Lost in Space, Found in Data

Scientific exploration in a Hogarth Universe

Lost in Space

True of False?

- Small experiments, guided by scientific intuition alone, are more efficient than experimental design DOE tools.

https://doi.org/10.1016/j.drudis.2015.09.015

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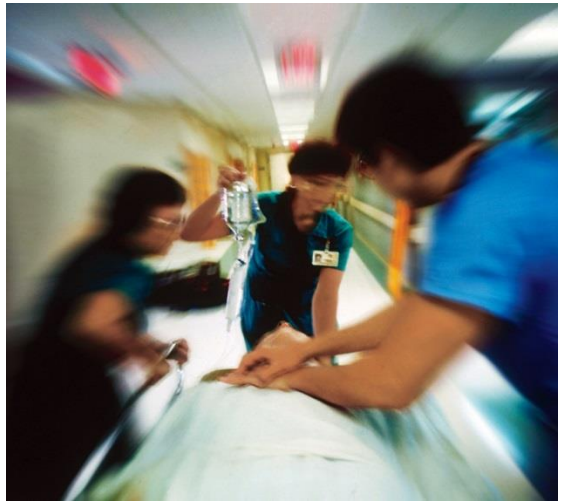
kind



unkind

Lost in Space

Hogarth Space or Perverse Learning Environment - Noun

- An environment in which feedback misguides rather than informs, systematically reinforcing erroneous beliefs or strategies, while appearing instructive.

Lost in Space

Lost in Space

The Paradox of the Self-Fulfilling Prophecy

Using low-dimensional tools to explore high-dimensional spaces has the **beguiling property** of generating data to support our initial choices of conditions even when those choices are totally incorrect.

https://doi.org/10.1016/j.drudis.2015.09.015

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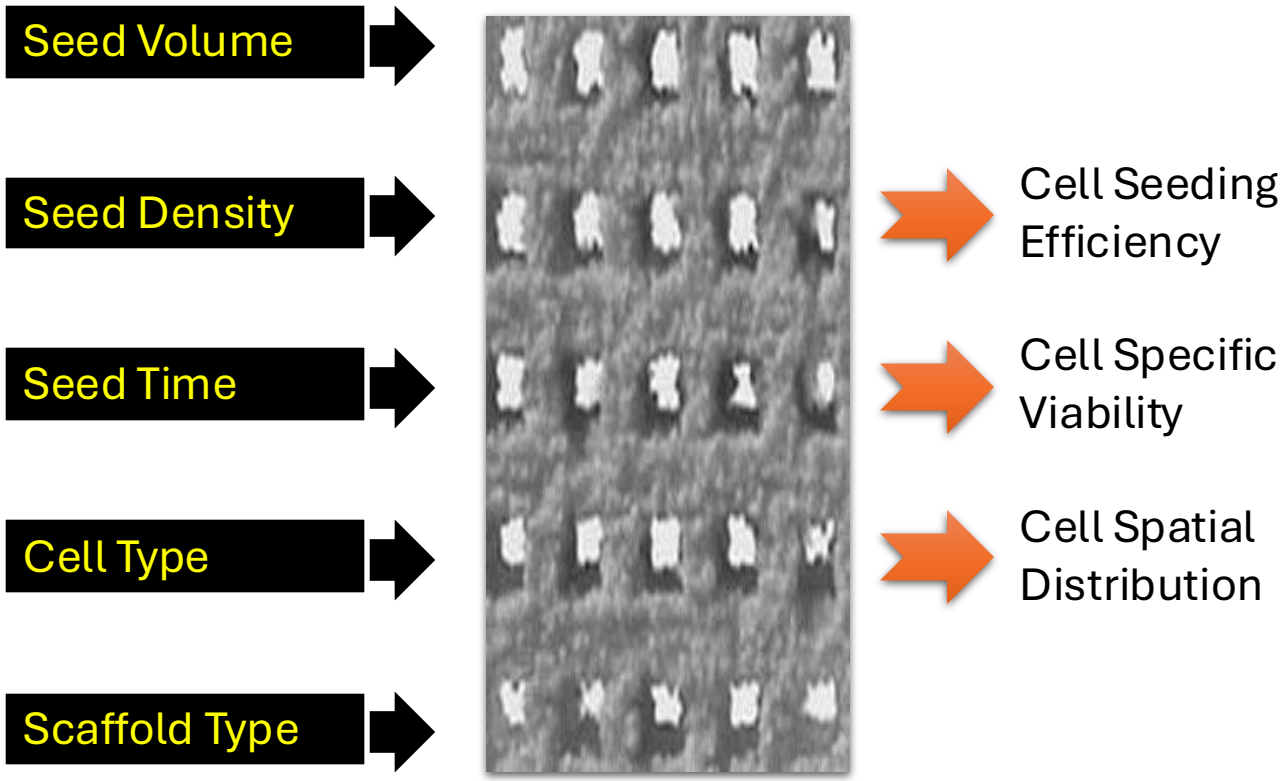
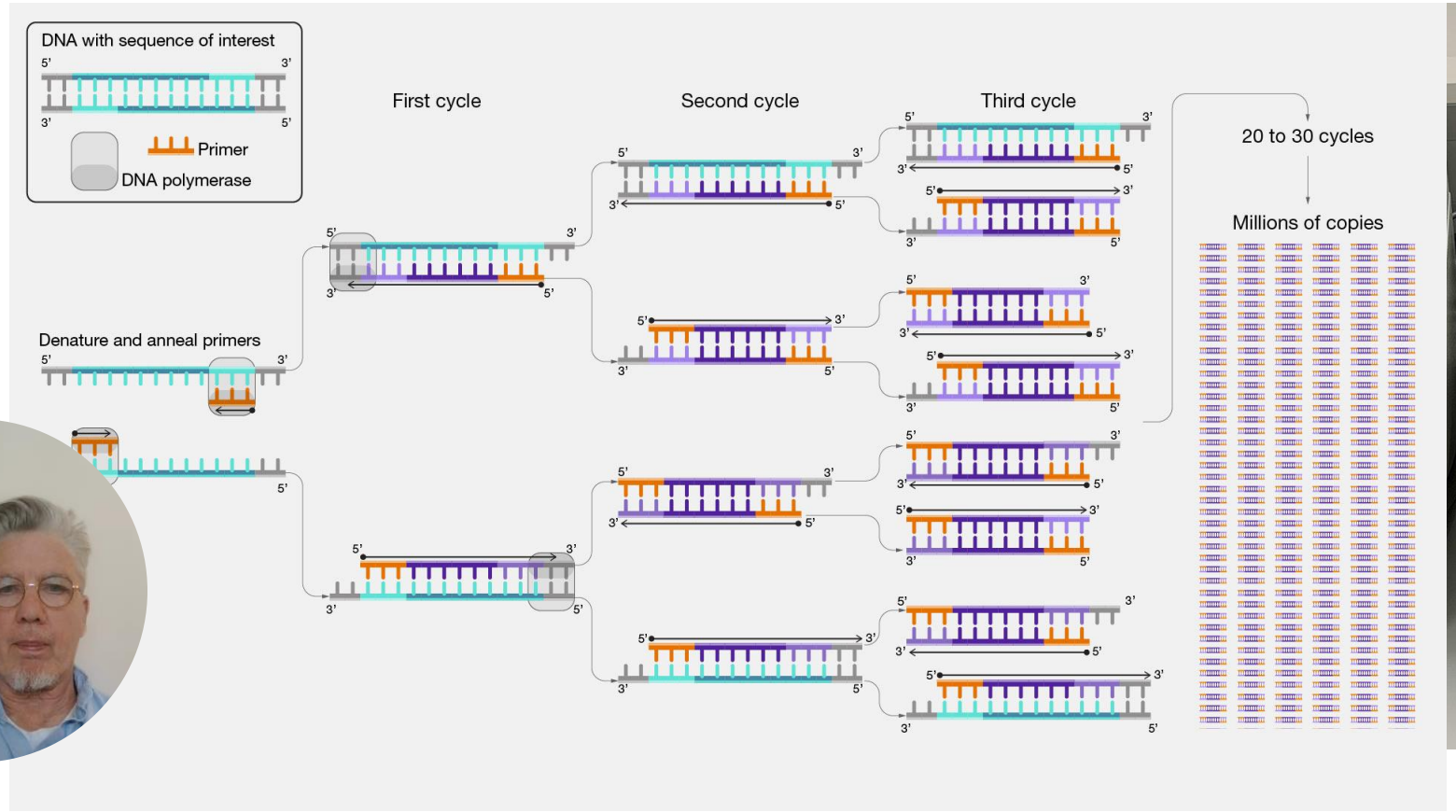
https://www.sciencedirect.com/science/article/pii/S0040402025002819



Chen *et al* **2011** Optimization of Cell Seeding in Scaffolds: QbD Approach for Skeletal Tissue Engineering, **Tissue Engineering**, 17, 2111-1220

Found in Data

- DNA Amplification through the Polymerase Chain Reaction PCR



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Virtual PCR Simulator instructions harfel

Parameters

No. of cycles 15

Denaturation 98 °C for 10 sec.

Annealing 50 °C for 10 sec.

Extension 70 °C for 30 sec.

Each dNTP 7.6 µL *

Each primer 3.8 µL **

Plasmid 10 ng

Polymerase 1 U

of Phusion

(*) from 10.0 mM stock
(**) from 10.0 uM stock

Run PCR

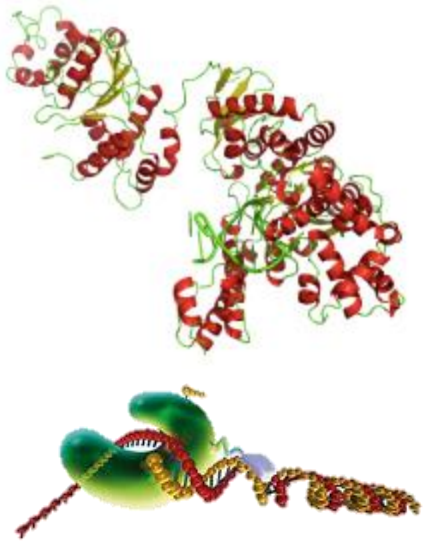
Results Gel image Export

	Yield [ng/µL]	Purity	Time [min]
	1st	1st	
Run 5:	349.5	91.1%	22.5

cycles	15
denat. temp (°C)	98
anneal. temp (°C)	50
extension temp (°C)	70
denat. time (s)	10
anneal. time (s)	10
extension time (s)	30
plasmid (ng)	10
primers (µL)	3.8
dNTP's (µL)	7.6
polymerase	Phusion
polymerase conc. (U)	1

return to these parameters

Run 4:	483.3	98.8%	22.5
Run 3:	22.7	18.0%	22.5
Run 2:	5.4	39.6%	22.5
Run 1:	0.1	11.0%	20.0



http://virtual-pcr.ico2s.org/

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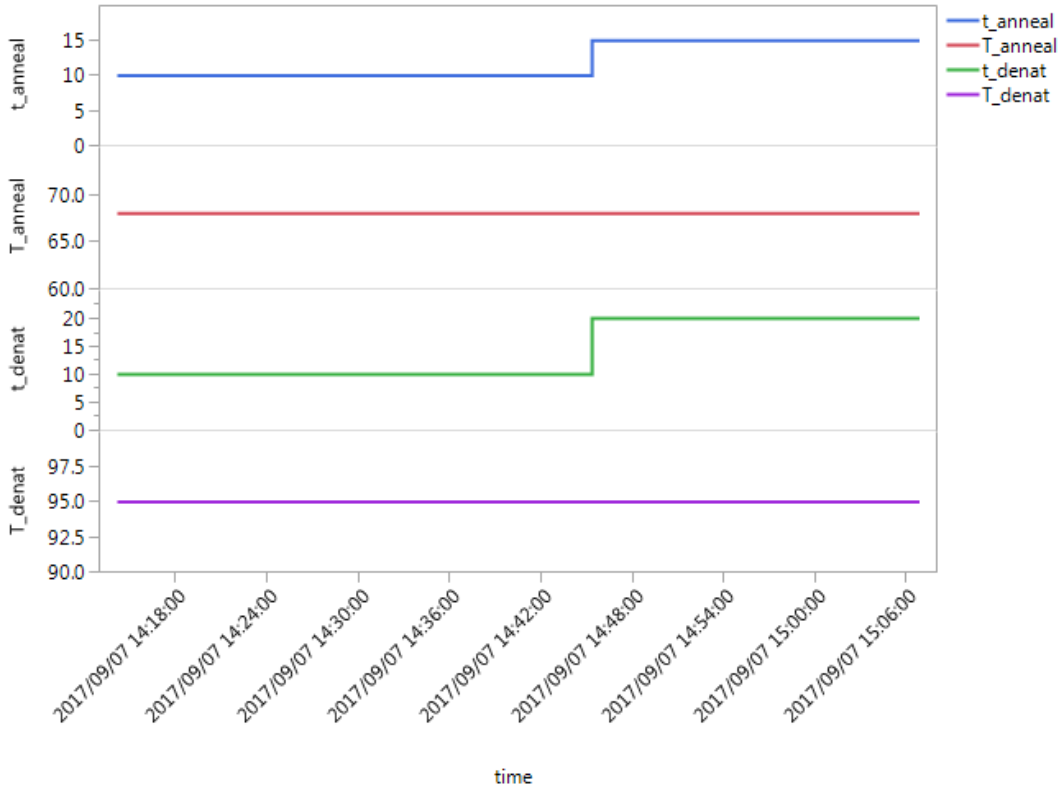

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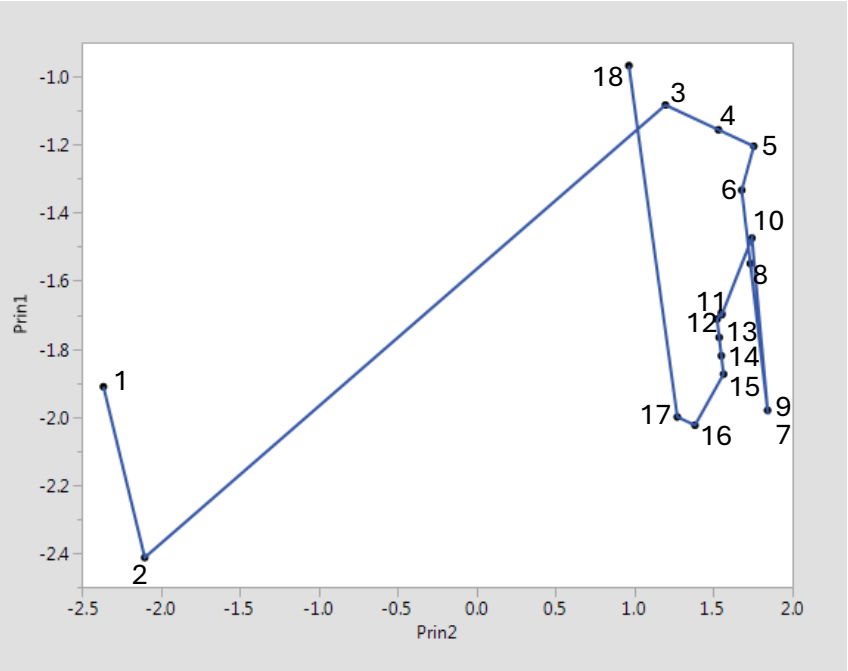

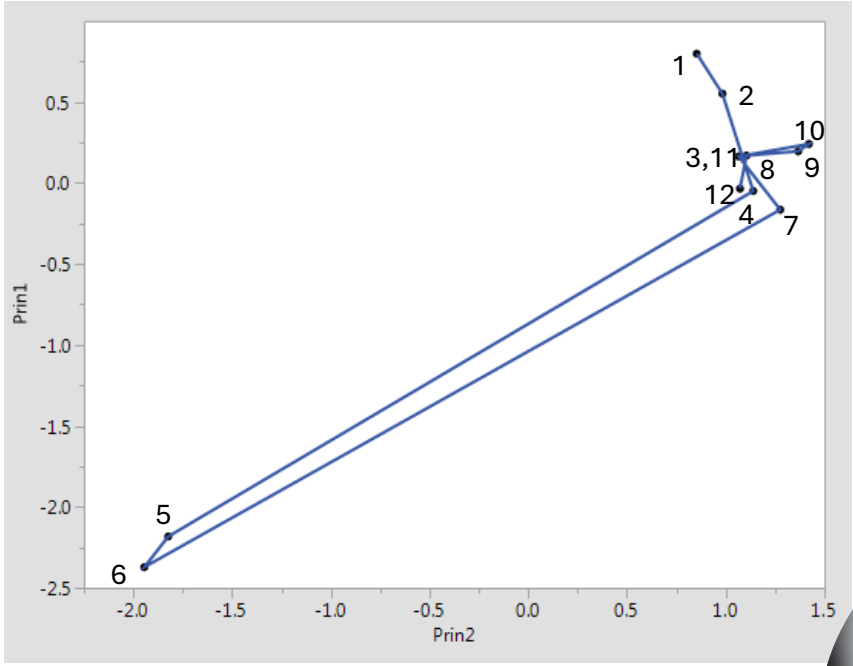

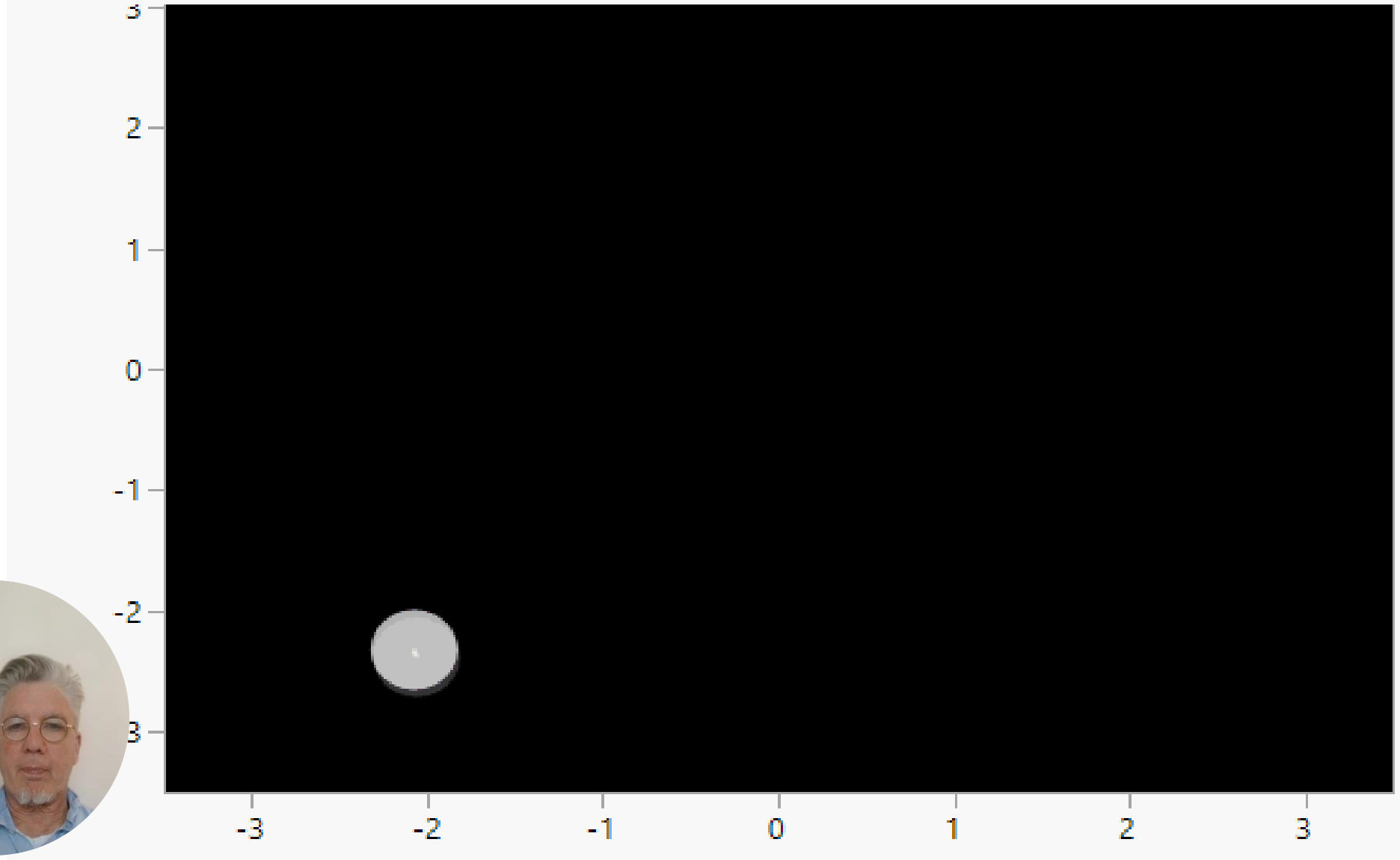
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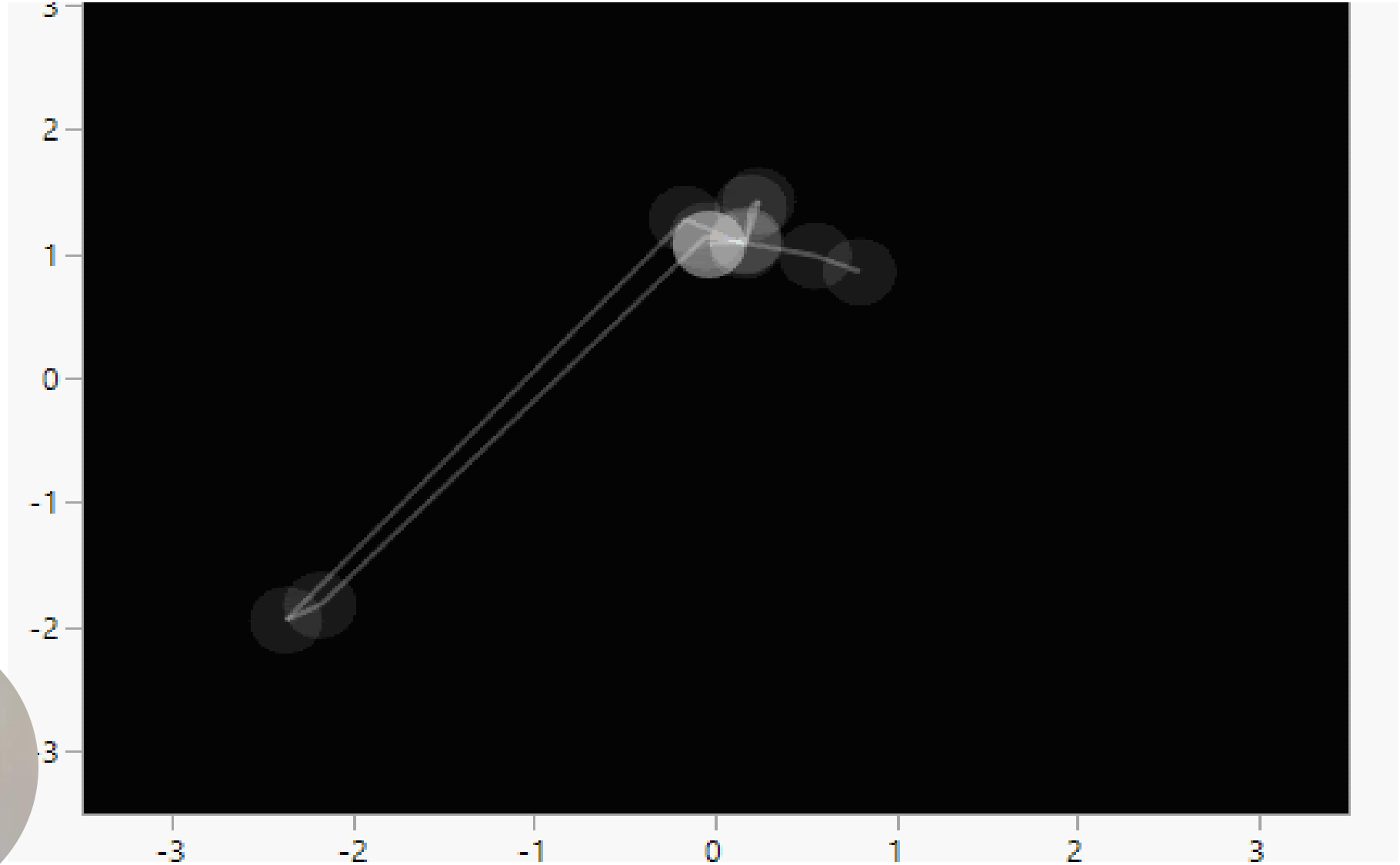
3
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Lost in Space

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Scientific Foraging

noun

The misapplication of low-dimensional search strategies - such as area-restricted searching – to complex, multidimensional systems.

Found in Data

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Moore’s Observation

Virtually any design is better than no design at all.

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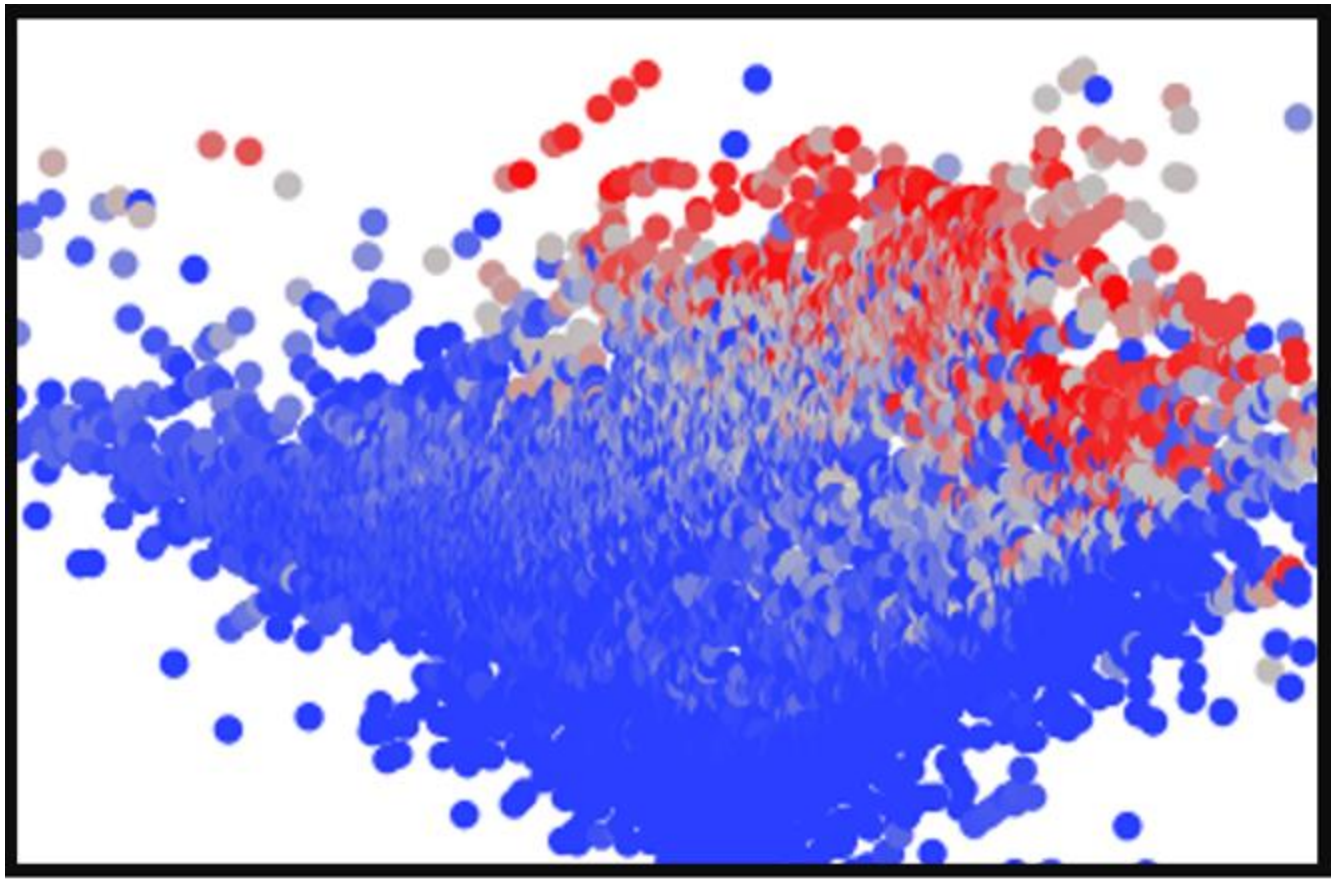

N = 10,042

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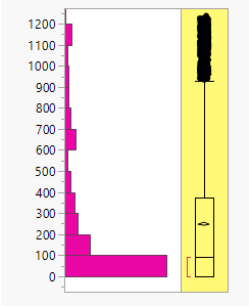
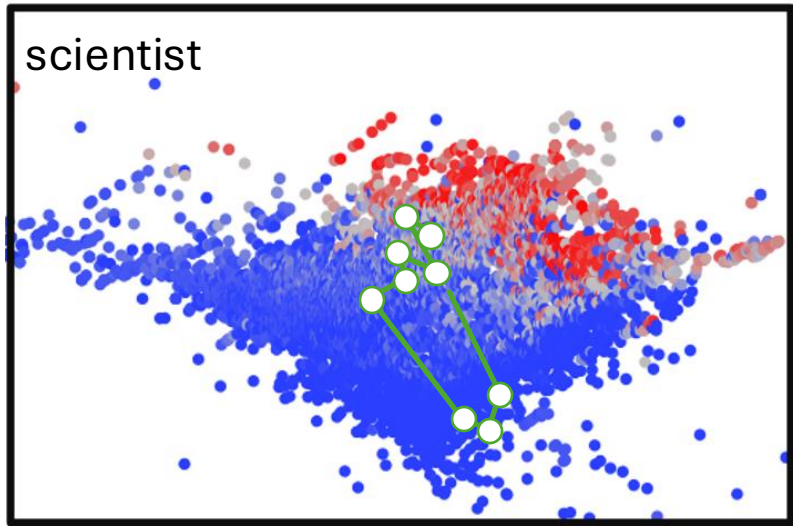
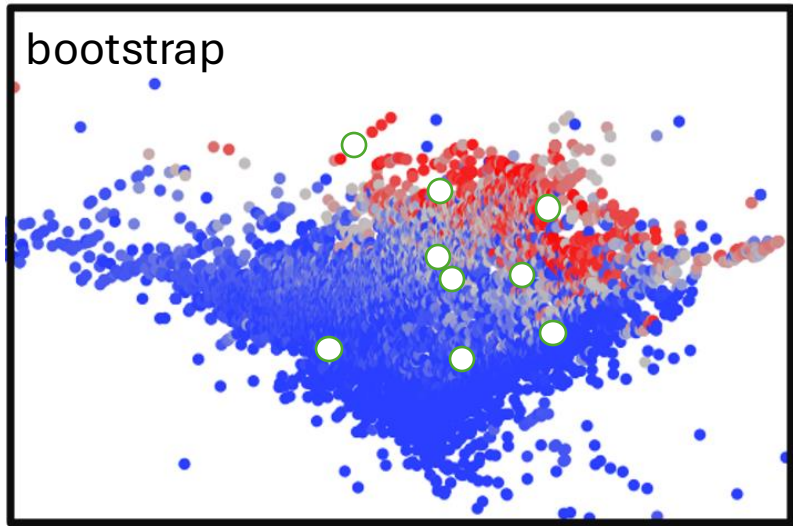
N = 10,042





Scientific Foraging



A Randomly Selected Experimental Series

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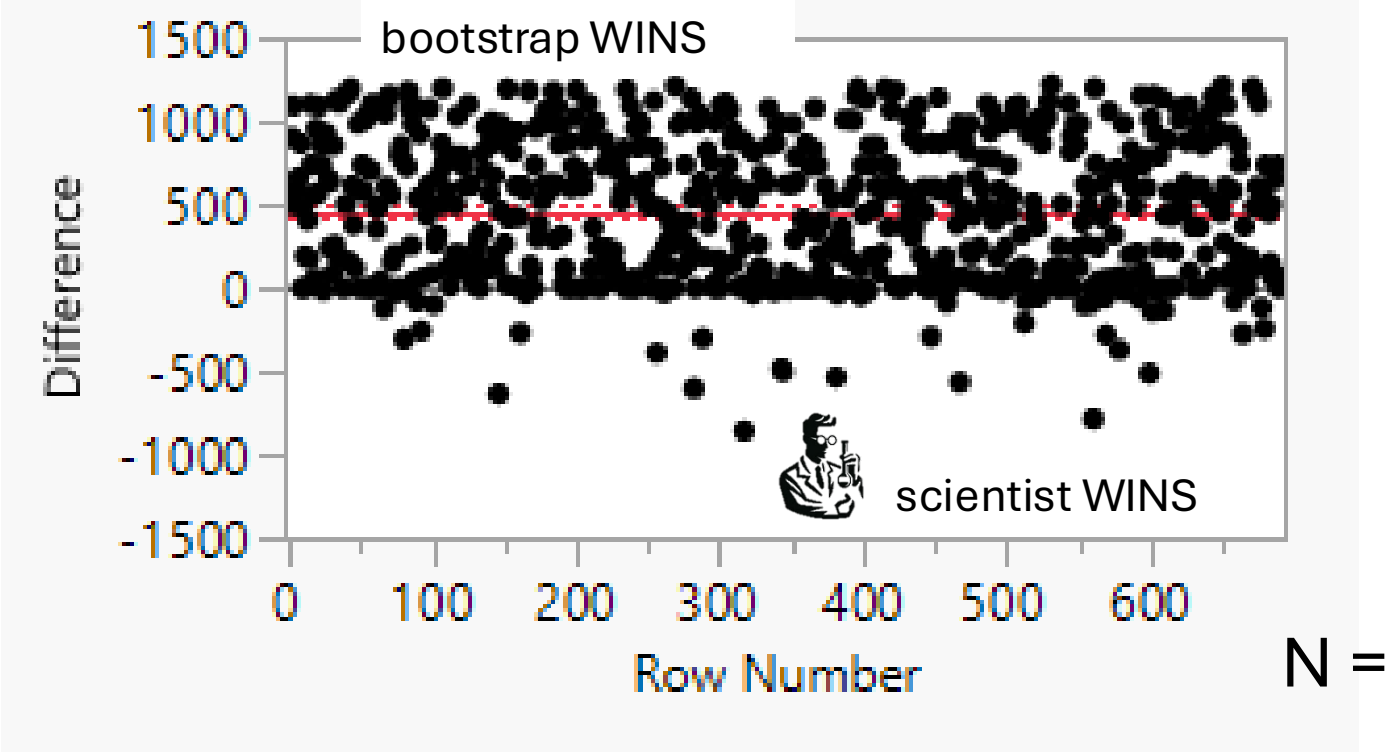
- scientist vs bootstrap



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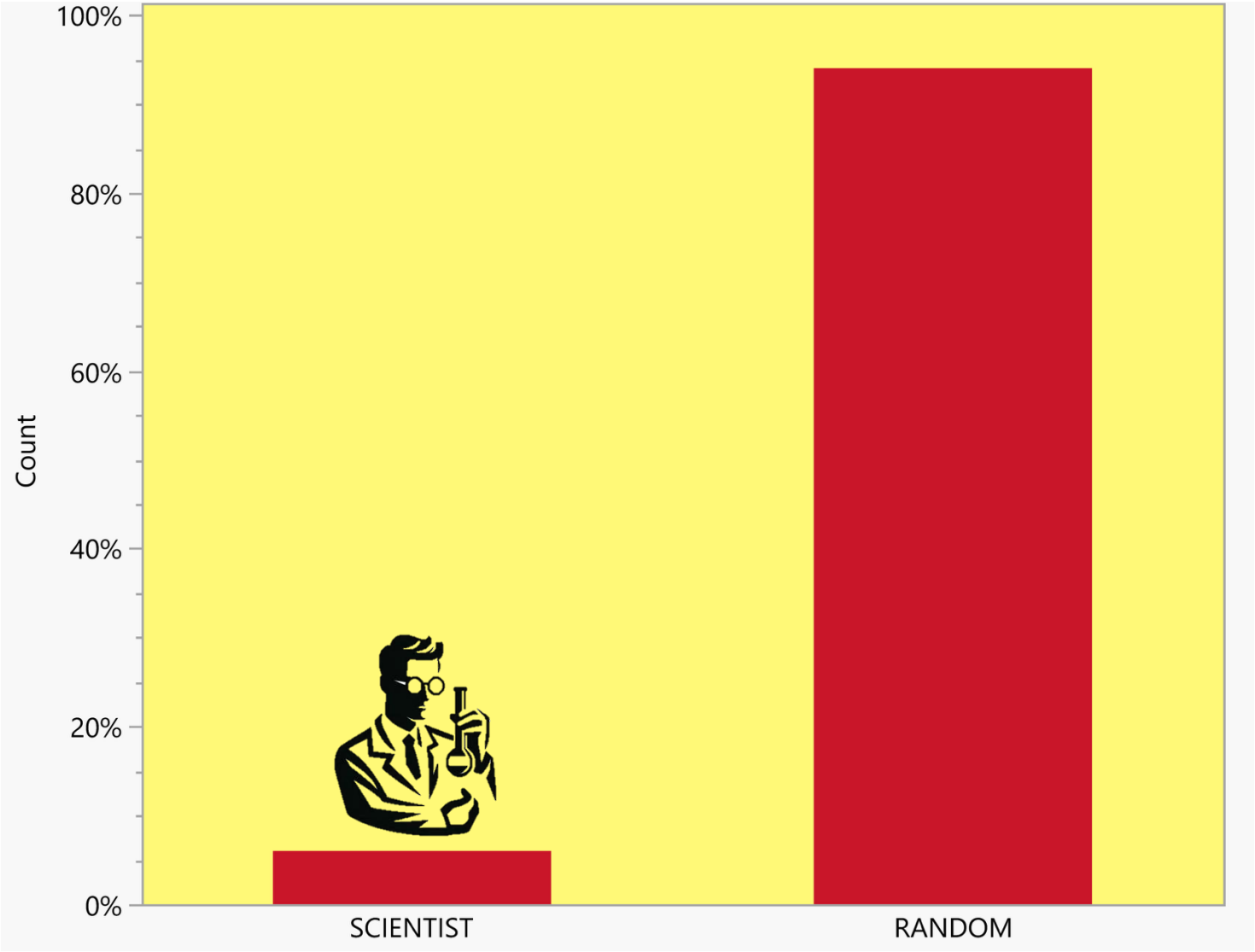

Found in Data

Let that sit.

Take Home

- We work in a tricksy multidimensional world.
- Our evolutionary biology is an issue.

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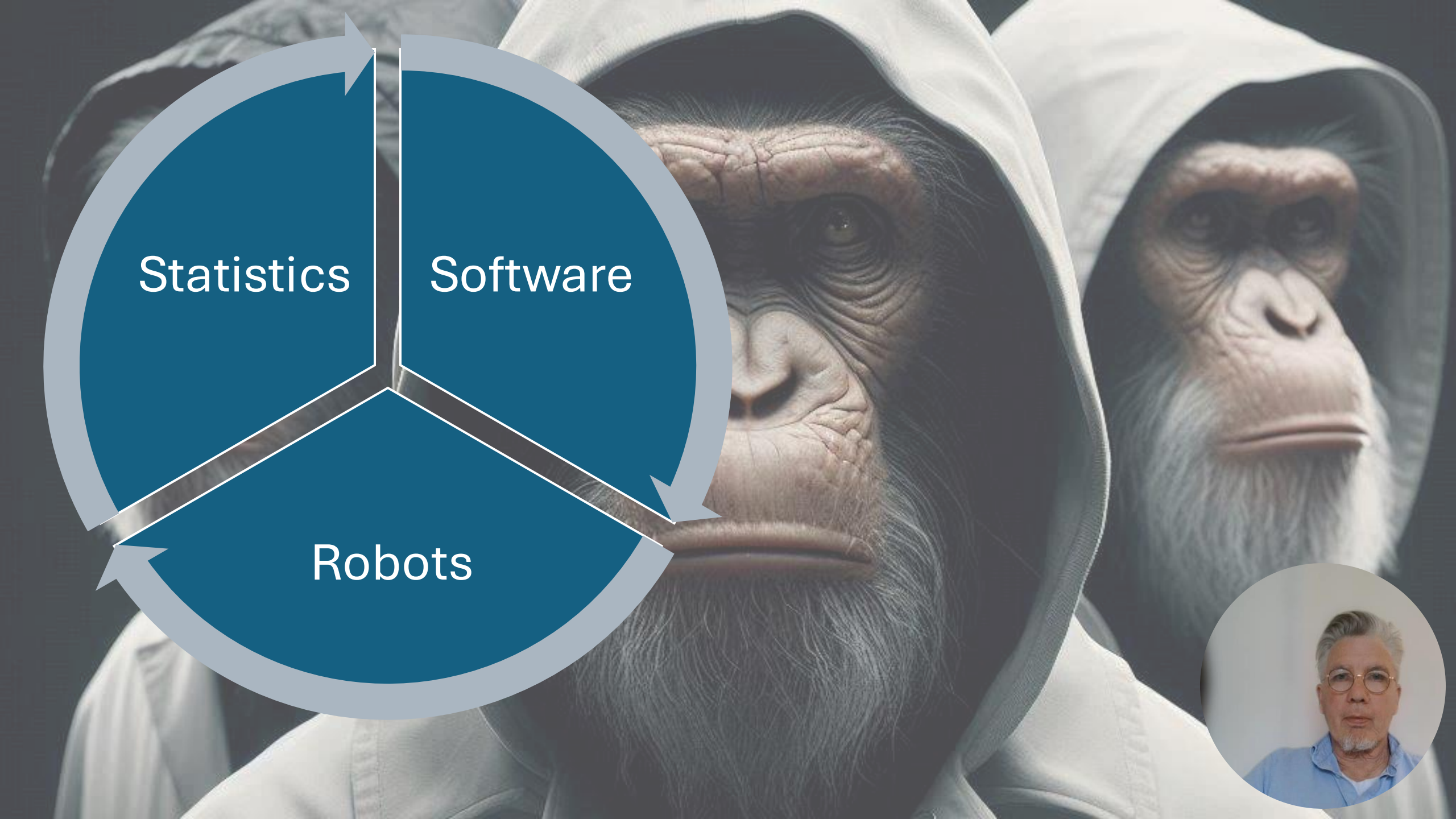
Statistics
Software
Robots

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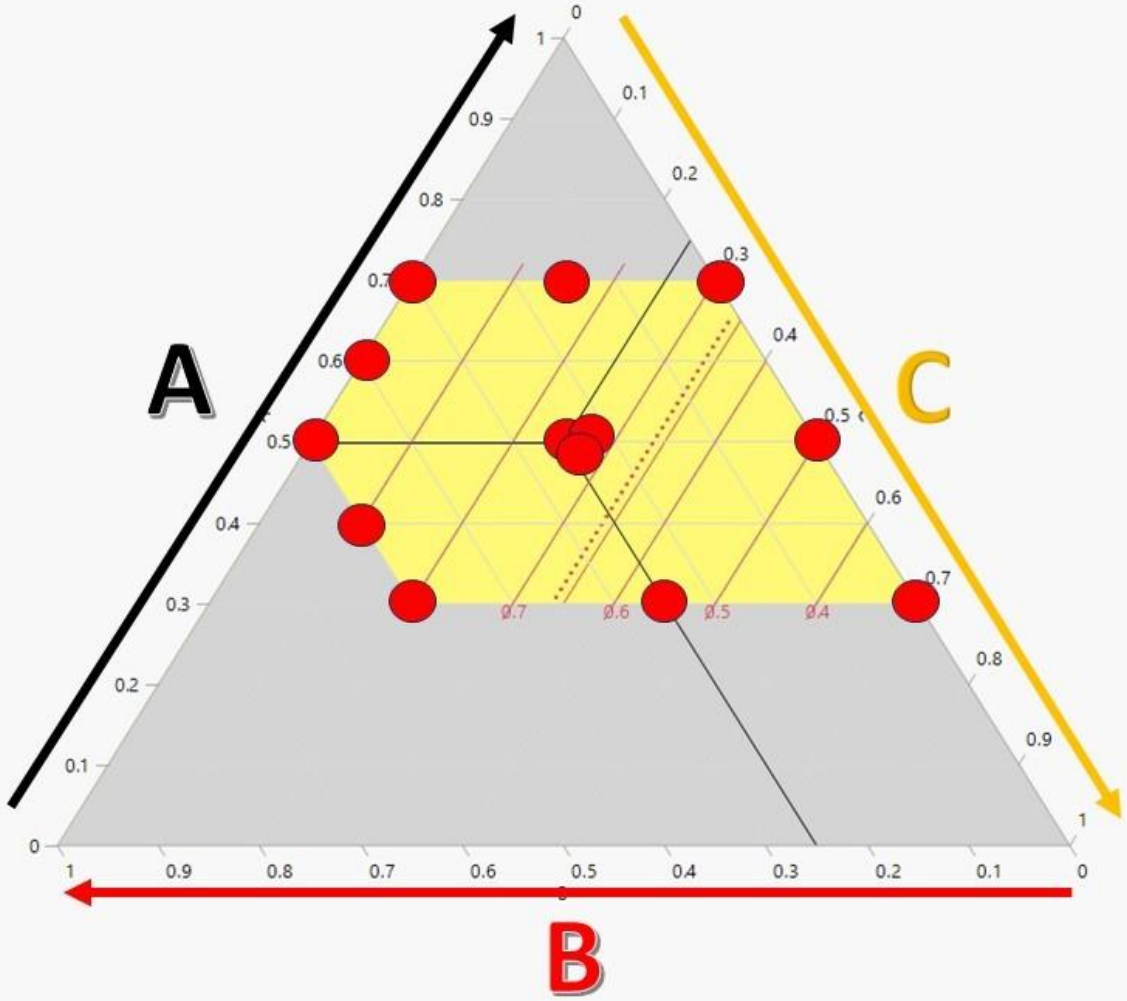

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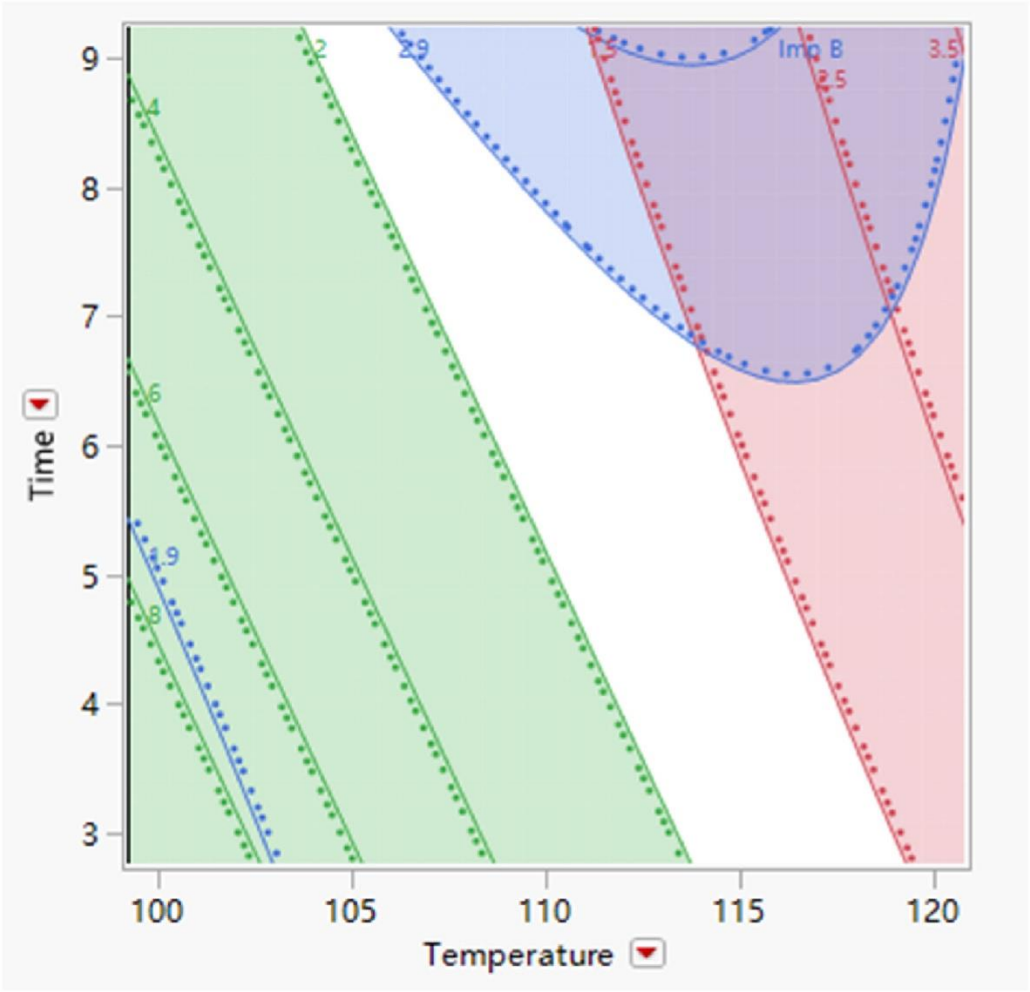

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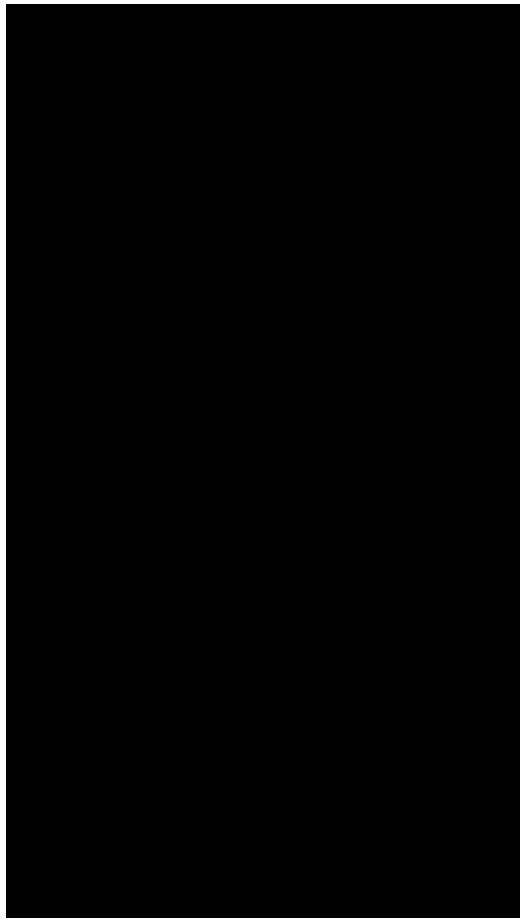

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We admit that we are like apes, but we seldom realise that we are apes –
Richard Dawkins