



Selected articles from  
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## What's the Probability That $X$ Could Occur Just by Chance?

By [Jack Robinson](#)

While [managing the TBS booth](#) at the Atheist Alliance International Convention this past April, Rani Kottiath and Dana Smith did something that particularly interested me. They conducted some "Skep Tests," the most popular of which was the "Psychic Challenge." Ten cards were drawn from a shuffled, standard deck, and the challenger tried to use telepathy or remote viewing to perceive the suit of each card. Since there are four suits, the expected result for a non-psychic challenger was  $1/4 \times 10$ , so the expected score was 2 or 3 hits (and almost everyone had three or fewer). But Rani and Dana reported in our last newsletter that "James 'The Amazing' Randi . . . 'remote viewed' an incredible 8 out of 10 (a 1 in 2,400 chance)!"

How does one calculate the probability that 8 out of 10 hits could occur by chance alone? For each card, the probability of a correct guess is  $1/4$ . The probability of correctly guessing two cards in a row is  $(1/4)^2 = 1/16$ . Similarly, you might think that the probability of 8 hits should be  $(1/4)^8$ , which is about  $1/65,500$ . But that would be wrong, because you'd be overlooking Randi's 2 incorrect guesses.

The probability of each incorrect guess is  $3/4$ . So the probability of 2 incorrect guesses in a row is  $(3/4)^2$ , which is  $9/16$ . And the probability of 8 correct guesses in a row, followed by 2 incorrect guesses is  $(1/4)^8 \times (3/4)^2$ , which is about  $1/116,500$ . That cannot be the final answer, however, because it is too remote a probability. It is easier to make 8 out of 10 correct guesses than to make 8 out of 8, and  $1/116,500$  makes 8 out of 10 correct look harder than the  $1/65,500$  figure for 8 of 8. There must be something else involved.

The  $1/116,500$  probability was based on the assumption that the correct guesses were the *first* 8, and the 2 incorrect guesses came *last*. Actually, however, the 2 incorrect guesses could have come at *any*

*time*. So the value 1/116,500 should be multiplied by the number of ways in which the 2 incorrect guesses could occur. In mathematical terms, this is "the number of sets of 2 objects that can be chosen from 10 objects," and  ${}_{10}C_2 = (10!) / (2!)(10 - 2)!$  is the formula for that. Fortunately, however, most scientific calculators have a button that can do this calculation for you. My calculator shows that  ${}_{10}C_2 = 45$ . Therefore, the probability of exactly 8 correct guesses and 2 incorrect guesses is  $(1/116,500) \times 45 = 0.000386$ , which is approximately 1/2,590.

And there is one more factor that we need to consider. Rani and Dana said they were doing a "Skep Test." Usually in connection with a test, one wants to know the probability of scoring at a certain level *or higher*. In the present case, then, we must also calculate the probability of scoring -- by chance alone -- exactly 9 out of 10, and the probability of scoring exactly 10 out of 10. Then we must add the three probabilities for scores of 8, 9, and 10. The sum of these probabilities comes out to 1/2,405. That's how the probability figure in their article was determined (I assisted them in determining it).

But I still haven't figured out how Randi was able to outperform everyone else who took the "Skep Test," and score 8 hits when 2 or 3 was the expected (and typical) result. Was it by chance alone? That is one possibility -- tests for evidence of genuine "psychic" power generally are crafted by skeptics to require a performance in the 1/1,000,000 range, so a 1 in 2,400 performance does not arouse suspicions of supernatural prowess (unless the test subject achieves such results consistently). However, conjurer that he is, we suspect that there may have been more involved in Randi's performance than mere chance (for example, might he have had a confederate in the audience?). So, another lesson to take away from this discussion relates to the need for properly controlling the experimental conditions whenever conducting such a test.

If anyone wants to learn more about probabilities and how they can be used in tests for "psychic" powers, I highly recommend the little book, *Lady Luck: The Theory of Probability*, by Warren Weaver. It's entertaining as well as informative. Alternatively, if any reader of *TBS Report* needs help in connection with problems involving probability, I would be glad to assist (send me an [e-mail](#)).

## CHAIRMAN'S CORNER

By [Terry A. Smiljanich](#)

### "Been There, Done That"

We Americans are notorious for our short attention spans. Fads come and go. They burst upon the scene with a splash, undergo exponential growth through massive media attention, and then quickly die out from overexposure. "Been there, done that." Examining them later, they usually look silly in retrospect.

So how do you keep a fad going? There's only one way — evolve with the times. Keep people's

interest with new variations of the old fad before it fizzles out. But eventually that strategy runs out, too. Sooner or later, all fads collapse of their own weight.

UFOs have been running this course for the past fifty years. From Kenneth Arnold's objects "skipping like a saucer" in 1947, through the Roswell craze of the 1980s, and on through the abduction stories of the 1990s, the claims made by UFO believers just get crazier and crazier. The latest version? We are being abducted by the millions every year, and the only reason our skies are not flooded with UFOs is because they're probably invisible. Really.

Which brings us to our old friend [Richard Hoagland](#). Remember him? Someone playing the cloud game ("Hey, that one looks like a castle") had noticed a face looking back on a Viking I orbiter photograph of the Cydonia region of Mars. Mr. Hoagland, a freelance writer, came along in 1987 and wrote a whole book exploring the many intricacies of this "Face on Mars" and the surrounding Martian region, including incredible and "impossible to explain" mathematical relationships between nearby "pyramids" and the remains of an ancient Martian city, all proving a prior alien presence on our planetary neighbor.

Of course, the problem with a claim like this is that it would seem to have a built-in expiration date. Sooner or later a better photograph will show up and the "Face" will crumble. Keeping the mystery alive, however, Hoagland began predicting a huge government conspiracy to cover up this evidence of aliens. The 1993 Mars Observer mission was going to send back better photographs, but when it failed, it provided further "proof" of a conspiracy. Finally, in 1998 the Mars Global Surveyor sent back a clear photograph, showing a rather nondescript hill, and an even better photo in 2001 (see again [here](#)).

Worry not, however, for Mr. Hoagland. According to an article in the August 2003 edition of *Sky & Telescope*, Hoagland recently appeared on the popular *Coast to Coast A.M.* radio show (formerly hosted by Art Bell), and discussed his "theories" surrounding the relationship between the Egyptian Sphinx and the constellation Orion (you gotta hand it to these guys -- they've got no shortage of imagination). Lest you think I'm making this up, let me quote from the article (page 88):

[Hoagland disclosed] an Orion-modulated conspiracy within NASA, which, according to Hoagland, is infiltrated by an eons-old priesthood with roots in ancient Egypt. Reporting that the constellation Orion was rising at the Moon's Sea of Tranquillity on January 27, 1967, he said -- on national radio -- that the fire that broke out during a simulated countdown in an Apollo capsule and killed three astronauts was a ritual sacrifice perpetrated by a cult as old as the pyramids.

There you have it -- the latest evolution in this fanciful story. Sooner or later, however, the pseudo-rationalizations will spin out of control, and we should finally be able to bury the "Face on Mars" fad. But the end-game of the larger UFO question is nowhere in sight. What can follow "invisible" spaceships? Stay tuned.

## Snippets



Looking for a way to help humanity? How about opening an afterlife telegram service? That's what 31-year-old Paul Kinsella of New Athens, Illinois, has done. For only \$5 per word, Kinsella will give your message -- intended for a dearly departed -- to a terminally ill volunteer "messenger" who commits it to memory and pledges to deliver it to the intended recipient in the great beyond. Though the macabre nature of the enterprise might have dissuaded someone less confident than Kinsella, "It occurred to me that you actually could send a message that way." The money goes to charity, or towards the messenger's medical expenses, and is refunded if the messenger does not die within a year. But it is not refunded if the messenger does die on cue but fails to complete the assigned task. "Since we cannot guarantee delivery nor prove that a telegram has been delivered, our customers do not pay for 'deliveries,' they pay for 'delivery attempts.'" So far, despite the Web site and media buzz, Kinsella's only paying customer has been a *Washington Post* columnist with a snotty message for Adolf Hitler.

(Knight Ridder via *St. Pete. Times*, May 18)

An unnamed 31-year-old financial planner (aren't they supposed to be experts in *not* losing money foolishly?) has reported to Tampa police that she has lost more than \$2,300 -- to a "psychic." According to the official report of the Delayed Criminal Investigation Unit, "The victim was suffering from evil influences against her spirit" and, following a Tarot card reading, had initially paid \$775 for some herbs, healing oils, and a magic candle. When that failed to cure what ailed her, she forked over an additional \$1,600 for more such schlock, again with no noticeable beneficial effect. Adding insult to injury, the "psychic" had guaranteed satisfaction, but then moved without providing a forwarding address.

(*St. Pete. Times*, May 15)

## TBS Media Inquiries

In mid-July, an assistant producer with the Miami-based Univision TV network contacted TBS for

assistance with their upcoming special project on "miracles." One subject being covered, a likeness of the Virgin Mary in a third-story window of a Milton, Massachusetts, hospital, is reminiscent of the [Mary "apparition" in Clearwater](#).

The *Boston Globe* reported on June 30 that tens of thousands of people have been drawn to [the Milton site](#), although, according to hospital officials, "The company that installed the window said the image formed when a sealant around the window allowed heat and moisture in, leaving a chemical deposit." Jack Robinson referred Univision to the [New England Skeptical Society](#), which has investigated the case and may be represented on the program. On Aug. 4 a producer from [Lion Television](#)'s New York office (they are based in London) contacted TBS about a series on "Paranormal Investigations" that they will be producing for The Learning Channel. Gary Posner is slated to be interviewed later this year for the pilot episode on "ESP."

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## Letters to the Editor / Readers' Forum

Editor: I found your Web site from an item linked on Fark.com and have spent the better part of two days reading various pages on both [your personal site](#) and the Tampa Bay Skeptics site. I just wanted to drop you a line saying how thoroughly I've enjoyed reading both sites!

Out of curiosity, is the upcoming "Between Meetings" Dinner/Snack/Discussion limited to only paid members of TBS, or are prospective members welcome?

Jeff Lee  
Tampa  
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*As I told Jeff, all of our functions are open to anyone wishing to attend. --G.P.*

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