AIGA SF Compostmodern: Think Even Bigger
California Academy of Sciences San Francisco 21 January 2016

Framing design as conversations about systems

Hugh Dubberly
presentations.dubberly.com/compostmodern.pdf

For much of the twentieth century and beyond, much of design was about giving form to objects.

Gerrit Rietveld
Red and Blue Chair, 1917

Raymond Lowey
Pencil Sharpener, 1933

Frank Lloyd Wright
Guggenheim Museum New York, 1959

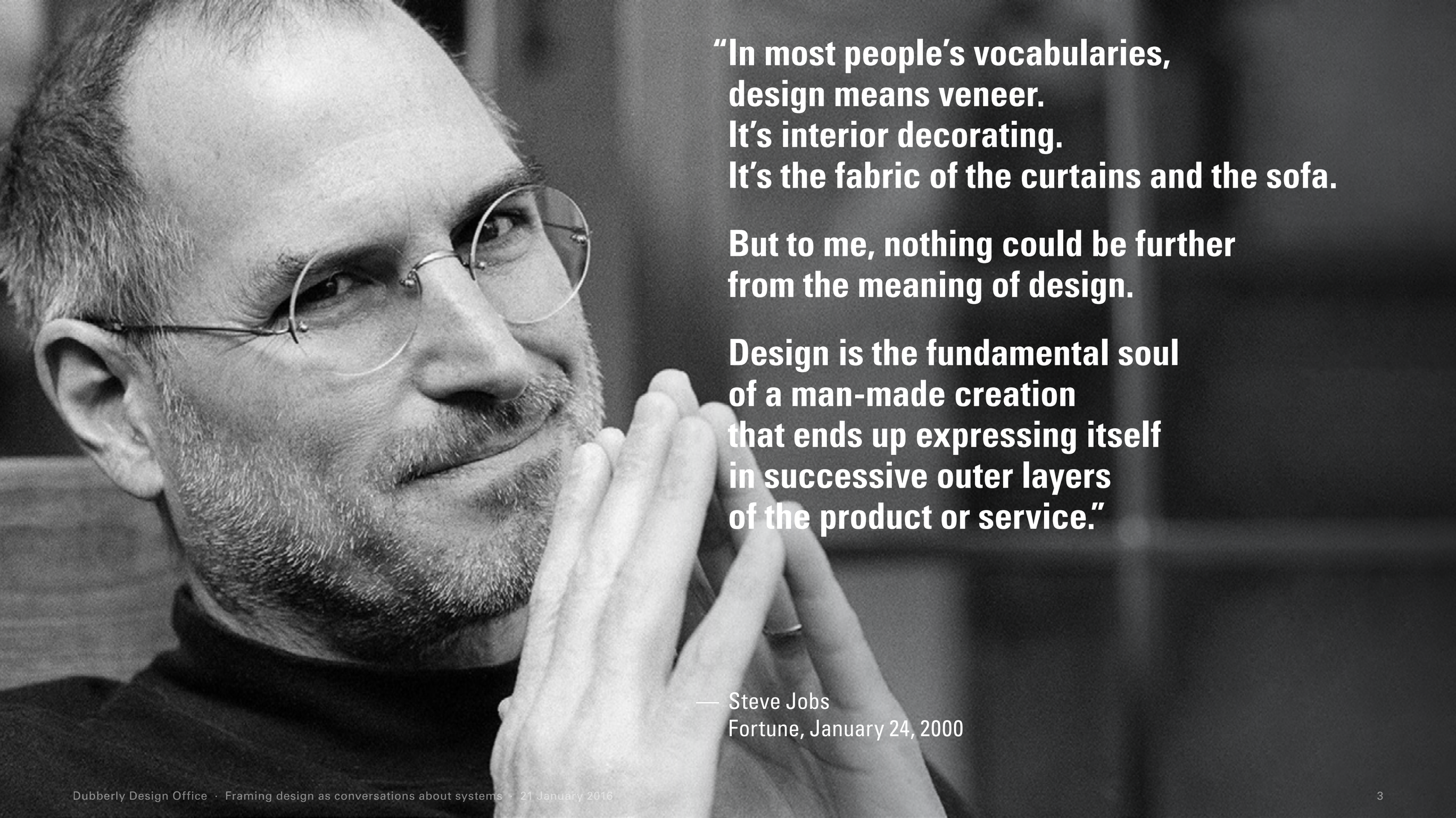
Dieter Rams
Braun TP1 Radio, 1959

Memphis Bookshelf
Ettore Sottsass Jr., 1981

Raymond Lowey
PRR S1 Steam Engine, 1939

Frank Gehry
Guggenheim Museum Bilbao, 1997

Jony Ive
Apple iPod, 2001

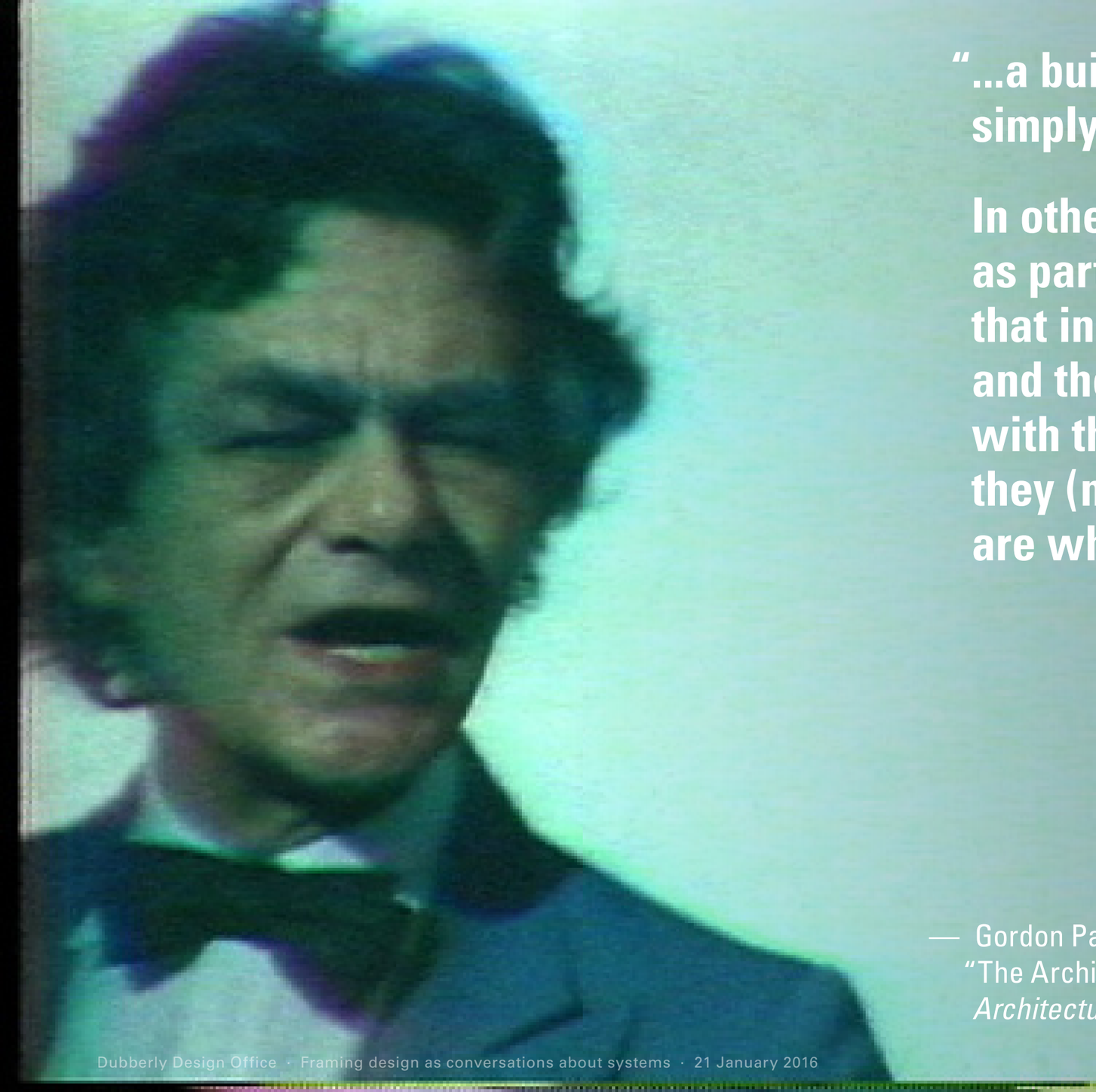


“In most people’s vocabularies,
design means veneer.
It’s interior decorating.
It’s the fabric of the curtains and the sofa.

But to me, nothing could be further
from the meaning of design.

Design is the fundamental soul
of a man-made creation
that ends up expressing itself
in successive outer layers
of the product or service.”

— Steve Jobs
Fortune, January 24, 2000



"...a building cannot be viewed simply in isolation...

In other words structures make sense as parts of larger systems that include human components and the architect is primarily concerned with these larger systems; they (not just the bricks and mortar part) are what the architect designs."

— Gordon Pask,
"The Architectural Relevance of Cybernetics,"
Architectural Design, 1969

“Design has also evolved
from the design of objects
both physical and immaterial,
to the design of systems,
to the design of complex adaptive systems.

This evolution is shifting the role of designers;
they are no longer the central planner,
but rather participants
within the systems they exist in.

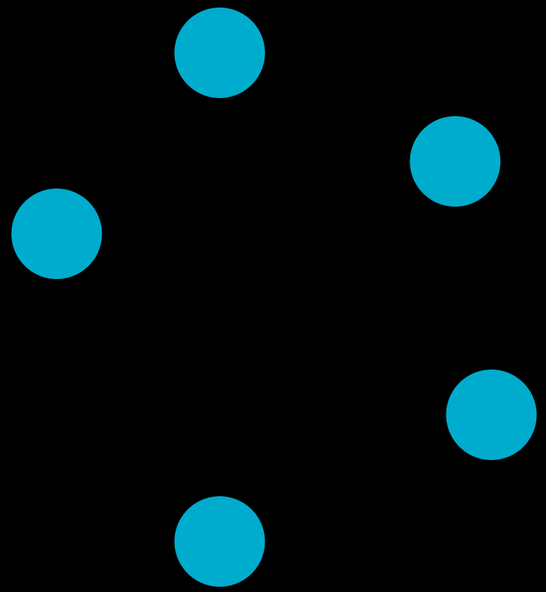
This is a fundamental shift—
one that requires a new set of values.”

— Joi Ito
Director, MIT Media Lab
“Design and Science,” January 11, 2016

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

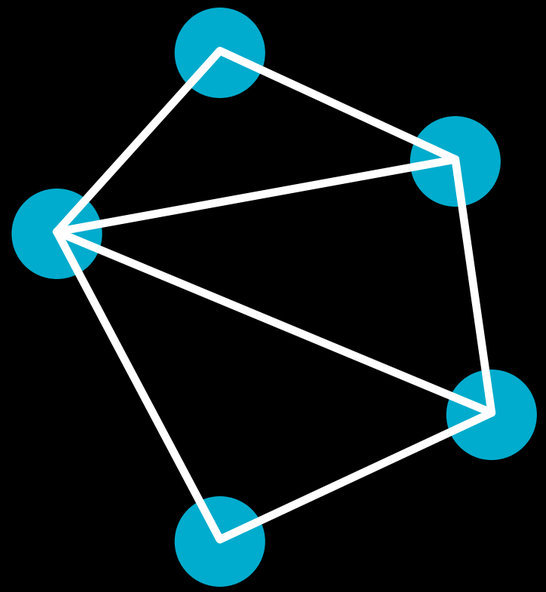
from

Nodes, Nouns
Objects, Products



to

Links, Verbs
Relations, Systems



from

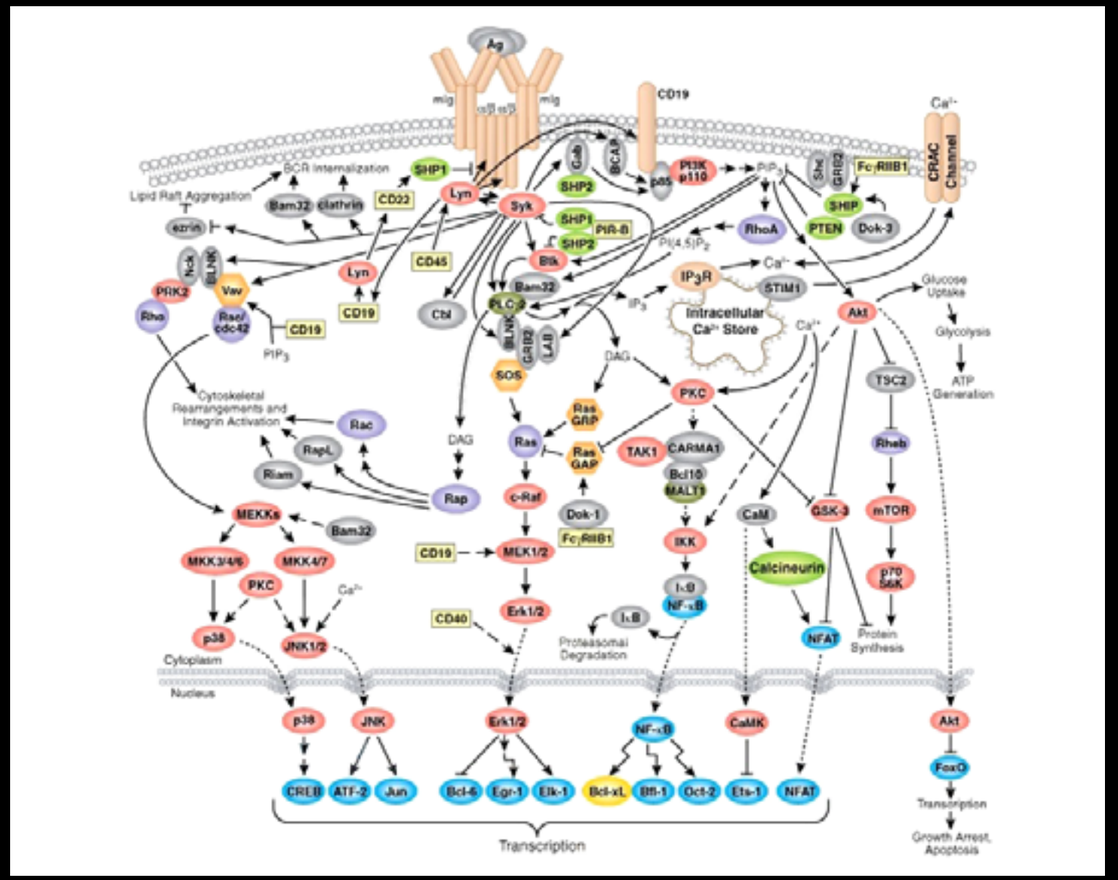
Linear causality

e.g., a hand crank generator

to

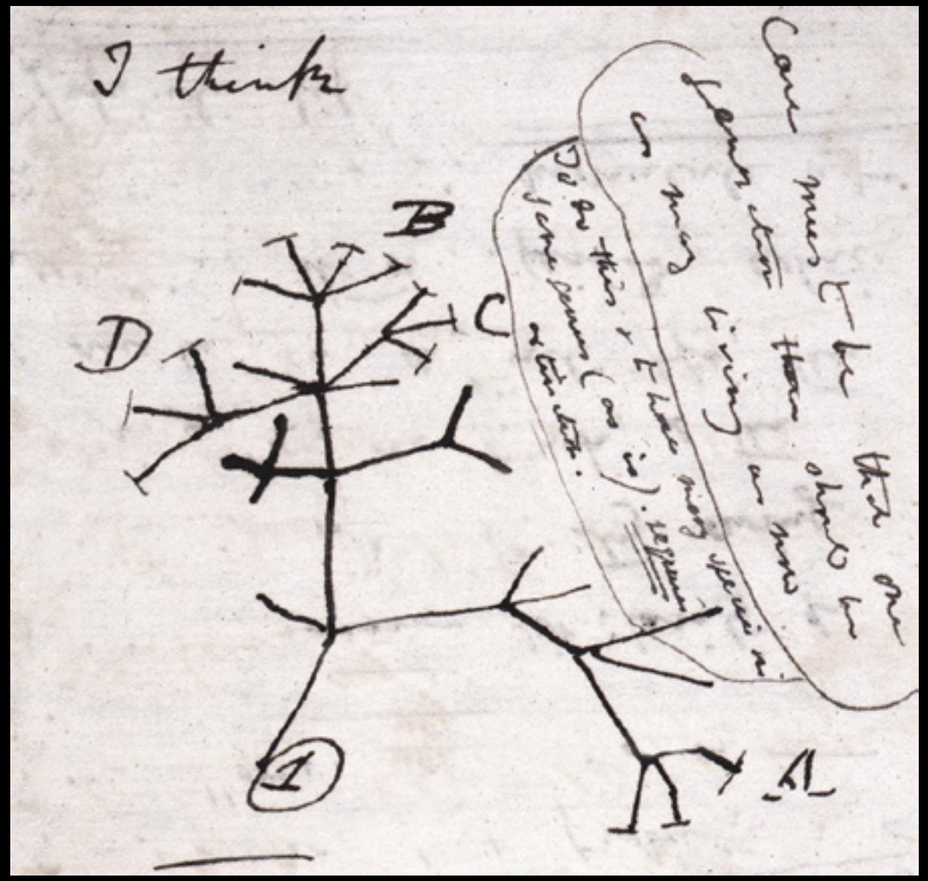
Cascades, feedback

e.g., cell signaling pathway



from

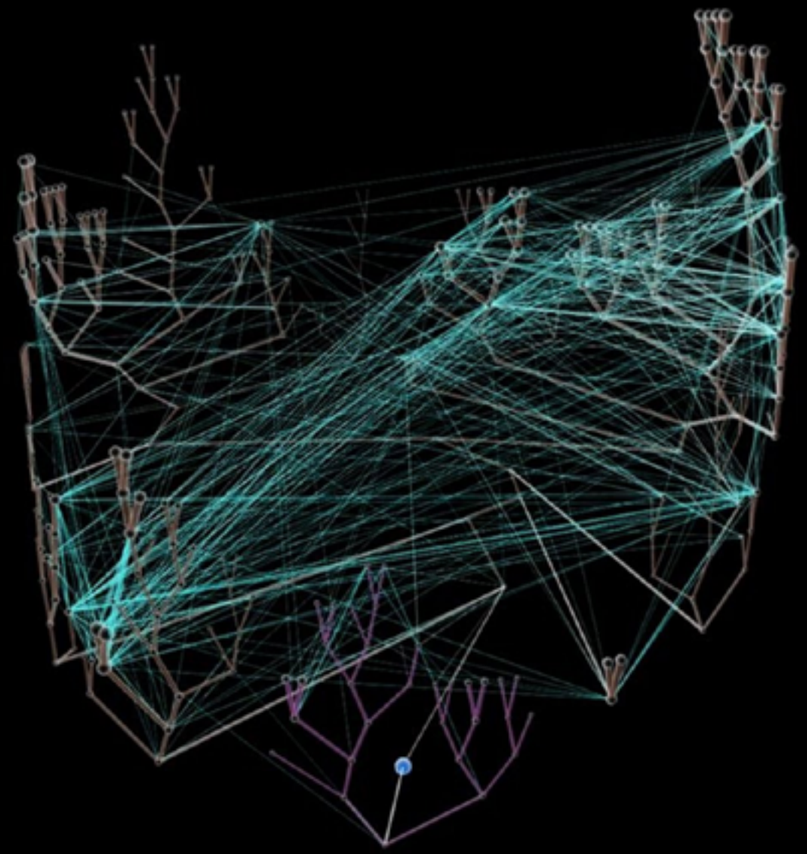
Tree of life



— Charles Darwin, 1859

to

Web of life



— V. Kunin, L. Goldovsky, N. Darzentas, and C. A. Ouzounis, 2005

— Manuel Lima, TED Talk, March 2015
http://www.ted.com/talks/manuel_lima_a_visual_history_of_human_knowledge#t-164372

from

Hierarchical and closed

—See Eric Raymond's essay, "The Cathedral and the Bazaar"

to

Distributed and open

from

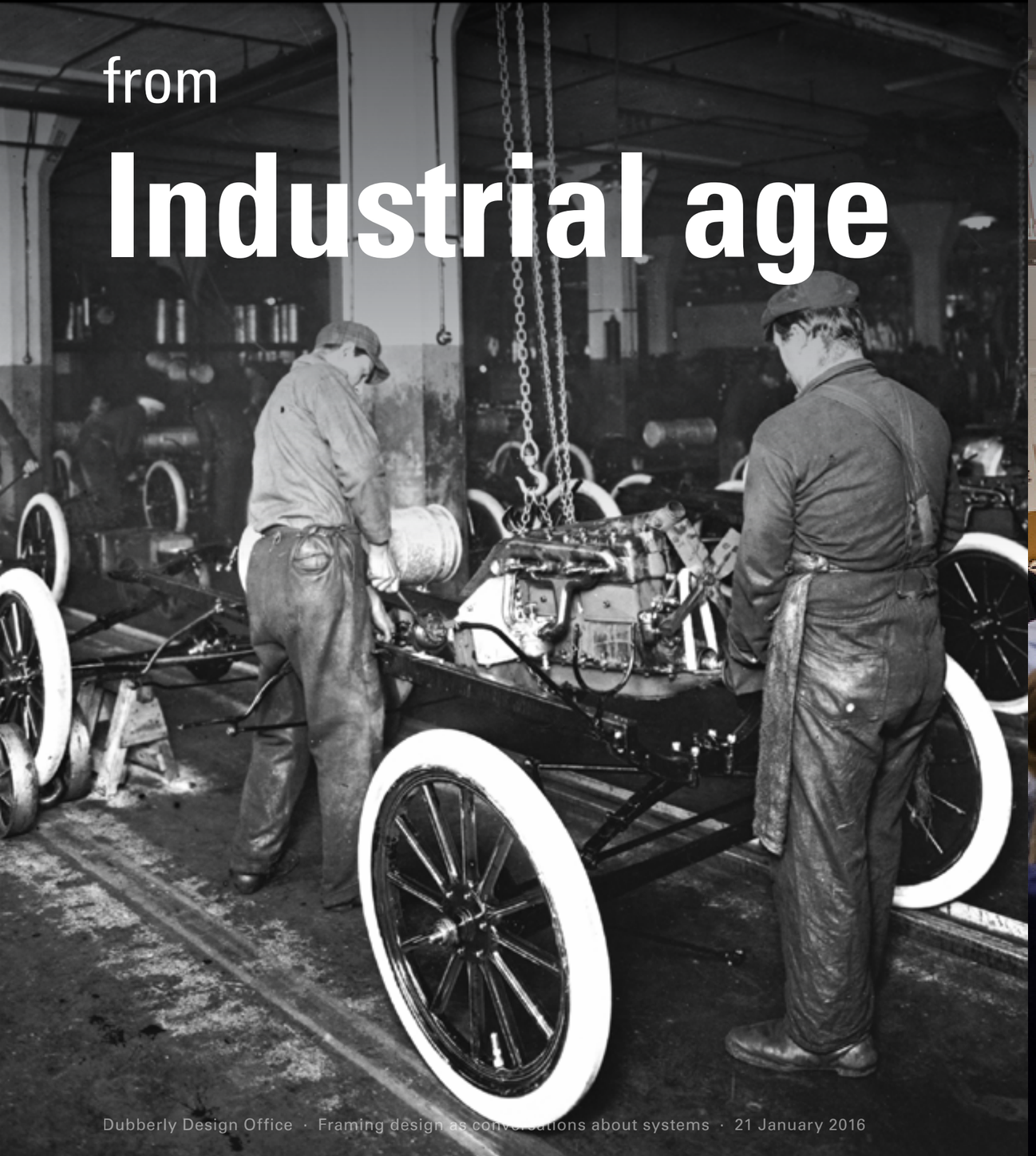
Mechanical

to

Biological

from

Industrial age

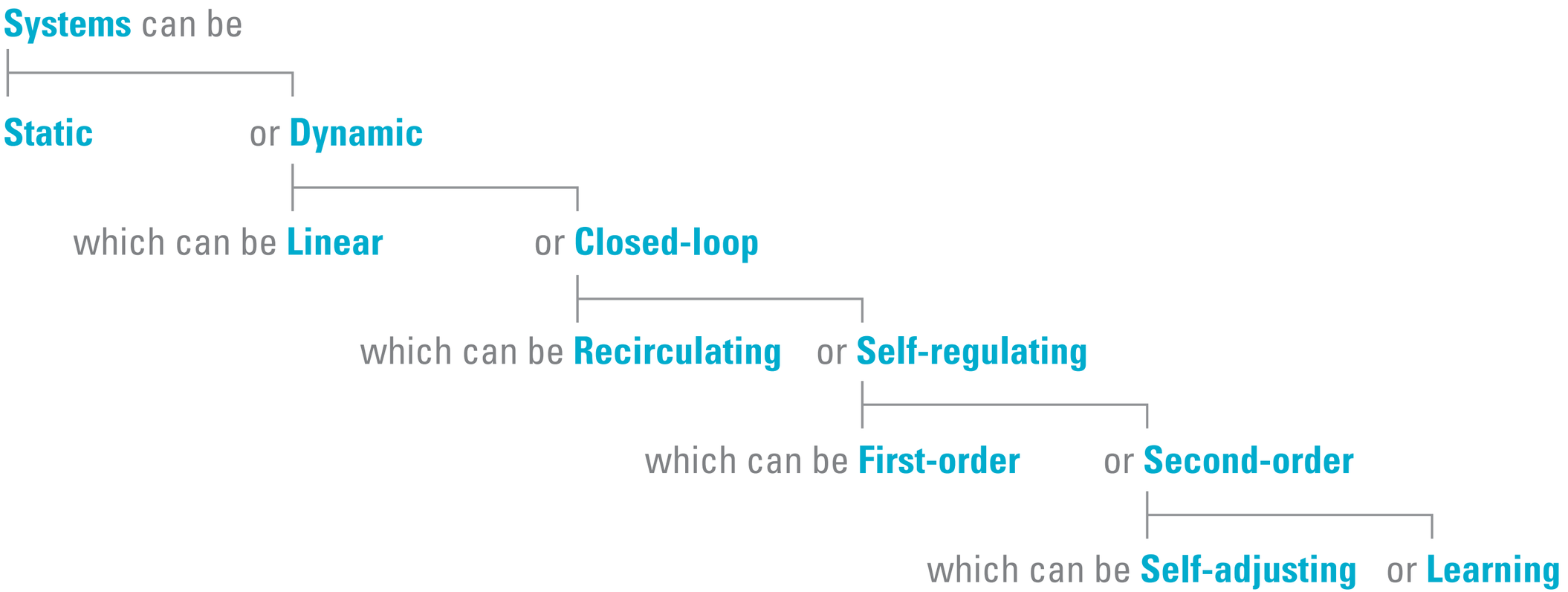


to

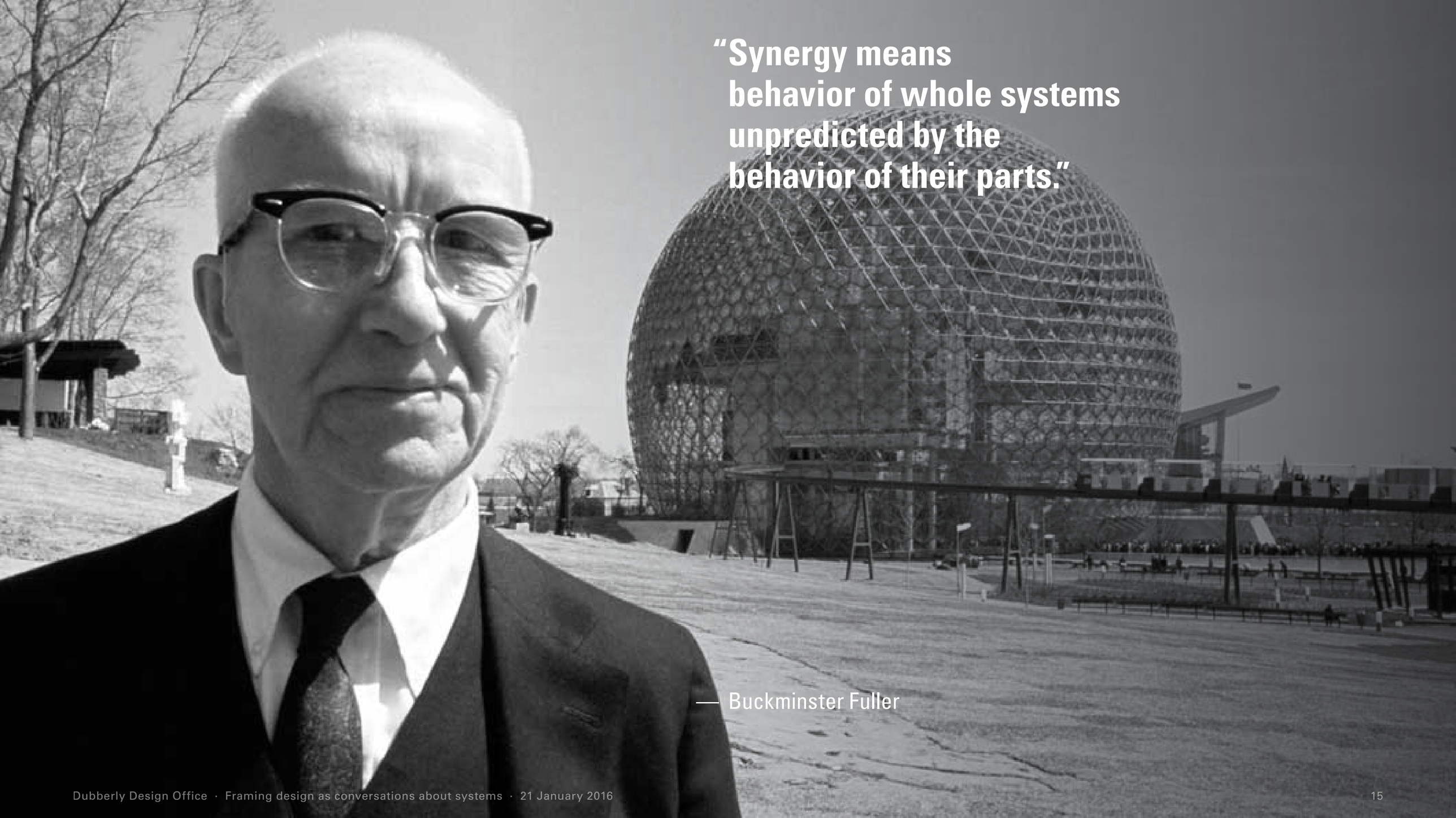
Information age

This shift encourages us
to think in terms of systems—
to consider objects,
relationships, and wholes.

A system is a set of elements that *someone* sees as related in *some way*, often creating emergent properties.



—After Kenneth Boulding


“Synergy means
behavior of whole systems
unpredicted by the
behavior of their parts.”
— Buckminster Fuller

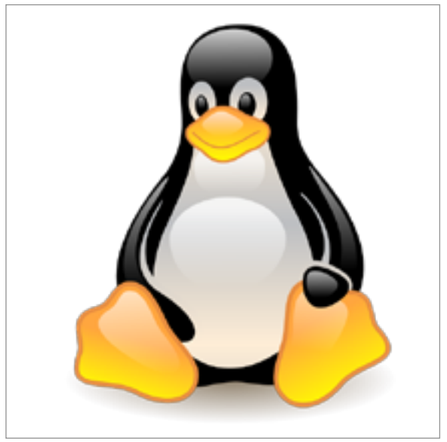
Systems are all around us—
facts of life we encounter everyday.

Anti-lock Brake System (ABS)

Columbia Broadcasting System (CBS)

Criminal Justice System

Domain Name System (DNS)



Federal Reserve System

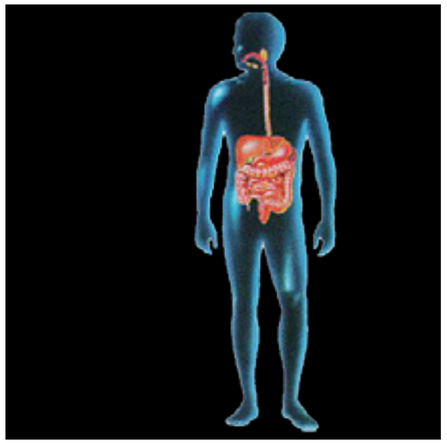
Honor System

Interstate Highway System

Linux Operating System (OS)

The human body is comprised of systems.



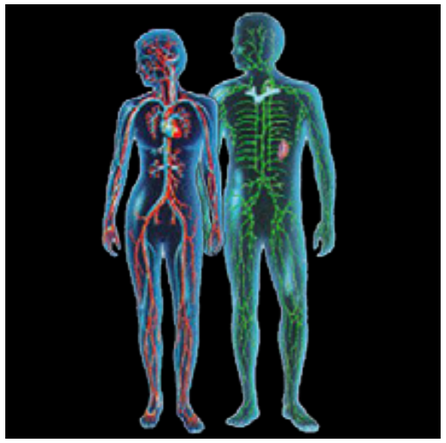
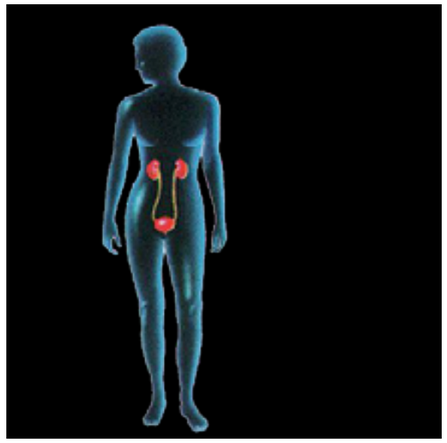



Integumantary system (Skin)

Skeleton + Muscle systems

Nervous + Endocrine systems

Digestive system

Circulatory + Lymphatic systems

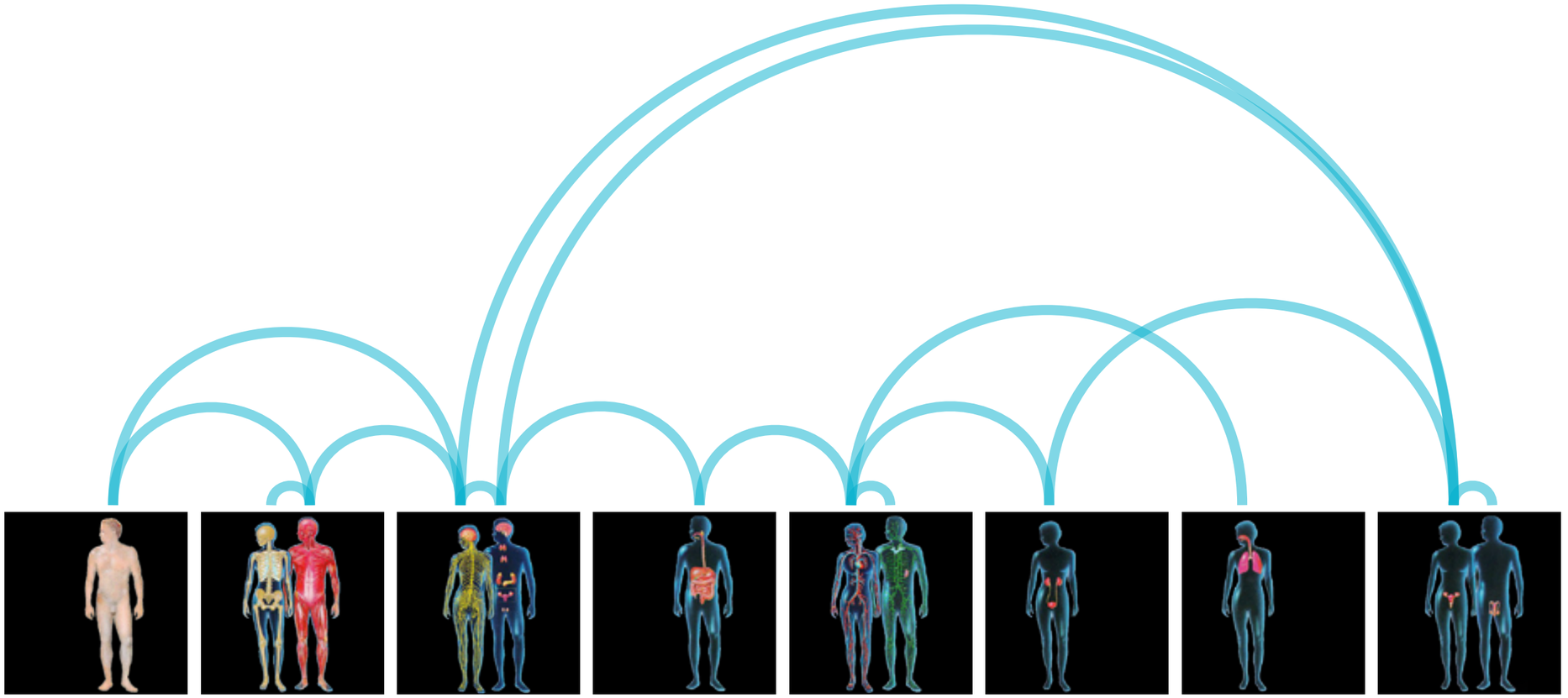
Urinary system

Respiratory system

Reproductive system

Not pictured:
Immune system
Metabolic system

The body's systems are richly connected—in a system of systems.



—

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Not pictured:
Immune system
Metabolic system

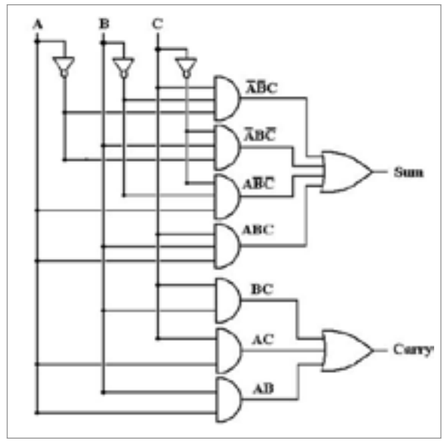
Systems may be categorized in many ways—
By domain or "content type."

Energy systems

Economic systems

Explanatory systems

Information systems



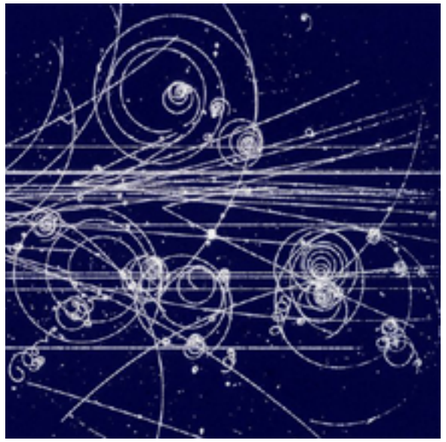
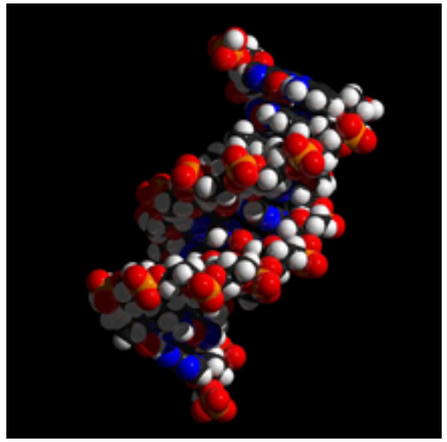
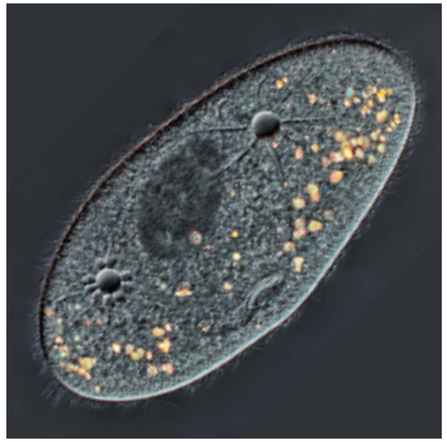
Language systems

Logical systems

Physical systems

Social systems

Systems may be categorized in many ways—
By scale—small or large.


Particles

Atoms + molecules

Cells

Multi-celled organisms



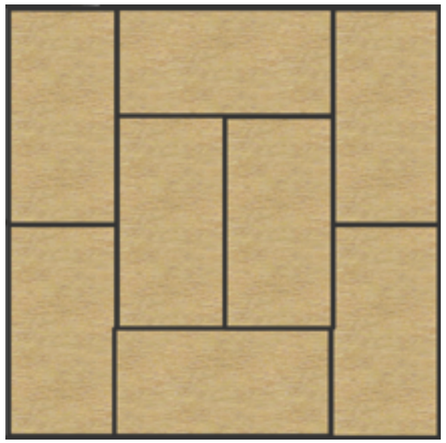

Social systems

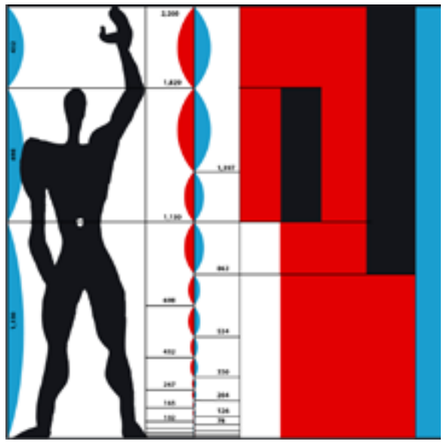
Ecosystems

Biosphere

Galaxies

Designers tend to think of systems in formal terms,
a theme and rules for variation and extension.





The Alhambra
Granada, ~1250

Münster Cathedral Cloister
Basel, ~1421

Tatami mats
Japan, ~1650

Le Modulor
Le Corbusier, 1950

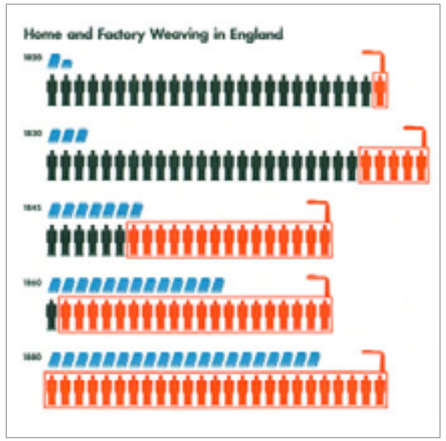
Univers
Adrian Frutiger, 1957

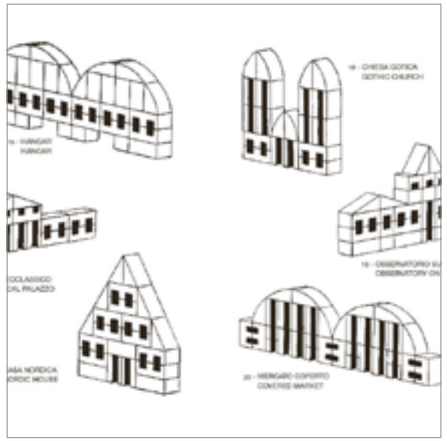
Schiphol airport signage system
Benno Wissing, 1967

Münich Olympics graphic standards
Otl Aicher, 1972

Oxo Good Grips
Sam Farber, 1989

Modernism's formal principles were codified in a series of books— the classics of design education tend to be systems oriented.



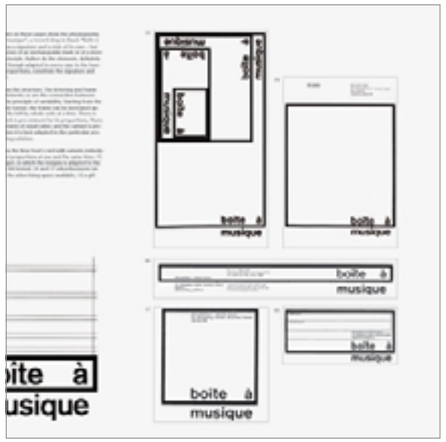


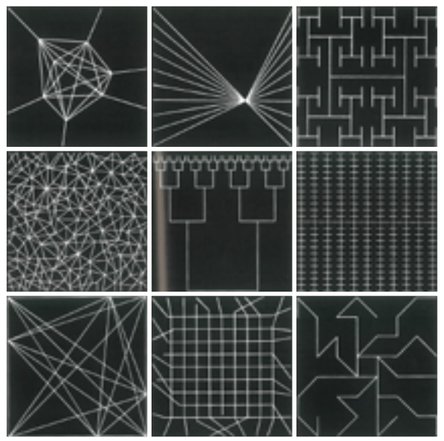
International Picture Language,
Otto Neurath, 1936

Scatola di Architettura
Bruno Munari, 1945

Visual Design in Action
Ladislav Sutnar, 1961

Interaction of Color
Josef Albers, 1963





Designing Programmes
Karl Gerstner, 1964

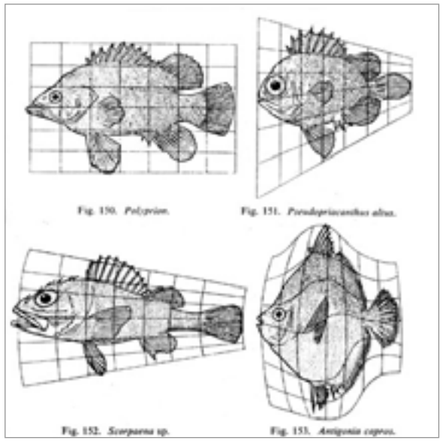
Typography
Emil Ruder, 1967

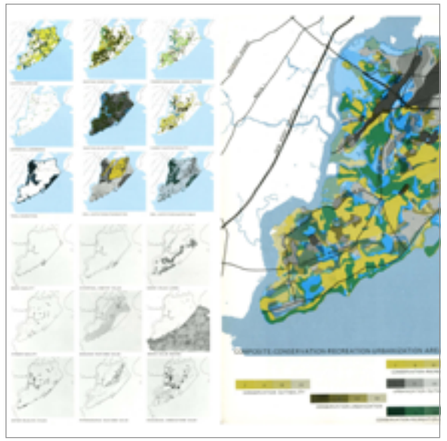
Visual Presentation of Invisible Processes
Anton Stankowski, 1967

Grid Systems
Josef Müller-Brockmann, 1981

Designers also looked to natural systems for form and structure, producing a growing literature and practice.

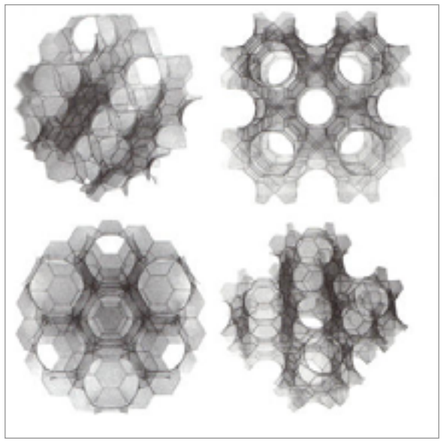
Bionics
Biomimetics
Biomimicry
Bio-inspired Engineering
Bio-inspiration
Biognosis





On Growth and Form
D'Arcy Thompson, 1917

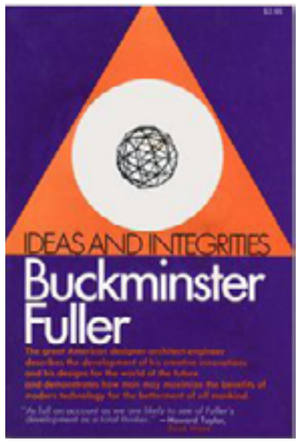
Design with Nature
Ian McHarg, 1969

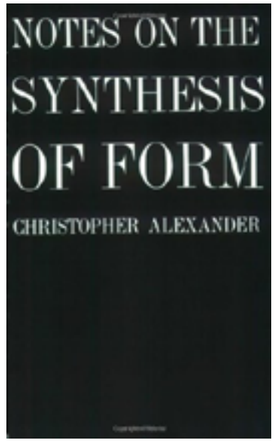


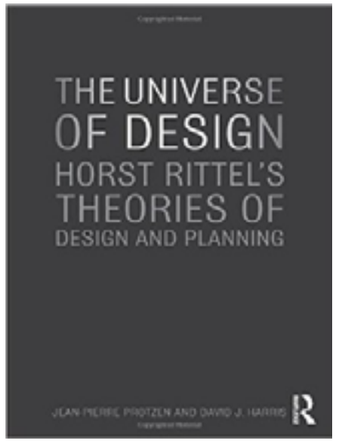
Structure in Nature is a Strategy for Design
Peter Pearce, 1978

Biomimicry: Innovation Inspired by Nature
Janine Benyus, 1997

Advances in systems science led to the design methods movement— a direct predecessor of “design thinking.”





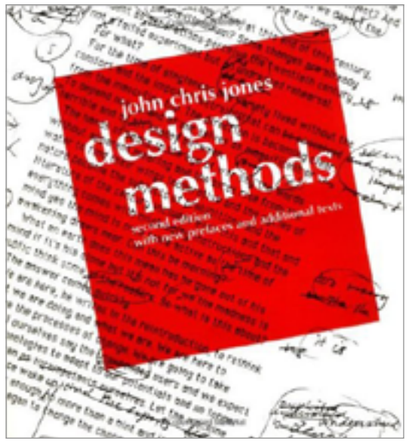


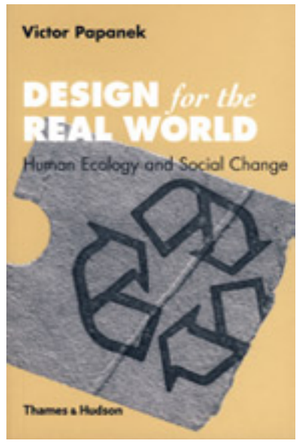
Ideas and Integrities
Buckminster Fuller, 1963

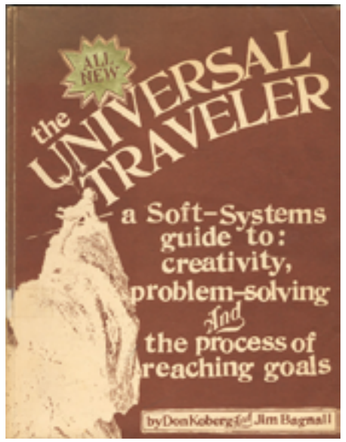
A Systematic Method for Designers
Bruce Archer, 1963-64

Notes on the Synthesis of Form
Christopher Alexander, 1964

The Universe of Design
Horst Rittel, 1964 (2013)







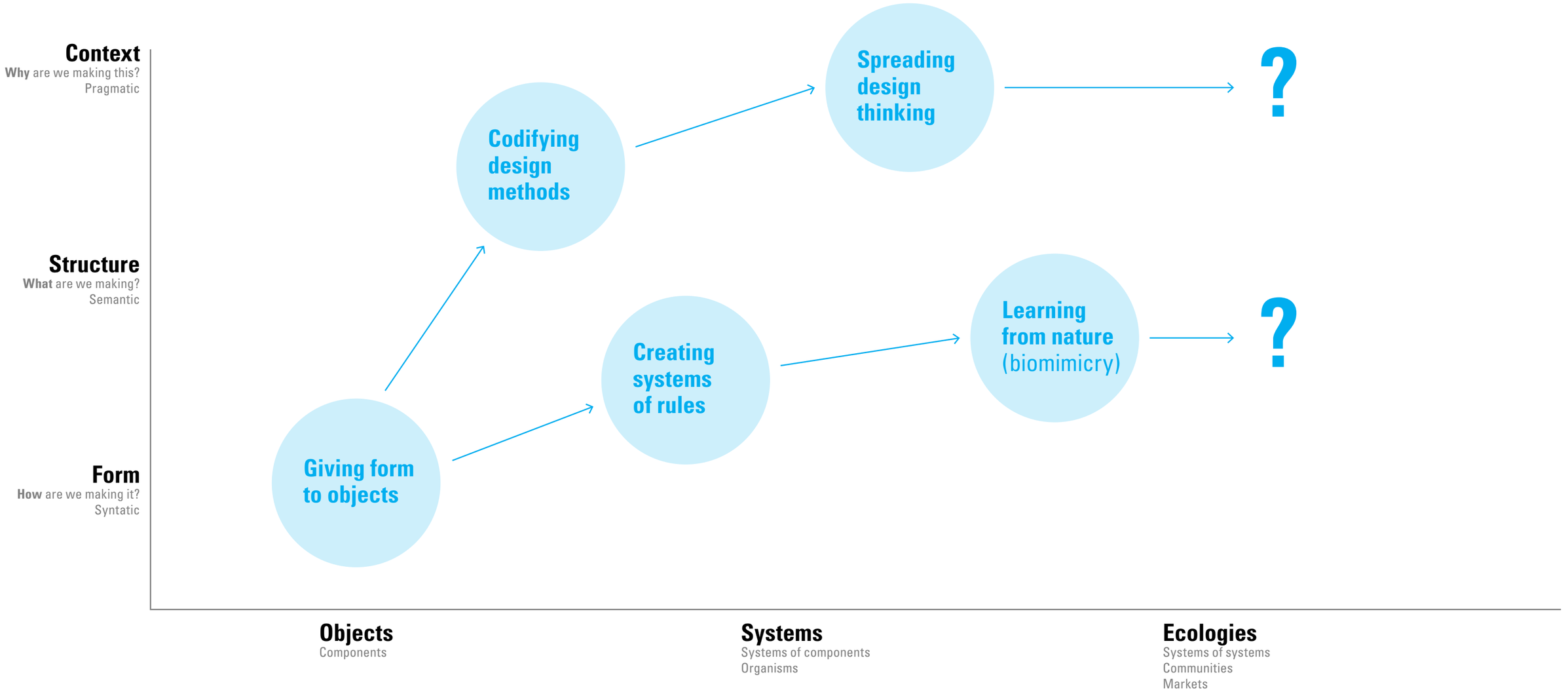
Sciences of the Artificial
Herbert Simon, 1969

Design Methods
John Chris Jones, 1970

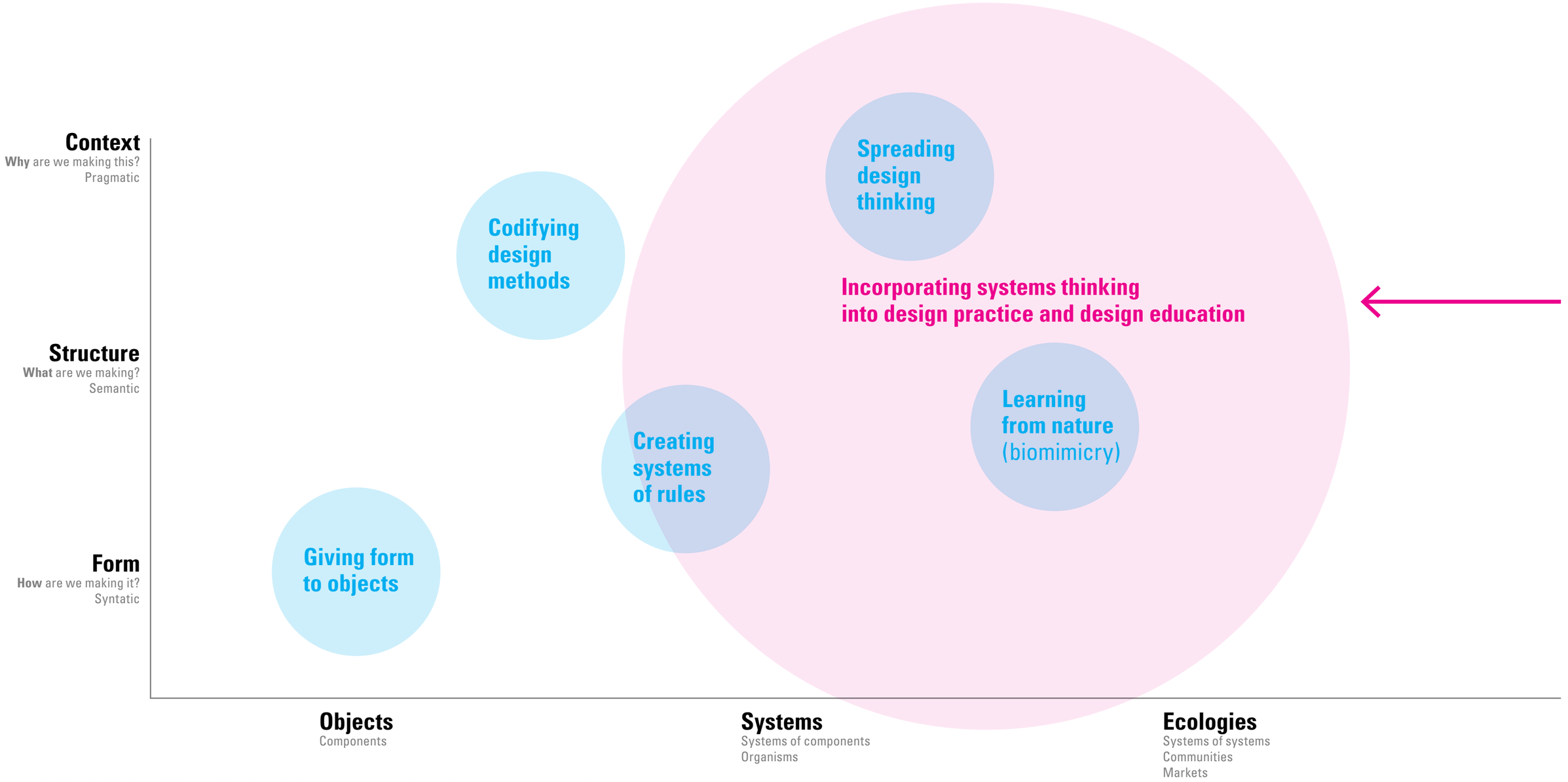
Design for the Real World
Victor Papanek, 1971

The Universal Traveler
Koberg & Bagnall, 1973

The scope of design practice is expanding.

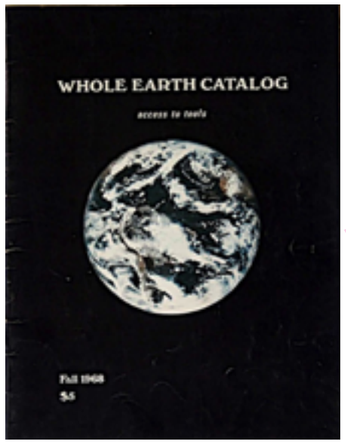


Taking a whole systems approach can make design more resilient.

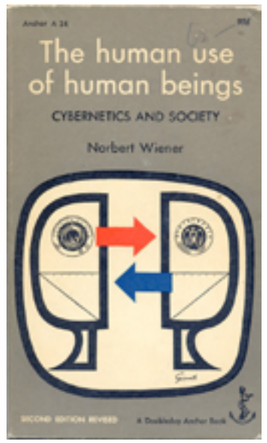


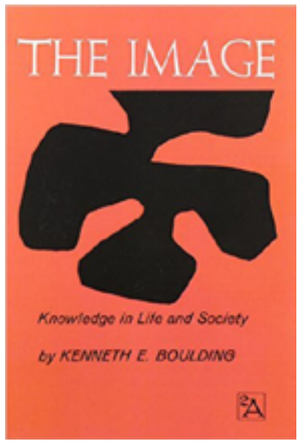
Stewart Brand connected design and systems.

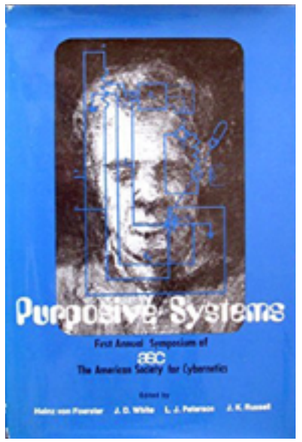
Stewart Brand connected design and systems— creating a great reading list for grad students.

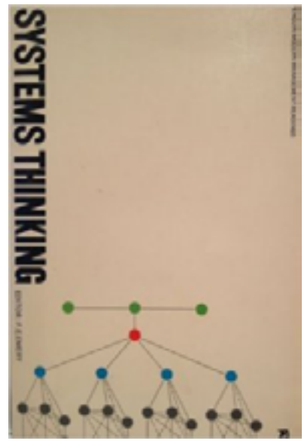


Whole Earth Catalog
Stewart Brand, 1968-1972









The Human Use of Human Beings
Norbert Wiener, 1950

The Image
Kenneth Boulding, 1956

General Systems Yearbook
von Bertalanffy and Rapoport, 1956

An Introduction to Cybernetics
Ross Ashby, 1968

Purposive Systems
Heinz von Foerster, 1968

Systems Thinking
F. E. Emery, 1969

The shift to systems requires—
not just a new set of values—
but also a **new vocabulary**
and a **new way of working.**

	from	to
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, growing**

Systems affect many dimensions of design.

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

Products are increasingly connected to:

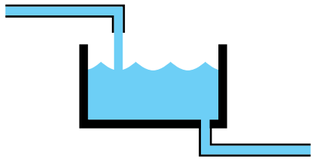
- Embedded **software**
- The **internet** and web-based applications
- Human **services**
- The **organizations** which develop and deliver the products and services
- **Communities** for which they provide infrastructure
- The **ecologies** in which they cooperate and compete

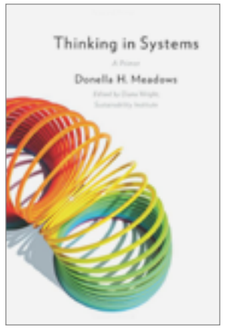
Thinking in terms of whole systems means:

- 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

Three systems ideas you can use tomorrow morning—
in your life, on the job, and in your community.

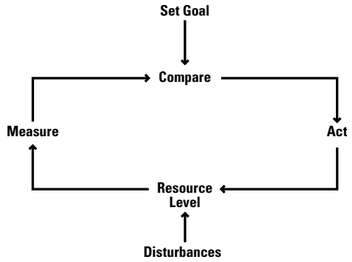
Dynamic equilibrium





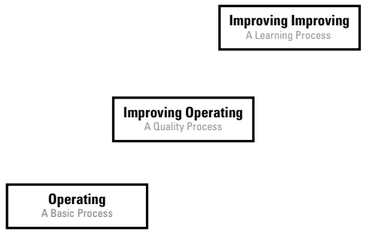
Thinking in Systems
Donella Meadows

Self regulation



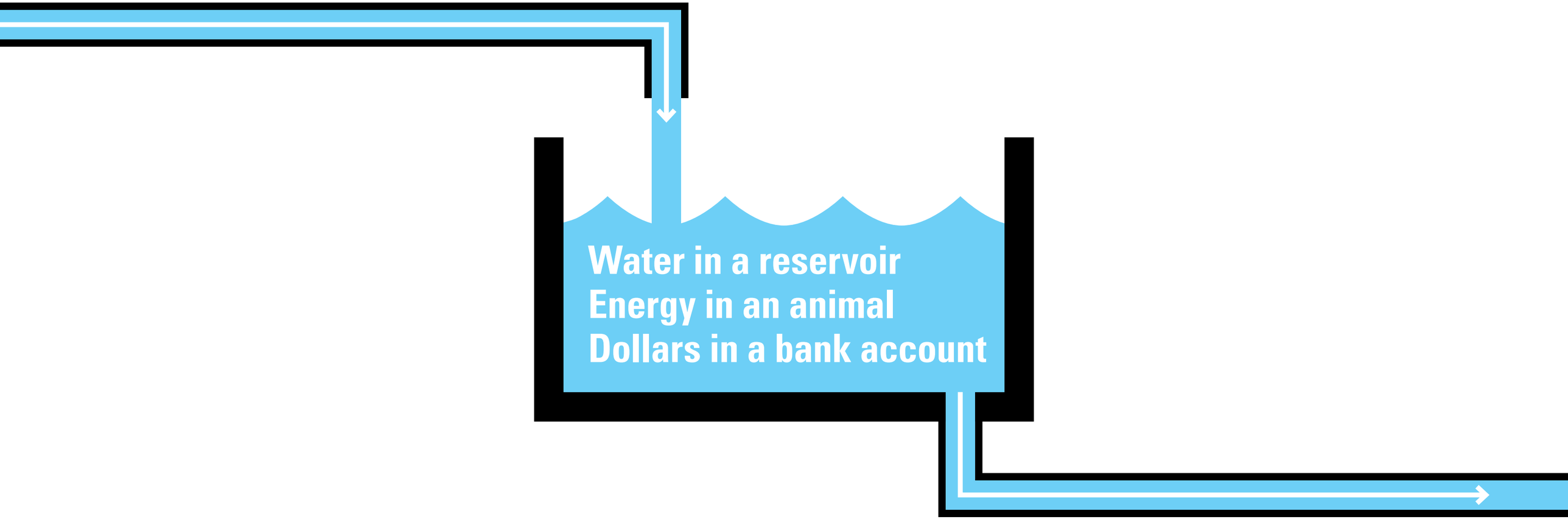
An Introduction to Cybernetics
Ross Ashby

Boot-strapping

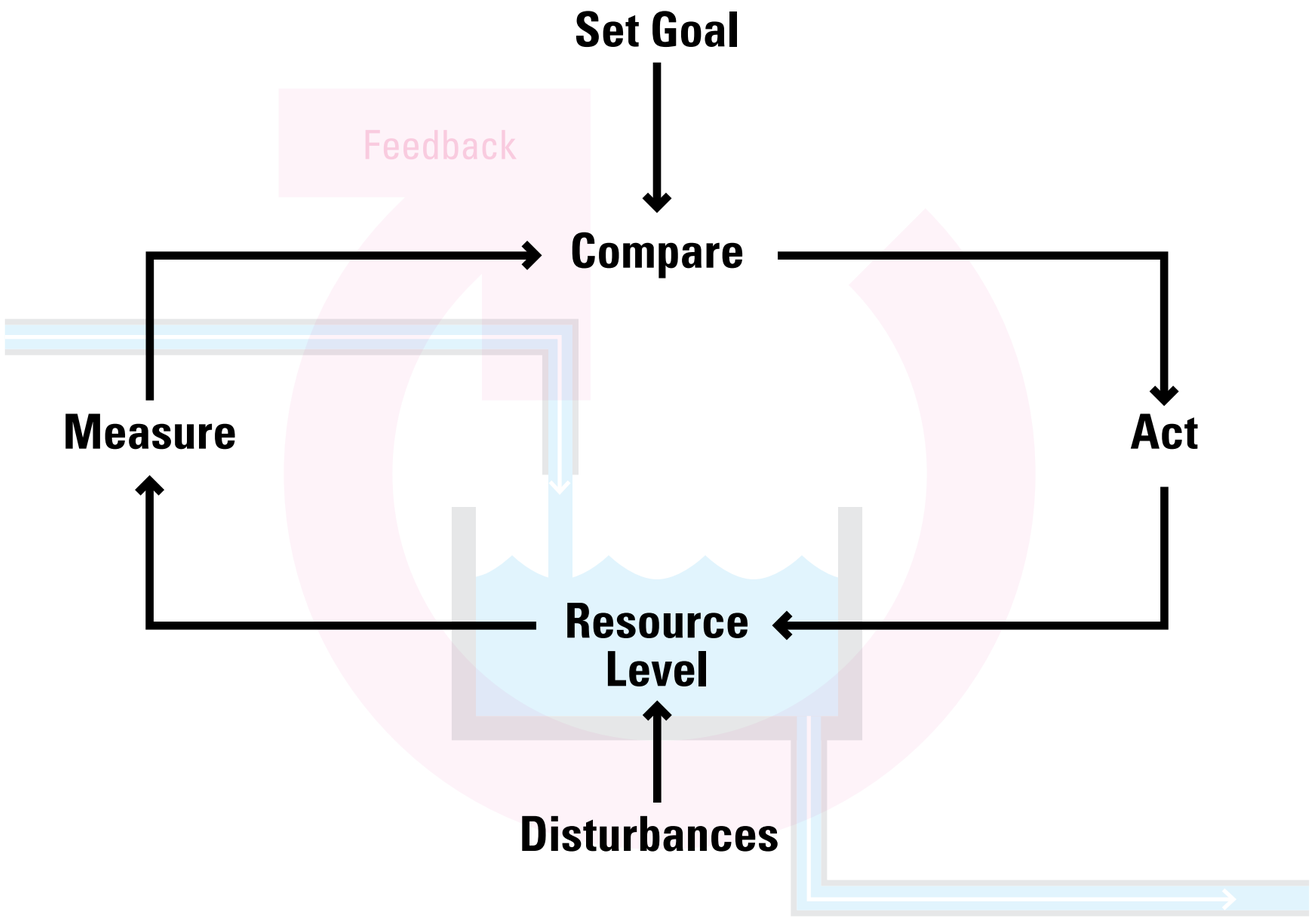


Bootstrapping Organizations into the 21st Century
Douglas Engelbart

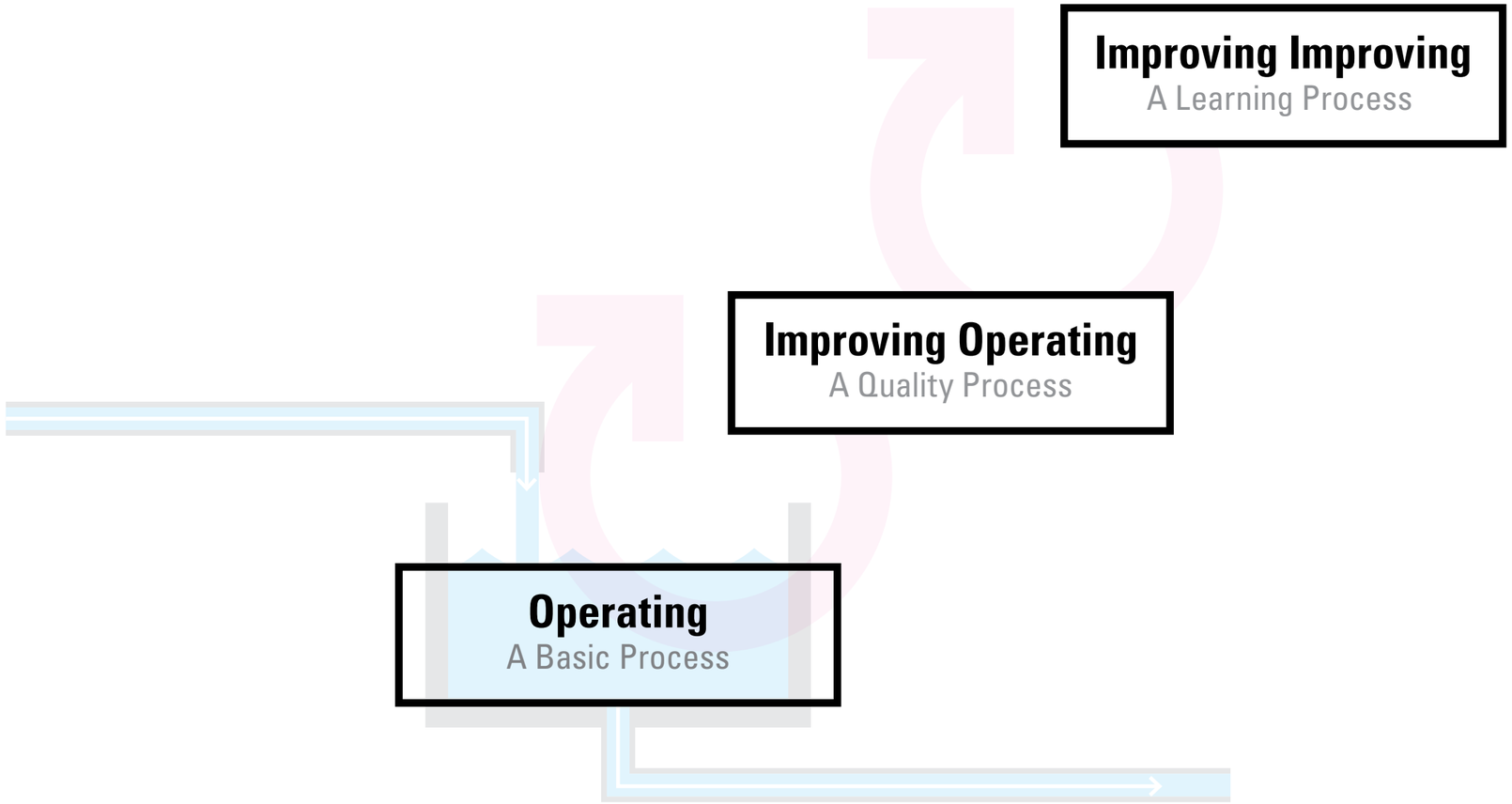
Dynamic equilibrium is a state of balance—
a resource that stays at the same level
even as it flows through a system.



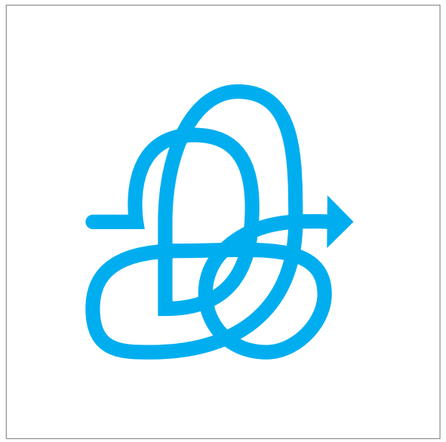
Self regulation is a process of maintaining balance—
using feedback to control the resource level,
e.g., governing how much flows in or out.



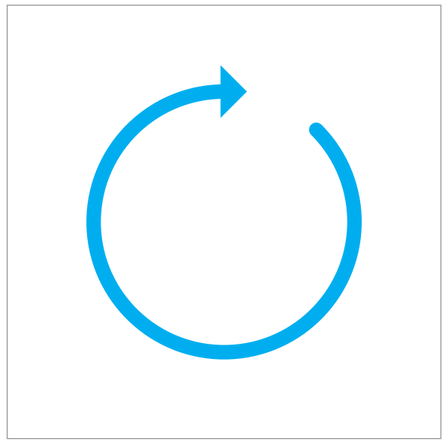
Boot-strapping is a process of self-improvement—
studying a basic process to improve it
and in turn studying the improvement process to improve it.



A final thought:
The design process can be represented by many forms.

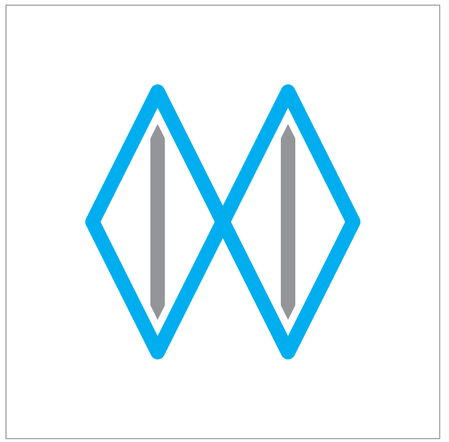


A random walk

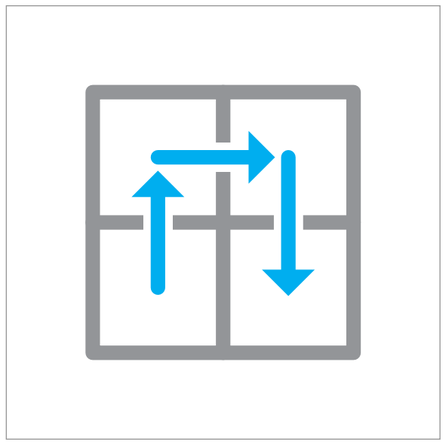


A feedback loop

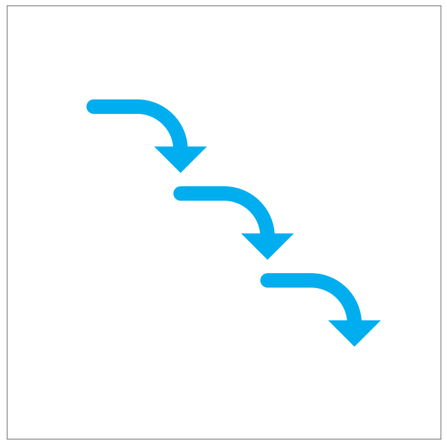
A converging spiral



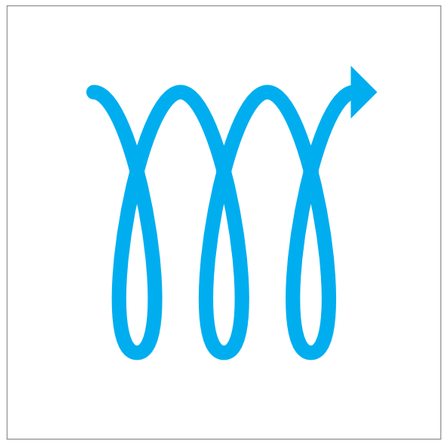
Diverging and converging diamonds



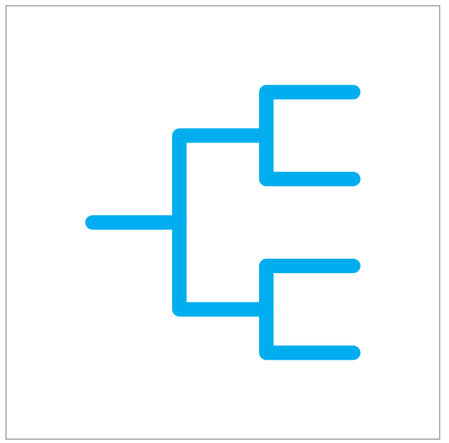
A bridge or learning cycle



A waterfall

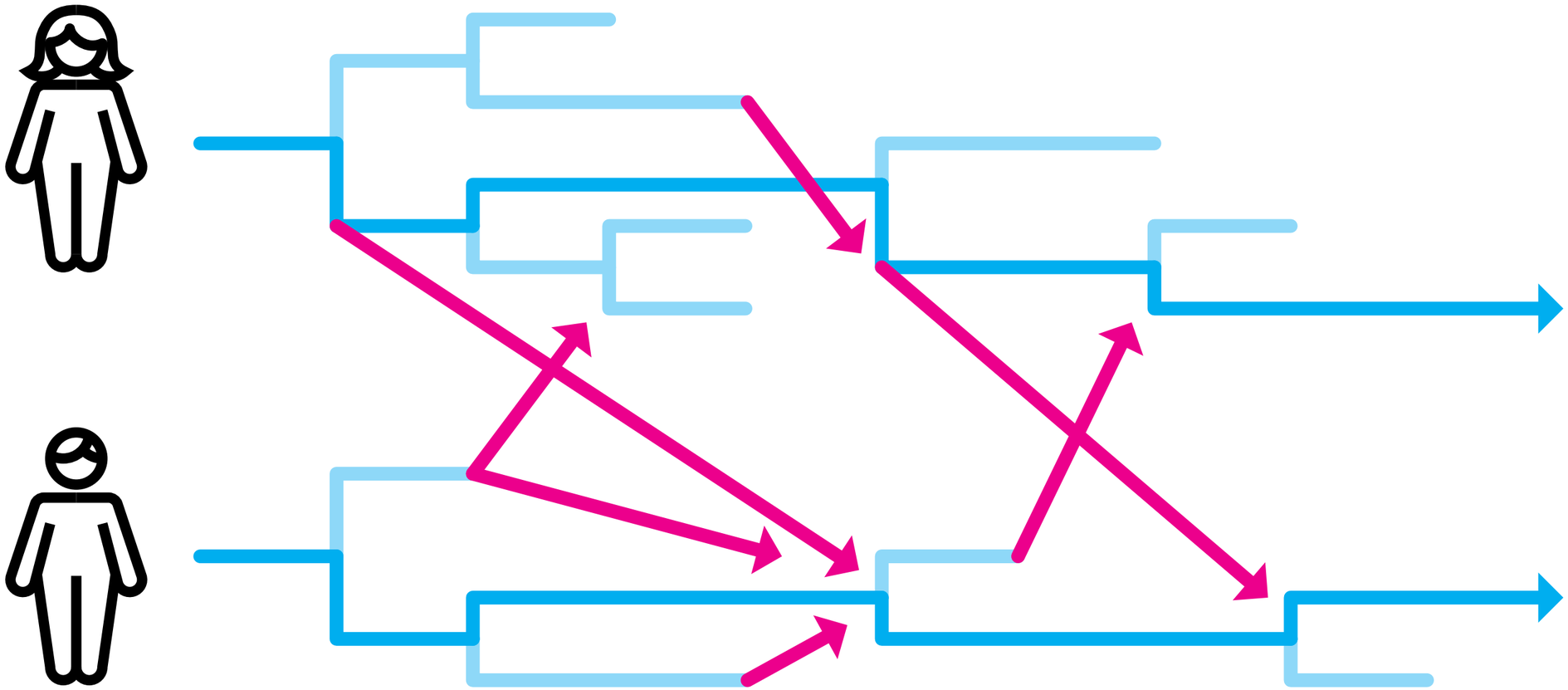


An iteration helix



A decision tree

Design is also a process of learning from one another—not just a decision tree, but also a web of conversations.



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