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Keeping Guides on Target

Enviroscope

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Examining the truth

Ever since I entered the guiding industry I have heard guides utter an astonishing array of rubbish as if it were gospel truth. The tragedy of this is that much of that original drivel I heard is still being talked about as if nothing had changed. Where do these stories come from?

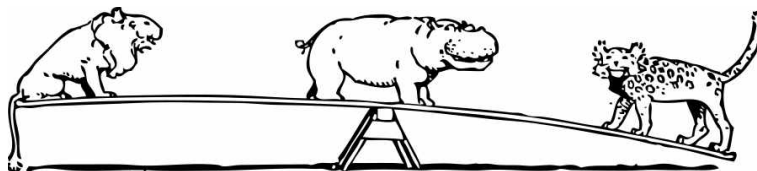
These inaccuracies come in a range of guises.

- There is the situation where information which was thought to be correct a long time ago is now known to be incorrect. Information and knowledge changes with developments in technology and when better research and scientific methodology are applied. Nobody can be blamed for quoting wrong information sourced from reputable places, but to repeat it years after new and better information has been released is just not good form.
- There are the just-plain-bad-science arguments

which come about simply because the information is published in a book. Be careful of the books you read - there are many books written which are so inaccurate that in my opinion they should actually be removed from library shelves - particularly those libraries where guides-in-the-making do their research.

- Another classic is the distortion-of-the-truth factor. Someone, somewhere hypothesises something which then gets taken to be true. This is then incorporated into the guiding repertoire. This is especially bad when the distortion is passed along by trainers.

Over the next few months (and as I find new things to query) I will be examining some of these errors. I will try and provide a balanced viewpoint on each topic and hope to be able to give you some more accurate information for you to use when talking about these subjects.



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Imagine if Earth had two moons!

According to a new theory, this may once have been the case in fact! Scientists have long been confused about something they call the **lunar dichotomy**. This revolves around the reasons there is such a difference between “our side” and the “dark side” of the moon. Our side is relatively flat but cratered, while the far side is also heavily cratered, but has mountains over 3000 meters high. This apparently does not make sense.

According to the scientific team who has proposed the idea, the global impact that created the moon in the first place may have resulted (albeit briefly) in two satellites. In this scenario, the vast quantity of materials thrown up by the impact resulted in two separate accretions, one pretty large and the other somewhat smaller. As the materials coalesced into the two neonate moons, the smaller one eventually caught up with and slowly crashed into the larger moon.

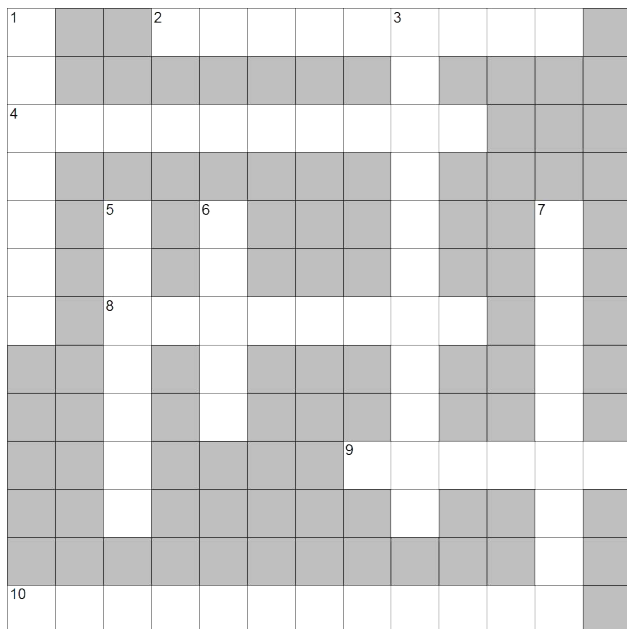
At the time of the impact the larger moon would have still been largely molten with a solid crust on top of a magma sea. The fact that the impact was a slow one is important in that any impact faster than 3 km per second would result in melting the rock again and

causing massive shocks. If this had happened the moon would have probably been smooth all the way round today. This slow impact would have displaced the molten rock from the impact site to the opposite side of the moon (our side) and would have left some relatively unaltered debris where the collision took place - on the dark side. This is an idea backed up by observations from Nasa's Lunar Prospector spacecraft.

The researchers involved hope that data from two NASA lunar missions will substantiate or challenge their theory within the next year - NASA's Lunar Reconnaissance Orbiter and a high resolution gravity mapping mission to be carried out next year by the Gravity Recovery and Interior Laboratory (GRAIL) mission.

According to Dr Maria Zuber from the Massachusetts Institute of Technology (MIT) in Cambridge, US, the theory and research “*demonstrates plausibility rather than proof*”. She also said that the authors “*raise the legitimate possibility that after the giant impact our Earth perhaps fleetingly possessed more than one moon*”.

Crossword



EclipseCrossword.com

Across

2. (of) fruits which open spontaneously at maturity to release seeds. (9)

- 4. The path followed by a bullet moving through the air towards its target (10)
- 8. A non-infectious potentially fatal disease usually caused in animals chewing on bones. (8)
- 9. The process of removing any outer covering that can be shed or cast off (such as the cast-off skin of a snake) (6)
- 10. The relation between two different kinds of organisms when one receives benefits from the other without damaging it. (12)

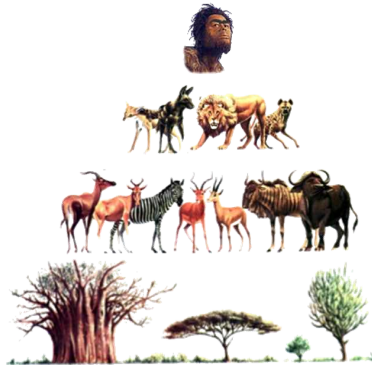
Down

- 1. The egg case of insects such as preying mantises. (7)
- 3. The teeth found in carnivora which are adapted for shearing flesh. (11)
- 5. When referring to the moon, which is more than half full. (7)
- 6. A milky exudate from certain plants that coagulates on exposure to air (5)
- 7. Posterior part of a bird's body from which the tail feathers grow and where the preen gland is found (9)

Tallying our species

Over the years I have heard such widely differing estimates of the number of species on earth that I have no idea who to believe anymore. What I do know, is that the number of species that have been through the process of being described and named (about 1,2 million so far) is very small in relation to the total number of species on earth.

Recently, a group of scientists have used some sophisticated mathematical formulae and predictions to try and get a more accurate estimate of our fellow species. Using common and easily discovered forms such as mammals and birds, they modelled the numbers of other less well-known groups within the classification hierarchy. The number



they came to was 8.7 million plus or minus an error of 1 million.

The figure includes all animals, plants algae etc but excludes bacteria, viruses and other very simple single celled organisms. According to other scientists who peer reviewed this work, this is the most accurate estimate of its kind ever. The results would indicate that earth is host to about 7.77 million species of higher animals (12% described), 610000 fungi (7% described), 300000 plants (70% described) 40000 protozoa (22% described) and 30000 complex green algae (50% described).

The work is published in the public library of science.

The Red Queen Hypothesis



In Lewis Carroll's novel "Through the Looking Glass" Alice and the Red Queen hold a race in which they run in place without ever getting anywhere. This seemingly futile race is the inspiration for the naming of a hypothesis which looks at the reasons why sexual reproduction takes place at all.

Male animals are generally superfluous to the needs of the population, merely contributing their genes to the next generation. Males don't make sense. A population of asexually reproducing animals can increase at a rate far faster than is possible when sex is involved. So, if this is the case, why then are there males at all and why does sex play such an important part in the animal kingdom?

The red queen hypothesis relates to an evolutionary race that is taking place between animals and the parasites which infect them. Given time, a parasite species gets the hang of how to best utilise its host, which is a very undesirable situation for the victim. This is believed to be one of the reasons that sex was "invented" in the first place. By recombining their genetic code during sexual reproduction, a species occasionally comes up with rare combinations of

genetic material called alleles. These combinations foil the parasites attempt at colonisation. Of course, there is also a better chance that the alleles will perpetuate themselves in the population affording the species at least a temporary reprieve from the parasites attentions. Michael Brothurst wrote in the journal Science, that "*this continual selection for rarity favours sexual reproduction over asexual reproduction; sexual re-combination allows hosts to reshuffle their pack of alleles and generate new, rare combinations in their offspring.*"

What evidence is there for this one may ask? The hypothesis stands up to scientific scrutiny both practically and theoretically. In a study by Levi Morran and colleagues (Indiana University) the researchers tested how roundworms would fare against a species of bacteria that kills them. In this laboratory test, they found that the roundworms which produced asexually were killed off in just 20 generations, while the sexually reproducing worms were able to continually evolve to fend off their bacterial attackers.

Thanks heavens for parasites, or sex may have never been necessary, which would have been a very sad state of affairs, (especially for us males)!



"My religion consists of a humble admiration of the illimitable superior spirit who reveals himself in the slight details we are able to perceive with our frail and feeble mind."

Albert Einstein

How much water is there on earth?

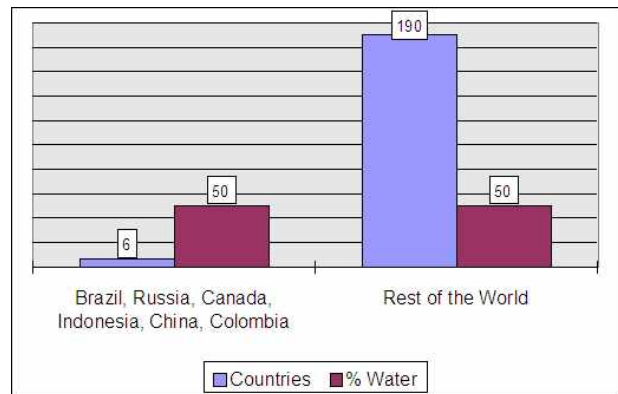
To understand this, let's shrink the earth to the size of a basketball. At this scale, all the water on earth would only fill a ping pong ball. According to the US Geological Survey there are about 1.332 billion cubic kilometres of water on our planet. Although this sounds like an enormous volume, it really isn't. Using another analogy, if the earth was an apple, all the water on earth would form a layer thinner than the fruit's skin.

Remember that this is ALL the water on earth. Fresh water is even more precious when one considers that the icecaps hold 70 per cent of it, the ground water and water vapour another 29 percent and surface water accounts for less than 1 percent of the world's freshwater total.

The freshwater that is accessible is also dominated by just six countries. Brazil, Russia, Canada, Indonesia, China and Colombia have 50 percent of the world's freshwater reserves. At least a third of the world's

countries are "water-stressed" meaning they consume more water than their environment is able to supply.

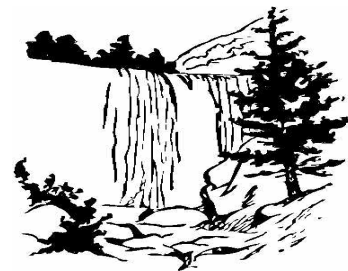
How long can we continue to use our drinking water to flush away our waste or to clean the car or water a bunch of mostly useless flowers in our gardens?



What is it?



This plant can be found in many bodies of water in South Africa, where it can become a serious problem. [Photo: Malcolm Douglas]



With legs in the air ...

Why is it that dead or dying insects always seem to end up lying on their backs with legs akimbo? In thinking of the best way to describe this, I came to the conclusion that insects actually die energetically, their last efforts being the cause of the all familiar upside down dead insect posture.



If sprayed by some insecticide (not by you surely?) the toxins cause the insect's muscles to convulse uncontrollably and the insect to lose co-ordination of its legs. This

will often cause it to "capsize" and end up on its back. Without the necessary co-ordination to rock itself around like healthy insects do, it is unable to right itself and will eventually die as a consequence of either the poison or from dehydration.

Similarly, sick insects, or those dying a natural death lose the ability to move properly and also end up on their backs. I recently watched a wasp in my bathroom do exactly this. It could no longer fly properly and each time it did, it would collide with something and end up tumbling to the floor, buzzing around in circles. On its final tumble it landed on its back and no longer had the strength or co-ordination to get back up again. I tossed its body outside yesterday.

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 - Level 3 (day and a half) - R1250
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 - Trails Guide (most of a day) - R850



Diclofenac is back (in the news)

Well actually it never went away! The story surrounding this drug has been ongoing for more than a decade and what a strange irony there is embedded within it. The way the Indian people revere and love their cattle means that they do not euthanase sick and suffering animals, choosing instead to ease their pain with anti-inflammatory drugs. Their drug of choice is diclofenac. This seemingly kind act however has a disastrous effect on vultures which feed on the animals carcasses when their time is eventually up.

Three species particularly have suffered rapid population crashes since the 1990's. Numbers of the Indian vulture (*Gyps indicus*) and slender-billed vulture (*Gyps tenuirostris*) are down 97% over the last decade and the oriental white backed species has crashed more than 99.9% in the same time.

A vulture-friendly drug called meloxicam can be used on cattle just as effectively and is as widely available as diclofenac in pharmacies in India.

Could a croc swim the Atlantic?

Crocodylians are divided geographically into the old world and new world forms. Ours and those from Asia are the old world types whereas those in the Americas are of the new world type. Regardless of their geographical distinctions, it is pretty obvious to most people that they share some very similar common characteristics. So how did they come to be in such far off lands? The answer seems to be that they swam!

Research into the DNA of crocodylians generally, shows that they share the same blood line. My first thought was that because they are such an ancient group, their DNA was already well mixed before the split of the continents, but according to the study which was headed by Dr Evon Hekkala, this is not so.



Their analysis of 12 species of crocodylians shows that the relationship of DNA is so close that the split must have taken

place very recently indeed, and well after the Atlantic Ocean had already attained its present day width. This indicates a date sometime between 3 and 7 million years ago. *“People talk about crocodiles as an ancient lineage that is static, like the dinosaur. Our evidence suggests that the diversification in the true crocodile has arisen during the same period of time that modern humans arose, which is relatively recent, suggesting that the crocodile evolution is actually a very dynamic phenomenon.”*

Could a croc actually survive such a long swim? Again, the answer would appear to be yes. They have salt glands to help them rid themselves of excess salt from sea water, they can go for more than a year without eating and they can retain active sperm for several years. This latter trick would have enabled crocs to reproduce in their new homeland. The scientists' evidence showed that a single lineage was established in the New World and then diversified into the current four Americas-based species.

What is it - Answer

The plant shown is a true fern that goes by the name red water fern, red azolla or mosquito fern (*Azolla filiculoides*). The plant originates in South America but has now spread to most of the warmer parts of the world including Asia, Africa and Australia. It is believed to have been brought to South Africa in the 1950's as an aquarium plant.

Although it is a serious weed in this country, it has a rather strange combination of good and bad characteristics. The plant lives in a symbiotic relationship with a bluegreen alga (*Anabaena azollae*) which can fix sufficient atmospheric nitrogen to supply all the plant's nitrogen needs. This allows the plant to

grow so fast that it can double its biomass every two to three days. At this rate it can totally cover a dam in very short order, preventing oxygen exchange at the surface and preventing sunlight penetration.

The plants are used widely in the rice paddies of Asia, where they prevent the growth of competing weeds and the decaying fern provides tonnes of nitrogen to the rice plants. The total surface cover also suppresses the survival of mosquito larvae, hence the name mosquito fern.

Ref: Bromilow, C. 1995. Problem Plants of South Africa, Bayer

Crossword - Answers

Across

2. DEHISCENT
4. TRAJECTORY
8. BOTULISM
9. SLOUGH
10. COMMENSALISM

Down

1. OOTHECA
3. CARNASSIALS
5. GIBBOUS
6. LATEX
7. UROPYGIUM