

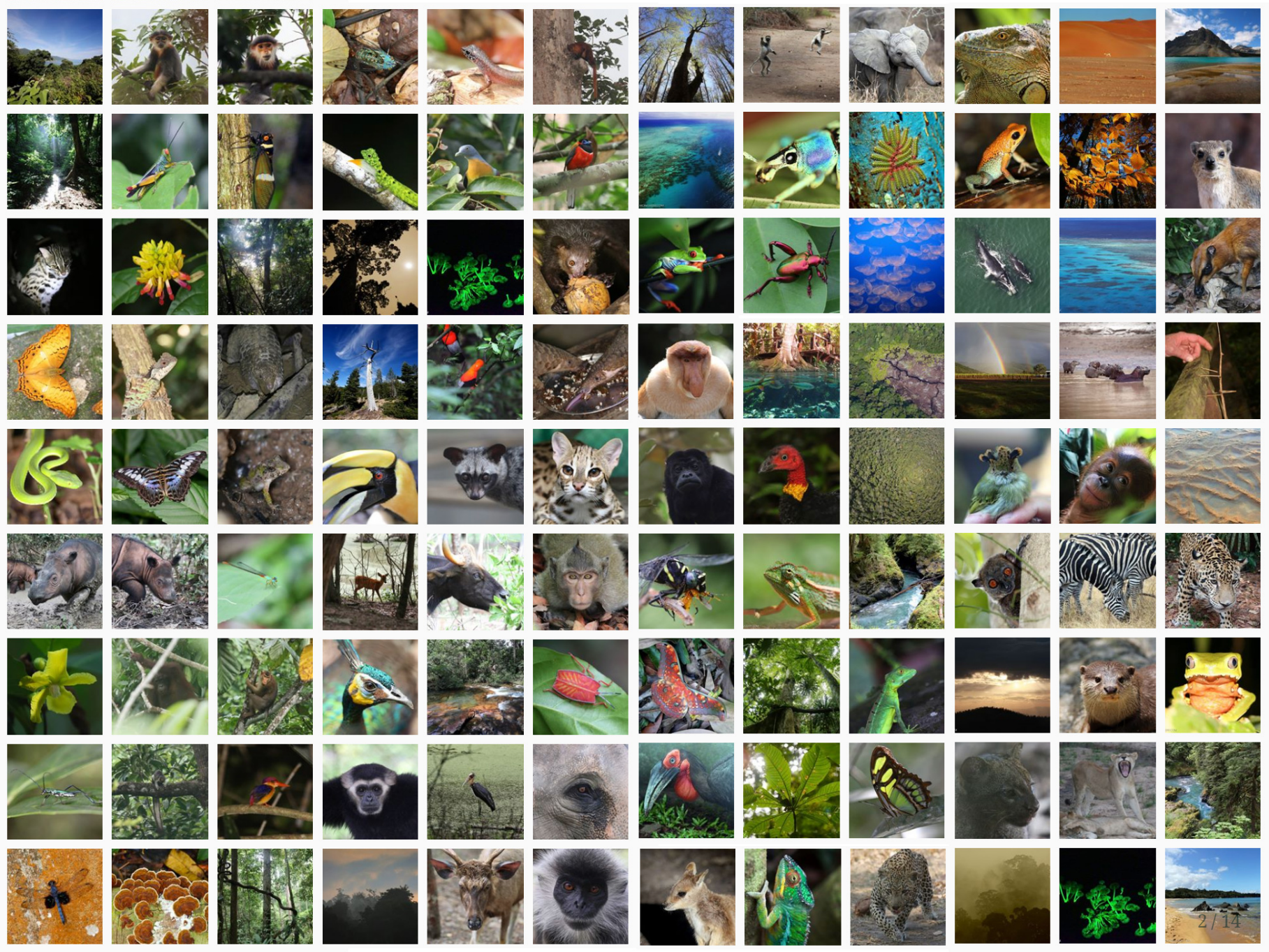
# *Rolling the Dice*

*evolution, chance and design*



George Matthews, Plymouth State University

2020



# *Darwinian Evolution*

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## *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.

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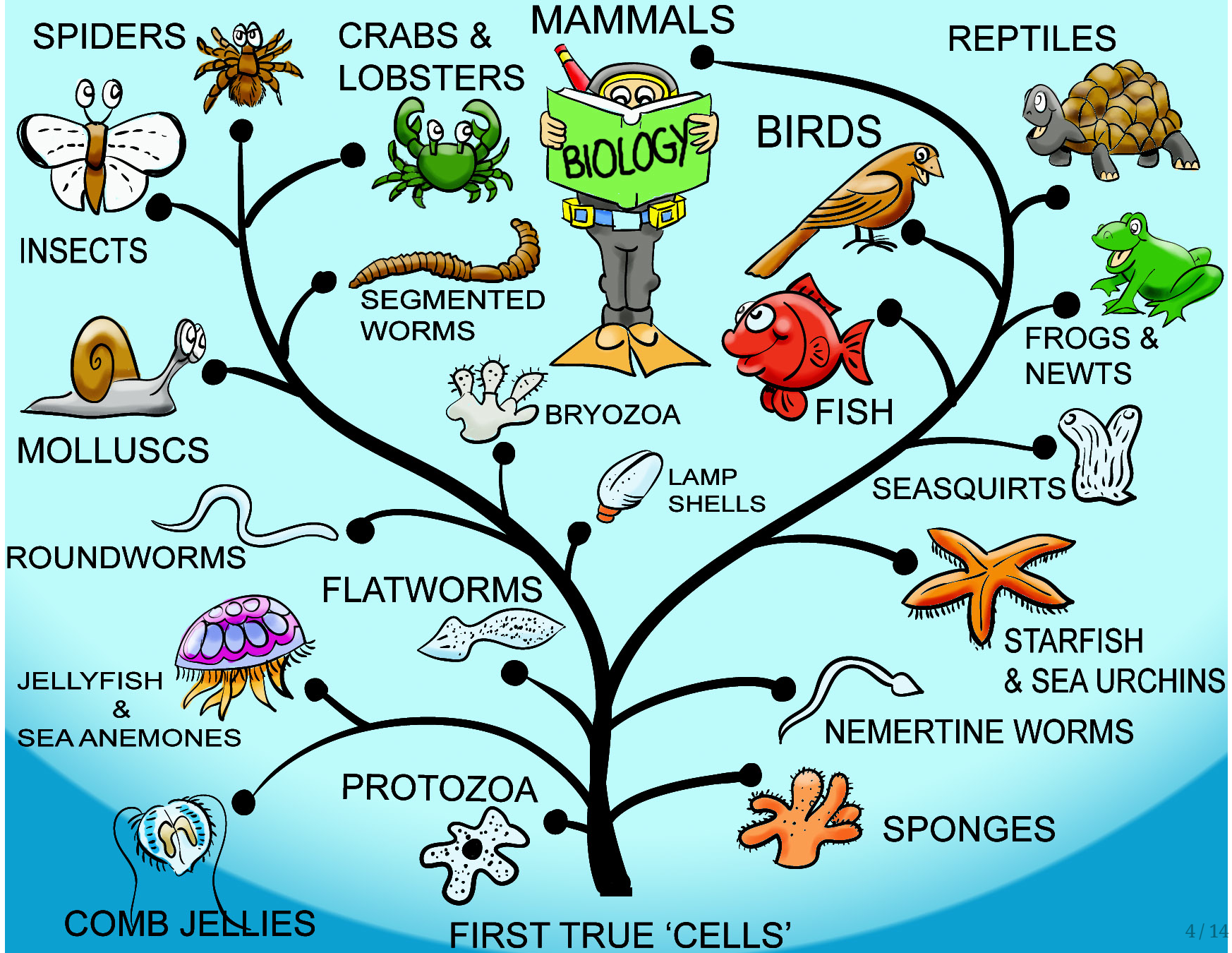
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- That is all we need to account for the staggering diversity and exquisite adaptation of life on Earth.
- Genetics and molecular biology provide mechanisms for this process.
- With minor adjustments the theory of evolution by natural selection remains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







**MODERN HUMANS**  
Sometimes called the “third chimpanzee” because of similarities with those apes. The human genome was decoded in 2000



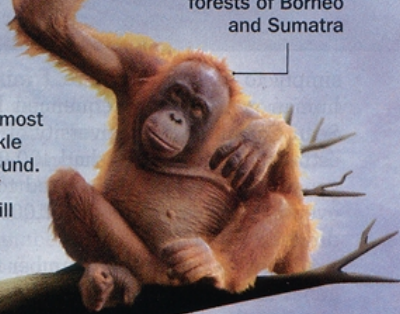
**CHIMPANZEES**  
Man’s closest relatives use tools and have a complex social structure. Their genome was decoded last year



**BONOBOS**  
Known as pygmy chimps, they inhabit forested areas of central Africa. They’re less aggressive than other chimps



**GORILLAS**  
The largest of the great apes spend most of their time knuckle walking on the ground. The sequencing of their genome is still under way



**ORANGUTANS**  
These more distantly related Southeast Asian apes live in the rain forests of Borneo and Sumatra



**NEANDERTHALS**  
Lineage first appeared 500,000 years ago. They coexisted with modern humans but died out about 28,000 years ago

**Common ancestor** ...  
Genetic clues suggest that the last ancestor chimps and humans had in common lived as recently as 6 million years ago

2 million to 3 million years ago

7 million to 8 million years ago

12 million to 14 million years ago

● Approximate date of divergence from common ancestors

# All in the Family

Modern humans, like the great apes, are primates, part of an extended family tree that includes more than 275 living species. By comparing our genetic blueprint with those of our closest relatives, scientists are starting to learn exactly how different we are and what those differences mean

Source: Nature  
TIME Graphic by Lon Tweeten;  
text by Kristina Dell

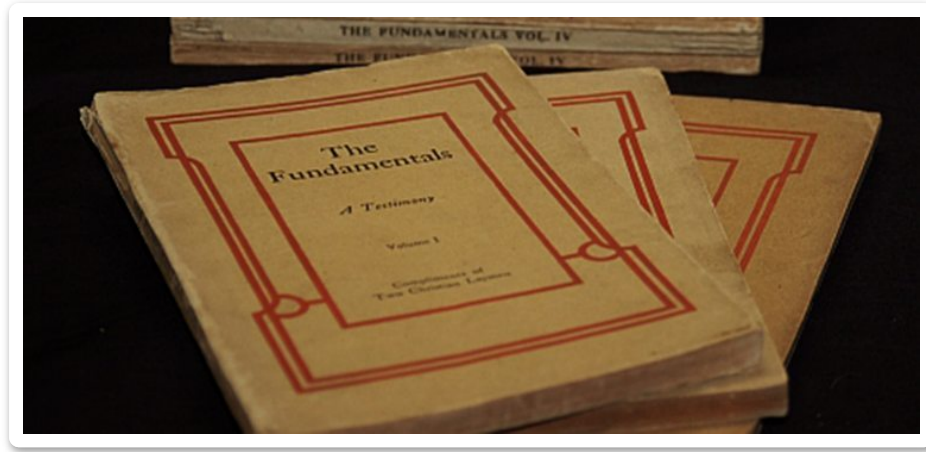
# *Objections to Evolution*

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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?

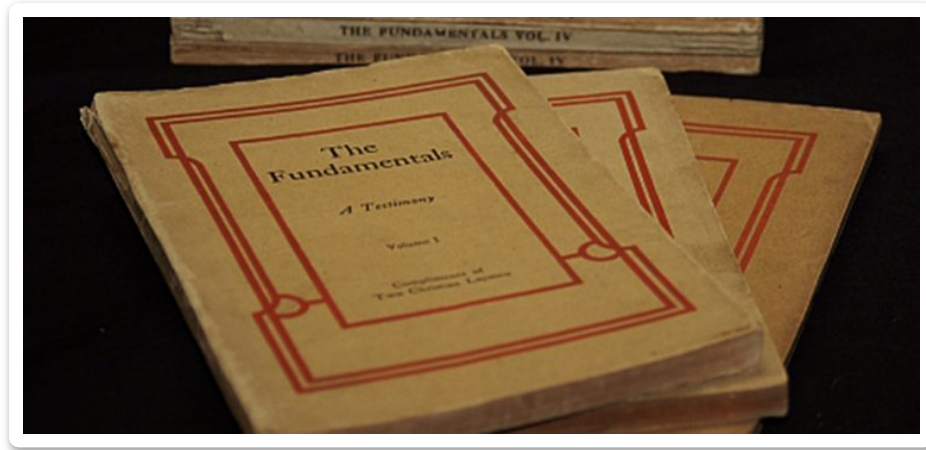
# *Modern religious fundamentalism*

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Response to two developments in 19th century science.

## *Modern religious fundamentalism*

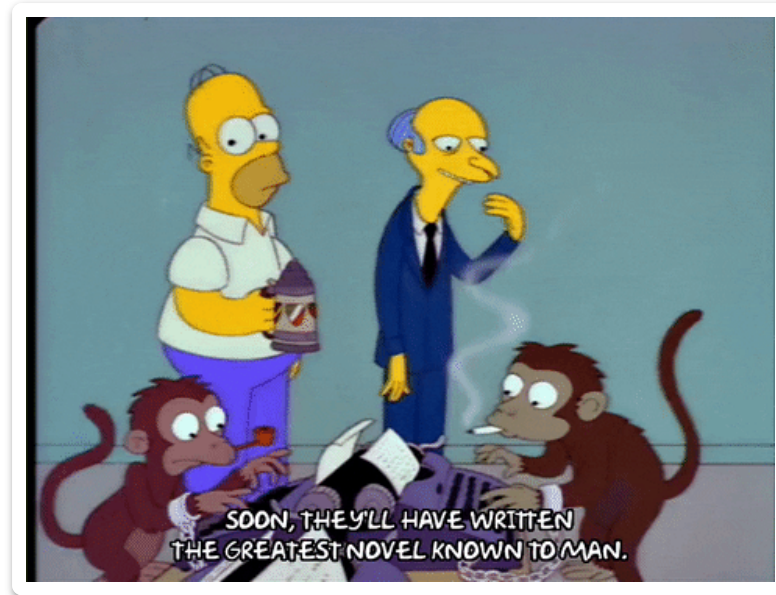


Response to two developments in 19th century science.

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.

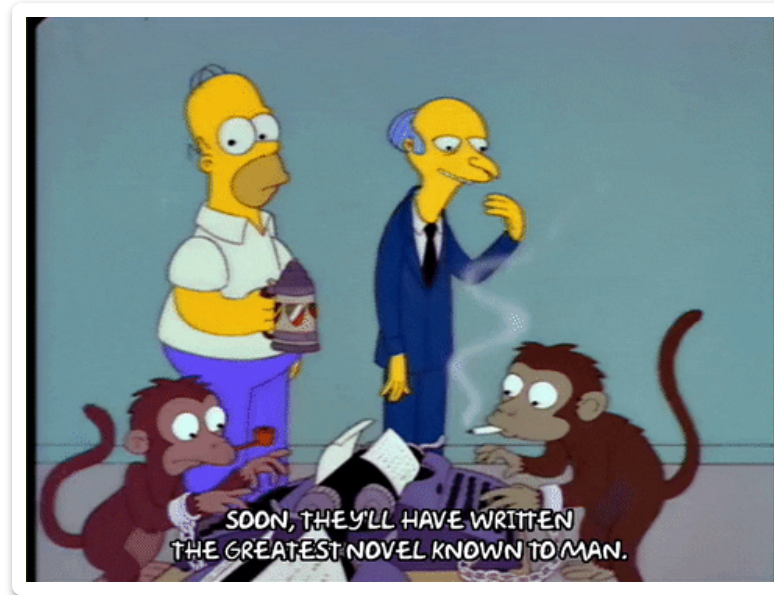
*How many monkeys would it take to write a novel?*

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



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!"

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## *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.

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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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