

A large flock of white swans is gathered in a body of water. In the foreground, a black swan is prominently featured, its dark feathers contrasting with the white of the other swans. The background is filled with many more white swans, some looking towards the camera and others looking away. The water is calm, and the overall scene is peaceful.

# Black Swans & Perfect Storms

## The breakdown of predictability

**Rasmus Dahlberg**  
Author, historian & consultant

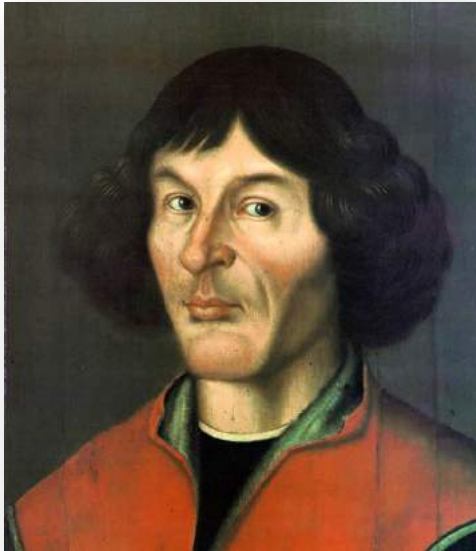
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# The Disaster Historian...





# The Scientific Revolution



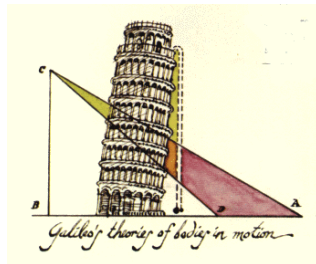
Nicolai Copernicus



Galileo Galilei

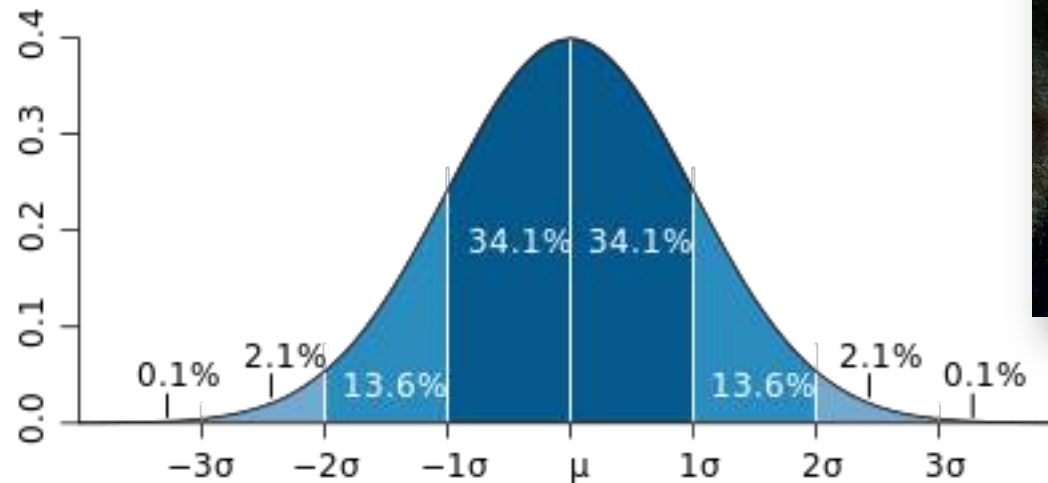


Sir Isaac Newton



**1543-1687:** Through reduction, approximation and linearization the great scientific thinkers created a **predictable** interpretation of the world.

# A nice and predictable world!



Carl Gauss



Pierre S. de Laplace

"We may regard the present state of the universe as the effect of its past and the cause of its future. An intellect which at a certain moment would know all forces that set nature in motion, and all positions of all items of which nature is composed, if this intellect were also vast enough to submit these data to analysis, it would embrace in a single formula the movements of the greatest bodies of the universe and those of the tiniest atom; for such an intellect nothing would be uncertain and the future just like the past would be present before its eyes." (1814)

*Pierre Simon, Marquis de Laplace,  
French mathematician and astronomer (1749-1827)*

# Unfortunately it is quite complex...



Complexity is **produced** by:

- A high degree of interconnectedness,
- Lack of resources/competition,
- Decisions based on local knowledge etc.

**Consequences** of complexity are plenty:

- Unpredictability
- Disproportionate relations between cause and effect (non-linearity)
- Emergent phenomena (undesigned patterns)



# Camelot! It's just a model...



"All models are wrong, but some models are useful."

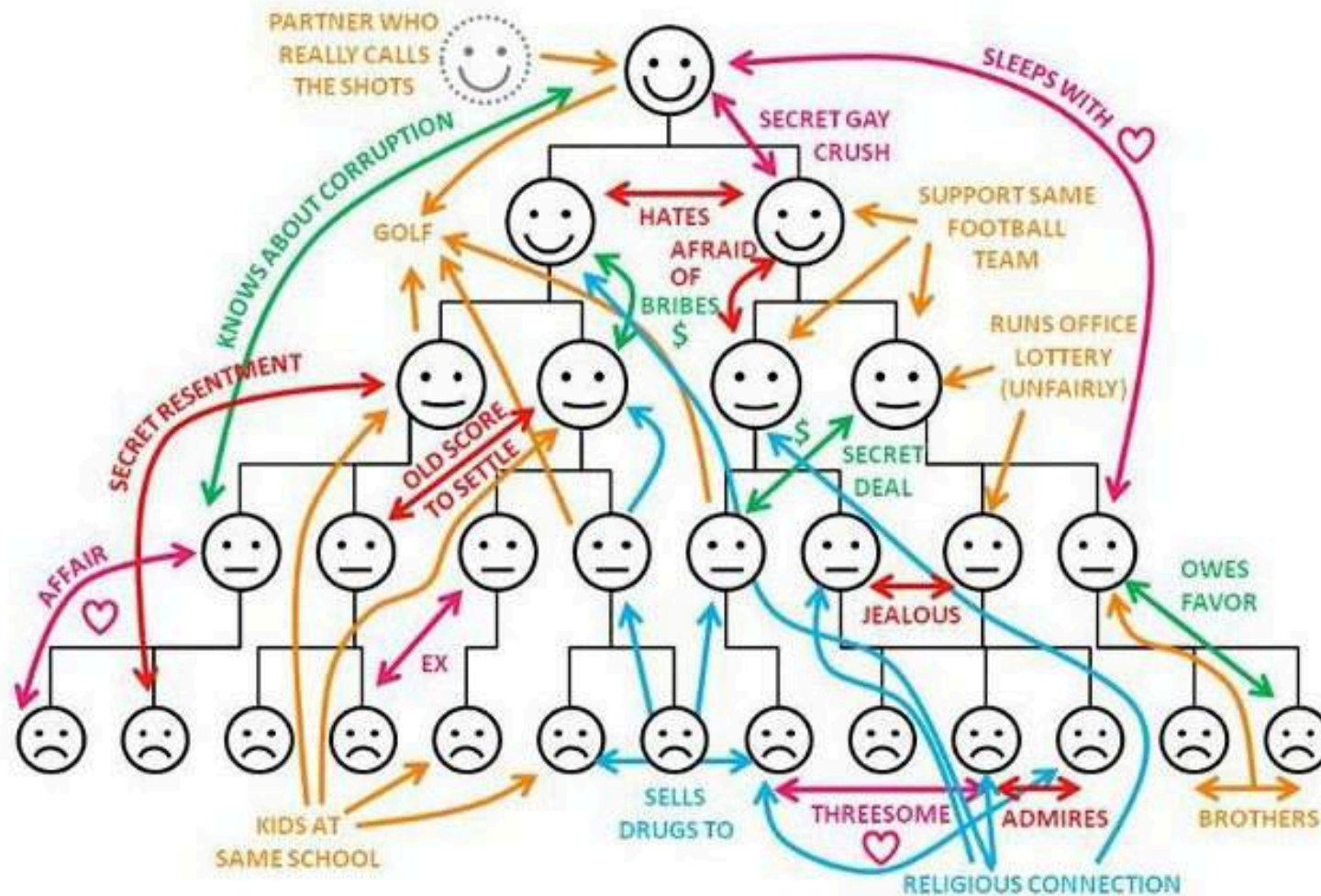
*George E.P. Box, statistician (1919-2013)*



# How we think the world is



# How the world really is

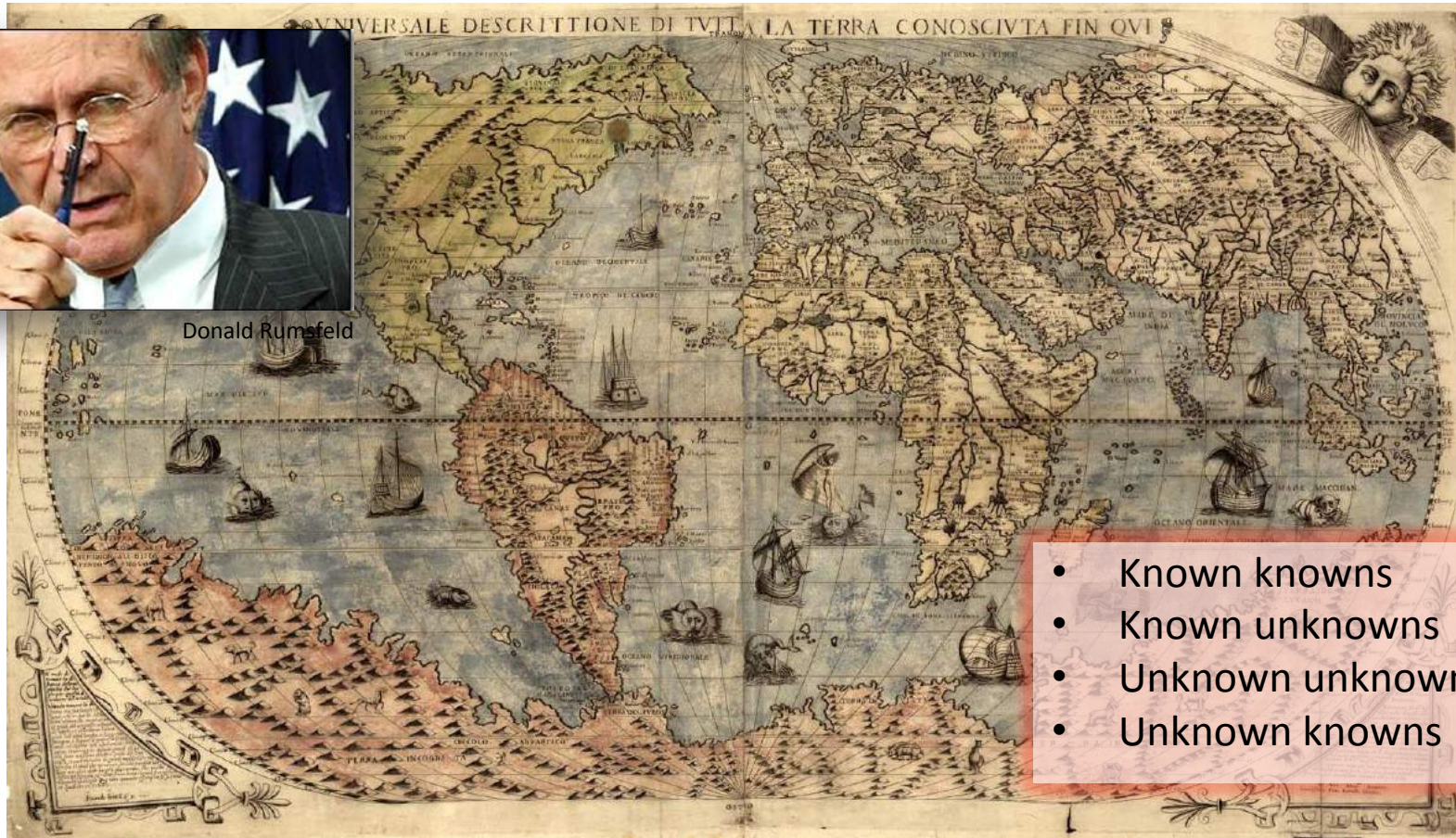




# The map and the territory



Donald Rumsfeld



- Known knowns
- Known unknowns
- Unknown unknowns
- Unknown knowns

# What is a(t) risk?

Risk = Impact x Probability

Risk = The probability of loss

Risk = Vulnerability x Hazard

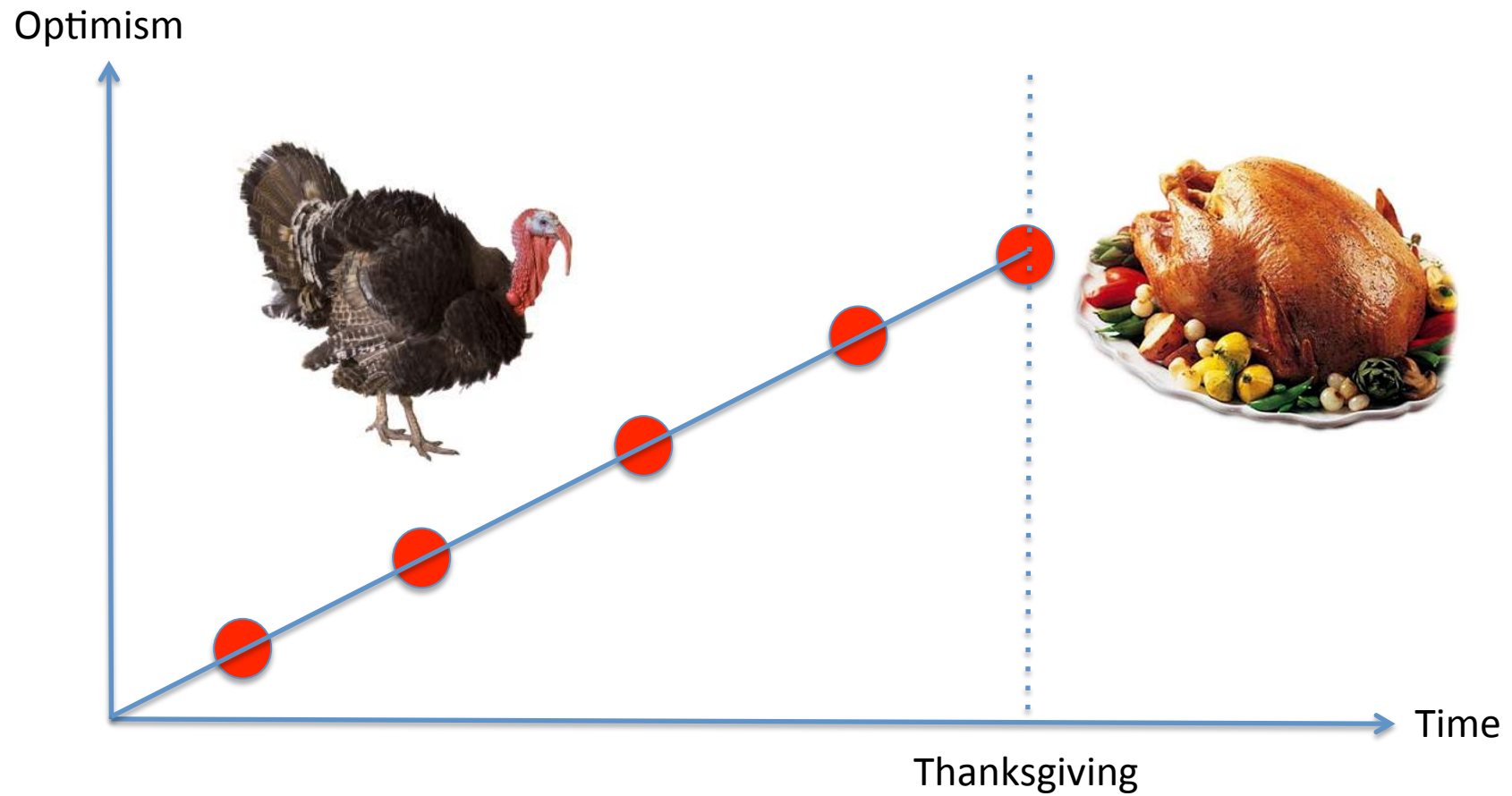
Risk = (Vulnerability x Hazard) / Capacity

Risk = (Vulnerability x Hazard) - Resilience



Probability	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
		1	2	3	4	5
		Impact				

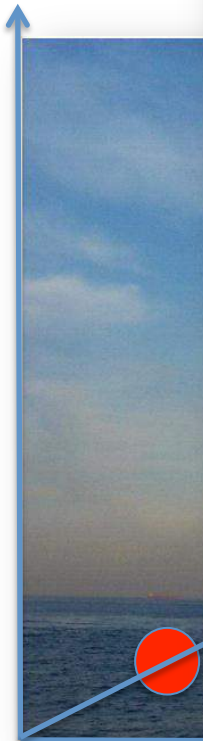
# The Turkey Fallacy





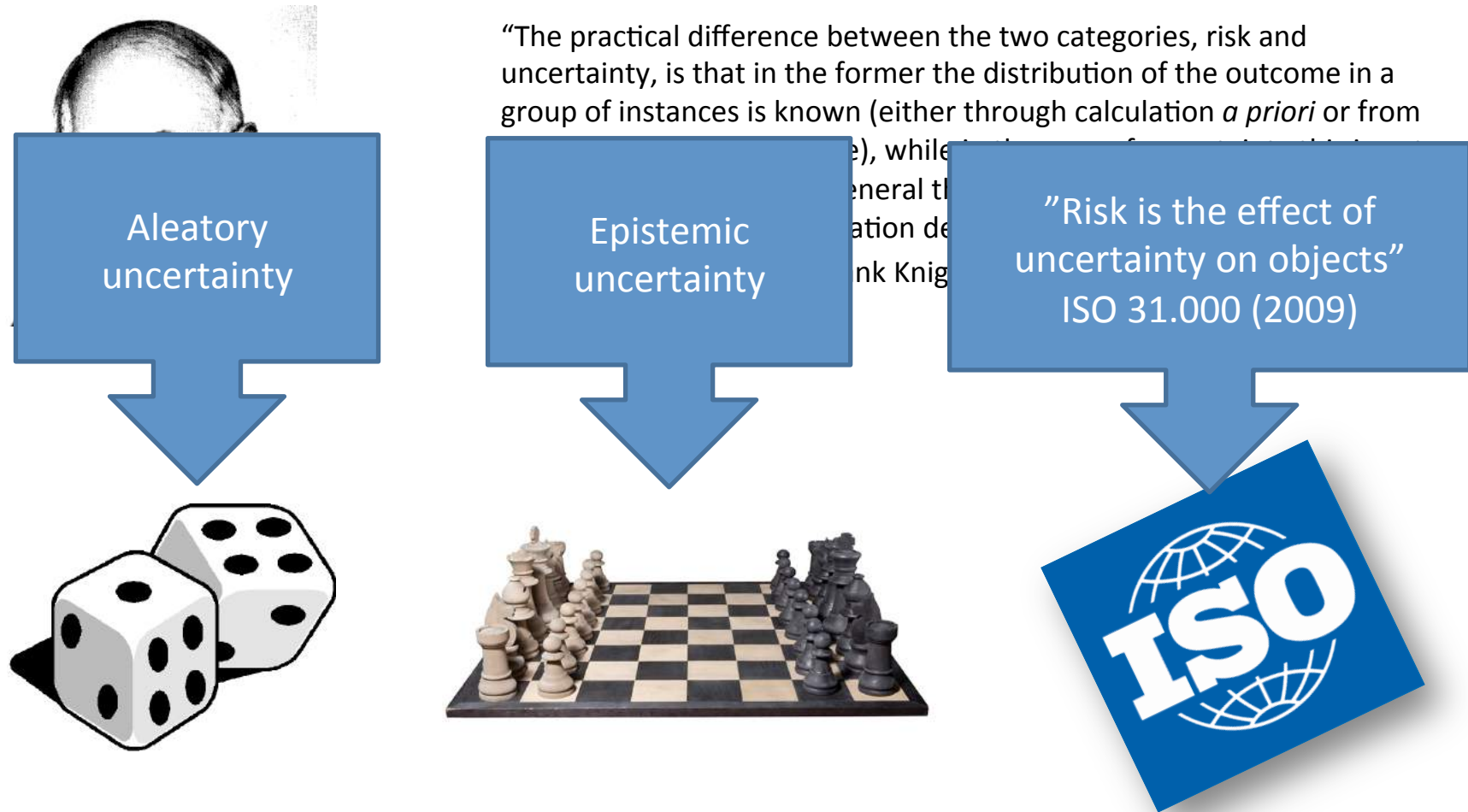
# The Well from Hell

Optimism



Time

# Uncertainty and risk



# Black Swans and Perfect Storms



- **Black Swans:** Unforeseen large-impact events that in hindsight look like something we should have been able to predict (epistemic uncertainties)



- **Perfect storms:** Unforeseen catastrophic combinations of calculable, predictable events (aleatory uncertainties)



# Two worlds

## *The Old World:*

- Predictable
- Analysis
- Control
- Hierarchy
- Stability
- Robustness

## *The New World:*

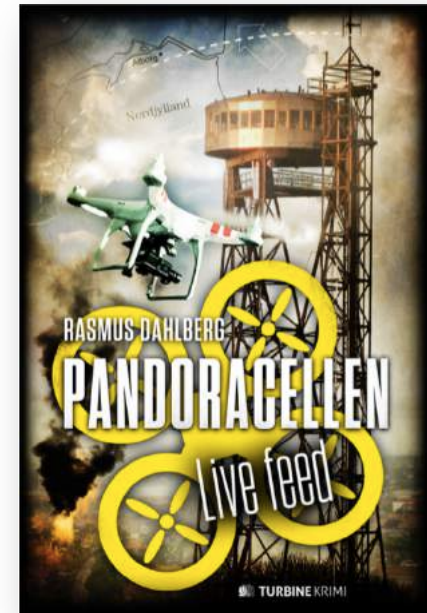
- Unpredictable
- Experiment
- Coordination
- Network
- Fleksibility
- Resilience

# Welcome to the New World!

- You are already behind
- You'll never have complete knowledge
- Old solutions do not work anymore
- The future can't be predicted
- The world will only become *more* complex

... have a nice day 😊

# Contact info



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