## Rolling the Dice

*evolution, chance and design*



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## Darwinian Evolution

**Descent with Modification**

1. Start with some self-replicating simple organisms.
2. Copy them with slight variations.
3. Allow them to compete for food, shelter and mates.
4. Repeat 10 gazillion times.

- That is all we need to account for the staggering diversity and exquisite adapation of life on Earth.
- Genetics and molecular biology provide mechanisms for this process.
- With minor adjustments the theory of evolution by natural selection remains the basis of modern biology.

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## Objections to Evolution

1. It's just an automated procedure (an algorithm) and yet its results seem so creative and intelligent.

2. How can randomness lead to the solution of real-world problems in a reasonable amount of time?

3. Doesn't this theory undermine human dignity and the meaning of our lives?

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## Modern religious fundamentalism
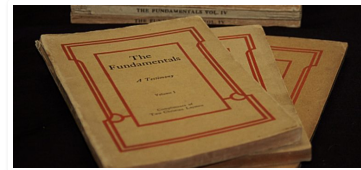


Response to two developments in 19th century science.

1. Darwin's theory of evolution which did away with the idea that God was needed as a creator of life.

2. Modern Biblical scholarship which looked at the Bible as a collection of ancient literature and not as God's eternal and unchanging word.

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## How many monkeys would it take to write a novel?

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Not as many as you might think.

## The Gambler's Fallacy



"I just flipped five heads in a row, so there must be a higher probability of tails coming up next."

## The Hot Hand Fallacy



"Get her the ball quick, she is shooting way above her average today -- she is on fire!"

10110101 00111011 11011101 11101001 11011111 11010111 00110111 11010010 00011001
01101101 10100110 00110110 01110110 01000100 11111011 11011010 11010000 01001111
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11101101 10010001 01111100 00011110 11011100 00111001 11101111 10101101 10010000

## The Tough love Fallacy

When the team plays exceptionally well and I praise them afterwards, they don't play as well in the next game.

When the team plays really poorly and I scream at them in the locker room afterwards, they play better next time.

So positive reinforcement fails and negative reinforcement works.

## The Monty Hall problem



Behind one door is a new car, behind the other two are goats.

- You picked door number one.
- Monty shows you the goat behind door number two.
- Should you switch to door number three when given the choice?



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