***Cheats and Deceits: Trickery and Deception Are Widespread.***

*A new book by University of Exeter ecologist Dr. Martin Stevens called Cheats and Deceits: How Animals and Plants Exploit and Mislead is a great read, full of lots of research data, fascinating stories, and surprises.*

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In nature, trickery and deception are widespread. Animals and plants mimic other objects or species in the environment for protection, trick other species into rearing their young, lure prey to their death, and deceive potential mates for reproduction. Cuckoos lay eggs carefully matched to their host's own clutch. Harmless butterflies mimic the wing patterning of a poisonous butterfly to avoid being eaten. The deep-sea angler fish hangs a glowing, fleshy lure in front of its mouth to draw the attention of potential prey, while some male fish alter their appearance to look like females in order to sneak past rivals in mating. Some orchids develop the smell of female insects in order to attract pollinators, while carnivorous plants lure insects to their death with colourful displays.

In Cheats and Deceits, Martin Stevens describes the remarkable range of such adaptations in nature, and considers how they have evolved and increasingly been perfected as part of an arms race between predator and prey or host and parasite. He explores both classic and recent research of naturalists and biologists, showing how scientists find ways of testing the impact of particular behaviours and colourings on the animals it is meant to fool. Drawing on a wide range of examples, Stevens considers what deception tells us about the process of evolution and adaptation.

An interview with Dr. Stevens goes as follows.

1. What does deception in animals and plants tell us about the process of evolution and adaptation?

On a broad level it tells us a great deal about how animals and plants evolve strategies to stay alive, capture food and nutrients, and reproduce. It tells us that in nature, playing ‘fair’ is not always the best approach and whatever maximises genetic contribution to the next generation wins. In some cases, the strategies can be highly specialist. For example, many orchid species are pollinated by just one species of pollinating insect, which the orchid entices with false promises such as of food or mates. In other species the approaches used are more generalist, for example the bright colours of some orb-web spiders are very effective in luring a range of flying insects to them which have a general sensory bias or attraction for colourful objects.

Deception also tells us a great deal about how evolution works. For example, studies of avian brood parasites and insect social parasites have long been valuable systems to understand evolutionary arms races and coevolution. Many cuckoos lay their eggs in the nest of another species of bird, so that the foster parents rear the foreign chick instead. In turn, many cuckoos have evolved egg mimicry to prevent their eggs from being detected by the foster parents, who over evolution then evolve improved discrimination abilities, and so it continues. The various attack and defence strategies that different brood parasite and host species use has been valuable to understand coevolutionary interactions, as well as things like the acquisition of behaviour, the use of sensory information, and cognition. This is the case for many areas of deception.

Deception also can help us to understand the ways that adaptations arise over time (generations). For example, recent work on Indian leaf mimicking butterflies (Kallima), which have an incredible **resemblance** to dead leaves, has shown that the transition from a non-leaf mimicking ancestor to the modern butterflies went through a large number of intermediate stages. This is just as Darwin and Wallace predicted, and contrary to the idea that such specialisation requires large **macromutations** or ‘jumps’ in appearance from one generation to the next.

2. How do scientists find ways of testing the impact of particular behaviors and colorings on the animals it is meant to fool?

There are many ways that scientists do this. One common way is to **manipulate some aspect** of a plant or animal and see how this affects the behaviour of the animals it is exploiting. For example, if you remove the black stripes on a hoverfly to make it look less like a wasp, do predators still avoid them or now attack them readily? Or it may involve making some sort of artificial stimulus **resembling the real thing**. For example, the orchid mantis is a species that has long been assumed to resemble a flower in order to lure pollinating insects towards it, which it then attacks. In some experiments, scientists made fake orchid mantis out of Plasticine, whereby they changed the shape of the mantis limbs to explore whether their shape is important in luring prey (apparently not).

Another common approach is **to simulate animal** vision using mathematical models of the way that animal photoreceptors encode information about the world around them. These models can, for example, test how closely something like a harmless hoverfly mimics a dangerous wasp, or how closely a moth is camouflaged against a tree trunk.

3. What are some ways that predators exploit the resources of others and entice victims?

There are many methods predators use! One remarkable example concerns blister beetle larvae. After hatching, these larvae crawl up the stem of a plant and from a ball of larvae, sometimes several hundred individuals in size. It looks a bit like a bee. Then, the larval aggregation produces a smell that mimics the mating pheromones of a female solitary bee. This causes male bees to approach and try to mate with the larvae. They then jump onto the male’s back, and he then tries to mate with a real female, at which point the larvae jump off him and onto her back. She then transports them back to the nest where the larvae jump off her and feed on her eggs and food stores.

Spiders are probably the masters of enticing prey. Many orb - web spiders are brightly coloured, and a range of work has shown that flying insects are attracted (lured) to the bright colours **and consequently get** ensnared in the web. One group of spiders, the bolas spiders (which have given up on building webs), lure male moths by mimicking the mating pheromones of female moths. Male moths are attracted to these smells and when close to the spider it swings a ball of sticky materials, capturing the moth and hauling him in to eat.

In fact, many species of predator lure prey with some sort of false promise. For example, angler fish wave a modified dorsal fin spine, like a fishing rod, over the top of their head with a fleshy ‘lure’ at the end. This attracts other smaller fish who respond to the lure as if it’s food, at which point the angler fish gobbles them up instead.

4. What are some tactics that carnivorous plants use to lure prey and increase capture rates?

These can be quite varied, using both visual and chemical deceit. Venus fly traps have been found to emit smells that resemble food to some insects like flies, so that the prey are actively lured into the traps. Some pitcher plants even mimic the chemicals of ant pheromone trails that scout ants use to recruit other workers to food sources. By resembling these pheromones, the pitcher plants recruit ants to them. Other pitcher plants use visual signals to lure flying insects. Under ultraviolet light the rims of the pitchers fluoresce a blue colour. Some insects are quite attracted to this bright blue signal, and are lured to the rim of the pitcher where they land and then fall in.

5. Why is social and brood parasitism restricted to a few select groups of animals?

I wish I knew! It’s really a bit of a mystery. It’s common in birds, social insects, and the odd other animal (a few fish, for example), but beyond that seemingly rare. In some animals parasitism isn’t an option due to internal gestation, such as in most mammals. So it can only really evolve in species that have nests with eggs and that care for the young. However, many other animals fit this description but lack evidence of brood parasitism. It might just be that we haven’t looked enough in other species. In things like birds the eggs are so strikingly coloured that an odd looking parasitic egg often stands out a lot. In other animal groups that might not be the case (e.g. reptiles and amphibians where the eggs lack coloration), and so we’d need other more detailed methods to detect parasitism, such as genetic analyses.

6. Why did you decide to write this book?

There are several reasons. In the first instance, it’s a subject with many remarkable examples of natural history and evolution. On top of that, there’s a long history of study, involving many pioneering evolutionary biologists and Victorian naturalists and explorers, such as Charles Darwin and Alfred Wallace. It’s also been a very active area of scientific research, with lots of recent modern science and breakthroughs telling us a great deal about evolution and adaptation. So the book really tries to combine all these three aspects. Finally, deception in terms of mimicry, camouflage, and avian brood parasites has always been a key area of my own research, so it’s a subject close to my own heart.

I highly recommend Cheats and Deceits. I'm sure you will be as **fascinated** and **surprised** as I was to learn about just how widespread trickery and deception are, not only among nonhuman animals, but also plants.

The author: Dr. Martin Stevens is an Associate Professor of Sensory and Evolutionary Ecology based in the Centre for Ecology and Conservation, University of Exeter. His research focuses on sensory ecology and behaviour, especially animal coloration and vision. He studies a wide range of animals, including fish, reptiles, birds, insects, crabs, and primates. Martin's work has frequently covered topics related to deception, including mimicry by brood parasites and anti-predator coloration, including camouflage, eyespots, and mimicry. He undertook his PhD at the University of Bristol on animal camouflage and bird vision, before spending seven years as a research fellow in the Department of Zoology at the University of Cambridge. He moved to Exeter University in early 2013. Martin has published over 70 scientific manuscripts, in addition to two textbooks, including a recent one on sensory ecology and behaviour.

Marc Bekoff's latest books are Jasper's Story: Saving Moon Bears (with Jill Robinson), Ignoring Nature No More: The Case for Compassionate Conservation, Why Dogs Hump and Bees Get Depressed: The Fascinating Science of Animal Intelligence, Emotions, Friendship, and Conservation, Rewilding Our Hearts: Building Pathways of Compassion and Coexistence, and The Jane Effect: Celebrating Jane Goodall (edited with Dale Peterson). ( Homepage: marcbekoff.com; @ MarcBekoff )

**Dictionary.**

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| Evolution | [ˌiːvəˈluːʃn̩] | Эволюция |
| Adaptation | [ˌædæpˈteɪʃn̩] | Адаптация |
| Macromutations | [ˈmæk.rəʊ ˈteɪ.ʃənz] | Микросистема |
| Cheats | [tʃiːts] | Обман |
| Tactics | [ˈtæktɪks] | Тактика |
| Evolutionary races | [ˌiːvəˈluːʃnri ˈreɪsɪz] | Эволюционные гонки  |
| Imitations | [ˌɪmɪˈteɪʃn̩z] | Имитация |
| Cognition | [kɔɡˈnɪʃən] | Познание |
| Mating | [ˈmeɪtɪŋ] | Спаривание |
| Pheromone | [ˈfɛrəˌmoʊn,] | Феромон |
| Race | [reɪs] | Гонка или борьба за победу. |

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In nature, trickery and deception are widespread. Plants and animals mimic other objects or species in the environment for protection, sustenance and reproduction.

In Cheats and Deceits, Martin Stevens describes the remarkable range of such adaptations in nature and considers the way they have involved. Giving many examples, he shows the impact of deception on the process of evolution.

Here are the main ideas of the interview with Dr. Stevens:

1. What does deception in animals and plants tell us about the process of evolution and adaptation?

In general, it tells us about how animals and plants evolve strategies to survive, capture food and reproduce. There are some cases when these strategies can specialize on definite species.

Generation by generation, species become more and more perfect in mimicry, so deception also tells us a great deal about how evolution works. Dr. Stevens gives as an example cuckoos, which lay their camouflaged eggs in the nest of another species of birds and let the foster parents rear their chick instead.

Deception can also help us to understand the way that adaptation arise over generations, before we see the final (contemporary) result there was many intermediate stages.

2. How do scientists find ways of testing the impact of particular behaviors and colorings on the animals it is meant to fool?

There are many ways how scientists do this, but among them there are two the most common ways. The first one is to manipulate some aspects of a plant or animal and to see how it influences the behavior of the animals exploiting it.

Another way is to simulate animal vision with the help of mathematical models of the way that animal photoreceptors encode information about their environment.

3. What are some ways that predators exploit the resources of others and entice victims?

There are many methods predators use. For example, they can mimic the smell of the mating pheromones of an animal. Predators can also use bright colors to lure prey. In fact, many species of predator lure prey with some sort of false promise. The best example proving it is angler fish, luring prey with its modified dorsal fin spine, which looks like food for other smaller fish.

4. What are some tactics that carnivorous plants use to lure prey and increase capture rates?

These can be quite varied, using both visual and chemical deceit. Carnivorous plants emit smells that resemble food to some insects like flies, so that the prey are actively lured into the traps, some mimic the chemicals of ant pheromone trails that scout ants use to recruit other workers to food sources. Other pitcher plants use visual signals to lure flying insects.

5. Why is social and brood parasitism restricted to a few select groups of animals?

It’s really a bit of mystery. It’s often found in birds, social insects and in a few fish, but this is still rare. Some animals parasitize because they don’t have internal gestation, such as most mammals do. People know still a little about it and they have to use other detailed methods to detect parasitism.

6. Why did you decide to write this book?

There are several reasons. Deception in terms of mimicry, camouflage, and avian brood parasites has always been a key area of author’s research. Dr. Stevens says that the very subject is close to his heart, but besides this theme has always been interesting for scientists. This book tries to combine all the aspects.

Dr. Stevens recommends his book, saying that it will be interesting for readers to know about how widespread trickery and deception among animals and plants are.