Re: Junk DNA: A hypothesis

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From: Tim Tyler (*tim_at_tt1lock.org*)
Date: 01/25/05

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Larry Moran <lamoran@bioinfo.med.utoronto.ca> wrote or quoted:
> Tim Tyler <tim@tt1lock.org> wrote:
> > Larry Moran <lamoran@bioinfo.med.utoronto.ca> wrote or quoted:

> >> Why do you feel the need to find an adaptionist
> >> explanation for junk DNA?
> >
> > I don't. However, I do think it is worthwhile examining
> > the various selective forces that act on junk DNA, in the
> > hope of learning more about them.
>
> What are the "selective forces" that act on junk DNA?

They look something like this:

Likely negative selective forces
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1) Junk DNA has a metabolic cost. In increases nutrient
demands, and takes time and energy to copy.

2) Junk DNA harbours self−replicating DNA capable of
horizontal transmission between loci − such DNA
acts like a germ−line virus, and causes mutations.

...and probably many others.

Likely positive selective forces
−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−

1) Junk DNA acts as spacing, and affects linkage.

Decreasing linkage can have selective benefits − e.g.
when it separates genes that benefit from recombination,
such as disease−restance genes.

2) "Junk" DNA improves evolvability by creating
"neutral networks" − and allowing scratch space

to allow evolution to work.

3) Junk DNA reduces the chance of crossovers occurring
in the middle of genes that don't like being split −
and can increase the chance or crossing over in the
middle of any genes that need to be expressed in
a range of forms.

4) Junk DNA can act as a sponge for intracellular mutagens
that bind to DNA − decreasing the effective mutation rate
in coding regions.

5) Junk DNA changes the nuclear volume − and having a large
nucleus can be beneficial[1].

...and probably many others.

[1] "Eukaryotic non−coding DNA is functional: evidence from the
differential scaling of cryptomonad genomes"

− http://calorierestriction.org/pmid/?n=10902541

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