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## The Demon-Haunted World

Category: General Science

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### General Bookthoughts:

As with all CS books, it is beautifully written, packed with wonderfully enlightening facts and ideas and is down-to-earth. The book takes aim at many holy cows, but never seems to patronise or judge. What a talent that is.

Richard Dawkins wished he had written this book. That is about as good an endorsement as you will find. The book unpacks all the cluttered thinking that surrounds popular subjects that are backed by little evidence – astrology, UFO sightings, new age ideas, religion etc. Thankfully he not only points out some flaws in the evidence, but highlights why we are susceptible to believing things (generally it makes us feel good) on little evidence and how the scientific method is the only way we know of that protects us from these traps.

I have not extracted all of his wonderfully enlightening thoughts. You simply cannot paraphrase CS. Read this book more than once.

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### Specific Bookthoughts:

- The teaching behind science is key. We need to promote awe and wonder and be creative in our teachings. CS was lucky enough to have been a student when scientists like Fermi (physics), Chandrasekhar (maths) and Kuiper (astronomy) were teachers. His father also instilled a sense of wonder in him (similar to Feynman it seems).
- Science has contributed directly to our quality of life. CS points out that, perhaps the best measure, is to look at longevity. Only 100 years ago our life expectancy was 50, now it is eighty and rising (in the developed world). This is directly connected to the discovery of the germ theory of disease, great general public health and medicines/medical technology. I think that, where medical care is missing, we see longevity decrease (developing world). The connection to science is direct. I wonder where we would be if we were not able to react to diseases like TB, Cholera, Malaria, AIDS, Swine Flu, Asian Flu etc. As CS says, "advances in medicine and agriculture have saved vastly more lives than have been lost in all the wars in history." As an aside, CS is also aware that science may also be the cause of devastation (fusion bombs etc).
- I really enjoyed this quote from Edmund Way Teale: "it is morally as bad not to care whether a thing is true or not, so long as it makes you feel good, as it is not to care about how you got your money as long as you have got it."
- CS adds his in quotable point: "For me, it is far better to grasp the Universe as it really is than to persist in delusion, however satisfying and reassuring."
- It is important that something is both provable and disprovable. If an idea cannot be tested (immune to proof), it is inherently unreliable.
- Science is "a way of thinking" at its core – the results are a body of knowledge. It refines itself by eliminating errors as it progresses.
- CS points out that the level of scientific knowledge is very poor outside of the scientific community. Our ability to survive and run our lives as we expect is very dependent on science (transport, communication, agriculture, medicine, entertainment, education etc.) and yet there is this paradox – we are very illiterate from a science perspective. "We have also arranged things so that almost no one understands science and technology. This is a prescription for disaster." In particular he is referring to the combination of ignorance (by leaders) and power (science).
- Science aims to uncover facts. The universe is the way it is – rather than the way we hope or wish it to be – and so what we uncover may not be what we like or what we find to be intuitive.
- Another way that science butts up against human nature is when it challenges our long held beliefs. Criticism, if valid, is very useful but our wiring tends to cause us to reject criticism. From a common sense perspective, we should ignore what supports our ideas and welcome what challenges it.
- We also apply mental short cuts – we like patterns (particularly faces) and read patterns into information whether it makes sense or not.
- Mars has a surface area about the same size as the land area of the Earth.
- CS discusses his disappointment with how lazy and superficial we tend to be – celebrity cultures, watching daytime TV, playing video games, reading magazines etc. It made me wonder about a related analogy: if fresh vegetables are good for us, why do we not crave them? Yet, we do crave what is bad for us: chocolate or big Macs. Why would evolution set us up like this (both our mental cravings and physical cravings seem counter intuitive?). I will get into this in a thoughtpiece....

- There is a chapter on alien abductions. Interestingly, out of all the beliefs that have shallow evidence, this one is sided with science in that scientists do wish it were true (which they don't for astrology, alchemy, new age beliefs, religion etc.). This shows me that science remains critical even when it wishes something were true. This goes against our instincts – we tend to believe something is true if we need it to be true (religion) or it makes us feel good.
- Before 1947, there are almost no reports of flying saucers (post 1947 we saw movies and read books with flying saucers in them). The bulk of them are also within North America.
- With alien abductions, assuming they are part of a dream, makes me wonder why we would want to have sex with a being with antennae and compound eyes. Why would our brains construct this particular story?
- Skepticism is not something we need to learn – as CS shows, we have it each time we buy a second hand car. Yet, in really important aspects of our life, we are credulous – economics, politics, business (advertising) and in religions.
- CS shows how alien abductees who maintain contact with the aliens can answer questions that we already know the answer to, like: “should we be good?” but cannot answer questions we yearn to understand like “please provide a proof of Fermat’s last theorem.”
- Our ability to create a virtual reality of the world is innate in us – each time we see, we are creating such a virtual reality. Therefore, software exists to transform nerve impulses into pictures and emotions. It is not a massive step for us to extend this software into the realm of hallucinations (indeed this happens each time we dream).
- We are reminded that we all hallucinate – when we dream. We also hallucinate when we are very tired, when we take certain narcotics, when we have a high fever and when our brains are not functioning properly.
- King James 1, the first Stuart monarch, was the one who translated the bible into English (King James bible).
- CS is another author who is sceptical of therapists who often seem to endorse or even create false memories. We now know that memories are not fixed or stored in some specific place in the brain. They are reconstructions that occur and draw on various parts of the brain the construct the story as we believe it happened (and we know how biased we are about our own abilities and character). Clearly scepticism of a patient’s story is potentially offensive to the patient and could cost the therapist business.
- I remember once reading, I think in *The Blind Watchmaker*, that Dawkins never knowingly says something that is not true or something he does not believe in. CS adds to this – he points out that “it’s okay to reserve judgement until the evidence is in.”
- I enjoyed the reference to the obvious insult portrayed against our intelligence each time we see a celebrity endorsement of a big brand that has nothing to do with their particular speciality (tennis player endorsing a watch, golfer endorsing software etc.). How shallow are we?
- The much quoted baloney detection kit is worth looking at over and over again. Some of the ideas for the toolkit are: independent verification of facts, open debate to those who do not share your opinion, authority must have no role or rank in the debate, attempt to explain the data in more than one way, remember that you will be more attached to your own ideas and that this works against an objective view of the facts, look for accuracy and quantitative measures, rather than subjective measures, all parts of an argument must work rather than only some components, remember Occam’s razor and, always assess whether the hypothesis can be disproven (remembering if it cannot be, then it is a worthless statement).

- In as many spheres as possible, we should use double blind, controlled experiments. Business can certainly use this approach.
- "The question, as always, is how good is the evidence?"
- There are so many issues with prayer to a deity, like the Christian God. CS discusses the lack of impact on disease – unsolvable health problems, given current technology, are not solved – for example regrowing an amputated leg, curing cancer or healing AIDS.
- There is a wonderful story about a faith healer called Carlos who James Randi created and let loose on the gullible Australian public. When Randi and Carlos admitted their deception, many people remained believers (in a similar way to Popof). This must be tied to the sunk cost error as well as the placebo effect (perhaps some people felt better after Carlos "healed" them).
- It seems that it is incredibly difficult for us to admit to ourselves that we have been a victim of deceit. This causes people to keep going back to faith healers and other charlatans. CS makes the point that it is often much easier to reject solid evidence than to admit we have been deceived (or are just plain wrong – self deceived).
- CS has a high regard for Thomas Paine, who he showed went against the established culture by being against slavery, sexism, racism, superstition, monarchy and aristocracy. He also shows how people we revere are also flawed – Jefferson and Washington kept slaves, Einstein and Gandhi were "imperfect husbands and fathers".
- Religion, certainly those that teach life after death, will likely present that particular culture with a survival benefit (soldiers are more committed). It is a perfect meme, because it is something that people would want to believe.
- An interesting experiment was done on a mouse to test for a soul. The experimenter weighed the mouse before and after it died and the weights were the same.
- There is discussion of fusion and fission bombs. Fission bombs (plutonium, uranium) have a "practical upper limit on the yield or destructive energy" whereas fusion bombs have no limit – but they do need an atomic bomb to trigger it.
- There are a great set of aphorisms that we tend to use in everyday life that contradict each other. Examples: Haste makes waste (or more haste, less speed) vs. a stitch in time saves nine. Better safe than sorry vs. nothing ventured, nothing gained. Where there's smoke there's fire vs. don't judge a book by its cover. A penny saved is a penny earned vs. you can't take your money with you. He who hastes has lost vs. fools rush in where angels fear to tread. Two heads are better than one vs. too many cooks spoil the broth.
- Astrology does not "pass the identical twin test."
- Being successful at science requires a balance of two opposing attitudes – scepticism (doubt) and openness to new ideas.
- Basic science was a survival advantage to our ancestors – knowing plants, hunting, making fire, problem solving etc. Of course, modern science is a different story – our massive increase in life expectancy is directly linked to science (medicine, agriculture etc.)
- CS spent a lot of time educating children. He mentions how kids are great scientists (besides their gullability) – they ask dumb questions, they are enthusiastic, they are curious etc. Yet, when they are in 1<sup>st</sup> grade they stop asking questions and start learning via memory, rather than curiosity. They lose their wonder and enthusiasm. He puts it down to a few factors, namely peer pressure (smart kids are nerds), societal focus on instant gratification, the (wrong) impression that maths or science will not make you rich and there are so few good role models in science and maths.

- Fascinating stat: Japan has half the population of the US but produces twice the scientists and engineers (with advanced degrees) each year.
- When we focus attention on talented kids with high IQs there is talk of elitism. But this is not the case on the sports field – talented kids are coached more.
- For 99% of the time that humans have been on Earth, they could not read or write.
- All magnetism is as a result of “moving electricity”. Electricity is caused by electrons that move along the wire – great conductors like copper have many free electrons (“not bound within atoms”).
- Maxwell’s equations are summarised beautifully: 1) no electric charges in a vacuum 2) no magnetic “monopoles in a vacuum” 3) a changing magnetic field generates an electric field and 4) vice versa!
- There are some great inventions mentioned that were not created for the purpose they are used. Maxwell was not thinking of radio, TV etc. Newton was not considering space flight, Roentgen (X Rays) was not thinking of medical uses, Curie was not thinking of a cure for cancer when working with radium, Fleming was not thinking of saving many lives when he discovered anti biotics, Watson and Crick were not thinking about curing genetic diseases etc.
- Einstein called Pauling a real genius. He was close to coming up with the double helix with Watson and Crick discovered it (they rushed to beat Pauling). He was the only person ever to win two, unshared, Nobel prizes.