

# Law of Large Numbers sucks fun from life

This is one of those columns where, as my editor says, I'm going to "suck all the fun out of life."

A few days ago, my wife and I were talking about her grandfather, who passed away many years ago. I asked if he had any brothers; she mentioned only one. The very next day, we got an e-mail from my mother-in-law. Her uncle, that very same brother, had passed away.

Most of us have had experiences like this. We've dreamed that something happened, and then found out it came true. We think of someone, and then the phone rings. When something that bizarre happens, doesn't it cry out for an explanation? Things like that just can't be coincidence, can they?

Actually, they can. It's all about the Law of Large Numbers.

Crudely speaking, the Law of Large Numbers says that when enough things happen, some of them will be weird. Combine that with our brain's hyperactive ability to make connections, and you wind up being surprised when you shouldn't be.

One well-known example of how badly our brains deal with large numbers is the Birthday Problem. Suppose you're in a bar and you count 25 customers. What are the odds that two of them share a birthday? 1 percent? 5 percent? Actually, they're well over 50 percent. There are more ways to arrange 25 birthdays than there are atoms in the sun. Most of them have at least one duplicate.

Don't believe me? Try it and see. The odds go up fast with the size of the crowd: 75 percent with 32 people, 99 percent with 57. It's a sucker bet.

Why does the Law of Large Numbers matter? Who cares about weird coincidences about relatives and birthdays? Actually, we all should. The human brain's difficulty with big numbers is the cause of a lot of social strife and misunderstanding.

One reason some people have trouble accepting evolution, for example, is because they see the astonishing complexity of living systems and find their emergence through evolutionary processes to be literally unbelievable. But 3 billion years is a large amount of time for things to happen. Combine that with the power of natural selection, and the complexity of life begins to make a little



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more sense.

Some of the sadder examples of people not understanding the Law of Large Numbers are Bible Code believers. Despite patient and well-publicized explanations by mathematical (and biblical) scholars, many people still believe the Bible contains hidden messages that could only have been placed there through supernatural means. Again, it's because our brains are not equipped to deal with large numbers very well.

In Bible Code theory, the rules used to discover messages generate a set of possibilities so impossibly huge that interesting messages are bound to come up. For example, using Bible Code rules, mathematicians were able to show that "War and Peace" contained messages that predicted the Philadelphia 76ers' championship season. The Law of Large Numbers strikes again.

Do you play the lottery? Whenever someone wins the jackpot, there's always a story about how someone "beat incredible odds." But of course they did no such thing. The Law of Large Numbers says that the odds of a specific person winning might be small, but the odds of someone winning are quite good. It's just that our brains don't see it that way.

Politicians rely on our inability to deal with large numbers all the time, particularly in an election year. Champions of wealth redistribution point to visible benefits as amazing, wonderful achievements on their part. They don't realize that with billions of dollars floating around, it's easy to find concentrations of redistributed wealth that make you look good and buy you votes. It's not that interesting. Or rather, it shouldn't be.

People dream a lot. They gamble a lot. Their governments spend a lot of money. If dreams never coincided with reality, if nobody ever won the lottery, if we never found concentrations of redistributed wealth that created the illusion of getting something for nothing, that would really be weird. In fact, it'd be miraculous.

But as things are, the surprising patterns and coincidences we experience are pretty much what the math says we should. It may not be much fun, but it beats believing something that isn't true.

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