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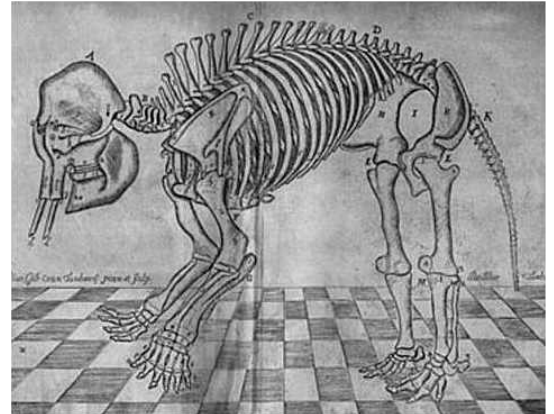
Keeping Guides on Target

Enviroscope

## The elephant's sixth toe

As long ago as 1706 scientists had suspected that elephants have six toes on their front feet. This was first noticed by one Patrick Blair who drew a picture of an elephant's anatomy and skeleton after having dissected one that died near Dundee in Scotland. On that picture he showed the six toes (right).

This discovery was later corrected to say that the sixth toe that he found is actually a rod of cartilage called the prepollex which is used to support the foot. This has once again been corrected by scientists at the Royal Veterinary College who found that the sixth toe is in fact an elongated bone - similar to ones called sesamoid bones, which are used to anchor tendons in other animals. Technically, the structure is not a toe, but it does hold the foot tendons in place.



It seems that the structure starts out as a cartilage strut but later ossifies into a true bone later in life. This is similar to the "thumb" that giant pandas have. The function of the bone is to stabilise the foot and balance the animal's huge weight by transferring weight up the bone and into the ankle joints which helps the animal balance.



Having made this discovery, the research team moved on to study rhino feet (left), which are very small for the load they have to bear. They devised a system of sensors that would be activated when trained zoo rhinos walked across the pressure plate. Their preliminary discovery is that rhinos generate more pressure towards the centre of the foot pad whereas elephants distribute their weight towards the outside of the foot.

## Mis(guided) - Daddy Longlegs Spiders

Some time around 1974 I heard a story from a friend of mine that the daddy longlegs spider was actually the most deadly spider in the world. This suddenly became a matter of great importance, since at the time we were lifting up rocks in the veld looking for snakes and the little spiders were a common find. Until then, I had always disregarded them as a nuisance that I would often find behind bits of wood and bags in my mothers potting shed. Now I was not so certain!

Needless to say, I needed to look into this matter since I so often encountered the spiders. I read up on them in the school library and managed to find out that some of the spiders people were pointing out were in fact not spiders at all, but were actually Harvestmen. These are arachnids but are not true spiders. To top it off they have no venom



**Malcolm Douglas**

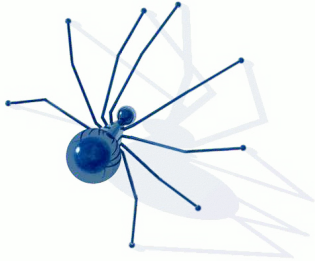
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apparatus at all, so at least part of the story was debunked.

The other spiders referred to as daddy longlegs (*Family Pholcidae*) were the ones with the very tiny bodies and ridiculously long legs that hide out in dark places. These are the little ones that go crazy when you disturb them and start up a whirling motion that gets so fast you can barely follow their movements. If you have ever seen this you'll know what I mean. Unfortunately I could find nothing specific at the time about their venom, but drew comfort from the fact that the fangs were apparently too small to pierce human skin. From then on, I assumed them to be venomous, but ignored them (carefully) whenever I found them.



Thus remained the daddy longlegs status quo until 2004 when "science" stepped in, in the form of Adam Savage of Mythbusters. In his show he busted two myths. The spiders **are** capable of biting through human skin - they just have to be forced to do it! The venom also proved to be very mild, causing little more than a slight burning sensation at the bite site.

I still occasionally hear this tall tale told by guides and if you're one that still believes this - give it a break. Daddy longlegs are to all intents and purposes harmless.

"In order to form an immaculate member of a flock of sheep one must, above all, be a sheep."

Albert Einstein

## Modelling the impact of human-caused fires in Africa

The last million or more years have seen humans influencing Africa's natural environment. One of the most significant of these influences is through the use of fire in the last 300000 years or so. What is not clear is how frequently fire burned in "the old days" versus what is happening today.

A recent study done at the Council for Scientific and industrial Research (CSIR) has helped shed light on how human-started fires have shaped Africa's landscape. The findings appear in the Proceedings of the National Academy of Sciences.

Analysis of current satellite data is quite alarming since it shows a huge number of fires burning at any one time on the continent. What the researchers wanted to know was if there is more fire in Africa today than there was in the past, so they designed a mathematical model to assess this. According to their findings, the current frequency of fires is at its lowest level in the last 40000 years.

The researchers, led by Dr Sally Archibald hope that the model will be useful in helping national parks develop fire management policies. "*People have been in Africa for over a million years, so you cannot try to suppress all human fires. You have to include humans as part of your system, and fire managers still need some guidance on what is the best way to burn these systems and yet maintain biodiversity*".



## Ostriches have “lymph” penises

All birds have a single urogenital opening through which they reproduce, defecate and urinate. The way birds usually copulate is to use the “cloacal kiss” in which the cloacae are briefly pressed together and sperm is transferred from the male to female. In a few birds, an erectable penis is used for this transfer. If you have ever seen a male ostrich “urinating” you no doubt noticed the large and contorted penis that protruded when it did. Of all the birds, it is only the ratites (ostrich, rhea, emu, cassowary and kiwi), ducks and geese, flamingos and buffalo weavers that have penises that can be visibly erected (as far as I know).

Researchers studying the “explosive” erections for which male ducks are known, found that the erection is driven by lymphatic fluid driven into the penis. This cannot be sustained for any length of time, so erections are fleeting. Similar studies into the erection mechanism of ostriches came to the conclusion that unlike all other birds, the male ostrich’s erection is blood based. This was initially assumed because there are surface blood vessels on the ostrich penis which gives it a similar appearance to a mammal’s penis.

More recent studies conducted by scientists at Yale University have now found that the ostrich erection is also lymph driven. *“Earlier reports from the late 19th century had suggested that the ostrich had a blood vascular erection mechanism, while no data existed for the emu or rhea,”* said Dr Patricia Brennan who co-authored the study. *“Since all other birds with penises have lymphatic erection mechanisms, I always thought that it was strange that the ostrich would be blood vascular.”*



Boa constrictors mating.

Photo: M Douglas

“So what” you may well ask? The fact that all birds are now found to use lymphatic fluid pressure to erect the penis raises some interesting questions about the evolution of the trait. It also confirms that this mechanism evolved in the ancestor of modern birds. The older reptiles use blood to maintain an erection (left) as do mammals. The question thus arises - why did birds evolve a mechanism that was based on lymphatic fluid and not blood? *“The reason why the change between blood vascular and lymphatic took place remains a mystery.”* Her findings are published in the Journal of Zoology.

## Conservation “triage”

There is almost unanimous agreement among scientists and conservation biologists that a massive loss of biodiversity is imminent on earth. The degree of loss is still debated. The most pressing challenge now is how to limit that loss, and to decide whether or not we should intervene and try to save certain species, or assign them to the “losable” list.

This is reminiscent of the system used in emergency trauma medicine in which multiple patients are triaged according to the severity of their injuries. Using this system, medical personnel can quickly assess the condition of the injured and place a card on the patient’s chest. The colour of the card determines the urgency of treatment you will receive. If you luck out and receive a black card, it means that you will be given pain medication only until your expected death. Red cards are for immediate treatment, yellow for delayed treatment and green for the walking wounded.

In a study conducted by Dr. Murray Rudd from the Environment Department at the University of York, 583 scientists were surveyed regarding their assessment of the likelihood of a major species loss on earth. Not surprisingly 99.5% of the responders agreed that it was ‘likely’, ‘very likely’, or ‘virtually certain’ that major losses will occur. Between 73% (western Europe) and 91% (southeast Asia) thought that the likelihood was ‘very likely’ or ‘virtually certain’.



The respondents were also asked to consider conservation triage. What did they feel about making decisions to

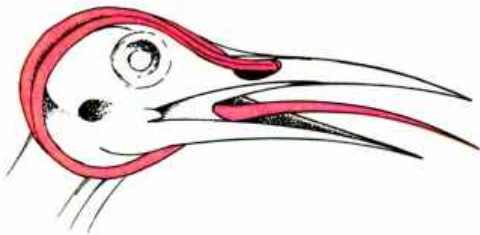
NOT intervene to save a highly threatened species? Although triage has always been considered controversial in conservation circles, 50.3% agreed and 9.3% strongly agreed that these sorts of criteria for triage decisions should be established.

## More on the woodpecker head

Much work has been done on the woodpecker skull structure and how it prevents brain injury when the bird is pecking at a hard tree trunk. All this has been documented and written about in scientific paper after scientific paper. Now another paper, (the result of work by Ming Zhang of the Hong Kong Polytechnic University) has attempted to put more accurate numbers on the forces at work.

What is already known about this is that the birds have a very small subdural space between their brains and their skulls. This prevents the brain from accelerating and decelerating back and forth as it does in humans. This factor is what leads to concussions. Also, a woodpecker's brain is longer top-to-bottom than front-to-back, which spreads the forces out over a greater surface area.

What the researchers found was that while pecking, the head reached velocities of 6 m/s and a deceleration of just over 1000 times that of gravity. The pecking actions were modelled and fed into computer simulations which calculated stresses and other physical factors. An important discovery is that the length of the upper and lower parts of the bill are uneven. This causes the forces to be unevenly distributed into the bones and lowers the total strain individual bones have to take. The birds also twist their heads very slightly from side to side as they peck, also contributing to asymmetrical loads being generated in the bone.



Another (already known) factor is that the hyoid bone (which loops around the whole skull) acts as a safety belt for the skull. The most important factor however, is the fact that the bone density is not equal throughout the skull. The differing densities help redirect and absorb stresses as they pass through the material and before they reach the brain. All these small, but important factors combine to make a skull that can endure incredible forces. The results of this study are published online in the journal Plos One.

## What is it

This rather exotic looking snake is actually quite a common species in South Africa. This is a young specimen, but adults (particularly the females) assume a far less colourful guise.



## In the news

### Prices to die for

Mr Kiyoshi Kimura is the owner of a sushi restaurant chain - and earlier this month single-handedly contributed a major death blow to the bluefin tuna by buying a single one for \$736,000. With prices like that there is little hope of keeping tuna fishermen from plying their trade and fishing this species to extinction.

### How the lethal frog fungus spread

The deadly chitrid fungus (*Batrachochytrium dendrobatidis*) (Bd) decimating the world's frogs was almost certainly distributed by trade in amphibians. The chitrid fungus genome has now been sequenced and Cape, Swiss, Mallorcan, and Japanese forms have been identified. Scientists led from Imperial College London believe now, that the most widespread and lethal form was probably created by a crossing two or more of the types. It

has been dubbed BdGPL because of its global prevalence. It seems that the centre of its origin is right here in Southern Africa - possibly dating back to the time when platanna frogs (*Xenopus laevis*) were exported to be used in pregnancy testing.

### Loggerheads take 45 years to mature

The longer an animal takes to reach maturity, the more vulnerable it is to anything that kills off individuals before they can reproduce. Mice for example live life in the fast lane and reach maturity in about a month. They therefore stand a good chance of maturing and reproducing. Research now published in the journal Functional Ecology gives the best estimate for time to maturity as 45 years for the female loggerhead turtle. Is it any wonder that they (and all other marine turtles) are struggling to cope with the human onslaught?

### Another unfounded HIV cure claim

One of the largest geckos on earth is the feisty Tokay gecko. This harmless animal was always a common feature in the cities of the far east where they provide an excellent service in eating up insects attracted to the city lights. Between 1998 and 2002 more than 8,5 tonnes of dried geckos were **legally** imported into the USA for traditional chinese medicinal purposes. Many more tonnes are traded in the east - Indonesia alone exports about 1,2 million dried animals a year. Recent claims being spread around the internet that the dried tongue and internal organs can cure AIDS and cancer have escalated the trade to new "heights", bringing with it a new low on my respect-of-humans scale. Traders in Java expressed dismay that the geckos are getting harder to find ...!

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- Trails guide (most of a day) R850



## What is it - Answer

The snake shown is a juvenile boomslang (*Dispholidus typus*). The key features of this species seen in this image are the very large eye and the inflated throat. The large eye gives the snake a deep head, which then tapers down towards the snout. Young snakes start out being very colourful but gradually fade until they are a more uniform colour. After reaching sexual maturity they may again change colour - males becoming bright grass green and females a dull olive grey or brown. The colour changes mentioned take place in the low lying eastern parts of the country, but boomslangs in the eastern Cape particularly may colour up to become yellow and black.