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A Winged Cat Helps Explain The Principle Of Evolutionary Trade-Offs (<http://io9.com/a-winged-cat-helps-explain-the-principle-of-evolutionar-1612615341>)



<http://mark-strauss.kinja.com>

Mark Strauss (<http://mark-strauss.kinja.com>)

Filed to: [EVOLUTION \(/TAG/EVOLUTION\)](#) 7/29/14 11:00am (<http://io9.com/a-winged-cat-h>)

5,588 🔥 ↗ ★ ▼

You can't have it all. It's a cliché, but it's also a powerful principle in biology. Now, a set of new computer models reveal how evolutionary compromises ("trade-offs") drive the diversity of life.



"Biologists have long known that when species compete for limited resources such as food, they are pressured to diversify," [explains Chris Adami \(http://adami.natsci.msu.edu/bio/\)](http://adami.natsci.msu.edu/bio/), a Michigan State University professor of microbiology and molecular genetics. "But what we found through computer simulation is that trade-offs are the main driver of diversification when resources are scarce. The stronger the trade-offs, the more diversification will occur." However, there is price to pay when diversifying. Organisms cannot optimize all traits. In other words, they can't have it all.

The MSU researchers created an animation of Chester the Winged Cat (above) to demonstrate the principle. Watch as the virtual feline's descendants branch off into different species—each one developing a specialized trait, such as larger whiskers and ears, but at the price of losing other traits., such as their eyes.

We've seen evidence of this among living animals. In Madagascar, lemurs have evolved to eat different things, which ensures that there is enough food for all. Some lemur species eat fruit, but due to trade-offs, cannot eat leaves because their digestive tracts have become too short and cannot process the fiber. Other lemurs have long digestive tracts and can eat leaves, but they get sick from eating fruit because it ferments from staying in their guts too long. So to preserve the supply and demand of food, a compromise evolved between fruit- and leaf-eating lemurs—they are biologically prevented from eating each other's food.

"We did not know until now just how essential such trade-offs were in driving diversification among species," explained Bjorn Ostman, one of the MSU researchers. "The computer simulations allowed us to remove other possible factors that influence speciation, such as geographical barriers."

[Note: MSU assures the public that "no virtual cats were evolved (or harmed)" in the making of their video.]

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Malthius (<http://malthius.kinja.com>) ▶ Mark Strauss

7/29/14 12:13pm (<http://io9.com/i-learned-some-of-this-from-one-of-the-most-unlike-1612846766>)

(<http://malthius.kinja.com>)

I learned some of this from one of the most unlikely places: The TMNT RPG. In that game, every animal had BIO-E points. Those points represented how much change you could affect on yourself. You start out as a full animal. You want hands? Spend some BIO-E. You want to walk on two legs? BIO-E. How about two legs, but you're hunched and when you run, you'd rather use all four? That'll cost less than full biped. Need some more points, sacrifice some strength and get smaller. Got points to burn? Gain some mass.

It's fiction, but totally cemented these tradeoffs in my head. Pretty flowers don't always smell the best? Must have used it's BIO-E on prettiness. Underground fish gives up eyes? I wonder what he spent those points on.

8 ★ 4  [Reply](#)



[Tidezen \(http://tidezen-kinja.com\)](http://tidezen-kinja.com) ▶ Malthius

[7/29/14 2:09pm \(http://io9.com/heh-i-do-the-exact-same-thing-cept-i-didnt-know-there-1612939261\)](http://io9.com/heh-i-do-the-exact-same-thing-cept-i-didnt-know-there-1612939261)

<http://tidezen-kinja.com>

Heh, I do the exact same thing, 'cept I didn't know there was an awesome Turtles game like that. I read about it in one of my dinosaur books as a kid, although I believe it was also an element in SimLife.

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[7/29/14 2:31pm \(http://io9.com/well-i-dont-know-about-awesome-the-lore-was-great-bu-1612955567\)](http://io9.com/well-i-dont-know-about-awesome-the-lore-was-great-bu-1612955567)

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Well, I don't know about awesome. The lore was great, but try as I might, the Palladium rules system never quite worked for me.

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[Neopopulas \(http://neopopulas-kinja.com\)](http://neopopulas-kinja.com) ▶ Malthius

[Thursday 10:18pm \(http://io9.com/ha-haar-palladium-oh-those-books-were-are-such-a-1614423353\)](http://io9.com/ha-haar-palladium-oh-those-books-were-are-such-a-1614423353)

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Ha haar.. Palladium.. Oh those books were.. are such a mess...

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[Friday 8:08am \(http://io9.com/so-much-lore-such-broken-rules-1614562527\)](http://io9.com/so-much-lore-such-broken-rules-1614562527)

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So much lore. Such broken rules.

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