

Snake origin theories spark venomous debate

September 4 2006



Dr. Michael Caldwell won't settle for conventional wisdom.

Rudyard Kipling tells a tale of how the elephant's trunk might have originated, thanks in part to the efforts of a quick-thinking snake. It seems Kipling did well to steer clear of questions pertaining to the evolution of snakes themselves - he might have found himself enmeshed within a highly charged debate which rages to this very day.

Not one to back away from a challenge, Dr. Michael Caldwell, a professor in the Departments of Biological Sciences and Earth and Atmospheric Sciences at the University of Alberta, is one of a handful of vertebrate paleontologists at the centre of this debate.

His Natural Sciences, Engineering and Research Council-funded research examines the evolutionary history of thousands of living and extinct species of snakes and lizards, in an effort to determine how they have changed over the years, how the various species are related, and

which groups are the most primitive, or basal.

Although it has long been believed that iguanians (a group of sticky-tongued lizards including the iguana and the chameleon) were at the root of the tree from which later species of snakes and lizards descended, Caldwell's research suggests there is a need to re-examine this premise. Specifically, it appears that an extinct group of marine lizards may be quite closely related to snakes. If this is the case, it may ultimately necessitate a complete rewriting of theories on relationships between snakes and lizards which have gone unquestioned for many years.

While this at times generates some fiery debates with other vertebrate paleontologists, Caldwell is more than willing to subject his work to the scrutiny of others in the field. He characterizes the debates generated by his work as being "mean, nasty, polemical, rhetorical and downright interesting" and is sincere when he says he finds it "quite fun" being at the centre of such controversy. In fact, he sees science as thriving on this sort of continued debate and rigorous questioning of assumptions, and he approaches his own research with complete openness to new ideas and findings, not to mention an insatiable curiosity. He has a saying: "Each answer only rattles the question harder."

And he rattles them plenty hard. "That's what keeps the science dynamic. Ideas and hypotheses should always be fluid and they should always be debated. Otherwise the cornerstone of what makes science science ceases to exist, the minute it becomes entrenched as dogma and no one questions it. Even if it seems to be a good idea, it should still be poked and prodded. Otherwise it sits there and rots."

His research, which he modestly says boils down to "banging on rocks", actually involves intensive fieldwork around the world (he just recently returned from Southern England and Portugal). He and his graduate students collect and examine fossil records dating back some 150 million

years, and carry out lab work involving careful descriptive analysis of the fossil content using such tools as three-dimensional computer tomography which allows them to, for example, manipulate images of the inside of the skull of a fossilized lizard.

Caldwell is hard at work putting together the pieces of a massive paleontological puzzle. It's no small feat, considering there are more species of living (let alone extinct) snakes and lizards in the world than there are mammals. So how have snakes changed over the millennia? "The list is endless," said Caldwell. "They've lost their external ears, they have no eyelids, they've lost one lung almost as an entire group. They've added 200 vertebrae to their bodies and completely lost all evidence of their limbs."

In addition to the changes Caldwell has noted between living and extinct varieties of snakes and lizards, there are also notable differences between the many species currently in existence: "It's not necessarily the case that we have living fossils among snakes, but rather, that among the living snakes there are certain groups that are more primitive than other groups of living snakes."

It's the process of tracking and documenting these various distinctions and linking them to hypotheses about relationships between the species that is leading to continual discoveries in the field of vertebrate paleontology, and it's Caldwell's passion for the scientific process and his questioning of previously held assumptions that is keeping the U of A at the forefront of research in this exciting area.

Source: by By Kent Cameron, University of Alberta

2024 from <https://phys.org/news/2006-09-snake-theories-venomous-debate.html>

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