

Design & Cybernetics

Friday at 12:30 in 7-431. Contact Daniela Stoudenkova at danielas@mit.edu

MIT Design and Computation Group
Department of Architecture

School of Architecture + Planning

Design & Cybernetics

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Department of Architecture
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10/07 12:30 pm

It's Not What You Think: An Evolutionary Theory of Spiritual Enlightenment

Jeff Lieberman

Artist and Scientist, Founder, Pebian Design

10/21 12:30 pm

Conversations for Design + Design for Conversations

Paul Pangaro

CTO and Founder, CyberneticLifestyles

11/04 12:30 pm

Anamnesis and Amnesia: First Remember and then Forget

Ted Krueger

Graduate Program Director
Director, PhD Program in the Architectural
Sciences, School of Architecture
Rensselaer Polytechnic Institute

12/02 12:30 pm

Chaos and Communication

Alise Uptis

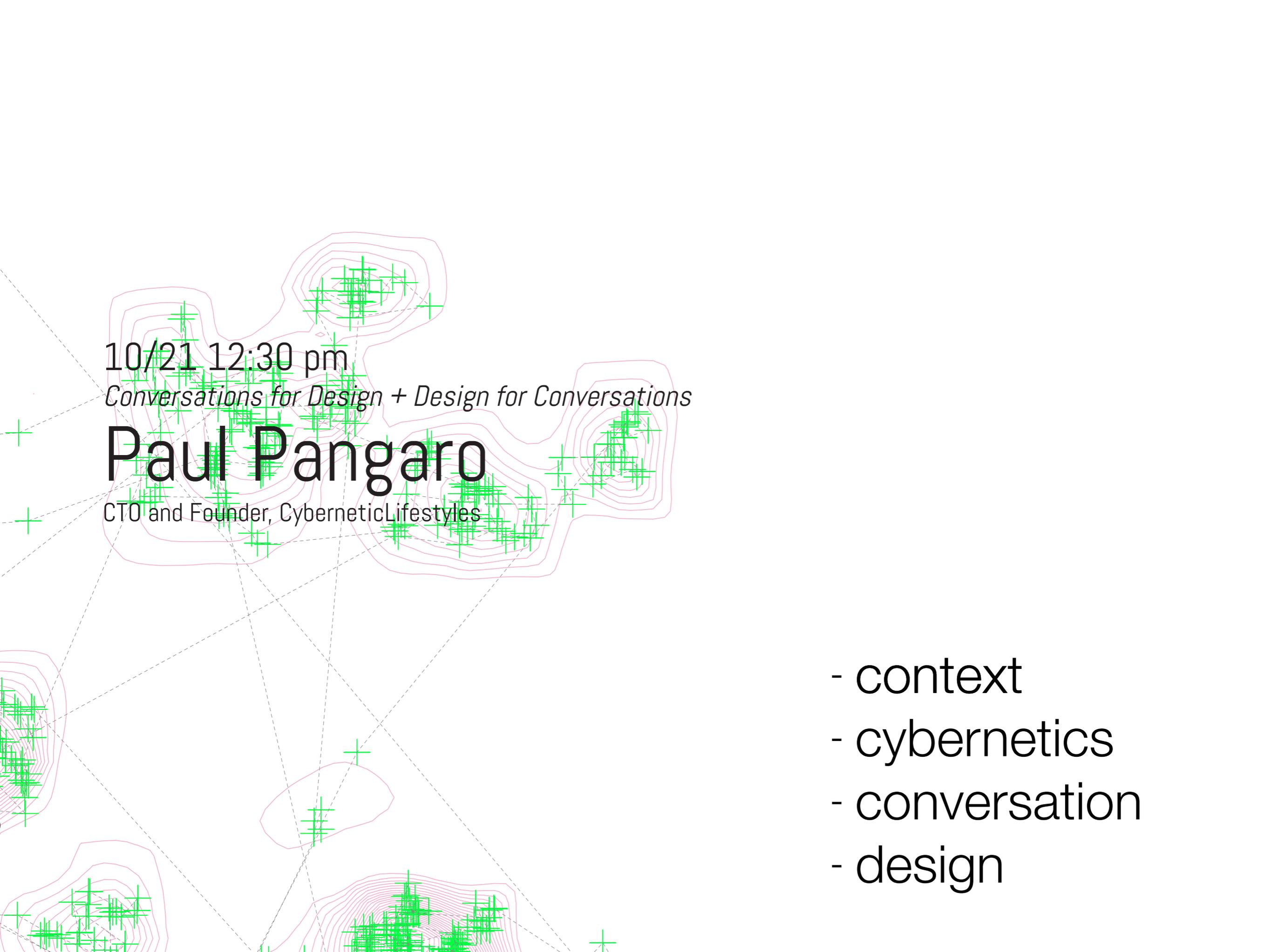
Public Art Curator
MIT List Visual Arts Center

12/09 12:30 pm

Craft and the Computer: Theory and Practice

Ayodh Kamath

Partner, Kamath Design Studio



10/21 12:30 pm

Conversations for Design + Design for Conversations

Paul Pangaro

CTO and Founder, CyberneticLifestyles

- context
- cybernetics
- conversation
- design

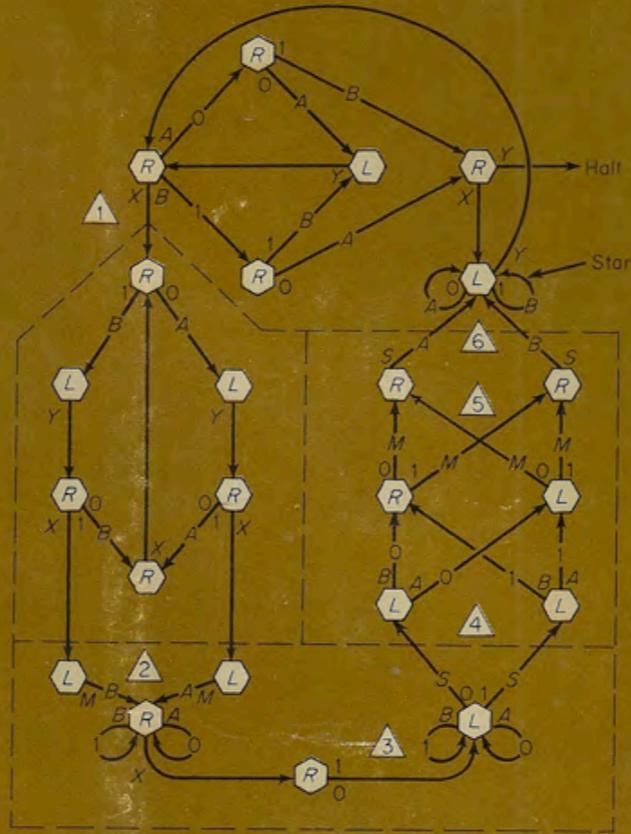
- context







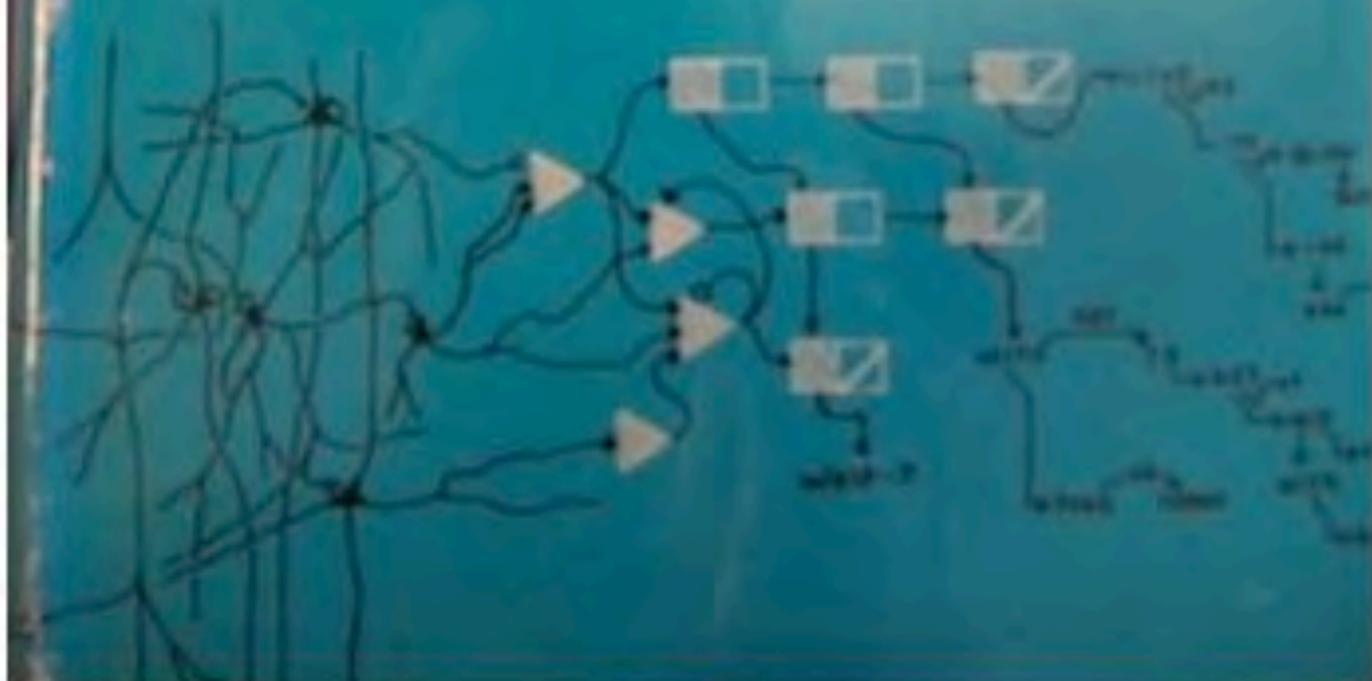
MARVIN MINSKY



**COMPUTATION
FINITE AND INFINITE
MACHINES**

PRENTICE-HALL SERIES IN AUTOMATIC COMPUTATION

Semantic Information Processing Marvin Minsky



MORE DATA,
MORE NOISE



A celebration of the 60th birthday of
JEROME Y. LETTVIN

M.I.T.

February, 1980

*What the Frog's Eye Tells the Frog's Brain**

J. Y. Lettvin[†], H. R. Maturana[‡],
W. S. McCulloch^{||}, and W. H. Pitts^{||}

SUMMARY

In this paper, we analyze the activity of single fibers in the optic nerve of a frog. Our method is to find what sort of stimulus causes the largest activity in one nerve fiber and then what is the exciting aspect of that stimulus such that variations in everything else cause little change in the response. It has been known for the past 20 years that each fiber is connected not to a few rods and cones in the retina but to very many over a fair area. Our results show that for the most part within that area, it is not the light intensity itself but rather the pattern of local variation of intensity that is the exciting factor. There are four types of fibers, each type concerned with a different sort of pattern. Each type is uniformly distributed over the whole retina of the frog. Thus, there are four distinct parallel distributed channels whereby the frog's eye informs his brain about the visual image in terms of local pattern independent of average illumination. We describe the patterns and show the functional and anatomical separation of the channels. This work has been done on the frog, and our interpretation applies only to the frog.

* Original manuscript received by the IRE, September 3, 1959.

This work was supported in part by the U. S. Army (Signal Corps), the U. S. Air Force (Office of Sci. Res., Air Res. and Dev. Command), and the U. S. Navy (Office of Naval Res.); and in part by Bell Telephone Labs., Inc.

[†] Research Laboratory of Electronics and Dept. of Biology, M.I.T., Cambridge, Mass.

[‡] Research Laboratory of Electronics, M.I.T., Cambridge, Mass., on leave from the University of Chile, Santiago, Chile.

^{||} Research Laboratory of Electronics, M.I.T., Cambridge, Mass.

What the Frog's Eye Tells the Frog's Brain

INTRODUCTION

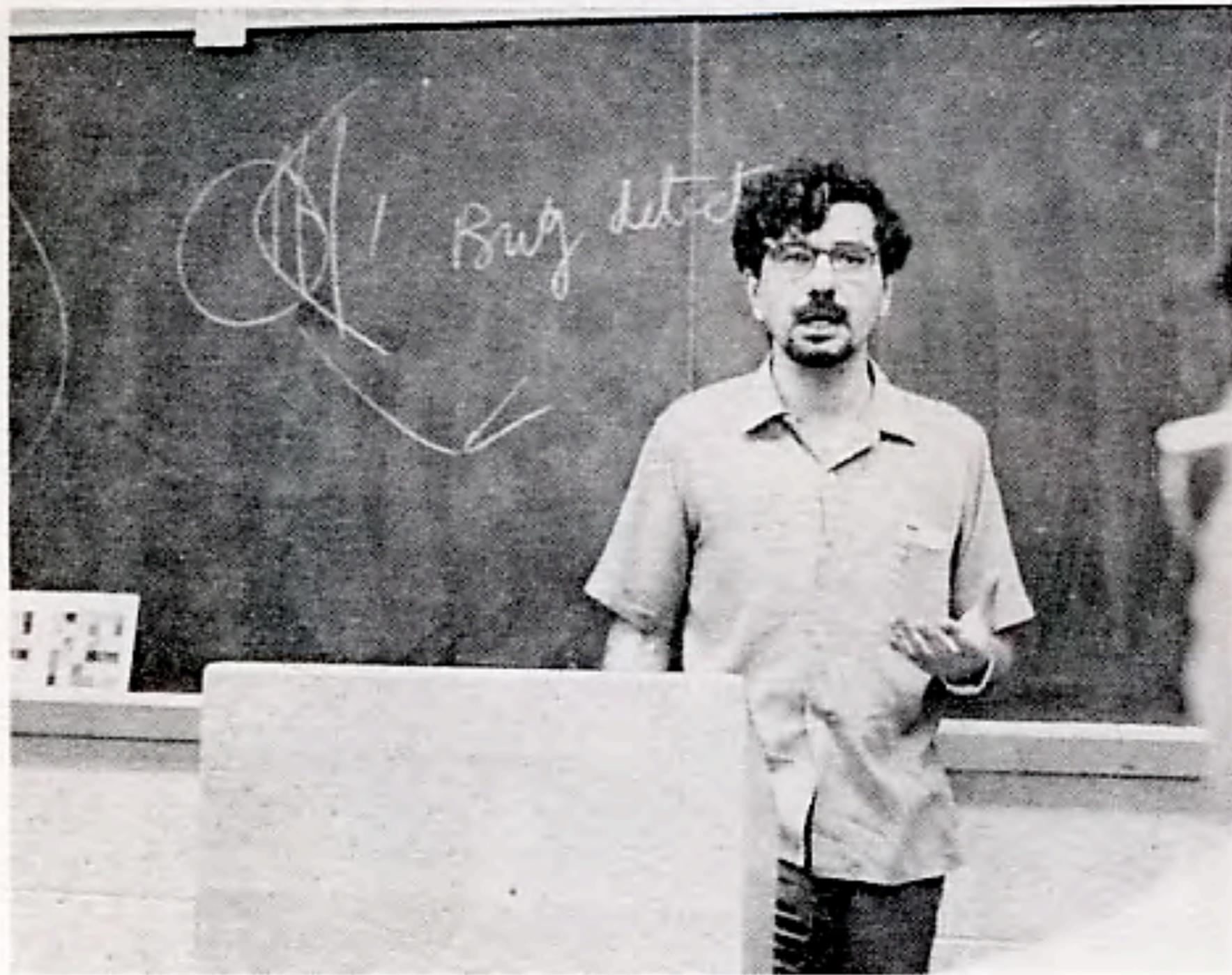
Behavior of a Frog

A FROG hunts on land by vision. He escapes enemies mainly by seeing them. His eyes do not move, as do ours, to follow prey, attend suspicious events, or search for things of interest. If his body changes its position with respect to gravity or the whole visual world is rotated about him, then he shows compensatory eye movements. These movements enter his hunting and evading habits only, e.g., as he sits on a rocking lily pad. Thus, his eyes are actively stabilized. He has no fovea, or region of greatest acuity in vision, upon which he must center a part of the image. He also has only a single visual system, retina to colliculus, not a double one such as ours where the retina sends fibers not only to colliculus but to the lateral geniculate body which relays to cerebral cortex. Thus we chose to work on the frog because of the uniformity of his retina, the normal lack of eye and head movements except for those which stabilize the retinal image, and the relative simplicity of the connection of his eye to his brain.

The frog does not seem to see or, at any rate, is not concerned with the detail of stationary parts of the world around him. He will starve to death surrounded by food if it is not moving. His choice of food is determined only by size and movement. He will leap to capture any object the size of an insect or worm, providing it moves like one. He can be fooled easily not only by a bit of dangled meat but by any moving small object. His sex life is conducted by sound and touch. His choice of paths in escaping enemies does not seem to be governed by anything more devious than leaping to where it is darker. Since he is equally at home in water and on land, why should it matter where he lights after jumping or what particular direction he takes? He does remember a moving thing providing it stays within his field of vision and he is not distracted.

Anatomy of Frog Visual Apparatus

The retina of a frog is shown in Fig. 1(a). Between the rods and cones of the retina and the ganglion cells, whose axons form



Humberto Maturana, 1969.

BOSTON STUDIES IN THE PHILOSOPHY OF SCIENCE

HUMBERTO R. MATURANA AND FRANCISCO J. VARELA

AUTOPOIESIS AND COGNITION

The Realization of the Living

VOLUME 42

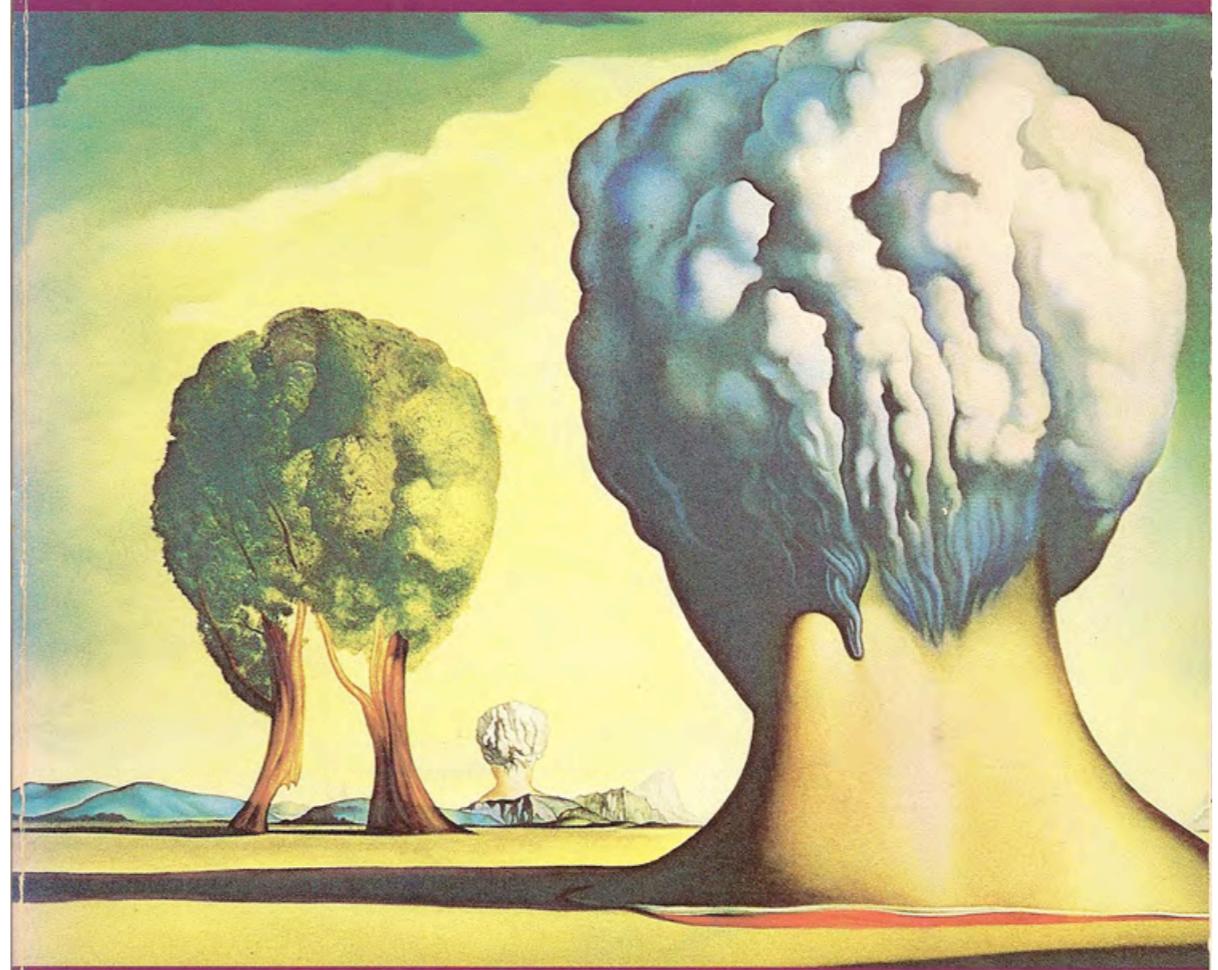


D. REIDEL PUBLISHING COMPANY

DORDRECHT : HOLLAND / BOSTON : U.S.A.
LONDON : ENGLAND

THE TREE OF KNOWLEDGE

The Biological Roots of Human Understanding



Humberto R. Maturana & Francisco J. Varela

FOREWORD BY J. Z. YOUNG

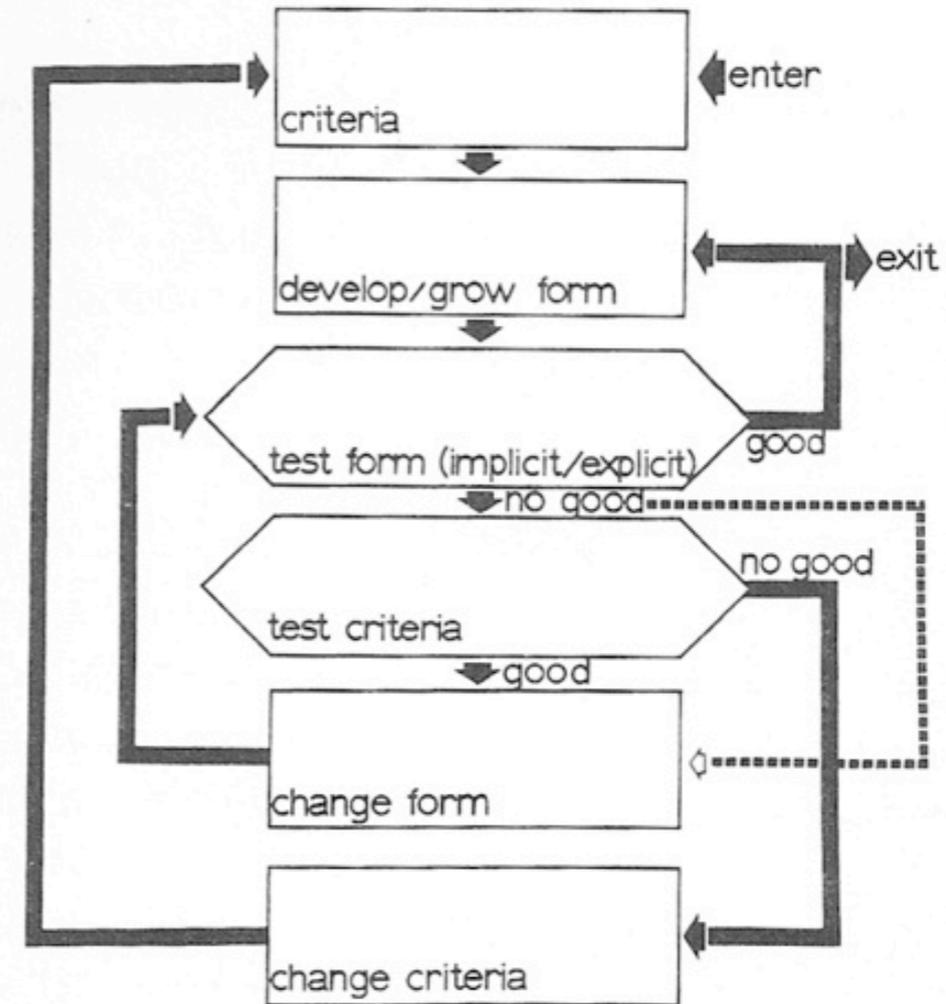
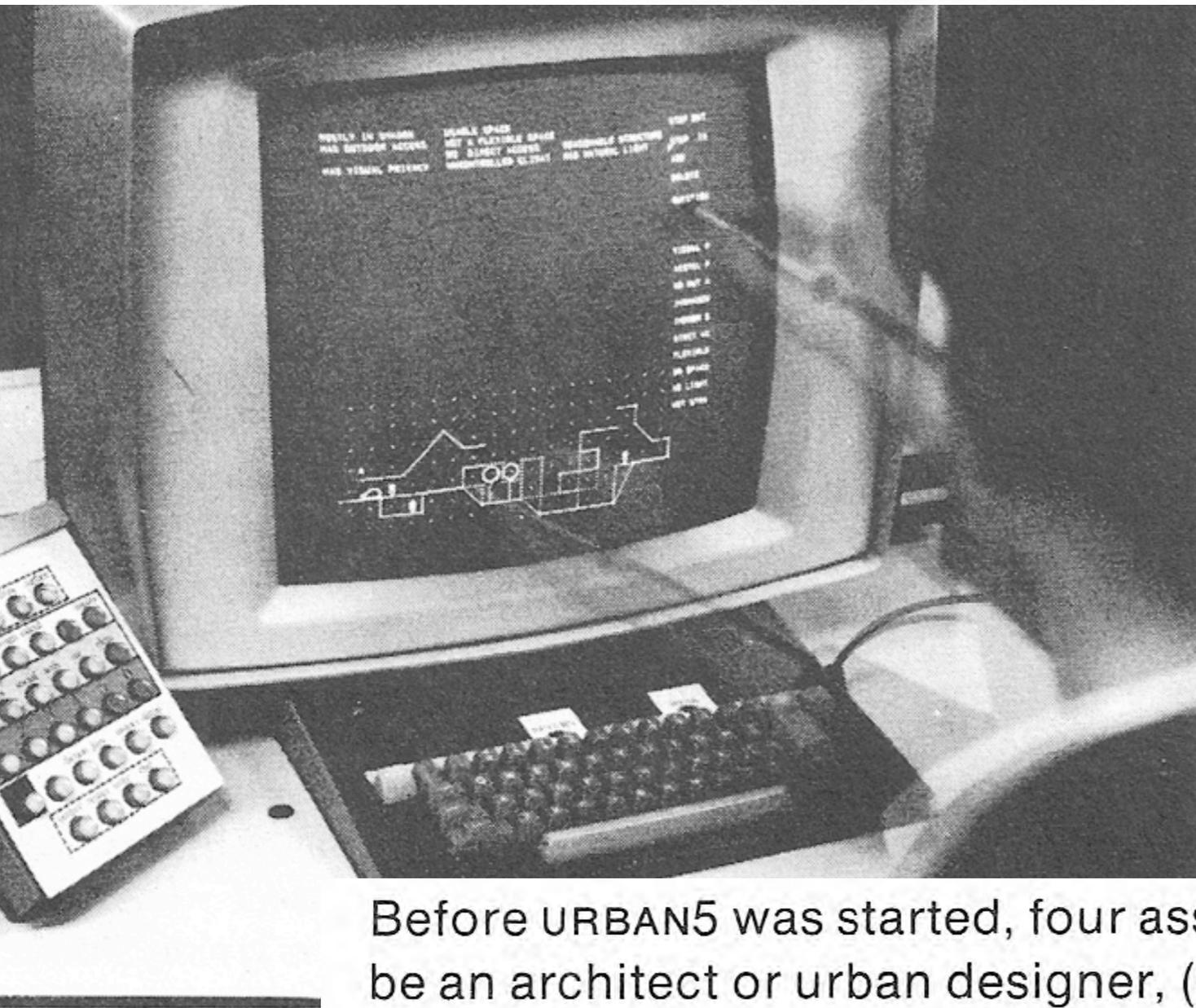




10 URBAN5: A Machine That Discusses Urban Design

Nicholas Negroponte and
Leon Groisser

International Business Machines
Cambridge Scientific Center and
Department of Architecture,
Massachusetts Institute of
Technology
Cambridge, Massachusetts



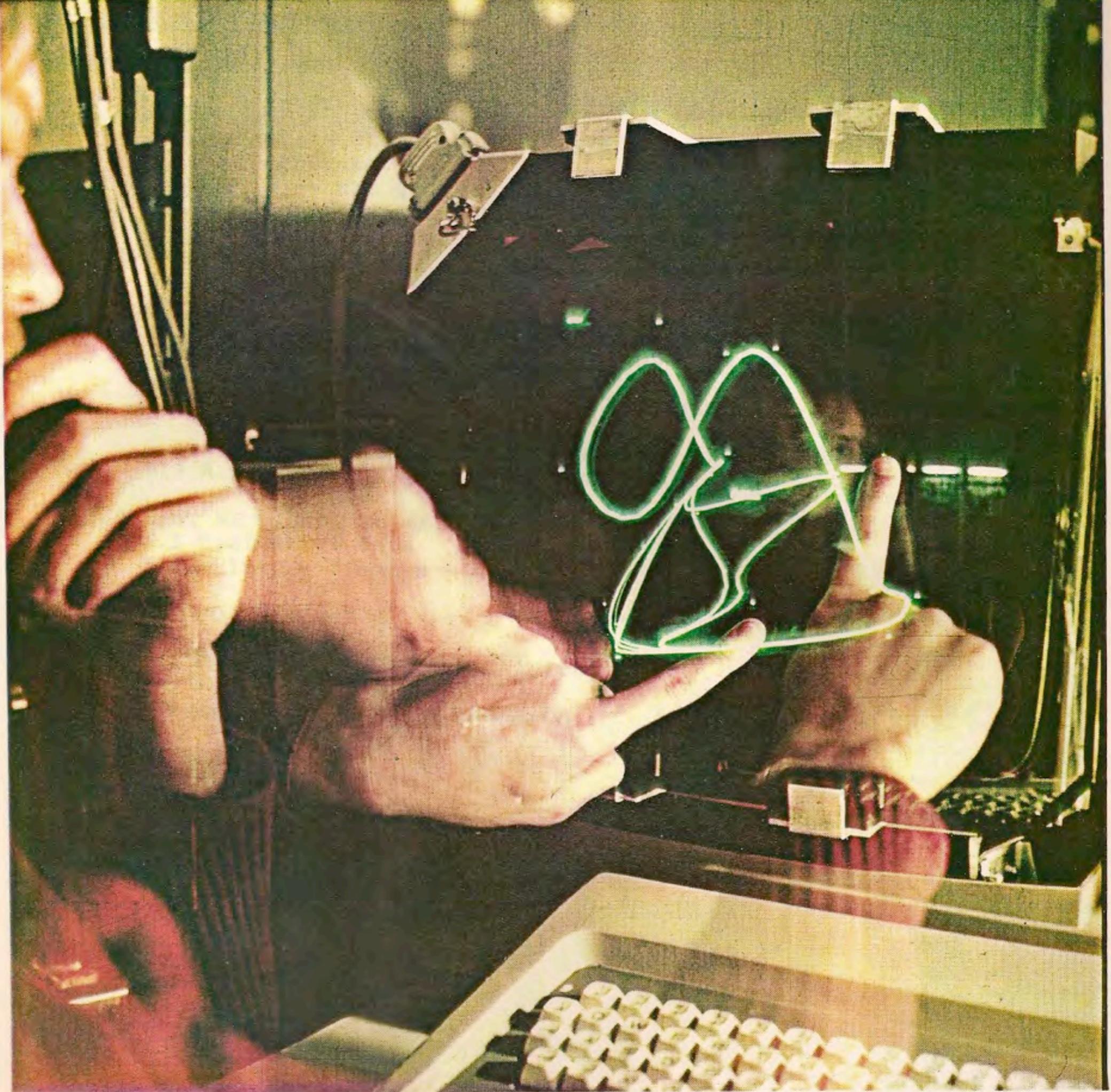
Before URBAN5 was started, four assumptions were made: (1) the user would be an architect or urban designer, (2) urban design is based on physical form, (3) the design process is not algorithmic, (4) urban environments are equilibria resolved from many basic, primarily qualitative relationships.¹ The first assumption alone generated the spirit of the system, as we further assumed

ARPA

Command Systems Cybernetics

Architecture Machine Group
MIT
March 1977

Touch Sensitive Displays



October / November, 1977
Price, \$2.00

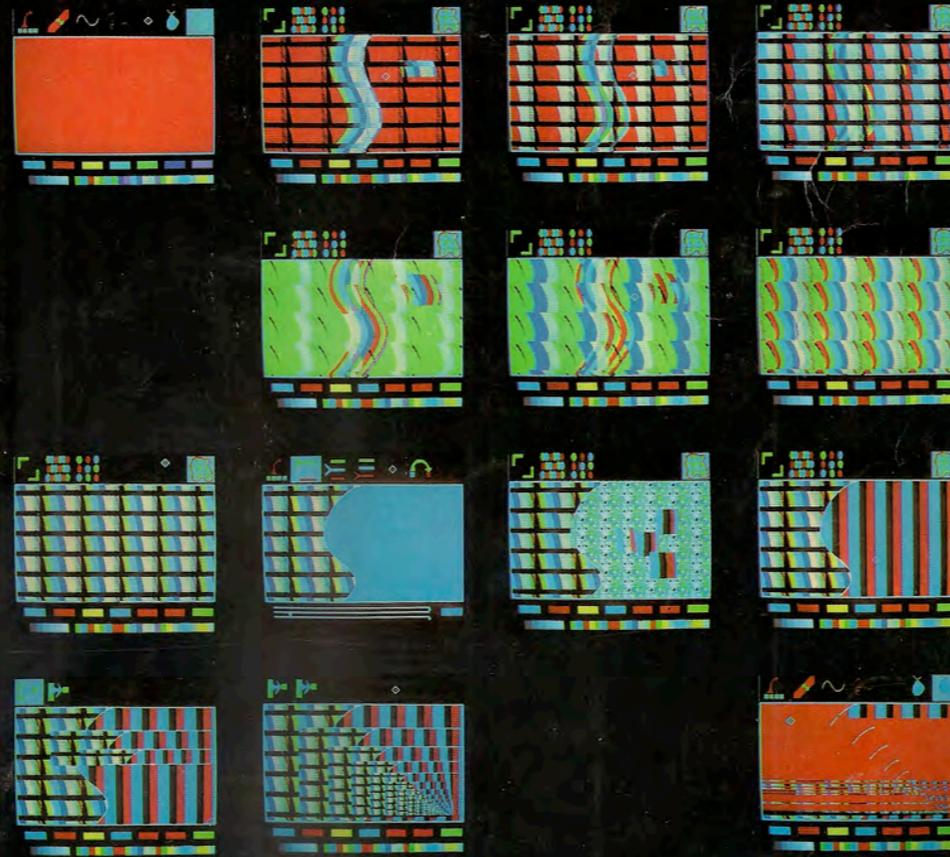
Beginning a Year-Long
Series on How to Make
New Things Happen

Innov^{aha!}tion

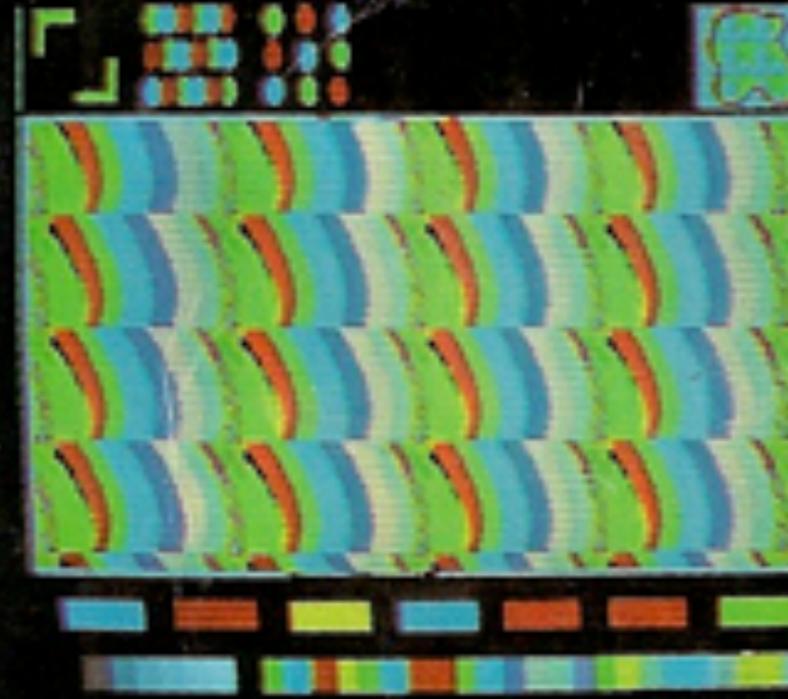
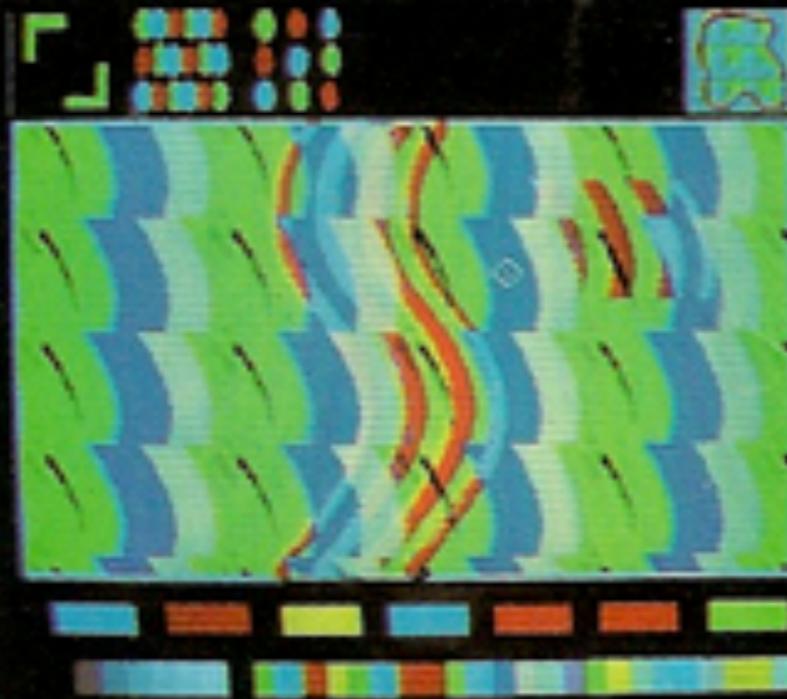
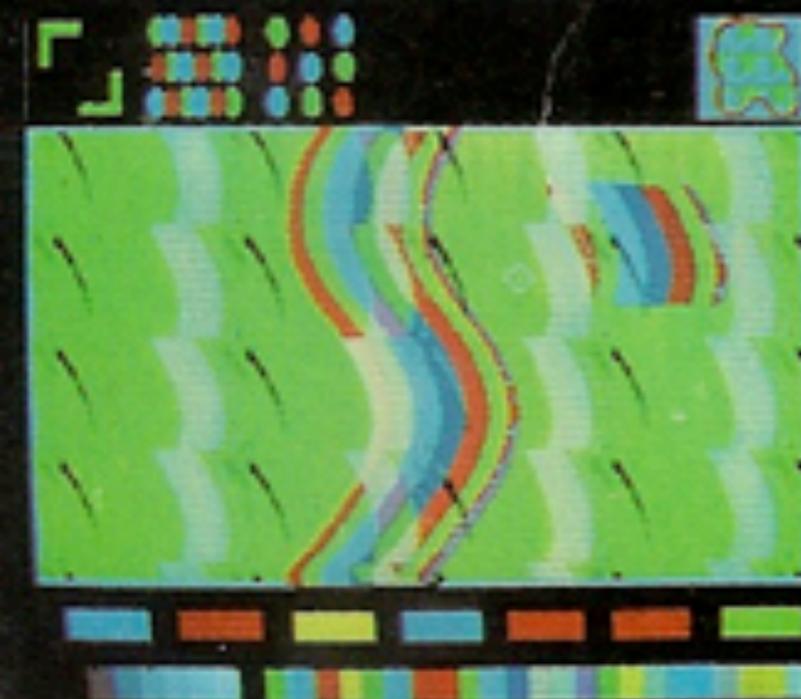
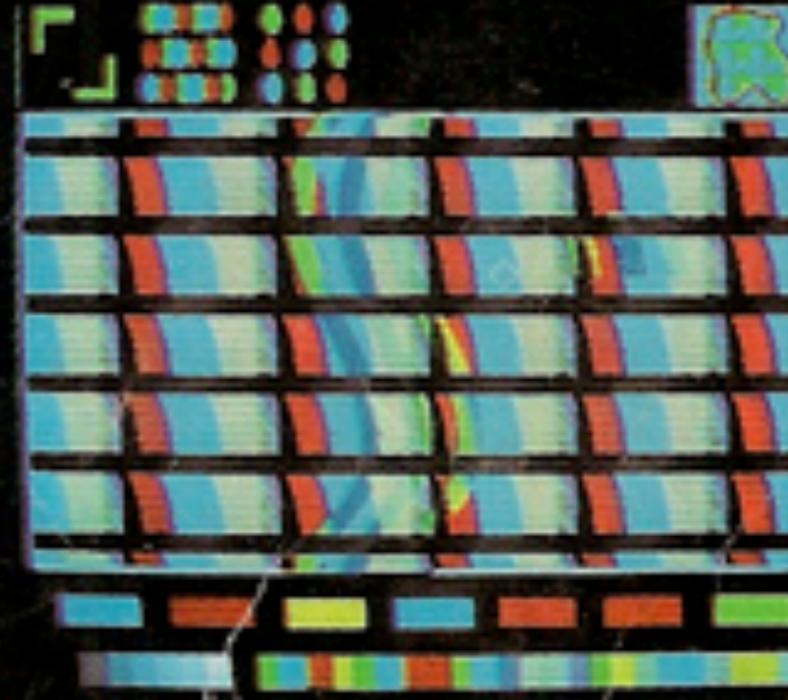
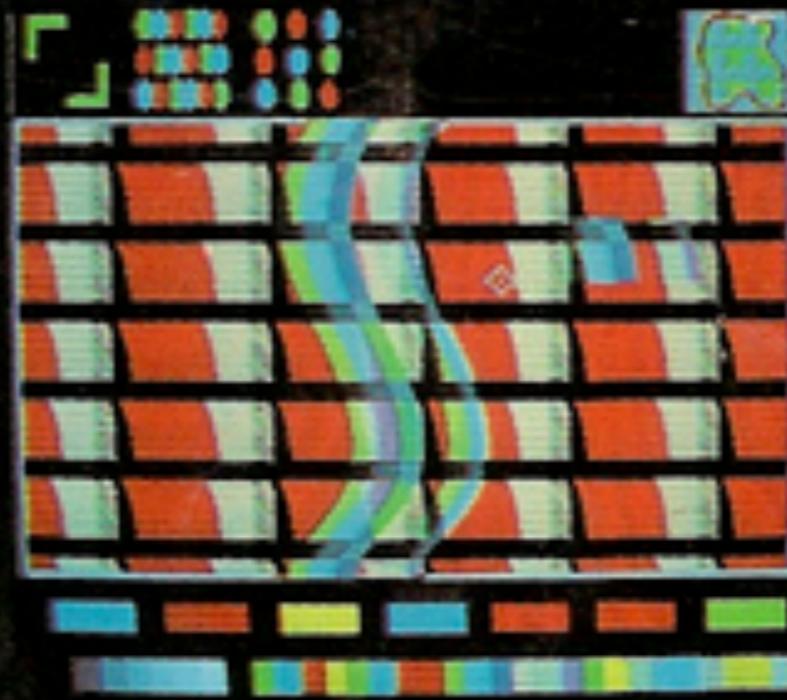
Technology Review

Edited at the Massachusetts Institute of Technology

Painting by Computer:
New Realms for Animation
*See page 34



Painting by Computer:
New Realms for Animation
See page 34





GORDON PASK

CONVERSATION,
COGNITION AND
LEARNING



A CYBERNETIC THEORY
AND METHODOLOGY

ELSEVIER

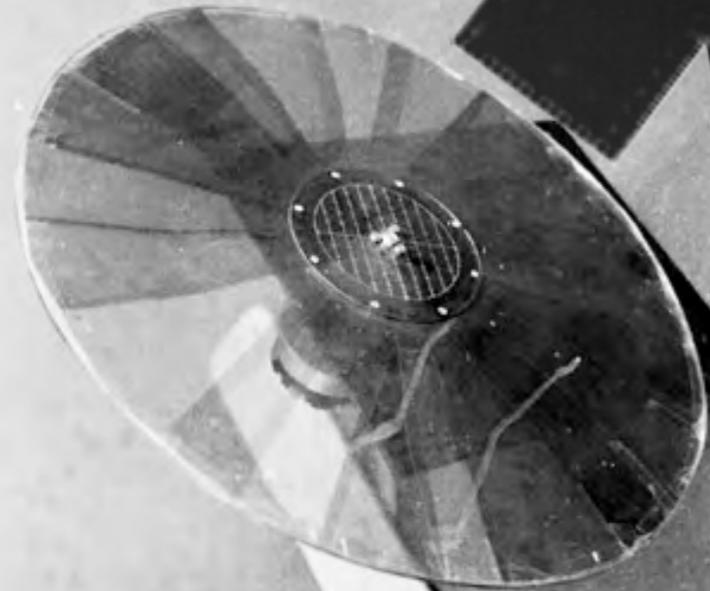
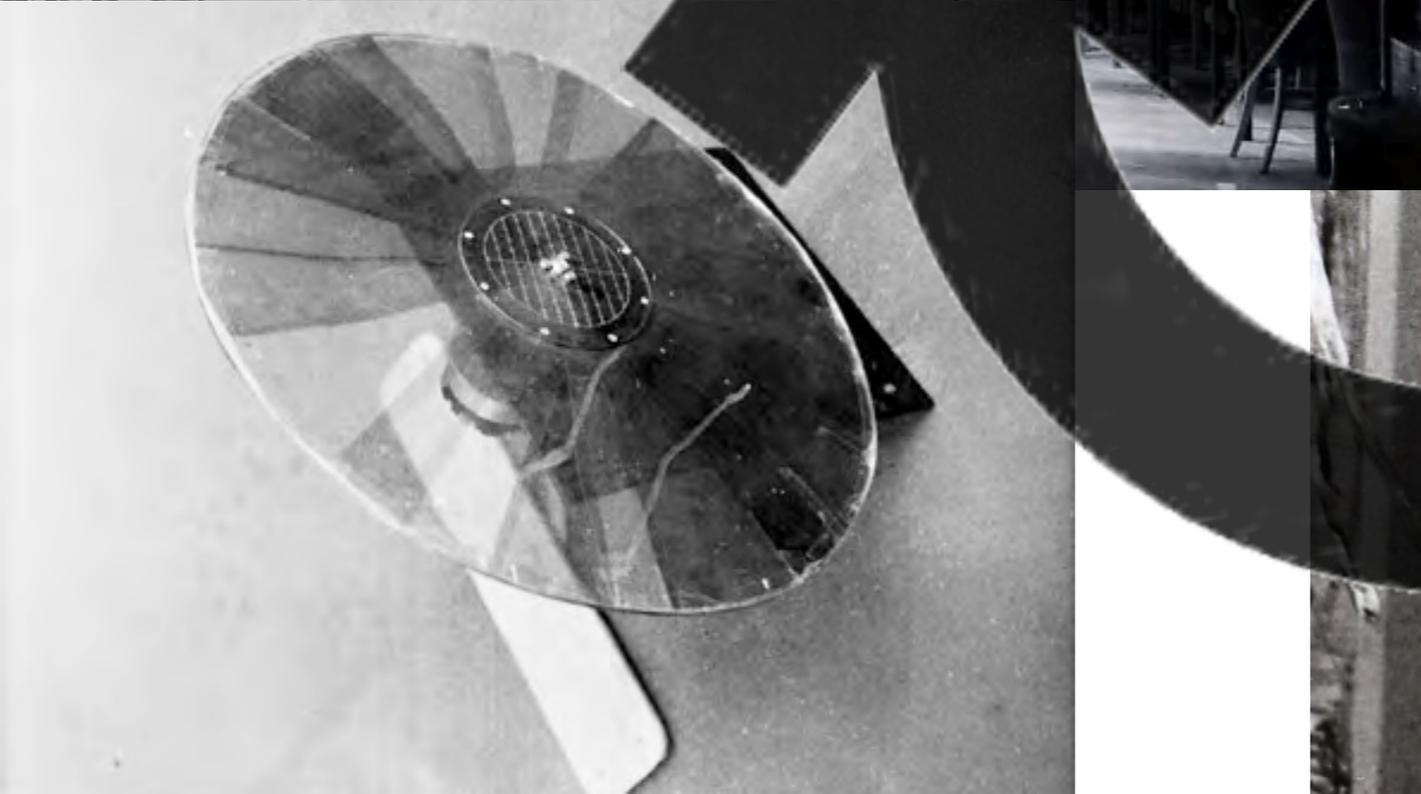
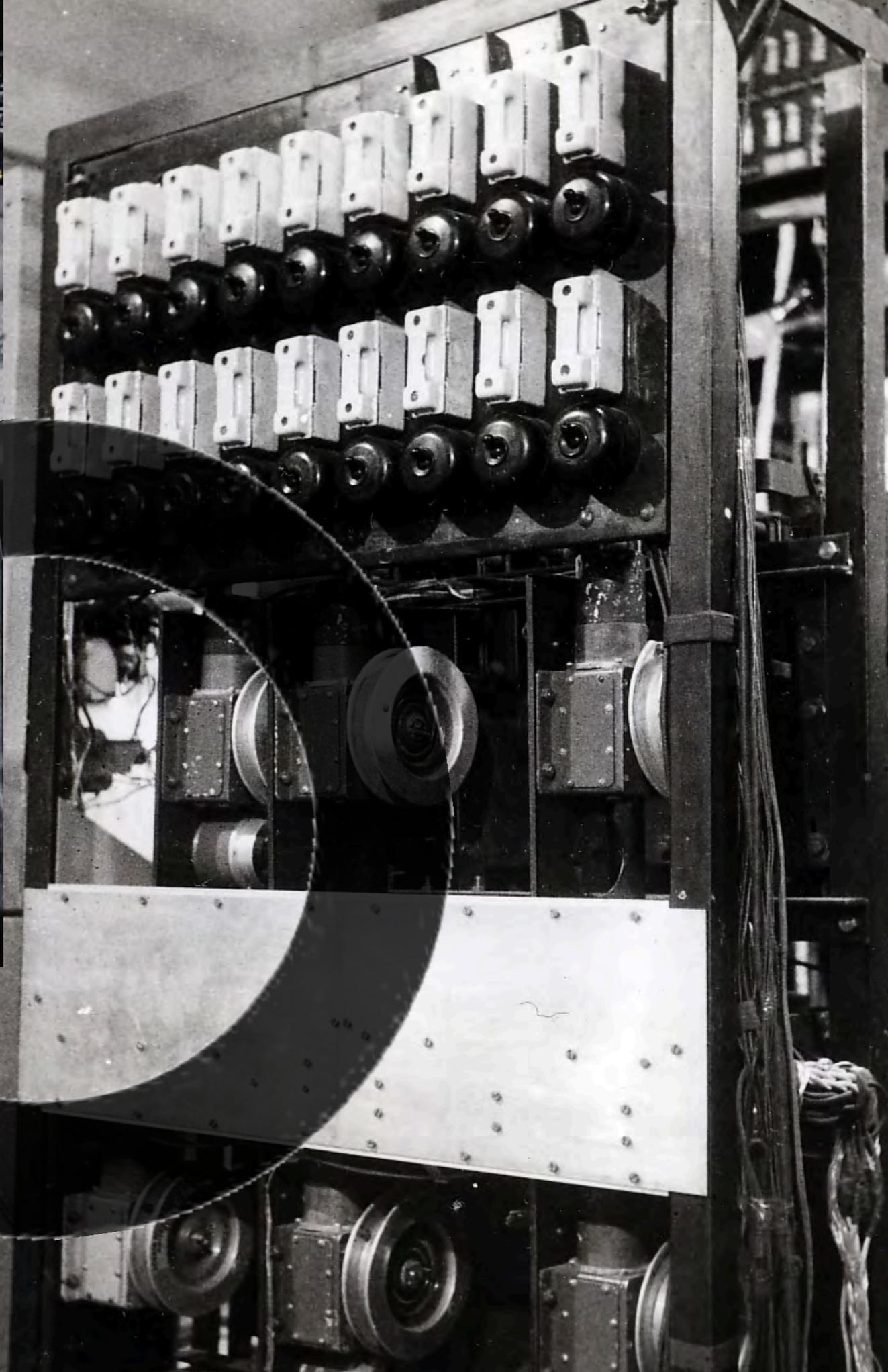
GORDON PASK

CONVERSATION
THEORY



APPLICATIONS IN EDUCATION
AND EPISTEMOLOGY

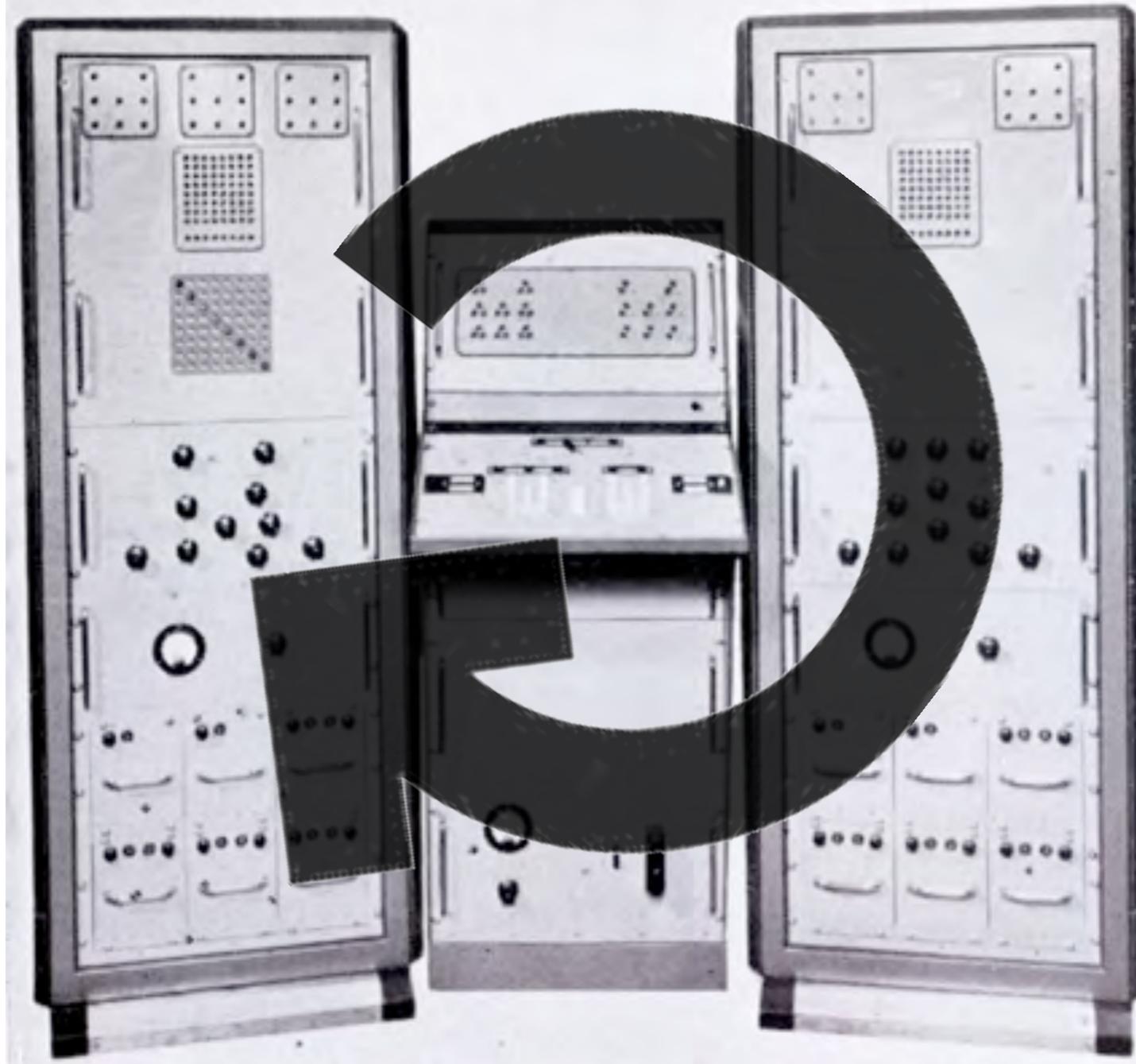
ELSEVIER



TEACHER
SIMULATOR

CONTROL
CONSOLE

PUPIL
SIMULATOR





Soft Architecture Machines

Negroponte



Soft

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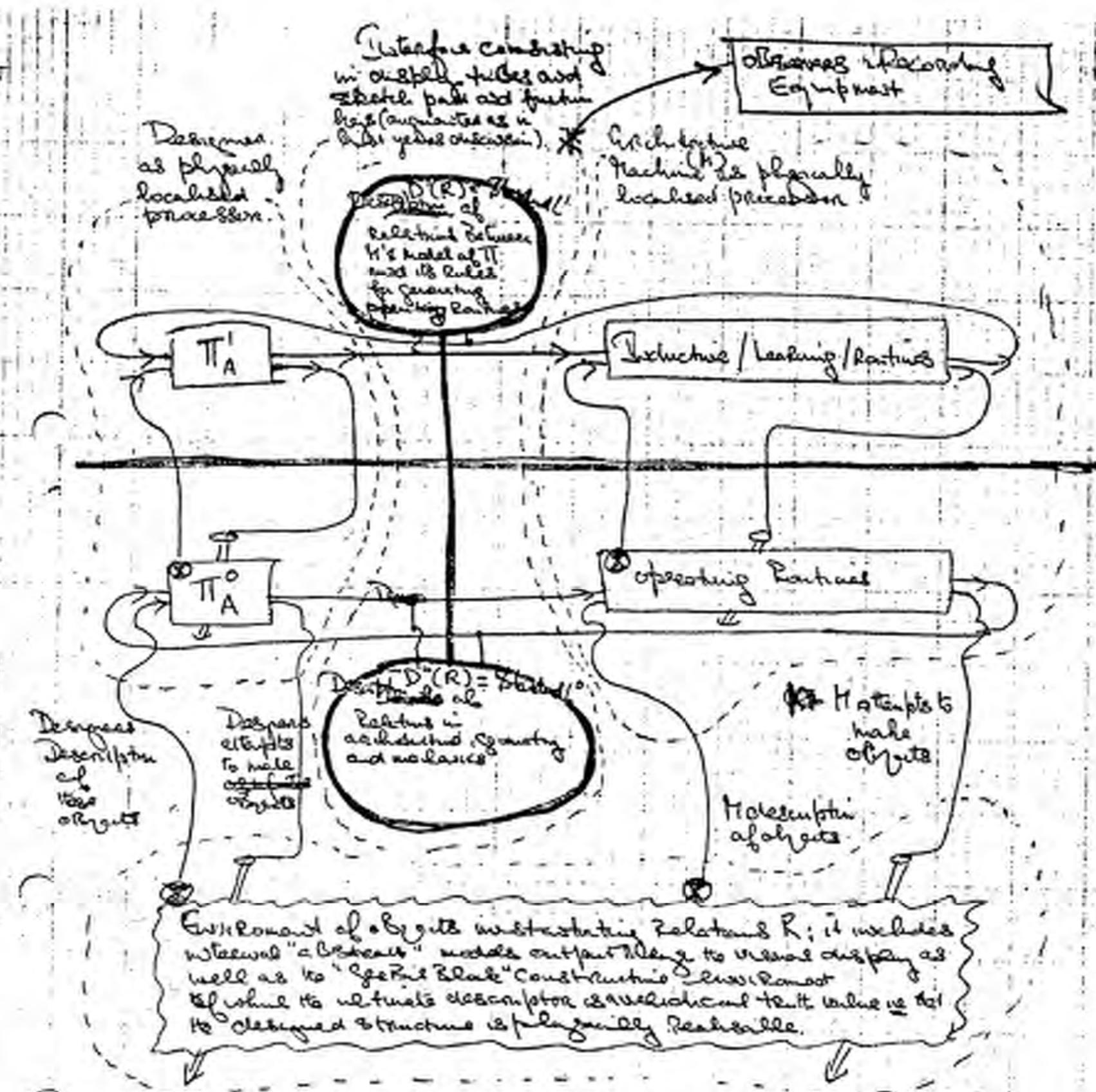
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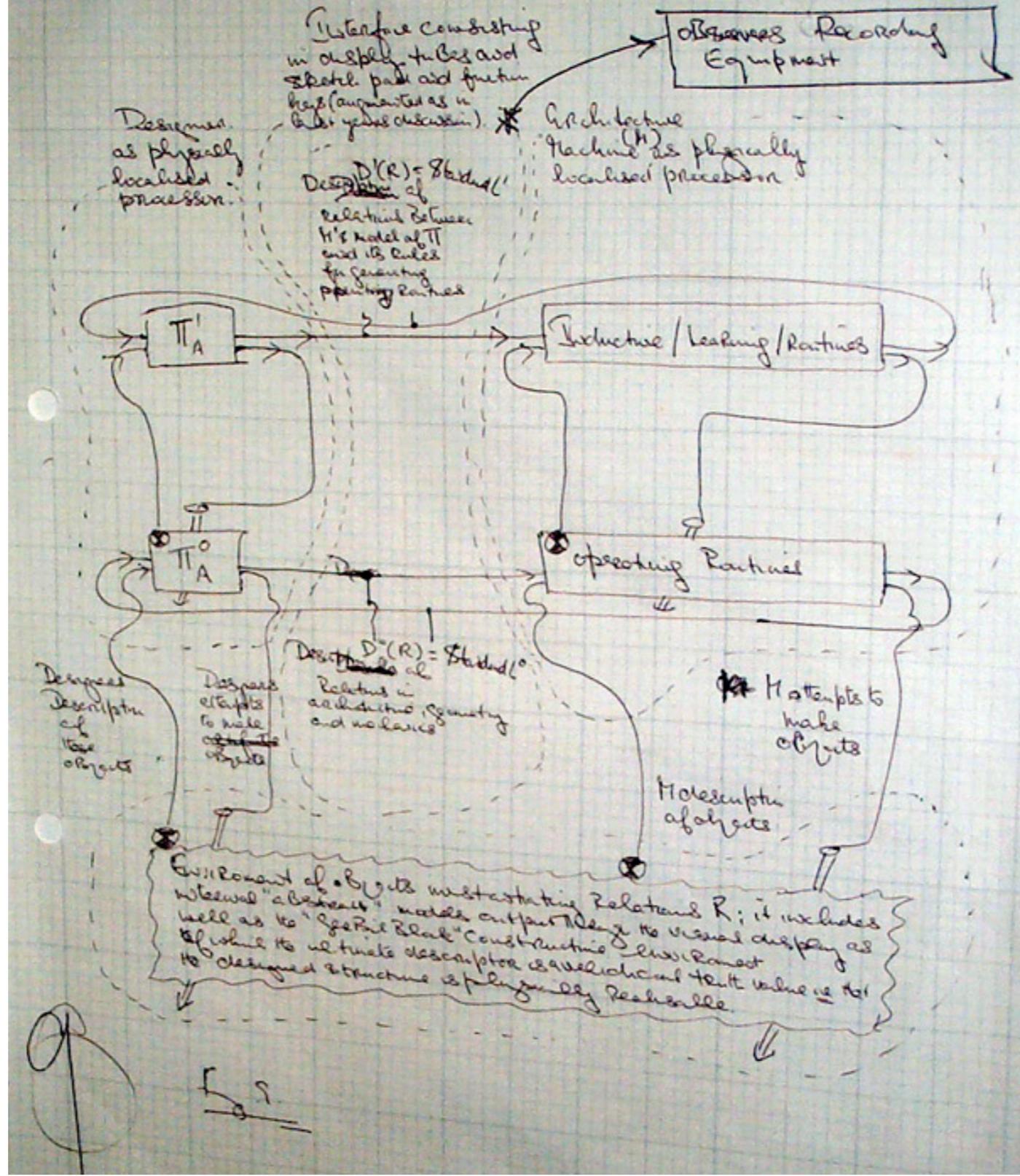
1

Aspects of Machine Intelligence

Introduction by Gordon Pask

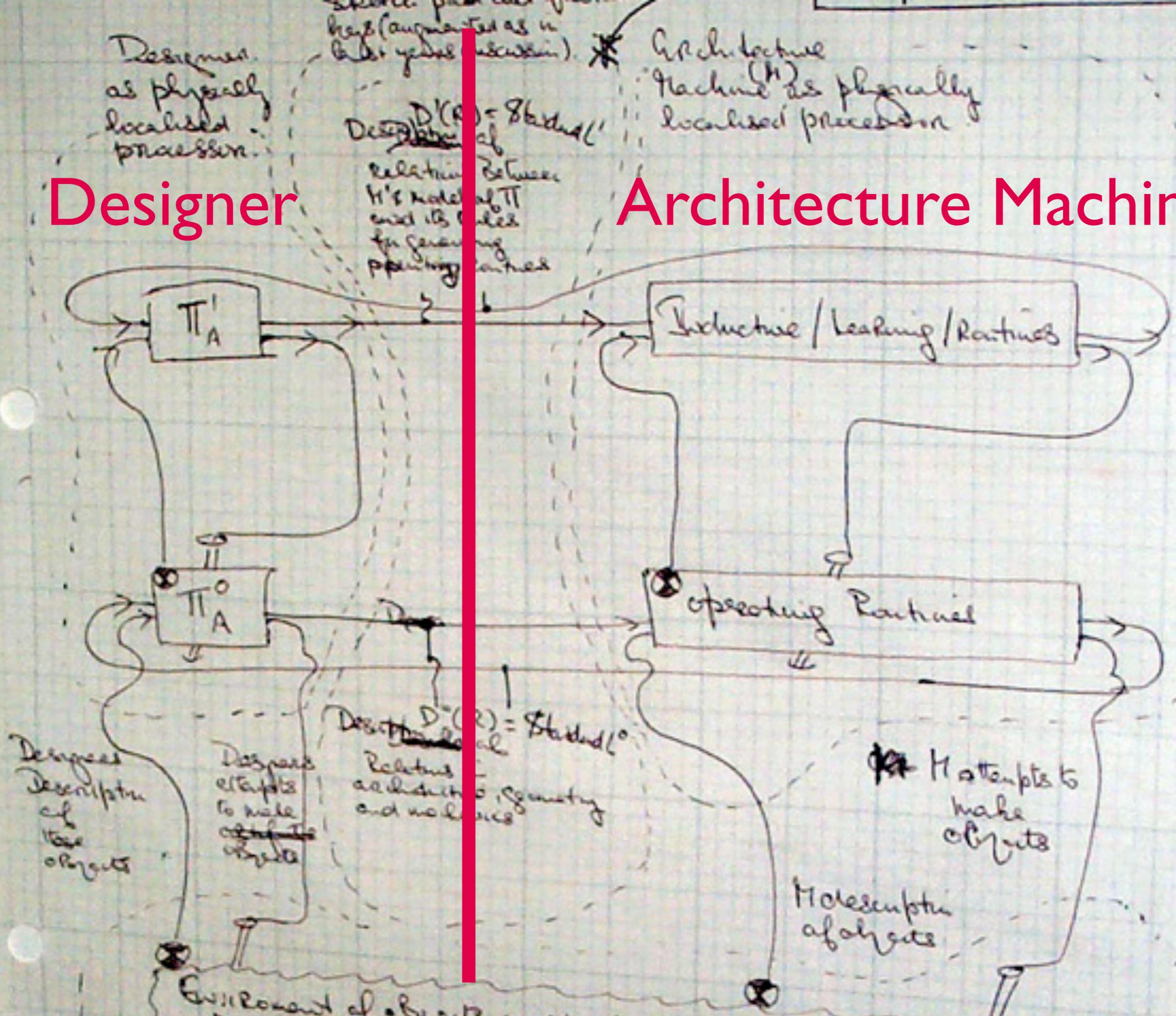


Handwritten scribbles and the letters "L S" at the bottom left of the page.



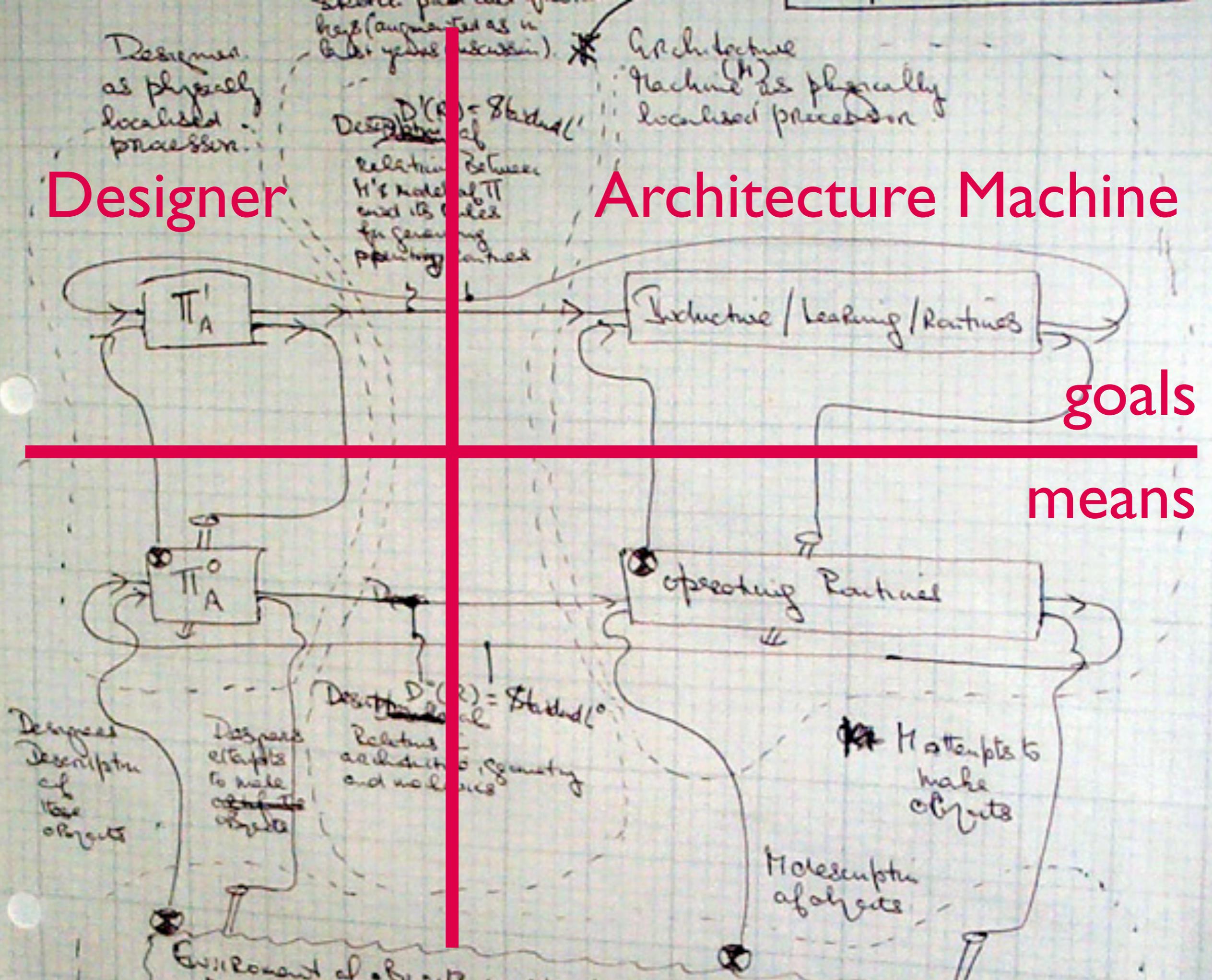
Designer

Architecture Machine



Designer

Architecture Machine



Interface consisting in display tubes and sketch pad and function keys (augmented as in later year discussion)

Observes Recording Equipment

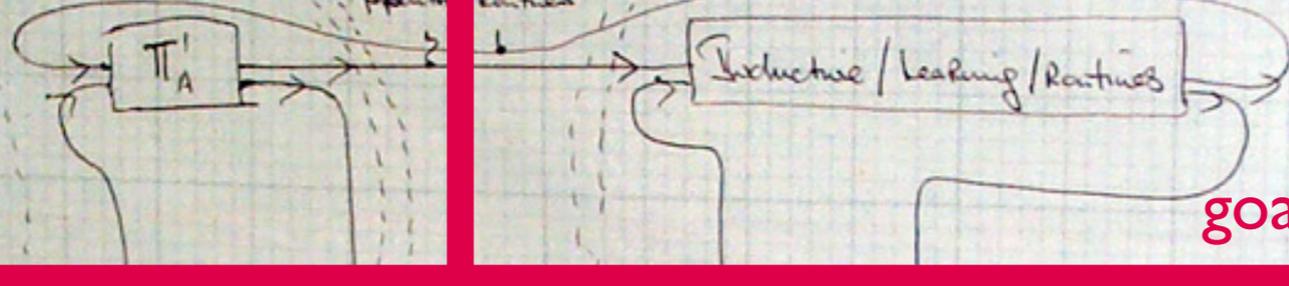
Designed as physically localized processes

Architecture Machine as physically localized processes

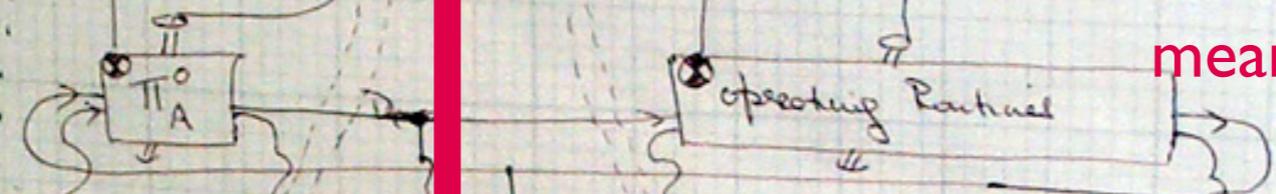
Designer

Architecture Machine

Description of relations between H's model of T and the rules for generating particular patterns



goals



means

Designed Description of the objects

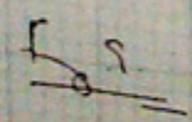
Design attempts to make objects

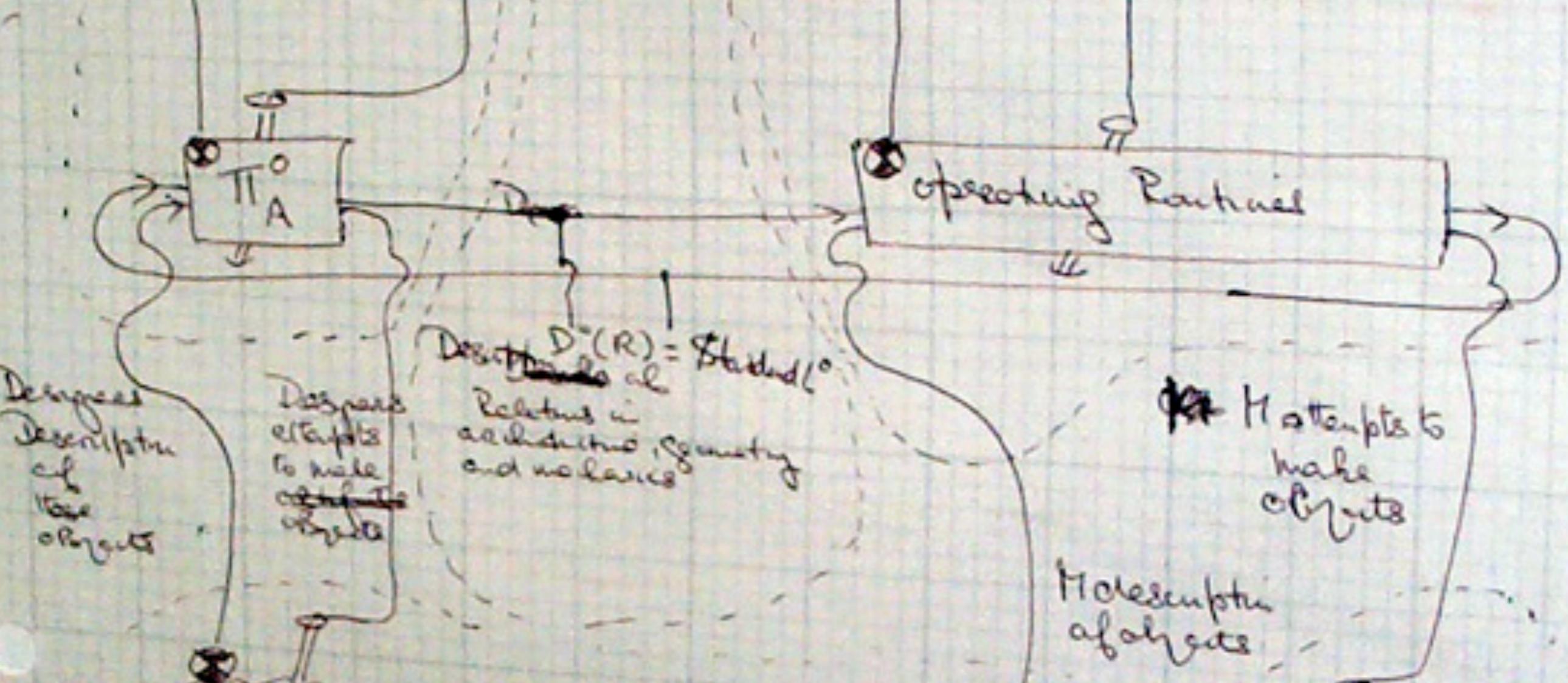
Description of relations between H's model of T and the rules for generating particular patterns

H attempts to make objects

Description of objects

Environment of objects interacting Relations R; it includes visual "elements" made out of the visual display as well as the "operational" construction environment of which the ultimate descriptor is a mechanical part value is the designed structure & physically realizable



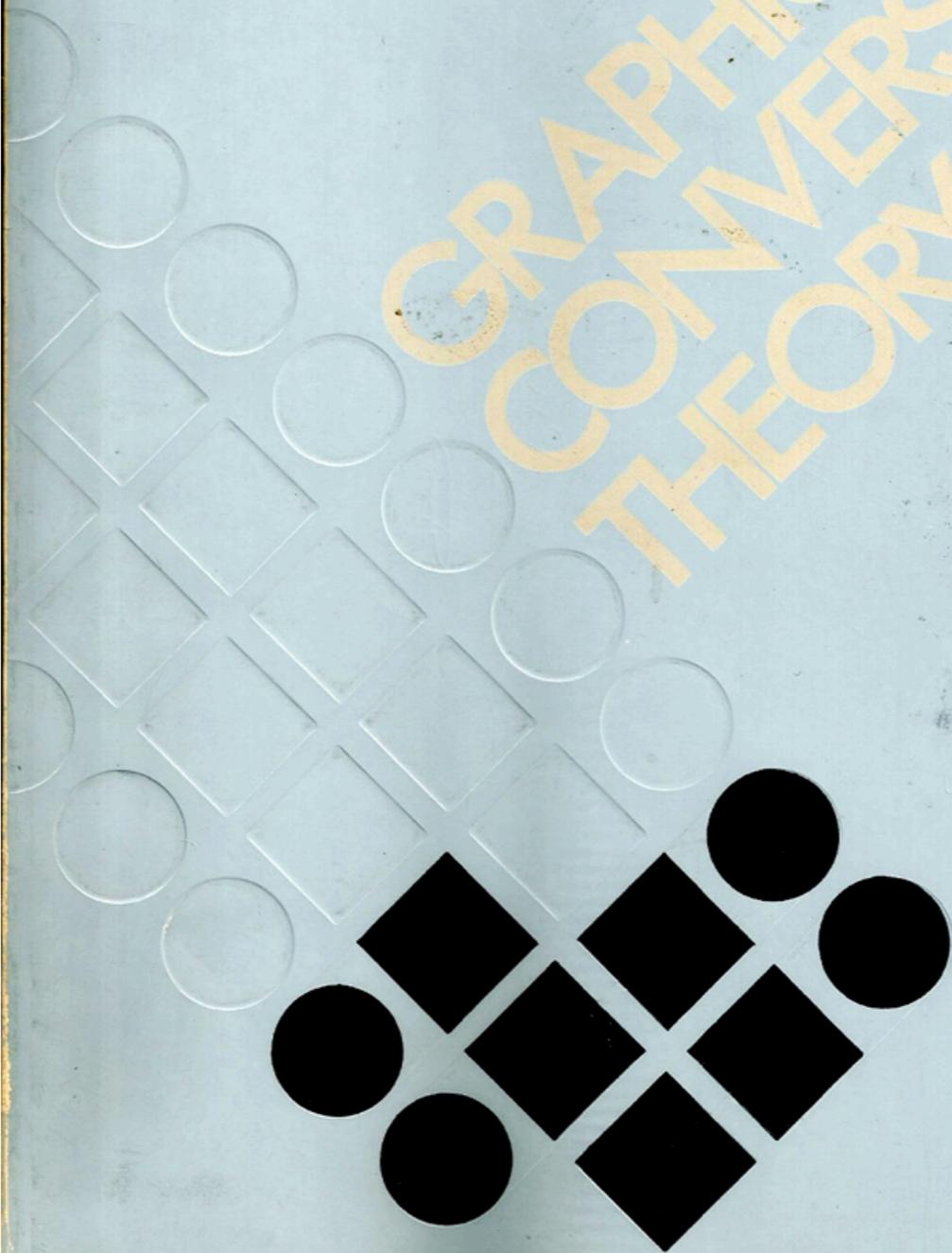


... well as the "Gerbil Block" Constructive environment...

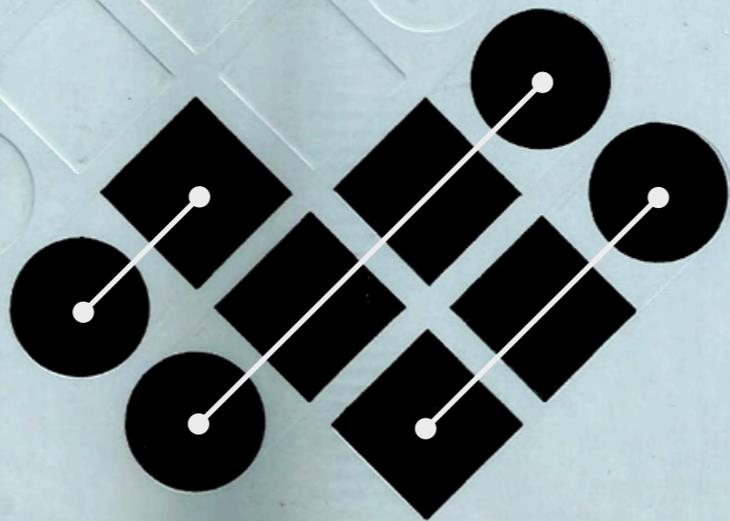
Environment of objects with abstracting Relations R ; it includes internal "abstract" model output through the visual display as the designed structure is physically reshaped.

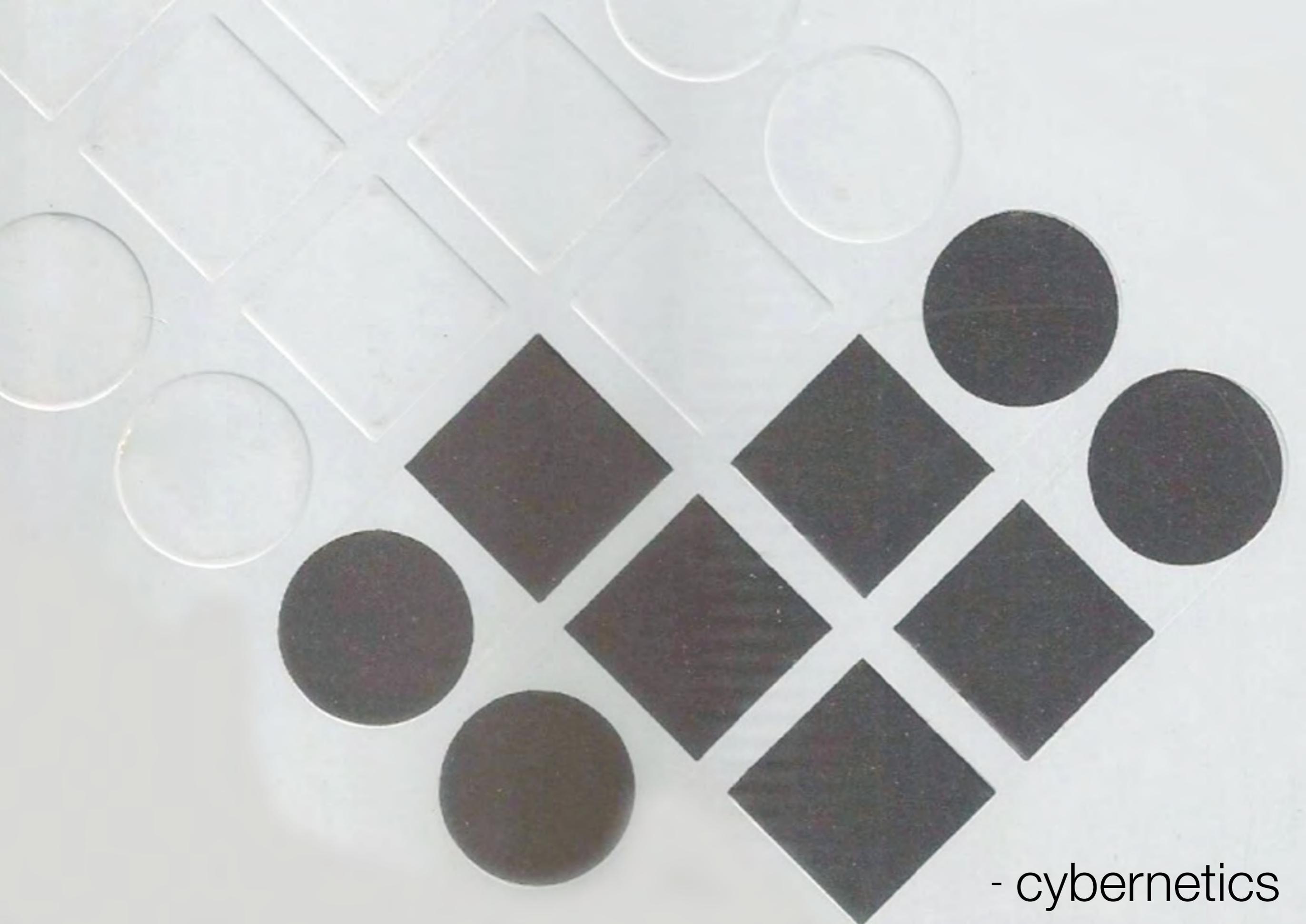


GRAPHICAL CONVERSATION THEORY



GRAPHICAL CONVERSATION THEORY



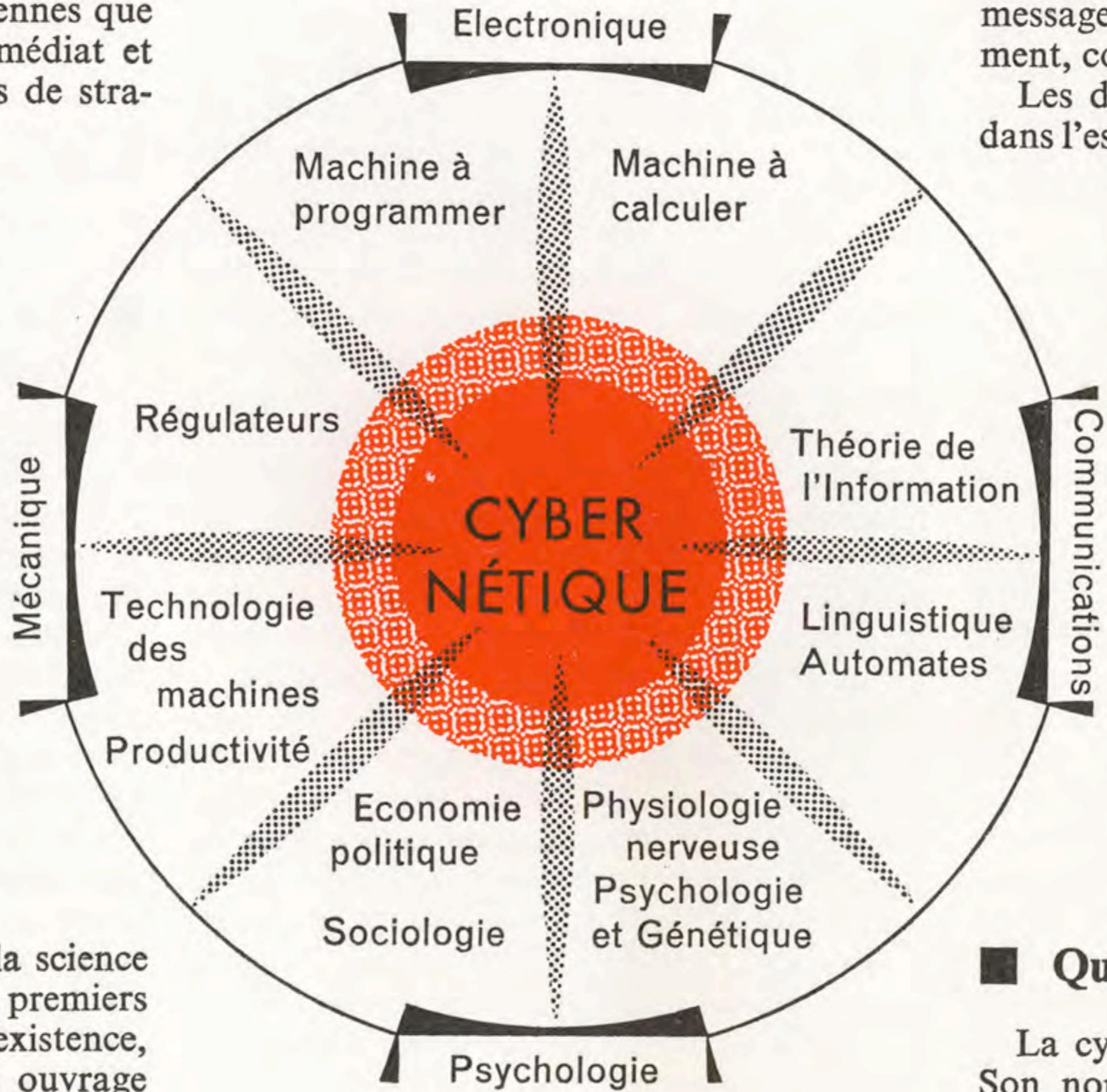


- cybernetics

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■ **Qu'est-**

La cyberne
Son nom pl

CYBERNETICS

what is cybernetics?

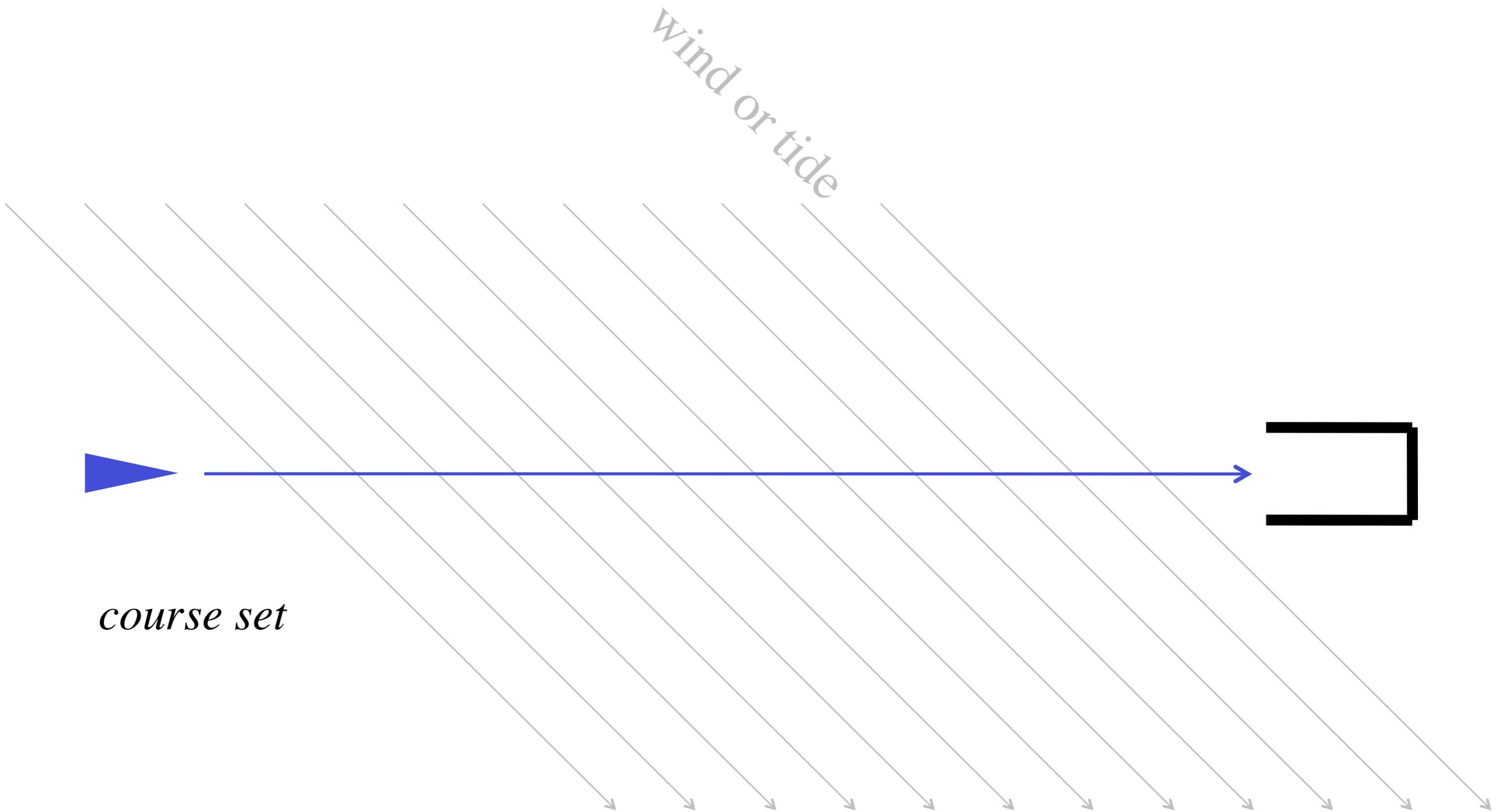
how is cybernetics relevant for design?

STEERING =

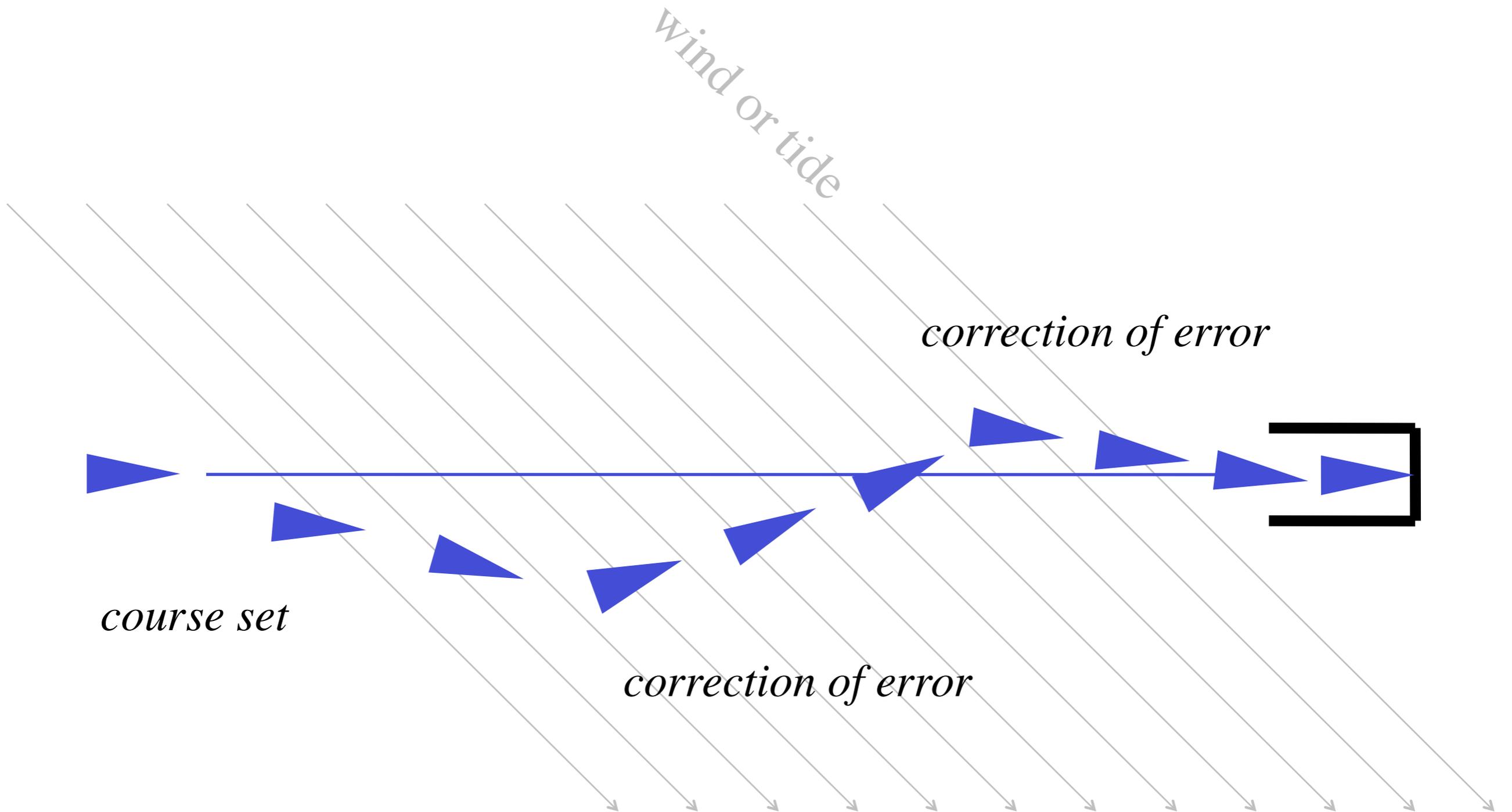
CYBERNETICS

from Greek 'kybernetes'—the art of steering

the art of steering

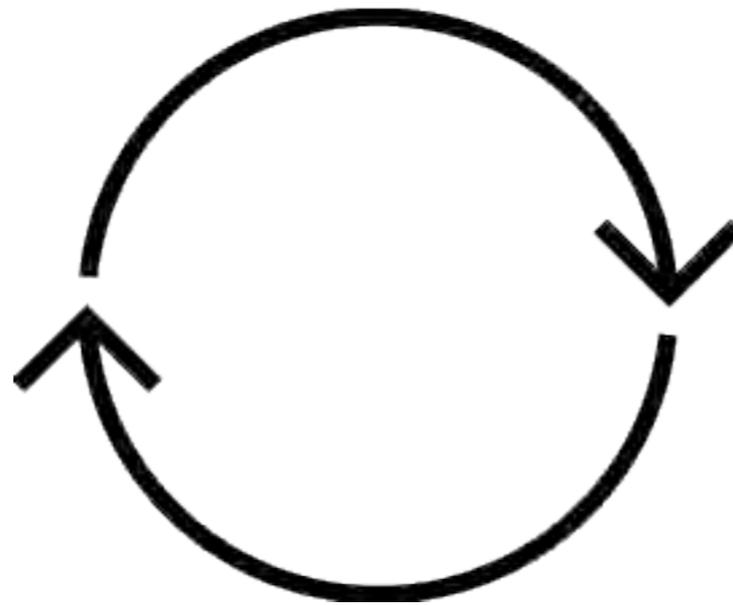


the art of steering



the art of regulation

compares heading with
goal of reaching port



adjusts rudder
to correct heading

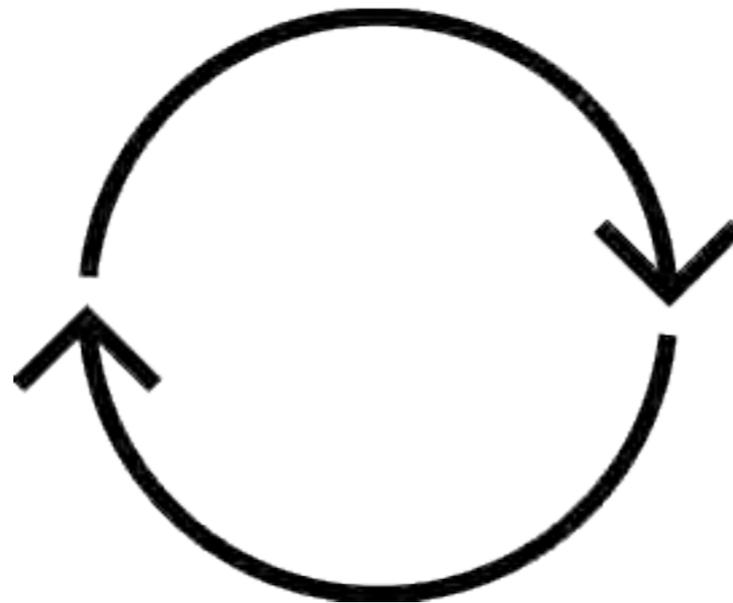
ship's heading

the art of regulation

detection of error

compares heading with
goal of reaching port

feedback



adjusts rudder
to correct heading

correction of error

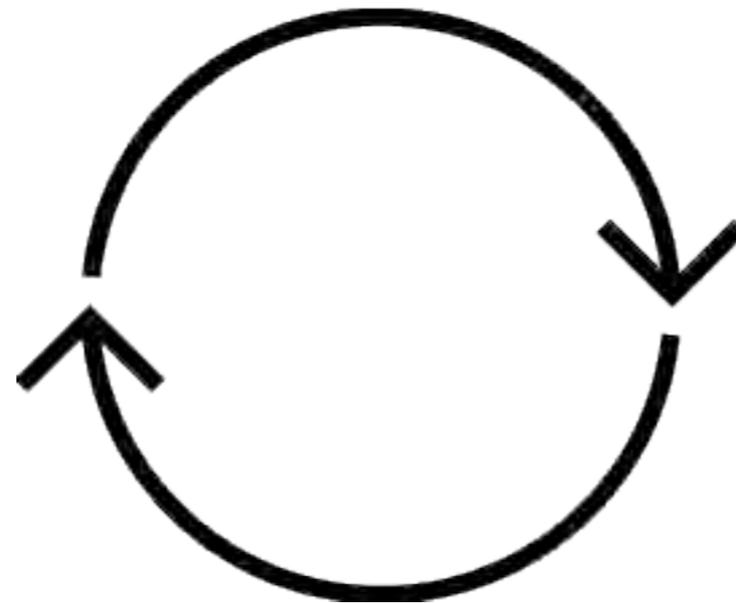
ship's heading

the art of regulation

comparing

compares heading with
goal of reaching port

sensing

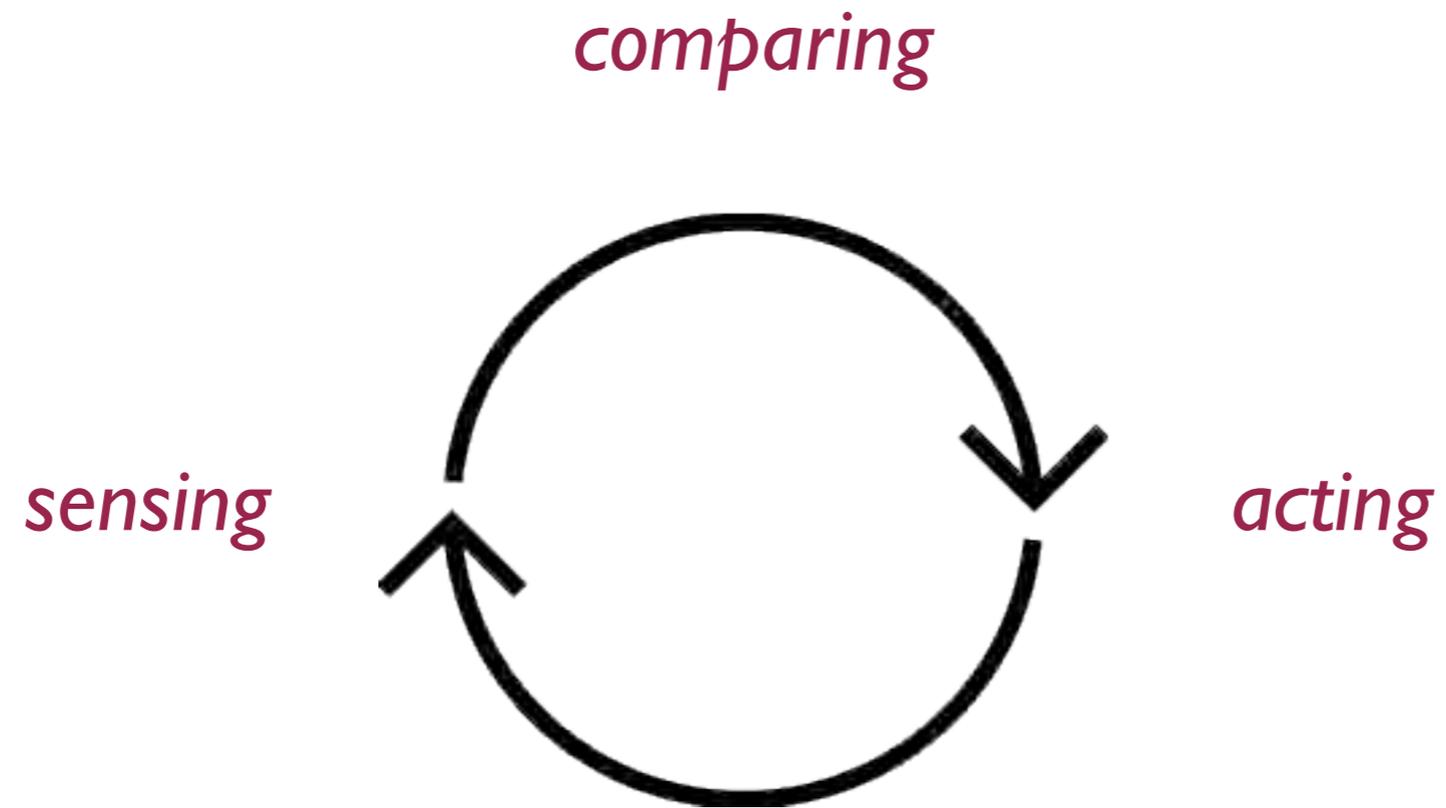


adjusts rudder
to correct heading

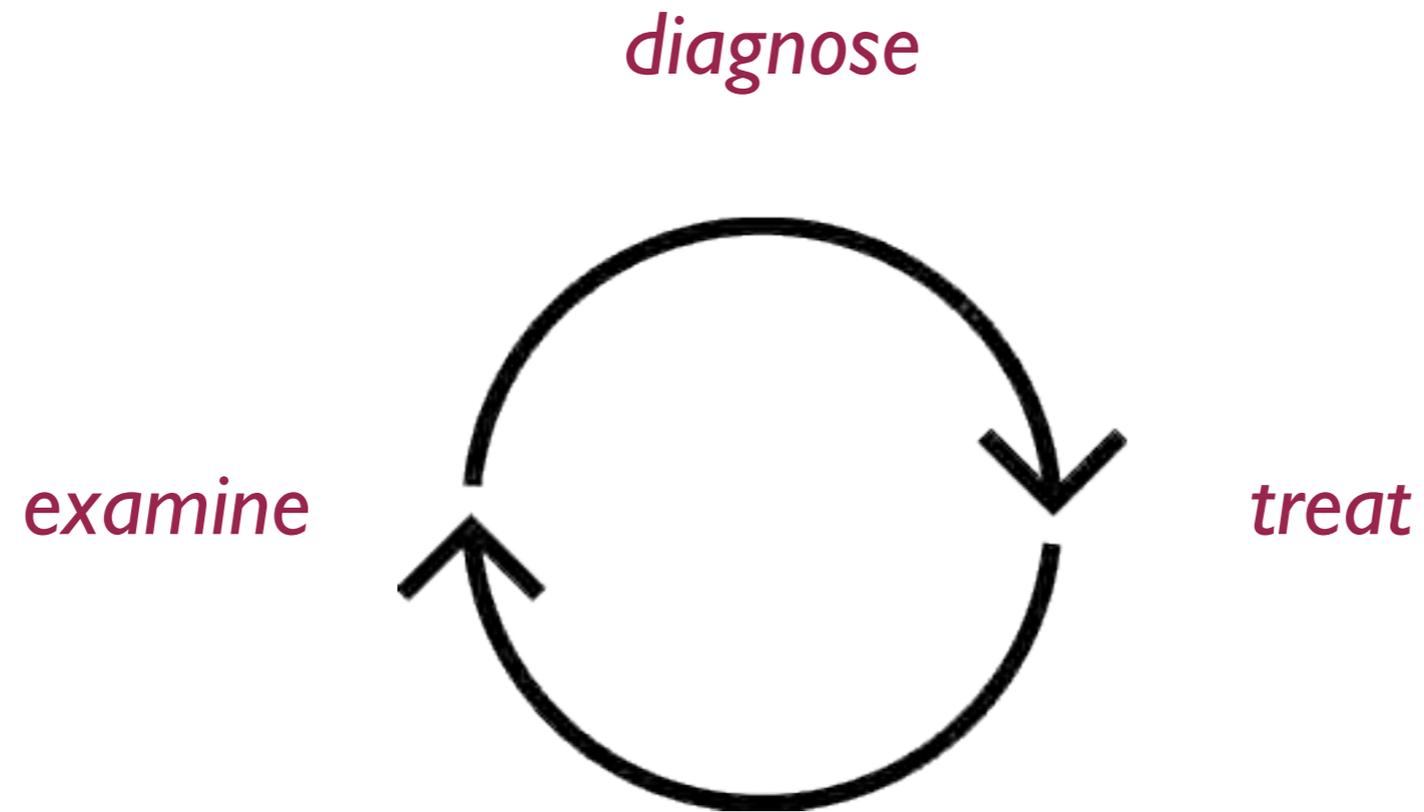
acting

ship's heading

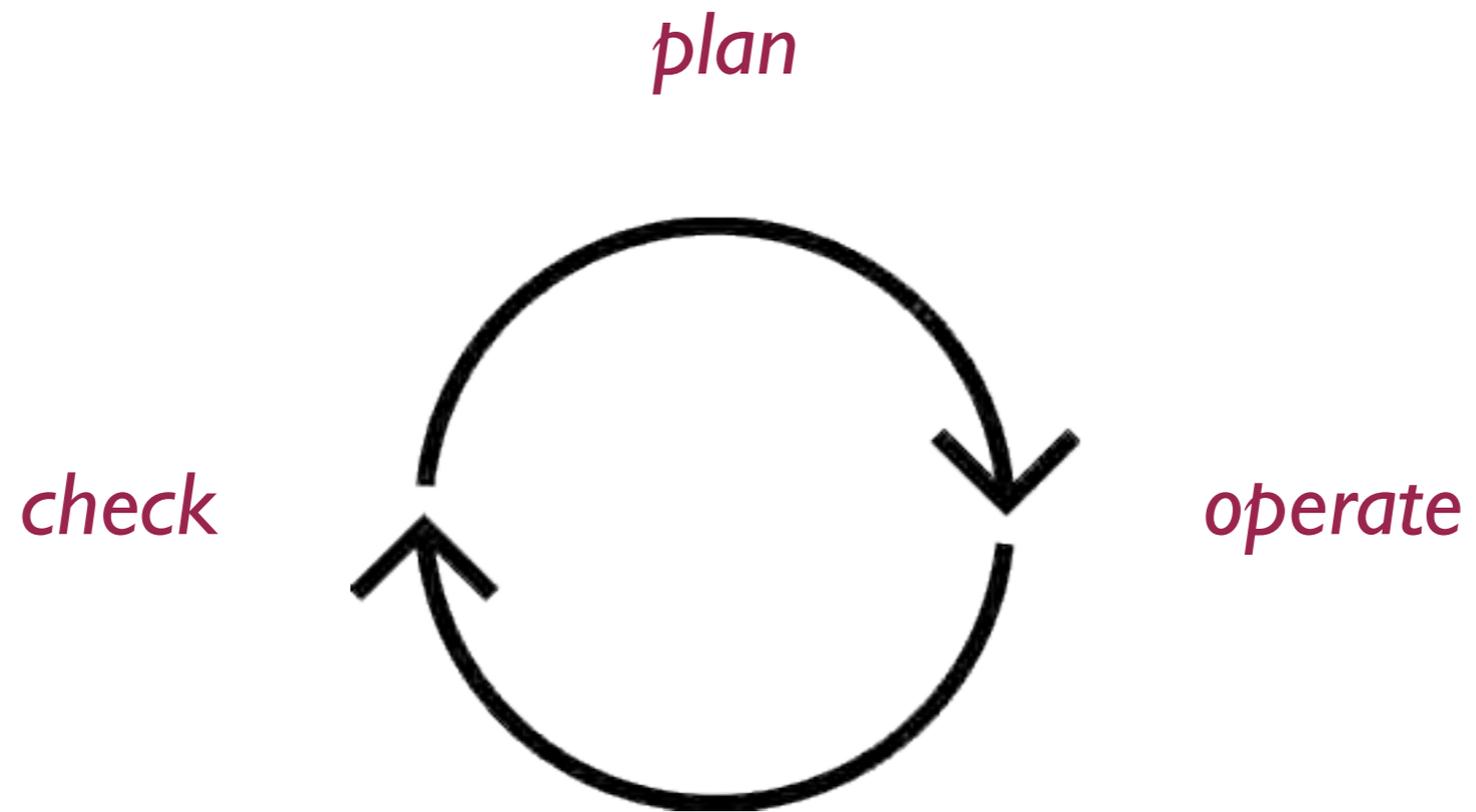
the art of regulation



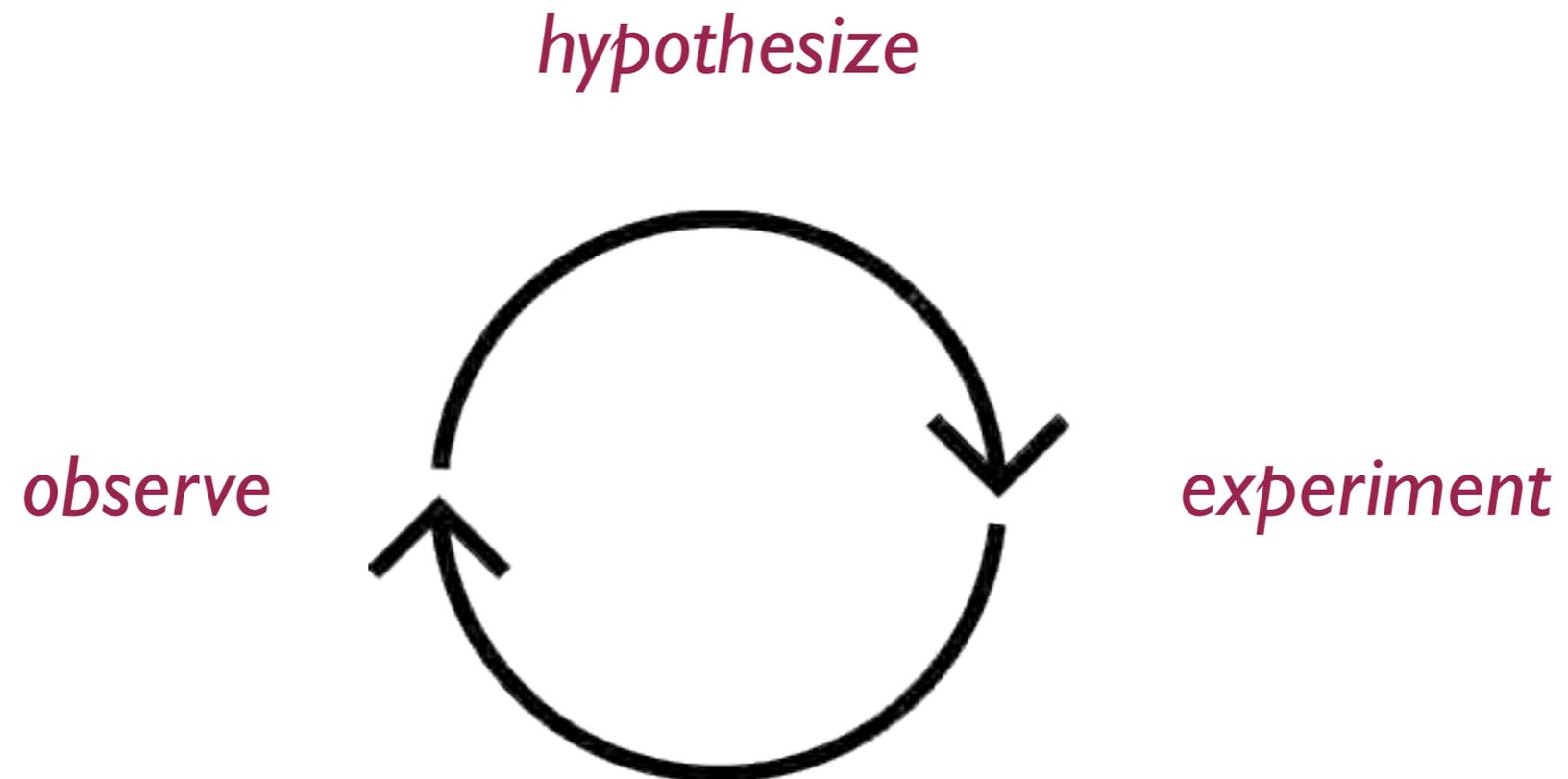
clinical practice (medicine)



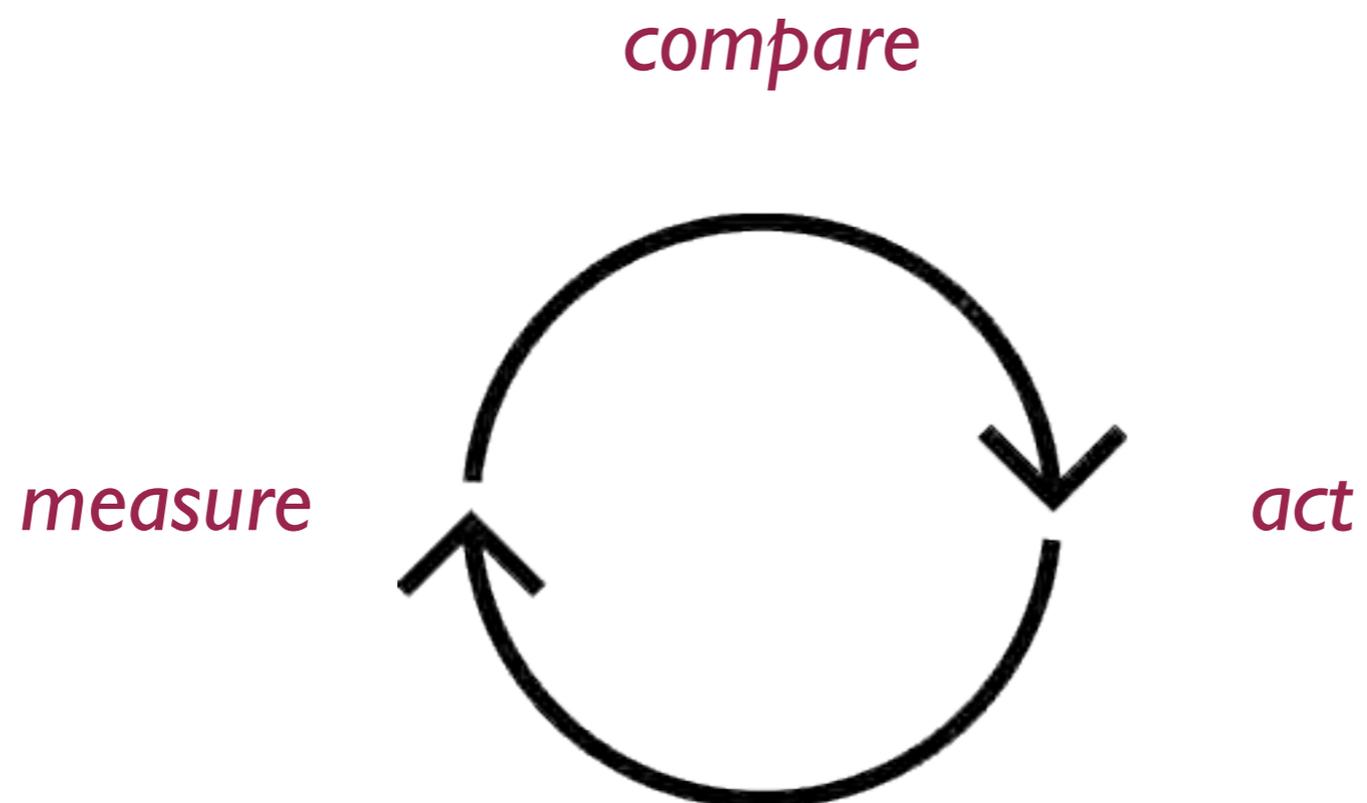
quality cycle (Deming)



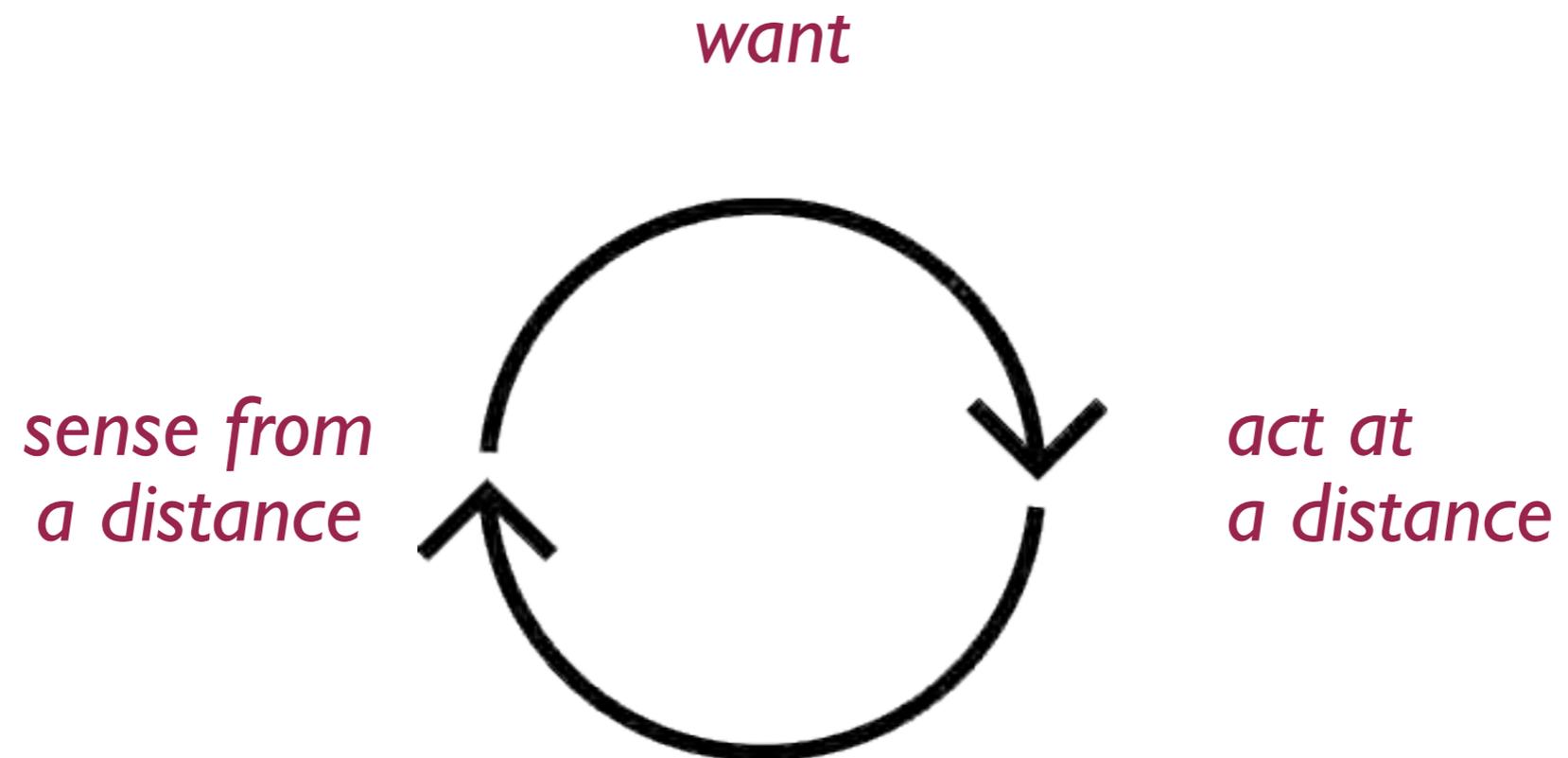
scientific method



design process



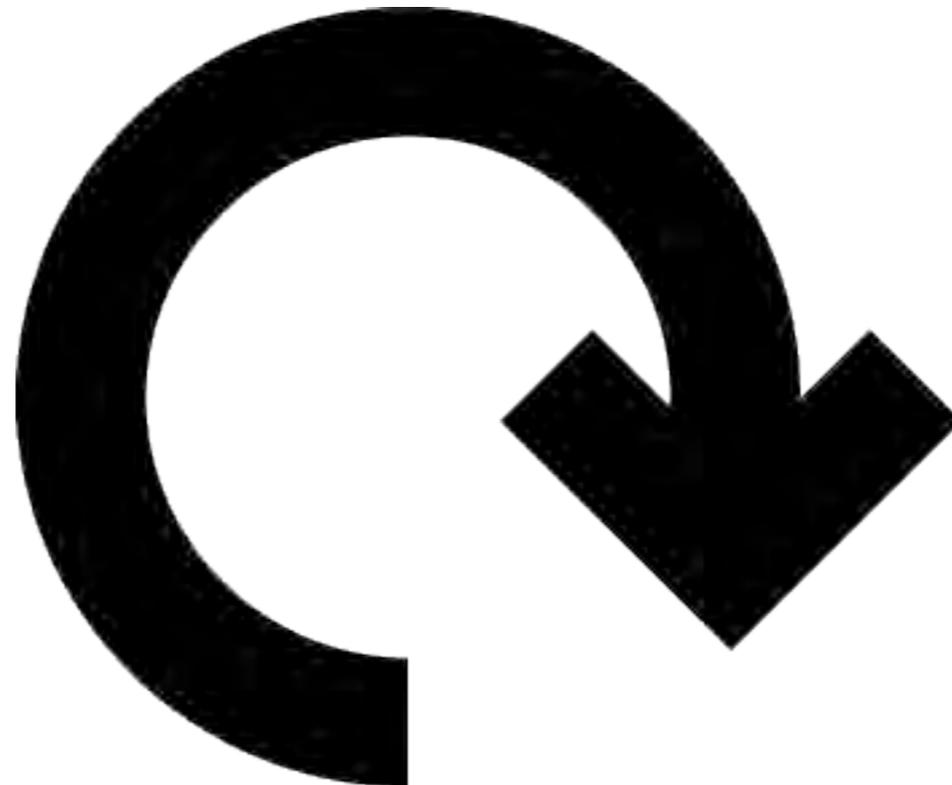
mobile devices



CYBERNETICS

“... introduces for the first time —
and not only by saying it, but methodologically —
the notion of circularity, circular causal systems.”

Heinz von Foerster



CYBERNETICS

from Greek 'kybernetes'—the art of steering
in Latin, the same term becomes 'governing'

- regulation by law or person
- government *means* regulation



LIBRARY

JUN 22 1949

U S PATENT OFFICE

CYBERNETICS

OR CONTROL AND
COMMUNICATION
IN THE ANIMAL
AND THE MACHINE

Norbert Wiener

PROFESSOR OF MATHEMATICS
THE MASSACHUSETTS INSTITUTE
OF TECHNOLOGY

THE TECHNOLOGY PRESS

JOHN WILEY & SONS, INC., NEW YORK

HERMANN et CIE, PARIS

CYBERNETICS



historical views of cybernetics

Cybernetics saves the souls, bodies, and material possessions from the gravest dangers.

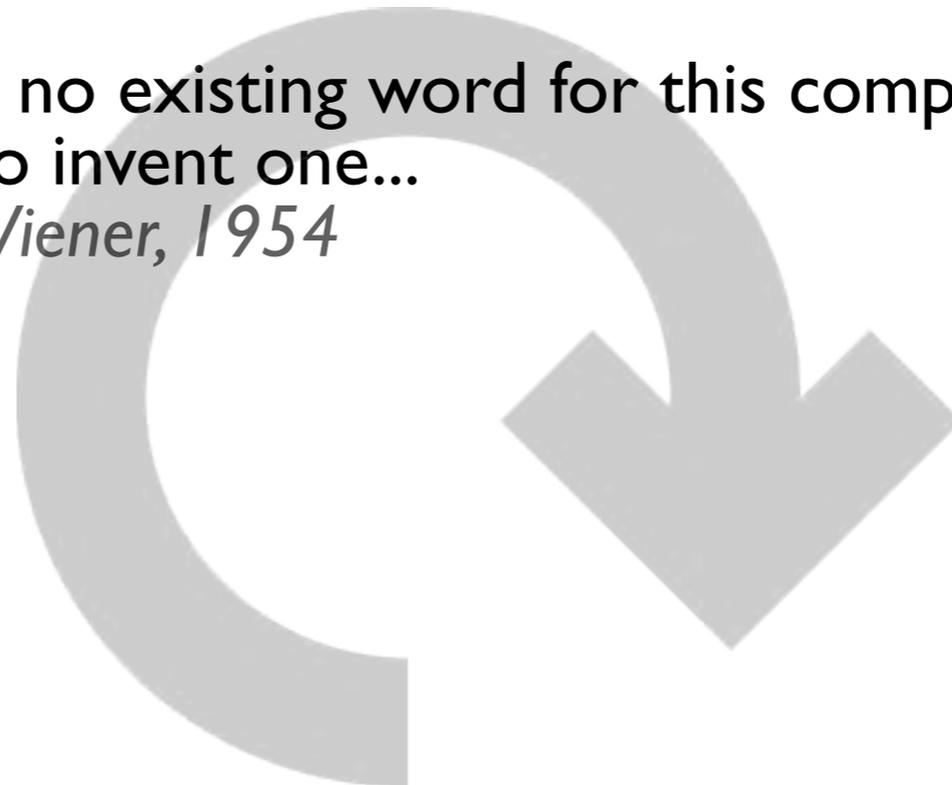
– *Socrates according to Plato, c. 400 B.C.E.*

The future science of government should be called “la cybernetique.”

– *André-Marie Ampere, 1843*

Until recently, there was no existing word for this complex of ideas, and... I felt constrained to invent one...

– *Norbert Wiener, 1954*



many views of cybernetics

La Cybernetique est l'art d'assurer l'efficacite de l'action.

– *Louis Couffignal*

The science of effective organization.

– *Stafford Beer*

The study of the **im**material aspects of systems.

– *W. Ross Ashby*

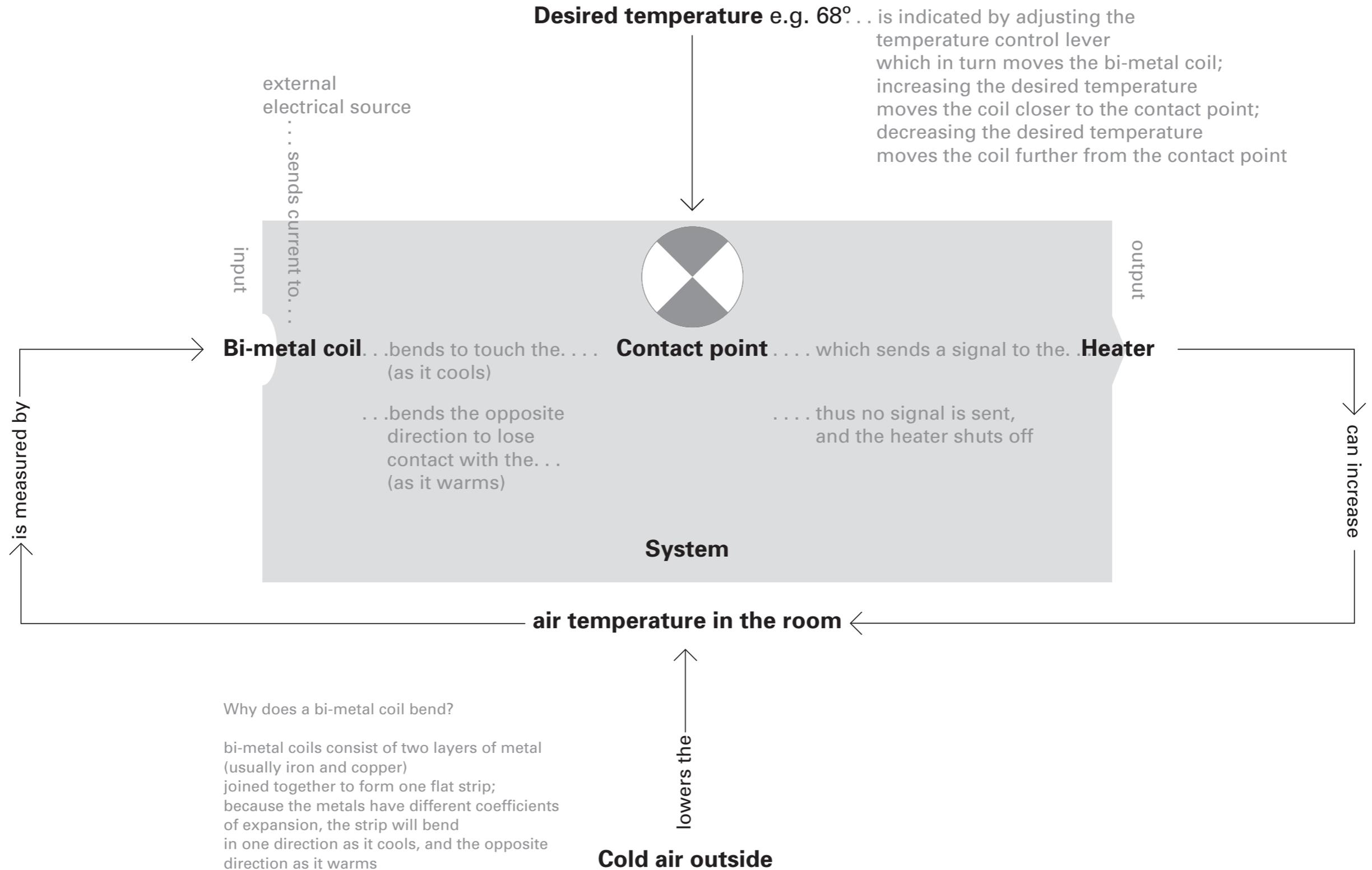
Cybernetics is... only practiced in Russia and other under-developed countries.

– *Marvin Minsky*



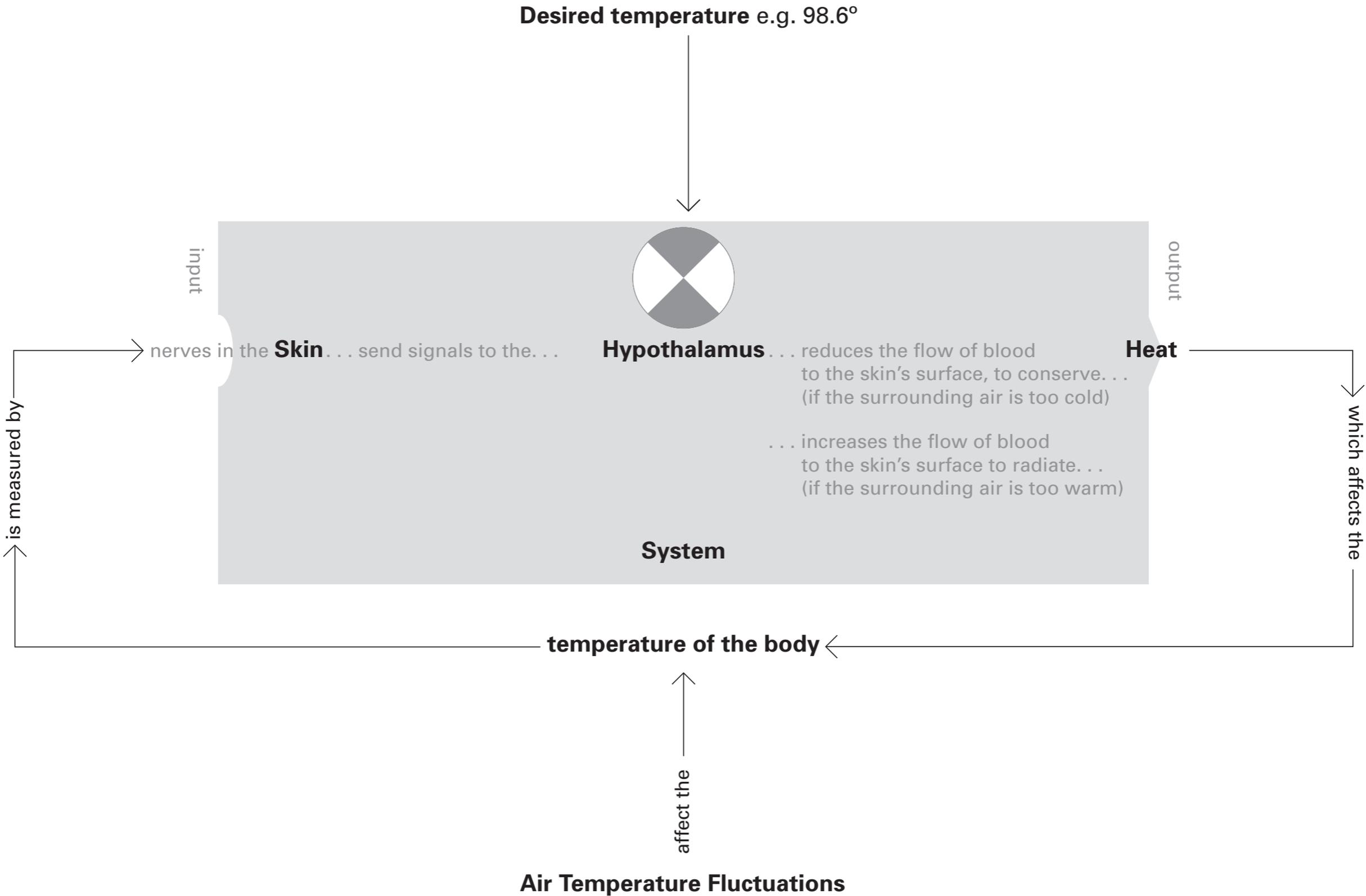
Feedback: Classic Example

Thermostat regulating room temperature
(via a heater)



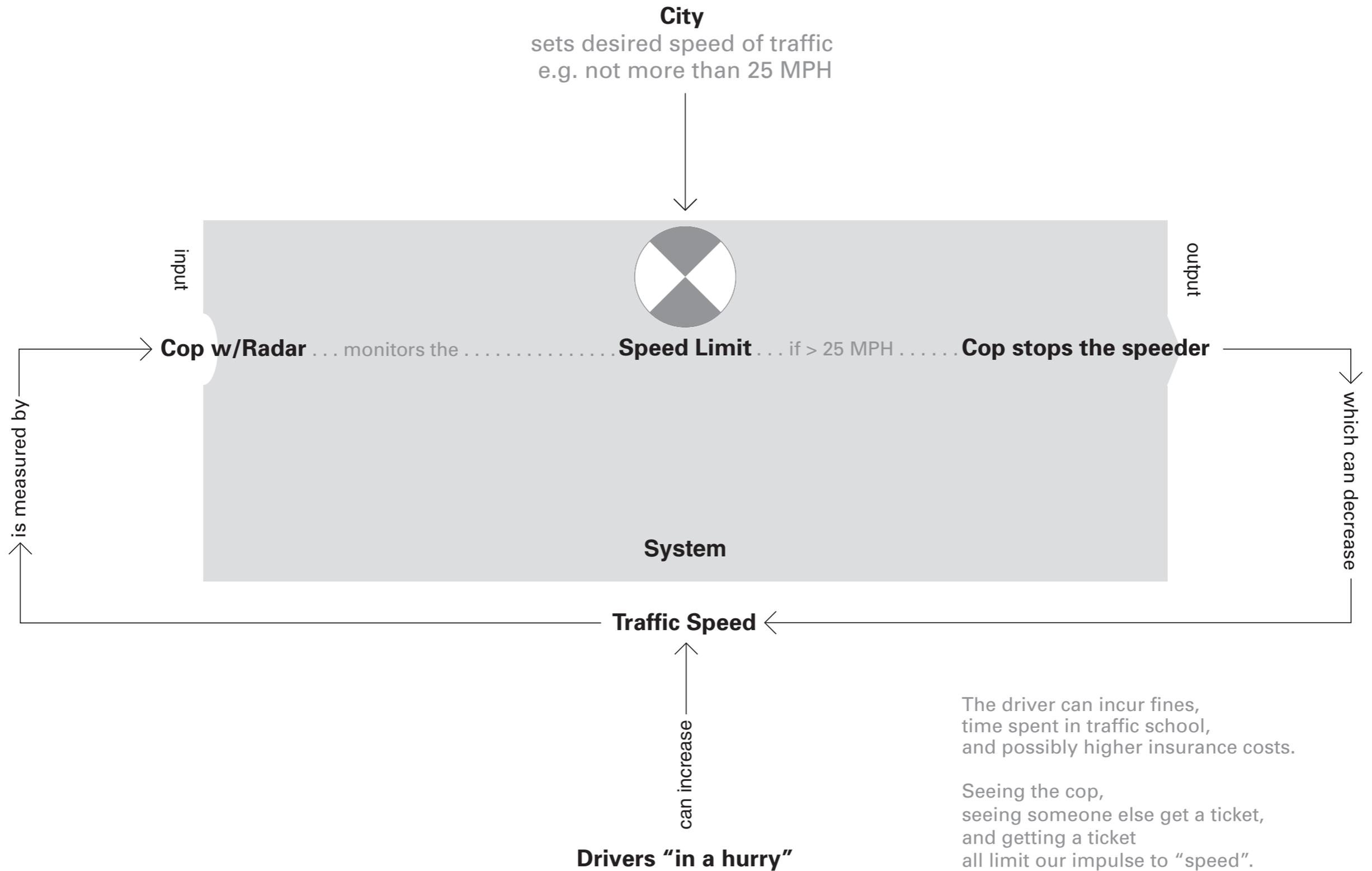
Feedback: Biological Example

Regulating temperature in the human body

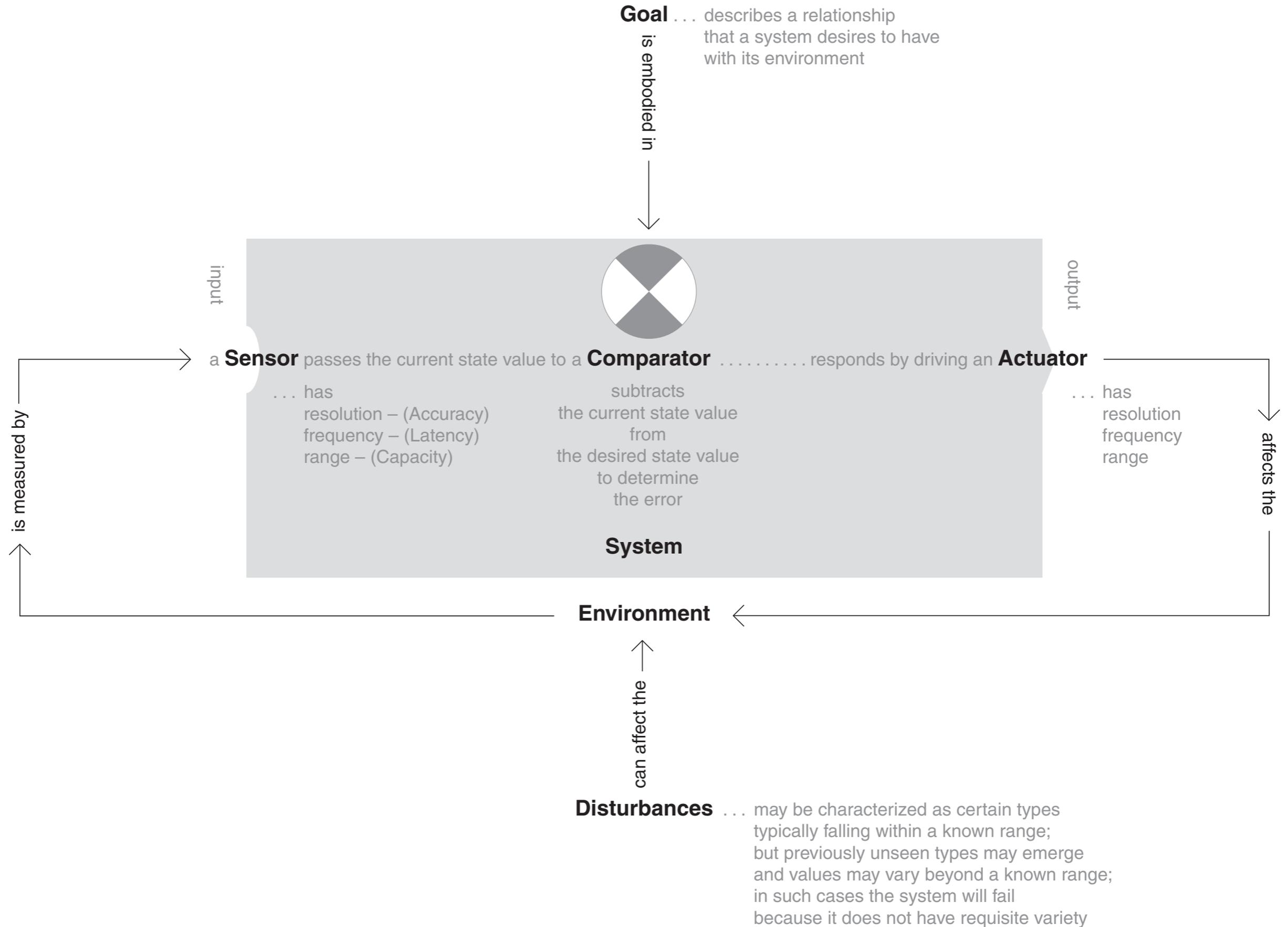


Feedback: Social Example

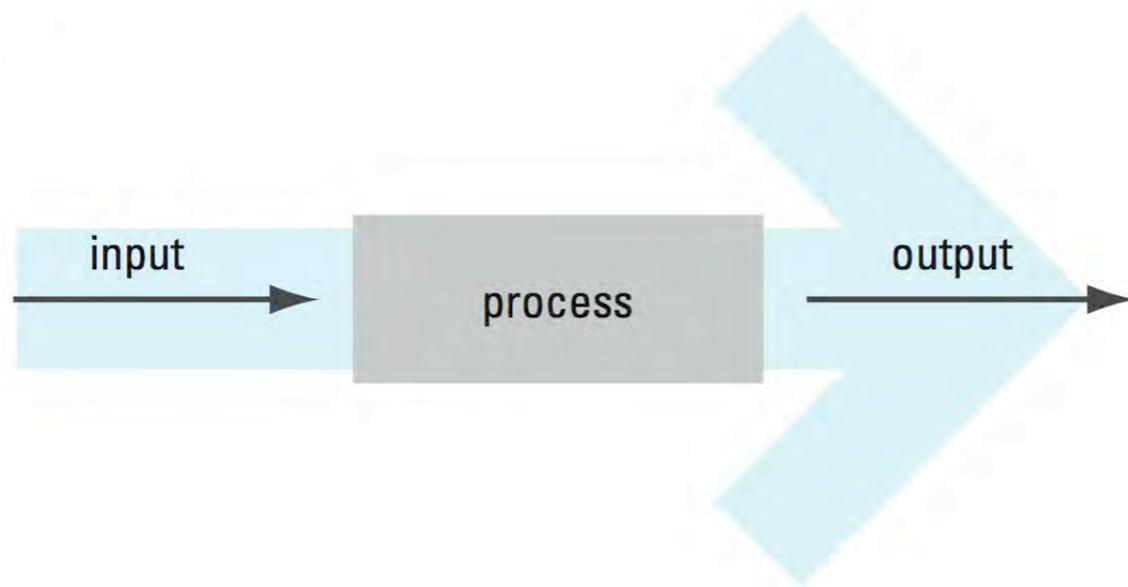
Regulating traffic speed



Feedback: Formal Mechanism

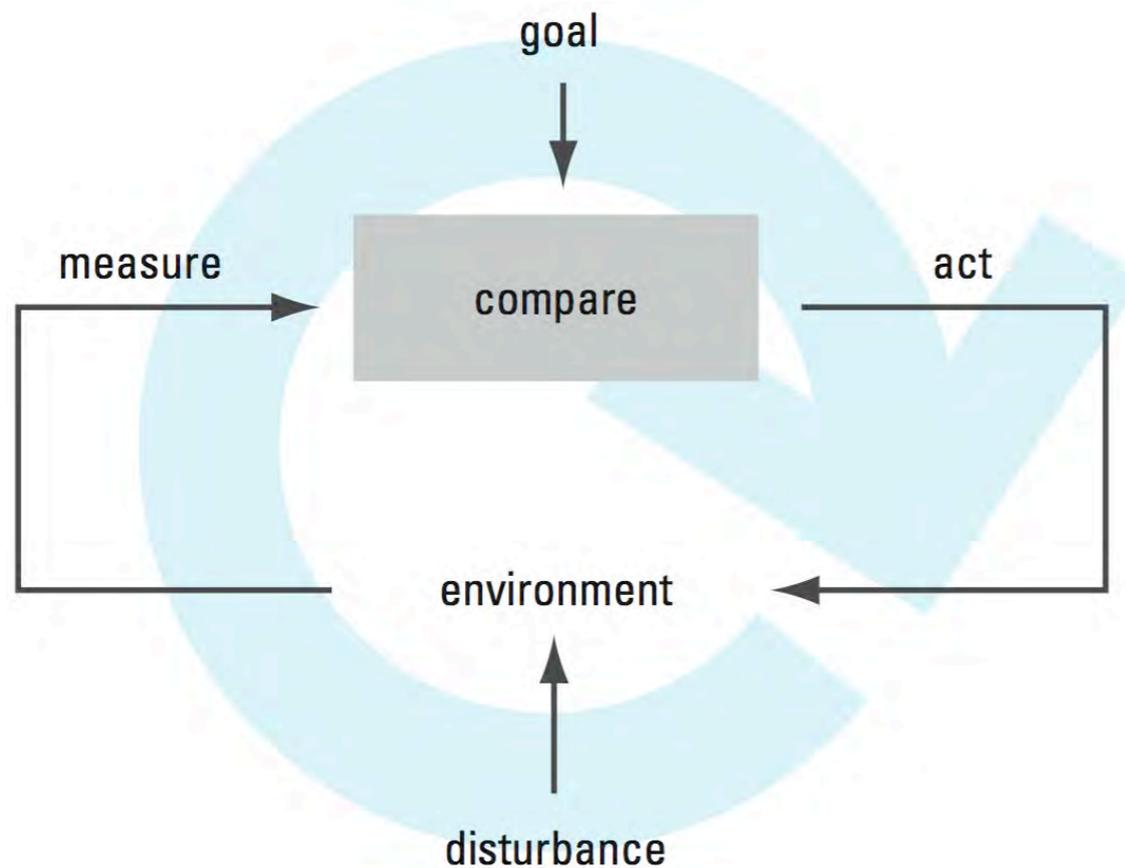


other sciences can only explain
how short linear sequences operate



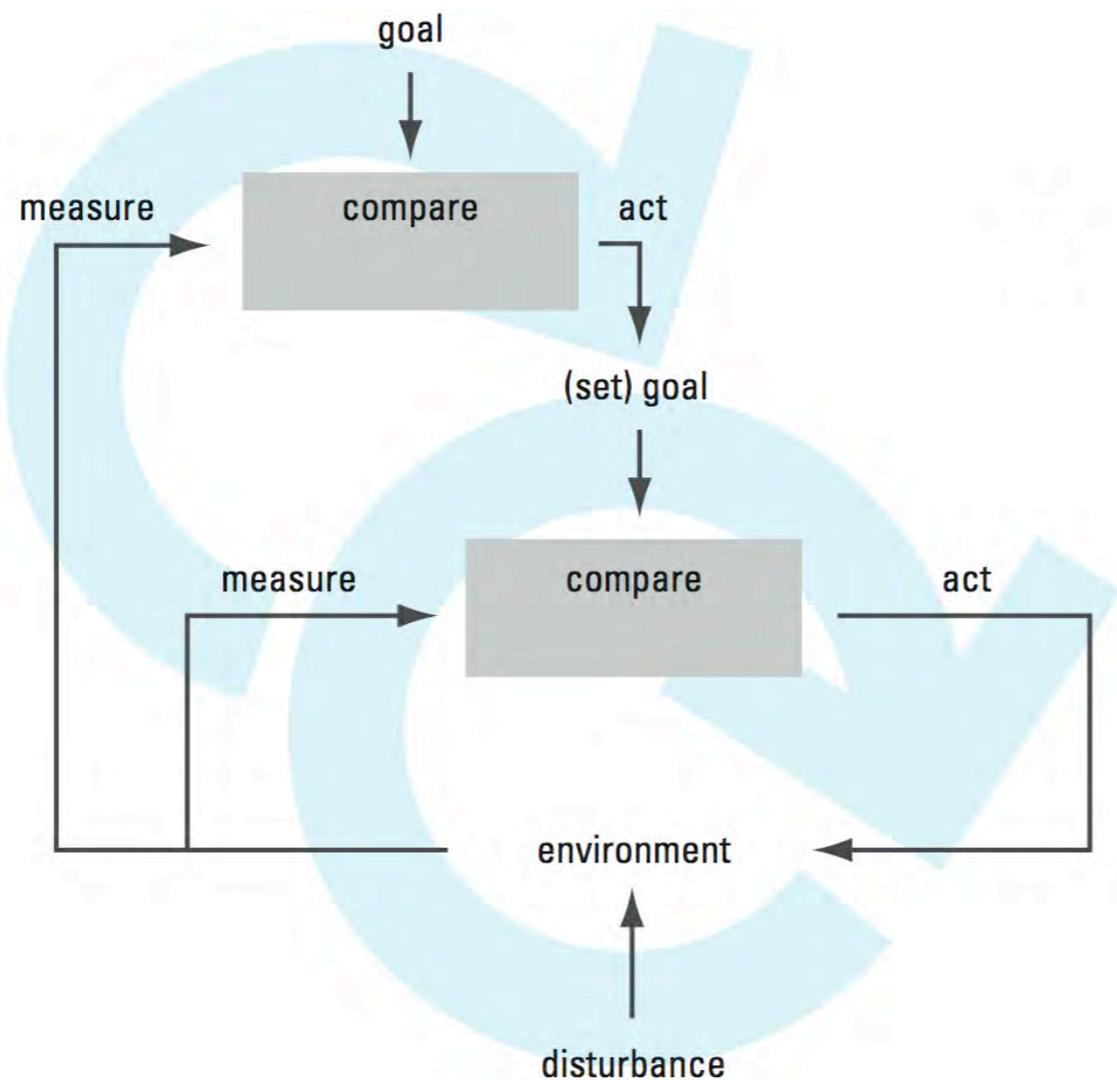
first-order cybernetics

cybernetics explains how
circular causal systems work



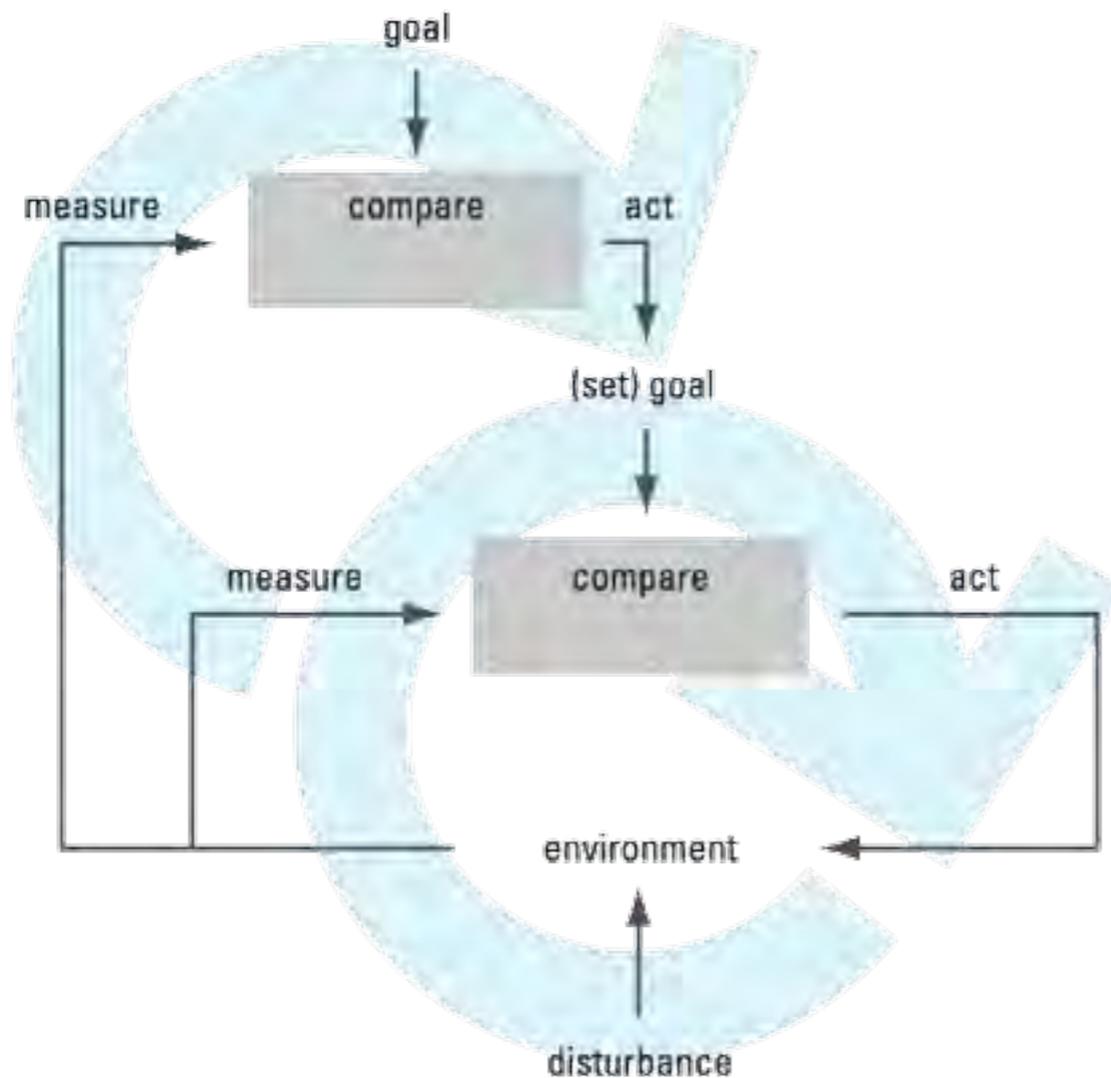
double-loop system

cybernetics explains how circular causal systems work— even when they self-regulate and modify their goals.



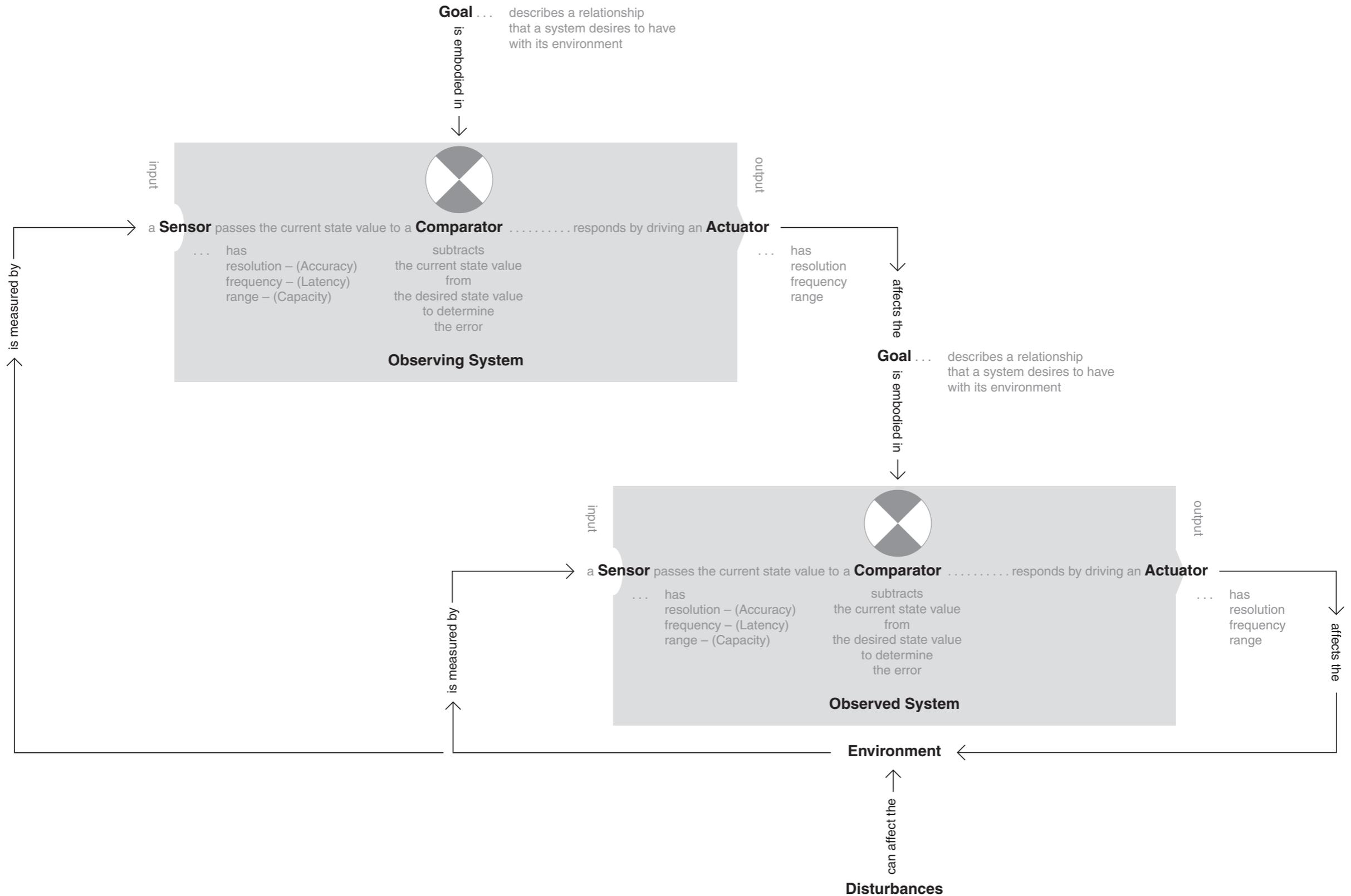
learning system

cybernetics explains how circular causal systems work—even when they self-regulate and modify their goals.



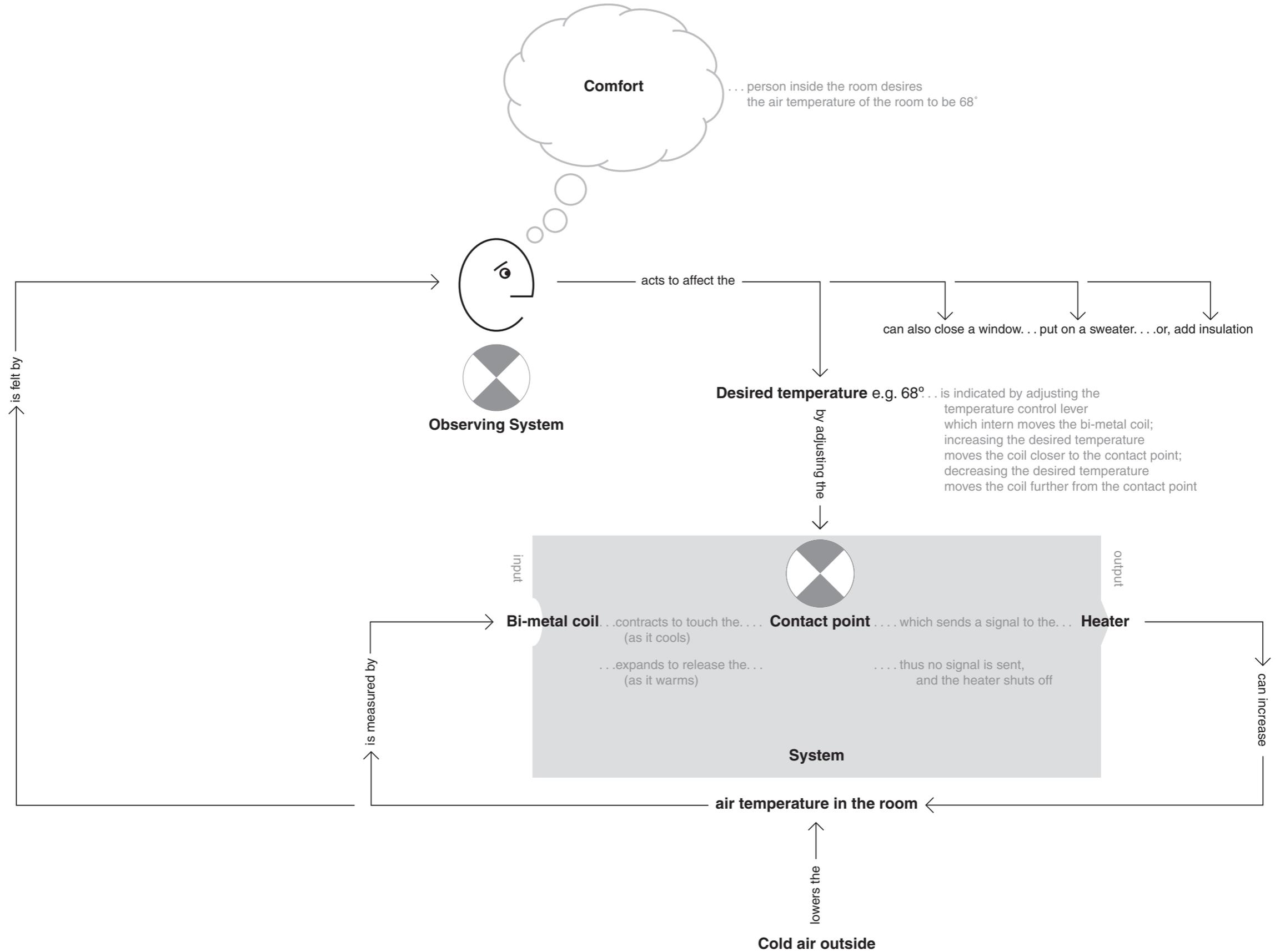
Second-order Feedback: Formal Mechanism

An automatic feedback system (first-order) is controlled by another automatic feedback system (second-order). The first system is 'nested' inside the second.



Second-order Feedback: Classic Example

Person controlling a thermostat (regulating a regulator)

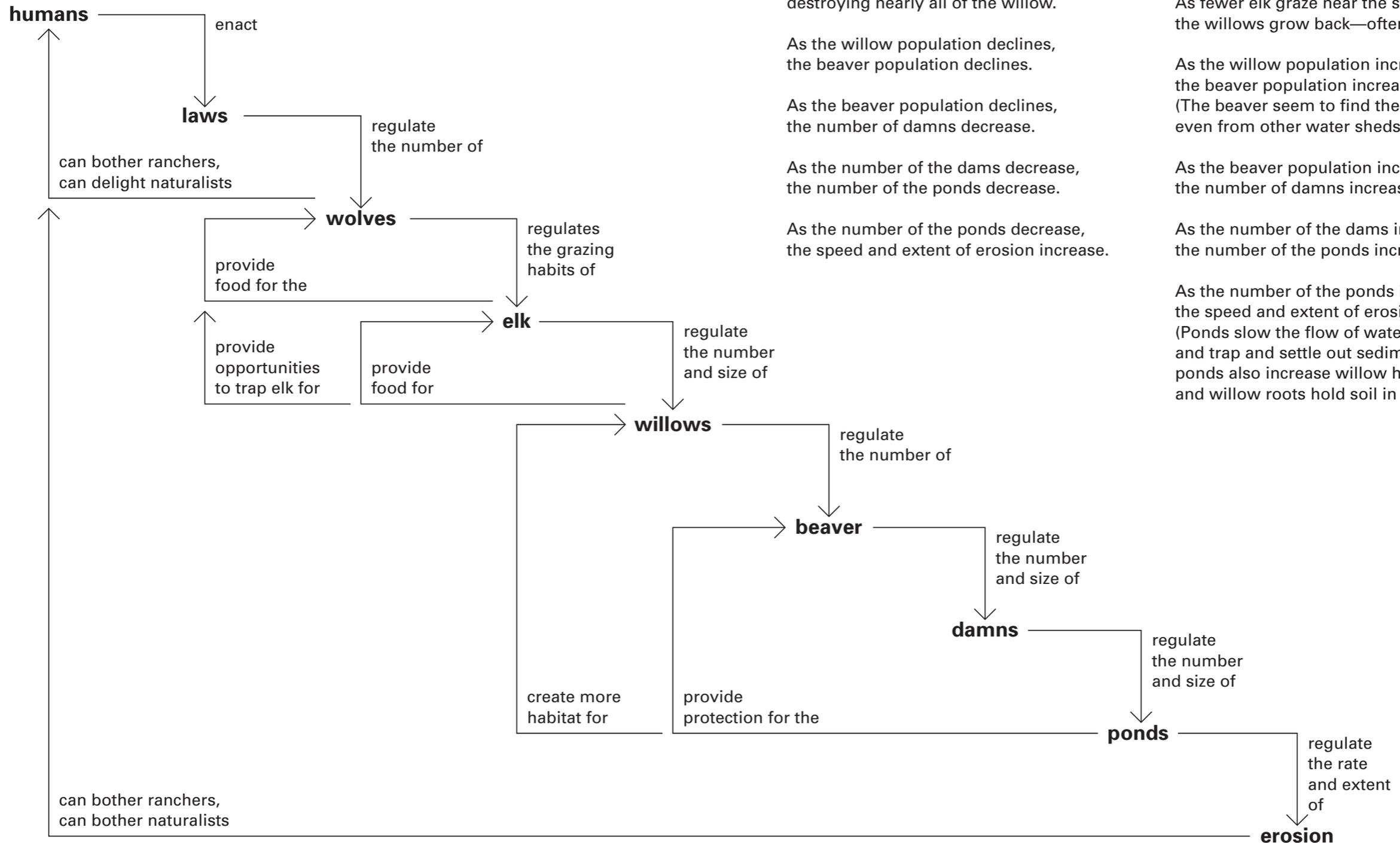


Second-order Feedback: Biological Example

The Role of Wolves in Regulating the Yellowstone Ecosystem

Decreasing the wolf population seemed to increase erosion (and created a more desert-like environment).

Conversely, restoring wolves seemed to reduce erosion (and restored much of the environment's diversity).



Increasing Erosion

As the number of wolves drops, the level of elk grazing around streams (and the nearby willows) rises (an unexpected outcome).

As more elk graze near the streams, they destroy more and more willows—eventually (over many years) destroying nearly all of the willow.

As the willow population declines, the beaver population declines.

As the beaver population declines, the number of dams decrease.

As the number of the dams decrease, the number of the ponds decrease.

As the number of the ponds decrease, the speed and extent of erosion increase.

Decreasing Erosion

As the number of wolves increases (after reintroduction), the level of elk grazing around streams (and the nearby willows) drops—presumably because the elk "sense" the increased danger in these areas where wolves can more easily trap them.

As fewer elk graze near the streams, the willows grow back—often quite rapidly.

As the willow population increases, the beaver population increases. (The beaver seem to find their way back even from other water sheds.)

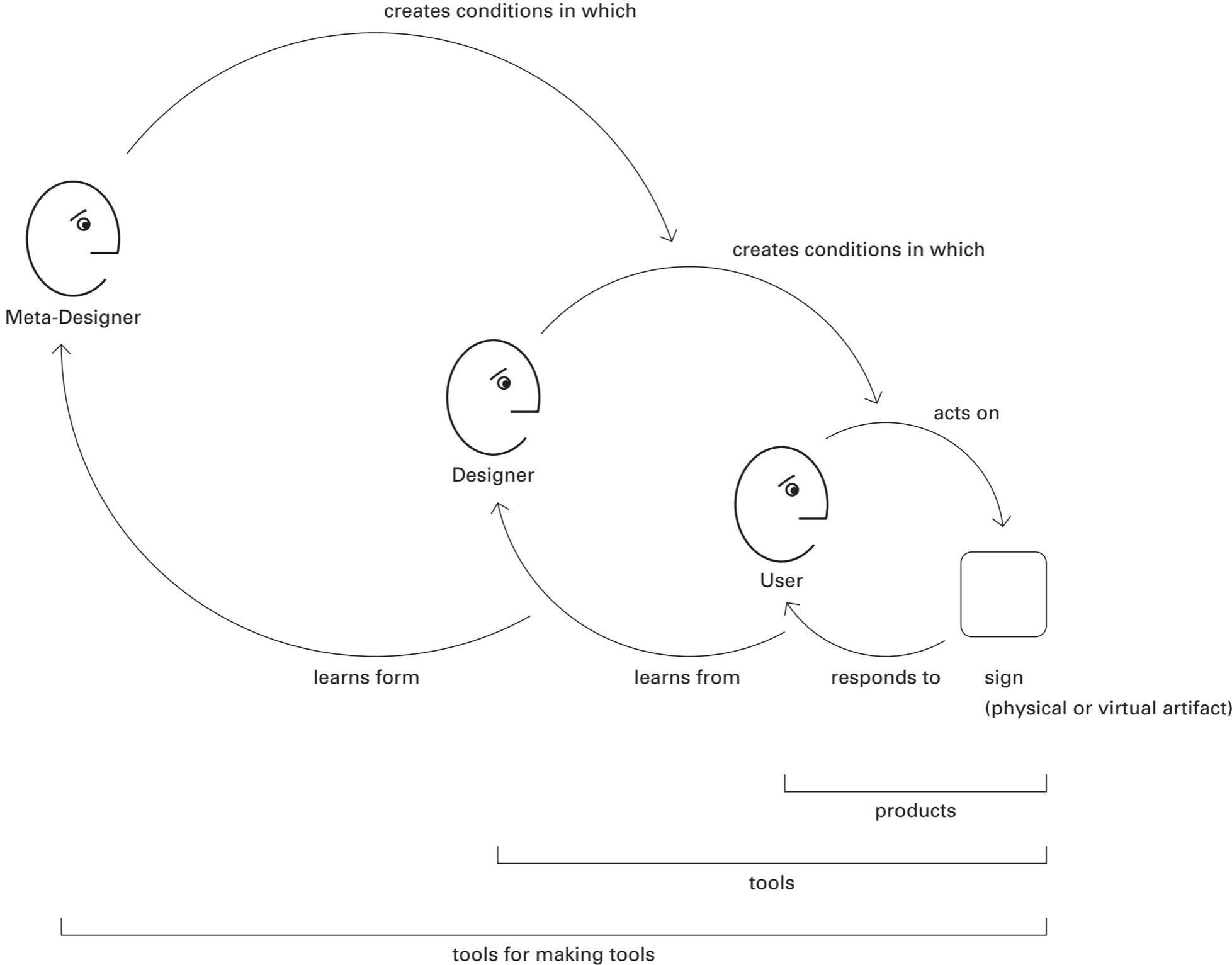
As the beaver population increases, the number of dams increase.

As the number of the dams increase, the number of the ponds increase.

As the number of the ponds increase, the speed and extent of erosion decrease. (Ponds slow the flow of water and trap and settle out sediment; ponds also increase willow habitat; and willow roots hold soil in place.)

Second-order Feedback: Social Example

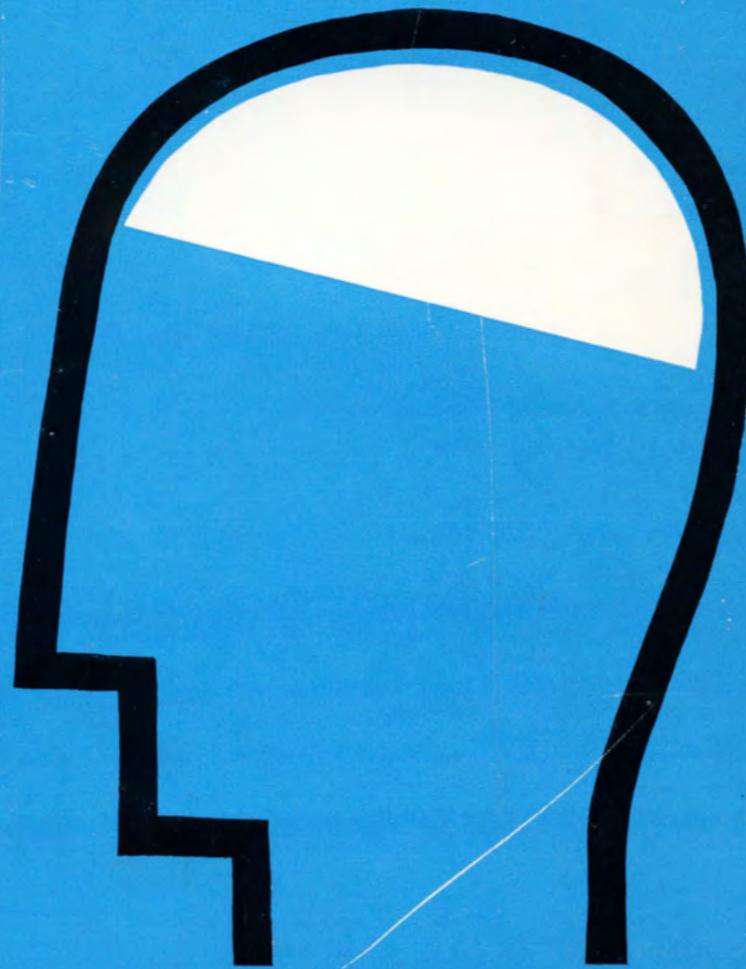
Levels of feedback in design processes





Design for a Brain

W. ROSS ASHBY



Science Paperbacks 

CYBERNETICS

CIRCULAR CAUSAL AND FEEDBACK MECHANISMS
IN BIOLOGICAL AND SOCIAL SYSTEMS

*Transactions of the Tenth Conference
April 22, 23, and 24, 1953, Princeton, N. J.*

Edited by

 HEINZ VON FOERSTER

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UNIVERSITY OF ILLINOIS
CHAMPAIGN, ILL.

Assistant Editors

MARGARET MEAD

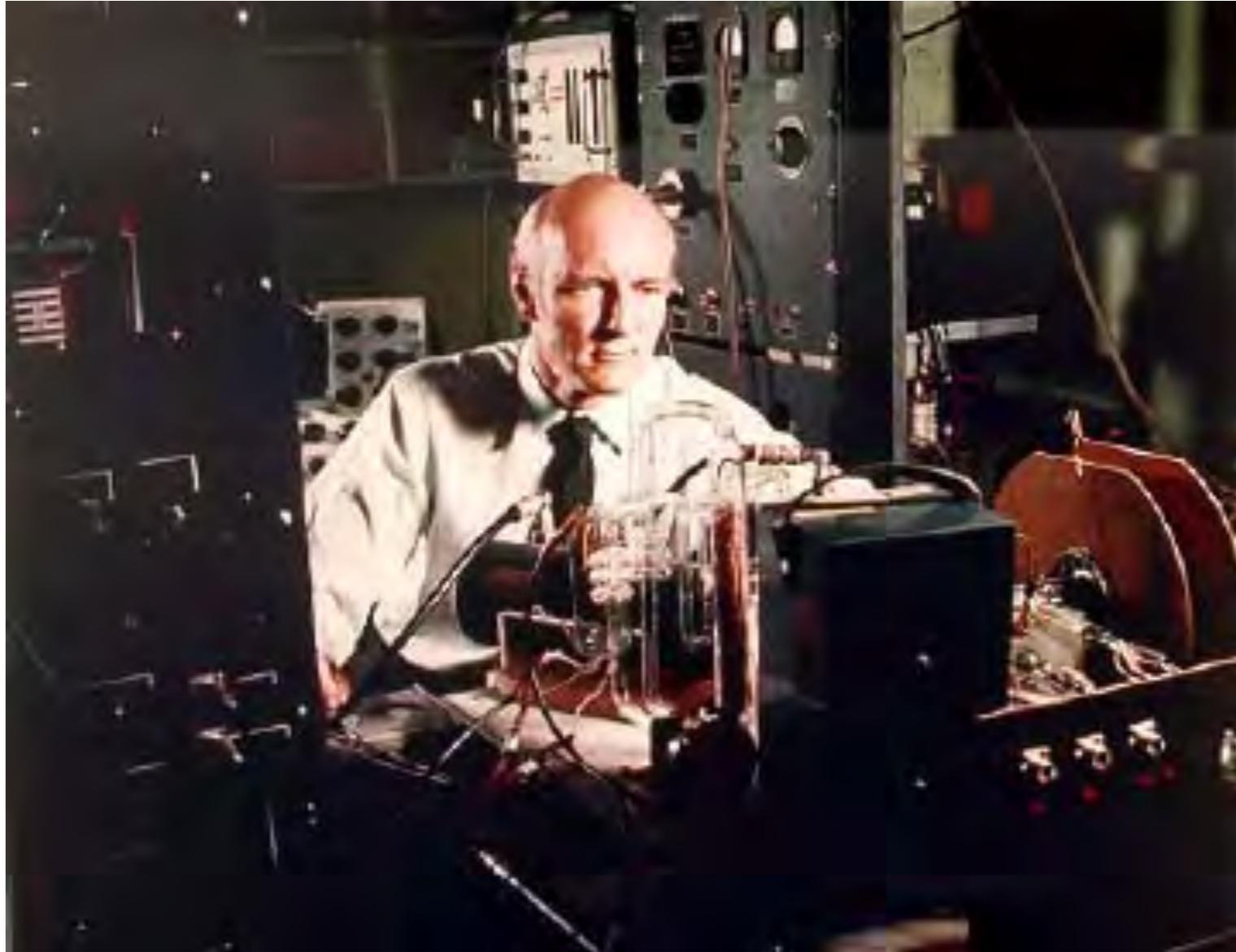
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Heinz von Foerster



**OBSERVING
SYSTEMS**



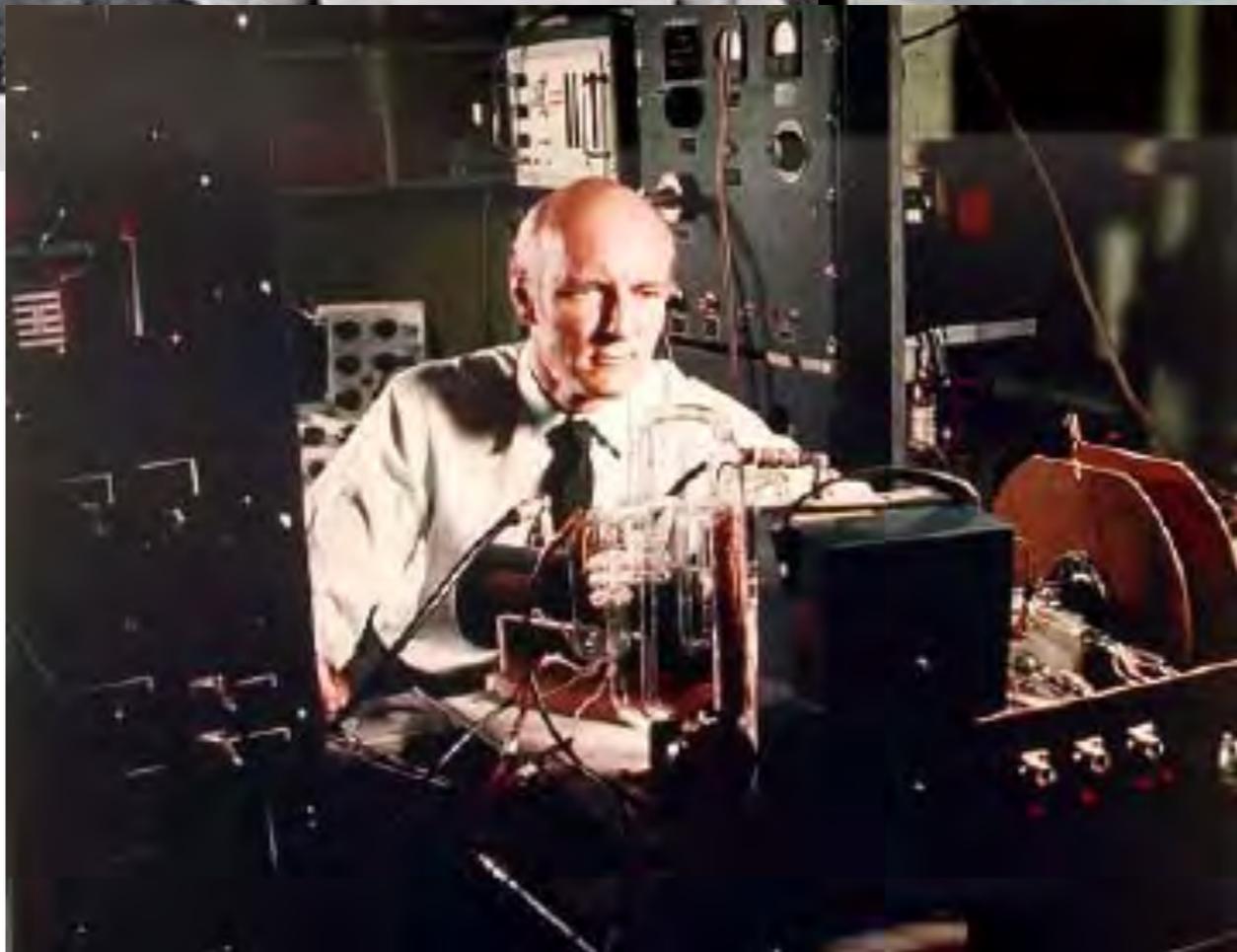
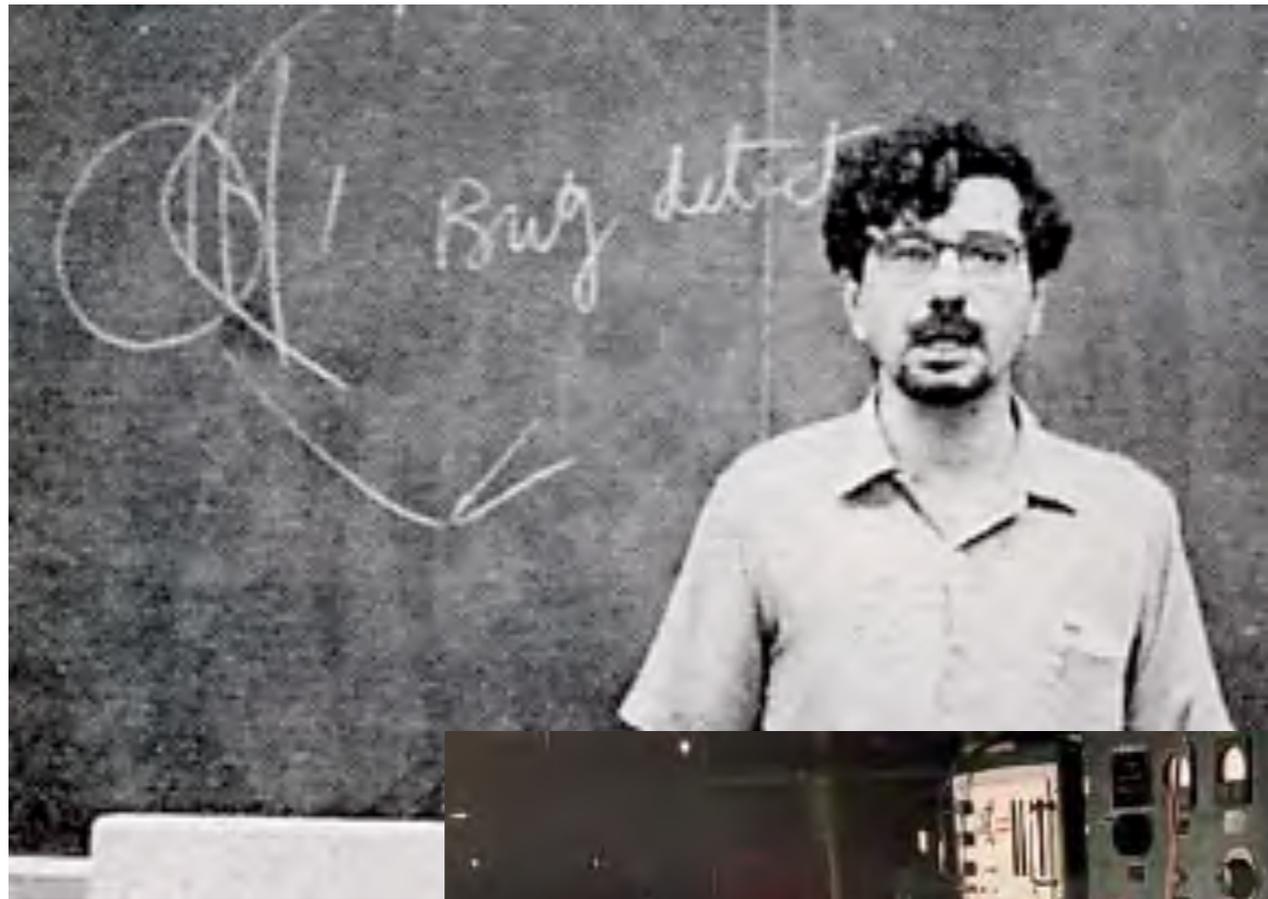
THE SYSTEMS INQUIRY SERIES
PUBLISHED BY INTERSYSTEMS PUBLICATIONS

**Understanding
Understanding**

Essays on Cybernetics and Cognition

Heinz von Foerster





VON HERTER

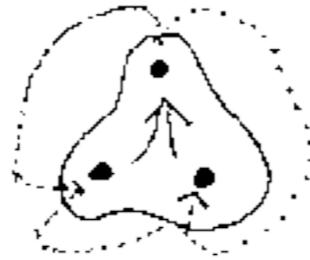
PASK

MATURANA

Convergence to Stability

Reproduction equals Stability

Self-Making means Stability

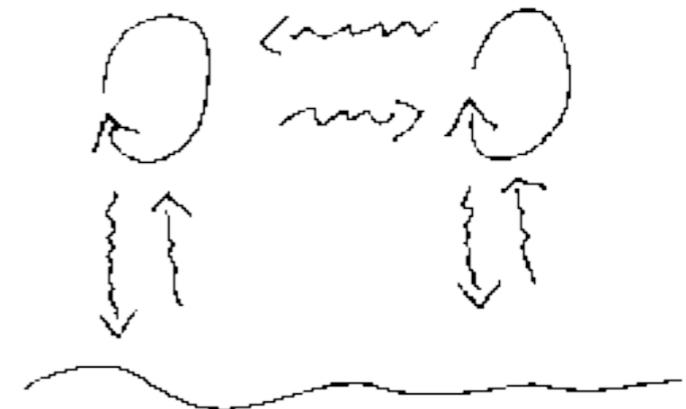
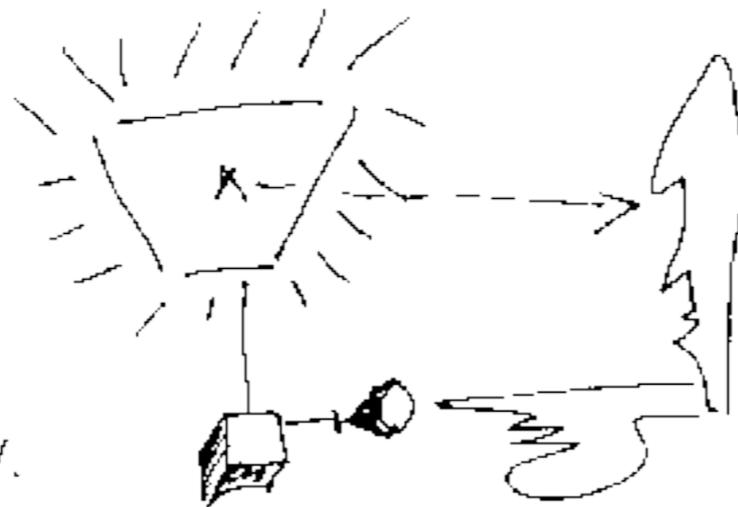
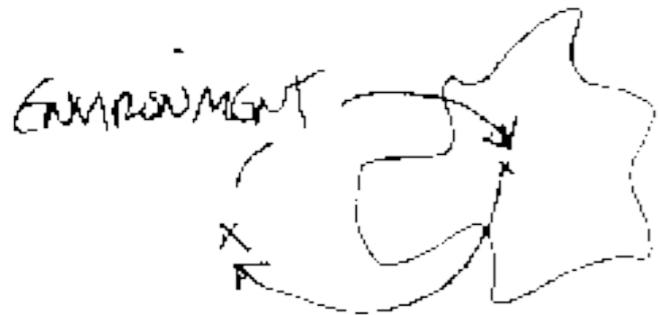


MEMORY AS PROCESS

ORGANIZATIONALLY - CLOSED CONCEPT

AUTOPOIESIS

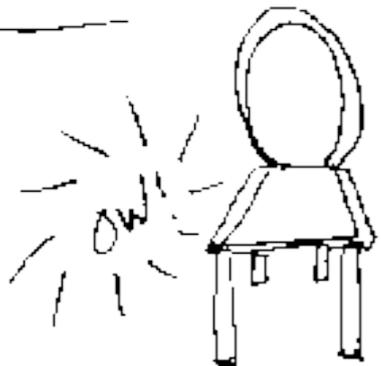
Autotypic ORGANISM



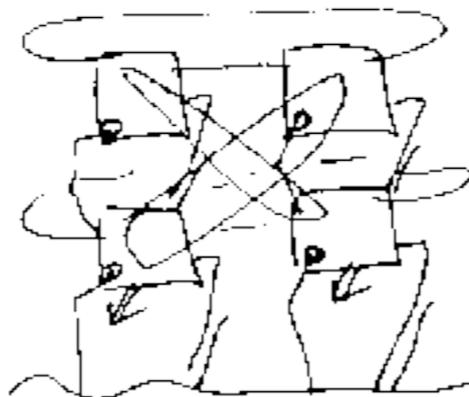
MAPPING of ORGANISM through ENV. and ENV. through ORG.

LEARNING AS MULTI-MODAL LOOP

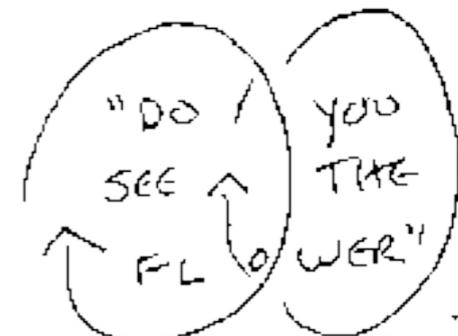
STRUCTURAL COUPLING



"RADICAL CONSTRUCTIVISM"



OTHERS AS EXTENSIONS OF SELF IN THE ENVIRONMENT



CONSENSUAL COORDINATION of ACTIONS

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Department of Electrical Engineering, University of Illinois
Champaign, Ill.

GREGORY BATESON

Veterans Administration Hospital
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ALEX BAVELAS†

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Cambridge, Mass.

JULIAN H. BIGELOW

Department of Mathematics, Institute for Advanced Study
Princeton, N. J.

HENRY W. BROSIN

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LAWRENCE K. FRANK

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RALPH W. GERARD†

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GEORGE EVELYN HUTCHINSON

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RAFAEL LORENTE de NO†

Rockefeller Institute for Medical Research
New York, N. Y.

DONALD G. MARQUIS

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† Absent.

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GUESTS

VAHE E. AMASSIAN

Department of Physiology and Biophysics, University of Washington
School of Medicine
Seattle, Wash.

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Department of Philosophy, Hebrew University
Jerusalem, Israel

JOHN R. BOWMAN

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Mellon Institute of Industrial Research, University of Pittsburgh
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HENRY QUASTLER

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Urbana, Ill.

CLAUDE SHANNON

Bell Telephone Laboratories, Inc., Murray Hill Laboratory
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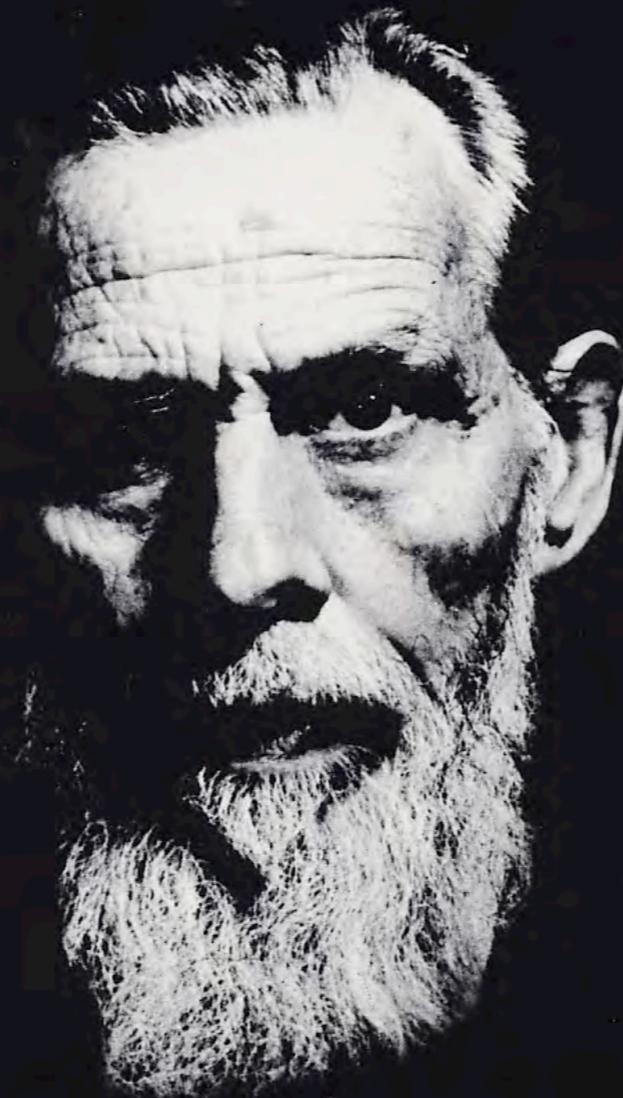
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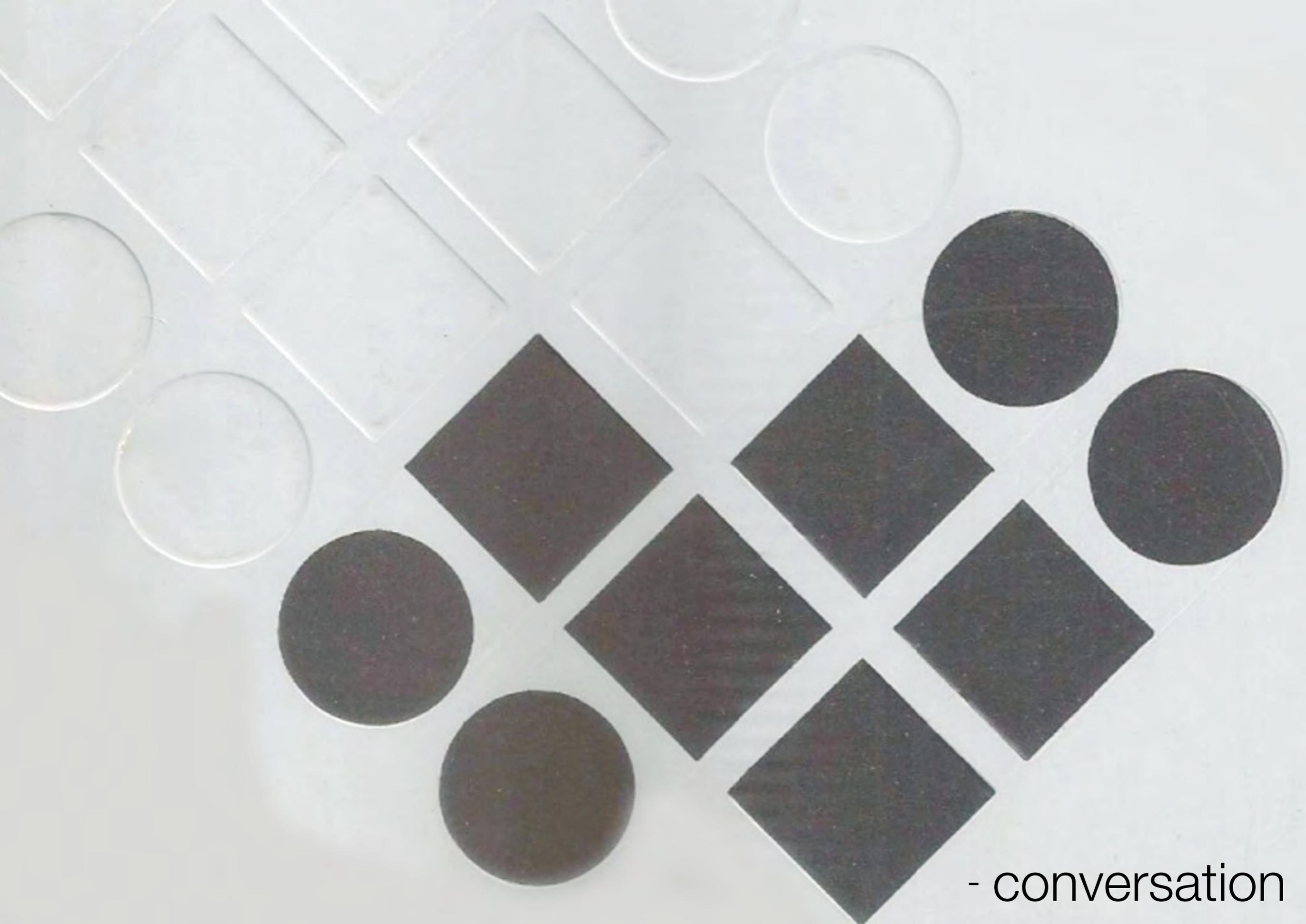
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Warren S. McCulloch
EMBODIMENTS OF MIND

Introduction by Seymour Papert

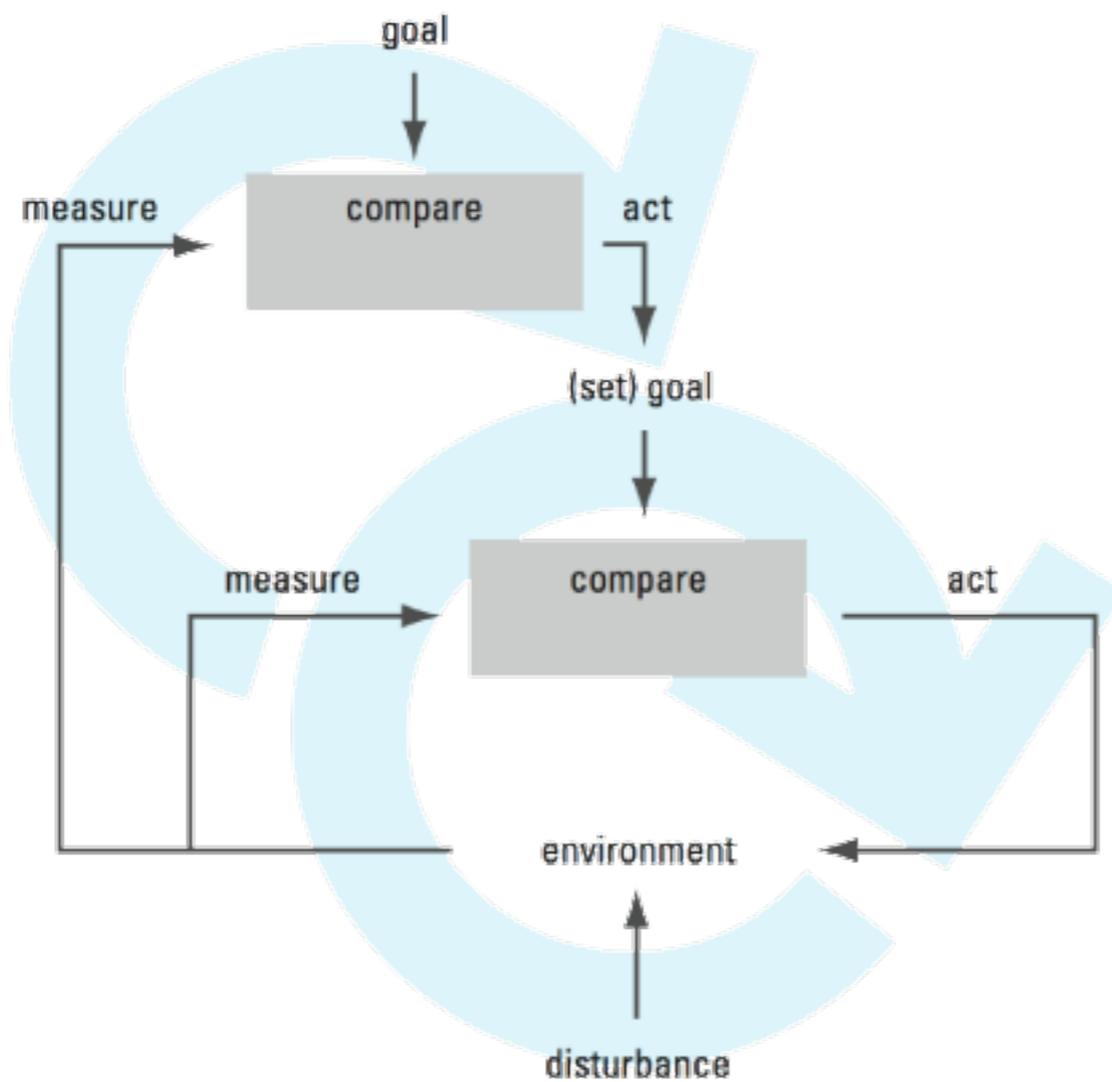
New Foreword by Jerome Y. Lettvin



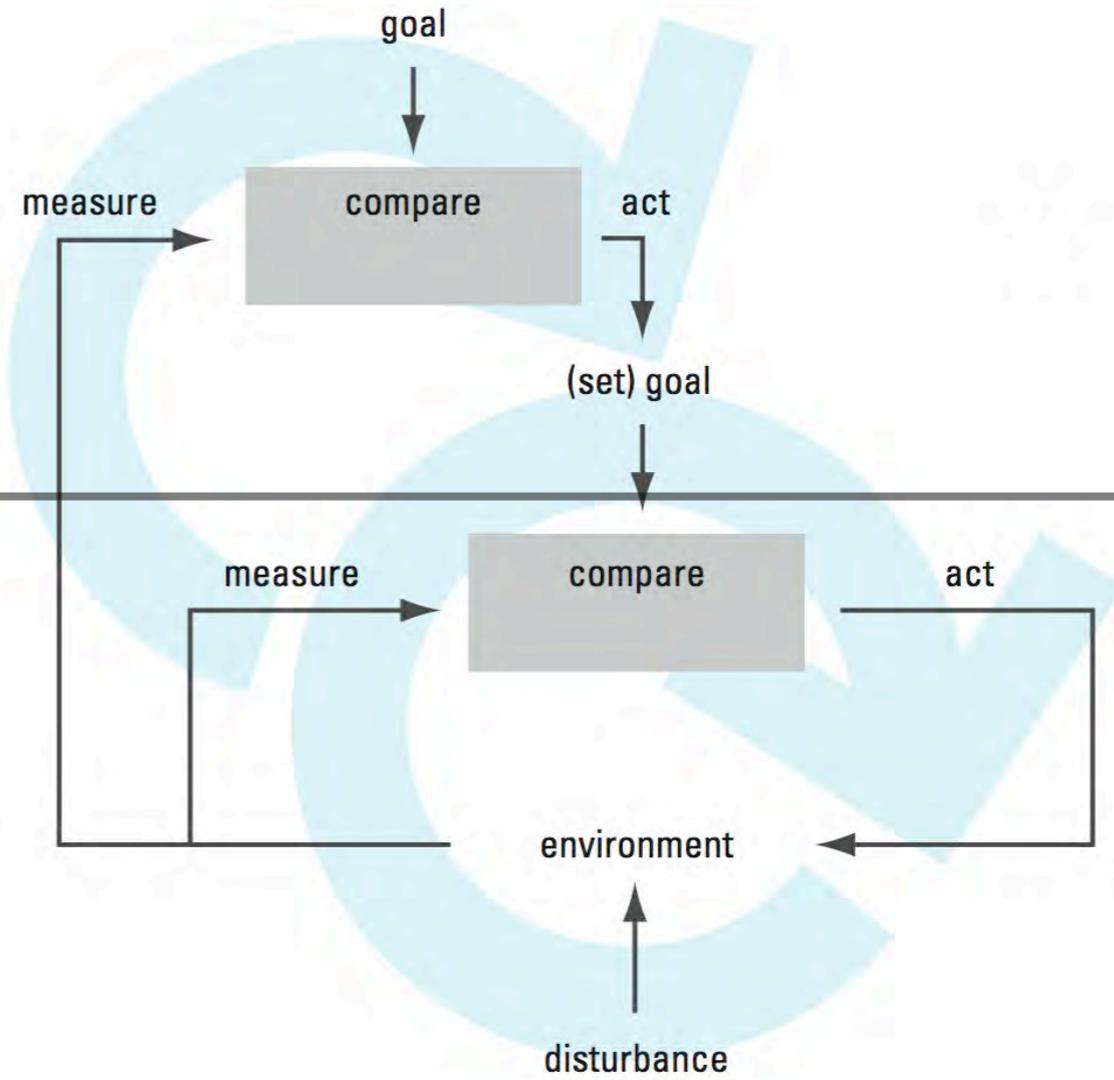
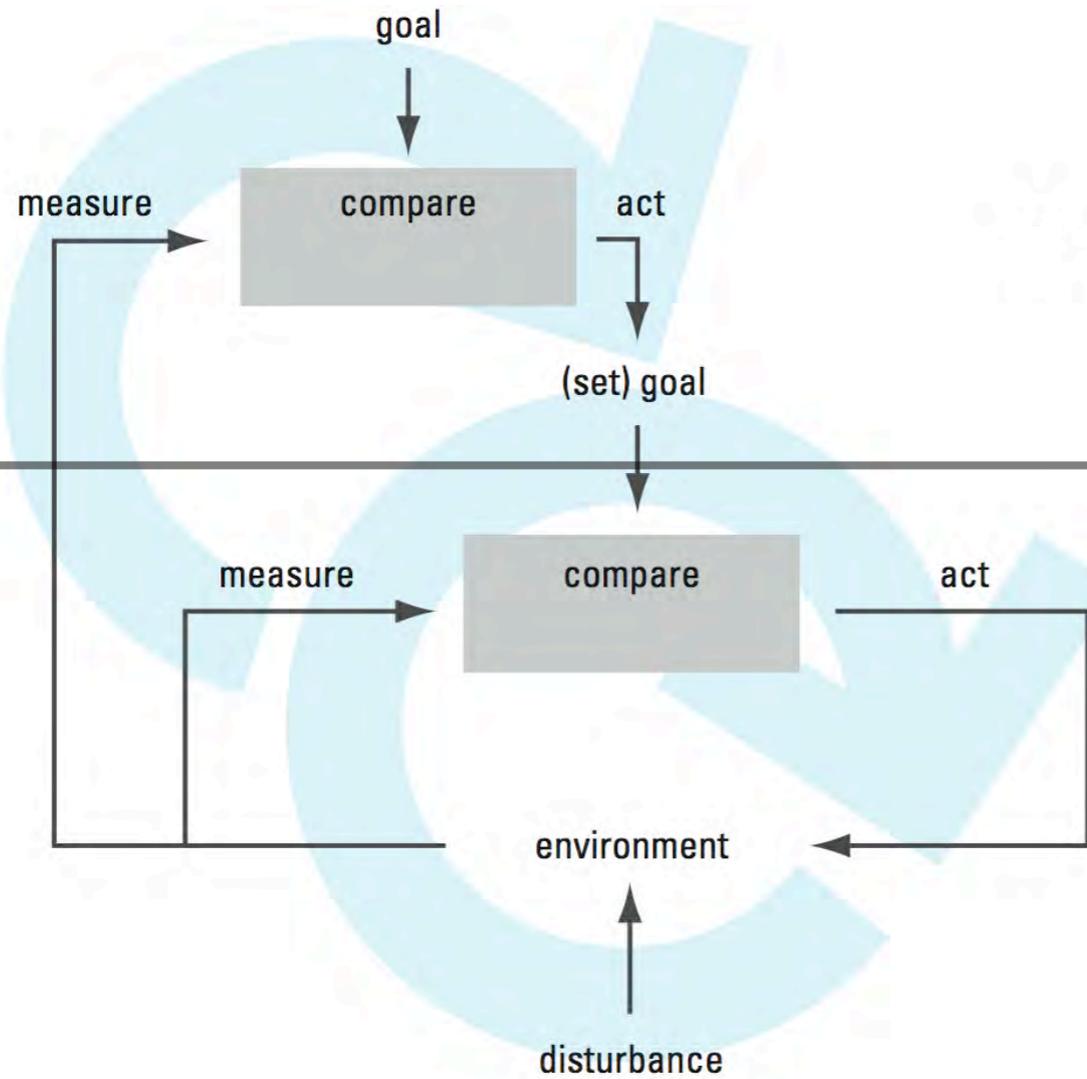
- conversation

learning system

two or more learning systems may interact.

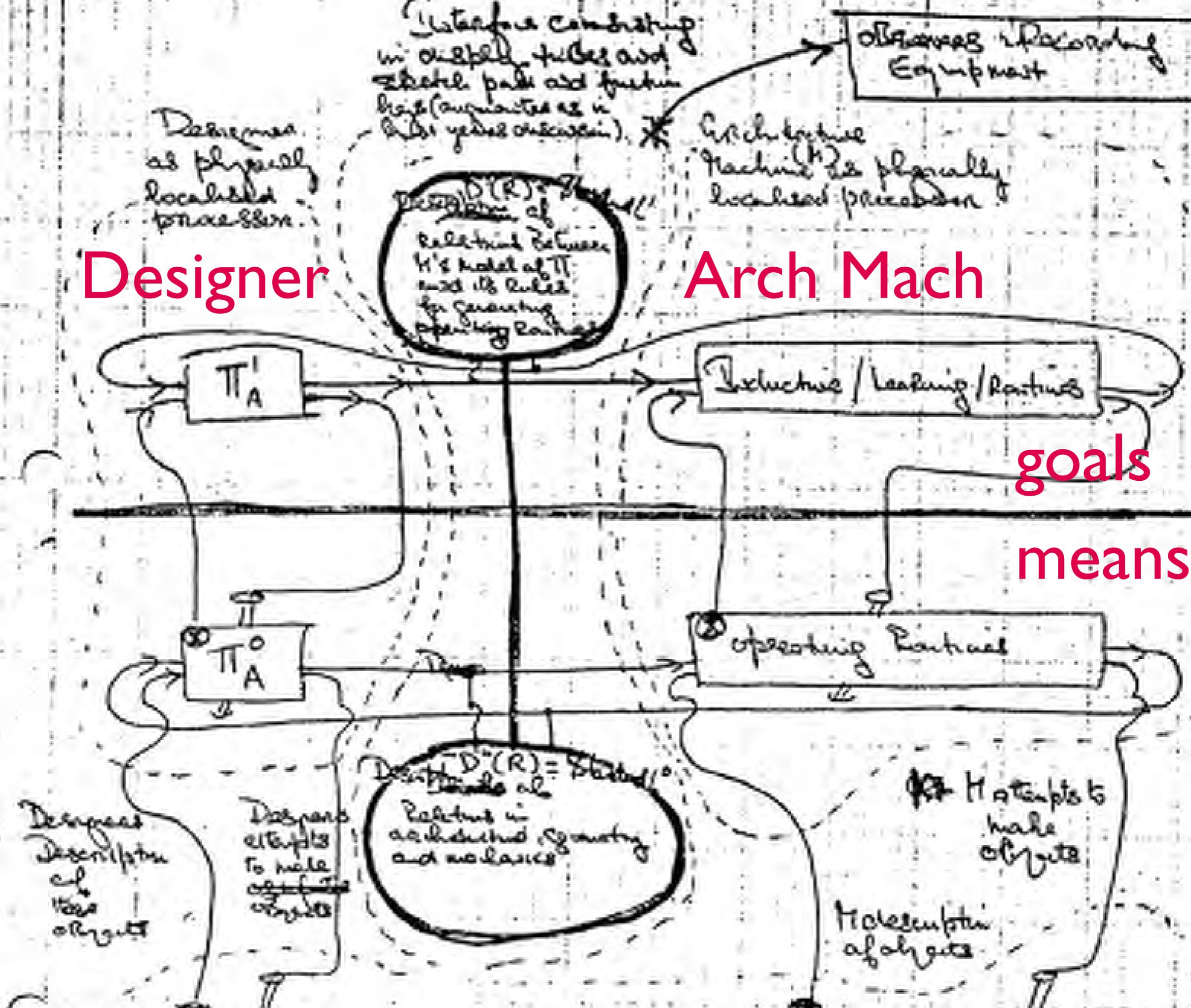


conversing systems

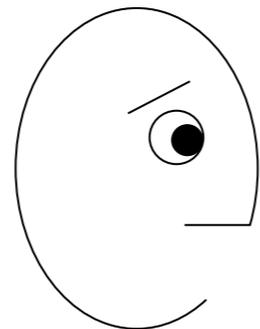


Designer

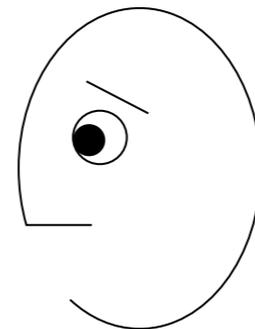
Arch Mach



how does conversation work?

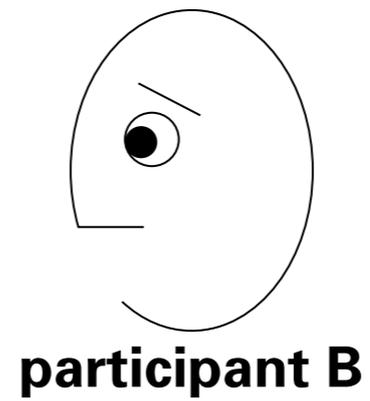
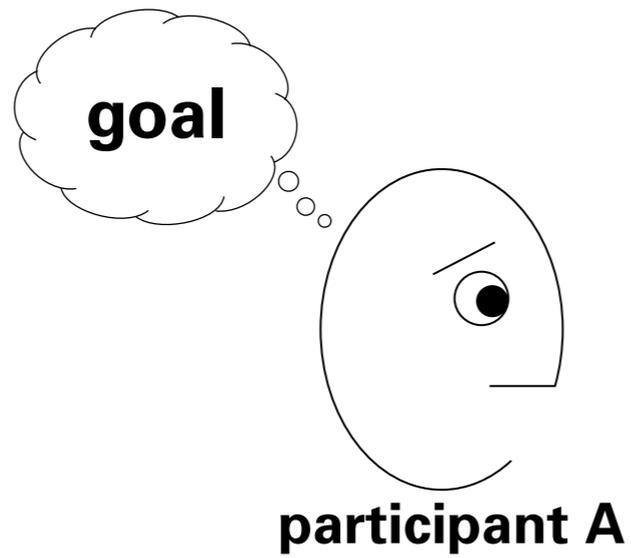


participant A

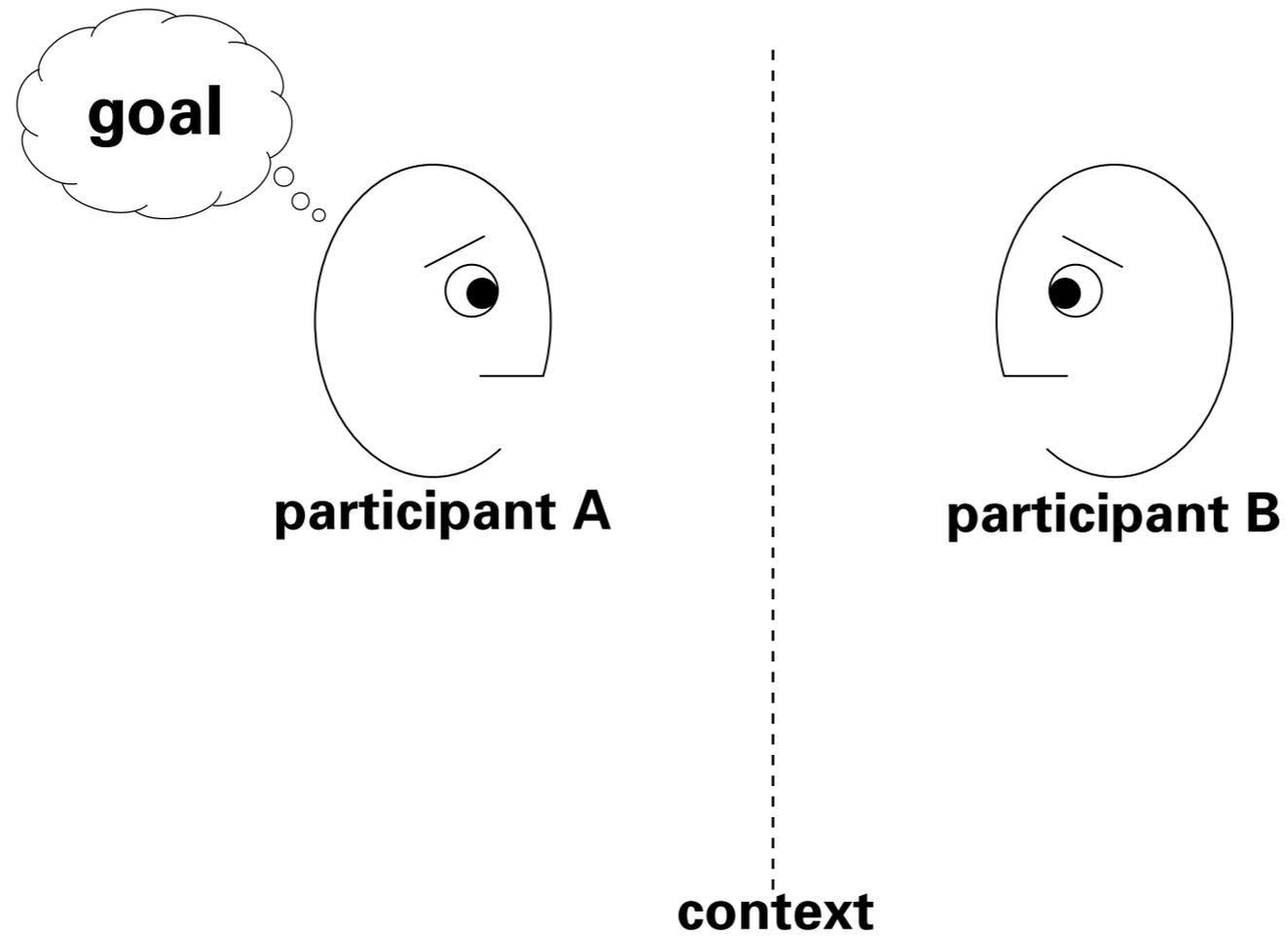


participant B

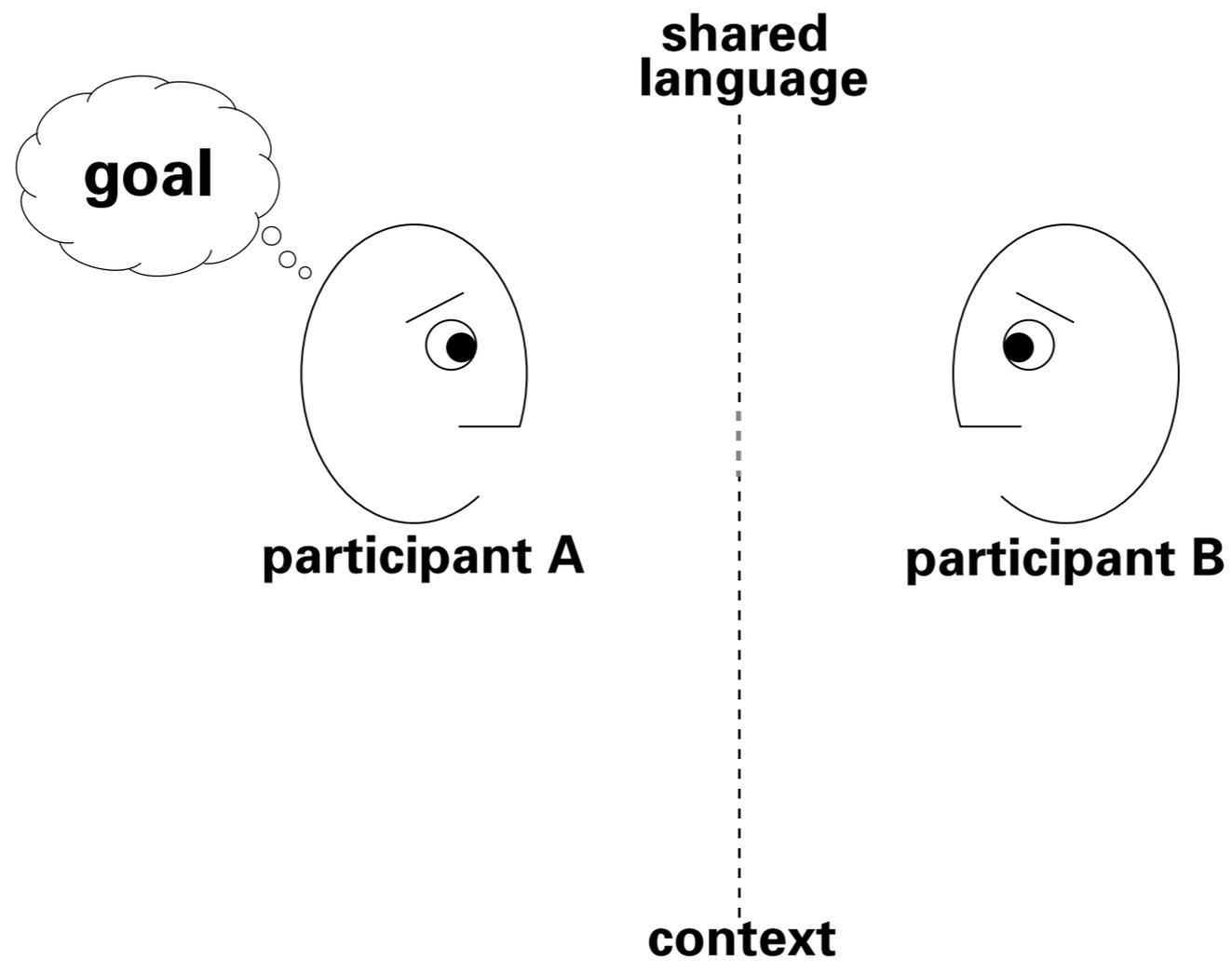
a participant has a goal



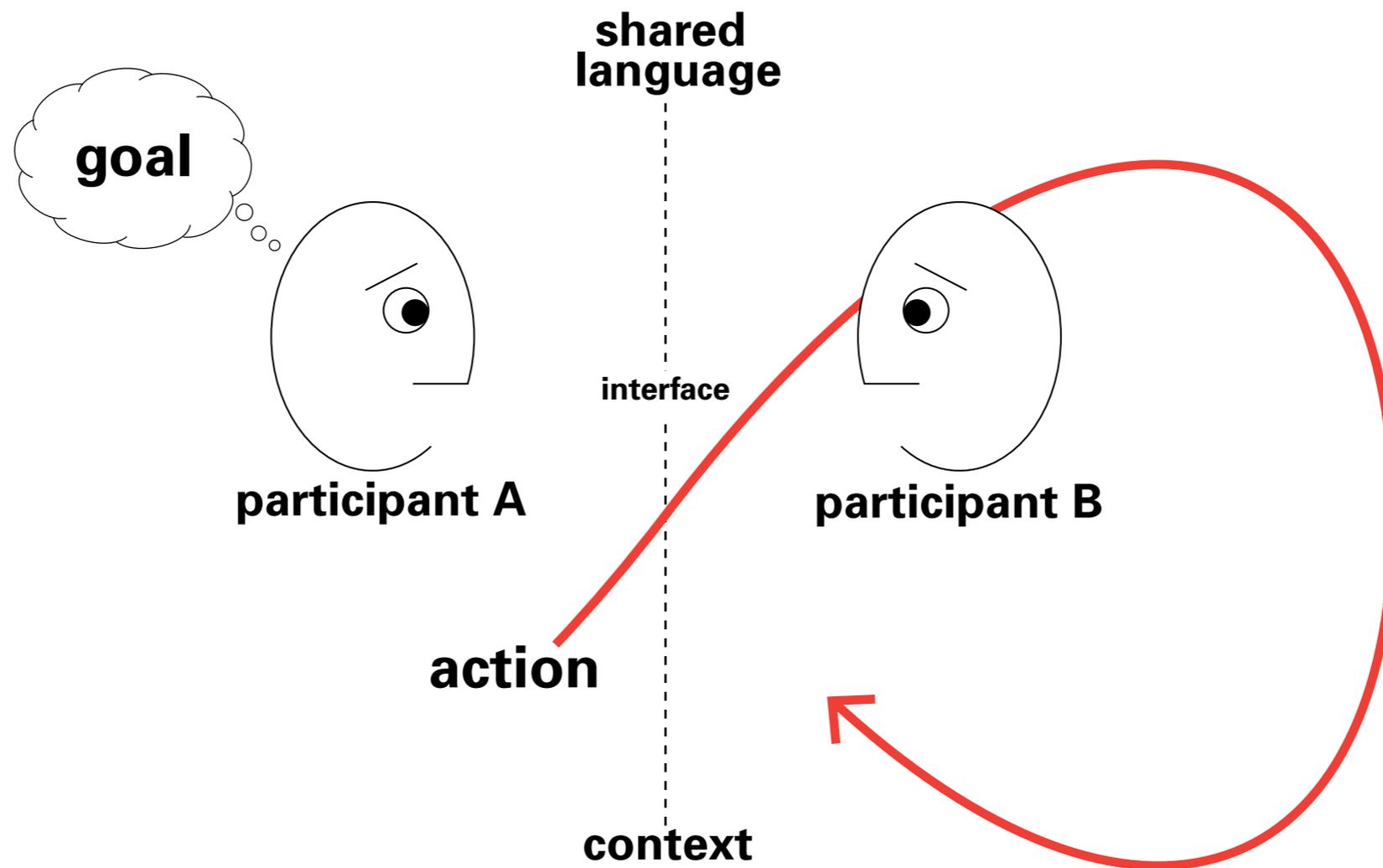
chooses a context



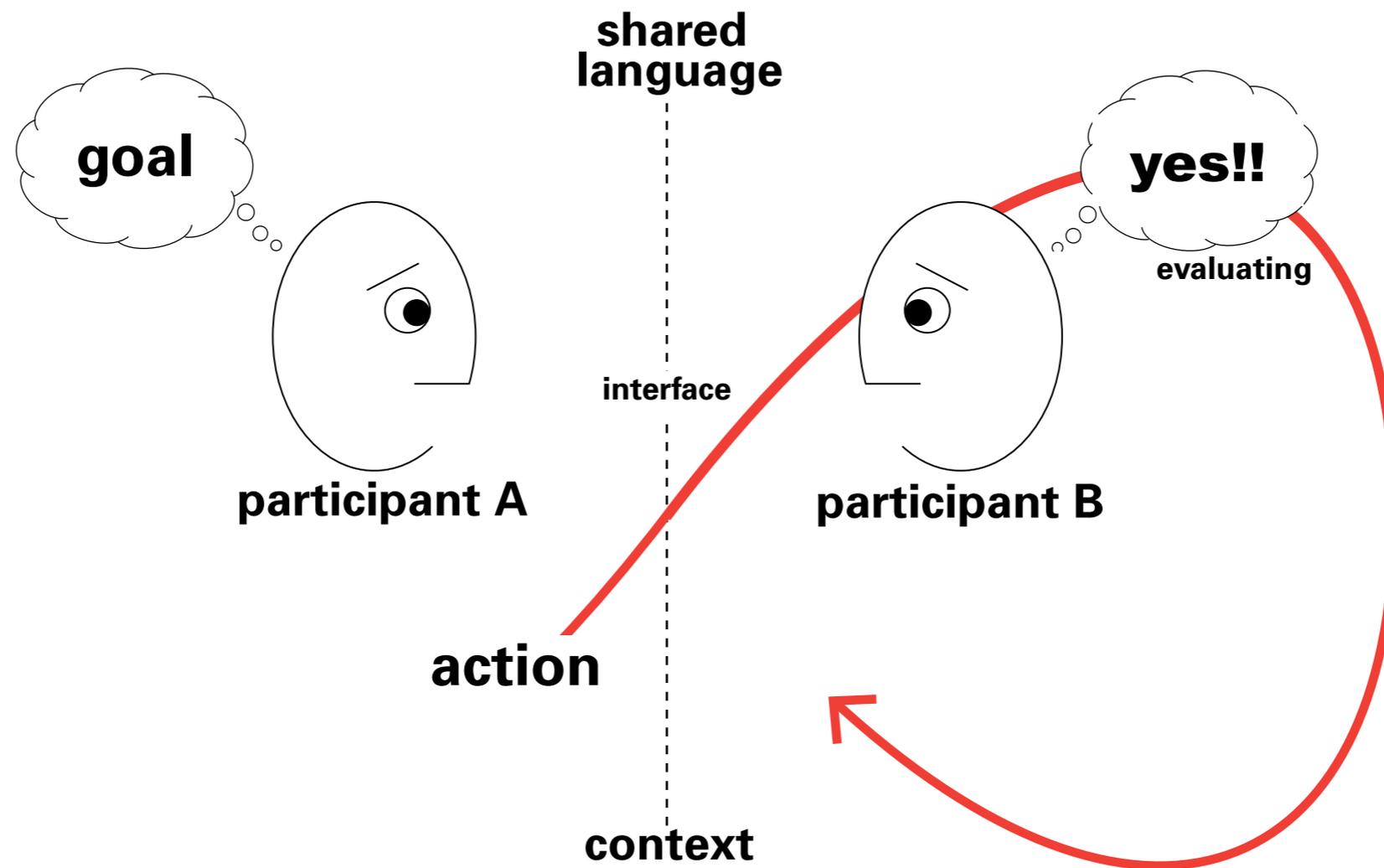
chooses a language



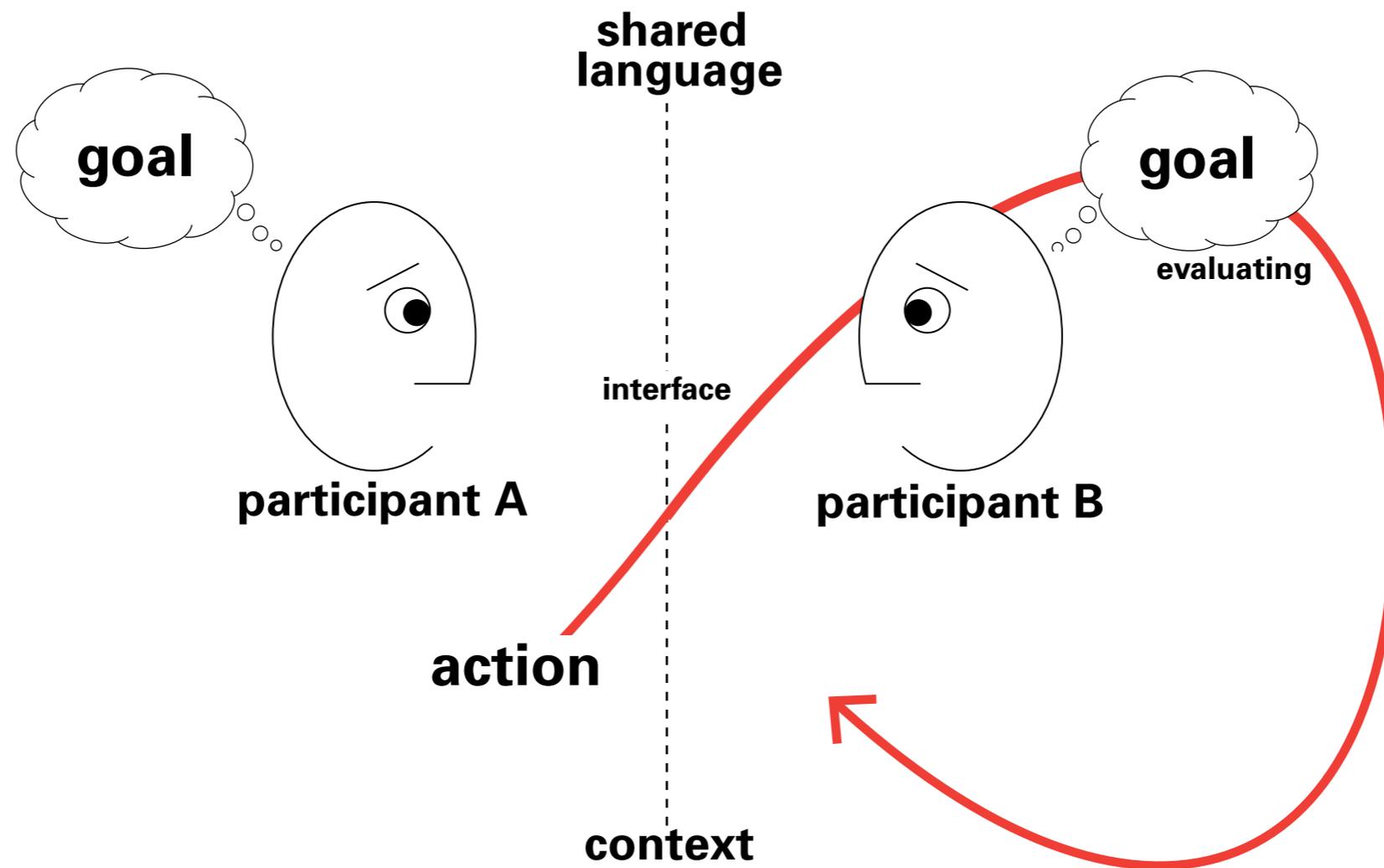
begins an exchange



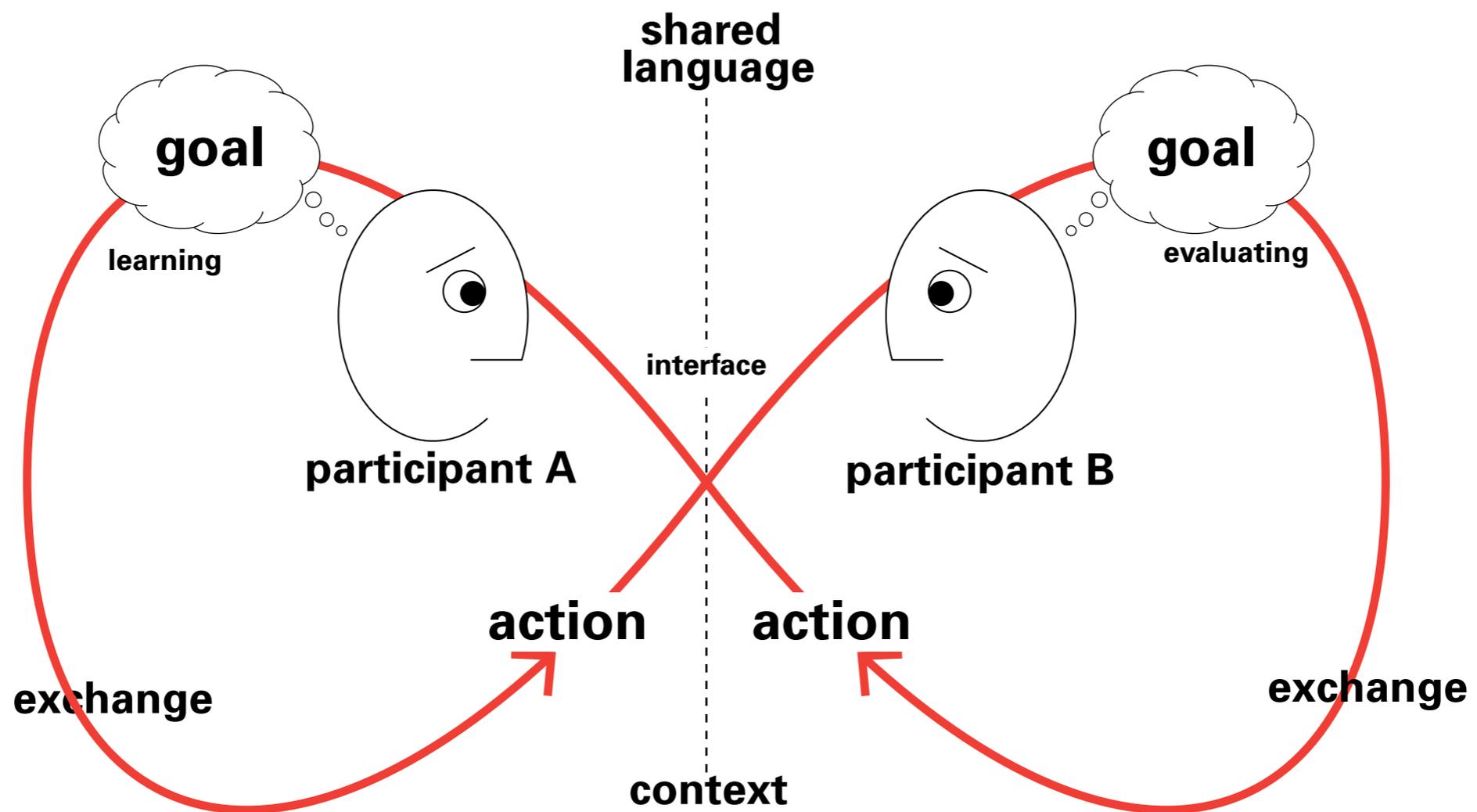
evokes a reaction...



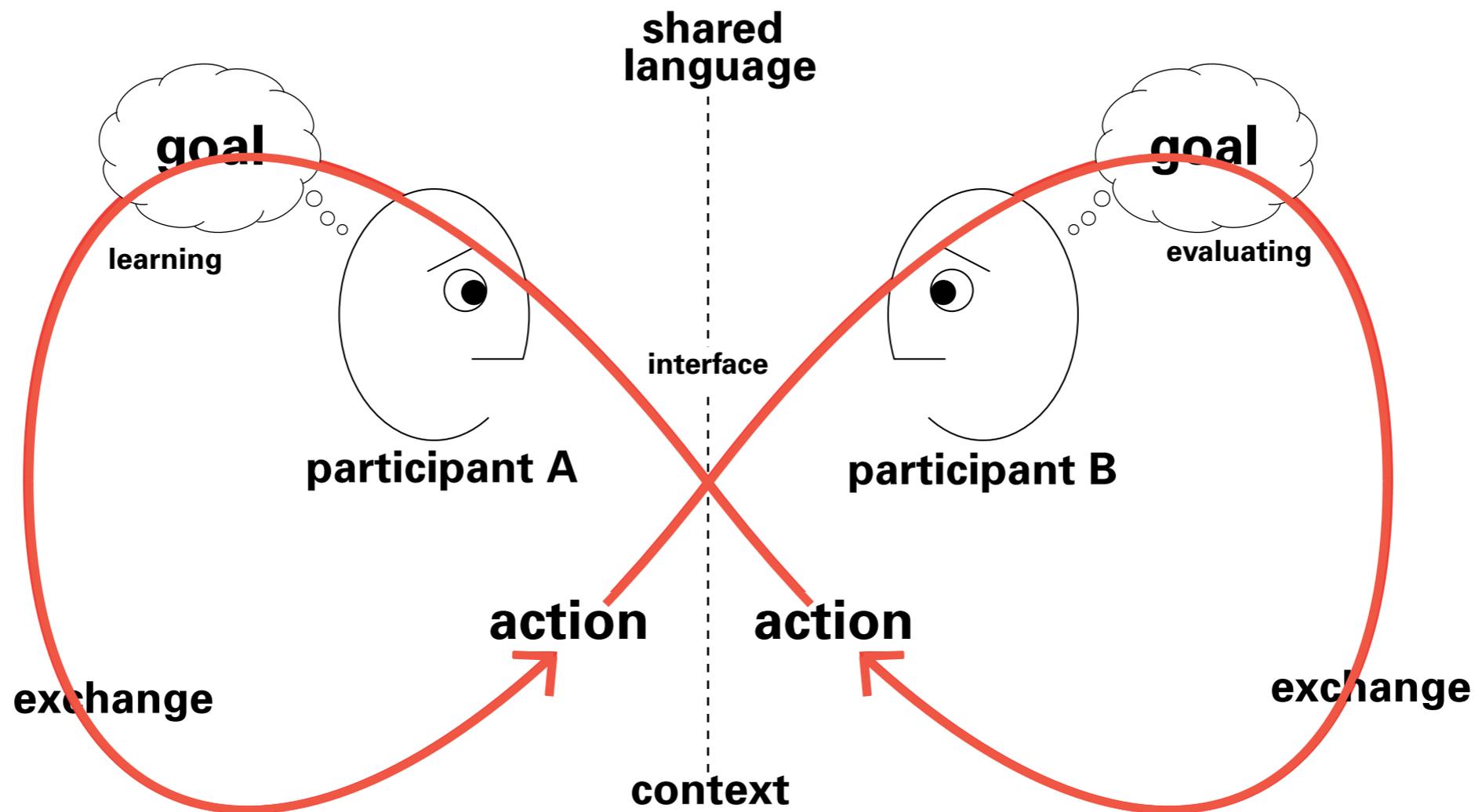
evokes a reaction...



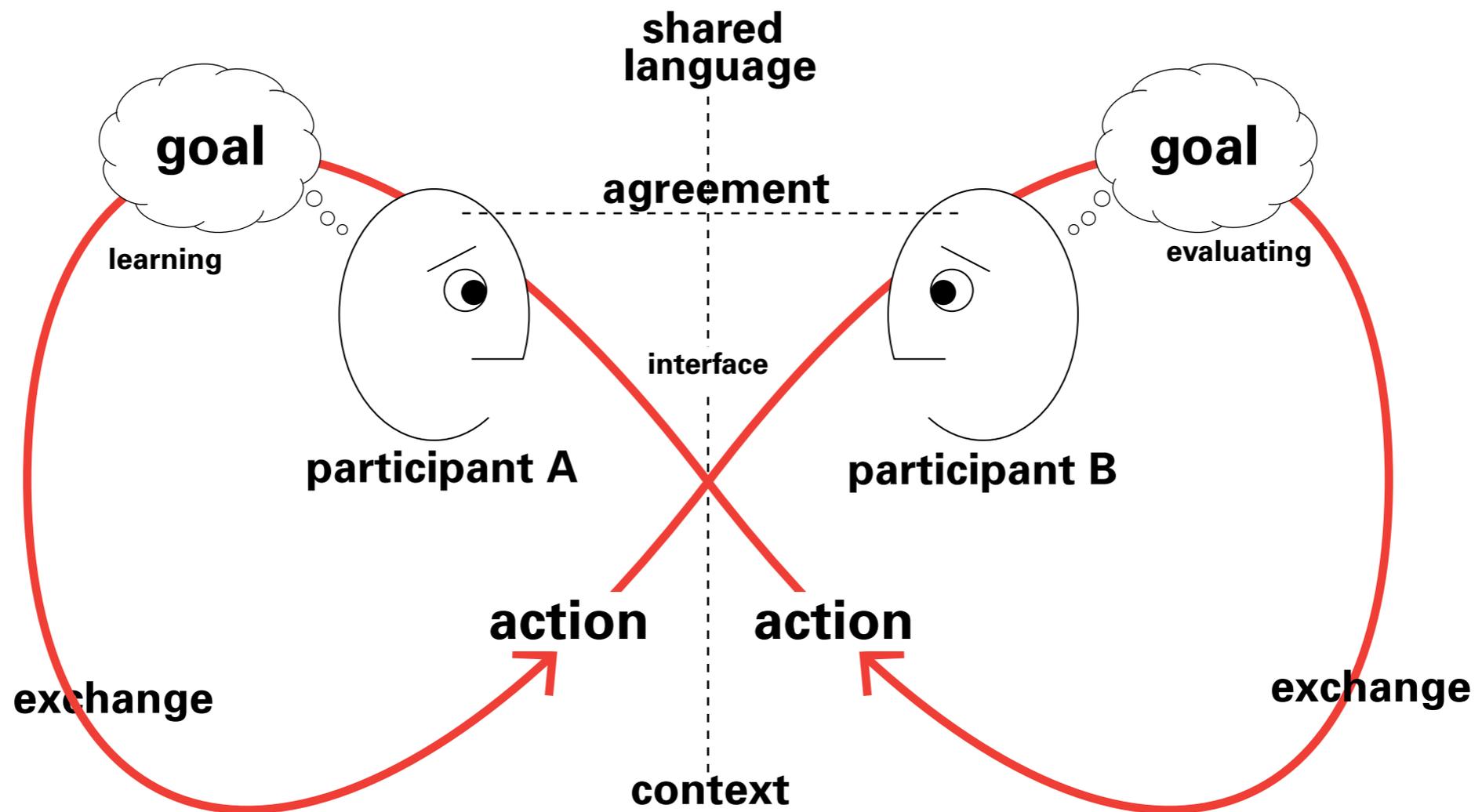
...that evokes a reaction



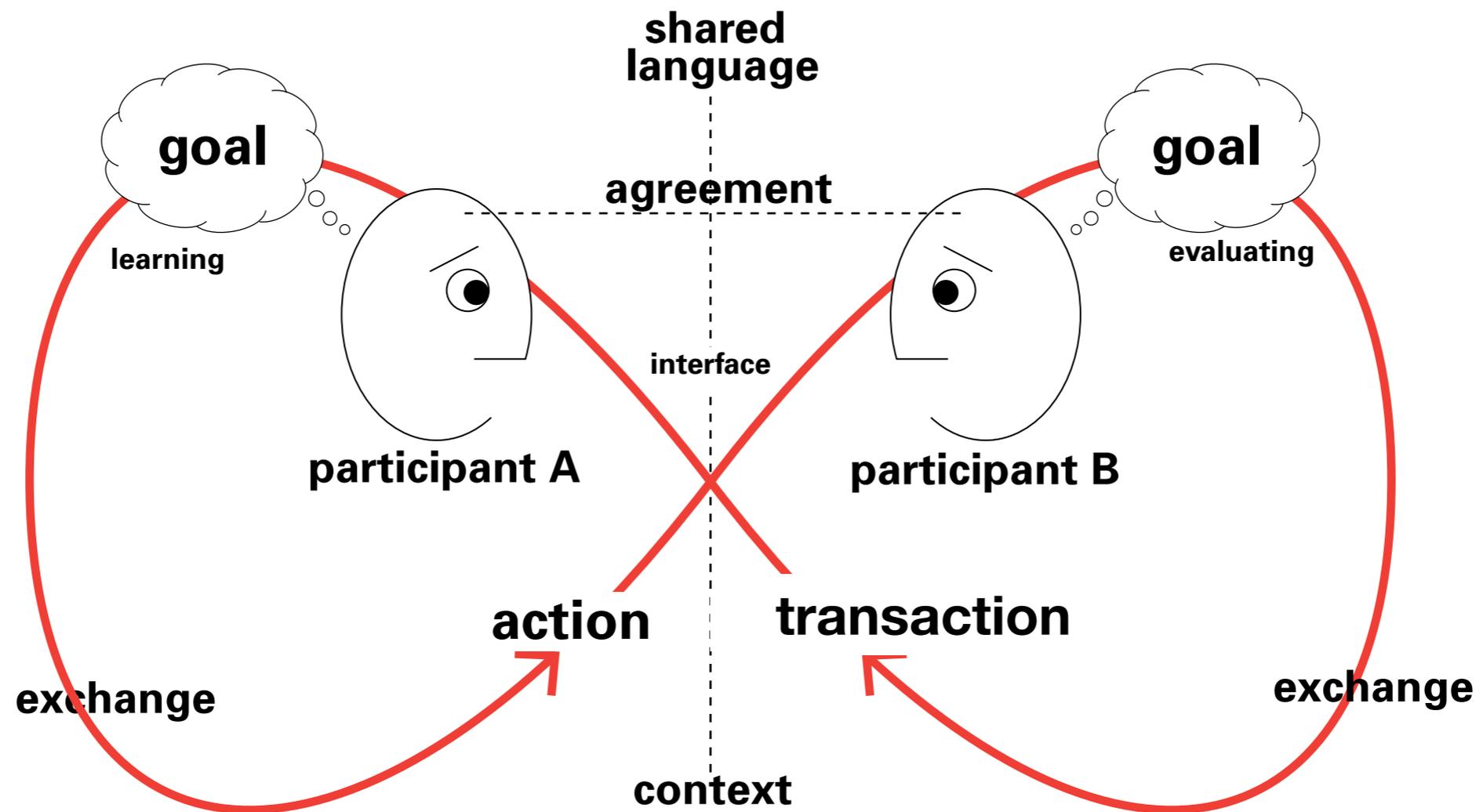
the exchange may continue



agreement may be reached

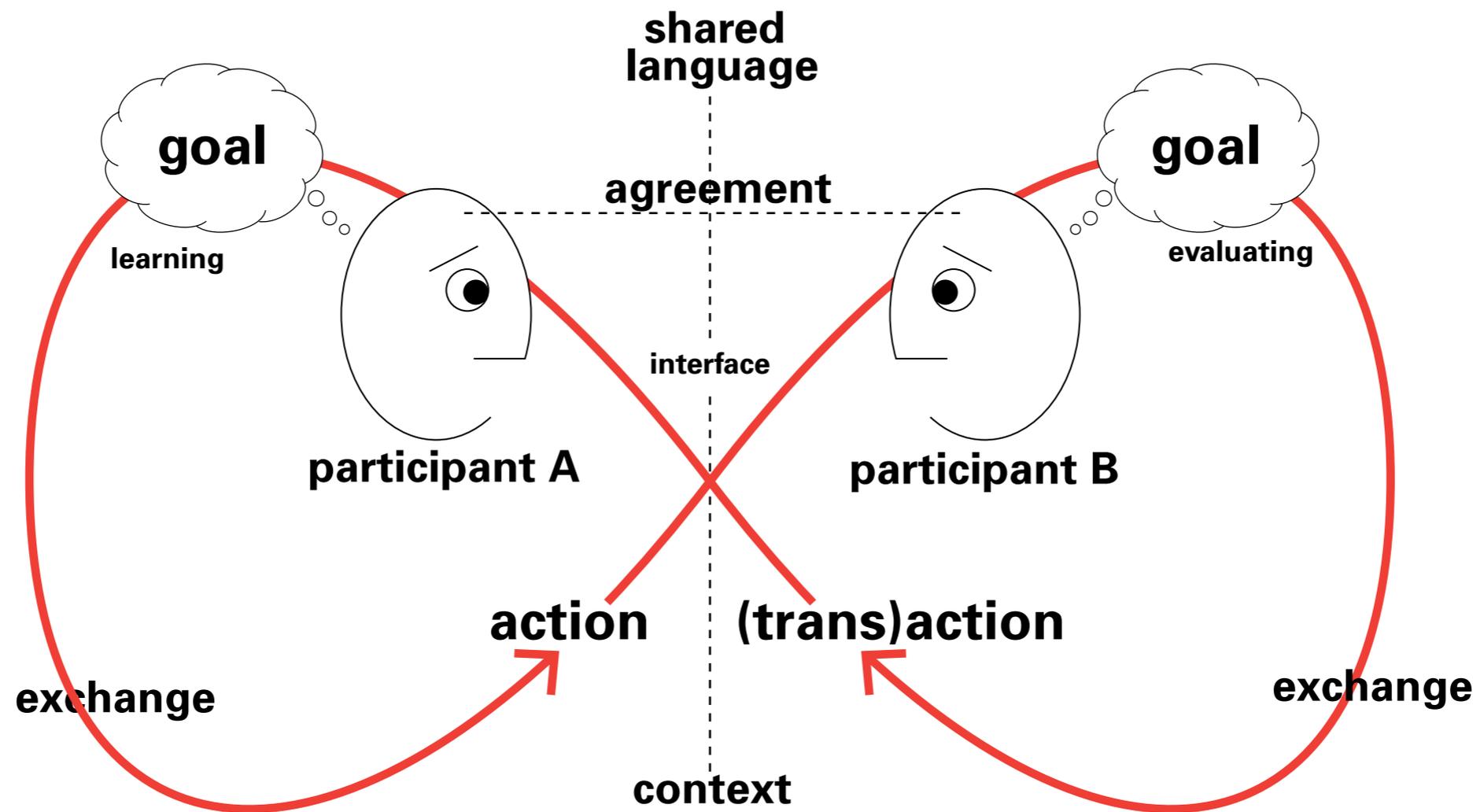


a transaction may occur

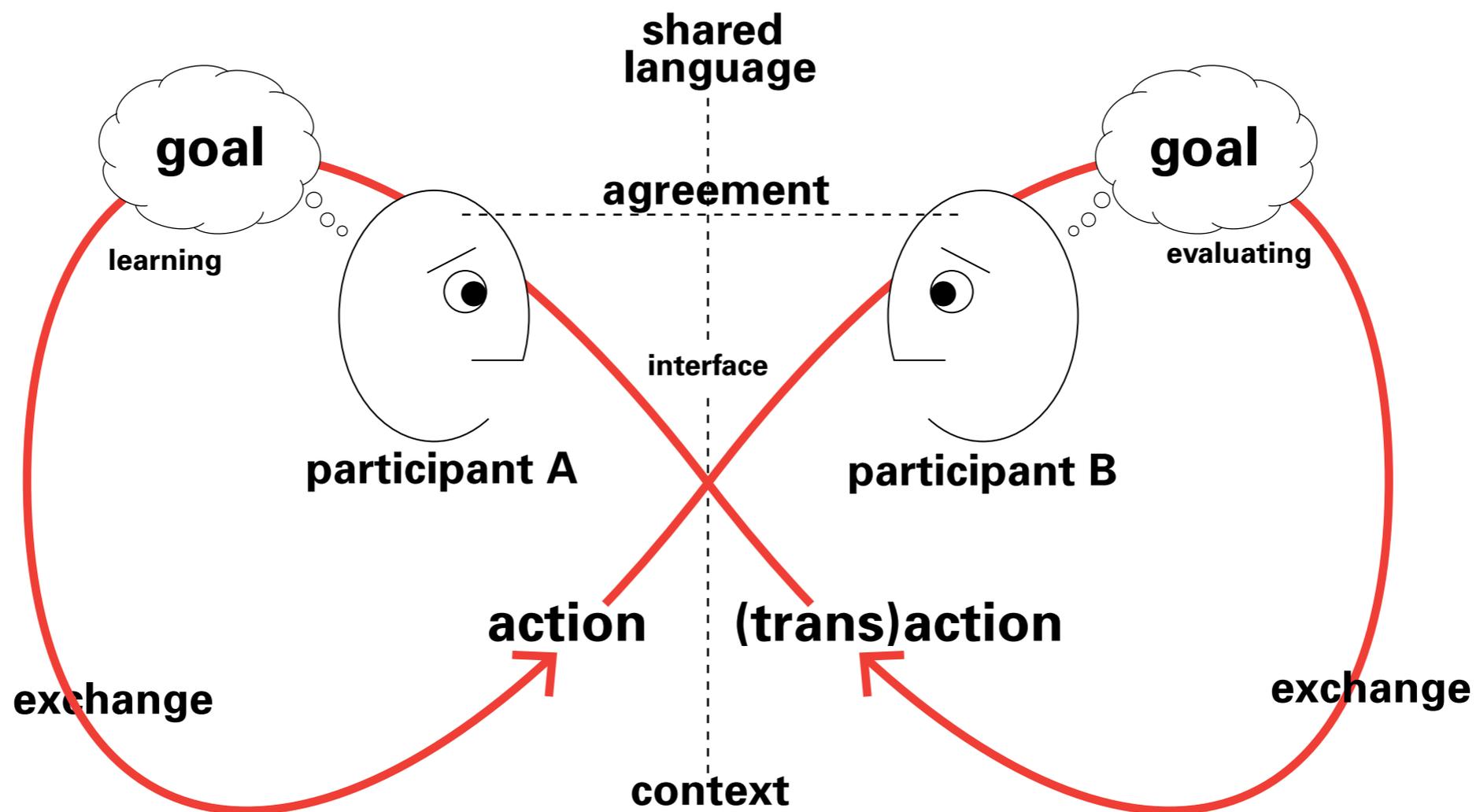


after Dubberly Design Office 2008

CONVERSATION REDUX



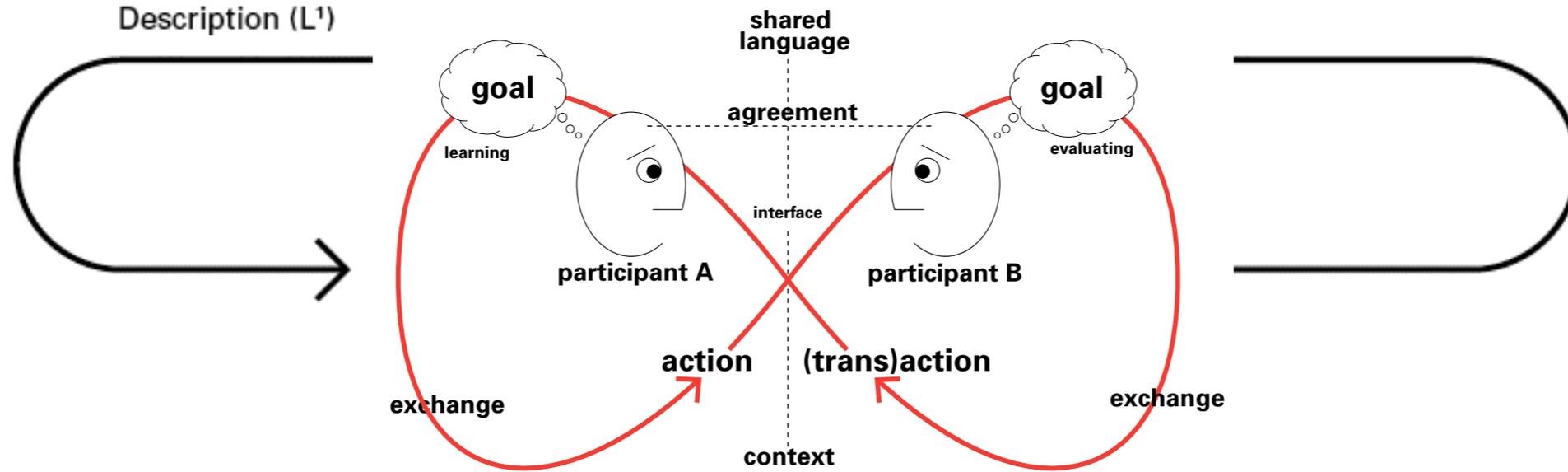
CONVERSATION = C-L-E-A-T



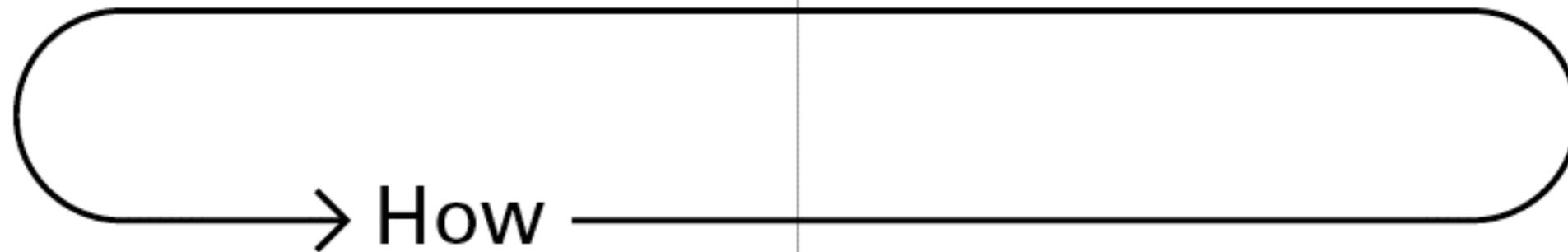
Participant A

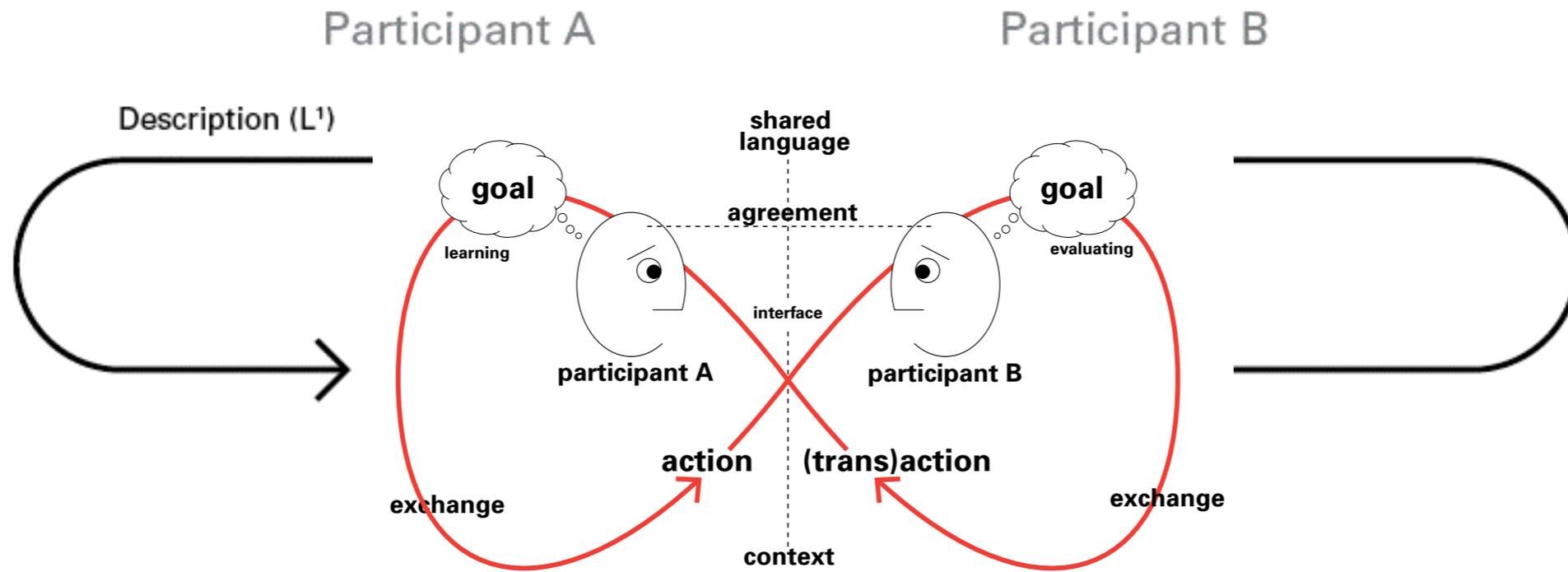
Participant B

Description (L¹)

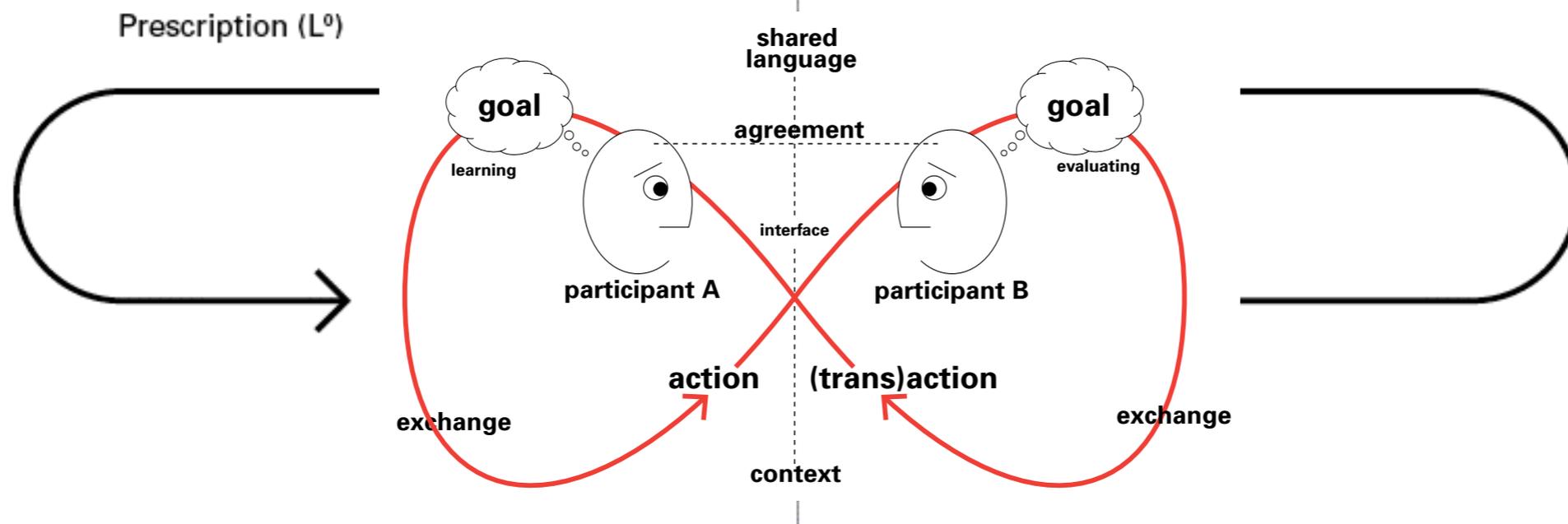


Prescription (L⁰)

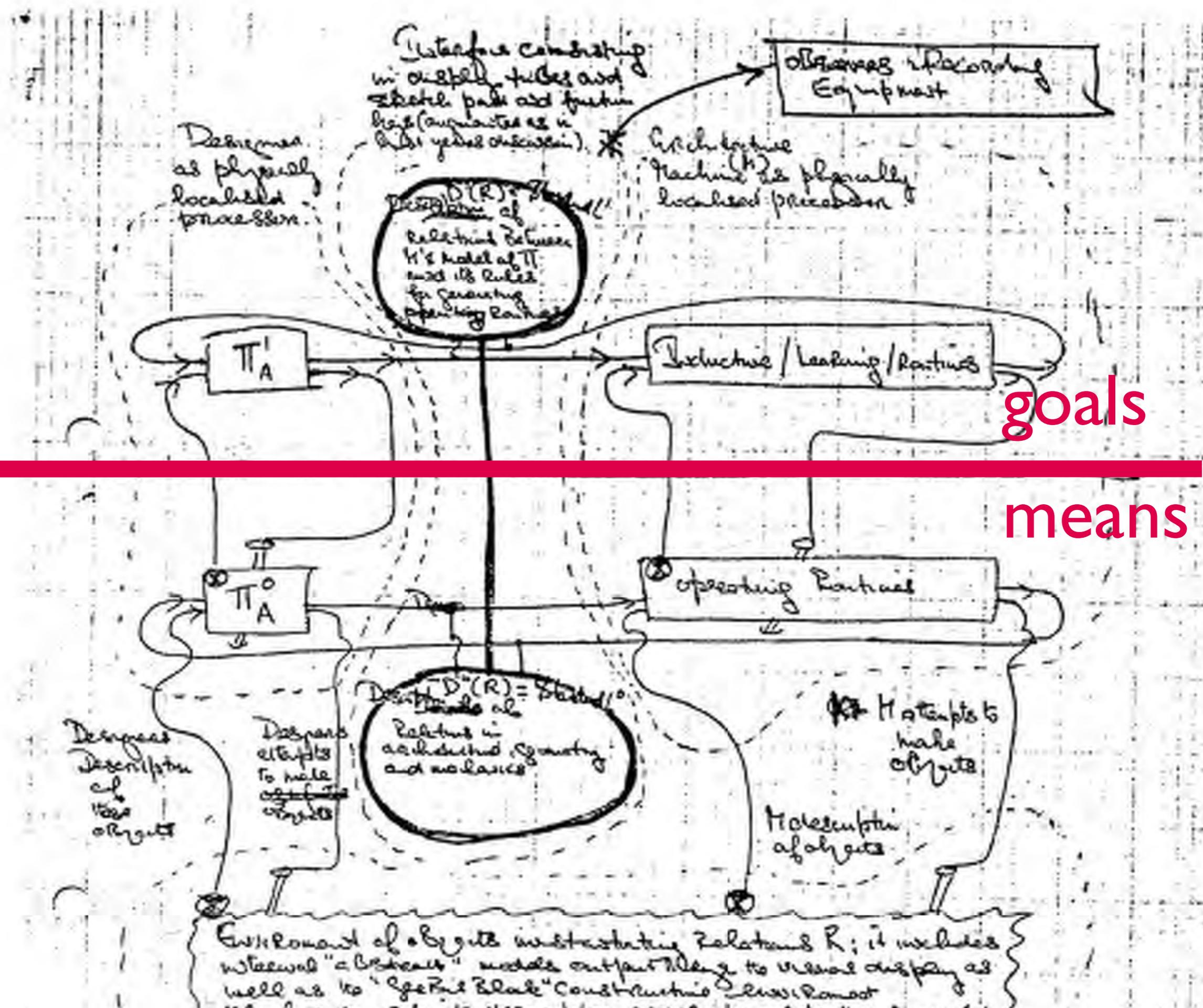




goals

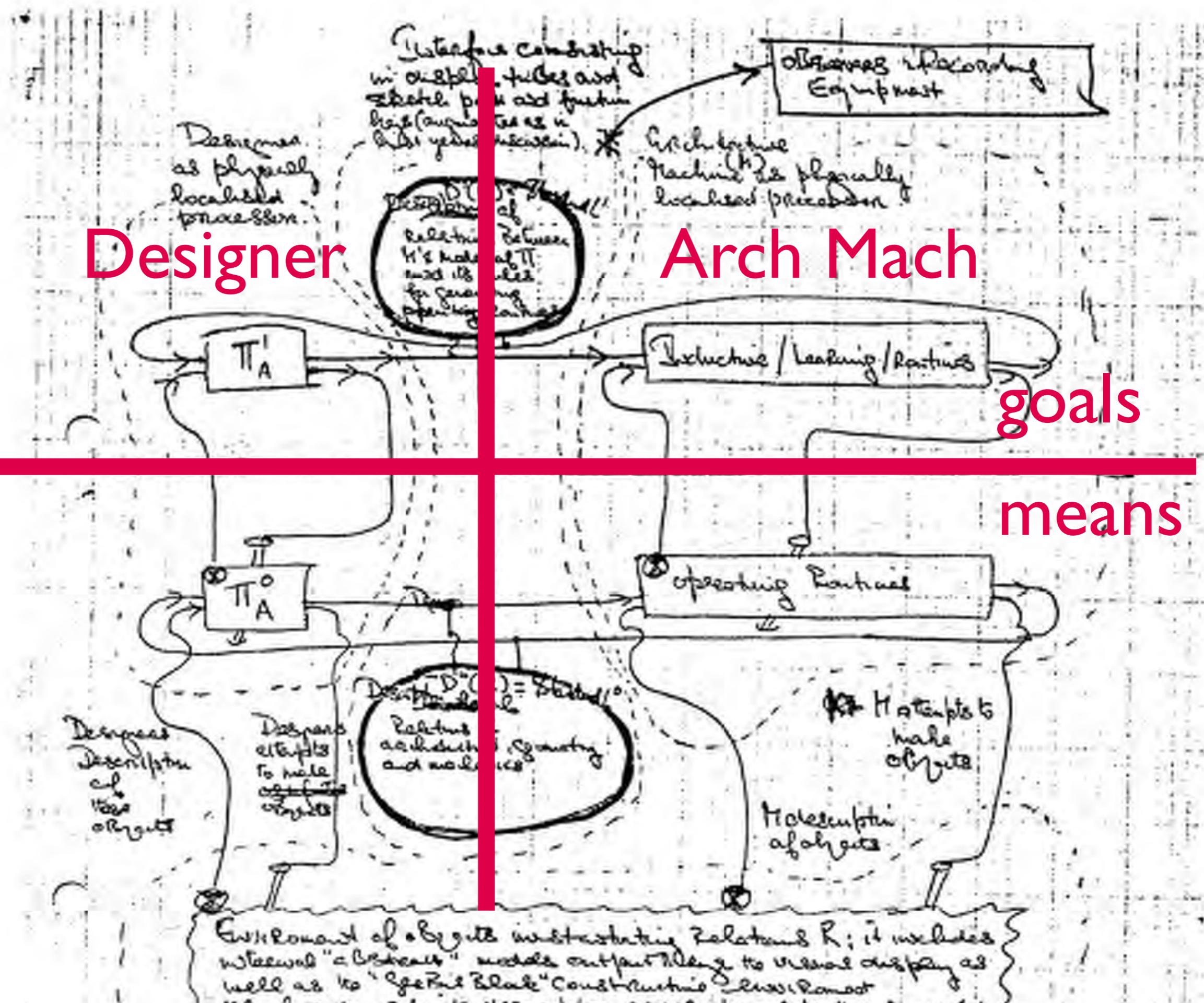


means



goals

means



Designer

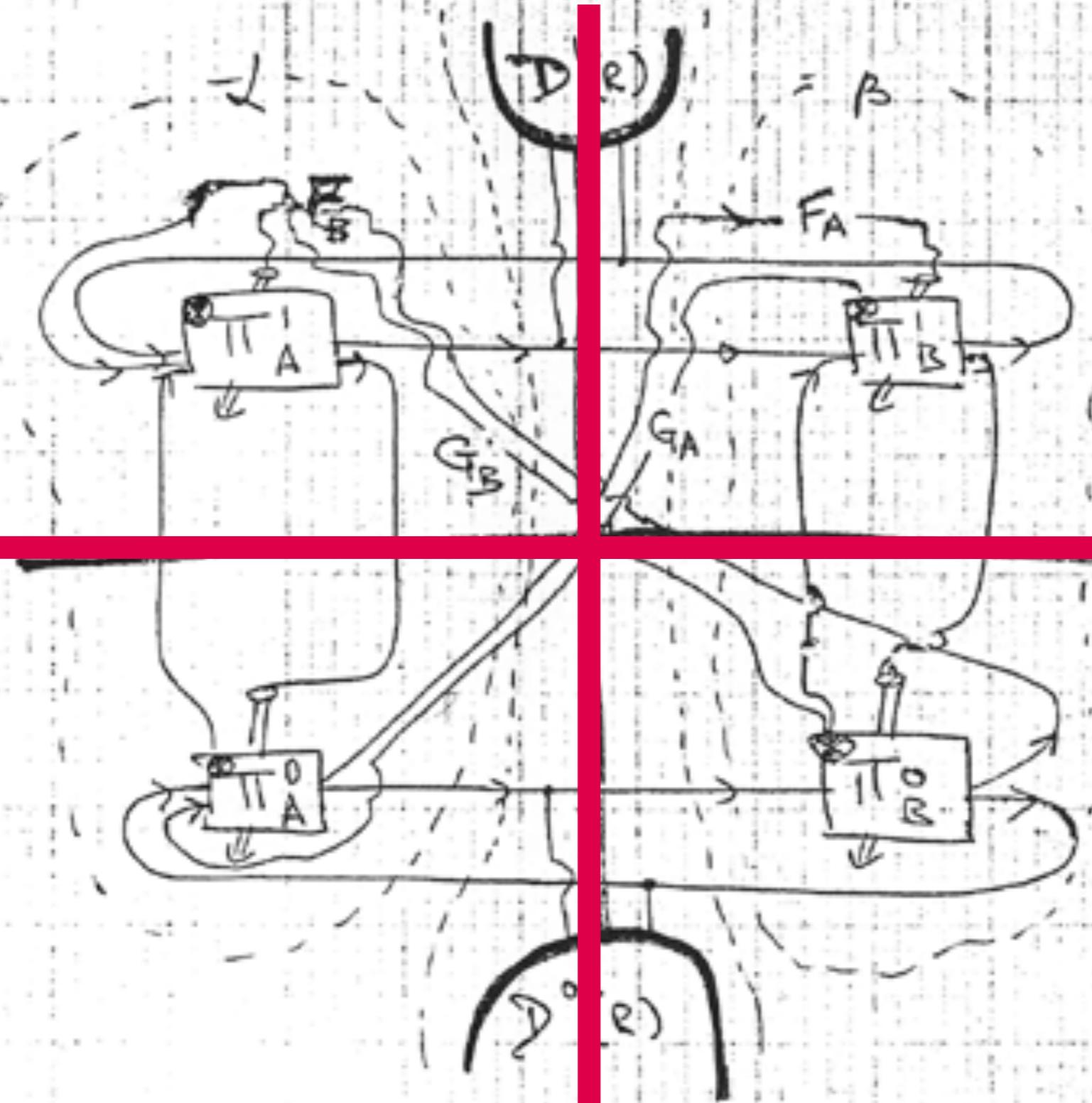
Arch Mach

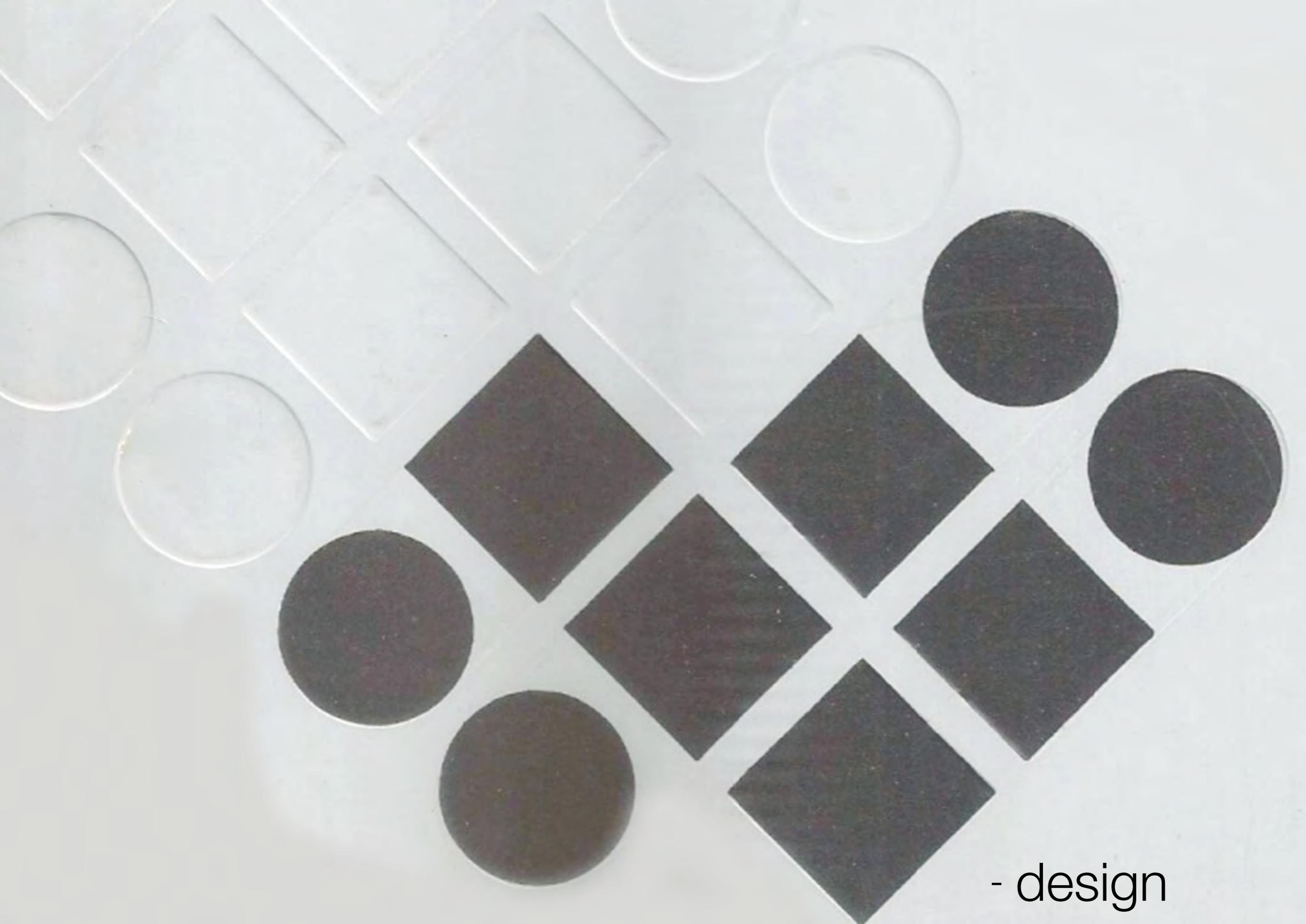
goals

means

Environment of objects interacting relations R; it includes internal "abstract" model output along to visual display as well as to "operational" construction environment...
 H attempts to make objects
 Description of objects

Obers.
Interface





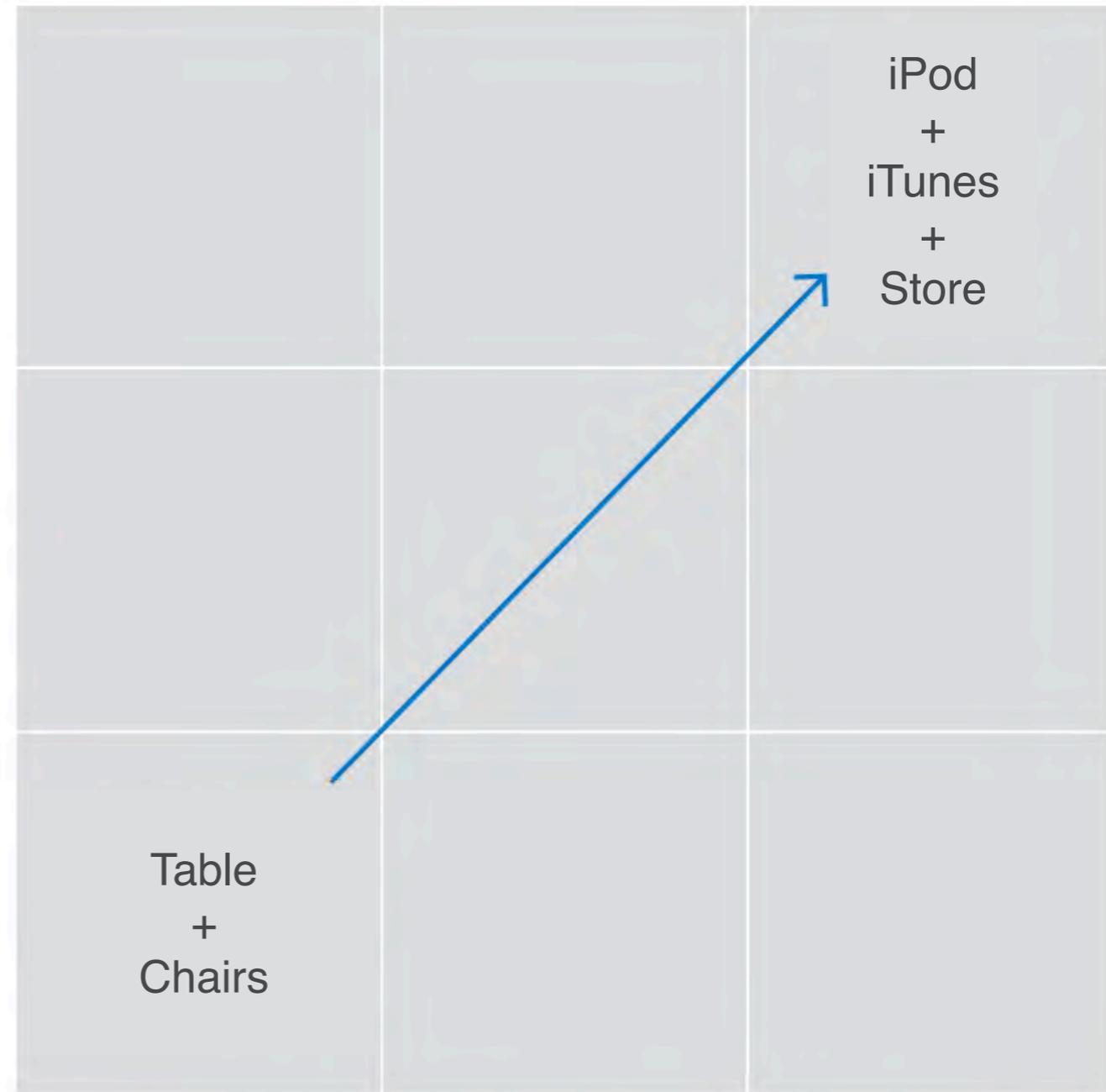
- design

design has changed...

Why (Context/use)

What (Meaning/Structure)

How (Form/Grammar)



Object

System

Community
of systems

Hugh Dubberly

design has changed...

Why (Context/use)

What (Meaning/Structure)

How (Form/Grammar)



Object

System

Community
of systems

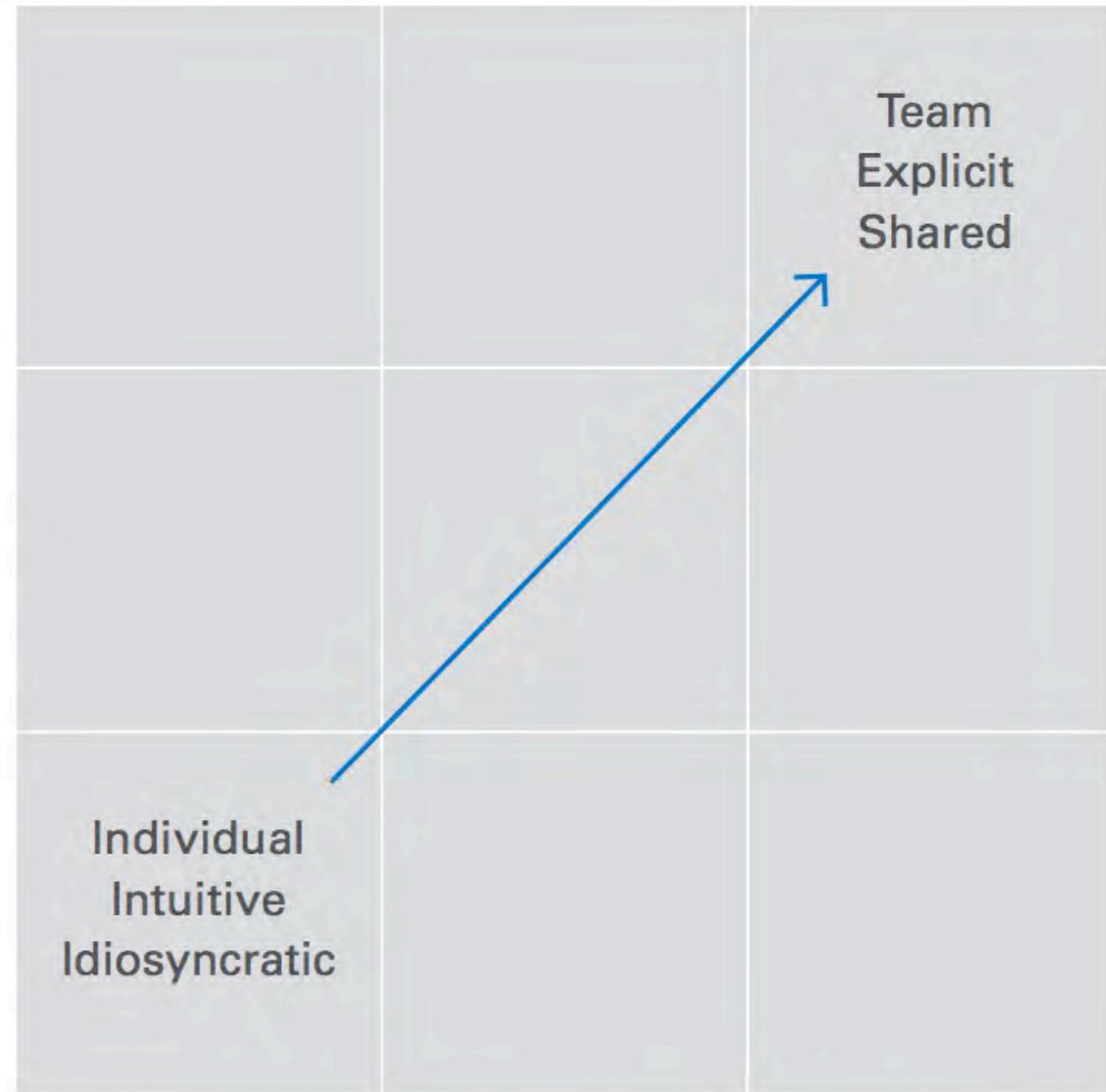
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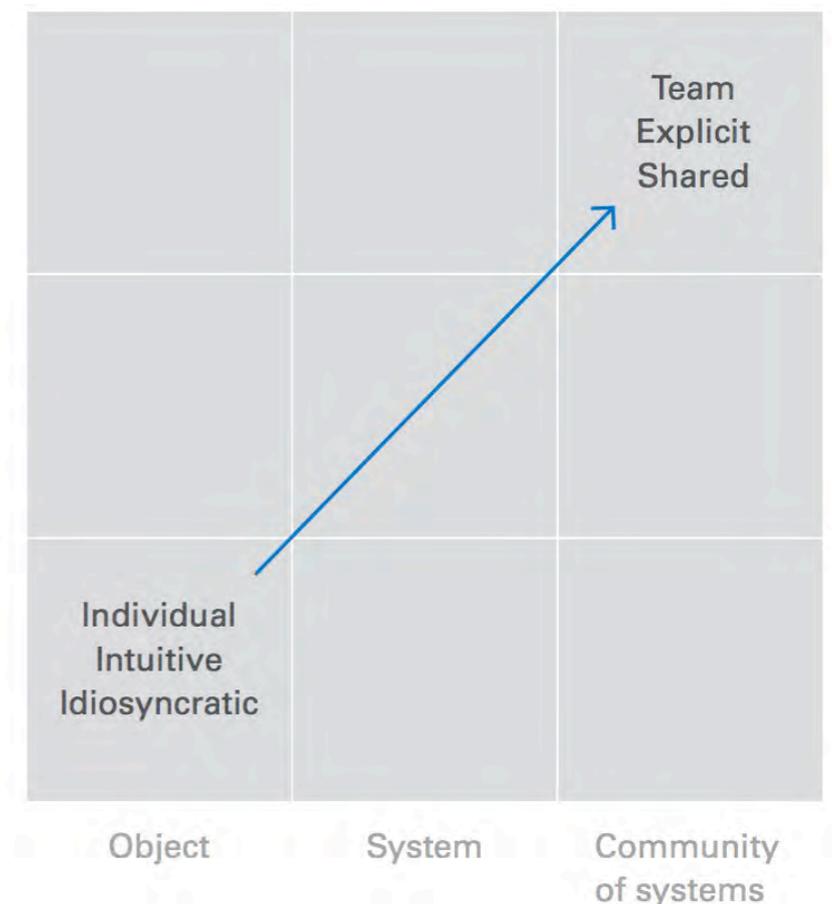
design process must change

We are in a new era of technology, where the sensor + mobility + video webs are being added to the “text web”.

Designers will have new tools and media, which will change the way they work, which suggests changes in design education.

Designers will focus on systems not objects, embrace complexity, and move from form-giving to conversation-managing.

Hugh Dubberly



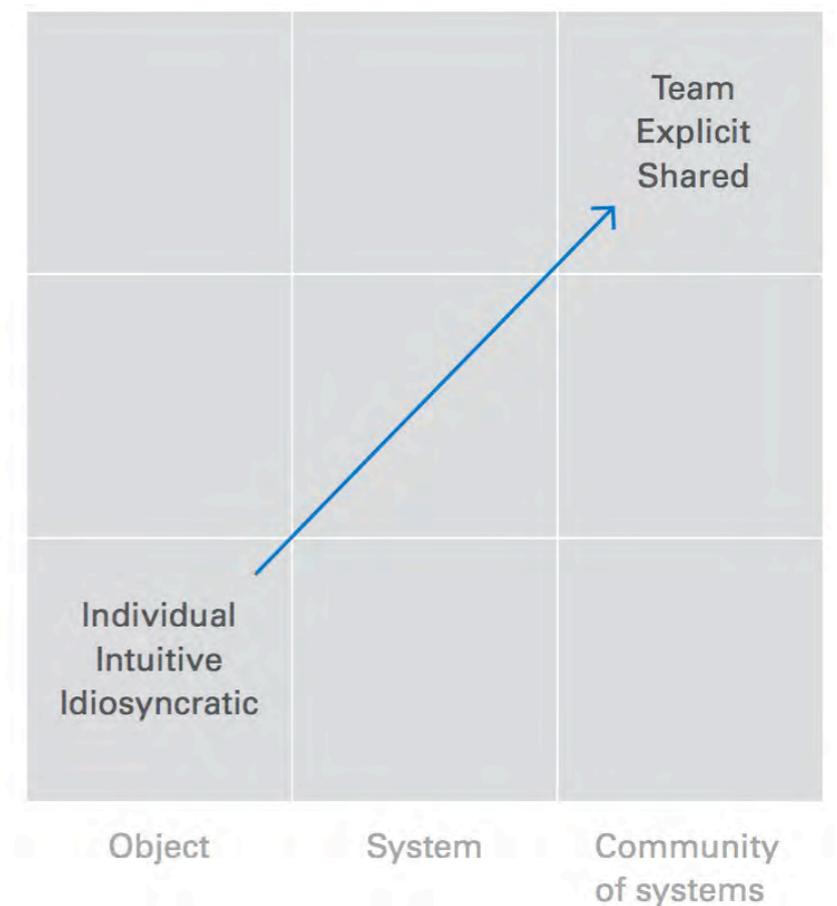
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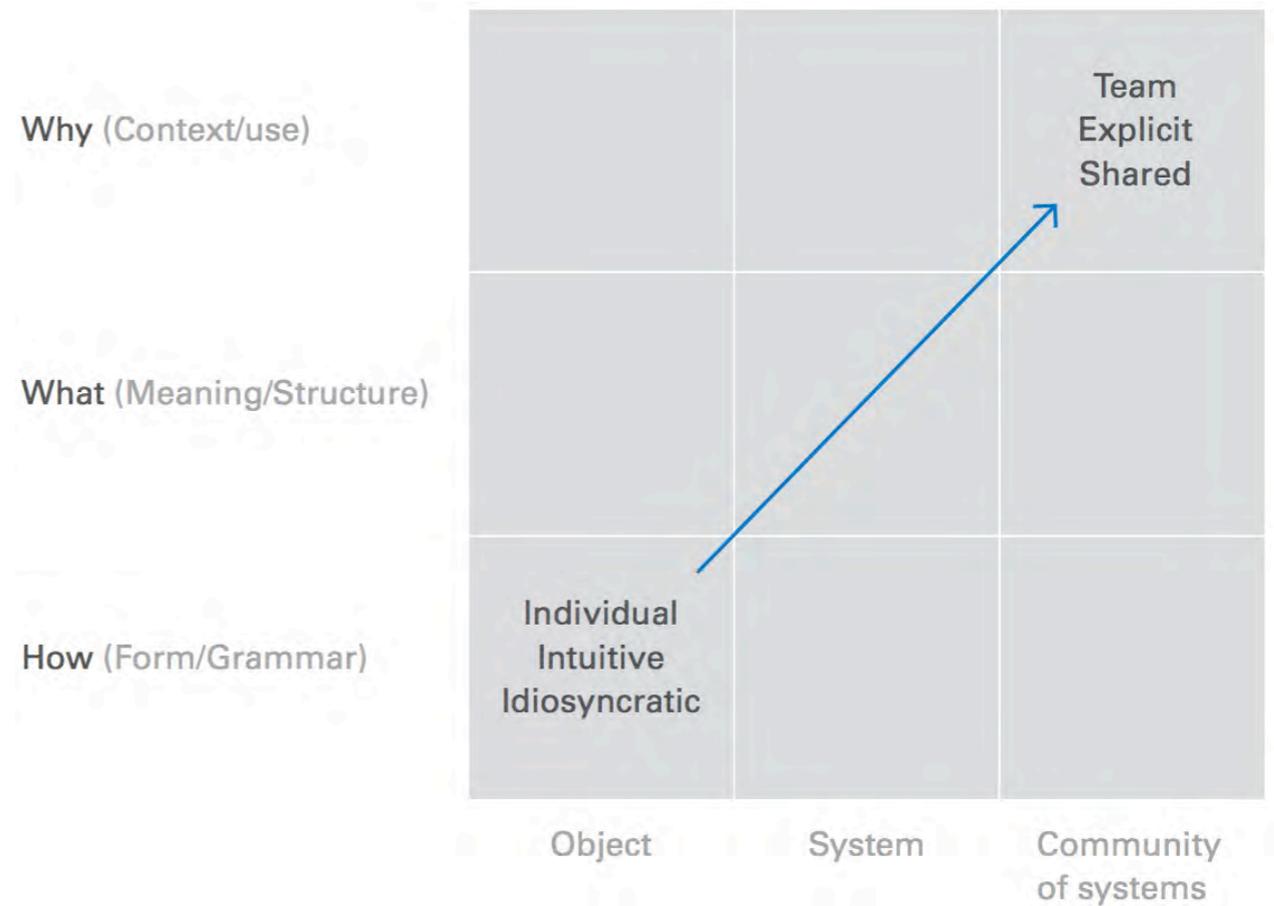
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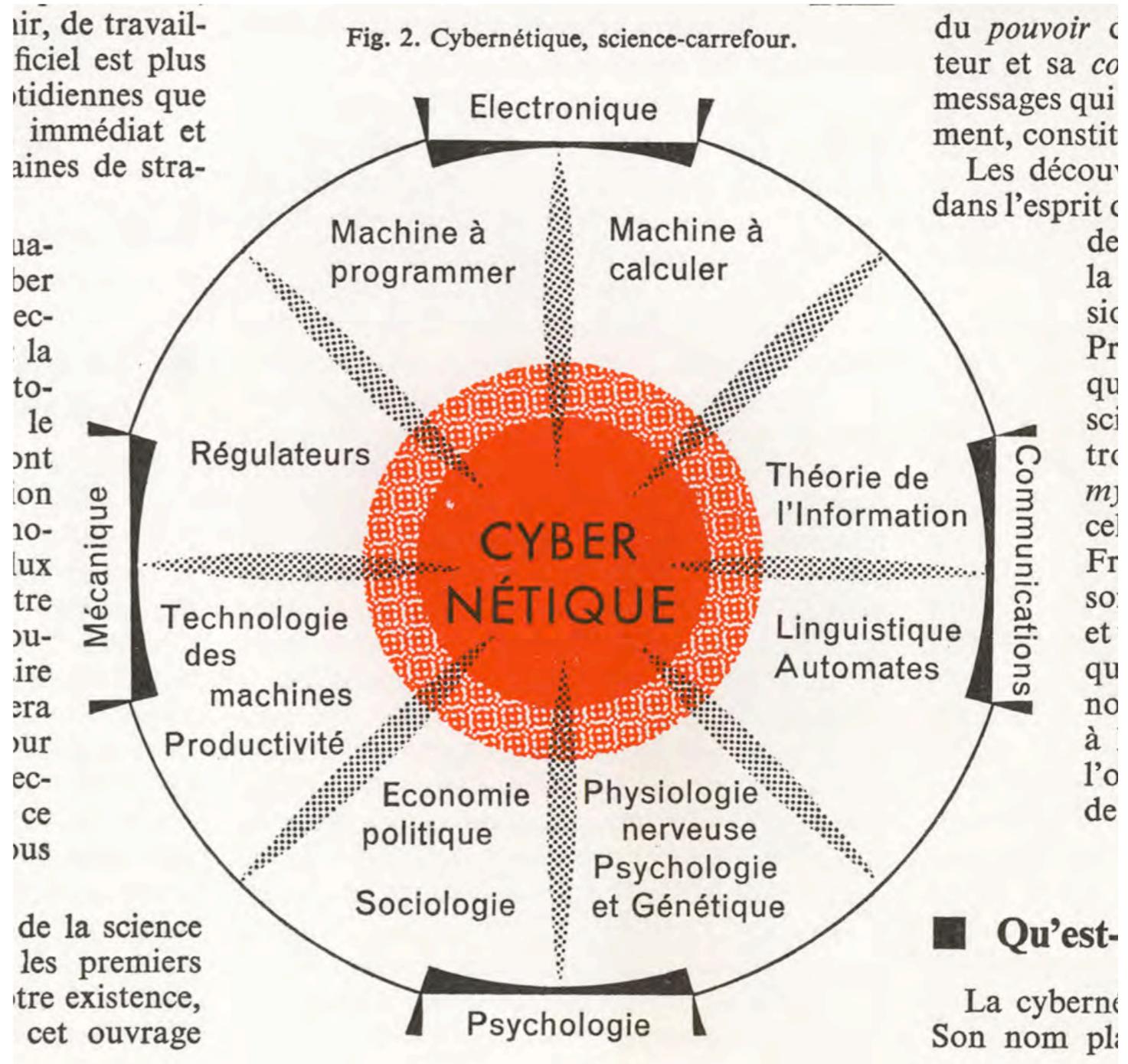
design process must change

Design = systems +
complexity +
conversation

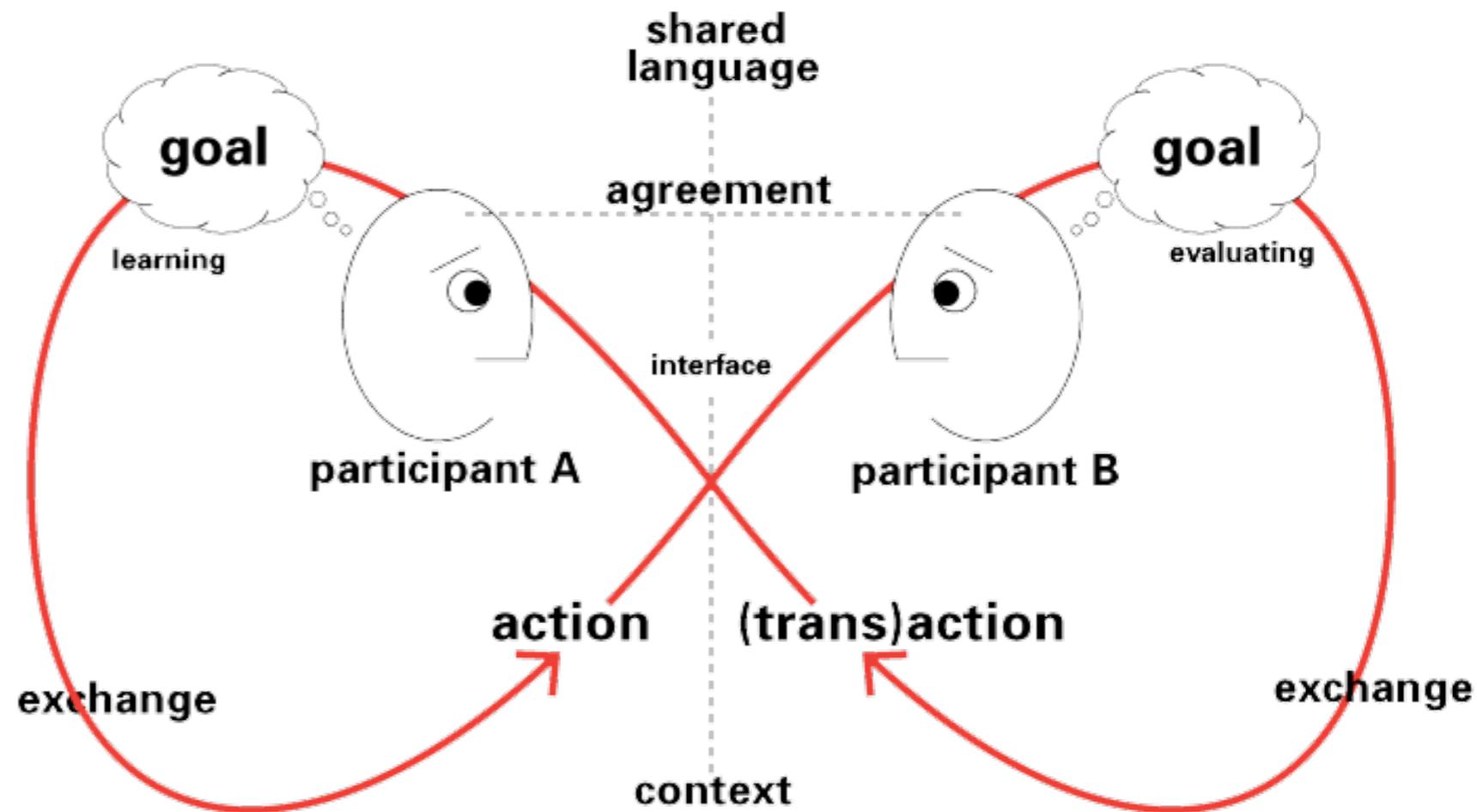


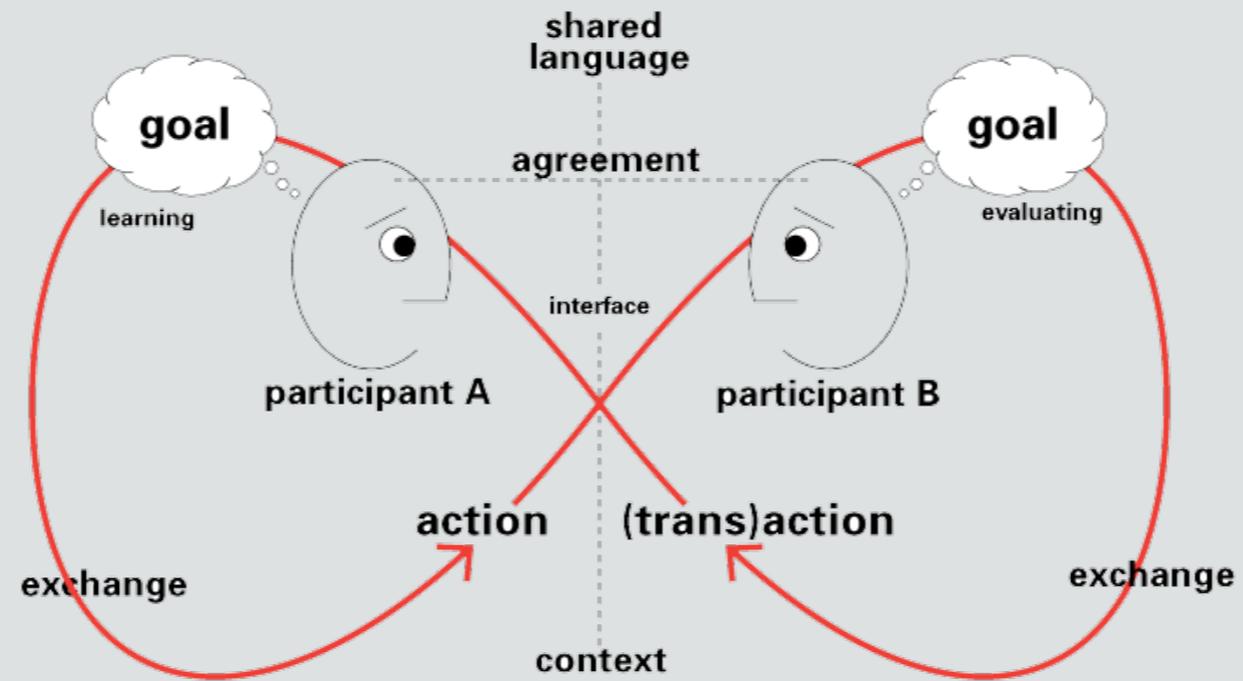
Design = systems + complexity + conversation

=



Design = systems +
complexity +
conversation =





design for context
language
exchange
agreement
(trans)action

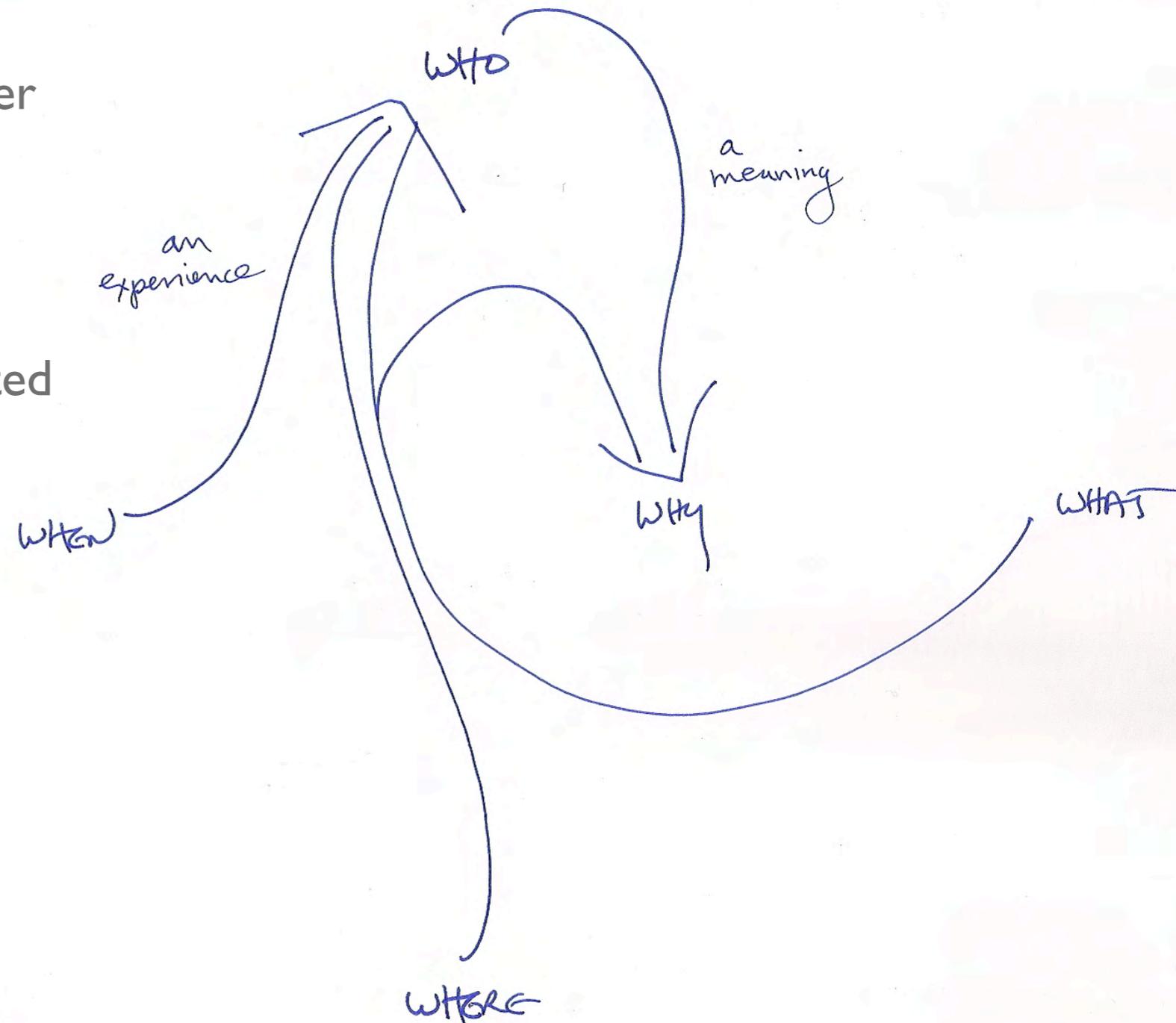
context of sharing



context of sharing

the WHY or value of an experience gives a user an impetus to:

- capture it, in order to remember
- remember, to re-live
- re-live again by sharing
- share in order to connect
- connect to be seen + appreciated
- be seen in order to participate
- participate to create new possibilities.



2010.02.27.4

acts of sharing

| | user's experience + desire to share | | | |
|-------|---|--|--|--|
| WHO | Mary | | | |
| WHAT | beach experience | | | |
| WHEN | now = family vacation | | | |
| WHERE | Hawaii | | | |
| WHY | enjoying leisure time with family | | | |

acts of sharing

flowing from situation to situation



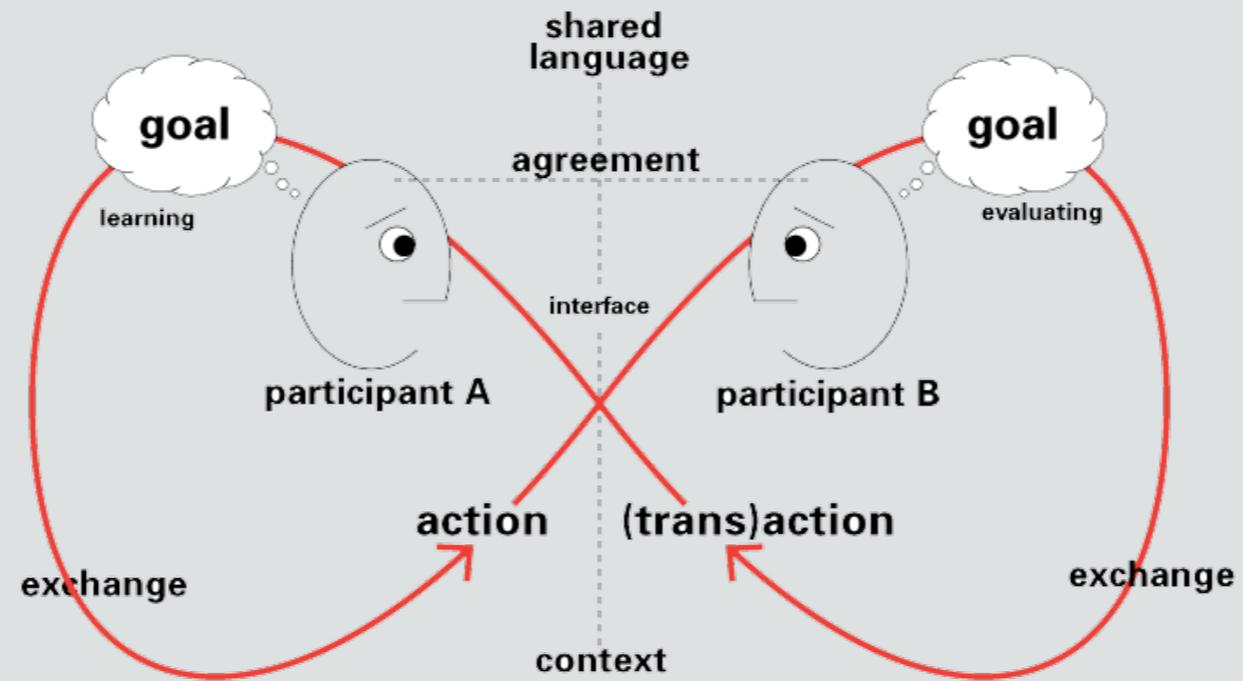
| | user's experience + desire to share | create a sharable | offer a conversation | others evolve conversation |
|-------|-------------------------------------|-----------------------------------|------------------------|---------------------------------|
| WHO | Mary | Mary | 3 closest friends | further forwarding |
| WHAT | beach experience | photo | photo | photo |
| WHEN | now = family vacation | now = family vacation | today | 2 years ago when John was there |
| WHERE | Hawaii | Hawaii | Kaanampali, Hawaii | Kaanampali, Hawaii |
| WHY | enjoying leisure time with family | enjoying leisure time with family | sharing the experience | it rained the entire time |

acts of sharing

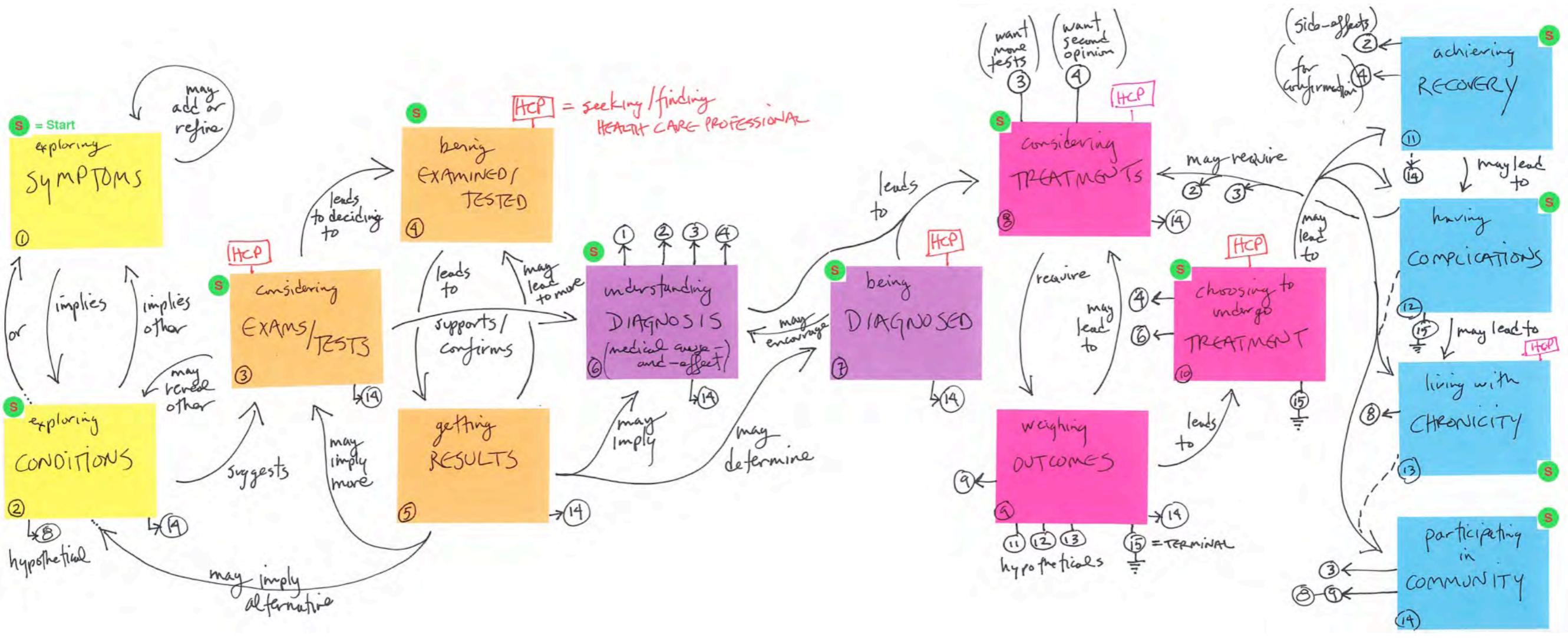
flowing from situation to situation

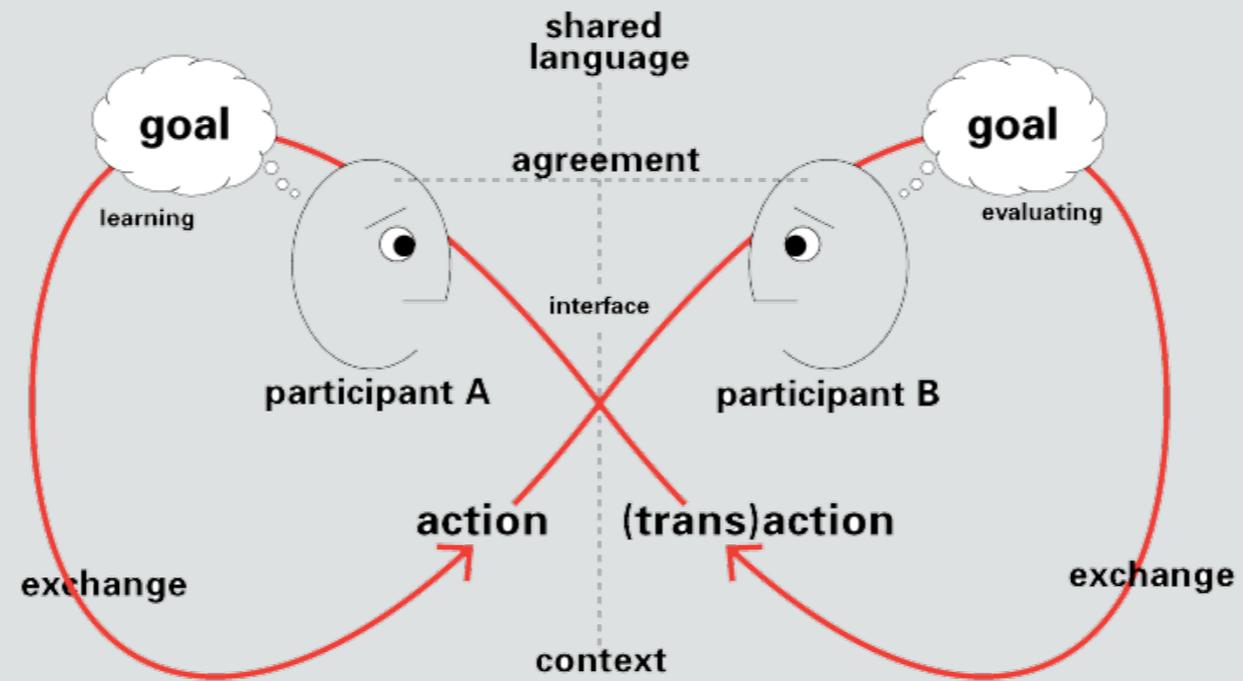


| | looking for beaches | posts query to FB | friends respond with comments | user takes advice | user uploads outcomes |
|-------|---------------------------------|---------------------------------|------------------------------------|---------------------------------|---------------------------------|
| WHO | Alberto | Alberto | Mary | Alberto | Alberto |
| WHAT | beach locations for snorkeling | places posted to FB | “loved Snorkeling at Mary’s beach” | photos of recommended place | beach locations for snorkeling |
| WHEN | future = upcoming vacation | future = upcoming vacation | future = upcoming vacation | now = on vacation | now = on vacation |
| WHERE | at home but about Hawaii | at home but about Hawaii | at home but about Hawaii | Snorkeling at Mary’s beach | Snorkeling at Mary’s beach |
| WHY | finding great places to snorkel | finding great places to snorkel | finding great places to snorkel | finding great places to snorkel | finding great places to snorkel |



context
 design for language
 exchange
 agreement
 (trans)action

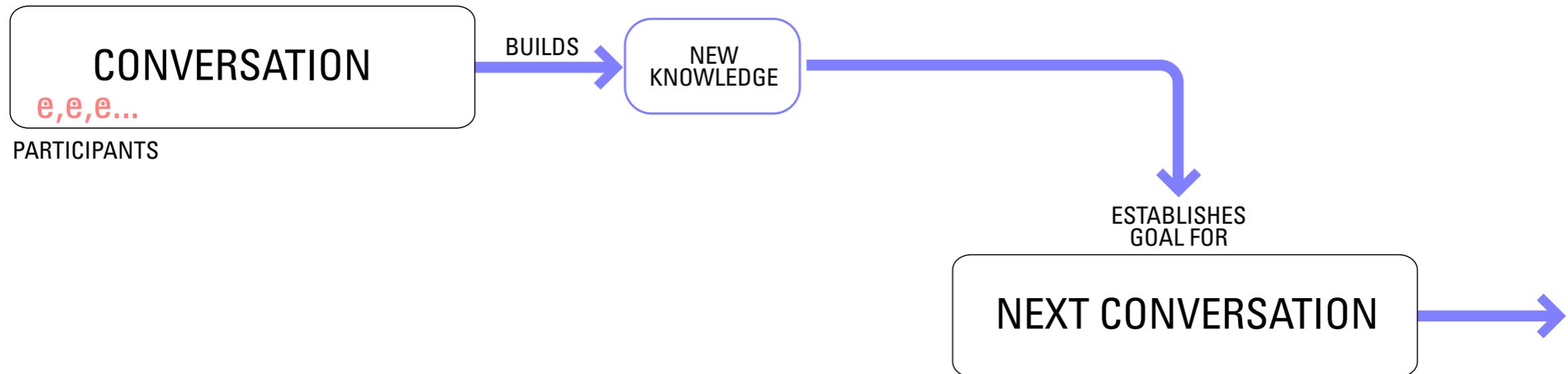


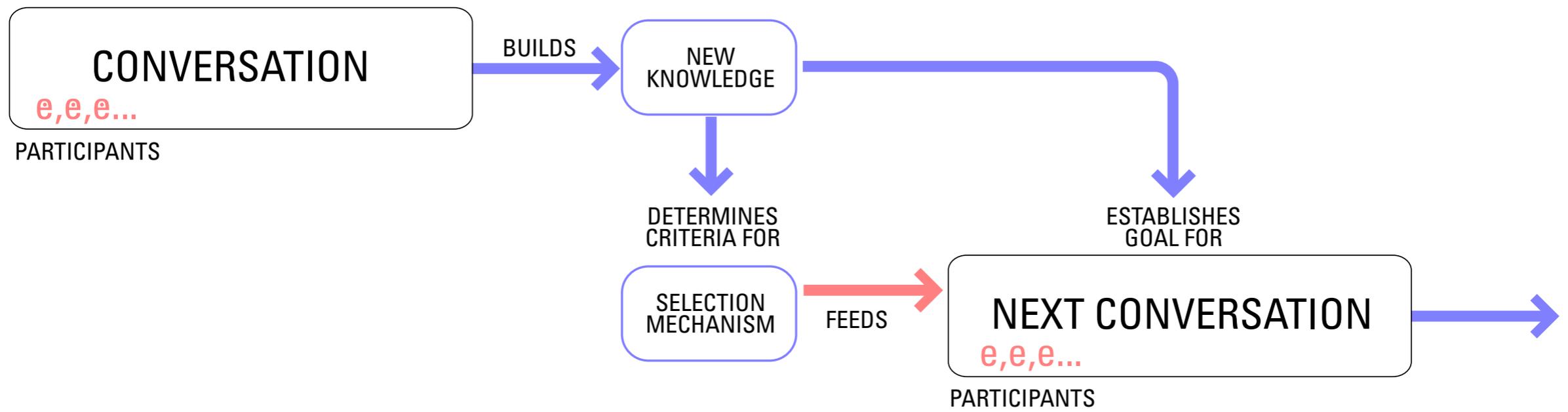


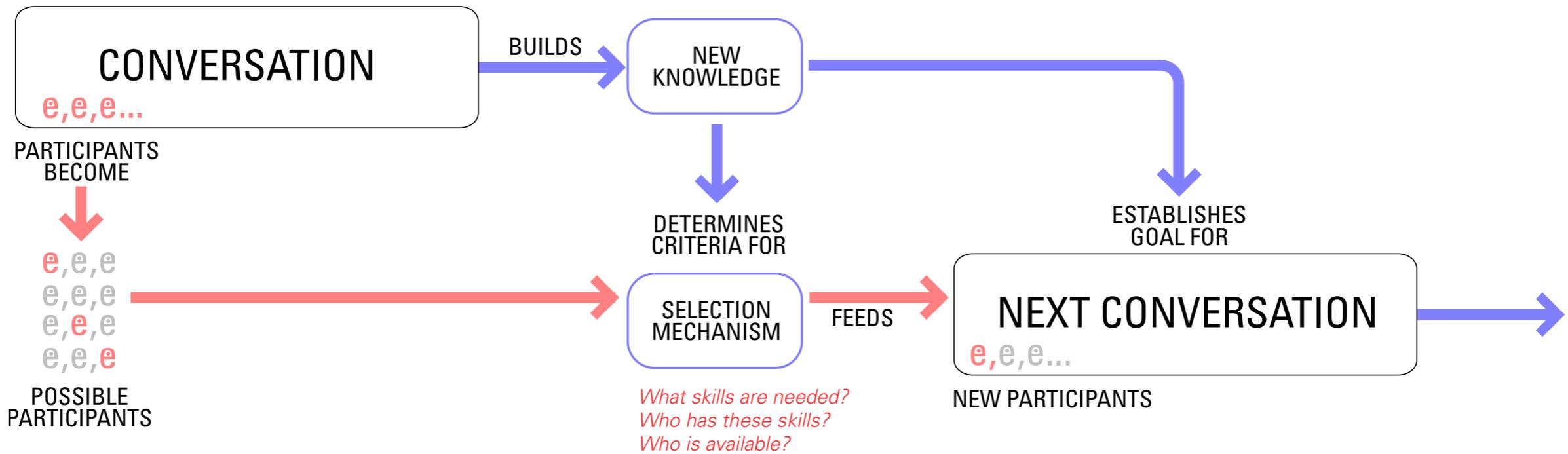
context
 language
 design for exchange
 agreement
 (trans)action

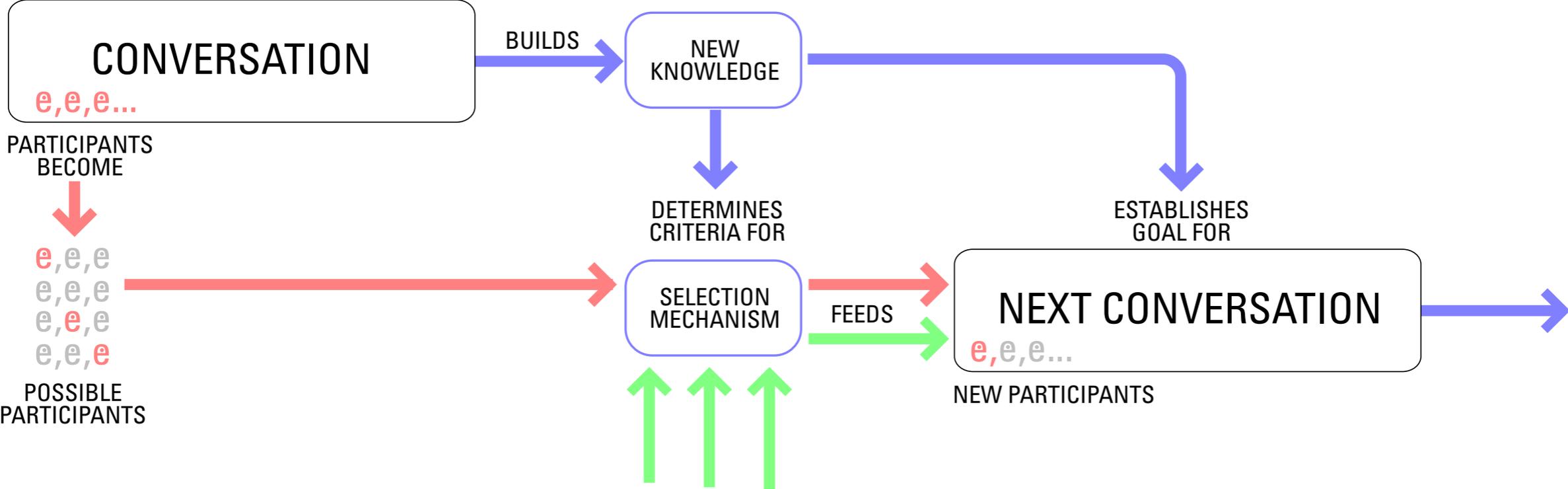
DESIGNING for COLLABORATION

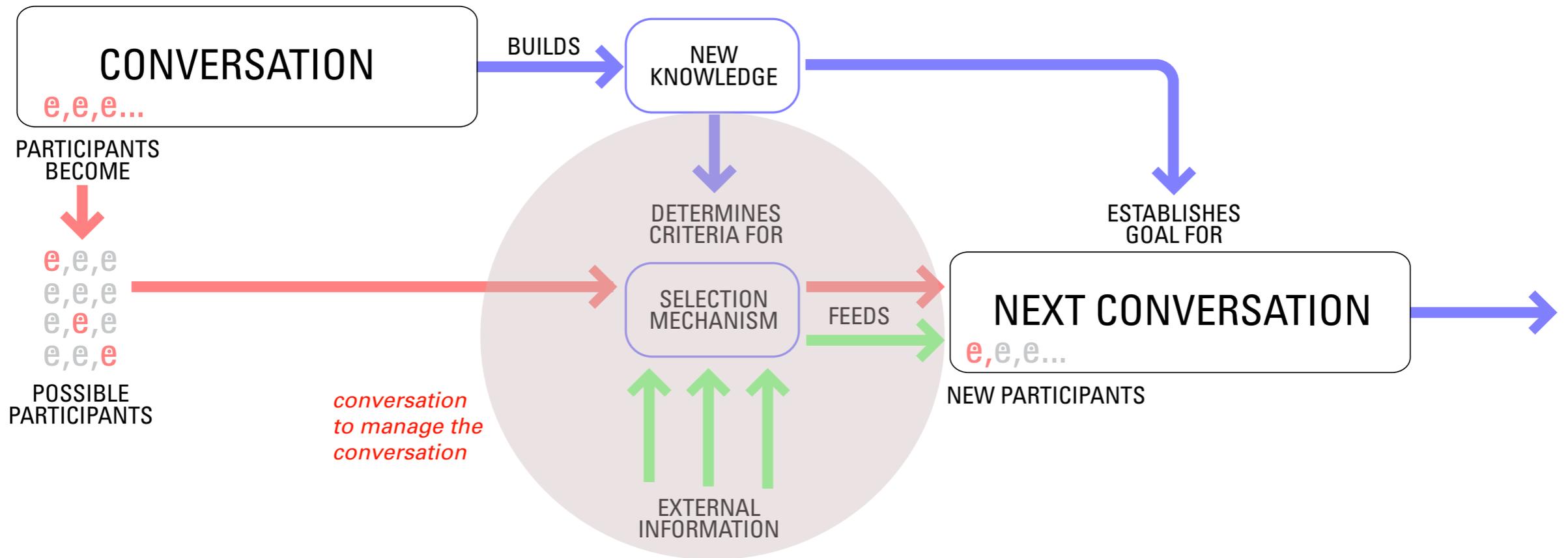
Designing conversations and managing complexity











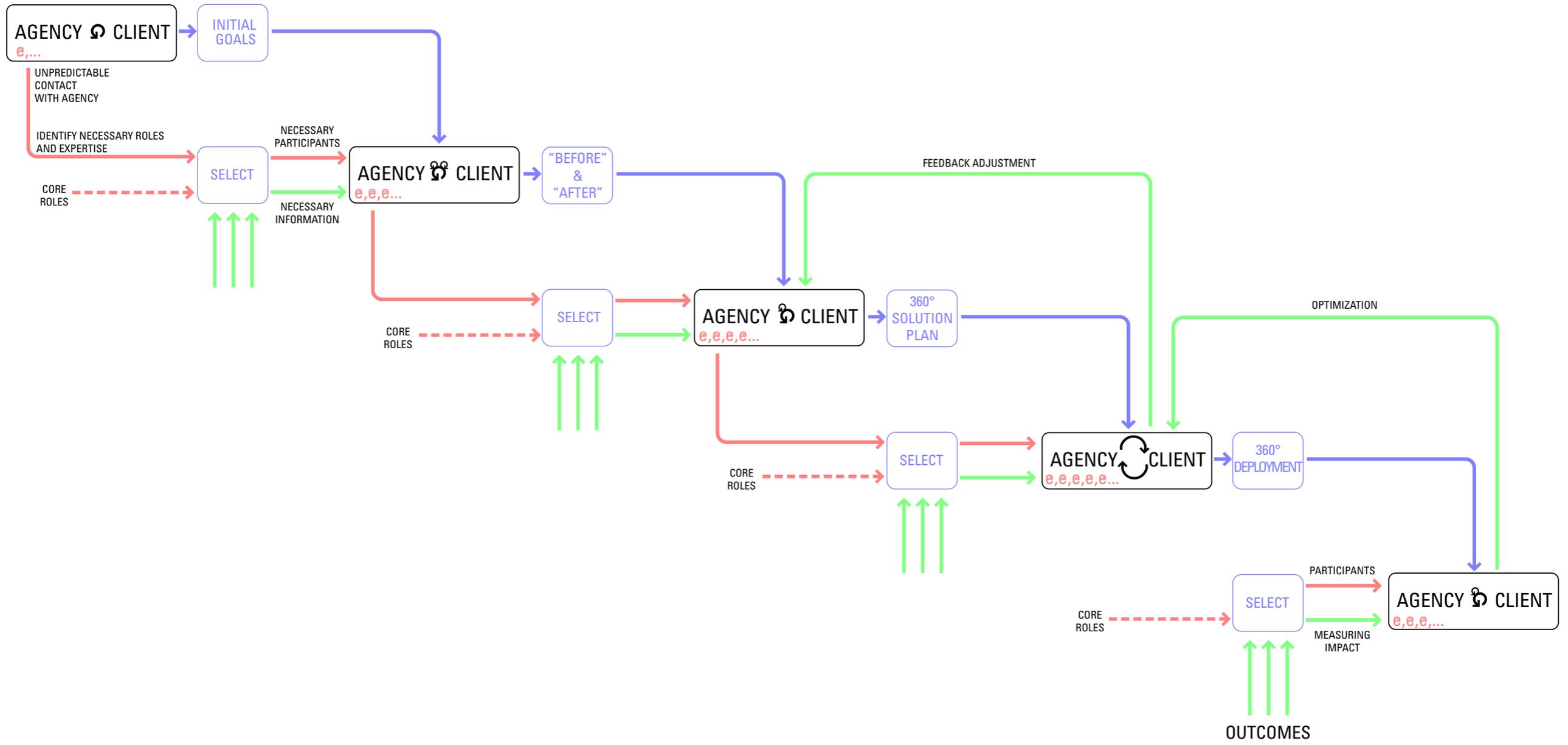
catalyst

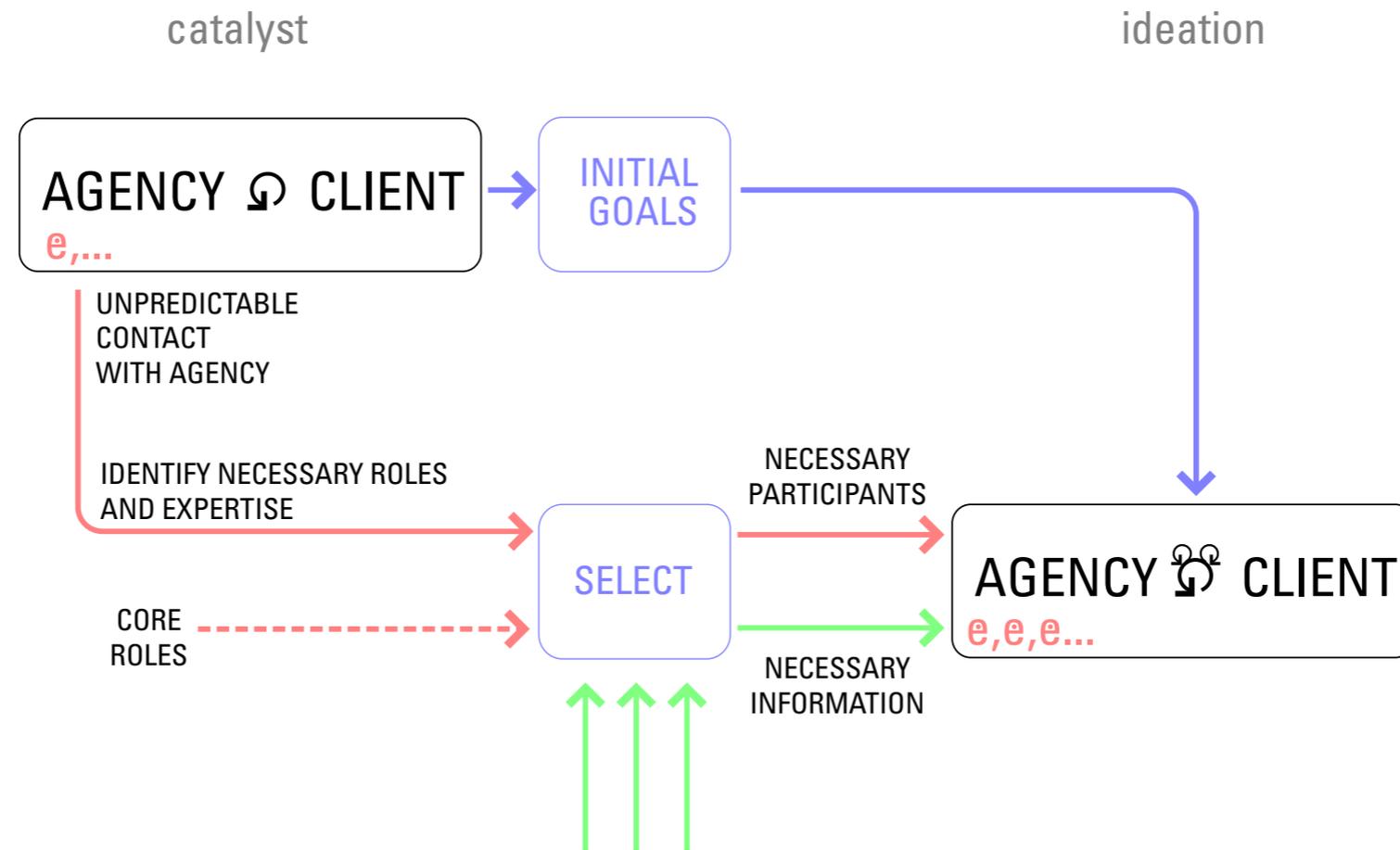
ideation

solution

delivery

evaluation





Every new engagement begins from an initial contact: client and agency have some exchange. This can't be predicted and so who from the agency is engaged can't be planned. In the exchange the agency learns of some catalyst, some reason why the client has made contact, and may learn little more in this first, usually brief, encounter. A set of questions defines selection criteria for participants and information for the "ideation" conversation:

What was catalyst for the contact? What was said?
 What is bothering the client?

What is the business and market context?

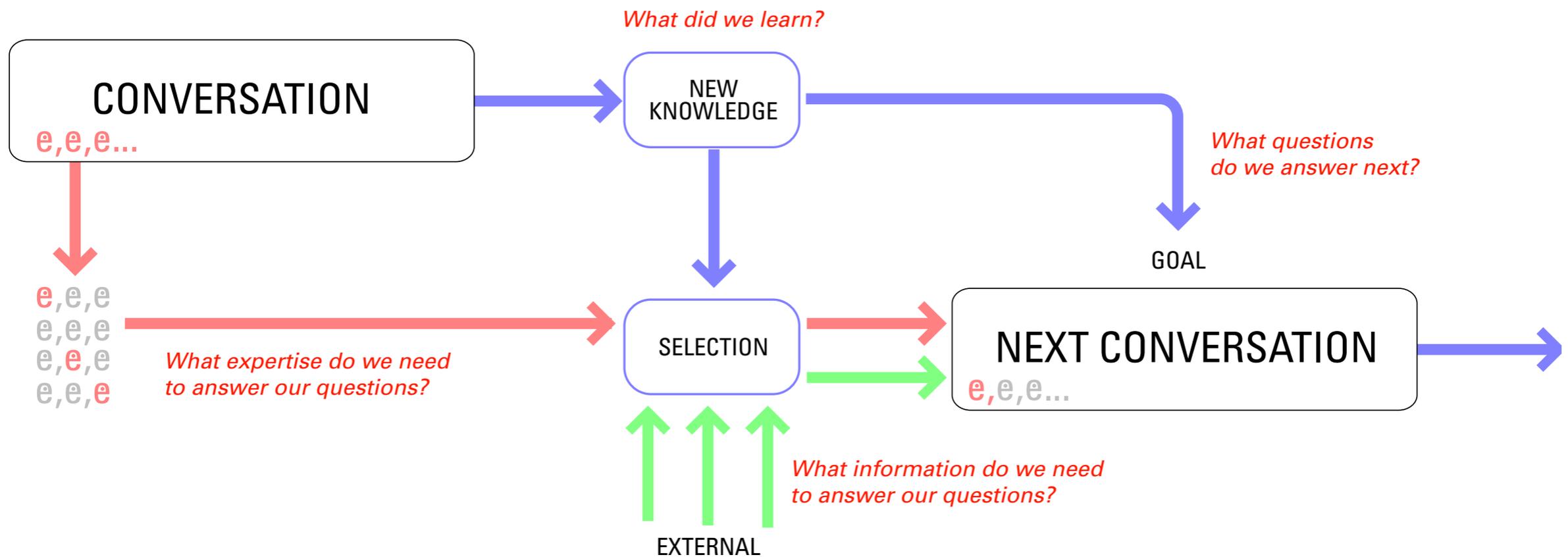
Who are key players for client and agency?

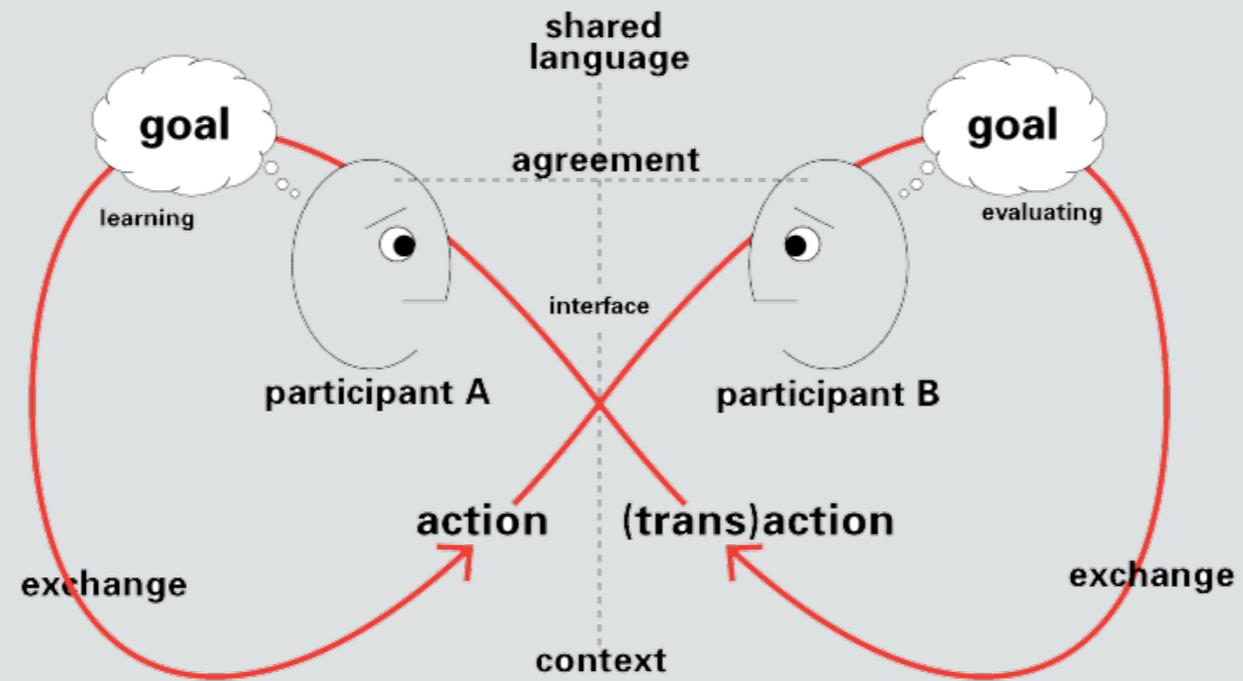
What is the client culture and brand about?

What are client's goals? Does the client know them?

Given the above, what roles, filled by what individuals, are appropriate for the ideation stage?

DESIGNING for INNOVATION





context
language
exchange
design for agreement
(trans)action

innovation

- **what is innovation?**
- how do we get it?
- when do we need it?

innovation

innovation is
an insight that
inspires change
that creates value.

innovation

value

innovation is not just

...an idea

...an invention

...an improvement

...simple creativity.

change

insight

convention convention

innovation

innovation

value

...can be modeled as a conversation
— goals + feedback + actions

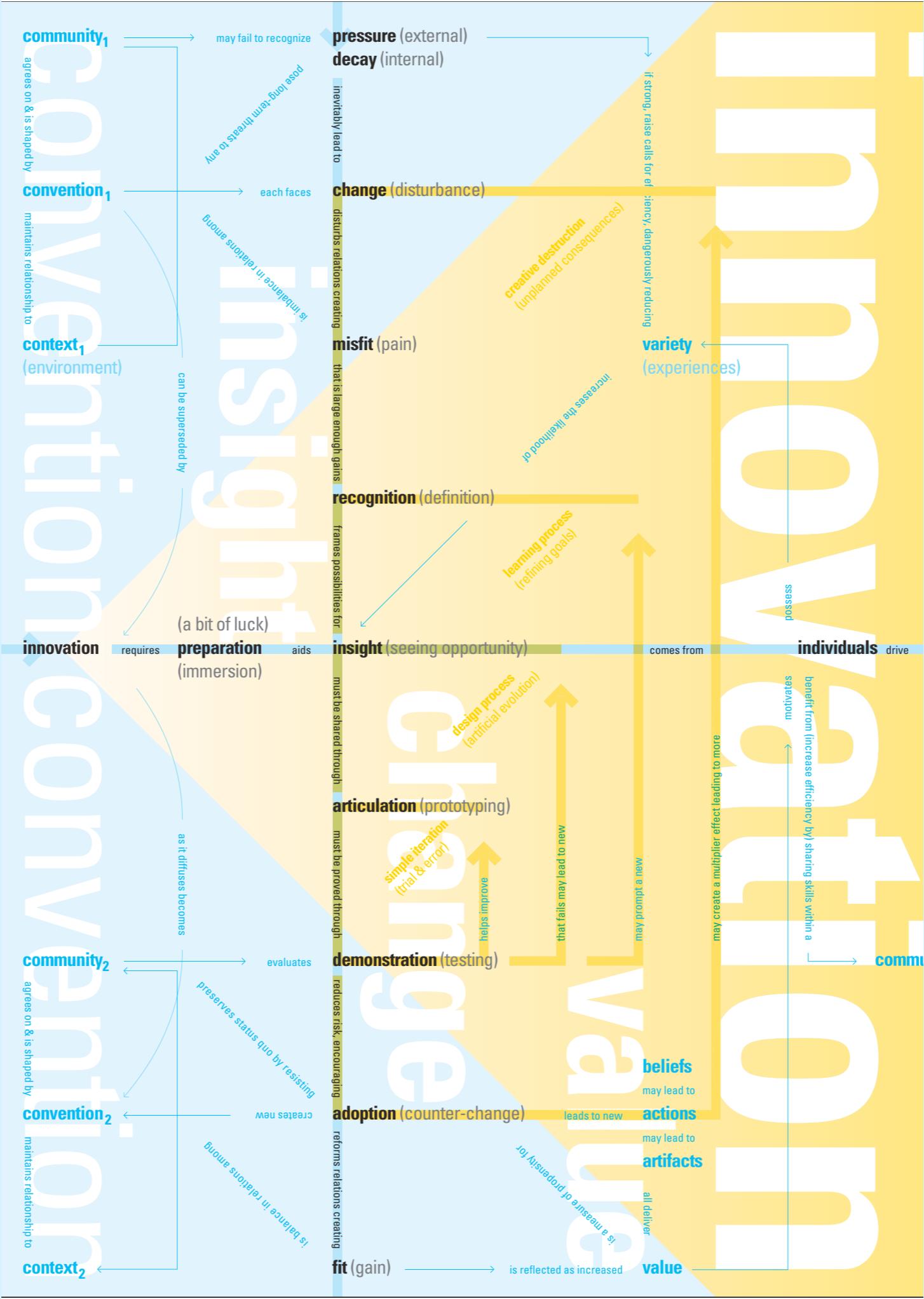
change

...requires sufficient variety

...is a co-evolutionary process.

insight

convention convention



community₁

agrees on & is shaped by

convention₁

maintains relationship to

context₁

(environment)

may fail to recognize

pose long-term threats to any

each faces

! imbalance in relations among

can be superseded by

pressure (external)
decay (internal)

inevitably lead to

change (disturbance)

disturbs relations creating

misfit (pain)

that is large enough gains

recognition (definition)

creative destruction
(unplanned consequences)

increases the likelihood of

if strong, raise calls for efficiency, dangerously reducing

variety
(exp)

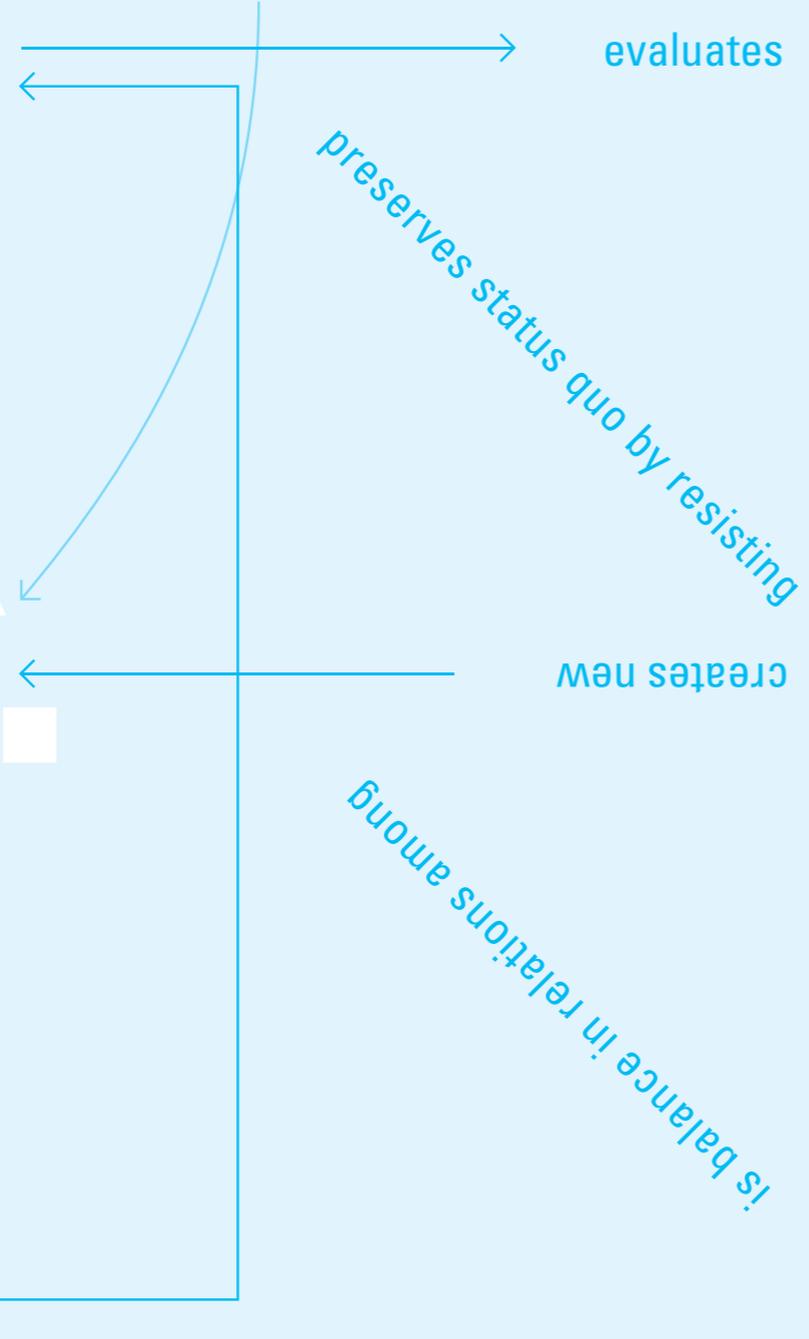
community₂

agrees on & is shaped by

convention₂

maintains relationship to

context₂



as it diffuses becomes

evaluates

preserves status quo by resisting

creates new

is balance in relations among

must be proved through

demonstration (testing)

reduces risk, encouraging

adoption (counter-change)

reforms relations creating

fit (gain)

simple iteration
(trial & error)

helps improve

that fails may lead to new

may prompt a new

belief

may lead

action

may lead

artifacts

all deliver

value

leads to new

is a measure of propensity for

is reflected as increased



Notes on the
Role of
Leadership
and Language
in Regenerating
Organizations

An organization is its language.

Ultimately,
an organization consists of conversations:
who talks to whom, about what.

Conversation leads to agreement.
Agreement leads to transaction.

Narrowing language increases efficiency.

Organizations create their own internal language to solve specific problems.

This language serves as a kind of shorthand: Managers use it every day, knowing they will be clearly understood.

Over time, this internal language grows increasingly specialized — and narrow.

Narrowing language also increases ignorance.

The organization's internal language is designed to help managers facilitate present-day business — not look beyond it.

Using the internal language, managers increase efficiencies, but cannot recognize new fields of research, new discoveries, new approaches.

Narrowing language also increases ignorance.

The organization's internal language is designed to help managers facilitate present-day business — not look beyond it.

Using the internal language, managers increase efficiencies, but cannot recognize new fields of research, new discoveries, new approaches.

Like all of us, they cannot recognize their own limitations. Constrained by the previously successful language, we do not know that we do not know. Consequently, we think we know — and thus cannot learn.

Developed as a tool to increase efficiencies, the organization's language, paradoxically, becomes a trap.

Expanding language increases opportunity.

The conversations necessary
for generating new opportunities
come from outside the system.

For an organization to survive,
it must be able to acquire
new, relevant language domains.

To regenerate,
an organization creates
a new **language**.

To support an organization's future viability, effective decision makers actively introduce change into the system.

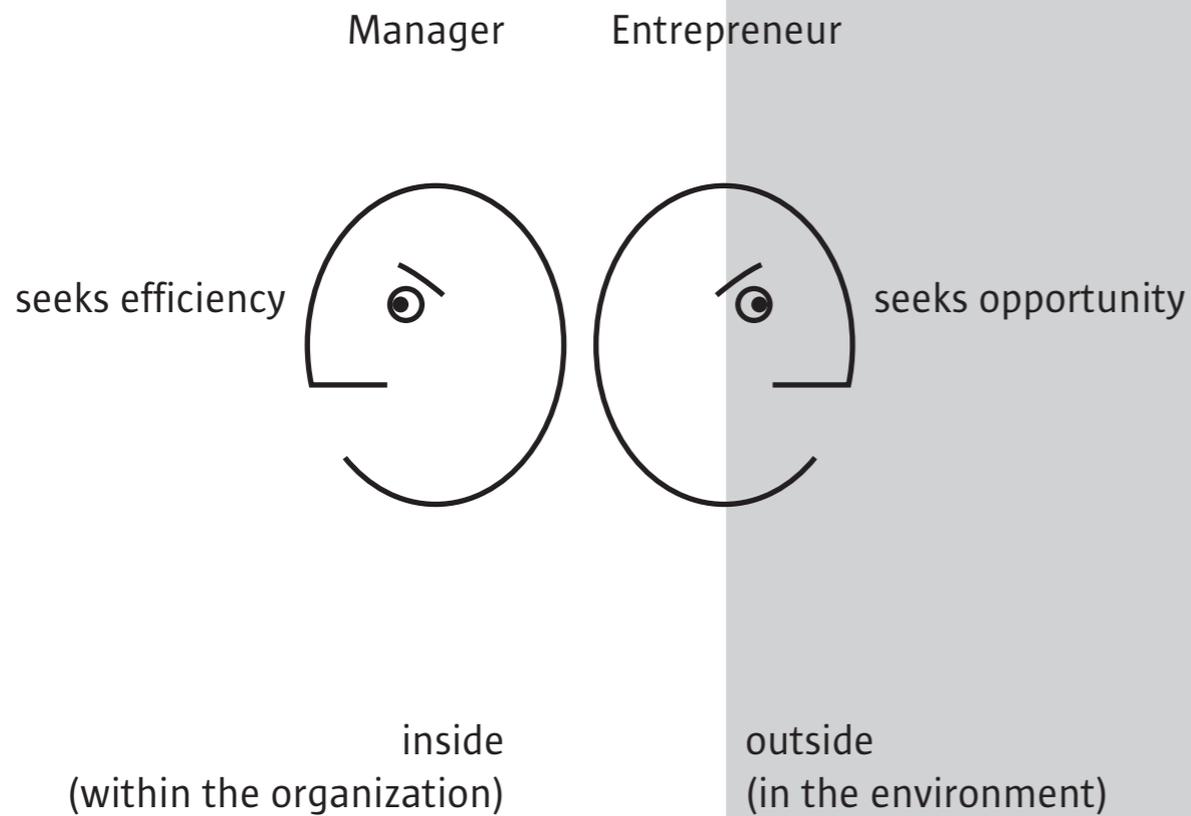
They do so by generating new language that appropriate groups in the organization come to understand and embrace.

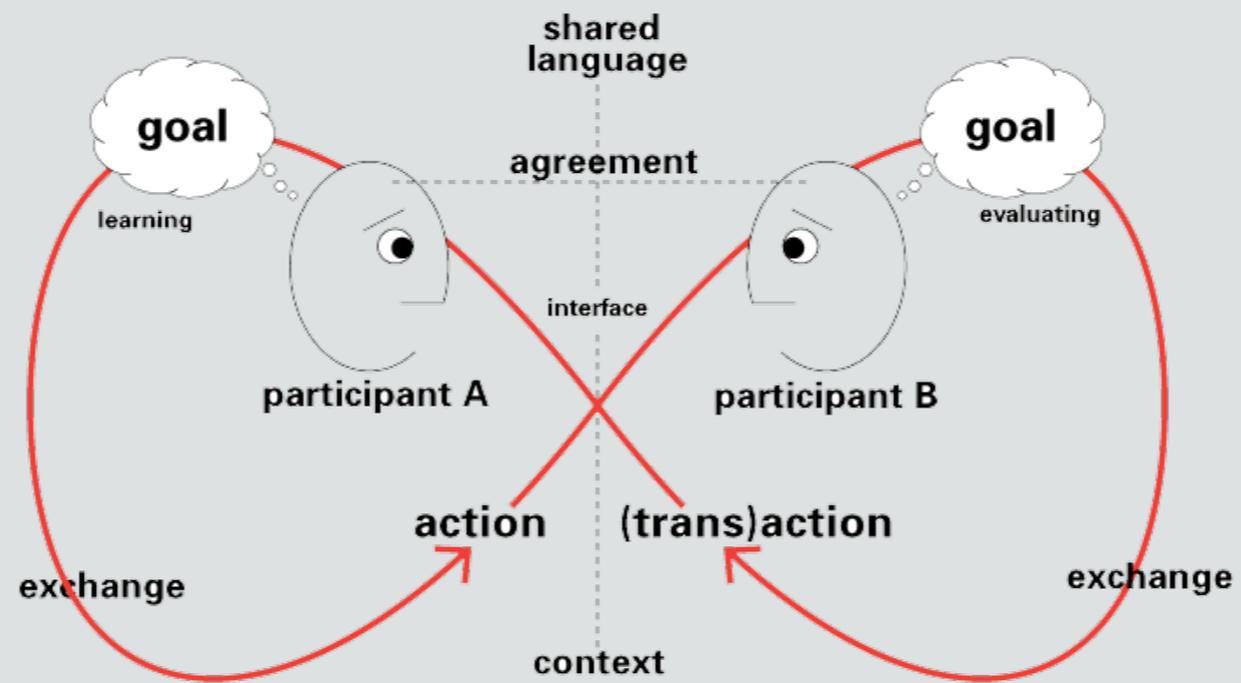
This new language does not overtly challenge the pre-existing, efficient system, but rather creates new distinctions and supportive relationships.

Manager and Entrepreneur.

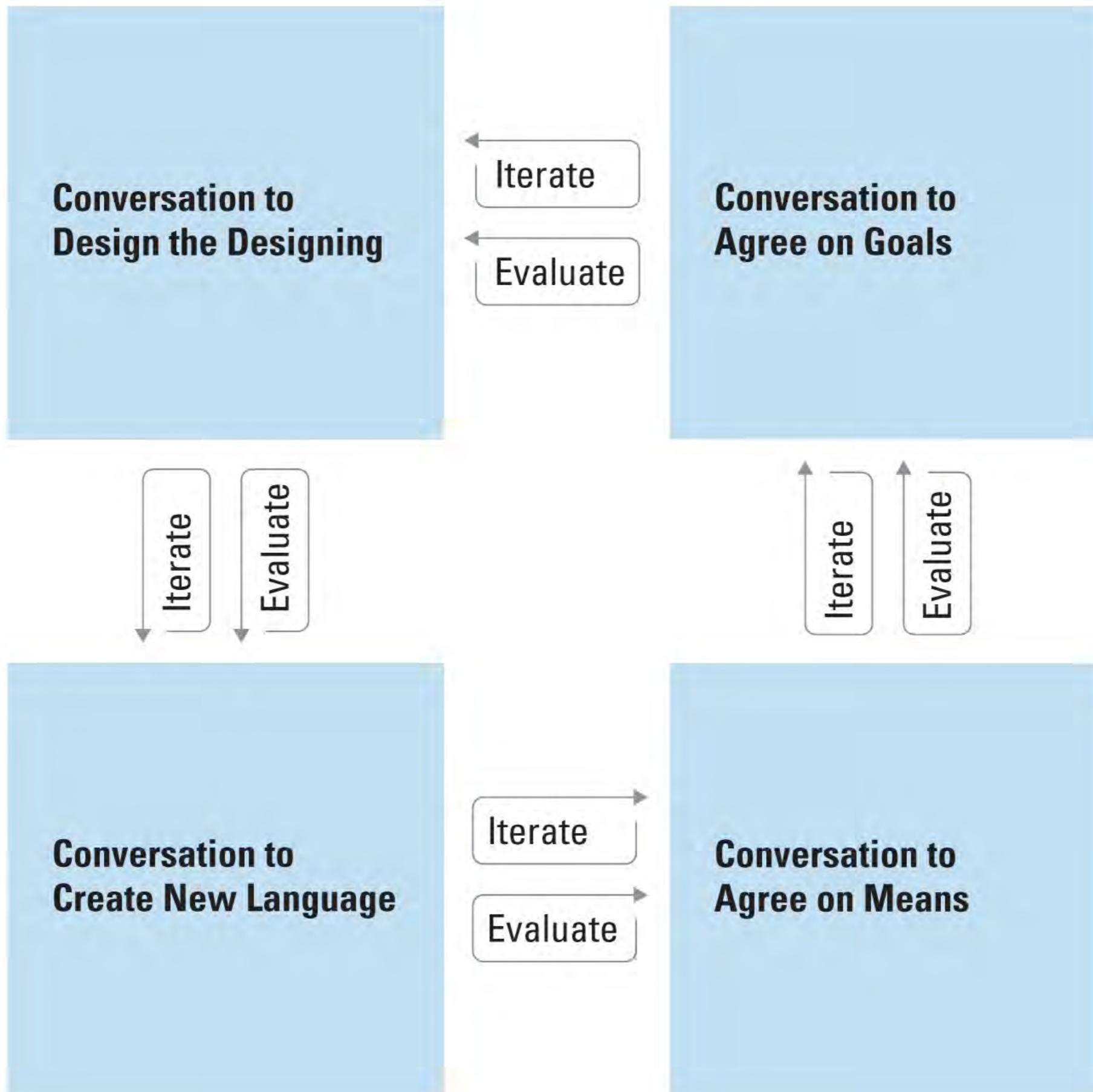
The Manager is responsible for improving the organization's present-day performance.

The Entrepreneur does not concern herself with present-day business.





design for {
context
language
exchange
agreement
(trans)action



- A. **Conversation to Agree on Goals**
Decide why we are doing what we are doing
 - to create value for shareholders
 - to pursue our vision for a market
 - to commit to sustainable innovation.
- B. Conversation to Design the Designing
Identify irreplaceable expertise for success in designing a new space of possibilities.
- C. Conversation to Create New Language
As a new space of possibilities evolves, a new language frames and defines it.
- D. Conversation to Agree on Means
Decide how to achieve our goals, that is, create a plan for the actions of the enterprise.



Conversation to Agree on Goals

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Conversation to Create New Language

C.

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Conversation to Agree on Means

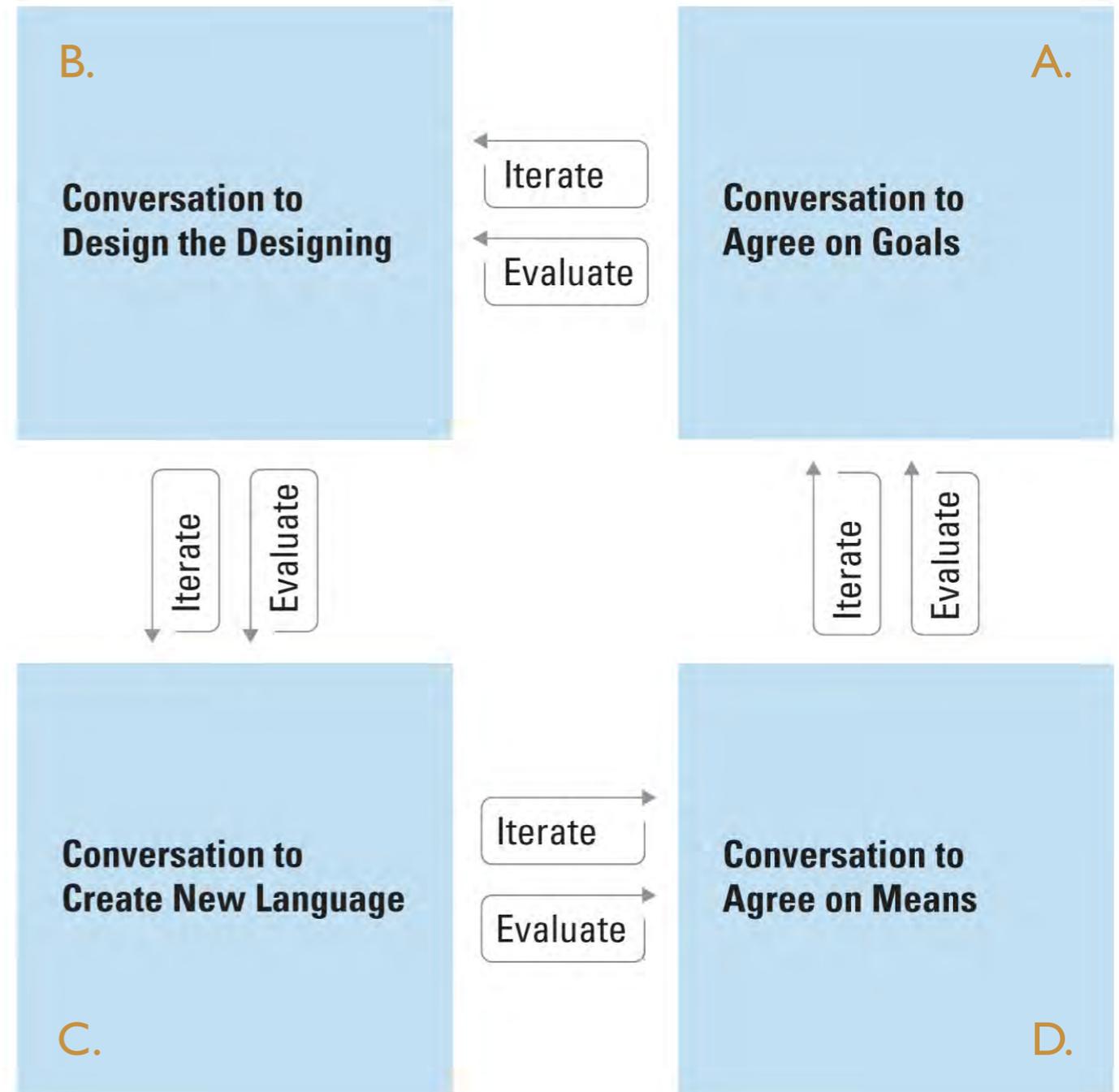
D.

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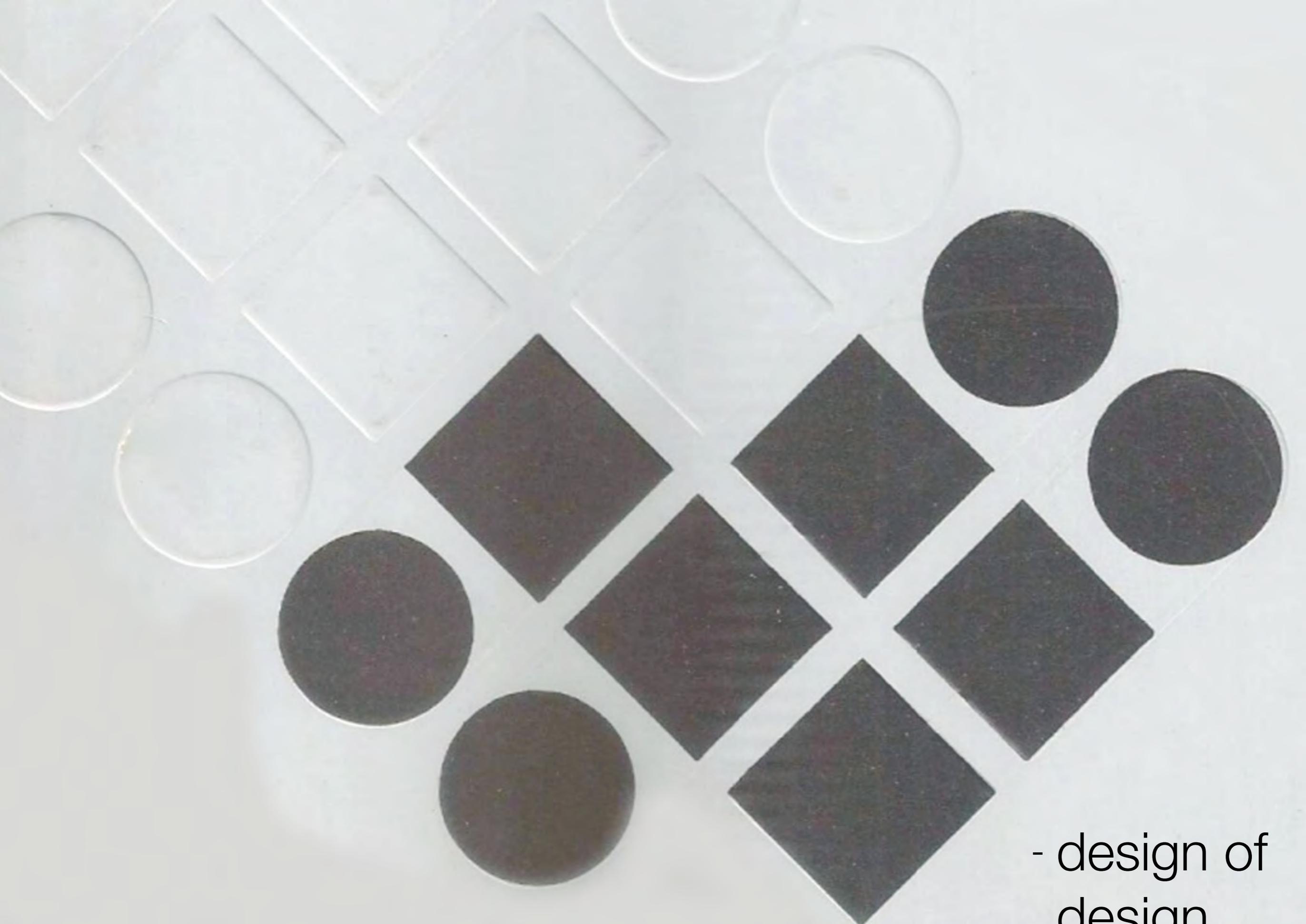
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Requirements for Focusing Problems

- Problem class replaces transformation of mass & energy with **actionable information flows**—so that it participates in the new economy—“bits to atoms”
- **Economic potential**—removing uncertainty in the market is worth something
- **Consistent with the social system**—to connect with who we are (our history) & what we can see ourselves engaging in
- **Requisite variety of domains of expertise** needed to solve problem can be defined and made available
- Initial set of **individuals who want to do it**
- An exemplar or **teacher for the business** as a whole—so that what is learned can be reproduced.



- design of
design

how has cybernetics influenced design theory?

begins in complex problems early in 20th century—then...

Hochschule für Gestaltung in Ulm, Germany

Norbert Wiener and Martin Heidegger lecture there

Bucky Fuller and Charles Eames visit

British and American design school faculty visit

Christopher Alexander and Horst Rittel teach there, then at Berkeley

Venturi's "Learning from Las Vegas" in 1972 marks the symbolic end of Design Methods as a focus in architecture

About the same time, John Chris Jones and Chris Alexander repudiate Design Methods

In 1972, Rittel critiques the state of design methods, calls for a shift to **design as rhetoric**, echoing 2nd-order cybernetics

Rittel's Problems

simple problems

question is clear—we only need to provide an answer

most design problems given in school are like this

complex problems

we frame the current situation in order to show how it differs from a preferred situation

most design problems encountered in practice are like this

wicked problems

participants hold conflicting views of the problem
coming to agreement on the problem is impossible—
without reframing

reframing is a process of construction and agreement

the most important problems of the 21st century are like this



1st-order
cybernetics



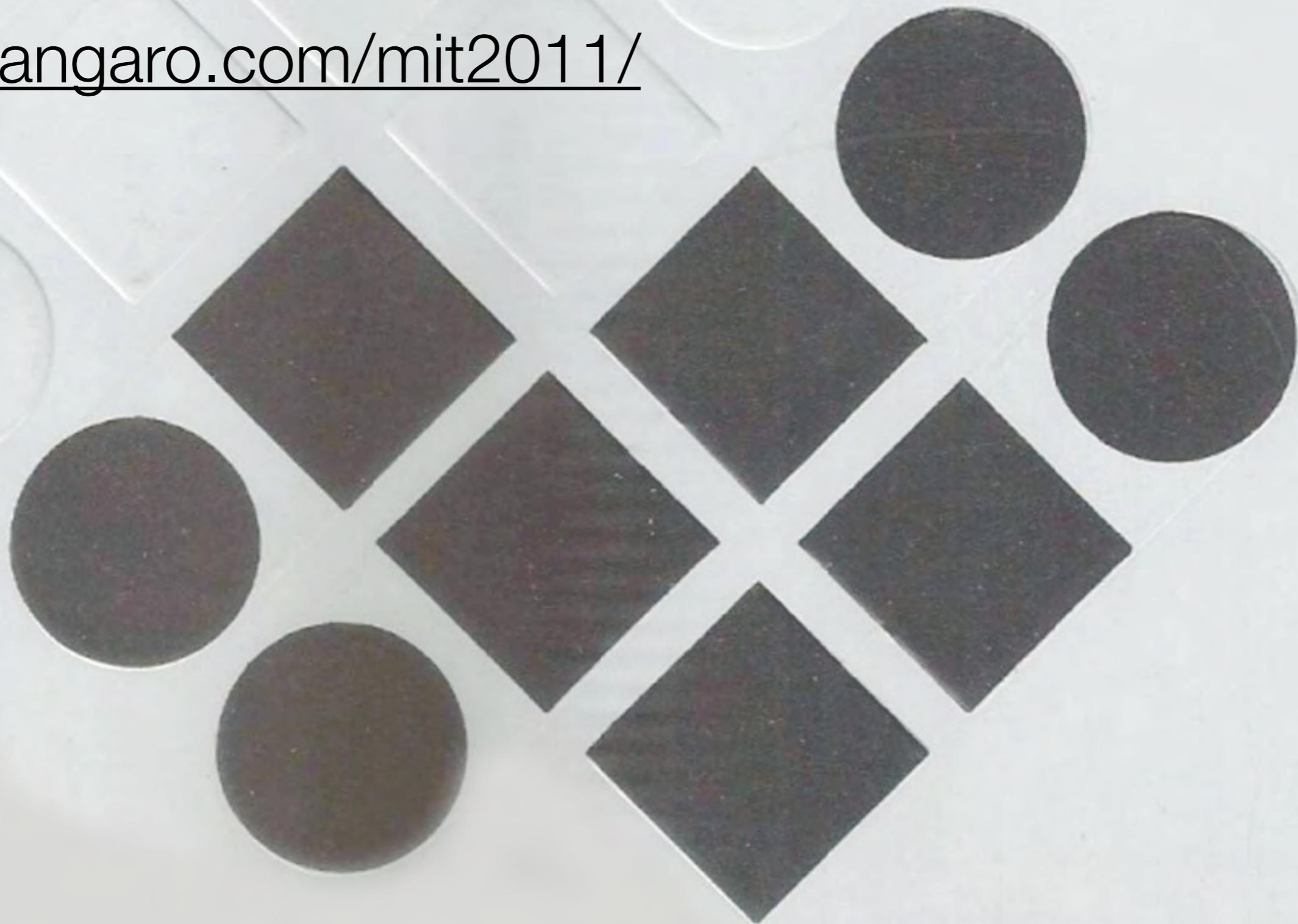
2nd-order
cybernetics

Machines & Revolutionary Eras

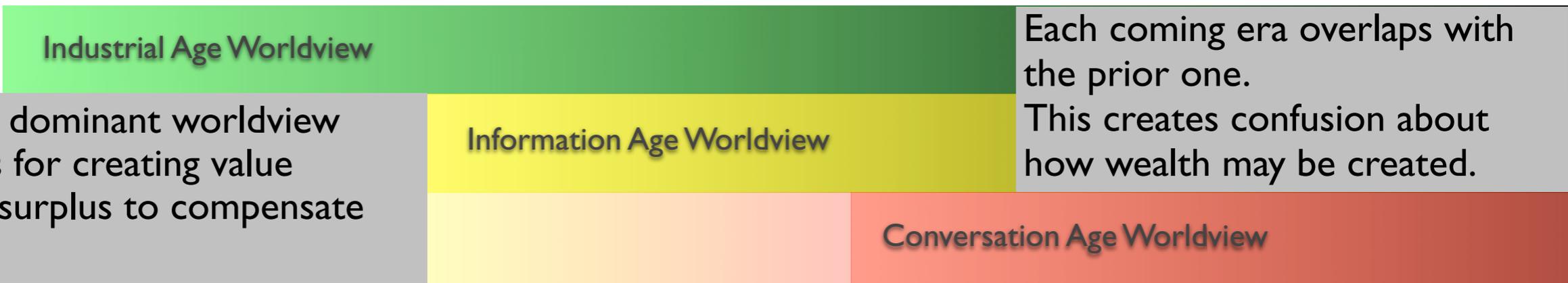
| | Industrial Revolution | Information Revolution | Conversation Revolution |
|---|-----------------------|------------------------|---------------------------------|
| | 1750—? | 1955—? | 1995—? |
| Machines... | amplify muscles | amplify nervous system | amplify variety in conversation |
| ... create wealth by lowering cost of ... | doing physical work | lowering uncertainty | evolving valuable insights |

paulpangaro@pangaro.com

<http://pangaro.com/mit2011/>



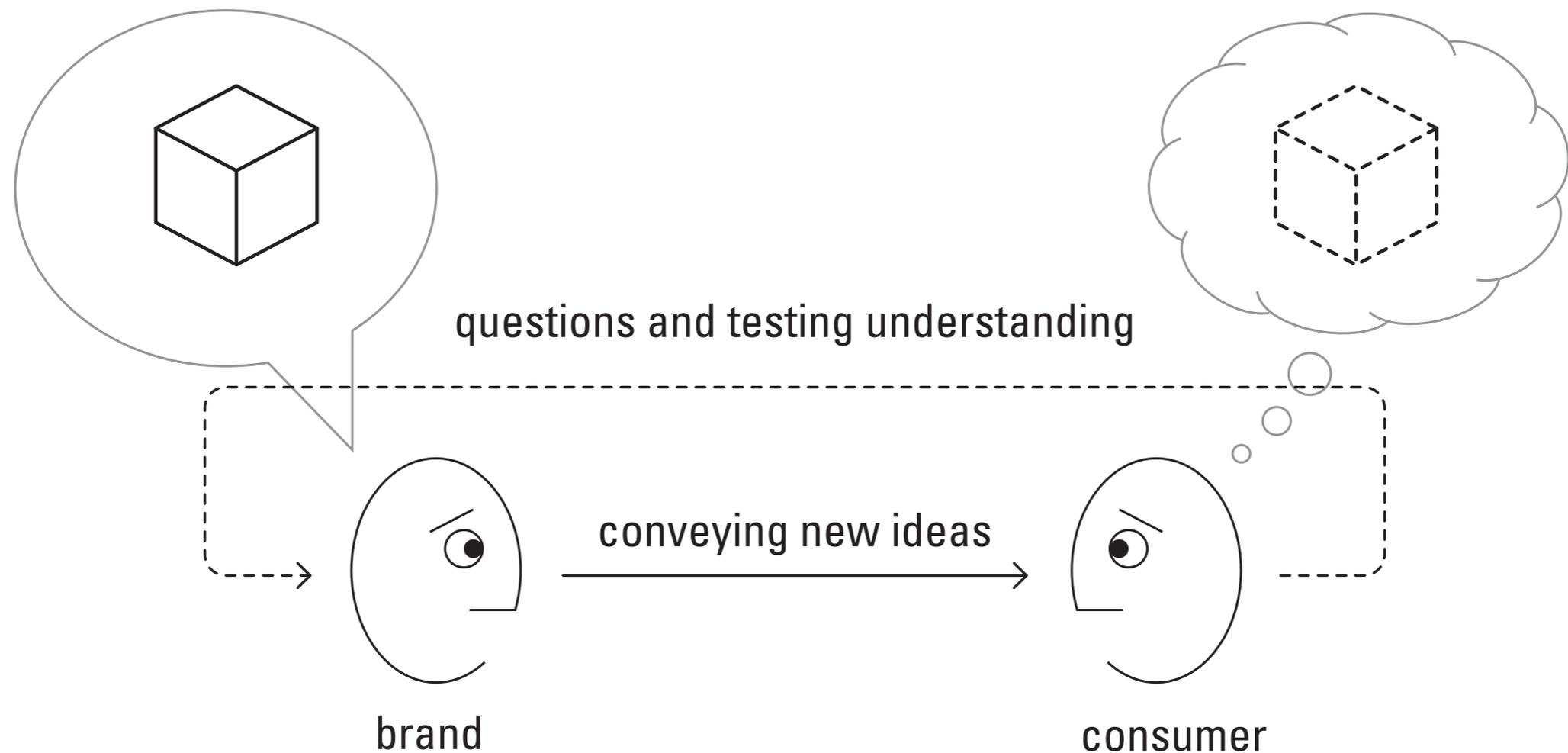
Eras



Every era has a dominant worldview that is the basis for creating value by exploiting a surplus to compensate for a scarcity.

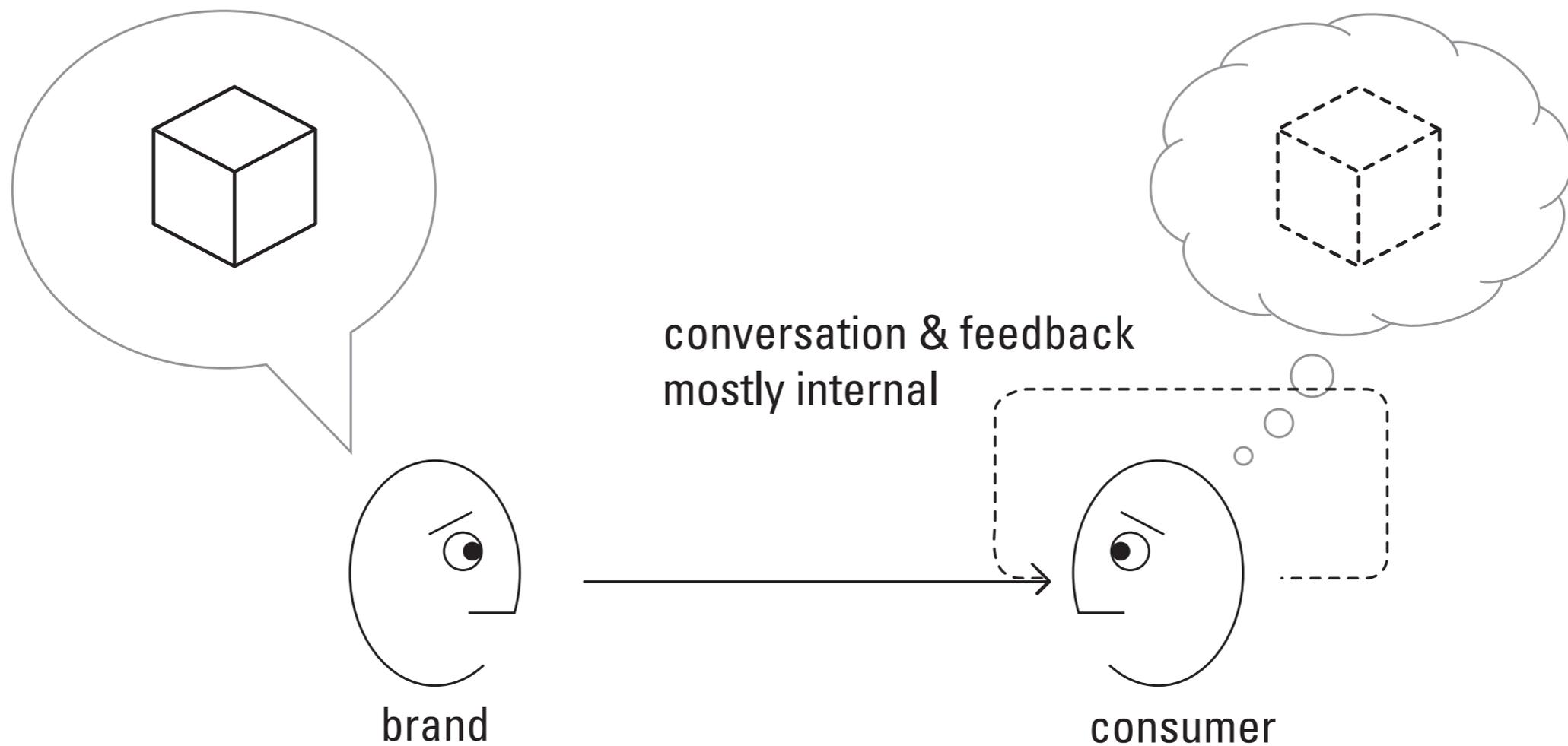
| | Industrial Age Worldview | Information Age Worldview | Conversation Age Worldview | |
|-------------------------------|---|--|--|---|
| years | 1760 to | 1970 to ... | 2010 to ... | ??? |
| constraint / primary cost | labor = time + effort | information processing | reaching insight | converging on effective plans |
| efficiencies sought... | save = break work into time smaller pieces save = machine extension labor of muscles | break information into smaller pieces: DB records & fields, message packets coordination by message passing | evolving insights faster & cheaper via just-in-time conversations using the social graph | just-in-time design: faster & cheaper agreement through dialectic |
| abundance | energy from fossil fuels | Moore's Law in computer hardware | Metcalf's Law of social networks | tracking of evolving agreements |
| means of wealth creation | mass production of product | mass production of data | demand-activated production | demand-activated innovation |
| technology of commoditization | hardware = machines + assembly lines | software = DBMS queries + messaging | services = agreement + trusted nets | services = bank of insights |
| new constraint created | lack of flexibility | reaching coherence | creating new designs | insight inflation |

changing beliefs requires conversation

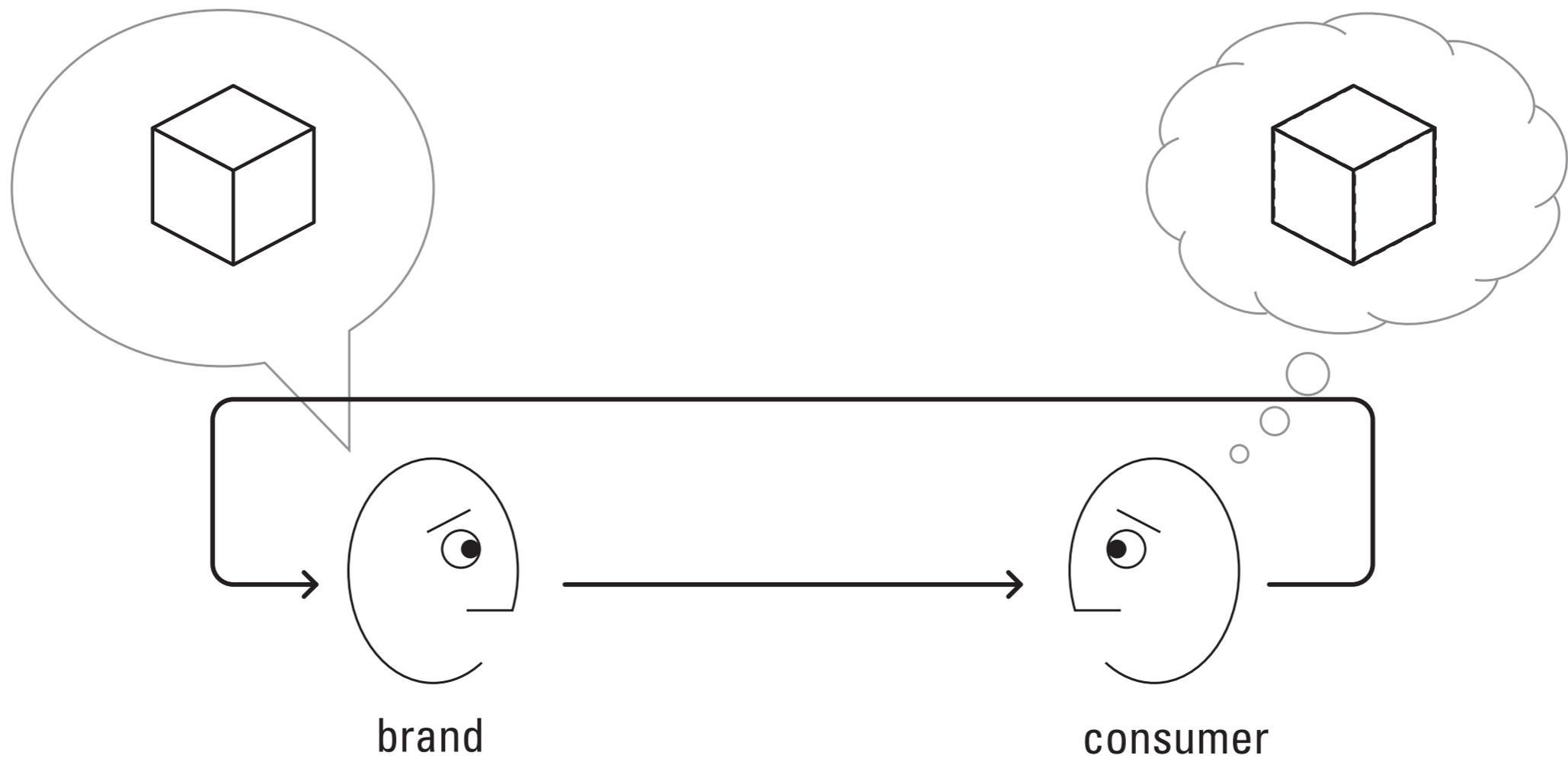


after Dubberly Design Office 2008

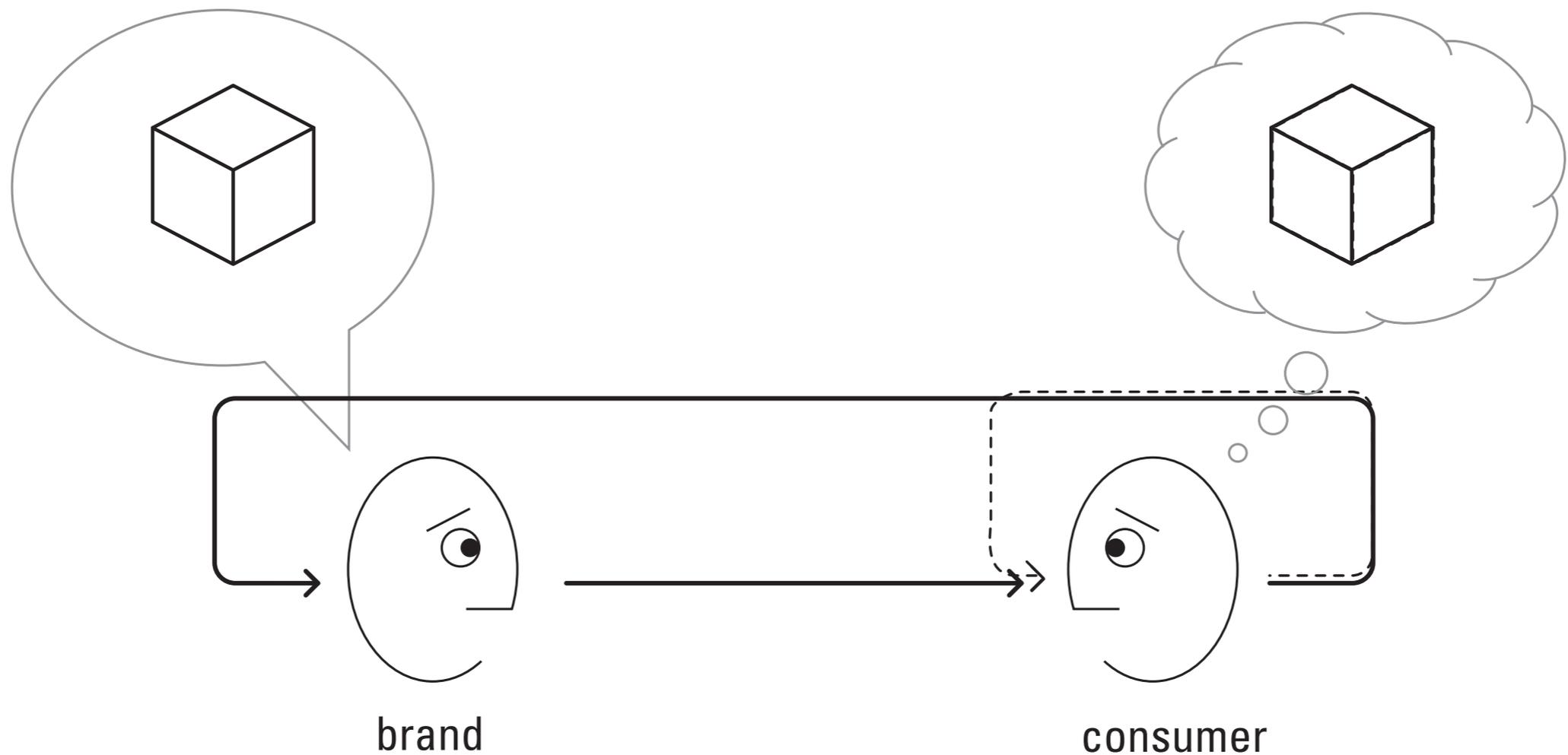
a lot of conversation is internal



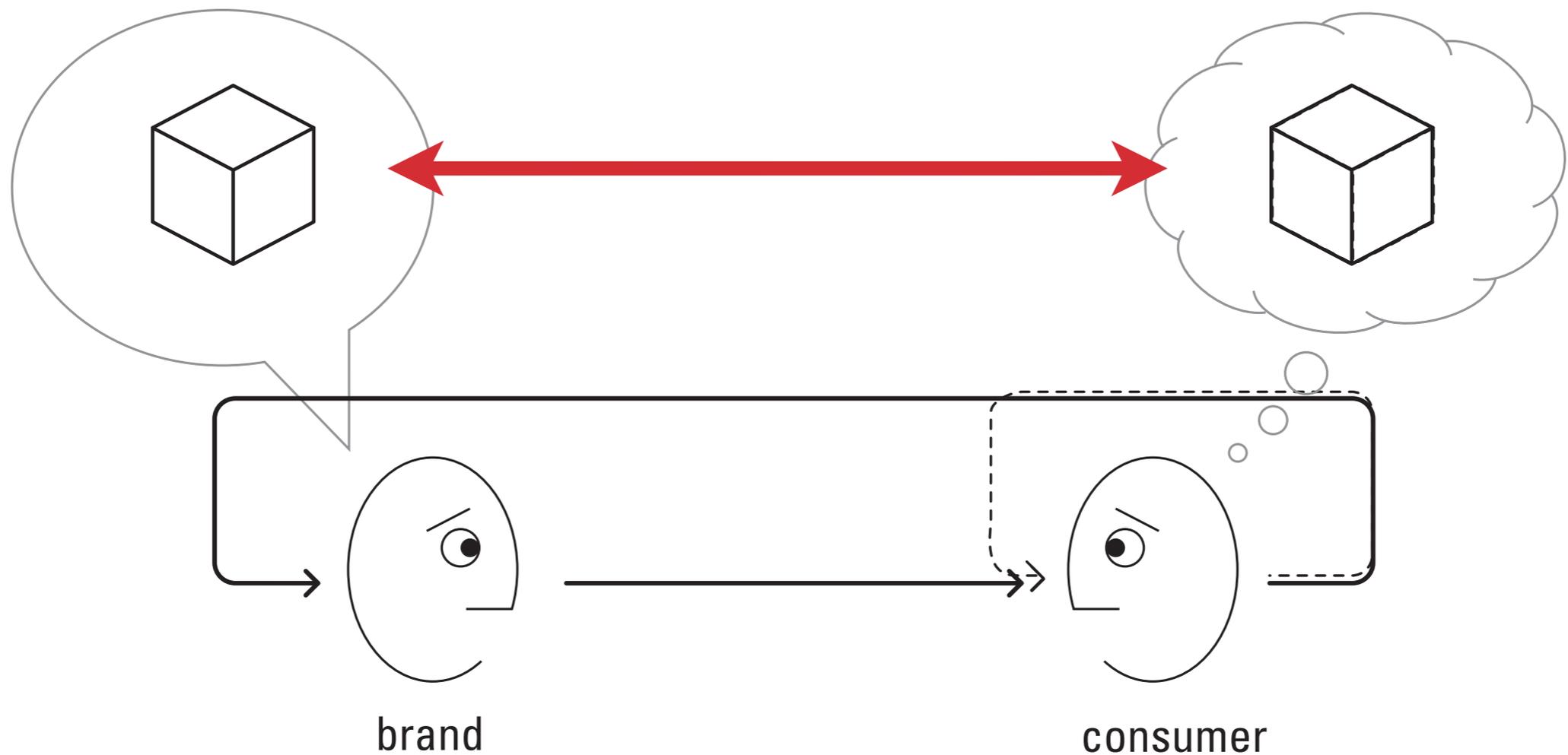
p2p conversation is more influential



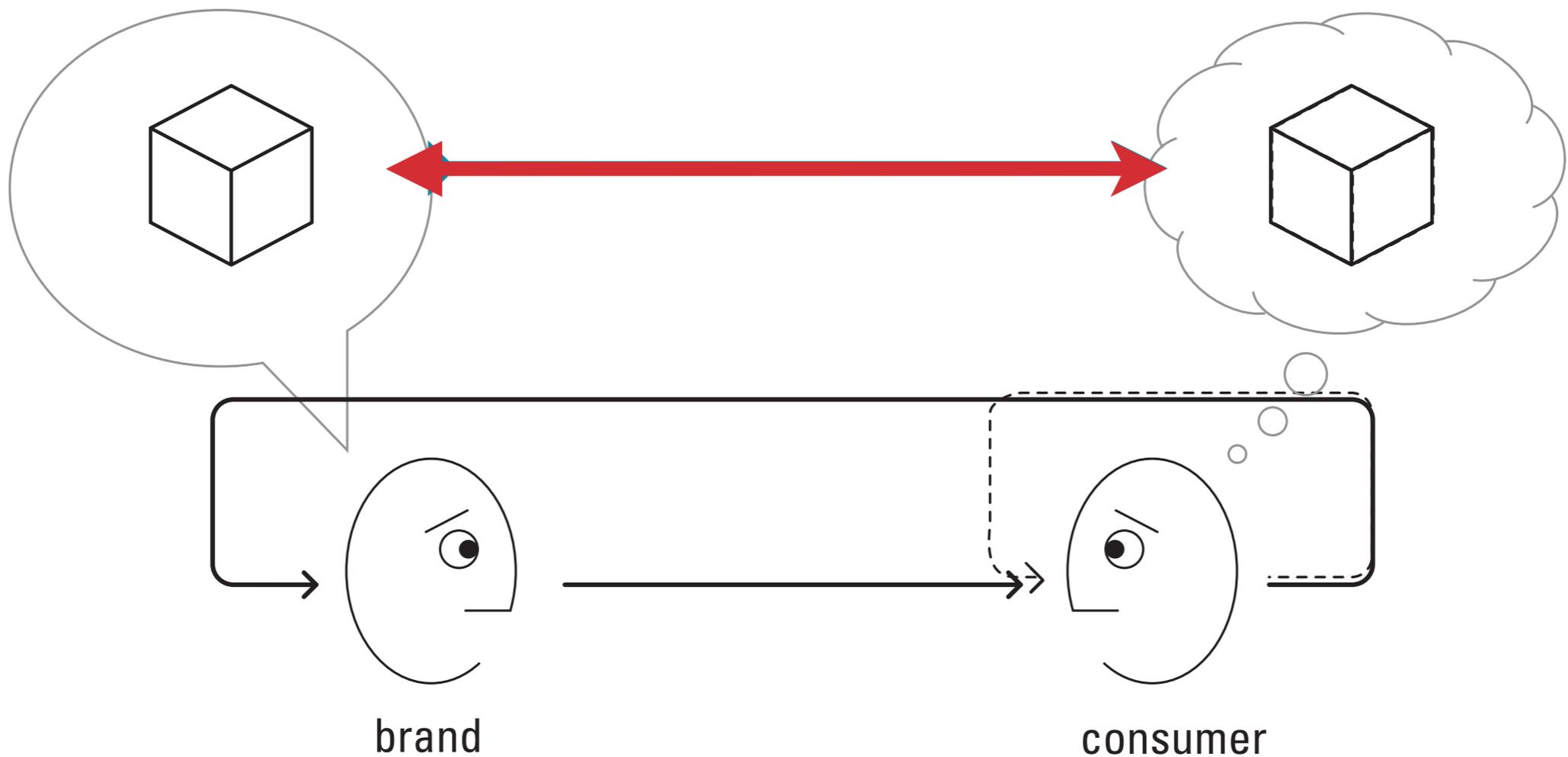
p2p + internal conversations are needed to ensure beliefs are shared



p2p + internal conversations are needed to ensure beliefs are shared



true conversation is a co-evolution
of ideas and possibilities



ARTIFICIAL INTELLIGENCE

contrasted with

CYBERNETICS

