

So, as you all know, Spain beat the Netherlands and won the World Football Cup in Johannesburg on July 11, 2010. As most of you may also know, this victory was predicted by a German octopus named Paul. Paul was presented before the match with two transparent boxes each baited with mussel flesh and decorated one with the Spanish flag, the other with the Dutch flag, and, yes, Paul the octopus correctly chose the Spanish flag box. One chance out of two, you might sneer, but Paul had correctly predicted, by the same method, the results of the seven matches in which the German team played. The probability of achieving by chance such a perfect series of prediction is $1/256$ or 0.003906 . More impressive, no? Paul the Octopus is now a TV news star: he has today more than 200,000 Google entries and more than 170,000 Facebook friends; he has received both death threats and commercial offers, and so on. On July 12, Paul's owners presented him with a replica World Cup trophy and announced that "he won't give any more oracle predictions - either in football, or in politics, lifestyle or economy."

Should you be impressed?

By Paul's performance, not really. To begin with, as argued [here](#), Paul may have been biased to prefer some flag patterns better exemplified by the German flag and the Spanish flag than by, say, the Unions Jack or the Dutch flag. Much more importantly, many other animals around the world, for instance rabbits, hippopotamuses, and parakeets also made predictions regarding the World Cup matches. Those that failed the first time (it must have been about half of them) disappointed their masters and did not make the news, nor did those who failed on the second or the third trial. By then, about one eighth of the animal oracles were still in business and might each have gained some local fame. The fallacy involved (known as the 'prosecutor's fallacy'*) is now easy to discern: if Paul had been selected at random among hundreds of candidates to be the unique World Cup animal oracle, his perfect performance would be remarkable. What happened however is that he had been selected as one the Cup's informal oracles because his performance had been perfect for five or six rounds. The chance that it would remain perfect for another three or two rounds was by then a mere $1/8$ or $1/4$. When this indeed occurred, he stood alone in what looked like preternatural oracular talent.

There are good reasons however, from a cognition-and-culture point of view, to be impressed with the interest generated by Paul's 'predictions'. The fallacy involved may arise in ordinary cognition and even more in cultural transmission. We are plausibly geared to pay attention to events that present a pattern that goes against our expectations. Eight flips of a coin resulting in eight tails grab our attention more than say a tail-tail-head-tail-head-head-head-tail series. Even though both series are equally improbable, only the first one has a noticeable pattern that causes us to pay attention to its improbability. We are geared to assume that regular patterns have a relevant explanation (a relevant explanation is one that explain a lot with relatively few assumptions, a good effort-effect ratio). The less we are able to explain a regular pattern, the more we are likely, *ceteris paribus*, to see its occurrence as remarkably improbable and its explanation as relevant. (Incidentally, this is far from being an absurd assumption.) Strikingly improbable regular patterns also provide us with a relevant topic of conversation. Hence, through communication, we are likely to pay much more attention to such patterns than we would if we were solitary observers of the world's regularities and to overestimate their frequency. Hence the prosecutor's fallacy is reinforced through communication (or, arguably, originates in communication). As a result, a variety of 'superstitions' seem to benefit from rich, culturally transmitted evidence.

Yes, but in the case of Paul the octopus, journalists who talked about his predictions did point out that they resulted from chance, and few of the people who spread the information - as I am doing right now - mistook it for a case of true predictions. So the idea of fallacy-based, apparently relevant, false beliefs falls short of really providing us with a good explanation of Paul's fame. Still,

the proper explanation, I would suggest, is not very far, and it is quite interesting in its own right. The mental mechanisms that cause us to pay more attention to information with greater expected relevance and to communicate it more readily are, Deirdre Wilson and I have argued (see [here](#) and [here](#)) not really representing the relevance of information and even less calculating it: they are, rather, sensitive to rough features that correlate well enough with relevance to make it adaptive to allocate mental resources, e.g. attention, on the basis of these features. So, information that looks relevant by these rough criteria is enough to trigger the processes and the mental elation that goes with expectations of relevance. It falls, if I may use the jargon, in the 'actual domain' of relevance detectors, whether or not it falls in their 'proper domain', just as pornography may cause arousal even though it falls outside of the proper domain of potential sexual partner detection.

We may get pleasure from having our expectations of relevance aroused. We often indulge in this pleasure for its own sake rather than for the cognitive benefits that only truly relevant information may bring. This, I would argue, is why, for instance, we read light fiction. This is why I could not resist the temptation of writing a post about Paul the octopus even before feeling confident that I had anything of relevance to say about it.

* The "[prosecutor's fallacy](#)" typically results from multiple testings: if a male murderer is known to have had blue eyes, red hair, plucked eyebrows and a limp, the larger the population that you test for this combination of features, the higher the probability that you will find an individual matching it, but the lower the probability that he will be the murderer you are looking for.