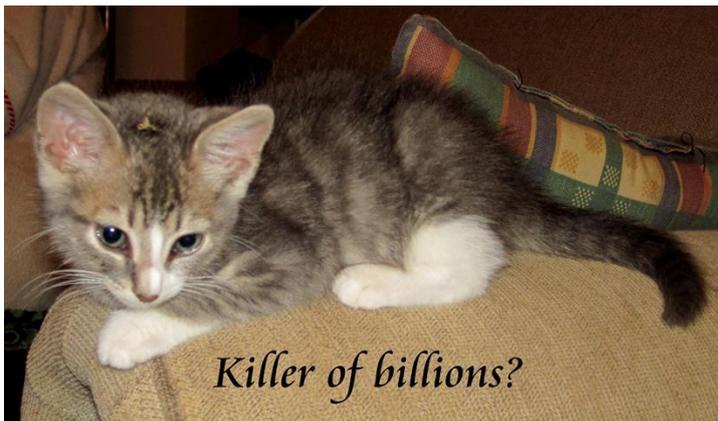




Cats stand accused – further indictments!

In 2010 (if I recall) I wrote about the huge toll being taken by domestic cats on urban wildlife. In that article I was hesitant to mention that the current estimate of birds killed by domestic cats in the **USA ALONE** was around 480 million birds a year. The figures and the methods by which they were derived did not sit well with me. Since then, I have seen this figure revised ever-upwards and have avoided writing anything further about it for fear of publicising incorrect information as well as for fear of retribution by lovers of the domestic moggy!

I now need to tell you that that first information was way off the mark. The numbers have now been revised so much higher that one could hardly be blamed for thinking that birds must be extinct in the States! According to the results published in a January 2013 joint study¹, cats (domestic and feral) kill up to 20 billion animals per year in the US. The figures are made up of between 1.4 – 3.7 billion birds and 6.9 – 20.7 billion mammals.



I would have immediately pooh-pooh'd this had it not been for the fact that the research is rigorously peer reviewed and was conducted by scientists from two of the world's leading science and wildlife organizations - the Smithsonian Conservation Biology Institute and the U. S. Fish and Wildlife Service (FWS). According to them, about 69 percent of the bird mortality from cat predation and 89 percent of the mammal mortality was from un-owned, or feral, cats.

Cats are a serious problem for wildlife, there is no doubt. Of the island extinctions of mammals, birds and reptiles recorded by the IUCN, 14 per cent (33 extinctions) have been caused by or been assisted by feral cats. If this isn't bad enough, another study by British scientists² (lead by Karl Evans of the University of Sheffield) has indicated that as little as a single brief appearance of a cat near a bird nest results in at least a doubling of the chance of that nest's failure. Affected parents bring about 33 per cent less food to the nest than do undisturbed parents and they protect the nest less which increases the chance of the nest being robbed by third party predators.

¹ Loss, S.R. Will, T. Marra, P. (2013) The impact of free-ranging domestic cats on wildlife of the United States. Nature Communications 4, Article number: 1396 doi: 10.1038

² Bonnington, C., Gaston, K. J., Evans, K. L. (2013), Fearing the feline: domestic cats reduce avian fecundity through trait-mediated indirect effects that increase nest predation by other species. Journal of Applied Ecology, 50: 15-24. doi: 10.1111/1365-2664.12025



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"Many people are alive but don't touch the miracle of being alive."

Thich Nhat Hanh

What causes lightning?

The way that electricity builds up in clouds has long been theorised to come from small ice particles rubbing together and creating tiny static electrical charges. These accumulate until a point is reached where they are discharged to the ground down a "ladder" of ionised particles. Now researchers have confirmed the validity of the theory. As incredible as it seems, minute frosty particles of ice rubbing against larger chunks of ice (called "graupel") can generate enough static electricity to generate a bolt of lightning three times hotter than the surface of the sun!



Fig 1: Build-up of static charges within a cloud and between cloud and ground. Source: National Earth Science Teachers Association (NESTA).

In a paper called [Precipitation Ice and Lightning: from Global to Cell Scales](#), Walter Petersen, Wiebke Deierling, Michael Gauthier and Hugh Christian of the University of Alabama, outlined the causes they discovered from research published in 2006. Over a three year period, Petersen and his colleagues used the Tropical Rainfall Measurement Mission (TRMM) satellite to look inside more than one million clouds. This satellite has radar that detects ice and a lightning image sensor (LIS) that detects lightning flashes. A simple comparison of the relationship between the two has revealed a very high correlation (above 90%) between ice quantity and frequency of lightning. On the scale of individual storms, systems with more than 10 million kilograms of ice in them were found to produce lightning flashes about once per minute.

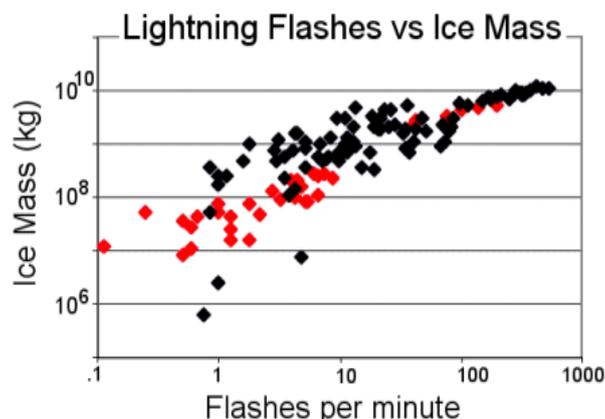


Fig 2. Correlation between amount of ice in a cloud and the incidence of lightning. (Source NASA)

In cumulonimbus thunderclouds air updrafts cause ice particles to rub together. The small pieces of ice become positively charged and float to the top of the cloud, while the negatively charged "graupel" sinks towards the bottom of the cloud because of its greater weight. As the two types of ice separate they generate mega-volts worth of static electrical potential that results in the lightning flash. Petersen believes that because of the strong correlation between volume of storm ice and lightning, future hail predictions will be made easier by analysing lightning flashes rather than the old method of trying to find where the ice was.

What is it?



This image was sent to me by my friend Petros Masombuka a little while back. He was asking what had caused the rainbow effect in the clouds. I was not exactly sure, but thought it was probably some form of diffraction being caused in the thin clouds. This is what I told him, but my answer was sketchy and needed some research. What would you say is going on here?

"Success is the ability to go from one failure to another with no loss of enthusiasm."

Sir Winston Churchill

There may be something to snake oil after all

Back in 2005, Professor James Hicks at the University of California made an amazing discovery about pythons. He found that within 48 hours of swallowing a large meal, the size of a python's heart increases in size by up to forty percent! This is thought to help with the metabolic functions of digestion. Once digestion is complete, the heart returns back to its original size and the metabolism starts to return to "sleep mode".

During gaps between meals, pythons shut down much of their unused body functions, yet are able to prevent significant loss of weight and condition. Apparently, cardiac proteins are produced that quickly enlarge the muscles of the heart's single ventricle to such an extent that the heart is capable of pumping 50 percent more blood while

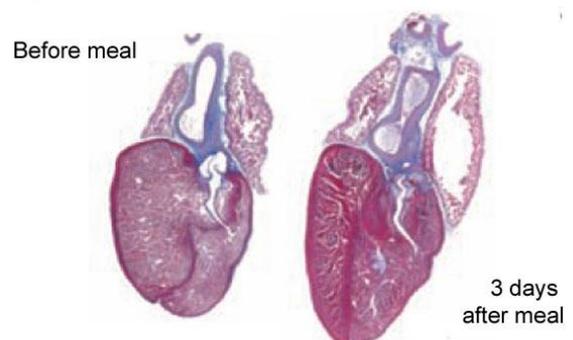


Fig 3: Burmese python heart before and after eating.
Source: Science



Burmese python Photo: M. Douglas

digesting than it can when the snake is slithering around in search of food or escaping an enemy. This fact has obvious implications for the treatment of heart disease and for increasing circulation generally and needed to be followed up.

New research at the University of Colorado and the Howard Hughes Medical Institute (lead by Leslie Leinwand) has been published in the journal *Science*³. What the team found was that there is a highly complex mix of circulating fatty acids

present in the blood of pythons that have recently fed. When this was introduced into the blood of pythons that had been fasting, they found that the effect was to also increase the heart size. They then took the mix and introduced it slowly into the blood stream of mice over a period of a week and the size of the mouse hearts increased - but so too did the size of individual heart cells. The effect of these substances in humans has not been tested, but there is clearly great potential.

Artemisinin resistant malaria

I have read that scientists believe as many as quarter to half of all humans who have ever lived have died as a result of malaria⁴. How they established this I don't know, but whatever the case, malaria is definitely the **KING** of infectious diseases – nothing comes close to its power to debilitate and kill.

The role malaria has played in our history is incredible. For example it is believed that Alexander the Great was killed by malaria at the height of his power. In 452 AD Atilla's invading army was stopped by malaria in Rome. Genghis Khan decided against invading Western Europe because of the disease. Napoleon Bonaparte was unable to put down the uprising in Haiti in 1804 because he was sick in bed with malaria at the time. The list goes on and on. What is not so well known is how widespread malaria was before the invention of DDT and other methods of eradicating mosquitoes.

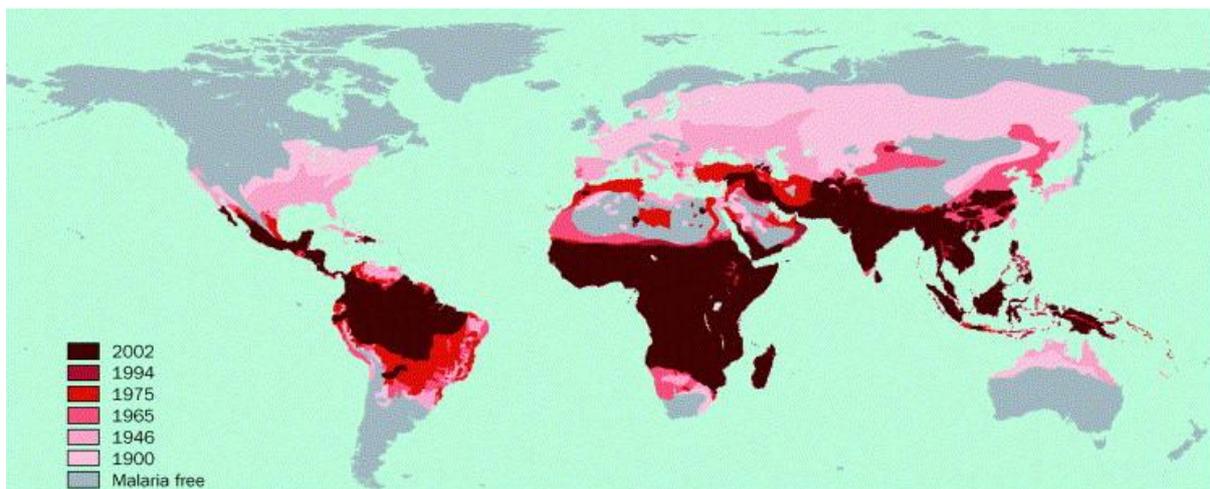


Fig 4: Historical distribution of malaria worldwide. (Source: Science Direct)

³ Leinwand, L.A. et al (2011) Fatty Acids Identified in the Burmese Python Promote Beneficial Cardiac Growth. *Science* 28 October 2011; Vol. 334 no. 6055 pp. 528-531 DOI: 10.1126/science.1210558

⁴ <http://ngm.nationalgeographic.com/2007/07/malaria/finkel-text/6>
[Xanthones as antimalarial agents: discovery, mode of action, and optimization.](http://www.nature.com/news/2002/021003/full/news021001-6.html)
<http://www.nature.com/news/2002/021003/full/news021001-6.html>

It is now reported from Cambodia, that the malaria parasite there is showing resistance to Artemisinin, the most important front line drug used for malaria treatment. This is very bad news in that over the years, the resistance of *Plasmodium* to drugs has usually started in SE Asia and then made its way around the world – especially to Africa. The problem is that the drug works so well that it is given out in much of Africa without much consideration for its proper use. In the same way bacteria become resistant to antibiotics, the malaria parasite slowly builds up a genetically based immunity to the prophylaxis. Many other drugs have already been rendered useless in this way and Artemisinin seems to be going the same route.

What is it – (Answer)

The image shows a phenomenon called a circumhorizontal arc. They are also incorrectly called fire rainbows, but they have nothing to do with fires and they are not formed in the same way as rainbows.

Requirements for formation are that the sun must be high in the sky (58° or higher) and there must be cirrus clouds present which contain plate-shaped ice crystals. Light enters the crystals through one vertical face and exits through the horizontal bottom surface. This acts like a prism and the light is diffracted into its constituent wavelengths. Red is always the upper colour.

Several other atmospheric phenomena look quite similar to circumhorizontal arcs, but are caused in different ways. For example, cloud iridescence is created in a way that looks similar to the effect we see when an oil film creates a “rainbow” in a puddle. Cloud iridescence may be seen when the clouds are very thin and sunlight is diffracted by very small ice crystals or water droplets. Cloud iridescence does not have to form lines parallel to the horizon as do circumhorizontal arcs (see fig 4).



Fig 5: Cloud iridescence left compared to circumhorizontal arc right (Source Wikipedia)

It's now more than just the 3 R's

1. **Reduce** - consumption
2. **Reuse** - don't buy new every time
3. **Repurpose** - turn old junk into something creatively functional
4. **Rot** - compost what organic matter you can
5. **Repair** - don't replace
6. **Return** - rather buy in glass that can be returned
7. **Refill** - avoid disposable containers where possible
8. **Refuse** - to buy overpackaged, disposable, single-use junk
9. **Recycle** – what cannot be used in any other way