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Main

Evolution

Newsflash: reptiles and invertebrates 'play'

10/25/2010



About the Author

Wendee Holtcamp has covered news about conservation, wildlife and adventure travel for nearly 15 years.

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Do Octopi play? Photo Credit NOAA.

A fascinating article, [Recess](#), in *The Scientist* by writer Jef Akst is a must-read for animal lovers. We all know that puppies and kittens - and human children, of course - play, but did you know that turtles, octopi, and even wasps may also play?

[Gordon Burghardt](#), a biopsychologist at the University of Tennessee-Knoxville, defined play as "repeated behavior that is incompletely functional in the context or at the age in which it is performed and is initiated voluntarily when the animal (or person) is in a relaxed or low-stress setting."

It was a turtle in the National Zoo in Washington D.C. which led to Burghardt's initial eureka years ago. He watched the old soft-shelled turtle called Pigface batting a basketball around its watery enclosure, and wondered, could this be play? That ultimately led Burghardt to create five characteristics of play, so he could systematically determine whether various species of animals play, and under what conditions. The criteria include actions that are spontaneous or pleasurable, repeated, and only occur when an animal is stress-free. The idea of whether invertebrates and reptiles play has its share of skeptics, but Burghardt has since documented 'play' in wasps, Komodo dragons, softshell turtles, and octopi.

Pigface has since died, but you can see a new giant Pacific octopus at the National Zoo Invertebrates website batting around a ball on their [playing-octopus-cam](#). This ball has food inside, though, so perhaps in the octopuses' case, it is not play, after all.

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Moray eel mystery

04/12/2010

If you're a Scuba diving fan and love coral reefs,



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chances are good that you have encountered a moray eel lurking in a crevice of a coral reef or rocky crag. Some 200 species exist throughout the world's oceans. When I saw a moray at Osprey Reef offshore from Australia (while doing the [Expedition Shark blog](#)), Céline Cousteau was diving with us, and I remember her signaling to me underwater, warning me to keep my distance – they have a powerful bite! In fact, morays have two sets of jaws: your typical mouth jaws, and a second set in their throat known as pharyngeal jaws. And did I mention the rear-facing fangs?

Turns out that moray eel I saw in Australia may be closely related to morays in Africa, or South America or Hawaii. A recent study [just published](#) in the online *Journal of Heredity* showed that morays living halfway 'round the world in the Indo-Pacific Ocean are genetically homogenous. Individuals of both species they studied - the undulated moray (*Gymnothorax undulatus*) and the yellow-edged moray (*G. flavimarginatus*) - had no genetic differentiation from other individuals of the same species in say, Hawaii versus Africa. How is that possible, when moray adults rarely leave their nooks?

Most species have different genes from one location to another, because an animal in Hawaii cannot normally mate with an animal in Africa - unless they migrate to a common breeding ground. But that does not happen with morays. "Adult morays rarely move more than a few hundred feet during their entire lives," says Joshua Reece, who conducted the study as part of his Ph.D. research at the University of Washington in Saint Louis, along with his collaborator University of Hawaii Professor [Brian Bowen](#), and other colleagues. "All of this migration is accomplished by tiny little transparent larvae known as leptocephalus larvae (Latin for "small head"). These tiny larvae disperse across open ocean from their coral reef of origin to distant reefs around the Indo-Pacific region. Moray eel larvae have greater dispersal capabilities than most reef fish studied to date."

That leads to the question of how did various eel species evolve in the first place? Most reef fish evolve due to geographic barriers but if all individuals within these two eel species had pretty much no genetic differentiation more than 13,000 miles across the sea, then how would species ever differentiate? It begs the question of whether some geographic barriers do exist – for eels or other marine animals - within what we humans may think of as an undifferentiated expanse of ocean.

And for Reece, that is perhaps a research project for another day.



Moray Eel/Copyright (c) Ellen Waldrop

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The world's first monogamous frog?

03/29/2010

Up until recently, scientists thought there weren't any monogamous frogs and toads. When breeding time comes around it typically works like this: males calls, females show up. Male grabs on (called amplexus), female lays eggs, male fertilizes. The frogs (or toads) go on their merry way, and the eggs develop into tadpoles soon after, which have to fend for themselves. But the mimic poison frog (*Ranitomeya imitator*) in Peru marches to a different beat.

Biologist [Jason L. Brown](#), a postdoctoral researcher at Duke University (and formerly at East Carolina University) used genetics to confirm that these frogs were truly monogamous, unlike every other known frog and toad. Biologists already knew that the mimic poison frogs appeared to be monogamous because they formed a pair bond, but genetic research has made it amply clear that many animals that form pair bonds and seem monogamous aren't in reality: Males or females from the mated pair will "cheat," sometimes siring offspring from a non-mate.

The female mimic poison frog lays only a few eggs on a leaf. After two weeks, the male collects the newly hatched tadpoles onto his back, and carries them to a tiny pool of water that has collected inside of a *Heliconia* plant. When the babies get hungry, the male calls mom, who brings a non-fertile egg for the young to eat. Brown confirmed genetically that, with one exception, the offspring from every paired poison mimic frog came from that mom and that dad, so they exhibit true monogamy. But for the scientists, the coolest question was asking why, out of all frogs, these ones should have evolved monogamy? And they discovered that monogamy could have a sole cause.

Comparing the frogs' mating habits to its close relative, the variable poison frog – a species it mimics – the biologists found that mimic poison frogs lay eggs and raise tadpoles in much smaller pools of water. Since these diminutive "aquatic nurseries" don't contain any food for the tadpoles, the biologists reasoned that the only way for the offspring to survive is through biparental care and forming a monogamous pair bond. When the froglets are hungry, the male chirps,beckoning the female, who then brings their offspring sustenance in the form of her unfertilized eggs. It appears that they need both mom and dad to survive in those particular conditions. Brown collaborated with Kyle Summers of East Carolina University Kyle Summers and Victor Morales of Ricardo Palma University in Lima, Peru and they [recently published](#) their discovery in the scientific



*A male mimic poison frog carries his tadpole offspring/
Copyright Jason Brown*

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By Month

Australia's Kimberley Islands a Biodiversity hotspot

11/24/2009

I don't know about you but I've always been a snail (and slug) fan. I grew up in my younger years in the Pacific Northwest, where slugs and snails abounded. As a kid, tomboy that I was, I thought they were rad! I guess I'd have a heyday if I ever visit the far northwestern coast of Australia, the Kimberley Islands, where scientists have recently discovered a whole bunch of new species of land snails. Australia's Kimberley region lies in the north part of the state of Western Australia, bordered by the Indian Ocean, and many of the islands had never before been explored. This is the same Kimberley Coast region mentioned in my post on the massive Montara oil spill offshore, which was finally plugged November 3rd.



A camaenid land snail (Amplirhagada sp.) found on Western Australia's Boongaree Island/
Copyright (c) 2009 Vince Kessner

Back to snails and other creatures... A team of biologists from the Australian Department of Environment and Conservation (DEC), the [Western Australian Museum](#), the [Australian Museum](#), and the [Kimberley Land Council](#) have been surveying 22 of the region's largest islands during both wet and dry seasons since 2006 for all manner of flora and fauna, and have been surprised and delighted to find so many new species- a whopping 84 camaenid land snail species, 72 of which appear to be new to science. Turns out, these Kimberley islands are one of Australia's biodiversity hotspots, especially for snails. The survey team still has nine islands to go.

Scientists distinguish snails by their private parts. Yep, you read that right. Species that look the same on the outside may have very differently shaped male reproductive organs, and that is how a malacologist tells the snails apart. Frank Köhler of the Australian Museum, the malacologist on the expeditions who identified the snails, says a high diversity of snails can be used to indicate the general health of an island's ecosystem and threats posed by various factors. The overall purpose of the four-year survey of flora and fauna was to identify species at risk from threats including fire, invasive plant species, human activity, and cane toads, a non-native species that has wreaked havoc on native mammals that die when they ingest the poisonous toads.

The surveys also found new populations of Australian vertebrates and doubled the number of species documented on most of the islands. Biologists found 139 bird species, and caught 2,500 reptiles and amphibians of 83 species. Although none of these were new to science, several had never been documented on these islands before. They did not find any threatened or endangered species, but did find evidence that endangered green and olive ridley sea turtles nested there. Some other cool species include the Merten's Water Monitor and the Yellow-spotted Monitor, both of which have declined throughout their range since the cane toad's arrival.

And on a completely separate note, there's a new land snail on the opposite side of the country now named... [Crikey steveirwini](#). It lives in the Wet Tropics of Queensland.

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Fanged frog, giant rat, and more found in Papua New Guinea

10/29/2009

Last week I talked about the amazing animal discoveries in Asia's Mekong delta, and here's the other promised story about an amazing expedition to the "lost world" of Papua New Guinea's Bosavi volcano. Reading about these amazing trips makes me want to join a scientific expedition like this!

Between January and March of 2009, a team of biologists and filmmakers became the first Westerners to [explore](#) inside Papua New Guinea's remote Bosavi volcanic crater. The country lies on the east side of the large island of New Guinea, north of Australia. [George McGavin](#), an insect specialist and explorer who works as an honorary research associate with the Oxford University of Natural History and the University of Oxford Zoology Department, led the scientific team which also included Bishop Museum herpetologist [Allen Allison](#), ornithologist [Jack Dumbacher](#) from the California Academy of Sciences, ichthyologist [Phil Willink](#) from the Field Museum in Chicago, mammalogist [Kristofer Helgen](#) from the Smithsonian, bat specialist [Alanna Maltby](#) of the Zoological Society of London, and [Muse Opiang](#) - the Papua New Guinean who did the first study of of [long-beaked echidnas](#) which I blogged about before, among others.



*A fanged frog ([Mantophryne sp](#)) discovered in Papua New Guinea's remote Bosavi volcano crater
Credit [Allen Allison](#)*

Because of the volcano's remote locale, the scientists had high hopes of finding unusual species there. The extinct volcano has high crater walls, so species with low mobility and species specializing in high elevation forest have remained isolated and hence evolved independently for hundreds of thousands of years. The expedition will appear in the BBC documentary series, [Lost Land of the Volcano](#) .

The expedition involved months of background prep for just a few weeks of collecting. On the initial trip to the village of Fogamaiyu, they met up with the Kasua tribe who live near the base of the volcano, who remain mostly isolated from Western civilization. They speak a dialect that fewer than 1,000 people speak, and had no televisions that might inform them about the outside world. The tribe didn't even have a cash economy, so explaining the concept of paying them so the team could set up a base camp near their village proved a challenge initially. The expedition team asked the tribe's permission to explore the volcano, which they received, and then hired several tribe members as trackers, medics, and boatmen, plus a cook.

The rest of the international expedition team members then flew in to Fogomaya by helicopter, which is still a four-day hike from the top. They trekked through dense rainforest to reach the summit of the nearly 9,000-foot Mount Bosavi volcano, which lucky for them is no longer active, and then ventured down into it. Once they reached the top, the hard work paid off. The scientists found a "lost world" with up to 40 funky, strange species that seem to be totally new to science, including 16 frog, one gecko, three fish, one bat and 20 insects and spiders. The scientists still must go through the peer review process to ensure these are indeed new species, so many of their scientific names have not yet been assigned.

Some of the critters discovered include the vegetarian, cat-sized rodent that Helgen has named the "Bosavi giant woolly rat" – one of the largest rats known in the world. It showed no fear of humans. The team also found a new subspecies of tree-dwelling silky cuscus (*Phalanger sericeus*) – a marsupial that looks like a gray teddy bear with very small ears – plus a tree kangaroo, a pigmy parrot no larger than one's hand, a fanged frog and the Henamo Grunter - a fish that grunts using its swim bladder. You can watch a video of the giant rat [here](#). Amazing stuff! What do you think? Do you dream of going on an expedition like this? Or do you prefer to stay home and read about or watch others doing this stuff?

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Will climate change have variable effects?

06/18/2009

Scientists have modeled how global climate change will impact various species around the globe, and in most cases, the answers are not good. But as someone trained as an evolutionary biologist, I have always wondered why so many articles report only doomsday scenarios, but rarely do you hear of species that may benefit, or the fact that some species may adapt via natural selection. Ecosystems will shift and species will move, or individuals that have traits that enable them to survive will prosper while others will die out. Evolution in action. Turns out a recently published study shows that one group of animals, the large mammals, may be able to adapt to climate change by changing what they eat based on what's available. Check out the Discovery News article, [Climate Change? Big Mammals may Be Flexible](#). And in another study, also discussed on Discovery News, [Climate Change May Supercharge Plant Growth](#). Animals and plants responses to changing climate may be variable. All that's not to say we do not have a human responsibility to help species that we have endangered due to negligence in protecting their habitat, or in curbing the emissions of greenhouse gases that we may have released that may have irrevocably tipped the balance of

the climate towards a rapidly warming earth. Because at least I believe we do. But research on how various species may respond, and a balanced understanding, is always helpful.

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The great apes laugh too!

06/12/2009

Besides the fact that mountain gorillas are my all-time favorite animal, and chimps come in a close second or third - the sloth is in there somewhere- this story on Discovery Animal News tickled me (pun intended!): [Chimps, Other Apes Laugh Like Humans](#) . Turns out we're not the only primate that laughs. Researchers showed that chimpanzees, gorillas, orangutans, and bonobos - three great apes - all laugh when tickled. What I want to know is, why did it take scientists so long to figure this out? It seems like something that someone would have studied before now, right? I guess it takes a systematic approach to determine whether a sound being uttered by the animals is truly laughter versus verbalizing something else that the researcher doesn't know what the meaning is. The scientists induced the laughter by tickling the apes. I guess it begs the question, how often do the various apes laugh in the wild? And would that correspond with which species has the most joyous, low-stress life?

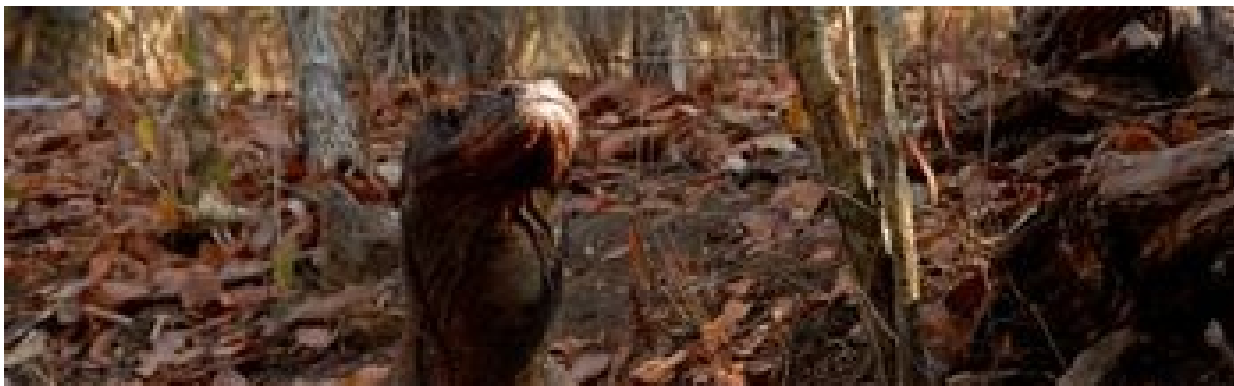
[Learn more about great apes from animal expert, Jane Goodall.](#)

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Are Komodo dragons venomous?

05/29/2009





*Two Komodo dragons feed on a deer in Komodo National Park on Rinca Island/
Copyright (c) 2007 [Chris Kugelmann](#)*

The world's largest lizard, the Komodo dragon, inspires fascination and fear. The thing is just totally cool. It's a massive lizard, found on some Indonesian islands, that grows nearly ten feet long, and it can kill prey even larger than itself, like water buffalo, goats, and pigs – sometimes with a single bite. Scientists have speculated about this predatory behavior for some time now. How could a single bite take down a large mammal? Sometimes those prey would wander off, seeming to escape, only to croak not long after – and then the dragon got its meal. Biologists had previously argued that the dragon's saliva had some sort of bacteria that infected the prey after a bite, causing it to die.

But in a recent study just [published](#) in the *Proceedings of the National Academy of Sciences* (PNAS), Bryan Fry, a biologist at the University of Melbourne in Australia who calls himself the [Venom Doc](#), and colleagues disagree with that, arguing that the dragon uses venom rather than bacteria that kill the prey. It's a new hypothesis, and until now, the only known venomous reptiles were snakes and another small family of lizards that includes only the Gila monster and the beaded lizard.

The PNAS study argued that the lizard's lightweight skull and its dimensions are not really suited to delivering super strong bites, like crocodilians do, but rather well adapted to bite and pull at flesh, leaving large wounds that get bathed in venom. After several Komodo dragons mysteriously died at the Singapore zoo, the zoo allowed Fry to dissect their jaws to study the neck glands and search for venom, something not possible in wild animals because of the lizard's endangered status. Fry and colleagues found two types of venom, one with anti-coagulation properties that exaggerates the effects of the deep wounds by preventing blood clotting, and another that induces low blood pressure and shock, hence immobilizing the prey. "This 'combined arsenal' is an effective way to dispatch a prey item," says Fry.

Up until recently, scientists thought venom in snakes and lizards evolved independently, but this study and another [published by Fry and colleagues in 2006 in the journal, Nature](#) argues instead that venom is a "basal characteristic," or a trait shared by both snakes (Serpentes), and several lizard families, including the one with Komodo dragons, monitor lizards, and the gigantic extinct *Varanus megalania*.

"There are three living members of this spectacular, unusual clade that all have the same sort of large, blade-like serrated teeth: Komodo dragon, Crocodile monitor, and the lace monitor of Australia that is simply a

smaller *megalania* but still big at up to 2.3 meters," says Fry. "They, and *Megalania*, are the most formidable lizards to have ever lived."

[Watch as Komodo Dragons take down prey nearly five times their size.](#)

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Opening a Can of Worms - Cryptic Species

05/22/2009



*Two spotted eagle rays near the Galapagos archipelago
Copyright (c) 2008 Bill Watts*

Animal lovers like to read about warm fuzzy animals, but sometimes lowly invertebrates get no respect. So I thought I'd give a shout out to worms today, since they've helped scientists understand evolution and natural selection just a bit better. Turns out the segmented lab worm (*Lumbriculus variegatus*) – commonly used in lab experiments to test impacts of environmental toxins – is actually two worms. Two species, that is. Although they look identical, genetic analysis showed 17% divergence in the mitochondrial COI gene (Cytochrome Oxidase subunit I) between the different species.

"The rule of thumb is that with a 10% or more COI difference, it is very likely that they are different," explains Sweden's University of Gothenburg Professor [Christer Erséus](#), "In vertebrates, the difference between species can be as low as 2-3%....Using the human-chimpanzee example for an estimate, a 1% difference may correspond to a last common ancestor being about 1 million years back in time! Perhaps evolution goes a little faster than this for worms, as their generation time is shorter, but the 17% difference in *Lumbriculus variegatus* certainly represents a split millions of years ago." Cool stuff! And it has implications for past studies that used the worms. If different genes translates to different responses to toxins, that could call into question the findings of some past scientific research. Erséus, his graduate student Daniel Gustafsson, and University of Florida's [David Price](#) published their finding in the journal, [Molecular Phylogenetics and Evolution](#).

In a similar study from 2008, scientists led by Cardiff University's [Bill Symondson](#) used genetic analysis to confirm that four of Britain's common [earthworms are actually complexes of several different species](#). These earthworms could play different ecological roles or have different niches, previously undiscovered. With the advent of genetic technology, our understanding of species continues to change rapidly. In addition to shedding light on evolution. "Never forget that speciation is normally a gradual process, so there are many cases when two putative species are in the grey zone of 'are they separate or not'," explains Erséus. He believes these recent discoveries have big implications for the world's biodiversity. The earth may have many more cryptic species, previously undetected, perhaps doubling or tripling the number of species in the world. That also means that many population estimates of already rare species may be lower than previously believed.

And worms aren't the only cryptic species - I just had to get a vertebrate in here, didn't I? A team of marine biologists from [Save Our Seas Foundation Shark Research Center](#), [Guy Harvey Research Institute](#), and [National Coral Reef Institute](#) at Nova Southeastern University in Florida, recently published a [similar finding in spotted eagle rays](#). These 'birds of the sea' are truly one of the ocean's most breathtaking species to behold in the wild. I watched them gracefully fly through the aquamarine water of Australia's [Tangalooma Bay](#) on an ecocruise with my kids, and I also cringed as I watched two kids cutting off the barbed tail of one they'd captured on a fishing line in Corpus Christi, Texas. The species was previously thought to roam throughout the world's oceans, but their genetic analysis revealed that although the rays look identical throughout the world, their genes show that they are at least two distinct and separately evolving species, and could be broken down further into subspecies.

The [World Conservation Union's Red List](#) currently lists spotted eagle rays as near threatened and declining, and the new discovery means that the one or more of the new species may be endangered or at greater risk than previously thought. According to Mahmood Shivji, who led the research team, more extensive sampling from around the works will likely reveal even more cryptic species in this charismatic ray.

Ancient primate ancestor - Holy Grail, or Hype?

05/20/2009

Scientists have a long history of understating their findings and discoveries. Unlike movie premieres, or new commercial products, or major athletic events, when a scientist discovers something that he or she thinks might revolutionize a field, or end up a major discovery, they almost go underground. They don't seek media attention, especially at first. They privately, and usually alongside many collaborators painstakingly document, research, and statistically analyze their find, and test their hypothesis. They try to disprove their ideas by testing for alternatives. Then they publish in what's called the peer review journal system, where a paper gets reviewed anonymously by their colleagues in the field. Oftentimes the first journal scientists submit to may reject it altogether and they have to start over, submitting to another journal.

It can be several years after the research begins before the final paper gets published, and only then does it usually catch the media's attention. Few scientists actively seek the glory and limelight of the media for their scientific findings, though many enjoy seeing their hard work talked about publicly. And when scientists speak of their own research, there's often a humility about it. You'll often hear hedge words in their speech, like "may show" or "suggests." They get excited, for sure, but most don't go around claiming they're changing some scientific paradigm, or they've made an earth-shattering discovery. That's just the way science works (incidentally, that is why claims of intelligent design being a new revolutionary theory that disgraces evolution should be met with great skepticism).

So why when scientists held a major press conference to announce the discovery of a 47-million year old fossil, *Darwinius masillae* (nicknamed Ida), the media went berserk this week. The extremely well preserved fossil skeleton has characteristics of anthropoids (which include humans, apes and monkeys) and another group of extinct primates, the adapiforms, and the discovery, [just published in PLoS One](#), is being hyped to the max. There's a book coming out, and a History Channel TV show about to air. The scientists claim it changes the way we understand evolution, as if it is *the* missing link that has been sought for so long. One of the scientists, Jens Lorenz Franzen, is actually quoted, on their glitzy website, [Revealing The Link](#), "When our results are published it will be just like an asteroid hitting the earth."

Seriously? Seriously?! Um, yea. Maybe not.

Now, I have been passionate about science education for many years now. I have taught college biology, testified before the Texas State Board of Education over evolution education and textbooks, and am even in the midst of writing a book, to be published by [Beacon Press](#), on making peace between evolution and Christianity (and I believe both, by the way). So I wasn't privy to the media circus, I didn't attend the press conference, but when I read science writer [Carl Zimmer's blog post over at Discover Magazine](#), I realized he'd hit the nail squarely on the head (to use a tired old cliché).

The problem with such claims is science doesn't really work that way, and it's to the detriment of society's understanding of science to hype a discovery when it's not yet a scientific consensus. The scientists are excited, they made a major discovery. But the PR folks need to tone down their rhetoric because in my opinion, they're doing a disservice to the general public's already woeful understanding of how science works. It's just the kind of thing that those folks dead-set on disproving evolution for various reasons will latch onto when other discoveries show this fossil is perhaps not an ancient anthropoid/human ancestor but

something else altogether. Of course, the anti-evolution claims will also be hogwash, that is sort of their specialty, but it just ends up muddling the public's understanding of science all the more.

I mean no disrespect to the History Channel, but maybe the producers there don't quite understand this about science. Admittedly, it's not like the cold fusion debacle, where two scientists claimed a (so-far) impossible feat, had a big media event, and then ended up disgraced when their claims proved untrue. In contrast, the published study of *Darwinius* is, as far as I can tell, valid science. It's a legit scientific discovery, published in a respected peer reviewed scientific journal. And naturally the scientists are excited about their find. But some of their archaeologist colleagues strongly disagree about the significance, and about the interpretation of the fossil's place on the evolutionary tree of life. We are far from scientific consensus. It may or may not be a missing link to primate evolution. And that's just the thing, there's not only one missing link. Many different fossil species have been and will continue to be discovered showing gradual, and sometimes rapid changes between species.

So let's just take a deep breath, and realize the hype is sort of like the swine flu. It may end up being more significant down the road. It is a news story of broad scientific significance. It is interesting to the general public, and it's great to have anything excite the public's imagination. It may make great television, and great reading. But the media hype is not the science. And I'm not sure at all that what they're claiming is a new model of how scientific discoveries should be hyped is a positive step. In fact, I'm pretty sure it's the opposite. What sets science apart is its piecemeal, slow, zigzag pace of filling in the giant puzzle of the mysterious past and present operations of our amazing universe.

[Find out more about ancient species and their extinction from Animal Planet's hit show, "Animal Armageddon."](#)

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