Systems theory in strategic practice

EPIC2022 Tutorial - 4/5 October 2022

Scott Matter

Associate Director - Shaping Futures
NSW Department of Premier and Cabinet

CITATION:
Matter, Scott. 2022. Tutorial: Systems Theory in Strategic Practice. Presented at EPIC2022, 5 October 2022.
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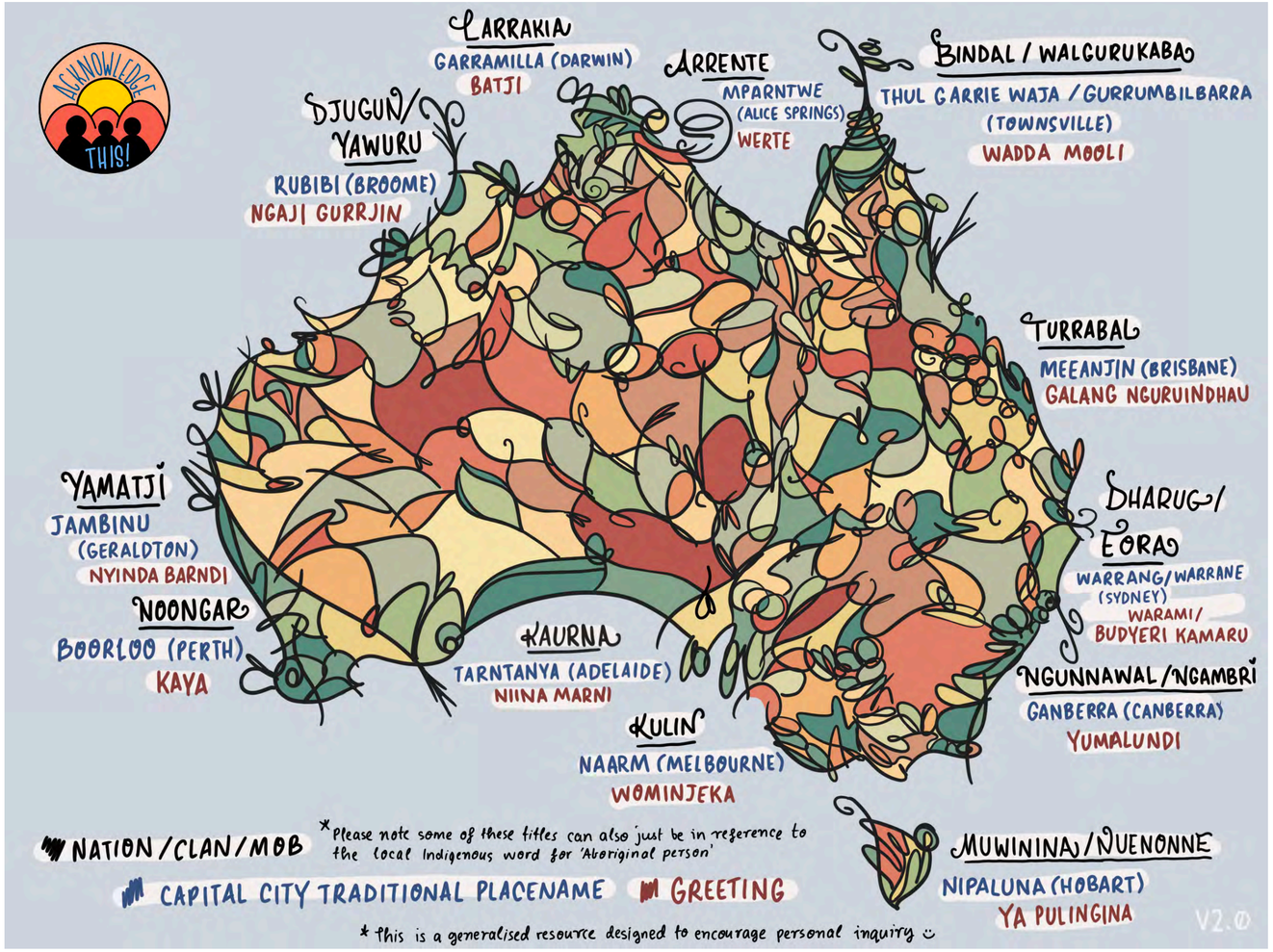
Acknowledgement of Country

Acknowledging I'm here on Wangal Country, and paying my respects to Aboriginal elders past, present, and emerging, whose connection to Country and Community stretches back at least 60,000 years and continues today.



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Overview of tutorial

First hour:

- Introduction and warm-up
- System concepts
- Break (~10 minutes)

Second hour:

- Sketching your system
- Break (~10 minutes)

Third hour:

- Changing systems

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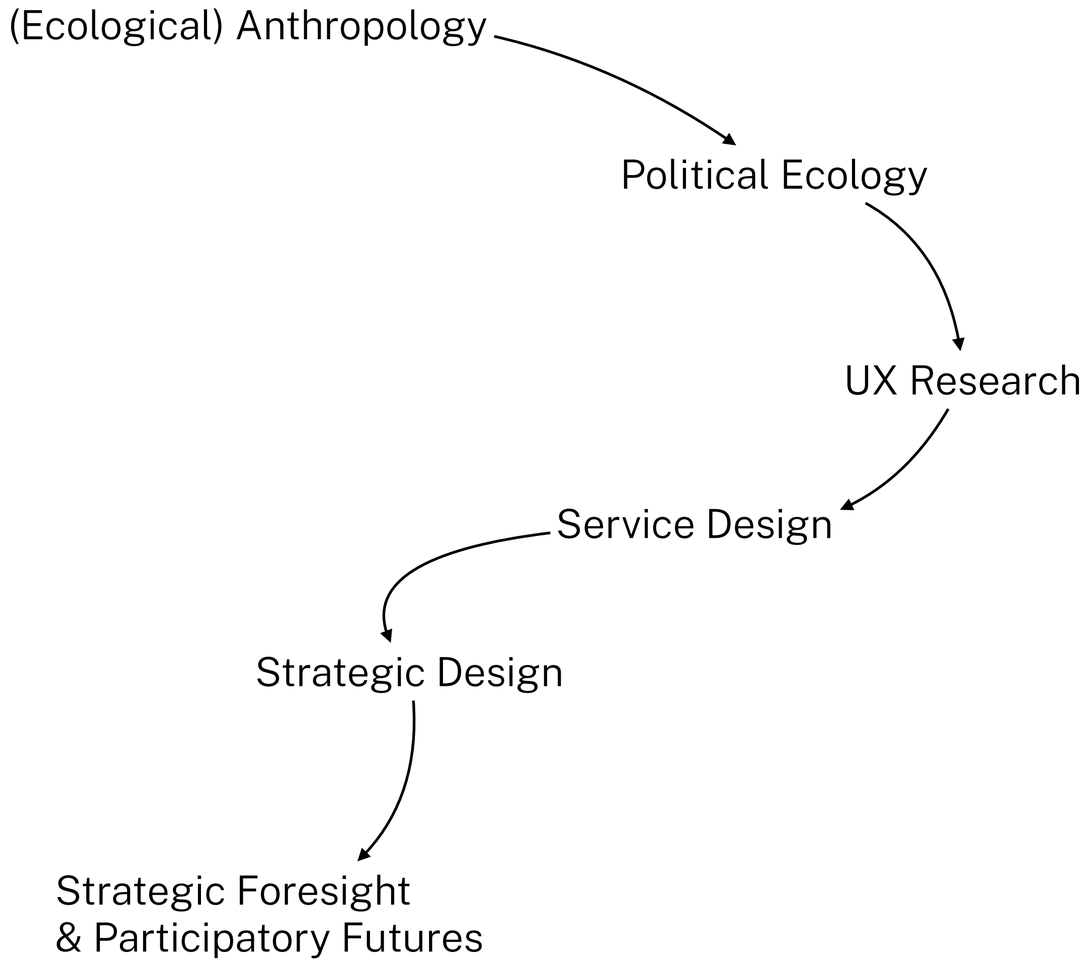
Introduction

A bit about me



I've used systems thinking and methods in recent projects:

- News media product / service strategy
- Internal business transformation
- Foresight advice on COVID-19
- 40-year futures scenarios for infrastructure and land use planning
- Service redesign for anatomical pathology

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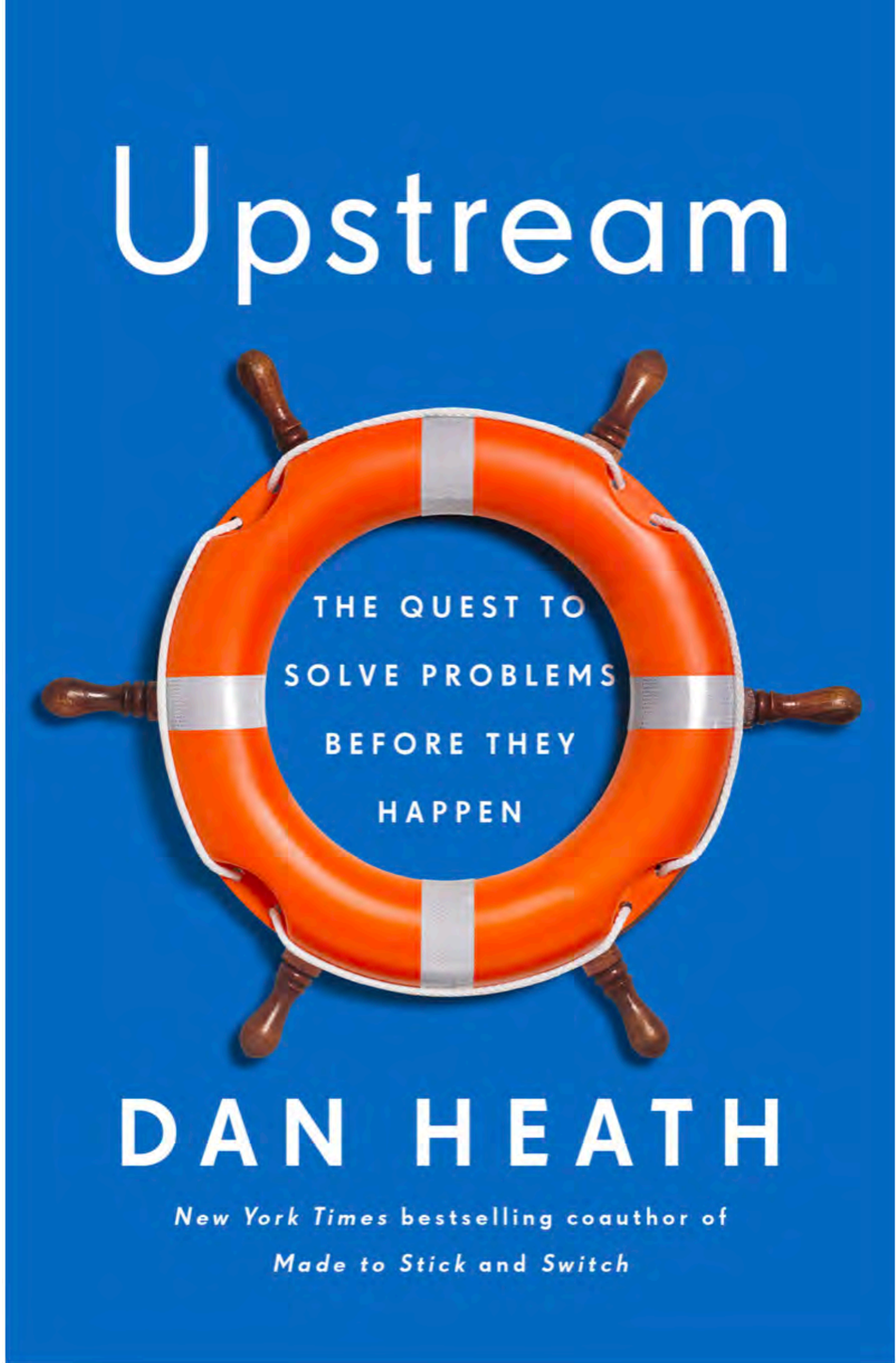
Going upstream

When you spend years responding to problems, you can sometimes overlook the fact that you could be preventing them.

We tend to favour reaction - downstream work is easier to see, and easier to measure.

Systems approaches help find better solutions to persistent problems.



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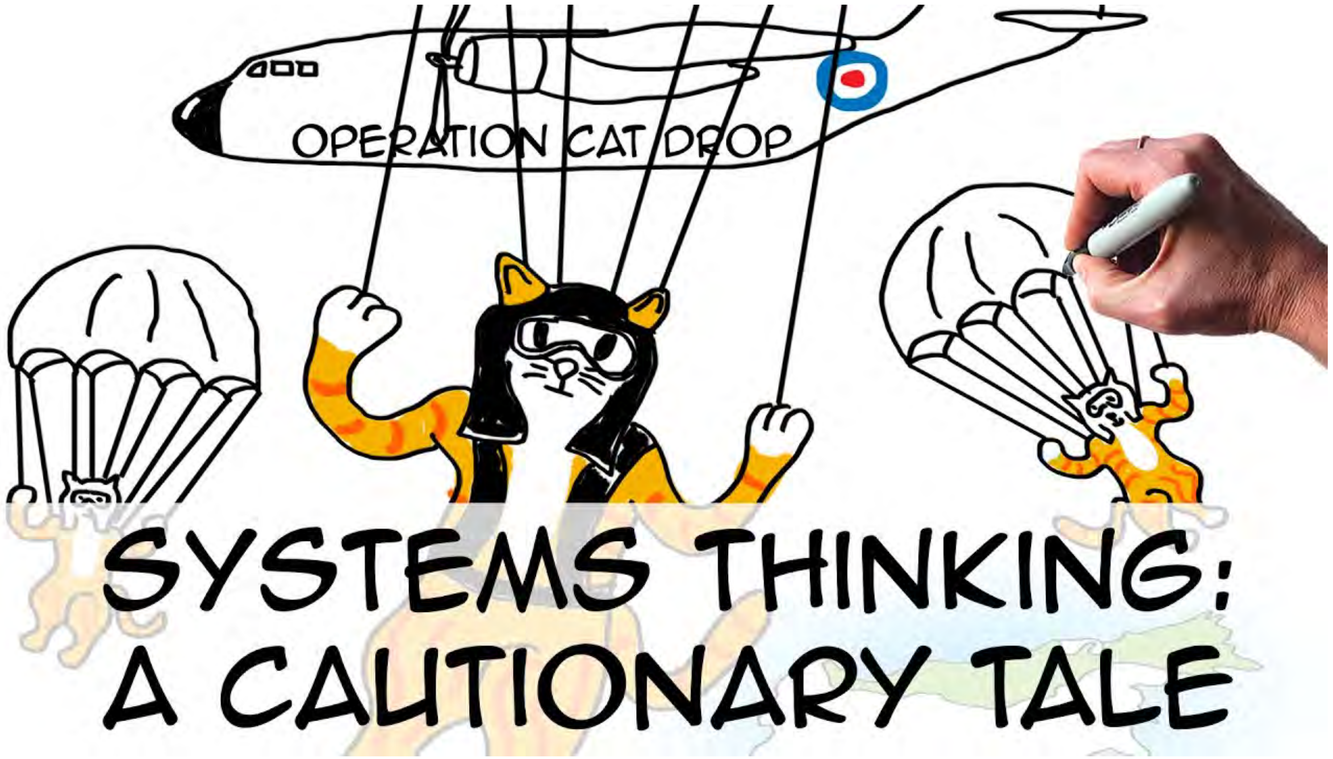
Operation Cat Drop



"If you don't understand the inter-relatedness of things, solutions can often cause more problems"

Systems theory and methods give us tools to **anticipate undesired consequences** of change.

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“Systems can’t be controlled, but they can be designed and redesigned. … We can’t impose our will on a system. We can listen to what the system tells us, and discover how its properties and our values can work together to bring forth something much better than could ever be produced by our will alone.”

Donella Meadows - Dancing with Systems / Living in a World of Systems

Let’s get warmed up!

Draw Toast

Take a couple of minutes and sketch out “how to make toast”

Why draw toast?

- Quick and easy warmup
- You’re already sketching systems!

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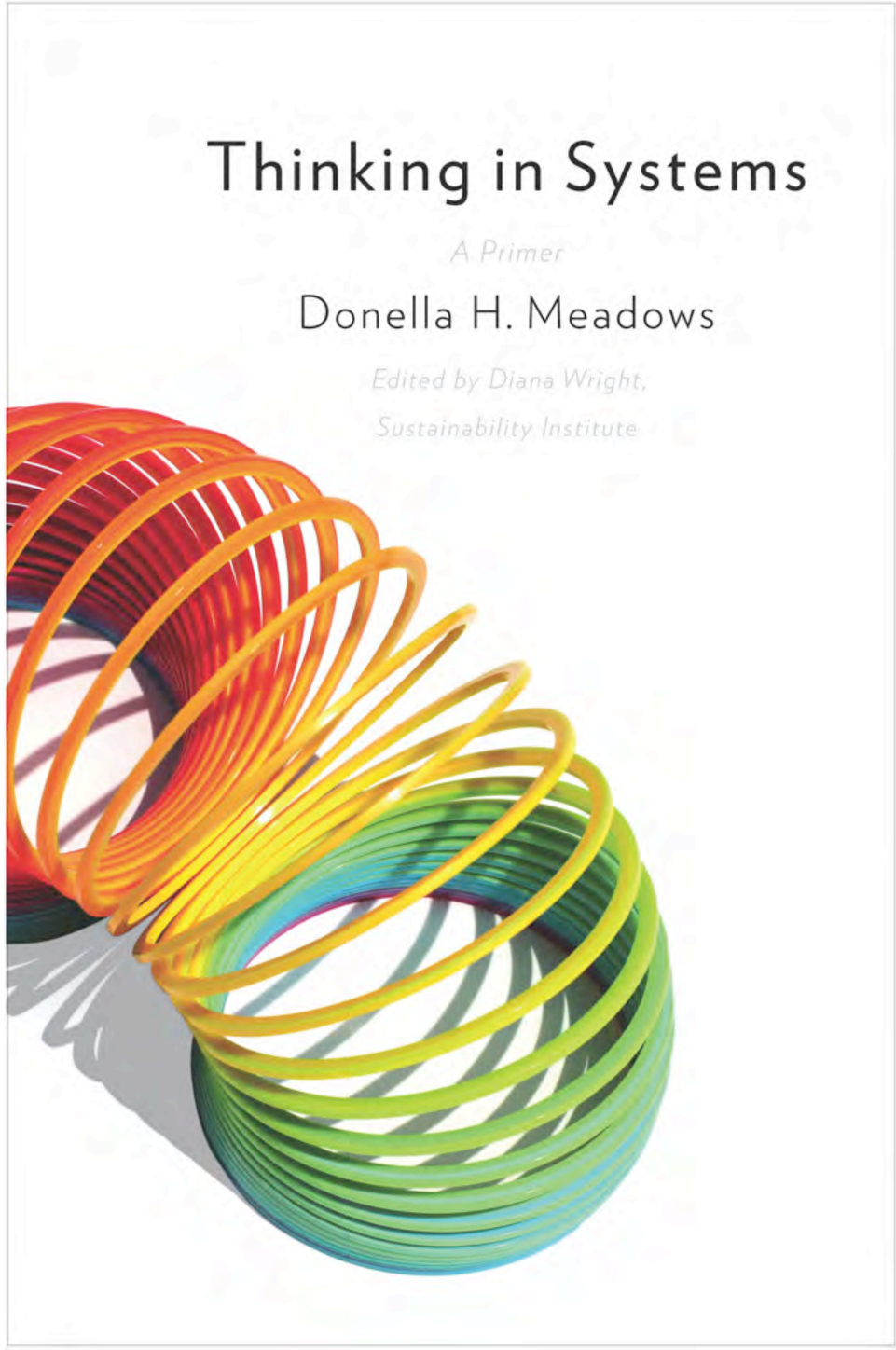
Defining “systems”

A system is an **interconnected set of elements** that is **coherently organised** in a way that **achieves something**

- A system is not just a collection of things
- Systems can be built, or they can be emergent
- Strategic work mostly involves complex adaptive systems



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Systems concepts

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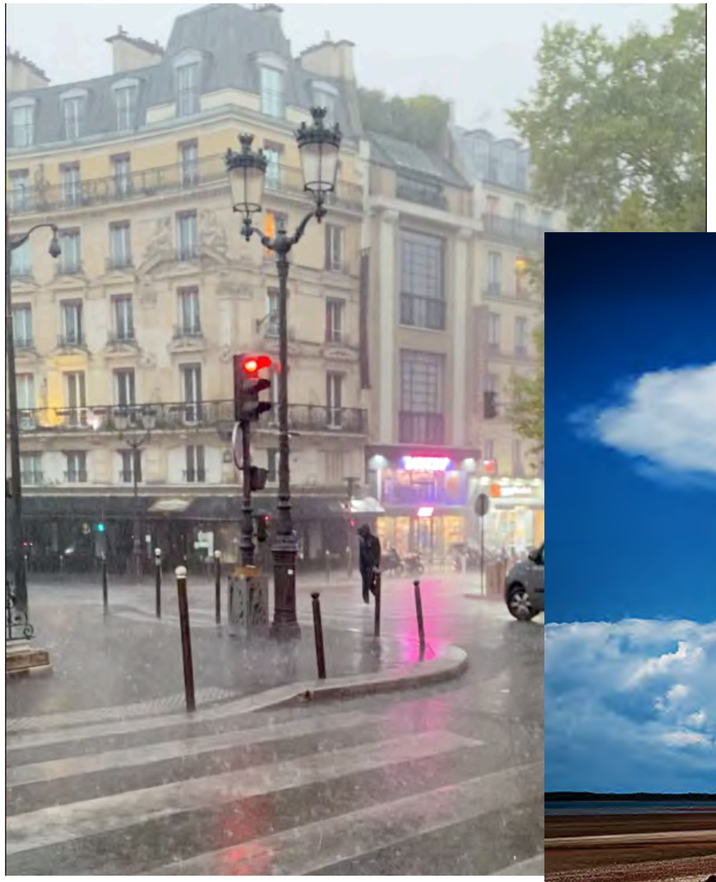
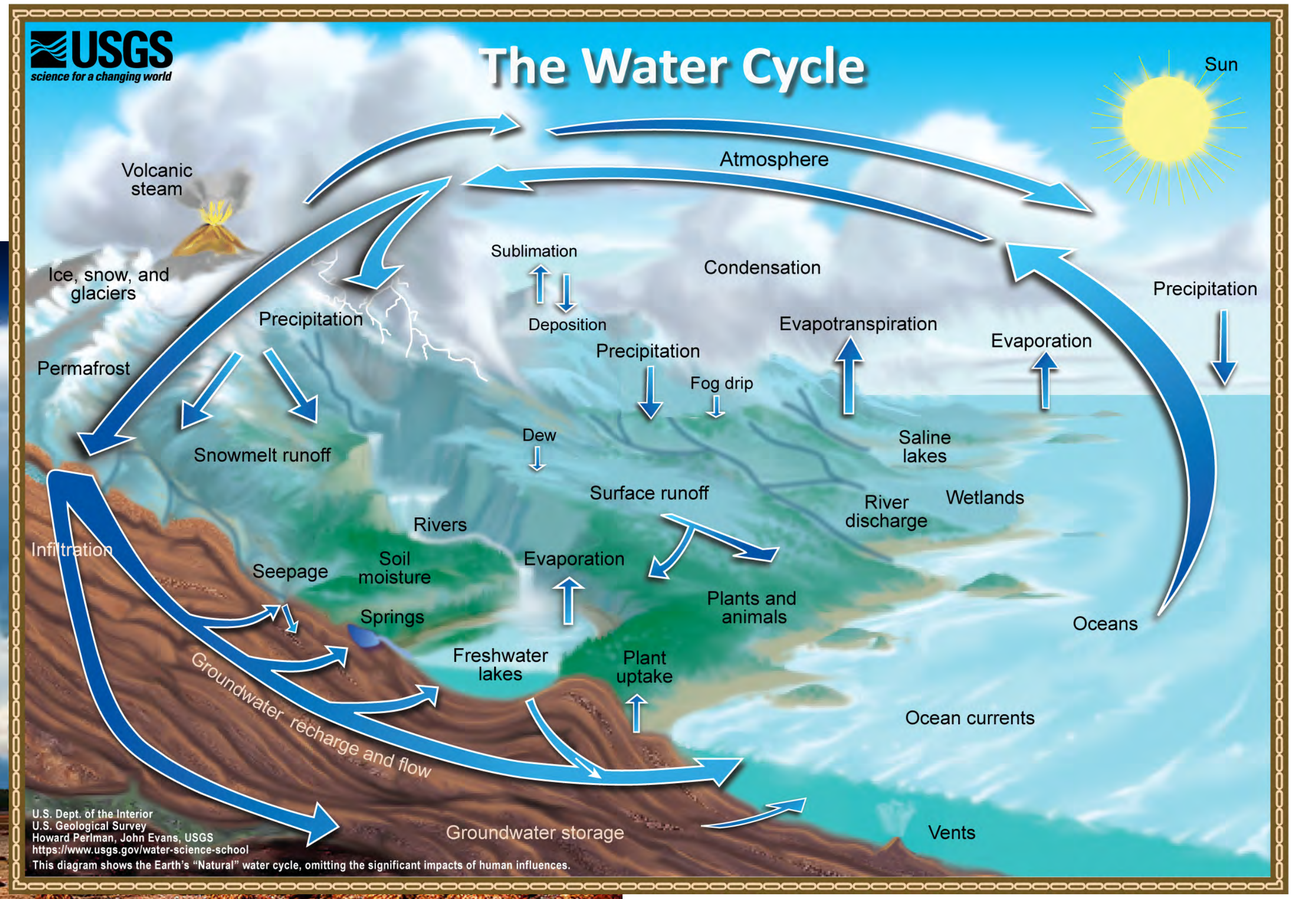
Events, patterns, structures





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Stocks and flows

Stocks

- Anything that can accumulate and be measured at a point in time
  - Money, population, water, … stress, trust? power?

Flows

- Represent things change over time, expressed as a “rate”
  - Interest rate, birth / death rates, rainfall

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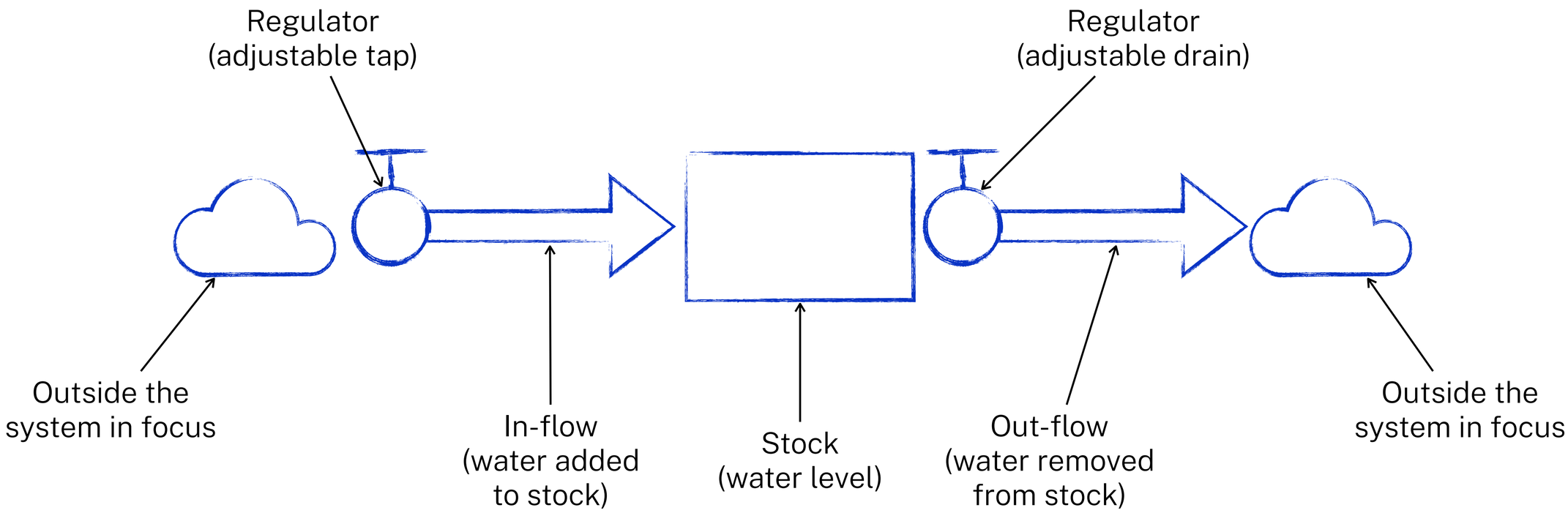

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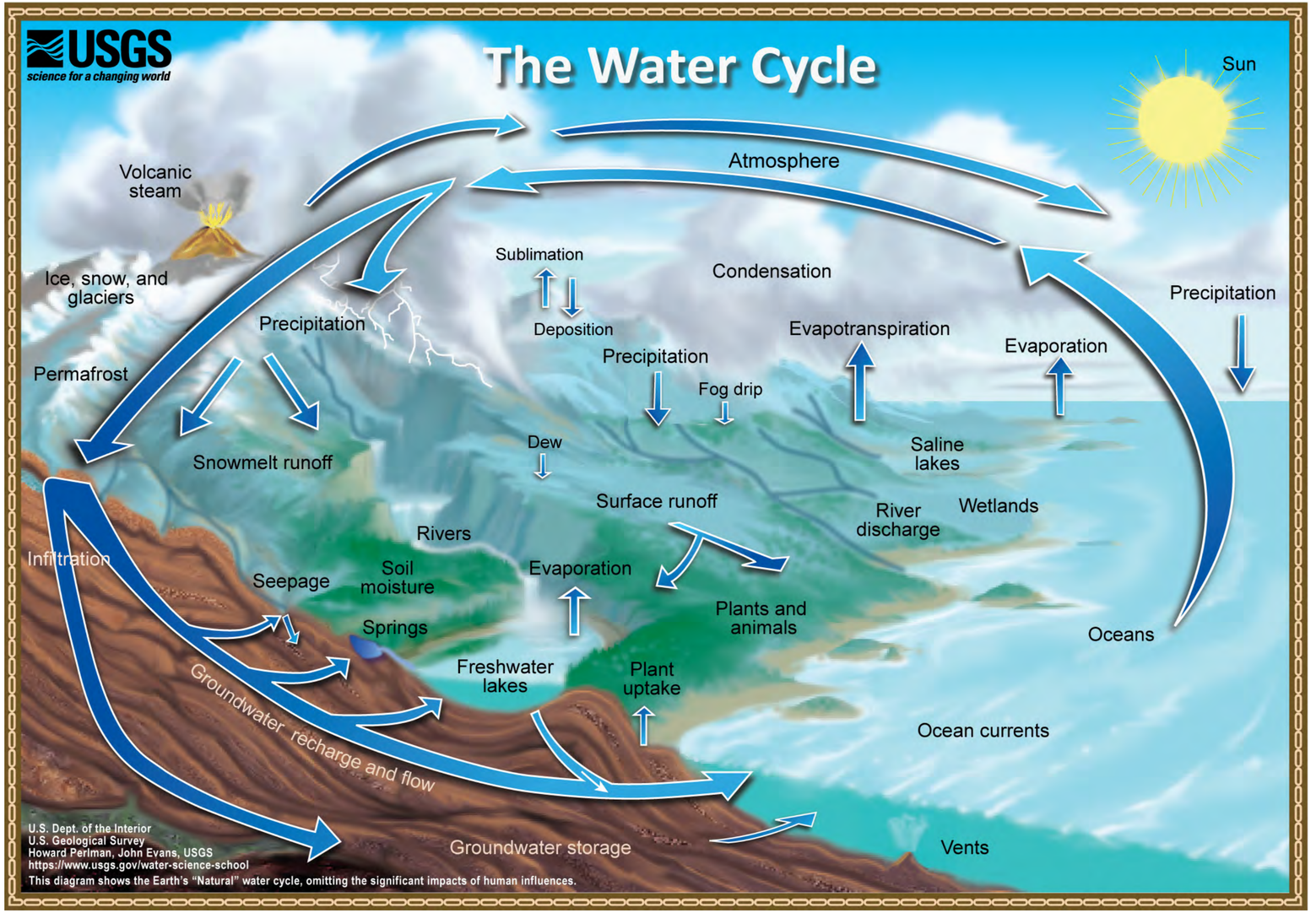

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Feedback loops

Feedback loops are control mechanisms in a system

A feedback loop is

- A closed chain of causal connections
- From a stock
- Through a set of decisions or rules or physical laws or actions that are dependent on the level of that stock
- And back again through a flow to change the stock

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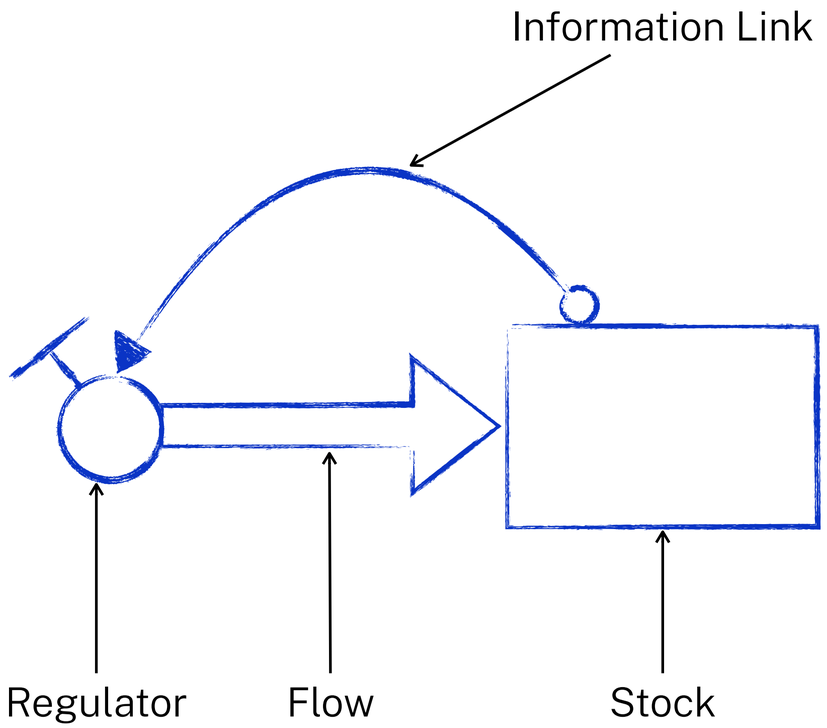
Feedback loops



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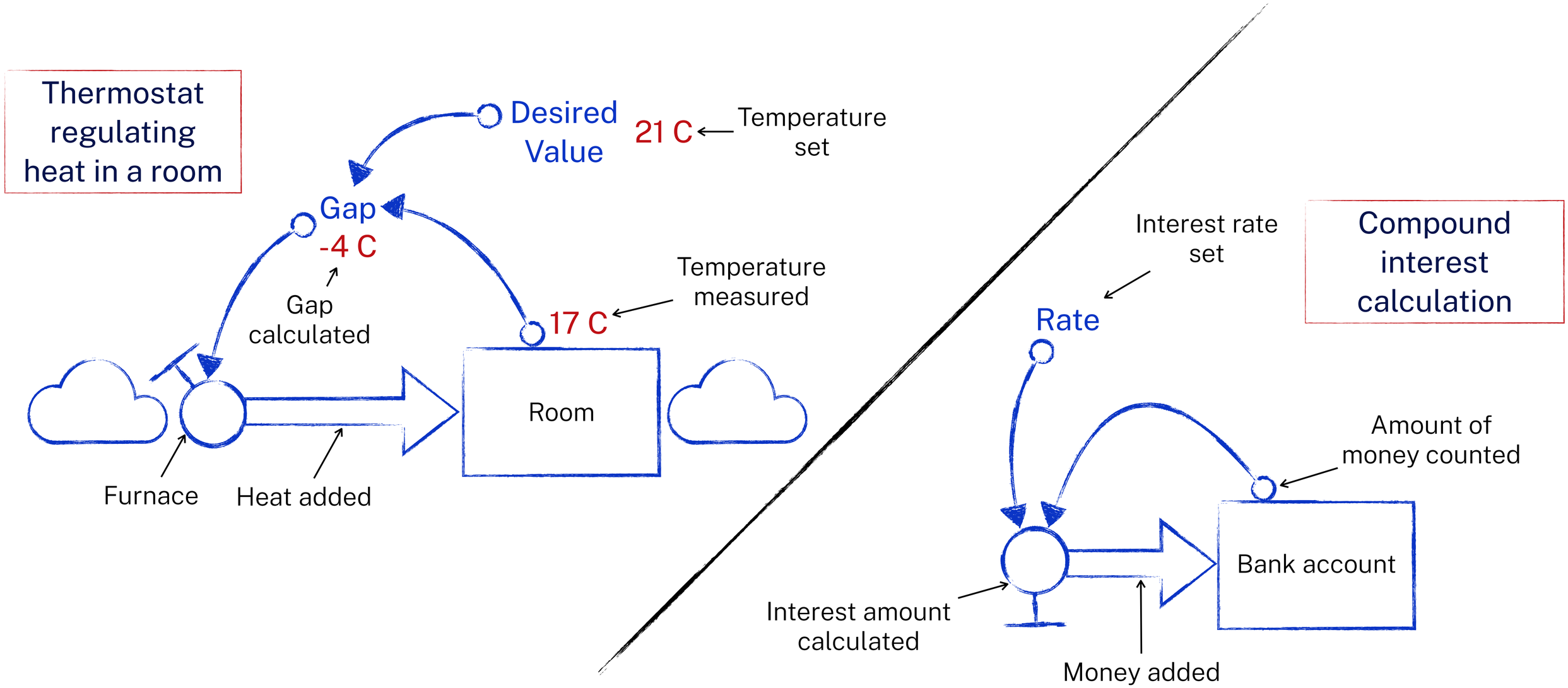
Feedback loops



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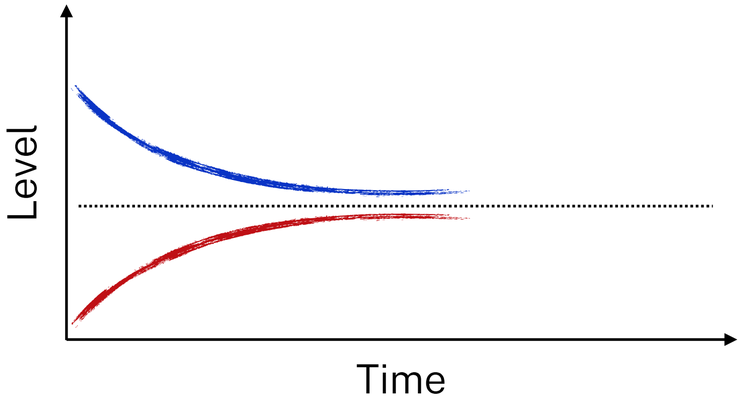
Feedback loops

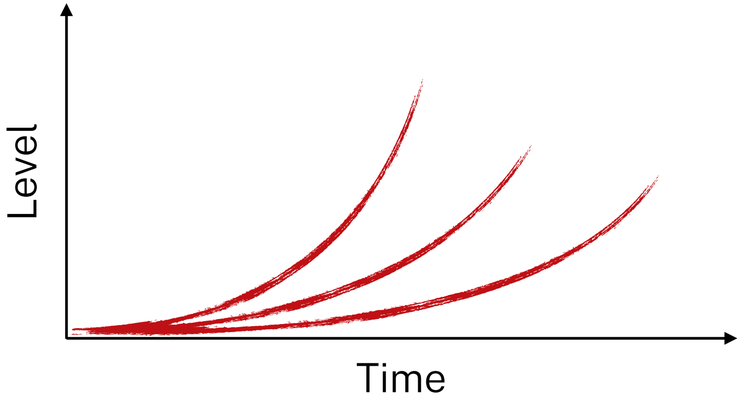
Balancing / stabilising loops

- Feedback loops that help keep a stock within an acceptable range



Reinforcing / amplifying loops

- Feedback loops that lead to (exponential) change in the level of a stock
- This can involve either increase or decrease



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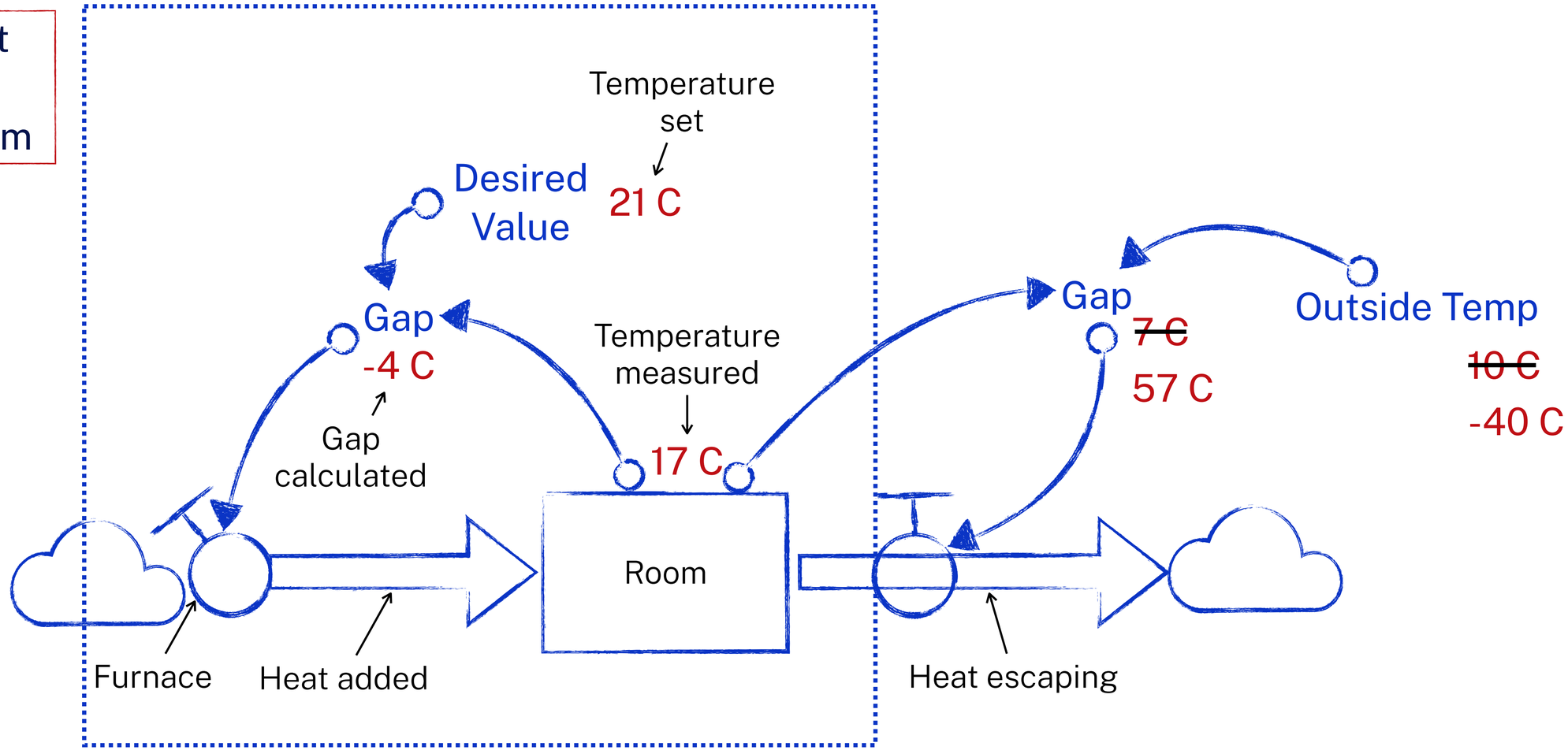
Boundaries around systems

Thermostat regulating heat in a room



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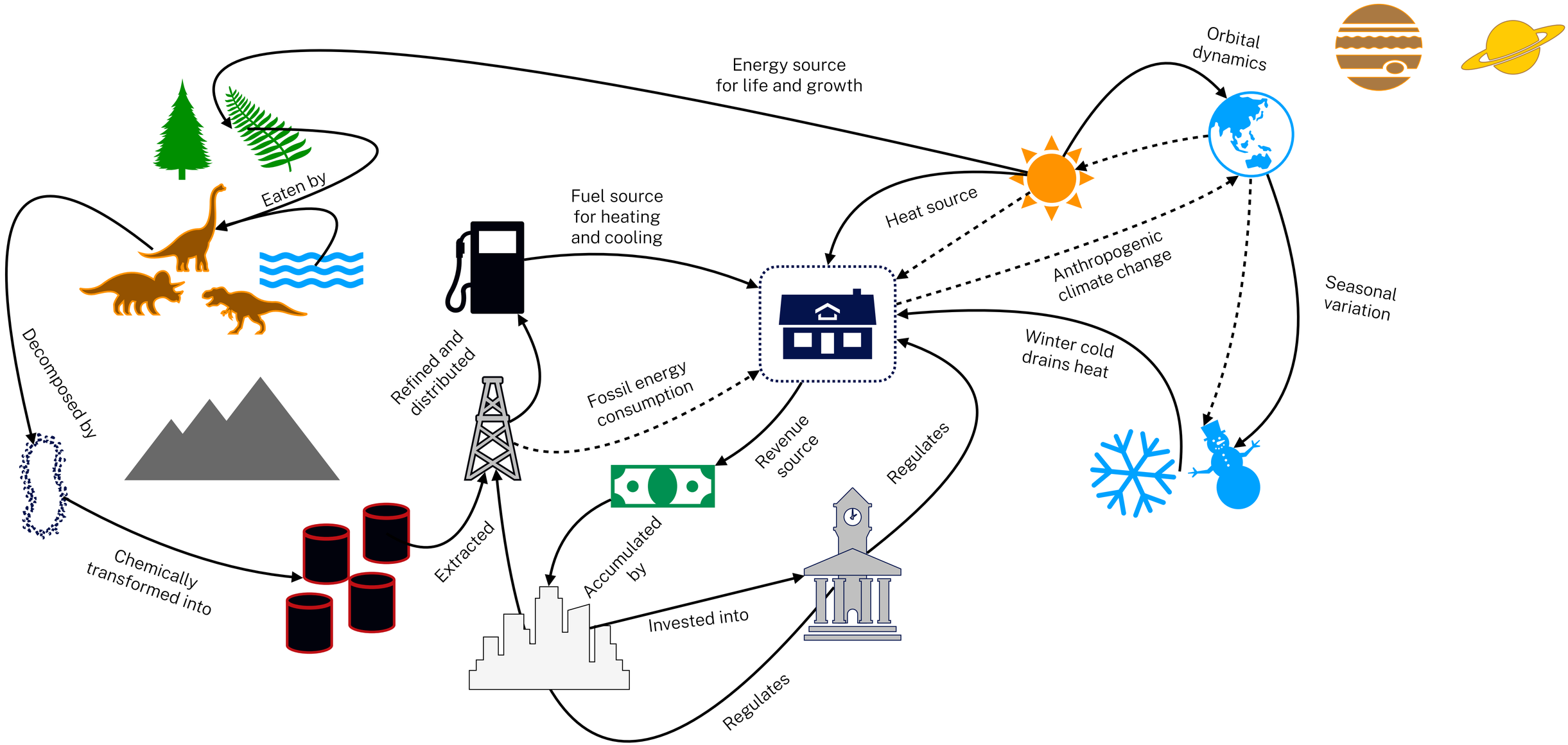
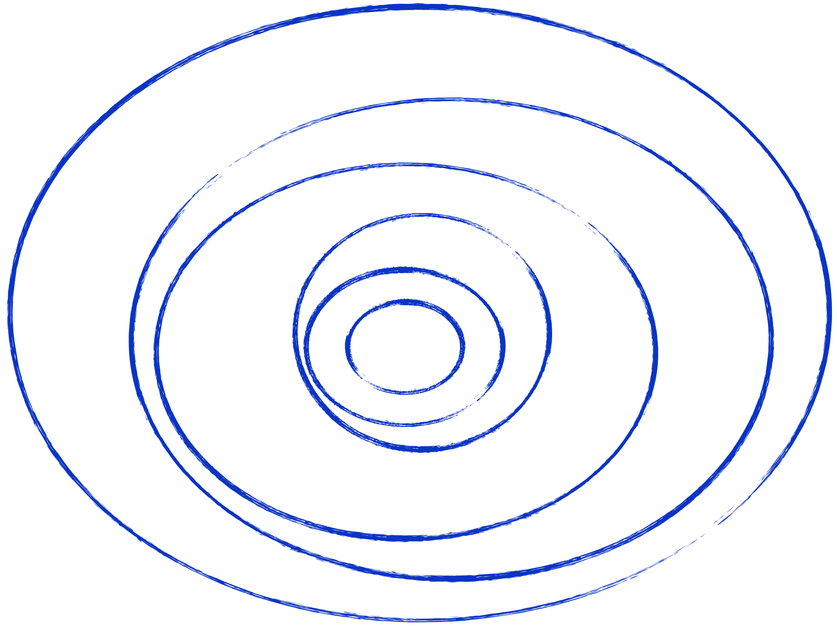
Boundaries around systems



Boundaries around systems

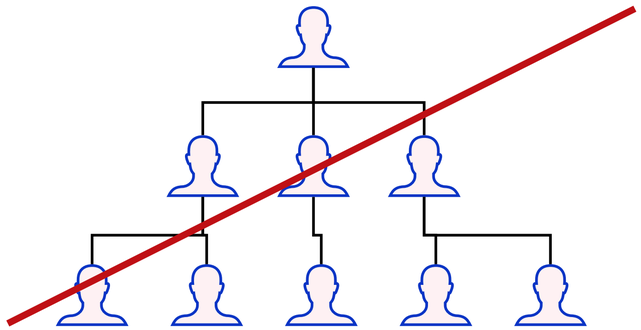
Holon

- A “thing” that is simultaneously whole and part of other things
- Levels of organisation within nested, intersecting systems



Holarchy

- Multi-scaled systems with emergent properties
- Contrast with implied top-down control in a hierarchical system?



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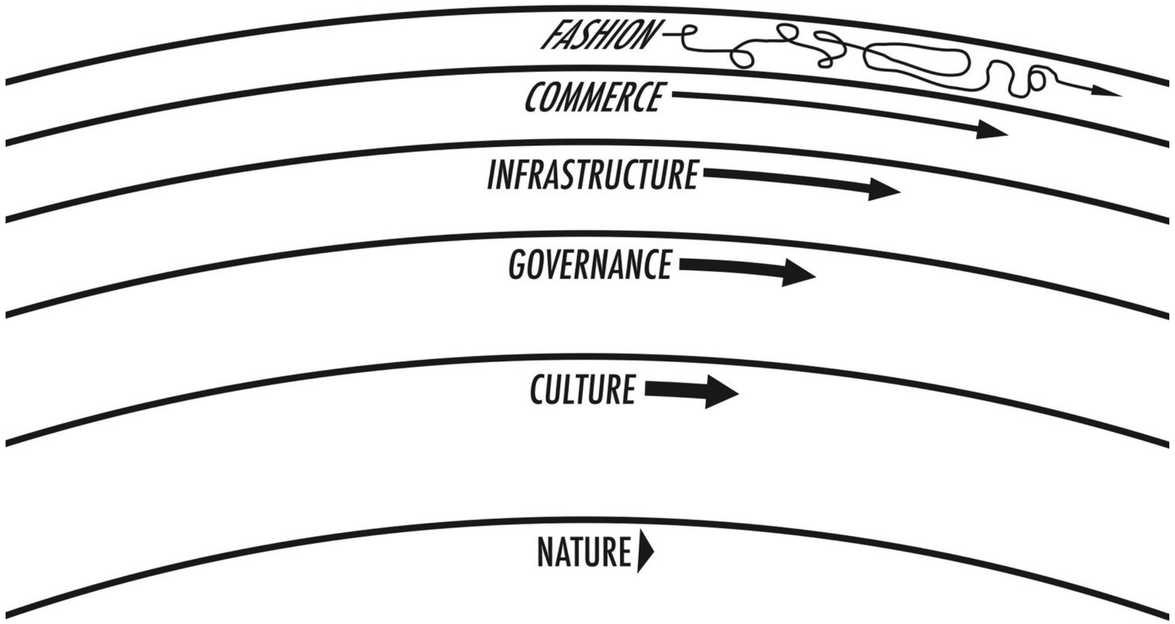


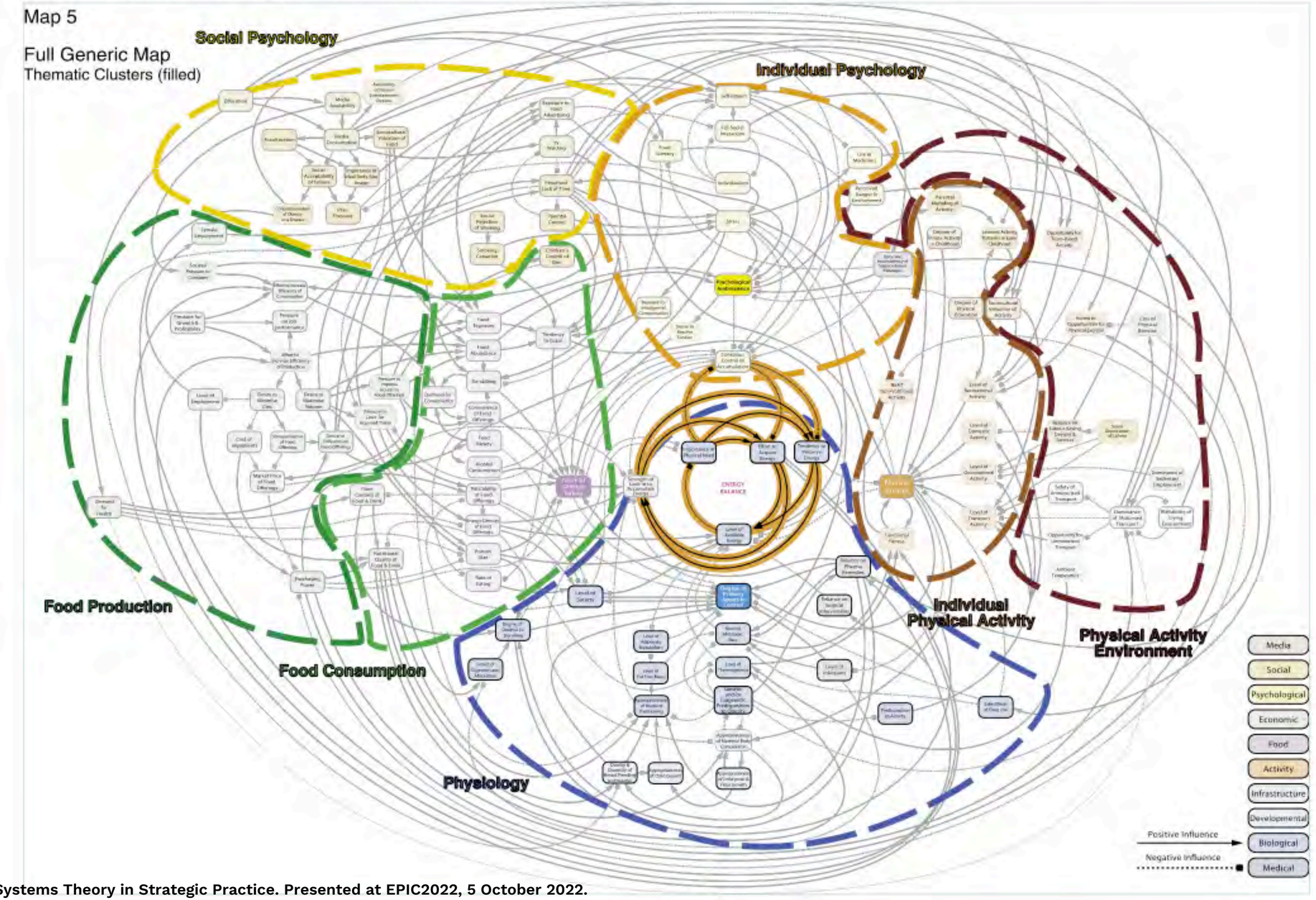
Pace layers

- Deeper layers move slower, shallower layers move faster
- Elements (and systems) interact across layers, and these interactions can be sites of turbulence or shear

“Our tissues change as we live: the food we eat and the air we breath become flesh of our flesh and bone of our bone, and the momentary elements of our flesh and bone pass out of our body every day with our excreta. We are but whirlpools in a river of ever-flowing water. We are not stuff that abides, but patterns that perpetuate themselves.”

–Norbert Wiener, The Human Use of Human Beings: Cybernetics and Society (1950 / 1990)

Figure 5.2: **The full obesity system map with thematic clusters (see main text 5.1.2 for discussion)**[17,18] Variables are represented by boxes, positive causal relationships are represented by solid arrows and negative relationships by dotted lines. The central engine is highlighted in orange at the centre of the map.



Boundaries around systems

Suboptimisation is one of the risks of choosing the wrong boundaries

- optimising for the benefit of a sub-part of a larger system
- with negative consequences for other parts or the system as a whole

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Questions before we break?

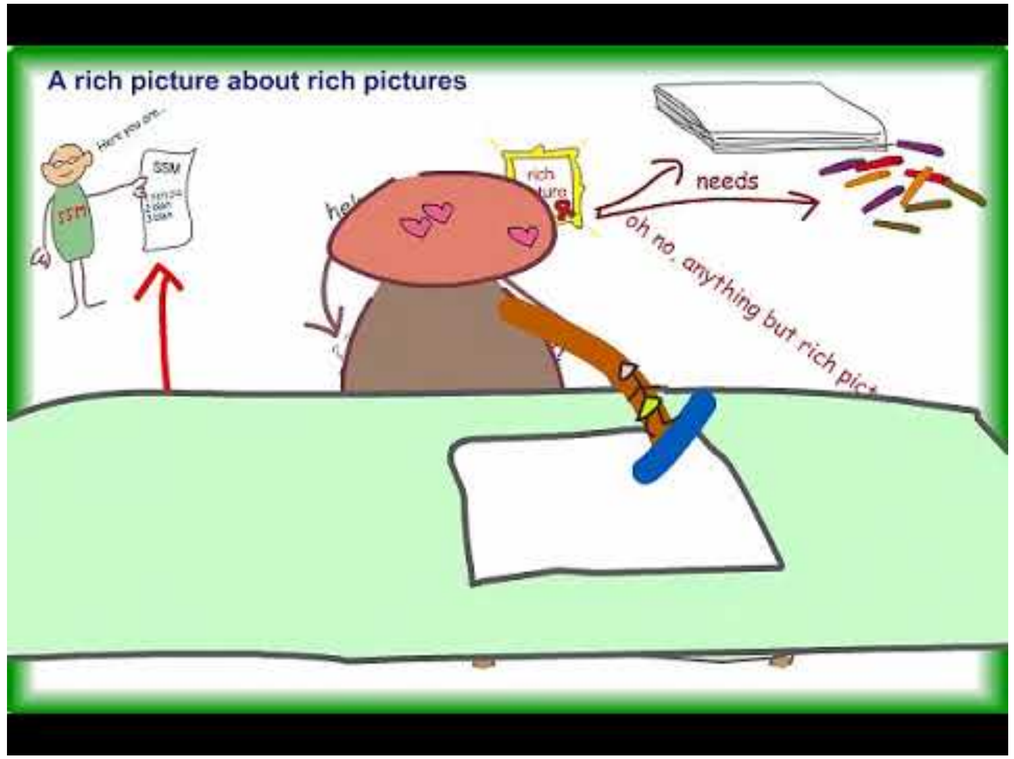
Your system in focus

When is something a “systems problem”?

Ideal situations for systems approaches have key qualities:

- The issue is important
- The problem is chronic, not a one-time event
- The problem is familiar and has a known history
- People have unsuccessfully tried to solve the problem before

Rich pictures



Tips for making rich pictures

- Use symbols, sketches, cartoons to visually describe elements of a situation
- Use arrows to connect elements of the system
- Add keywords or phrases to help convey more information
- Make multiple versions!

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Sketch, then show and share

Get your pencils ready, and start sketching up your chosen system

- Choose whichever techniques you'd like to try
  - Stock and flow / feedback loops
  - Rich picture
- We'll put people into breakout groups, I'll float between groups
  - Put up a hand or message me if you have a question

Upload a version to the Miro board to show and share

Changing systems?

Defining “systems”

A system is an **interconnected set of elements** that is **coherently organised** in a way that **achieves something**

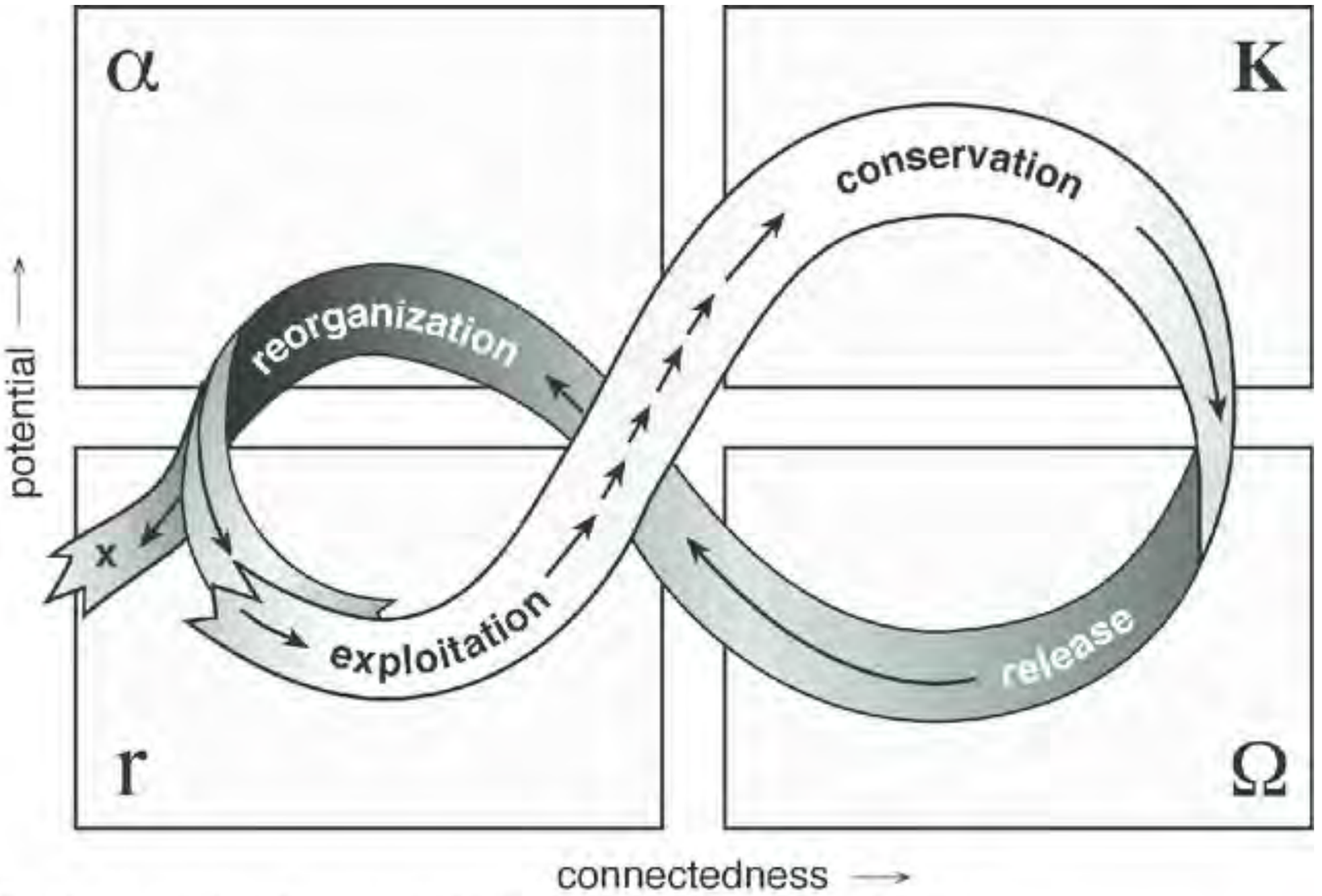
- A system is not just a collection of things
- Systems can be built, or they can be emergent
- Strategic work mostly involves complex adaptive systems

Complex (adaptive) systems have common properties

- **Resilience**
- **Self-organisation**
- **Holarchy**

Adaptive cycles and resilience

- Resilience helps systems maintain stability when faced with external or internal forces of change
- Complex systems use multiple feedback loops and redundancies to adjust to variable conditions



The adaptive cycle (from Panarchy, edited by Lance H. Gunderson and C.S. Holling: Figure 2-1 (page 34). Copyright © 2002 Island Press.

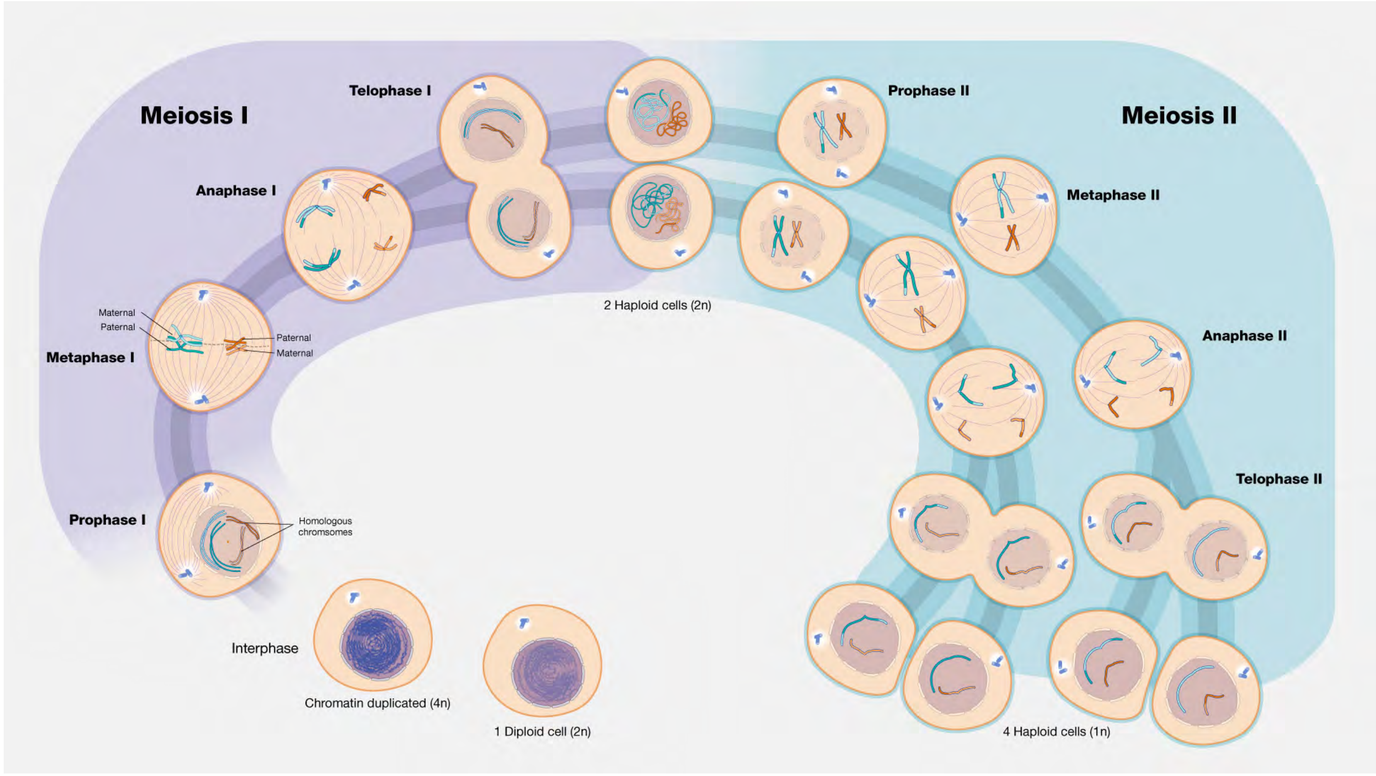
Systems learn and evolve

Replication with variation

- A system that makes imperfect copies becomes a “blind probe” and increases diversity

Rigour and imagination

- Mechanisms in place to check variation for viability
- “*Rigour alone is paralytic death, but imagination alone is insanity…*” - *Gregory Bateson, Time out of Joint, 1979*



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Leverage points - places to intervene in a system (in increasing order of effectiveness)

12. Constants, parameters, numbers (such as subsidies, taxes, standards)

11. The sizes of buffers and other stabilising stocks relative to flows

10. The structure of material stocks and flows (transport networks, population age structures)

9. The lengths of delays, relative to the rate of system change

8. The strength of [balancing] feedback loops, relative to impacts they're trying to correct against

7. The gain around driving [reinforcing] feedback loops

6. The structure of information flows (who does and does not have access to info)

5. The rules of the system (incentives, punishments, constraints)

4. The power to add, change, evolve, or self-organise system structure

3. The goals of the system

2. The mindset or paradigm the system arises out of

1. The power to transcend paradigms

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System change questions

To understand influence:

- Which components of our system in focus can we influence or control?
- Which are beyond our influence or control?

To examine implications and potential for change:

- What else changes as a consequence of this change?
- What does this change leave unchanged?

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Back to your system - discussion

- Questions about these systems change concepts?
- Where can you apply them in your system in focus?
- What are the leverage points in the system you've sketched?

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