I understand that kinetic theory might look and sound awfull to a non math oriented mind but there is non doubt in my opinion that in the very near future a lot of results from kinetic physics are going to be applied to biology. It is not to prove the biologists are worth nothing without a physicist supervising them. No, it is because the physical properties of the DNA molecule are todays under our microscope. It behaves weirdly, sometimes superconductor, sometimes not.
There are plenty of conservation laws in biology. Some are obvious (To talk crudely, biological systems are just a bunch of molecules that obey the same laws than any other molecules), some are less

evident and are peculiar to the biological systems.
Concerning my studies, I did start with biology and then switched to mathematical physics. After applying a lot of the tools learned in finance, in traffic theory, epidiemology, I have become more interested in the math beyond what you biologists call a random complex complicated weird system.

.