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A Systems Perspective on Design Practice

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We are in the midst of
a fundamental shift
in how we view the world—
and how we explain it.

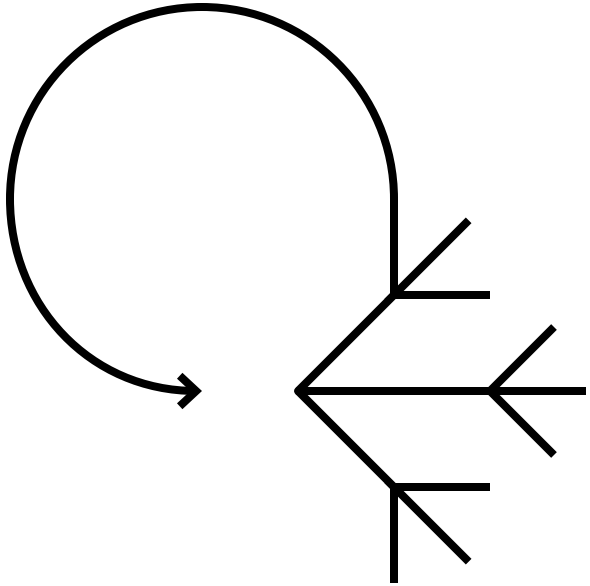
From ...

A causes B
and B causes C

To ...

A causes B, C, D, E, + F
and F causes G, H, I, J, + K
and K causes L, M, N, O, + P
and P loops around to cause A

i.e. A causes B
and B causes A



from

Mechanical

to

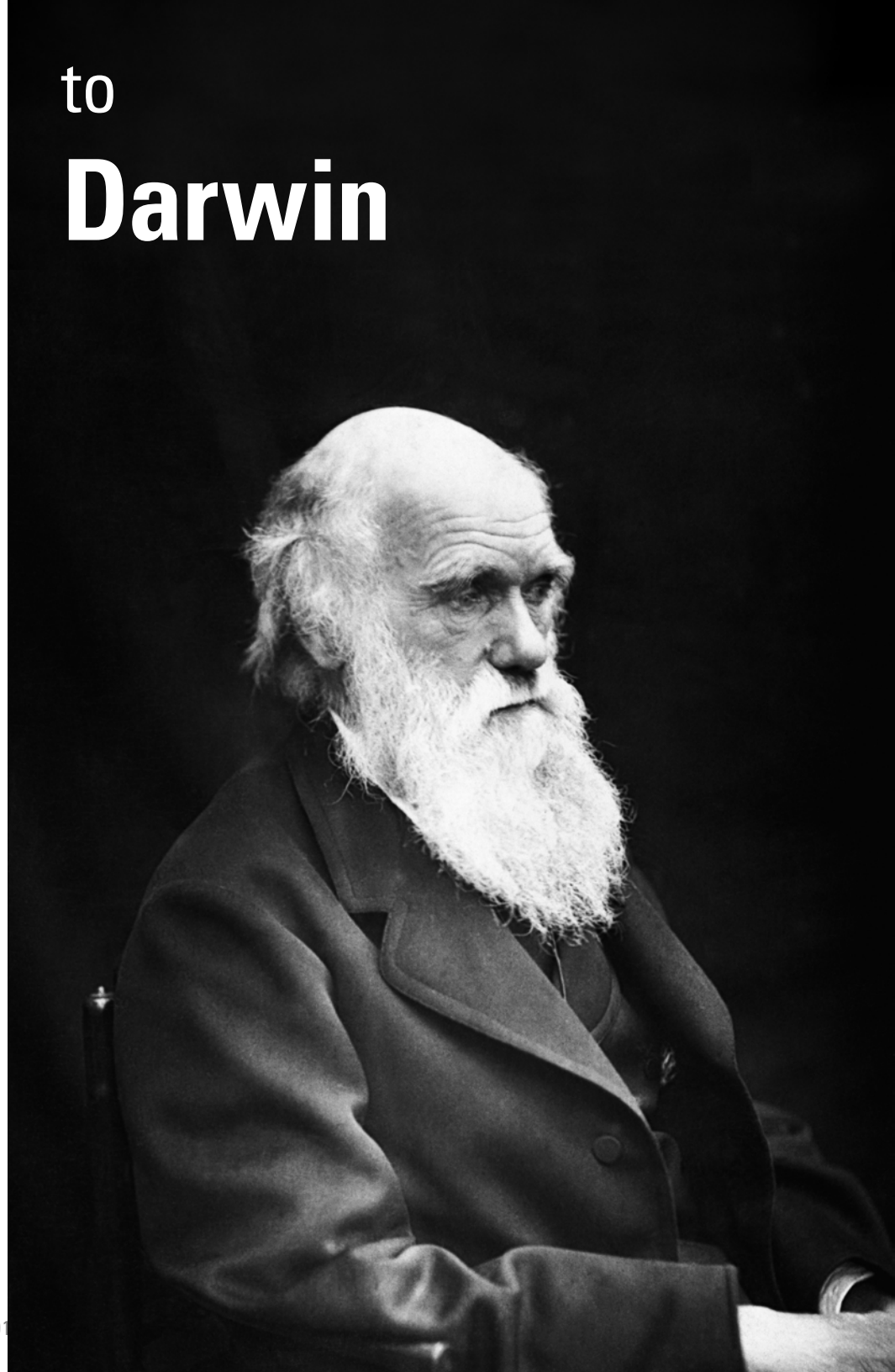
Biological

from

Newton

to

Darwin



from
Industrial age

to
Information age

The shift in world view coincides with a shift in our view of products.

"... commercial products are best treated as though they were services.

It's not what you sell a customer, it's what you do for them.

It's not what something is, it's what it's connected to, what it does.

Flows become more important than resources. Behavior counts."

— Kevin Kelley, *Out of Control*

Thinking in terms of whole systems means

- Building **relationships** between products
  e.g. roadmaps, product lines, platforms, APIs
- **Continuous change** + dynamic development
  e.g. stocks, flows, lags, oscillation
- Enabling **feedback**
  e.g. goal-action-measure-compare loops
- Adopting **metaphors from nature**
  e.g. ecology, evolution, emergence

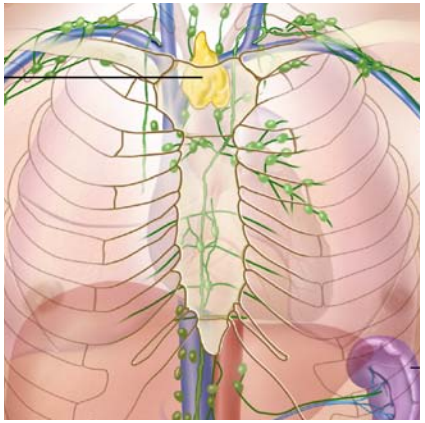
Systems are everywhere.

Columbia Broadcasting System (CBS)

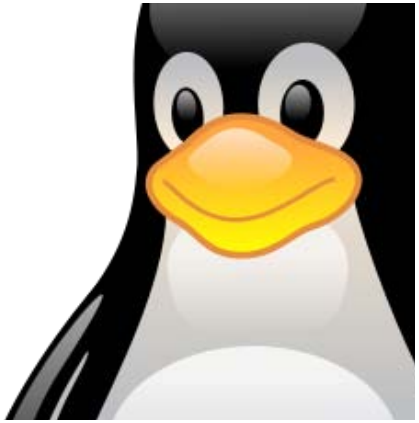
Federal Reserve System

Herman-Miller Action Office System

Honor System



Immune System



Linux Operating System

Mojave Desert Ecosystem

Schiphol Airport Signage System

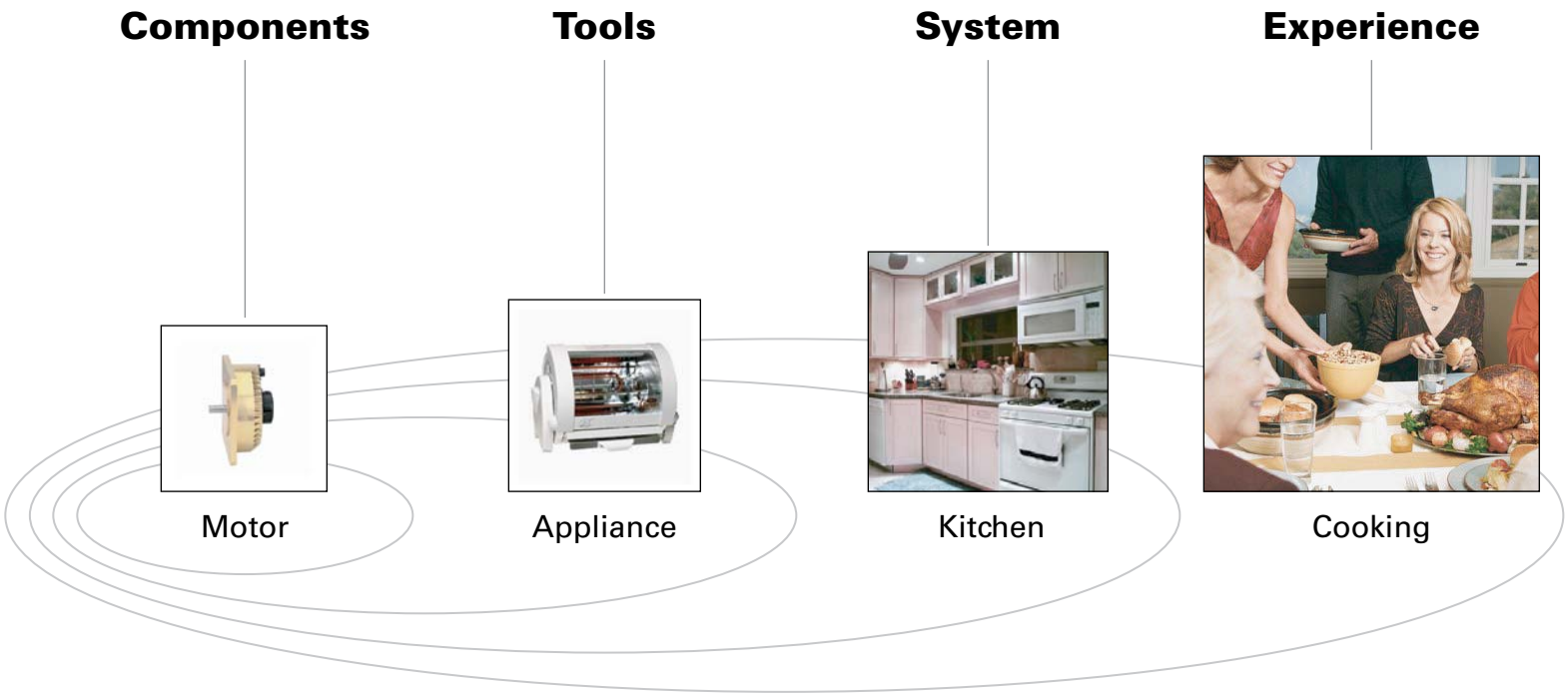
Systems affect many dimensions of design.

- Creating and managing (networked) **services**
- **Connecting** products + services
- **Integrating** across products
- Building a seamless **brand experience**
- Communicating with **consistency**
- Creating **sustainable** businesses (green design)

Hardware products are increasingly tied to:

- embedded **software**
- the **internet** and web-based applications
- human **services**
- the **organizations** which develop and deliver the products and services
- **communities** for which they provide infrastructure
- the **ecologies** in which they cooperate and compete

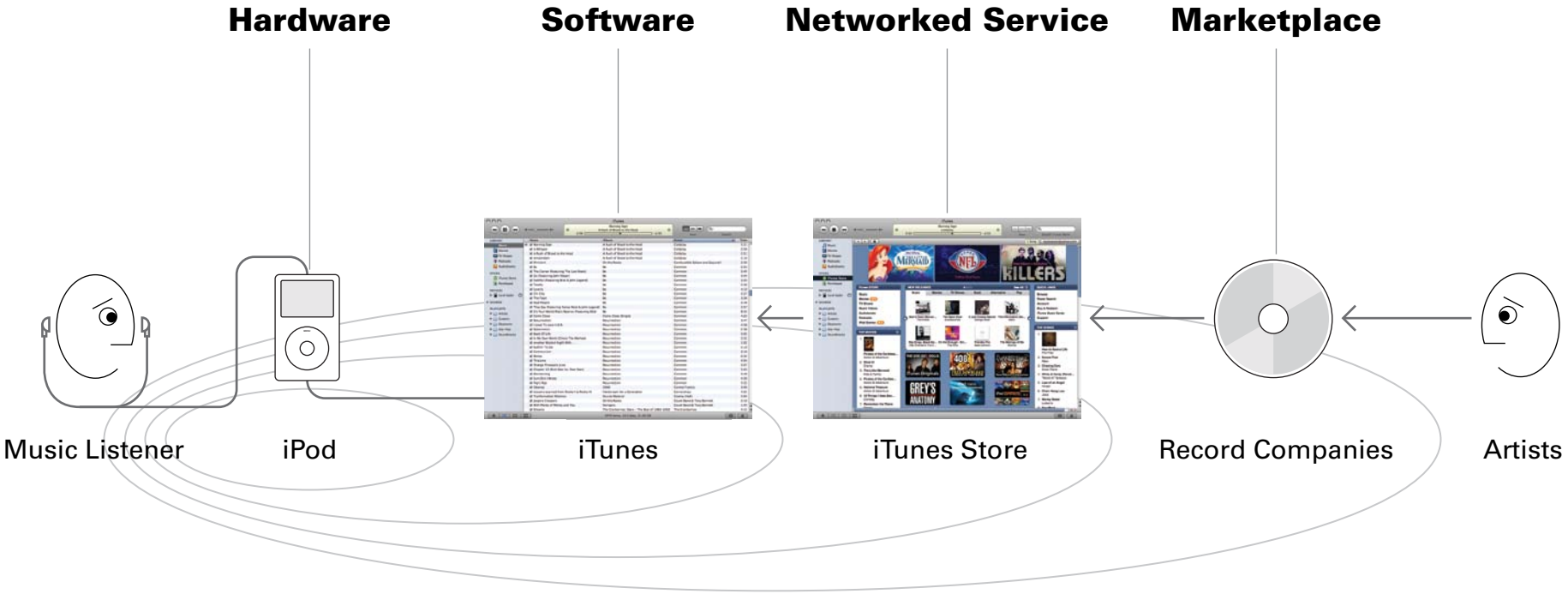
Value comes from interacting with larger systems—enabling an ecology.



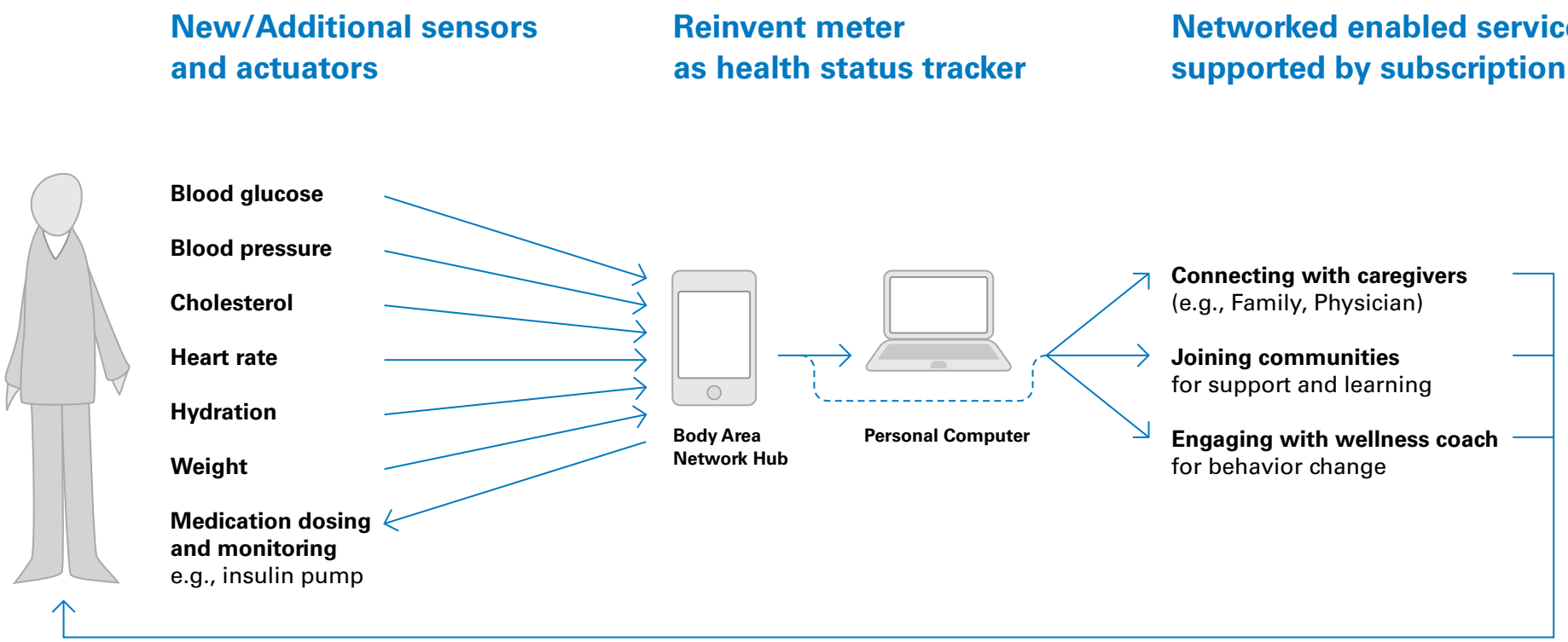
— John Rheinfrank & Fred Murrell

iPod is an integrated system.

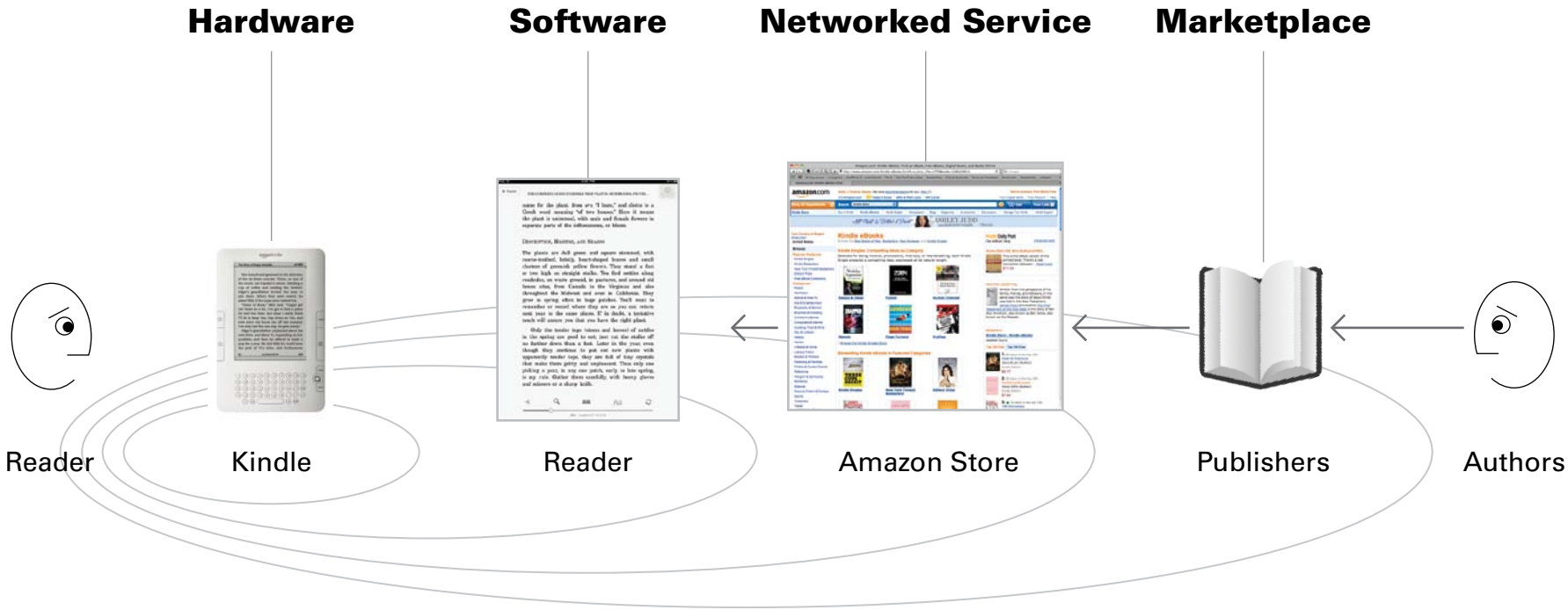
DRAM > mp3 player > music sharing service > my music



Smartphones are becoming hubs of body-area networks.



Amazon's Kindle-Reader-WisperNet-Store system is another networked-services ecology.



"I think of [the Kindle] as a service.
Part of [it] is of course the hardware,
but really, it's the software, the content,
it's the seamless integration of those things."
— Jeff Bezos

The shift
in the nature of products
requires a shift
in the way we design.

	From ... escaping the past	To ... inventing the future
	Manufacturing Age	**Age of Biology**
Focus	**Objects/Things**	**Systems/Behaviors**
Values	**Seek simplicity**	**Embrace complexity**
Designer's role	**Expert/Deciding**	**Collaborator/Facilitating**
Construction	**Direct**	**Mediated**
Stopping condition	**Almost perfect**	**Good enough for now**
Result	**More deterministic**	**Less predictable**
End state	**Completed**	**Adapting continuously**

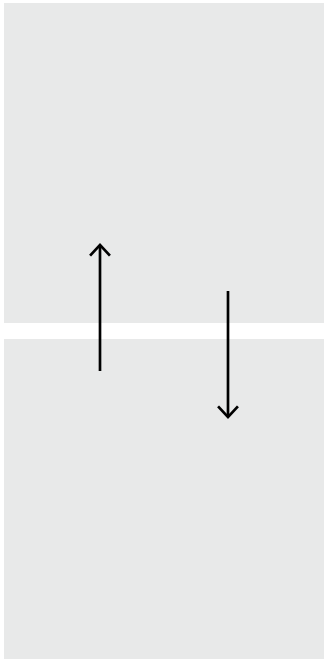
Design education focuses on the form of objects; much of practice does likewise.

How are we making it?
Form/Grammar
Syntactic

Object
Component

Form is governed by meaning and structure, though they are also affected by form.

What are we making?
Meaning/Definition
Semantic



How are we making it?
Form/Grammar
Syntactic

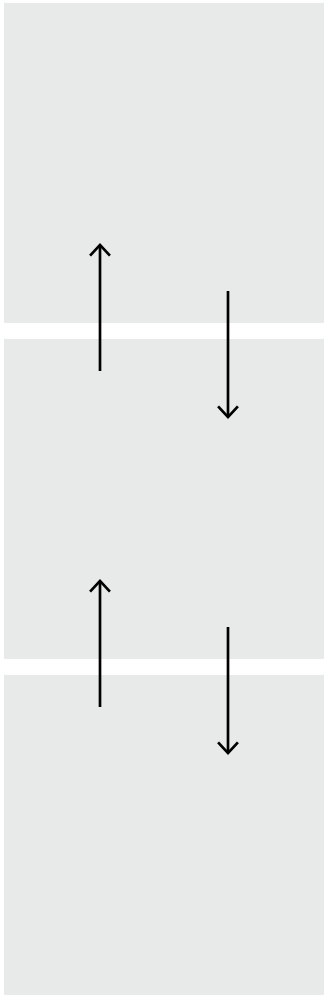
Object
Component

Meaning + structure are governed by context; context is also affected by meaning + structure.

Why are we making this?
Context/Need
Pragmatic

What are we making?
Meaning/Definition
Semantic

How are we making it?
Form/Grammar
Syntactic



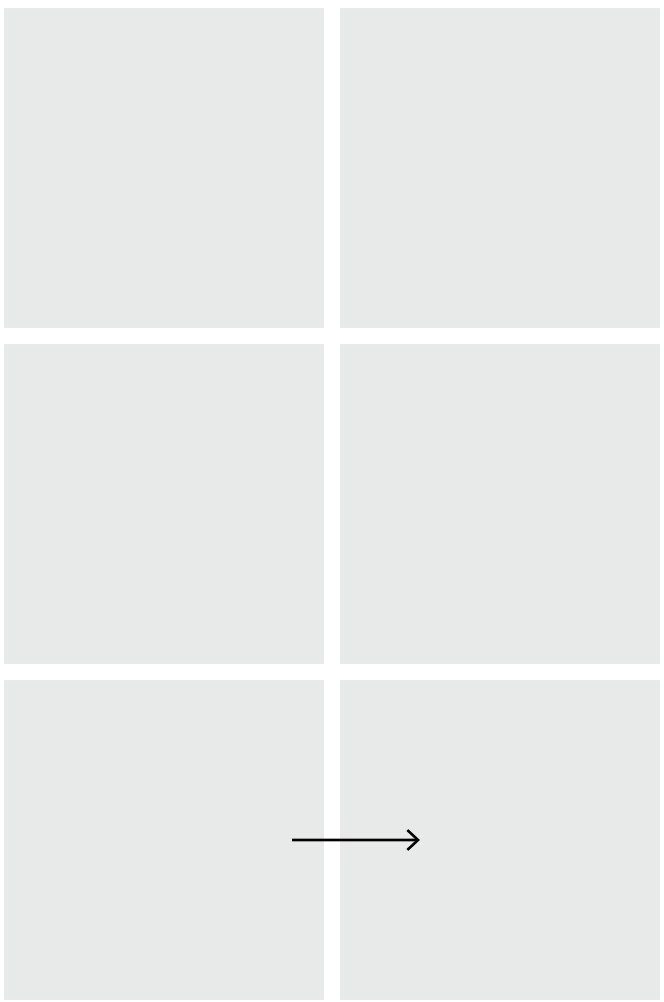
Object
Component

Objects are often embedded in systems.

Why are we making this?
Context/Need
Pragmatic

What are we making?
Meaning/Definition
Semantic

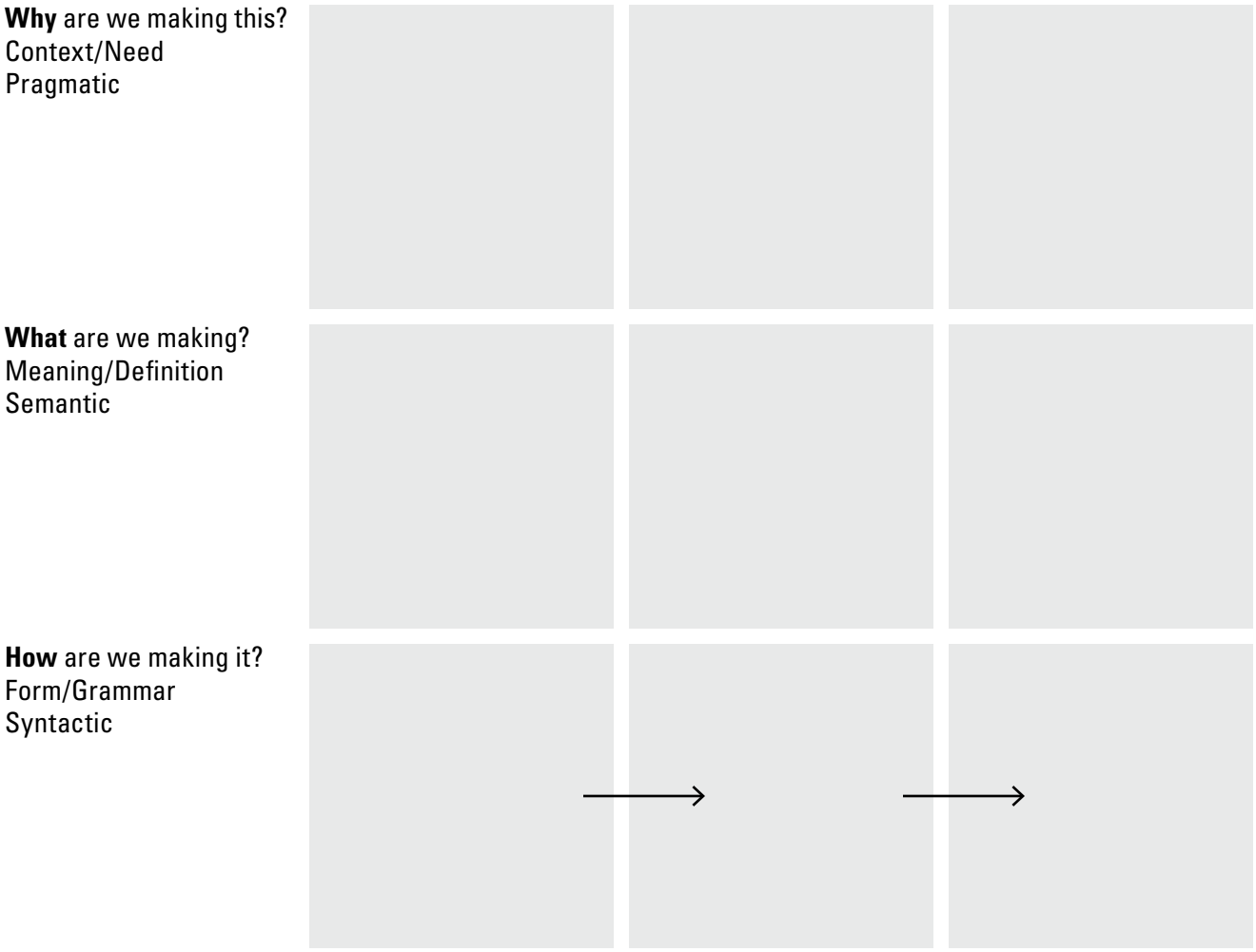
How are we making it?
Form/Grammar
Syntactic



Object
Component

System
Systems of components
Organism

Systems are often embedded in ecologies—communities of systems.

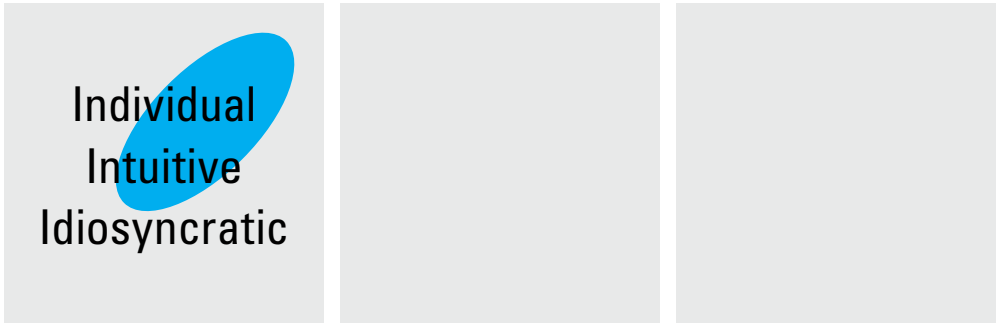


Practice focused on the form of objects can be direct and unmediated.

Why are we making this?
Context/Need
Pragmatic

What are we making?
Meaning/Definition
Semantic

How are we making it?
Form/Grammar
Syntactic

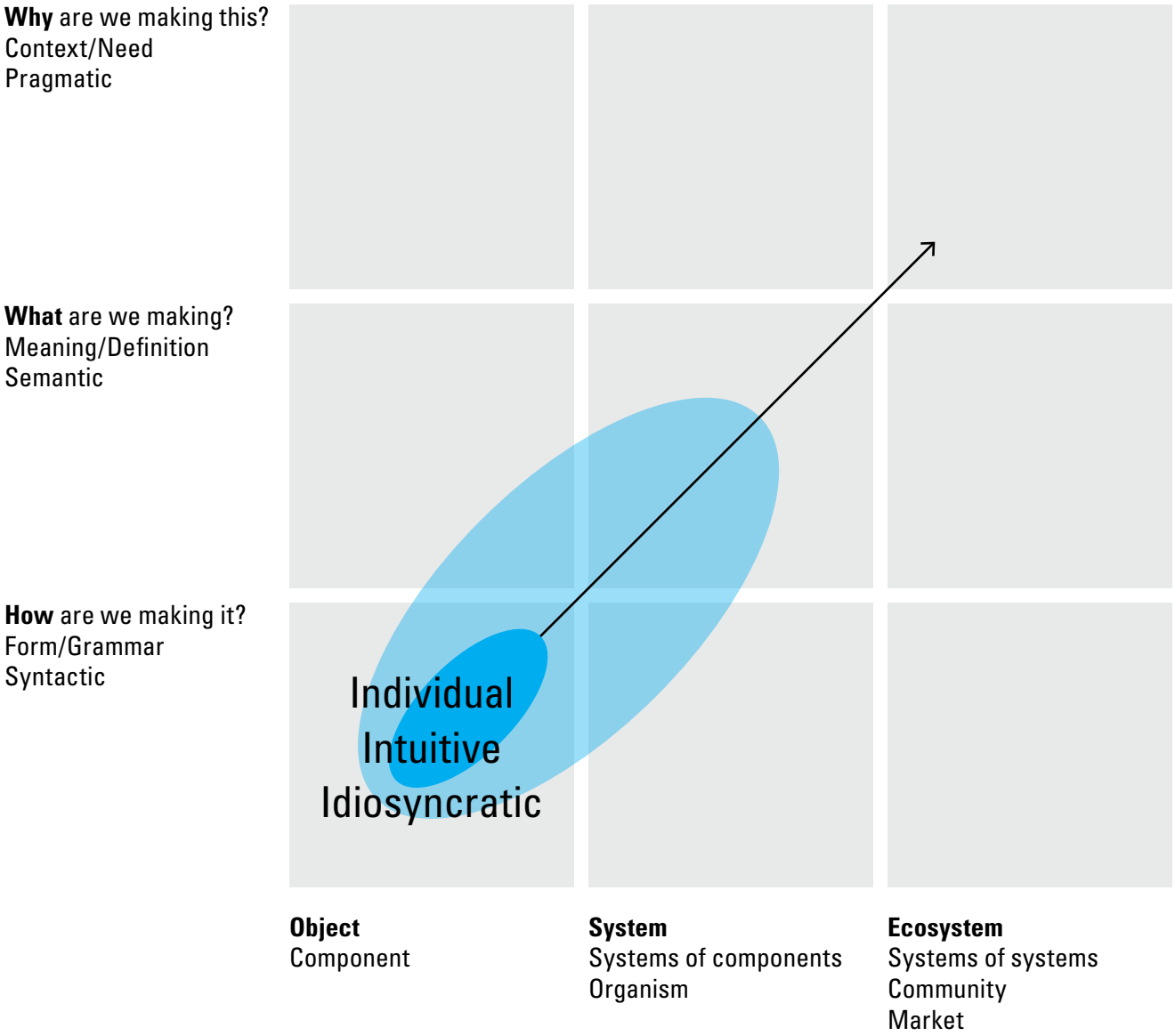


Object
Component

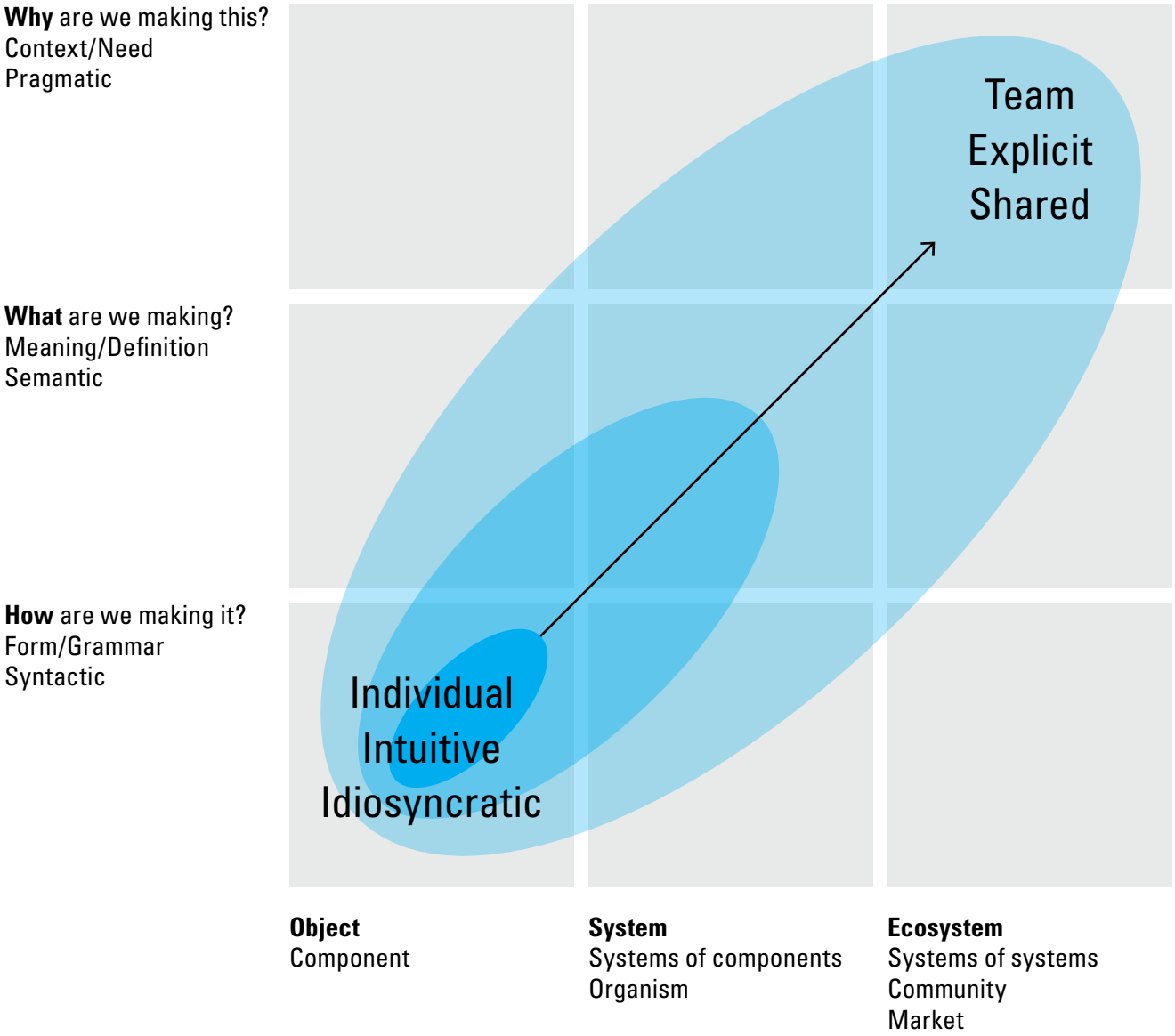
System
Systems of components
Organism

Ecosystem
Systems of systems
Community
Market

As practice expands, it becomes more complex.



When practice also concerns context + ecologies, project teams require many disciplines.



Moving our focus from the form of objects to the behavior of systems requires research.

Why are we making this?
Context/Need
Pragmatic

What are we making?
Meaning/Definition
Semantic

How are we making it?
Form/Grammar
Syntactic

Object
Component

System
Systems of components
Organism

Ecosystem
Systems of systems
Community
Market

Twentieth century design education focused largely on the form of objects.

Twenty-first century design practice already focuses largely on the behavior of systems.

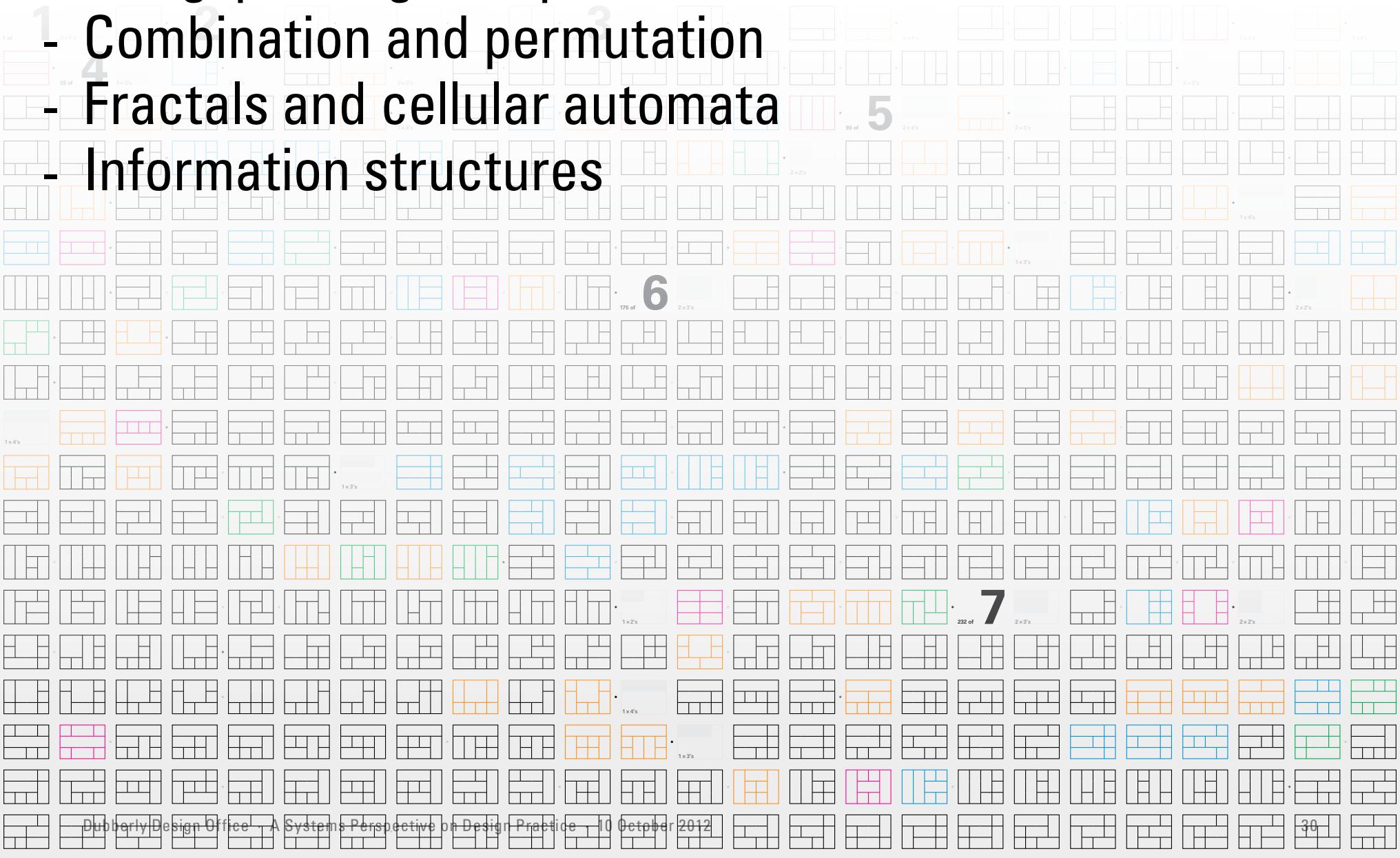
Let's (re-) imagine design education from a system's perspective.

Systems courses might be organized into six broad categories:

- Formal
- Resource distribution
- Dynamic
- Control
- Living
- Conversation

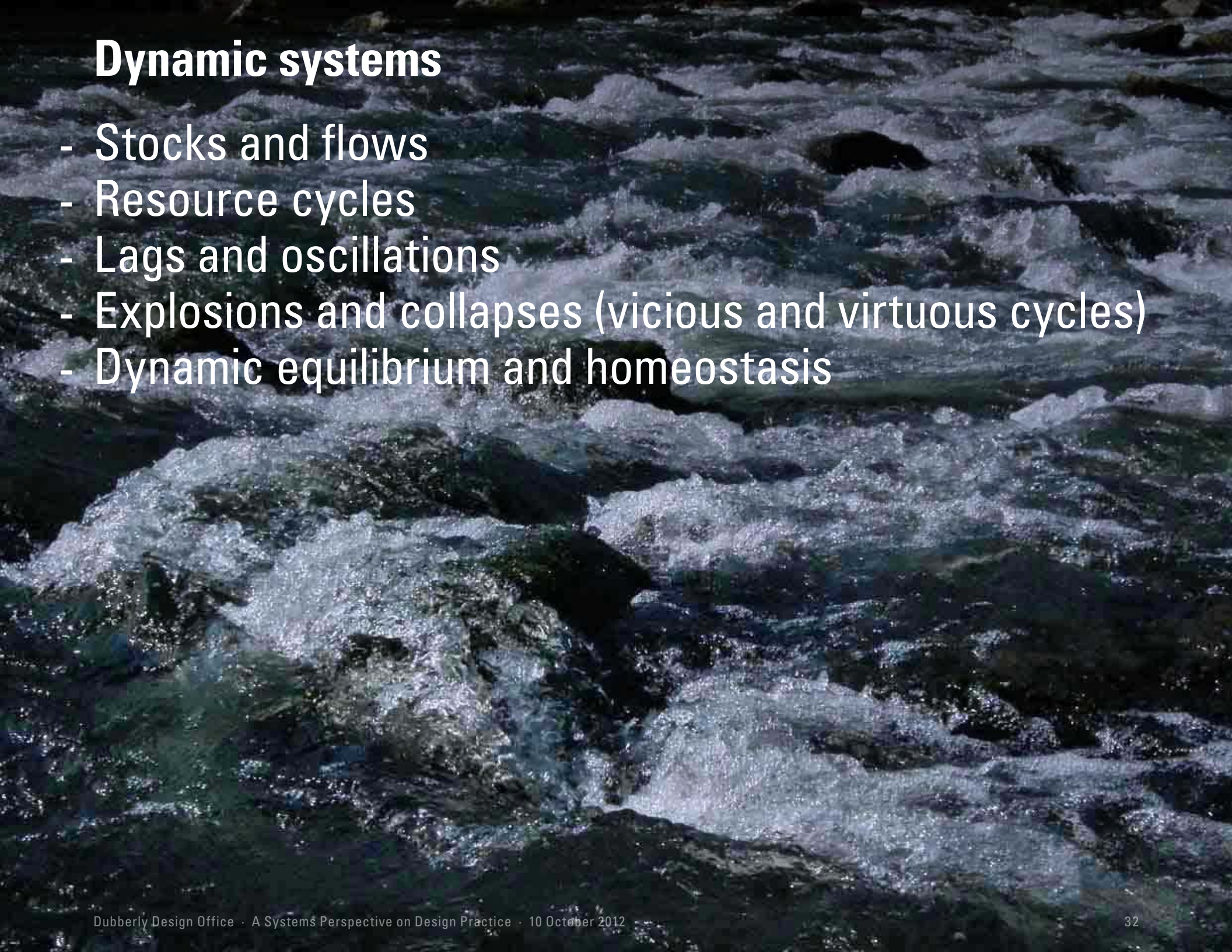
Formal systems

- Sequence and proportion
- Tiling, packing, and patterns
- Combination and permutation
- Fractals and cellular automata
- Information structures



Systems for resource distribution

- Chance and probability
- Exchange systems
- Voting systems

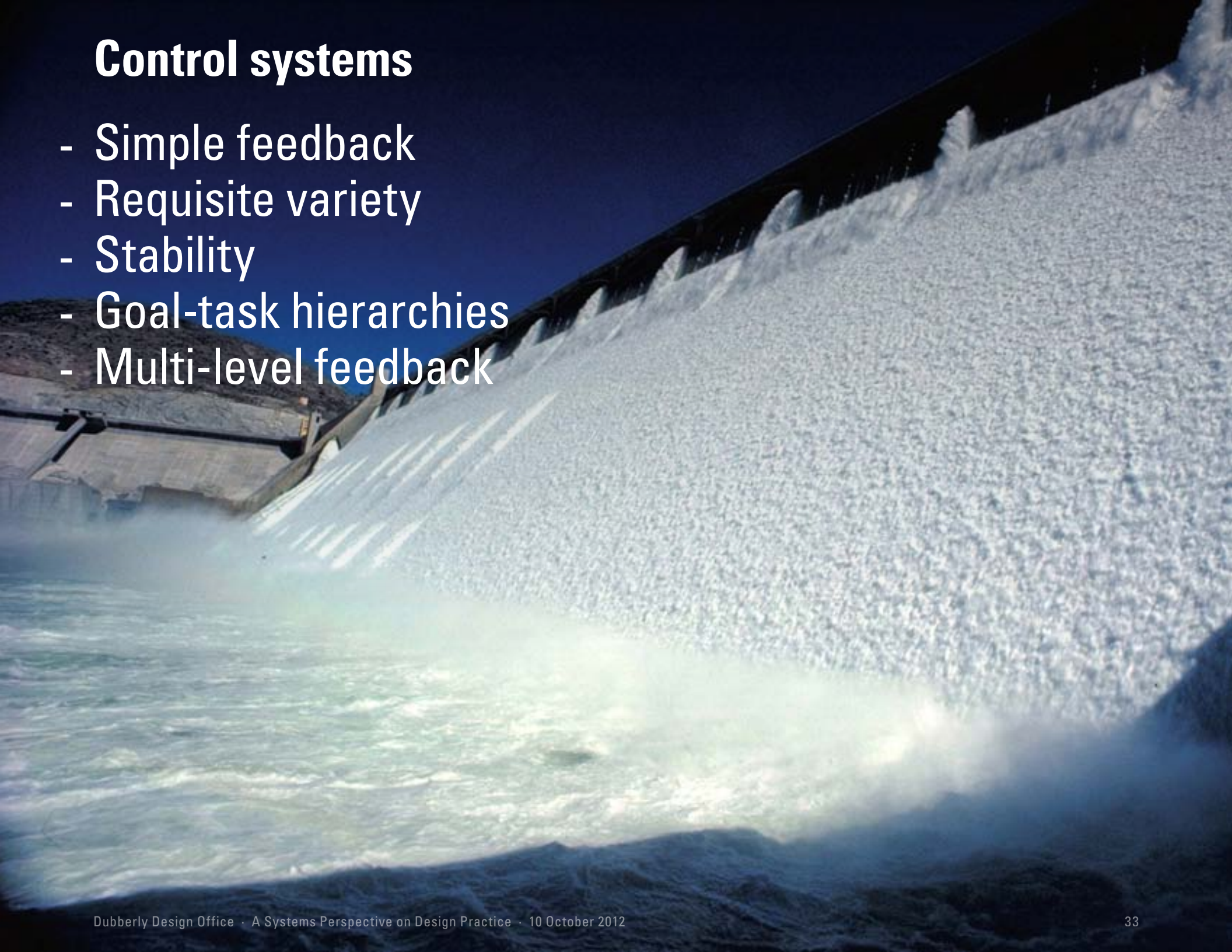


Dynamic systems

- Stocks and flows
- Resource cycles
- Lags and oscillations
- Explosions and collapses (vicious and virtuous cycles)
- Dynamic equilibrium and homeostasis

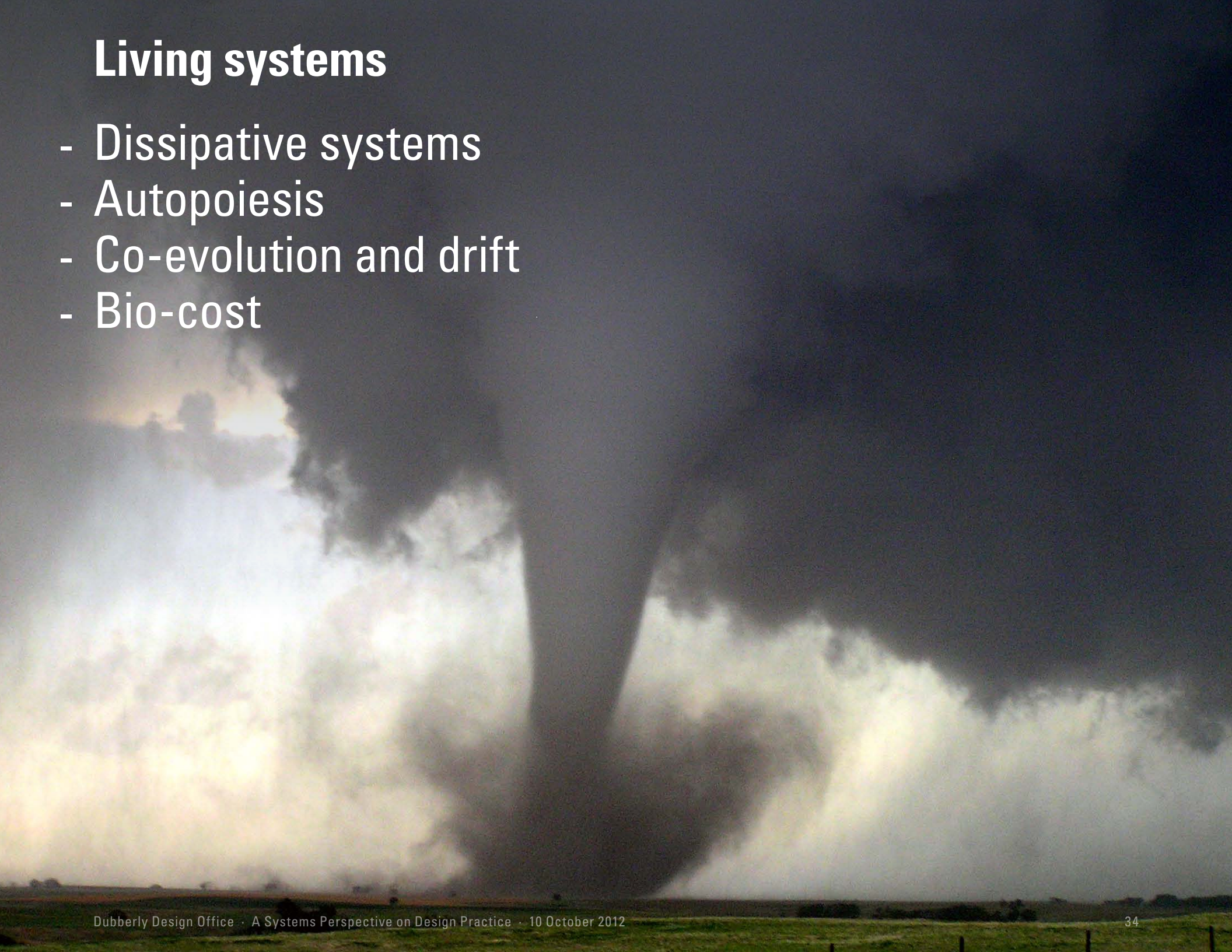
Control systems

- Simple feedback
- Requisite variety
- Stability
- Goal-task hierarchies
- Multi-level feedback



Living systems

- Dissipative systems
- Autopoiesis
- Co-evolution and drift
- Bio-cost



Systems for conversation

- Platforms, construction sets, and languages
- Understanding and agreement
- Learning and play
- Ethics, choice, and responsibility

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Presentation posted at
www.dubberly.com/presentations/iit_systems.pdf