

PLEIOTROPY



Bjørn Østman. With the kids.

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Pleiotropy comes from the Greek πλείων pleion, meaning "more", and τρέπειν trepein, meaning "to turn, to convert". It designates the occurrence of a single gene affecting multiple traits. and it is a

The trouble over inclusive fitness theory and eusociality

I don't know.

I think the subject of group selection is super interesting, and I try to follow what the researchers write on the subjects these days.



Research Blogging

On one side we have the majority of evolutionary biologists who think kin selection and inclusive fitness theory as described by Hamilton and Price explain a lot of phenomena in biology, notably [eusociality](#). Some of the more famous people squarely in this group are Jerry Coyne, Richard Dawkins, and Stuart West, but there are many more (at least [137*](#)).

Then there are those who think eusociality does not need kin selection, and that selection can work on groups even when members of the group are not related (kin). This would include David Sloan Wilson, Edward O. Wilson, and Martin Nowak.

Having said that, it might well be that not all these people are equally adamant that there can be no exceptions to their view, and that group selection and eusociality can sometimes best be explained by kin selection and determined by calculating inclusive fitness. So, apologies if anyone feels misrepresented (not that any of these people frequent this blog). Samir Okasha, who is one of the [137[©]](#), is also a proponent of multilevel selection, for example.

At this point in time, I am totally agnostic myself.

I really don't know, because of several problems. First, I am not capable (or willing) to rigorously go through the mathematical proofs that Nowak, Tarnitas, and Wilson claim to have given last year that "inclusive fitness theory is not a general description of natural selection", and other things related. Second, I have seen in simulations with my own damn eyes that

...hugely important concept in evolutionary biology.

All aspects of evolution interest me, but my research focus is currently on adaptation, adaptive radiation, fitness landscapes, epistasis, and pleiotropy.

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For a list of all posts on peer-reviewed journal papers, see my profile on [ResearchBlogging.org](#).

BLOG ARCHIVE

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[The trouble over inclusive fitness theory and euso...](#)

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[Carnival of Evolution #33 \(and 32\)](#)

► February (11)

group selection works, and I can intuitively understand and argue why groups can evolve without necessarily consisting of kin. But on the other hand, even though I suspect that kinship isn't necessarily always a necessary factor in explaining social behavior, I am not sure I can see how groups and kin can be separated. In very hypothetical cases they can, but in biology in any sort of general way...? I personally have a hunch that the crux of the matter of group selection is about communication or signaling, which in principle can be separated from kinship.

So, in response to the paper by Nowak et al. claiming that kin selection and inclusive fitness are insufficient and irrelevant for explaining eusociality, no less than five separate replies were published this morning in *Nature* all claiming that the three authors completely missed the point and totally failed to properly review the indeed very extensive literature on the subject. Nowak et al. have replied, and they don't budge an inch - it's more like a counterattack. As I read their reply, some of it does resonate with me, but I honestly can't say much more than that.

I could now close saying that it will be an interesting show, so bring the popcorn and sit back and enjoy it - light will be shed on the subject eventually, I presume, with clarity to follow. But I just have one more thing to say that taints the whole spectacle in a bad way.

A couple of days ago I learned that Martin Nowak is funded in a big way by the Templeton Foundation. To me, that in itself is not a bad thing, because I was personally supported by them through part of my PhD studies via a grant to my advisor, Chris Adami, who in no way shares their fascination with theology. However, as one can read right on this website about the '[Evolution and Theology of Cooperation](#)' [research project](#) at Harvard University (man, the title alone!), Nowak is clearly in the camp of the infamous accommodationists who believe science and religion can get along without any kind either invalidating the other. Phrases like these just gives me hives:

We propose to study the emergence of altruistic behavior, forgiveness and unselfish love in the context of biological, ethical and theological considerations.

(...)

This research represents a newly-conceived attempt to understand the evolutionary biology of a world created by God.

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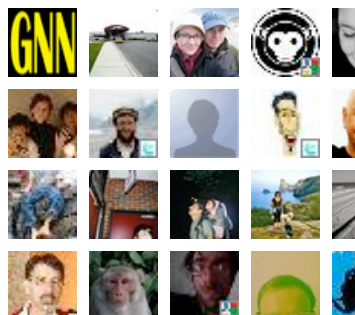


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Paul, the movie

2 hours ago

(...)

We propose to explore how additional concepts of theology might arise in the game theoretic approach. These concepts include love, wisdom, hope, dignity and sanctity.

(...)

Moving from these initial starting points and items for discussion, we shall go on to study which fundamental principles of evolutionary systems can support the emergence of true unselfish love as promoted by Christianity and other religions.


Such total nonsense doesn't look good on any body who wants to be taken seriously in science, in my opinion. I could never bear to work with Nowak after that garbage.

Reference:

Nowak, M., Tarnita, C., & Wilson, E. (2010). [The evolution of eusociality](#) *Nature*, 466 (7310), 1057-1062 DOI: 10.1038/nature09205


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West-Eberhard, M., Westneat, D., Wiernasz, D., Wild, G., Wrangham, R., Young, A., Zeh, D., Zeh, J., & Zink, A. (2011). [Inclusive fitness theory and eusociality](#) *Nature*, 471 (7339) DOI: 10.1038/nature09831
Nowak, M., Tarnita, C., & Wilson, E. (2011). [Nowak et al. reply](#) *Nature*, 471 (7339) DOI: 10.1038/nature09836

* One for each year since [Harry Houdini](#) was born, maybe?

BJØRN 3/24/2011 11:59:00 PM

REACTIONS: funny (0) interesting (0) boring (0) deep (0)

6 COMMENTS:



[yokohamamama](#) said...

Jerry Coyne's second post on this includes a reply from Dawkins, which itself includes a link to Dawkins' 12 Misunderstandings of Kin Selection". I've downloaded, and will read as carefully as I can-- when Dawkins undertakes to clear up misconceptions, he usually does so pretty thoroughly . Have you read it? I'd be interested in your take on that, too.

Didn't know that about the Templeton funding--or about the silliness of "the evolutionary biology of a world created by god". Seriously?

MARCH 25, 2011 2:16 AM



[yokohamamama](#) said...

Aaack! Gomen nasai! I have no idea why that double posted (a ra ra ra..)

MARCH 25, 2011 6:53 AM

 [James Sweet](#) said...

I read the "12 Misconceptions" yesterday, definitely enjoyed it. I felt some of the misconceptions were so obvious that it boggles the mind that serious thinkers missed it; but then again it also cleared up a number of things for me, so who knows where our blind spots are?

Aspect

Penis Spines, Pearly
Papules, and Pope
Benedict's Balls

1 week ago

e Carnival of Evolution

33rd edition on
Genome Engineering

3 weeks ago

**e Evolutionary
Novelties**

Mnemonic 2010

9 months ago


Bjørn, do you have any recommendations for lay-accessible literature that would describe how group selection might work? I have difficulty envisioning how it could create lasting evolutionary change -- but this is probably because I don't understand it. I'm certainly not going to be tackling any of the deep mathematics, but I'd like to have an intuitive understanding of the arguments being made...

MARCH 25, 2011 8:53 AM

e James Sweet said...

Actually, the Wikipedia article on group selection has helped tremendously already. I totally buy the haystack model, but of course that really only has an analog in nature in the case of

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course that really only has an analogy in nature in the case of things like viruses, parasites, and, arguably, multi-cellular organisms (if you look at each cell as the individual and each organism as the haystack, that is). The "trait groups" thing is intriguing, but the Wikipedia description of that is somewhat poorly written and I am having difficulty telling how brittle the mathematics are (i.e. do all the parameters have to be "just right" in order for this to work, or does it contribute across a range of parameters?)

I do not have *nearly* enough of a grasp on the technicalities of eusociality to have any sort of opinion on whether kin selection or group selection (or some mix of the two) seems the more plausible explanation. In fact, every time I read about the evolution eusociality, at some point I get really *really* confused :)

One more note about the comment I made about multi-cellular organisms... When I read "12 Misconceptions" yesterday, I was surprised that no mention of this idea was made in the entry about kin selection as applied to clones. Dawkins makes convincing arguments that while kin selection could in theory cause a clone to behave altruistically towards all of its clones, the sequence of events to facilitate this would be pretty unlikely. He then hedges by pointing out that maybe this has happened in a particular aphid species. I feel another hedge was called for, in that we can fairly safely say that something *exactly* like this happened in the evolution of multi-cellularity: A clonal population evolved unbounded altruism towards the in-group which was virtually guaranteed to be clones. The fact that this appears to have only happened *once* seems to support the idea that such an event would be quite rare, and so I think this is "the exception that proves the rule" in the original sense of the cliché. Maybe I'm making some horrible layperson mental error though :)

MARCH 25, 2011 9:17 AM

BRAIN TRAINING GAMES

Intelligence

Memory



Bjørn Østman said...

James, there are examples of observations of clonal colonies forming multicellular organisms. I wrote about one, [Chlorella vulgaris](#), a while ago. I don't think we can conclude that it only happened once.

MARCH 25, 2011 10:16 AM

Attention
Focus
Speed
Language
Visual Recall
Spatial Reasoning
Problem Solving
Fluid Intelligence
Stress
Reaction Time

▶ Play Games



Bjørn Østman said...

I don't know good literature for laypeople on group selection, but I can recommend scientific papers on group game theory experiments (Nowak has written many hints some, e.g. <http://arxiv.org/abs/1006.2903> <http://arxiv.org/abs/1012.0276> <http://www.ploscompbiol.org/article/info%3Adoi%2F10.1371%2Fjournal.pcbi.1000948>). Also, you might want to check out David Sloan Wilson's blog on [ScienceBlogs](#).

MARCH 25, 2011 10:55 AM

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