

# Less Interference / More Dance!

[pangaro.com/lasg2019/](http://pangaro.com/lasg2019/)

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Human-Computer Interaction Institute  
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Living Architecture Systems Group Symposium  
OCADU, Toronto  
March 2019

# Less Interference / More Dance!

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# Less Interference



verb: meddle, intervene

hinder

prevent

intrude

inhibit

impede

obstruct

hamper

suspend

thwart

interloper

# INTERFERE

## OBESITY of the BRAIN

hold up  
horn in  
step in  
intermit  
fool with  
get in the way  
get involved  
hang up  
intermeddle  
mix in  
poke nose in

# INTERFACE

*verb*: mix, merge

consolidate

incorporate

organize

unify

conform

assimilate

join

desegregate

fuse

# INTERFACE

immerse

be swallowed up

become lost in

become partners

come aboard

deal one in

hitch on

hook up

join up

line up

melt into

# Less Interference / More Dance!

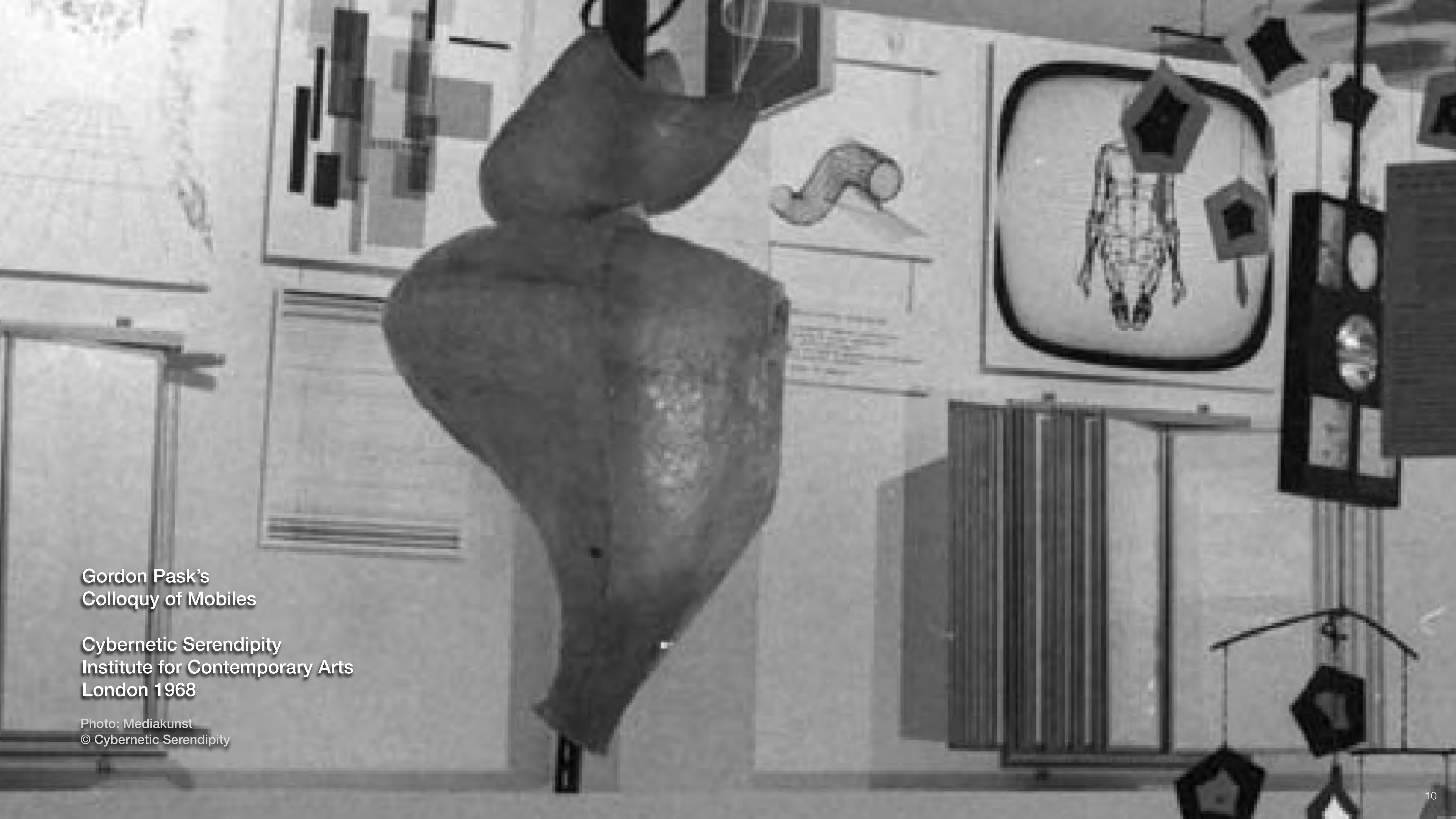




Gordon Pask's  
Colloquy of Mobiles

Cybernetic Serendipity  
Institute for Contemporary Arts  
London 1968

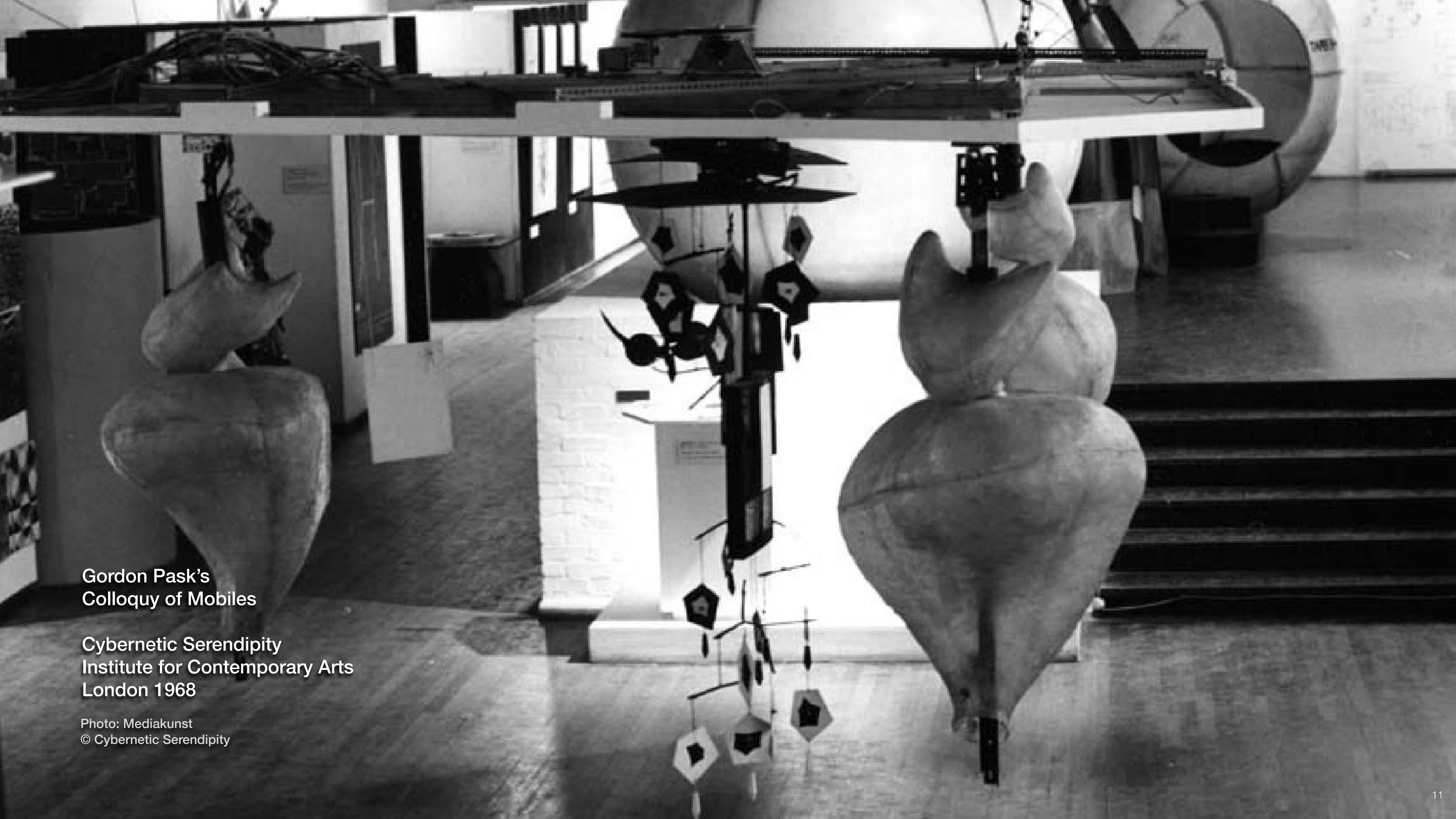
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Gordon Pask's  
Colloquy of Mobiles

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Gordon Pask's  
Colloquy of Mobiles

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**Gordon Pask in front of a male mobile  
of his own design**

**Cybernetic Serendipity  
Institute for Contemporary Arts  
London 1968**

Photo: Gordon Pask Archive  
University of Vienna





Photo: Gordon Pask Archive  
University of Vienna

**Yolanda Sonnabend, prominent theatre  
and ballet designer for the Royal Ballet,  
designer of Colloquy's female mobiles**

Photo: © Johnny Dewe-Mathews



# Cybernetic Serendipity

## Serendipity

Serendipity

the faculty of making  
happy chance discoveries

of means of control and communication machines  
both human and electronic

An exhibition

at the Science Museum, London, from 1964 to 1965





# Cybernetic Serendipity

## Serendipity

serendipity

the faculty of making  
happy chance discoveries

by means of control and communication machines  
both human and electronic

An exhibition

is a fortunate circumstance that leads to the discovery of something of value when the search for something else is the object.

serendipitous  
manifestations

Institute  
of Contemporary  
Arts

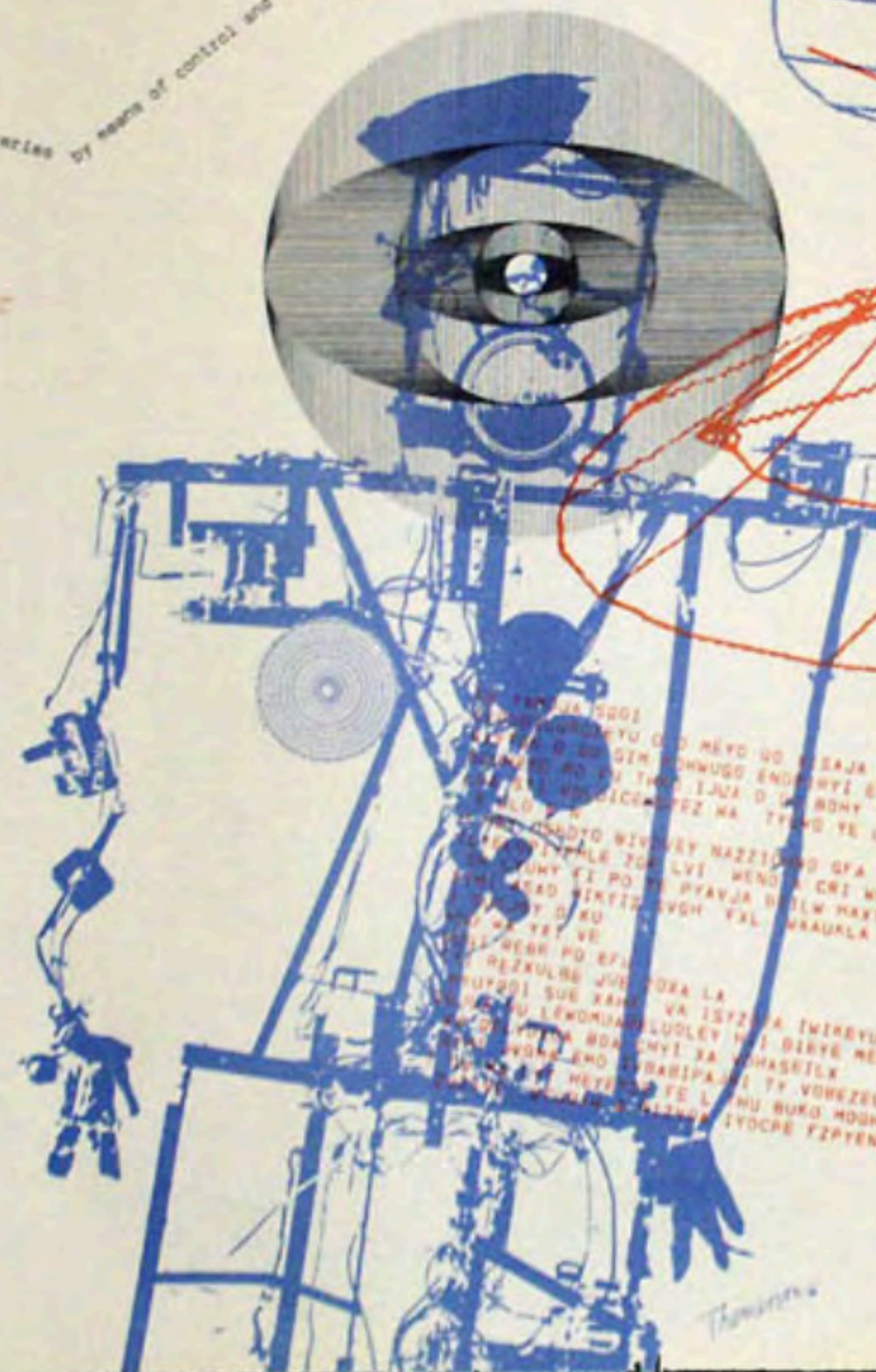
August 2 - October 26



Institute of Contemporary Arts  
South House, The Mall, London WC1R 4EJ  
August 2 - October 26

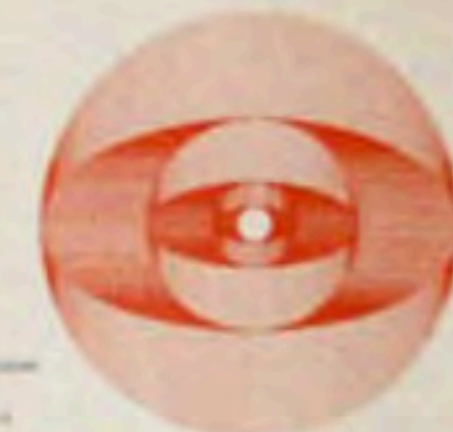
Curator: Franciszka Themerson  
Director: John White  
Assistant Director: Peter White  
Secretary: Alison White

Admission by arrangement and introduction only  
100 admission tickets  
Price: 20/-



THE HUMAN MIND  
IS A COMPLEX ORGANISM  
WHICH CAN BE TRAINED  
TO PERFORM TASKS  
WHICH WOULD OTHERWISE  
BE IMPOSSIBLE FOR IT  
TO PERFORM ON ITS OWN  
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CYBERNETIC  
SERENDIPITY  
LECTURES



Thursday  
August 8

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August 13

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August 15

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Wednesday October 16  
Thursday October 17

Exhibition poster by  
Franciszka Themerson

Photo: Mediakunst  
© Cybernetic Serendipity



Cybernetic Serendipity  
Institute for Contemporary Arts  
London 1968

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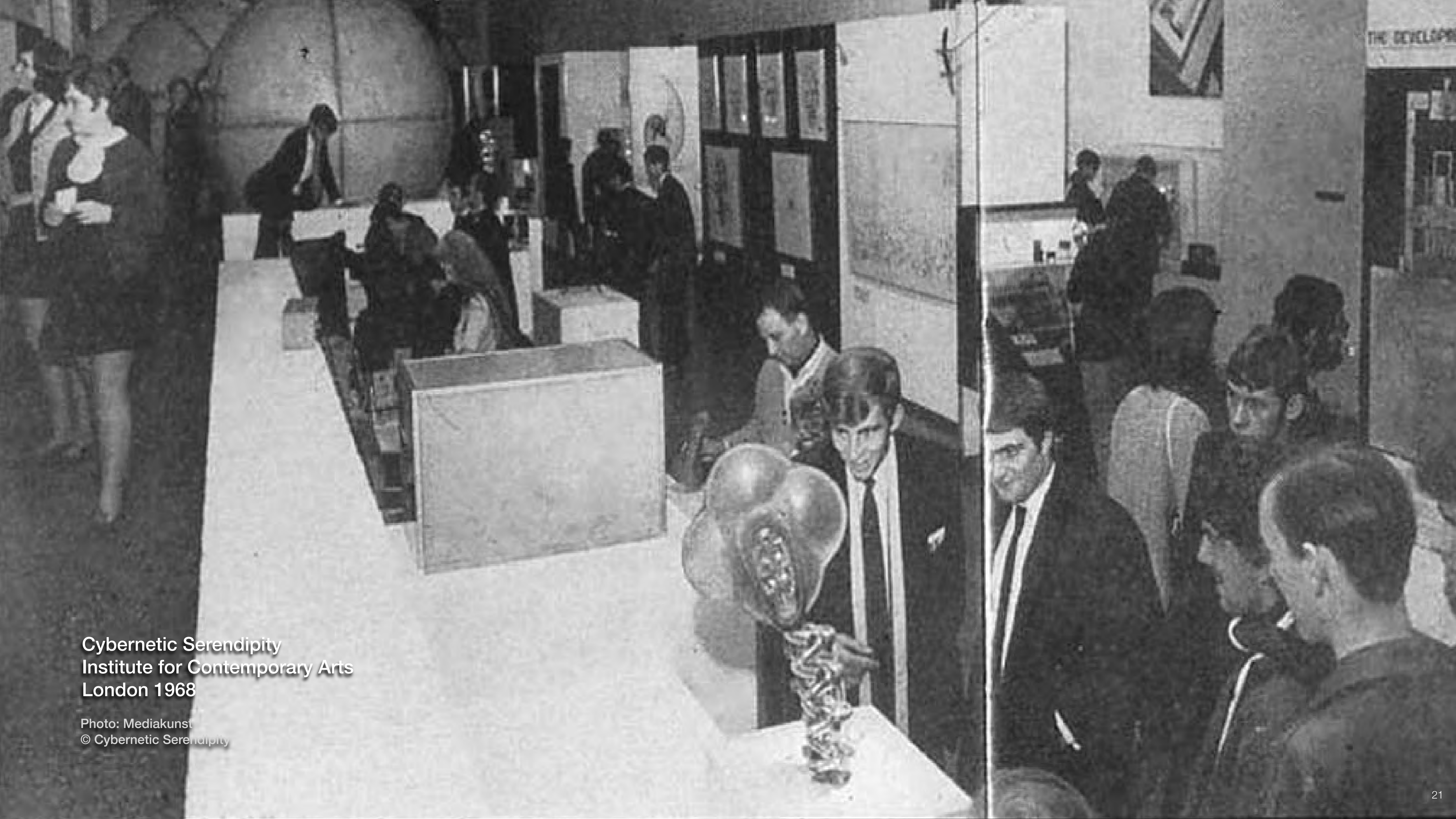
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**Cybernetic Serendipity**  
**Institute for Contemporary Arts**  
**London 1968**

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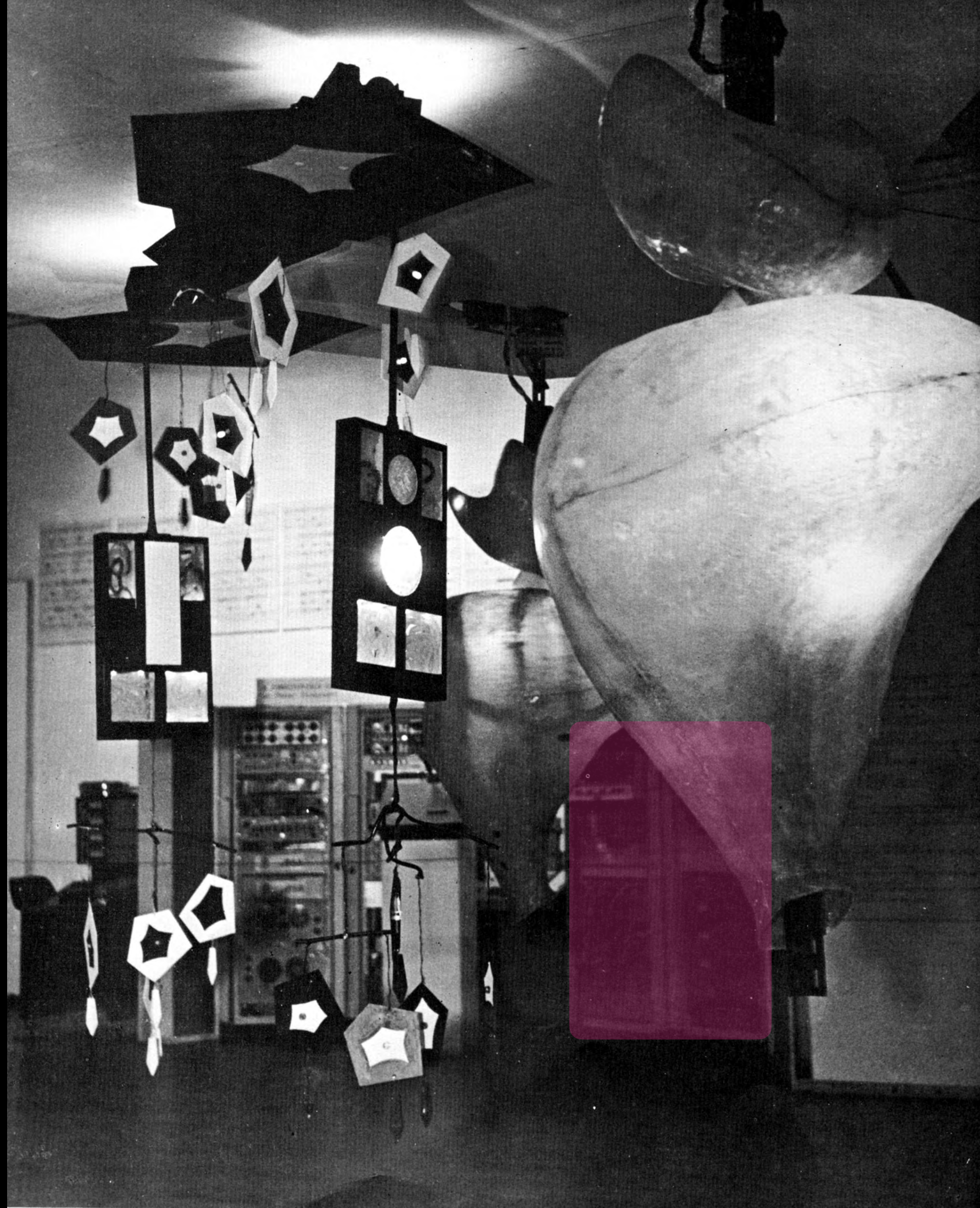


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1968

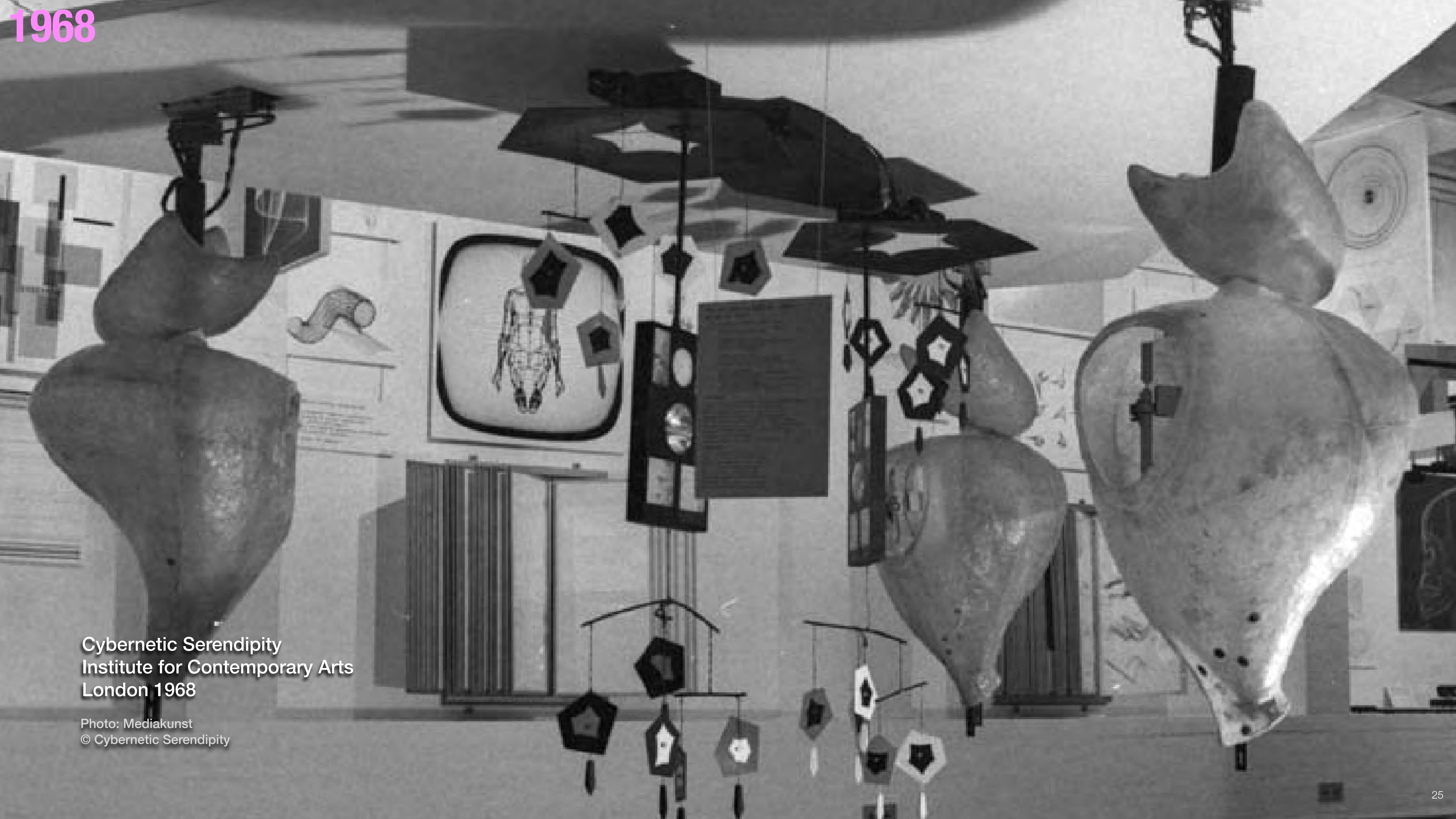


2018





1968



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London 1968

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2018



COLLOQUY 2018 Project  
College for Creative Studies  
Detroit 2018



COLLOQUY 2018 Project  
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Detroit 2018

# Colloquy



COLLOQUY 2018 Project  
College for Creative Studies  
Detroit 2018

# Colloquy



Brainstorming from Behaviors    Writing Scripts    Comparing Our A New    Summarizing the Project

Documenting the Project

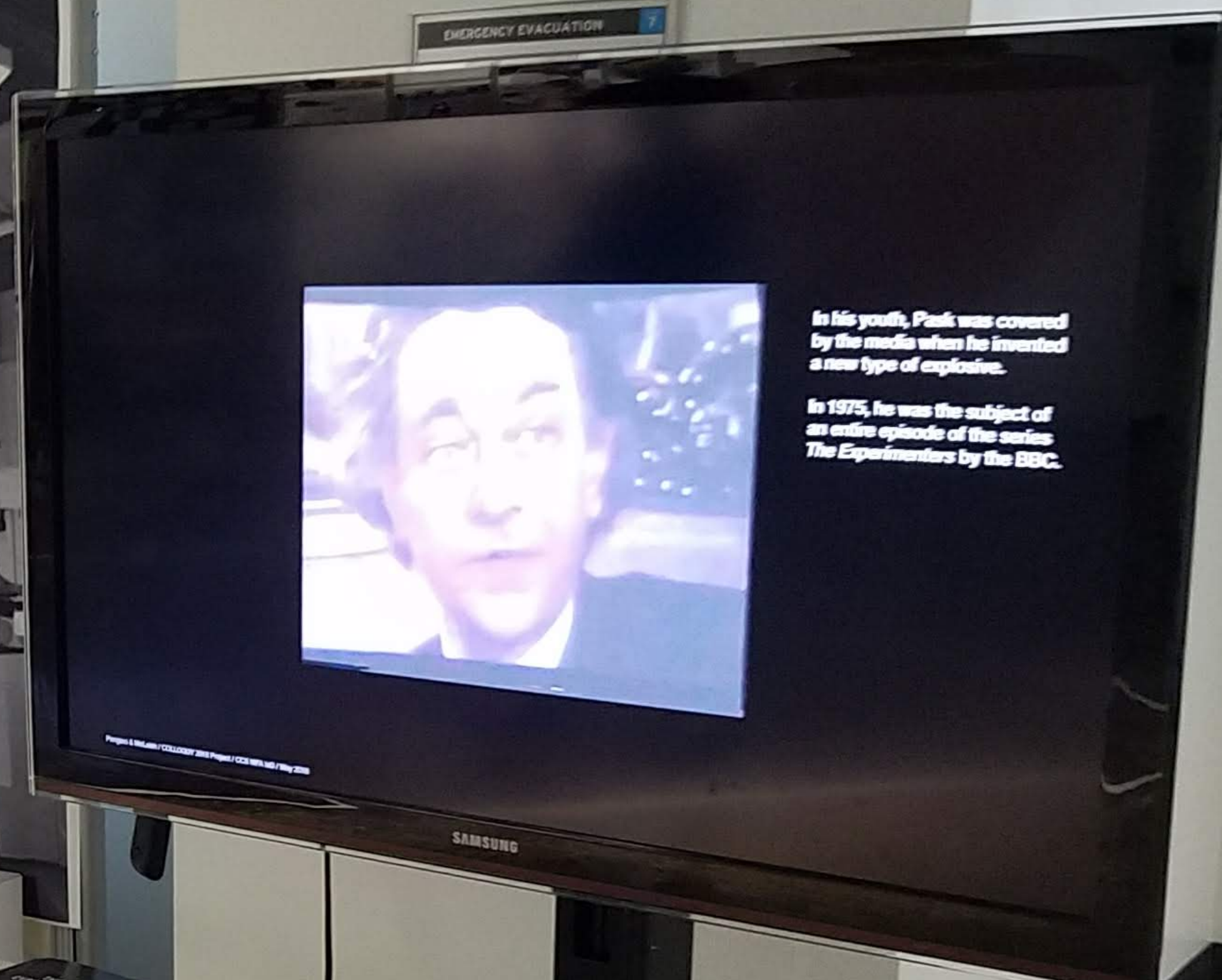


The Full-Scale Replica    Creating a 3D Model    Fabricating the Female Mobiles    Building the Structure

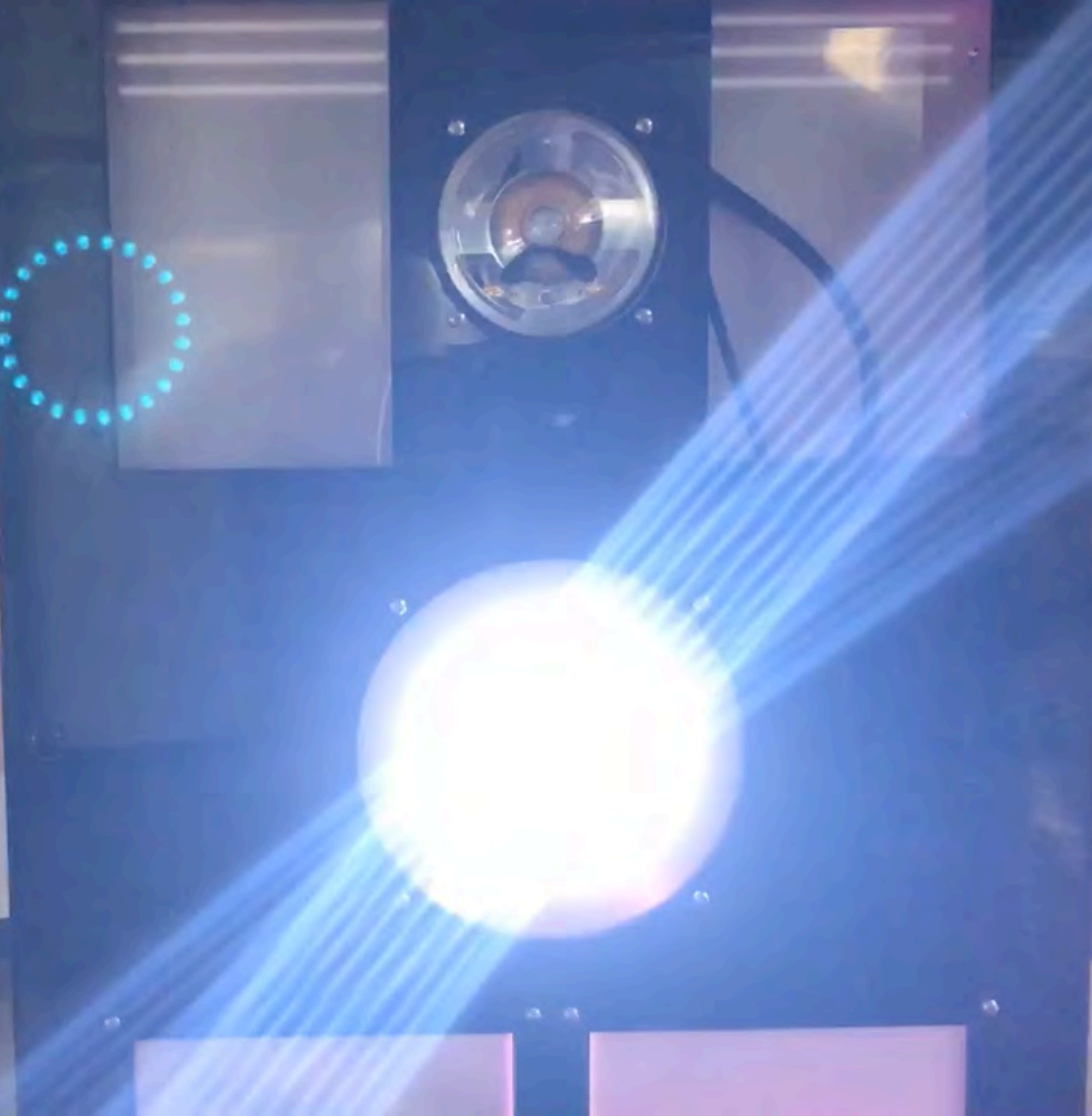
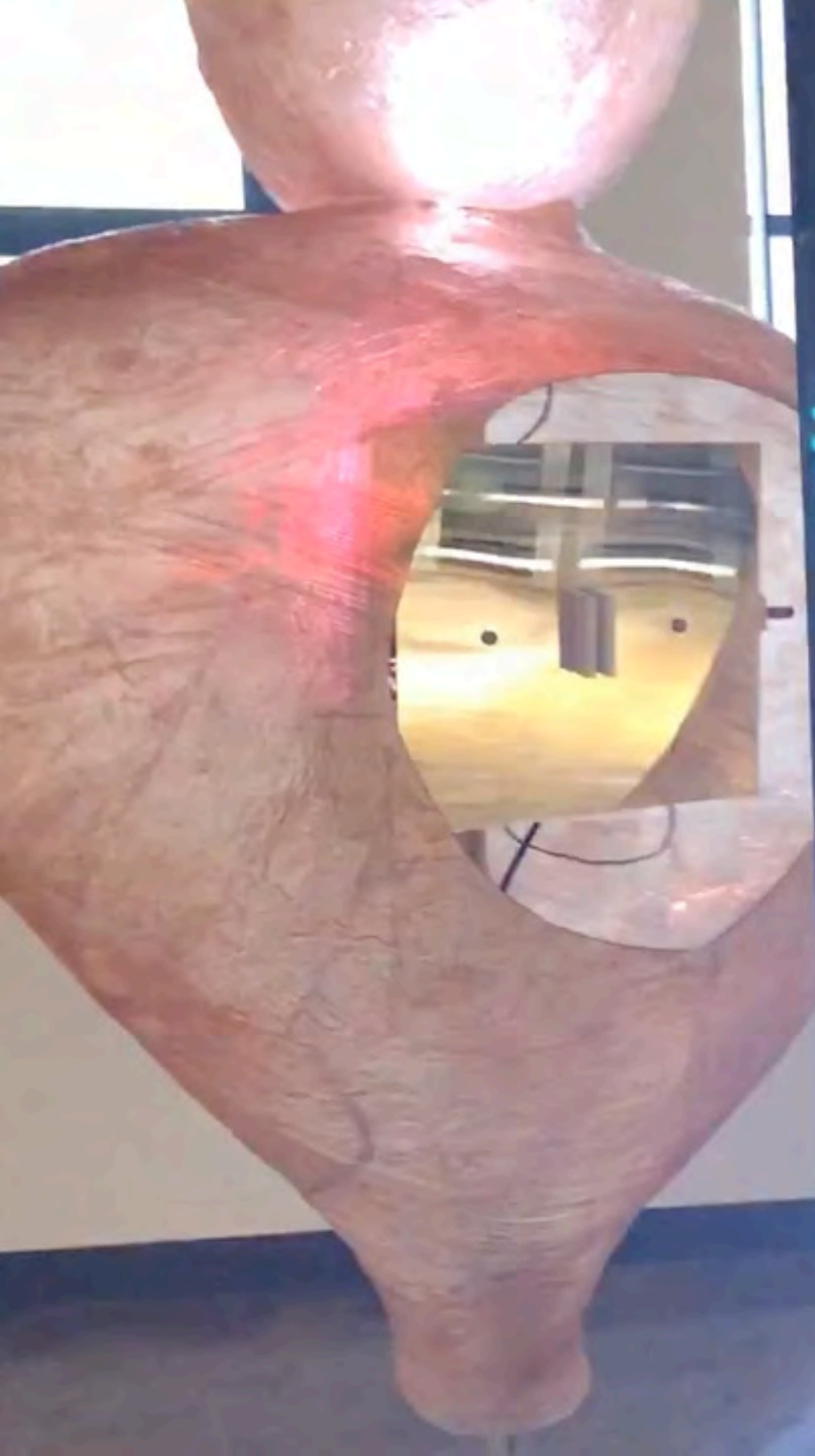
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COLLOQUY 2018 Project  
College for Creative Studies  
Detroit 2018

1/6 Scale Model



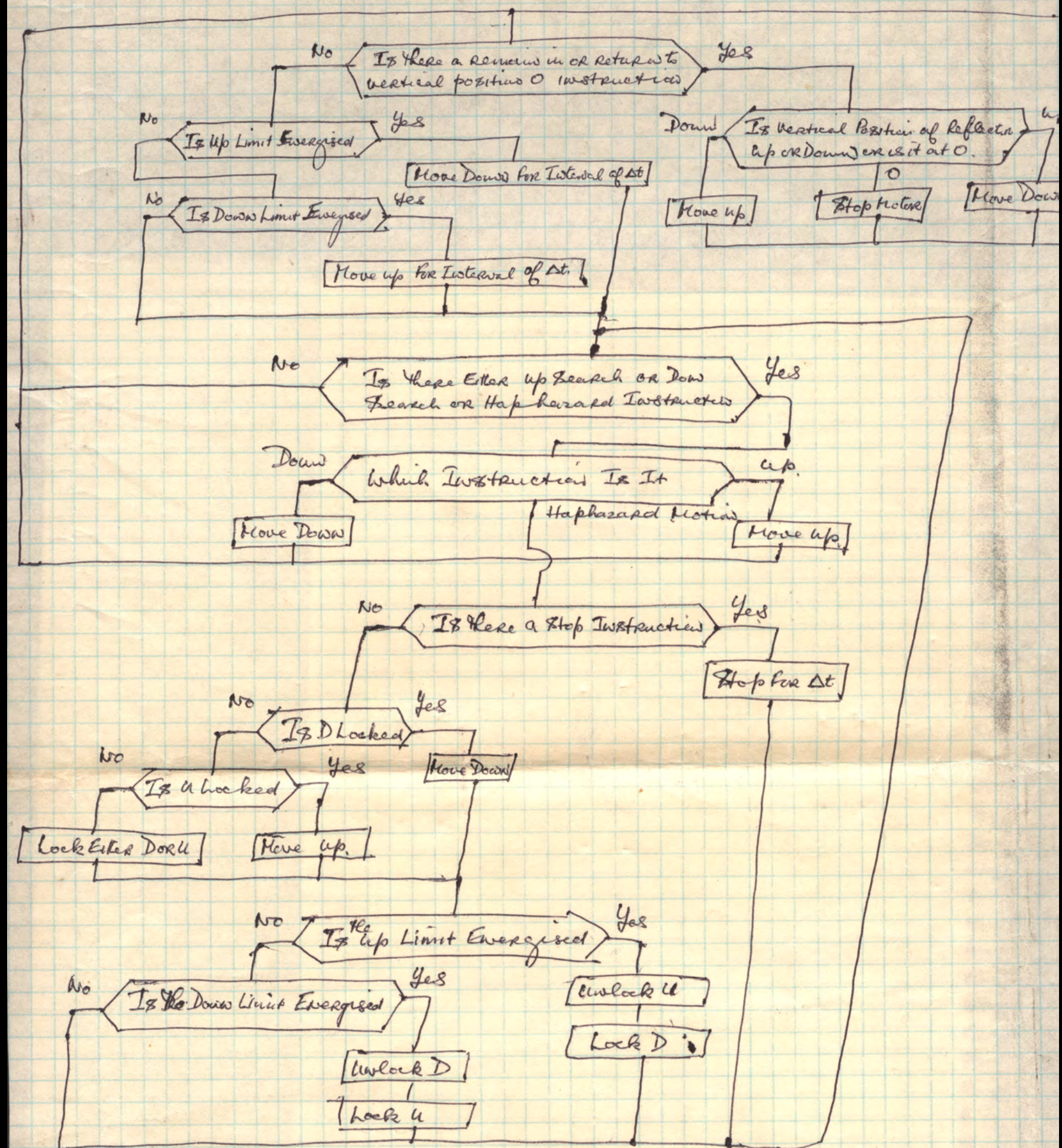
In his youth, Peak was covered by the media when he invented a new type of explosive.  
In 1975, he was the subject of an entire episode of the series *The Experimenters* by the BBC.



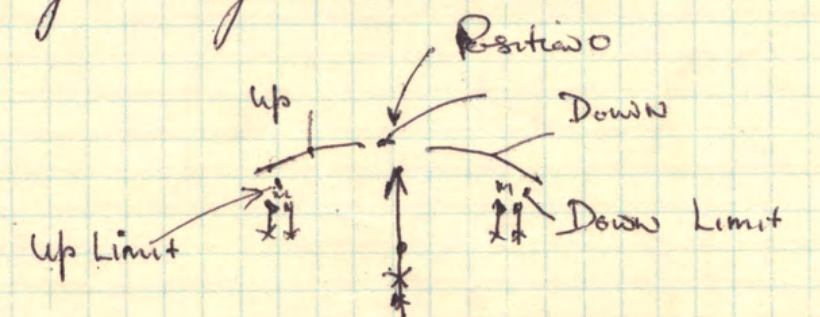




# Less Interference / More Dance



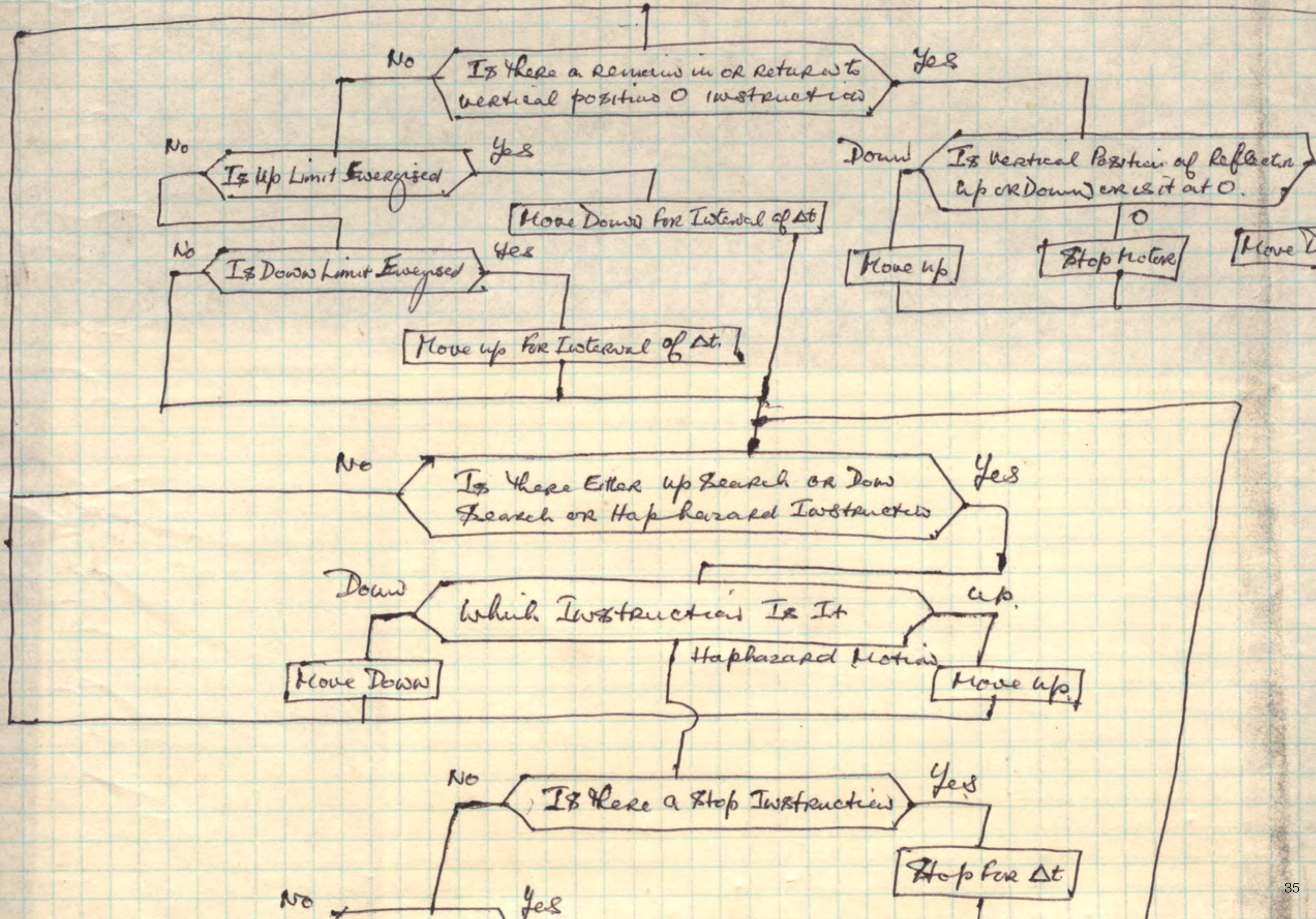
This programme receives instructions from the main female programme and information from a pair of limit switches and a positional sensing switch on the vertical reflector female motor. D and U are lock relays energized by the system.



Gordon Pask  
Female Mobile Behavior Flowchart

Diagram: Gordon Pask Archive  
University of Vienna

Vertical Reflector Motor Female Programme



Gordon Pask  
Female Mobile Behavior Flowchart

Diagram: Gordon Pask Archive  
University of Vienna

# CYBERNETICS, ART AND IDEAS

edited by Jasia Reichardt



*Cybernetics, Art and Ideas*  
Jasia Reichardt, ed.,  
Greenwich, CT: New York Graphic  
Society Ltd., 1968

# A comment, a case history and a plan

Gordon Pask

*'Man is always aiming to achieve some goal and he is always looking for new goals.'* (Pask)

This article was written prior to the Cybernetic Serendipity exhibition (ICA 1968) and is unaltered. The appendix was added later in 1968.

## A comment on the cybernetic psychology of pleasure

Man is prone to seek novelty in his environment and, having found a novel situation, to learn how to control it. Let us develop and qualify this cybernetic statement. In the symbolic domain which constitutes the most important aspect of the human environment, 'novelty' inheres in events or configurations that appear ambiguous to a given individual, that engender uncertainty with respect to his present state of knowing and pose problems. 'Control', in this symbolic domain, is broadly equivalent to 'problem solving' but it may also be read as 'coming to terms with' or 'explaining' or 'relating to an existing body of experience'. Further, when learning to control or to solve problems man necessarily conceptualizes and abstracts. Because of this, the human environment is interpreted at various levels in an hierarchy of abstraction (on the same page we see letters, words, grammatical sentences, meaningful statements and beautiful prose). These propensities<sup>1</sup> are at the root of curiosity and the assimilation of knowledge. They impel man to explore, discover and explain his inanimate surroundings. Addressed to the social environment of other men, they lead him into social communication, conversation and other modes of partially co-operative interaction.

To summarize the issue in slightly different words, man is always aiming to achieve some goal and he is always looking for new goals. Commonly, he deals with goals at several levels of an hierarchical structure in which some members are freshly formulated and some are in the process of formulation. My contention is that man enjoys perform-

<sup>1</sup> My 'propensities' have been adumbrated under various titles. Bartlett speaks of a 'search for meaning', Desmond Morris of a 'Neophilic tendency', Berlyn of a 'curiosity drive' and Bruner of a 'will to learn'. My own writing credits man with a 'need to learn'. Social psychologists, such as Argyll, have essentially the same concept. So do the psychiatrists. Here, the point is most plainly stated by Bateson, and by Laing, Phillipson and Lee.

ing these jointly innovative and cohesive operations. Together, they represent an essentially human and an inherently pleasurable mode of activity.

This dogmatic statement of the human condition does not apply in all circumstances. On occasion, perhaps, men are vacuous. On occasion, they merely respond to stimuli or act as passive receptors. But the characterization is accurate enough whenever a man is involved in aesthetic activities, which include:

- 1 Organizing a bit of symbolic environment by constructing a tangible work of art (e.g. painting a picture).
- 2 Writing a prescription which is interpretable as a work of art (e.g. composing music and writing the score).
- 3 'Performing a work of art' or, strictly, 'interpreting a work of art prescription, such as a piece of music'.
- 4 Appreciating or enjoying some work of art.

It does not seem useful to make a rigid distinction between the types of mental process that go on when a man occupies these different roles: 1, 2, 3 and 4. The composer is, in some sense, mentally akin to the performer and listener; the man who views a picture is mentally akin to the artist who painted it.

With all this in view, it is worth considering the properties of aesthetically potent environments, that is, of environments designed to encourage or foster the type of interaction which is (by hypothesis) pleasurable. It is clear that an aesthetically potent environment should have the following attributes:

- a It must offer sufficient variety to provide the potentially controllable novelty required by a man (however, it must not swamp him with variety—if it did, the environment would merely be unintelligible).
- b It must contain forms that a man can interpret or learn to interpret at various levels of abstraction.
- c It must provide cues or tacitly stated instructions to guide the learning and abstractive process.
- d It may, in addition, respond to a man, engage him in conversation and adapt its characteristics to the prevailing mode of discourse.

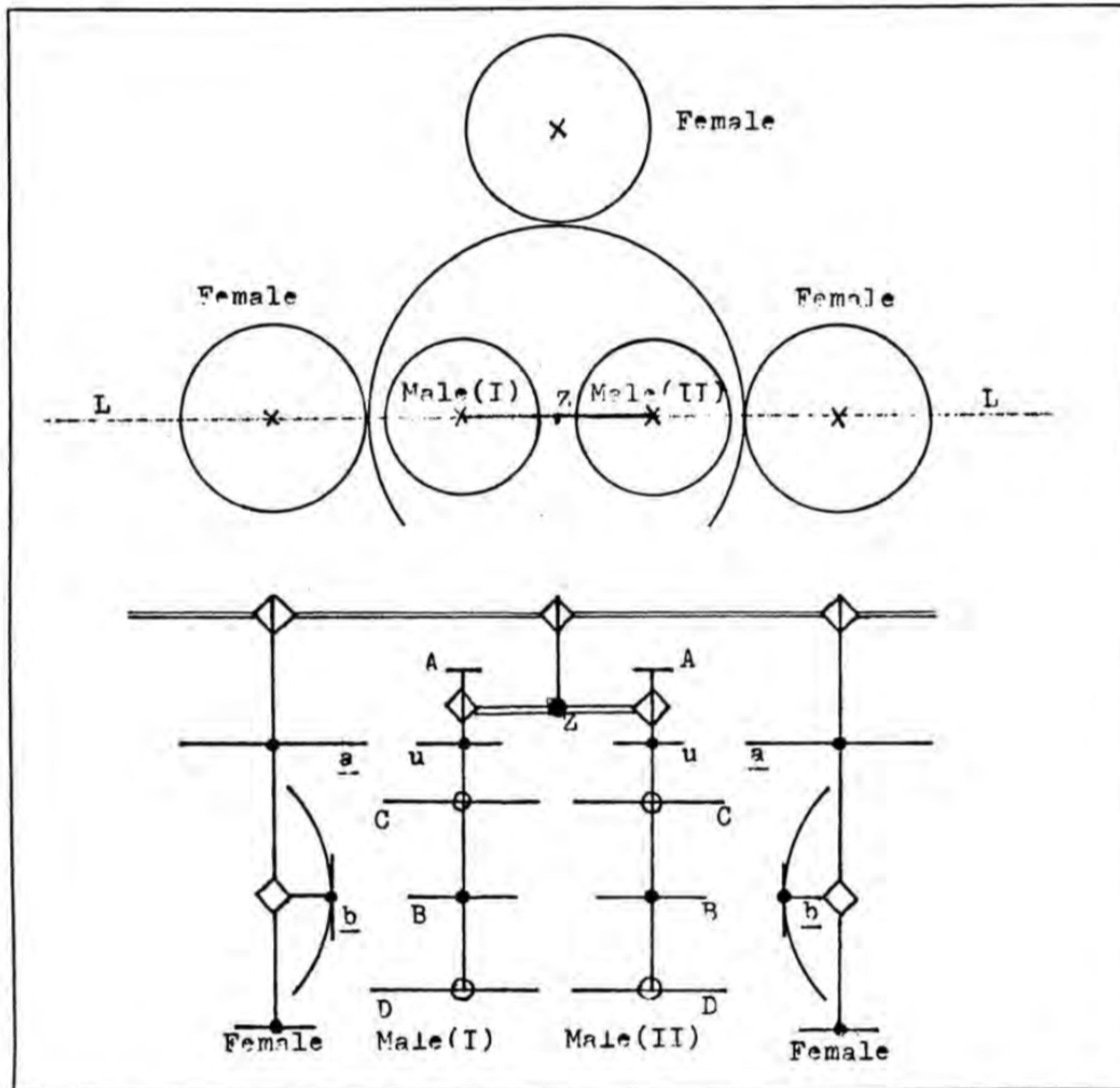
"A comment, a case history, and a plan", written by Gordon Pask before Colloquy was created

*Cybernetics, Art and Ideas*  
Jasia Reichardt, ed.,  
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Society Ltd., 1968

Plan and Section views  
of Colloquy of Mobiles

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Society Ltd., 1968, p 90

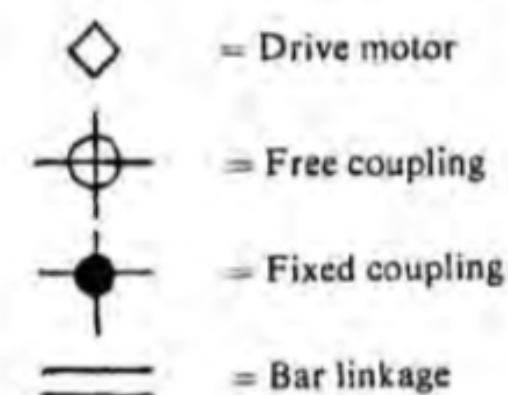


*Plan View*

*Section View*

Fig. 34 A rough sketch of powered mobiles.

- a Horizontal plan
- b Vertical section taken through line *L* in horizontal plan.
- A* = drive state display for male
- B* = main body of male, bearing 'energetic' light projectors *O* and *P*
- C* = upper 'energetic' receptors
- D* = lower 'energetic' receptors
- U* = non-'energetic', intermittent signal lamp
- a* = female receptor for intermittent positional signal
- b* = vertically movable reflector of female
- Z* = bar linkage bearing male I and male II



It is evident that the achievement of the *O* satisfaction goal involves an hierarchy of sub-goals and that communication in pursuit of these sub-goals takes place at various levels. Further, the selection of a main goal (such as *O* satisfaction) involves a still higher level process. Referring back to the list of desiderata, we can check that the male members of the mobile community satisfy all of them.

Consider a female: she also has an *O* drive and a *P* drive. Unless both drives are satisfied (when she becomes inert) the female rotates and searches for a male. According to her drive state, she is receptive to males offering *O* or *P* cooperation or to both. Suppose that she is looking for *O* cooperation and suppose she encountered male I in the state already described, on receipt of his intermittent directional signal, she puts his name 'male I' and his intention '*O* satisfaction' into a short-term memory. Next, she emits the correlated sound which he can recognize and expects to receive the 'energetic' beam of orange light. If this *does* fall on her vertical reflector, *b*, she stops her rotational motion and starts a search, using this reflector, to position the beam on some part of male I that will give rise to a reinforcement signal; her goal is to obtain the conjunction of orange light on her reflector and the reinforcement signal from male I; goal achievement reduces her *O* drive. Her likelihood of achieving this goal in the rather short time allowed for an unreinforced encounter, depends upon the vertical reflector search strategy and this in turn depends upon her previous experience (upon what she has learned and placed in a long-term 'memory'). In ignorance of males, her vertical strategy is a haphazard search reflecting the beam up and down. However, if she has previously learned that reinforcement for *O* light comes from reflecting it upwards (in fact on to *C*

of male I), then her strategy becomes a limited upwards search. A similar comment applies to *P* experience. Further, not all males are necessarily the same; some may like *O* light on *D* and *P* light on *C*; she can learn that trick also.

In any case, the vertical search strategy terminates after a short time (and the rotational search is resumed) if a reinforcement signal is not received from the male.<sup>1</sup> If a signal is received, the vertical search is prolonged possibly until the female drive state has been modified. The whole process is summarized in the accompanying flow-charts. There are five independent systems, three female and two male which are run asynchronously in parallel. The flow-charts of figures 35, 36 and 37 represent a female system and the flow-charts of figures 38 and 39 represent a male system.

This completes<sup>2</sup> our description of the social environment of mobiles.

The really interesting issue is what happens if some human beings are provided with the wherewithal to produce signs in the mobile language and are introduced into the environment. It is quite likely that they will communicate with the mobiles, for the mobiles are interacting already and ostensibly define the gambits involved in the process. Further, their community has quite an intriguing organization. At this level alone, the environment has the properties required of an aesthetically potent environment.

But the mobiles produce a complex auditory and visual effect by dint of their interaction. They cannot, of course, interpret these light and sound patterns. But human beings can and it seems reasonable to suppose that they will also aim to achieve patterns that they deem pleasing by interacting with the system at a higher level of discourse.

I do not know. But I believe it may work out that way.

<sup>1</sup> The vertical search is the female form of an autonomous process.

<sup>2</sup> We have cited special cases. The account is, however, readily generalized to cover all initial conditions of the mobiles.

## Description of behaviors of Colloquy of Mobiles

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In *Cybernetics, Art and Ideas*,  
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Society Ltd., 1968, p 91

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Movies of Colloquy  
Institute of Contemporary Arts  
London  
1968



Movies of Colloquy  
Institute of Contemporary Arts  
London  
1968

## Gordon Pask in 1975

*“...was to use in the classroom or certain places like that.*

*That is a machinery, hardly discernible perhaps, for um... running a Colloquy of Mobiles, as it was called.*

*Ah... is the wrong way up, yes.*

*These were large suspended mobiles and I was taxed with the ability of making an exhibition piece for entertainment, in fact, where the people would engage in ‘conversations through’...*

*So I made a family of mobiles... um...*



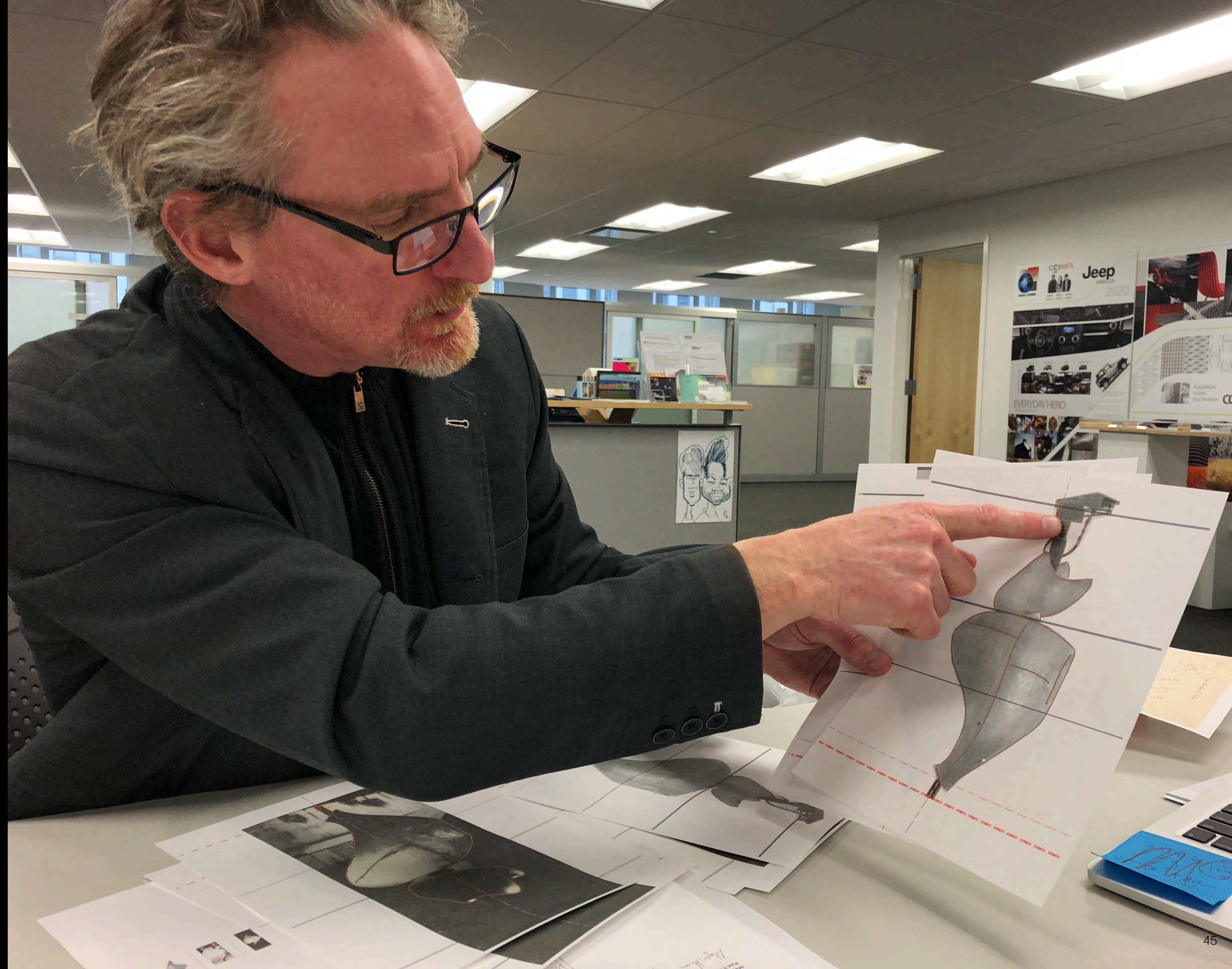
Click for video

*... which were these things on mechanically rotating beams, an environment out of PDP8 computers and whatnot, and what in those days would be the equivalent to a microprocessor with a load of junk in each one.*

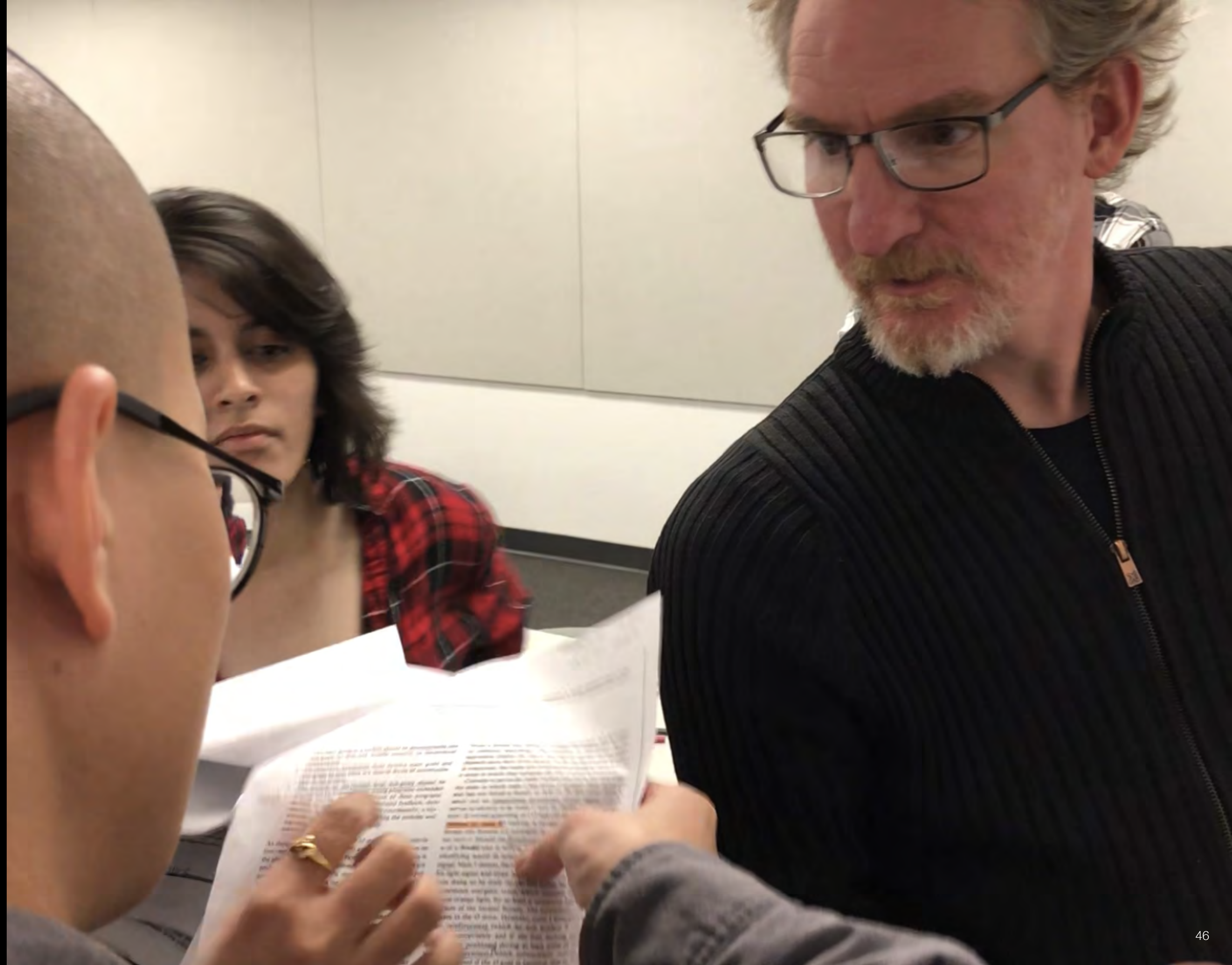
*The point being that the mobiles had a life of their own and they chatted to each other by beams of light which they wagged up and down... and by hooting sounds and so forth and anybody could go into that discourse if they wanted to and hoot at them or put their hand up in front of the light.*

*And they did.”*

# Less Interference / More Dance!



TJ McLeish, Master Fabricator  
COLLOQUY 2018 Project  
MFA Interaction Design  
College for Creative Studies  
2018



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2018



## Planning Document

TJ McLeish, Master Fabricator  
 COLLOQUY 2018 Project  
 MFA Interaction Design  
 College for Creative Studies  
 2018

Installation Elements			
Component	Description	Potential Materials	Prototype/Mo
Armature	the non-digital/electronic components of the installation responsible for structure and visual aesthetics of - the figural components of the piece, the mechanical components [actuation], sensing, and the computational hardware [brains]	Structure: Aluminium Strut, unistrut, perforated angle Plinth Surface: Fabric, foamcore, thermoplastic, Figure Composition: Fiberglass, resin impregnated fabric, thermoplastic	Study scale an Study scale an Study scale an
Mechanics	the actuation components of the installation that enable movement of the sculptural elements	12v/24v Motors and Servos, motor control boards, gearbox, pulley, belts	Study control load due to we
Wiring Harness	The components of the system that deliver power and signal [if necessary]to the distributed sensing/actuation/and computation components	DC wiring, enclosure	Study aestheti Study transmi
Sensing	The electromechanical components of the installation that enable the sensing of [at least] light	photoresistor, microphone, spectral analysis, limit switch thermal imaging device, photodiode, microphone, CO2 sensing, etc.	Study light sen Study reflecte conditions Study sound e conditions
Actuation	The electromechanical components of the installation that enable the generation of [at least] light	LED, incandescent light, speaker	Study moveme Study moveme Study moveme Study display
Computation	The devices that receive input from sensing and generate output to deliver to actuators via communications protocol, as well as communicate with other computational entities.	Microelectronic computers i.e arduino, electron, raspberry pi, intel edison, TI launchpad, LittleBits, etc.	Study
Communication	The means of communication amongst computational components	antennae, wiring, communications protocol i.e. 3G, WIFI, hardwired, etc.	Study commu system consic
Software	The logic that runs on the computational platform that determines installation behavior and interaction with installation participants both human and machine.	Programming language, development tools, API/Libraries used to communicate with hardware	Study algorith



## Plan and Section views of Colloquy of Mobiles

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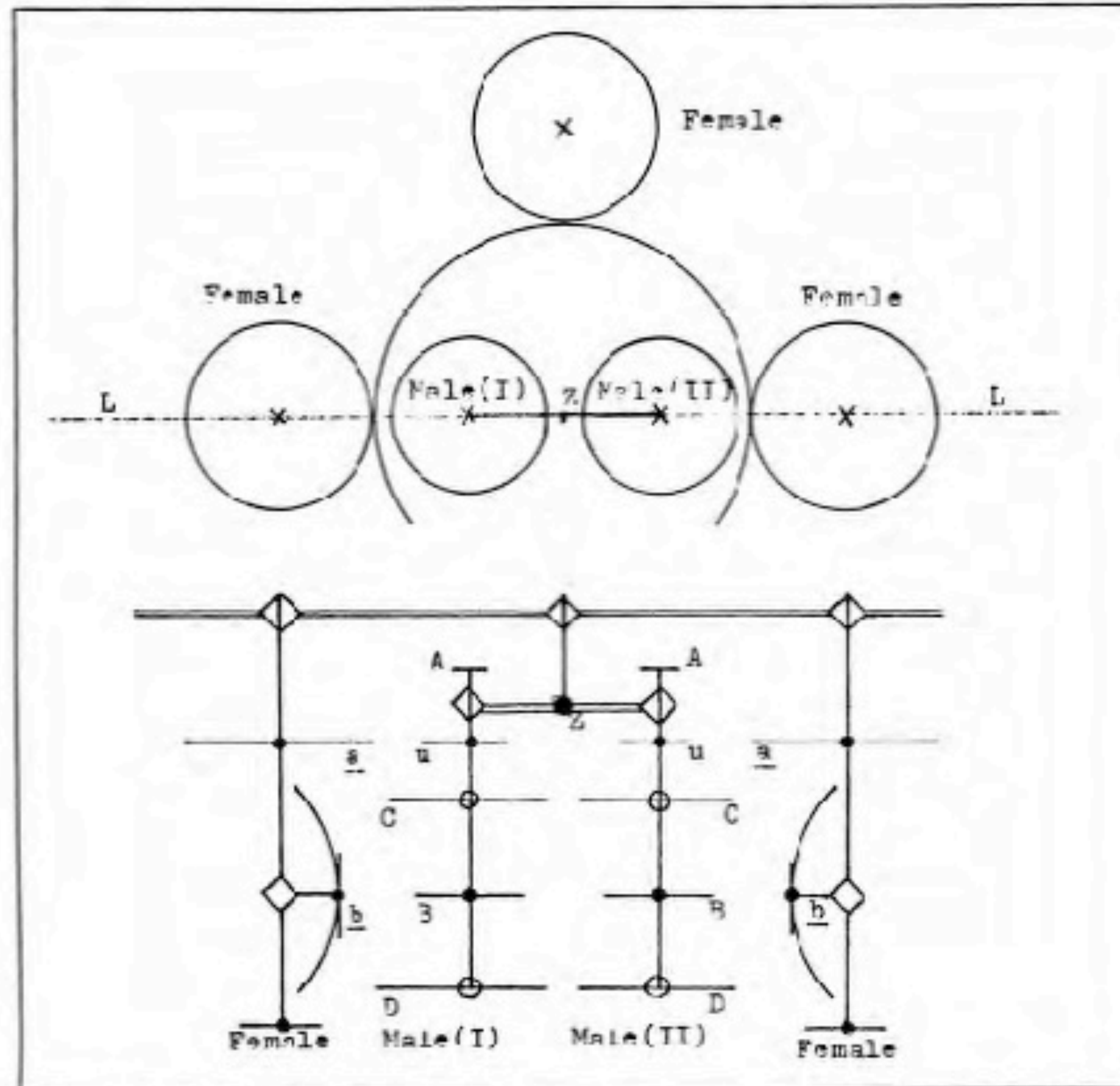
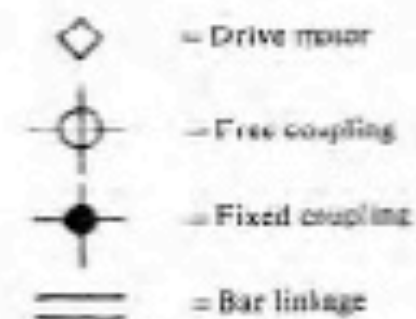
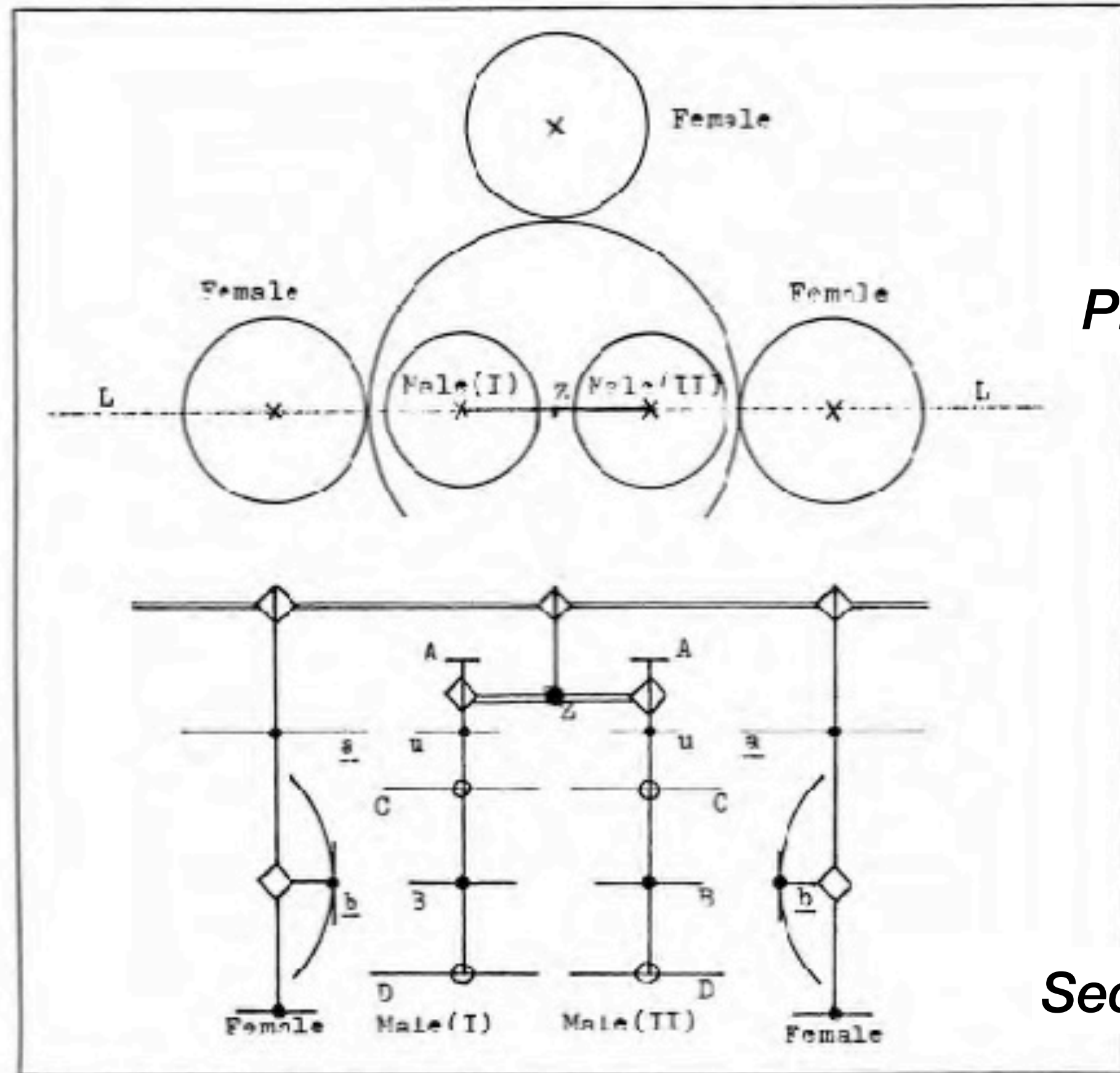


Fig. 34 A rough sketch of powered mobiles.

a Horizontal plan  
b Vertical section taken through line L in horizontal plan.  
A = drive state display for male  
B = main body of male, bearing 'energetic' light projectors O and P  
C = upper 'energetic' receptors  
D = lower 'energetic' receptors  
U = non 'energetic', intermittent signal lamp  
a = female receptor for intermittent positional signal  
b = vertically movable reflector of female  
Z = bar linkage bearing male I and male II



Pask's schematic drawing (before building Colloquy) 1968

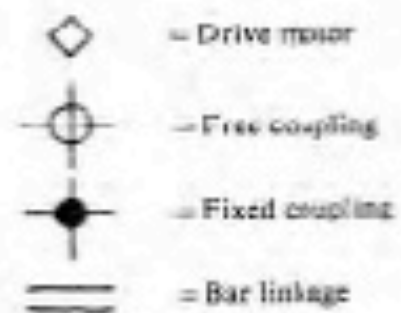


Plan View

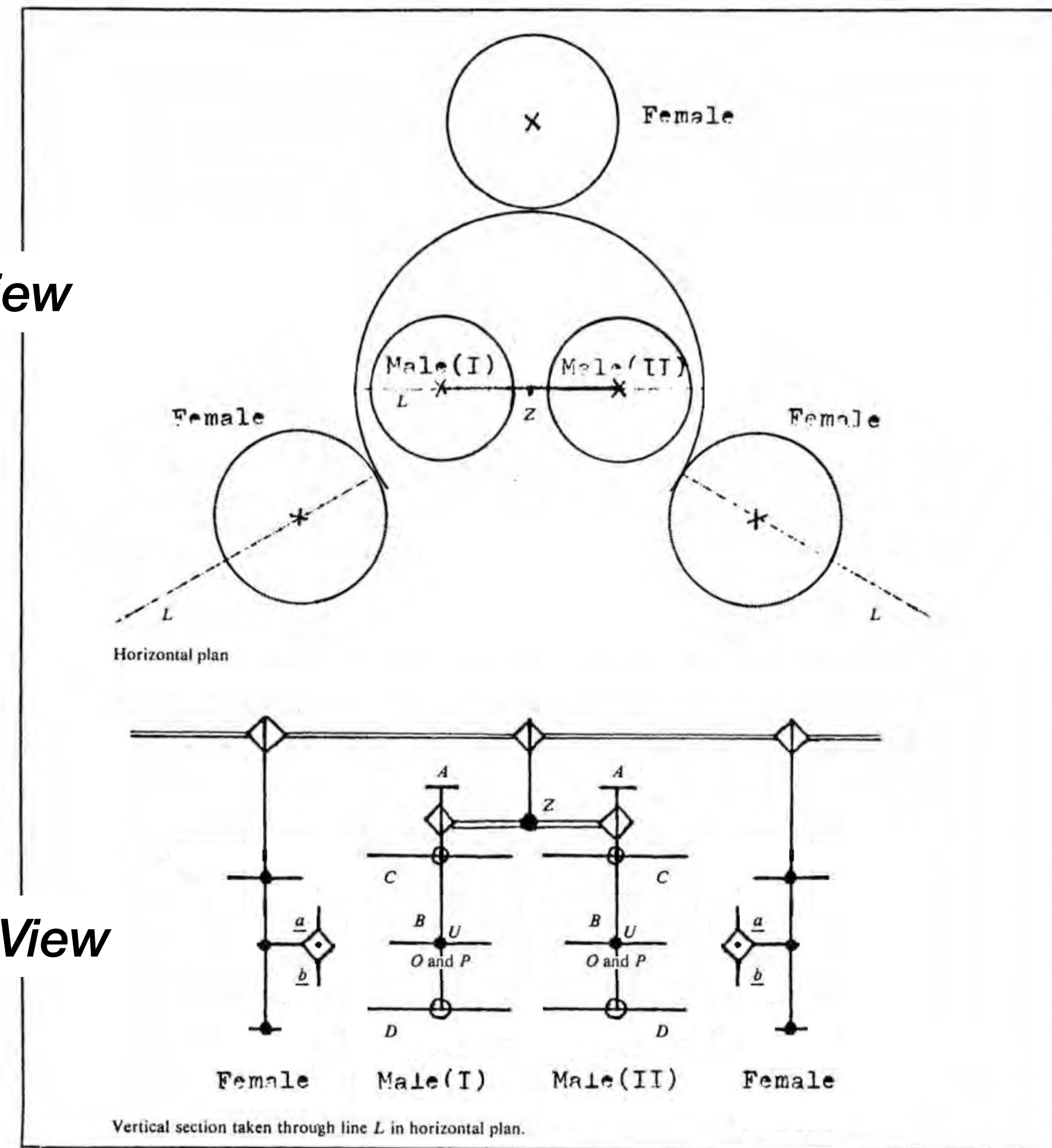
Section View

Fig. 34 A rough sketch of powered mobiles.

- Horizontal plan
- b Vertical section taken through line L in horizontal plan.
- A = drive state display for male
- B = main body of male, bearing 'energetic' light projection O and P
- C = upper 'energetic' receptors
- D = lower 'energetic' receptors
- U = non 'energetic', intermittent signal lamp
- a = female receptor for intermittent positional signal
- b = vertically movable reflector of female
- Z = bar linkage bearing male I and male II



Corrections based on photographic record 2018

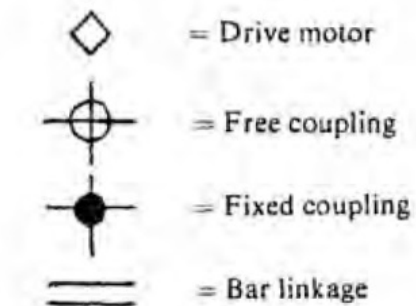


Horizontal plan

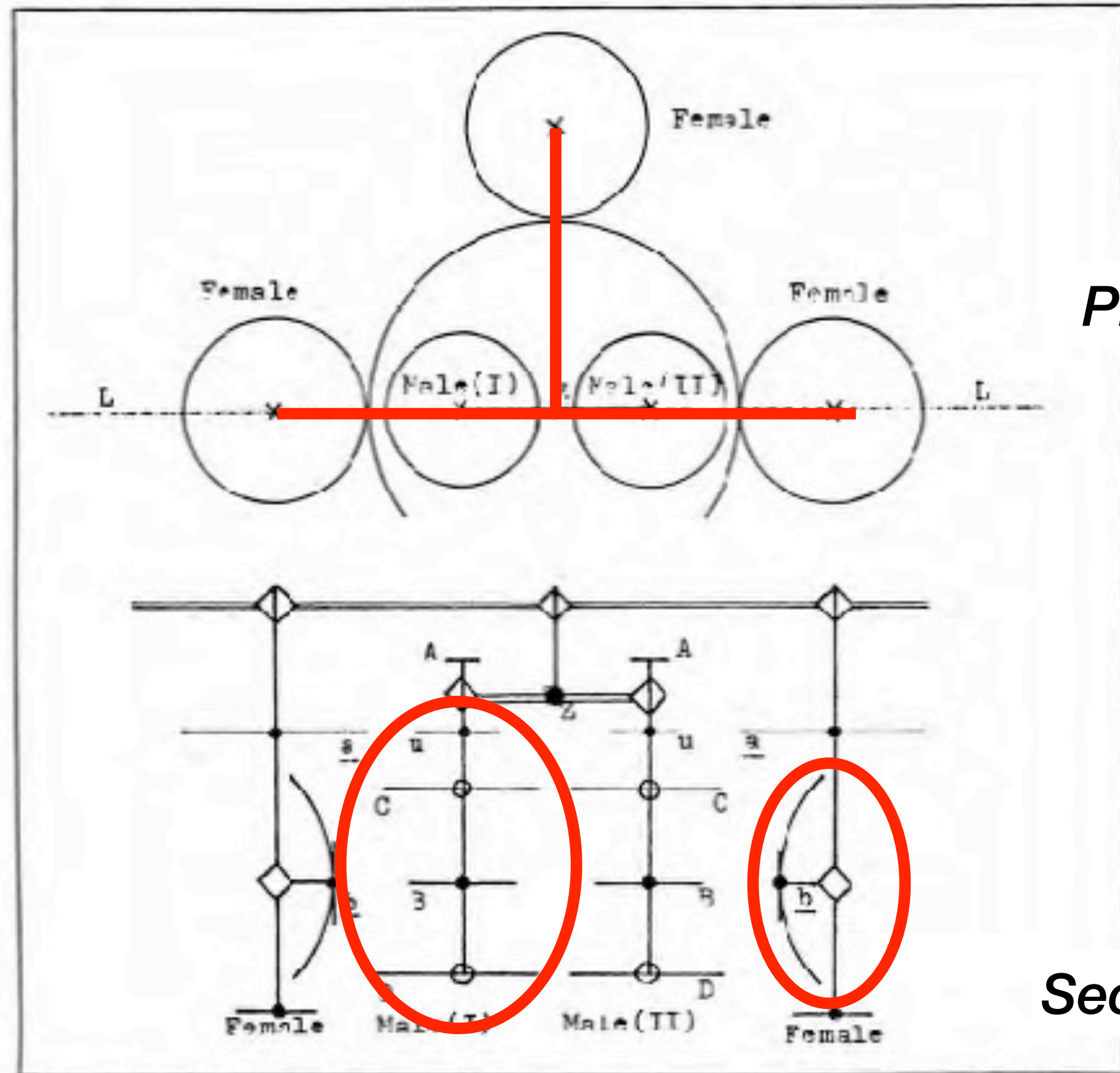
Vertical section taken through line L in horizontal plan.

Fig. 34 A rough sketch of powered mobiles.

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Pask's schematic drawing (before building Colloquy) 1968

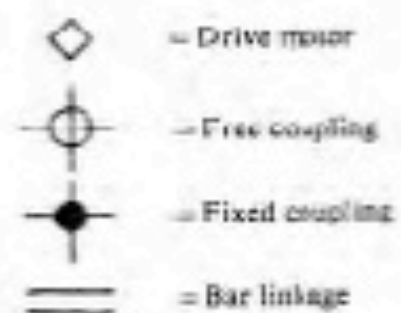


Plan View

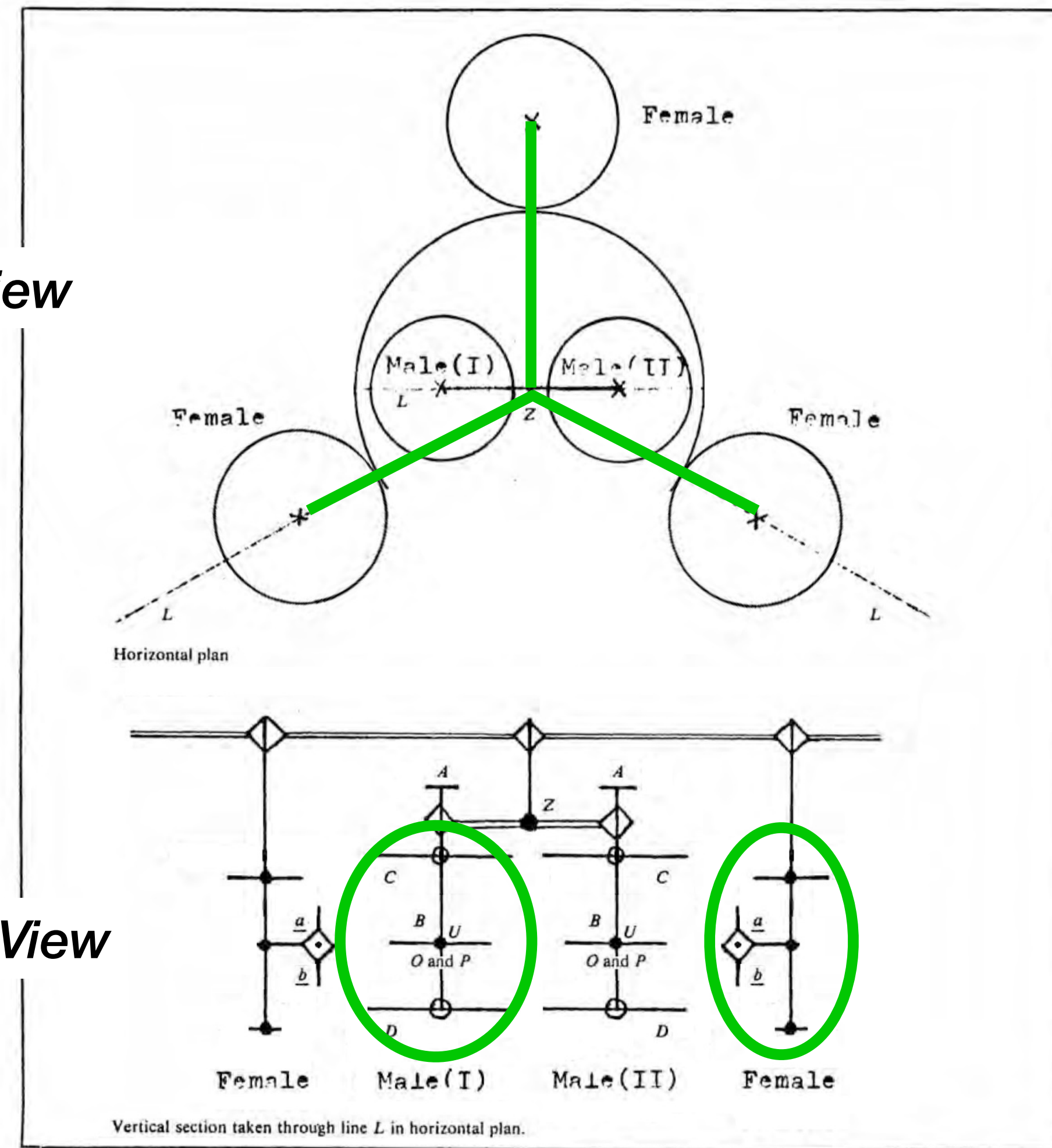
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Corrections based on photographic record 2018

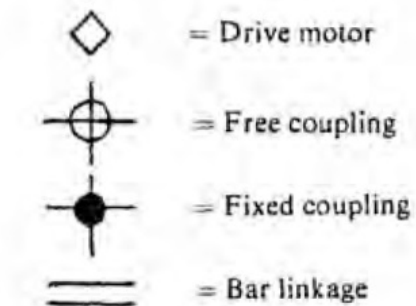


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## Description of behaviors

“A comment, a case history, and a plan”, written by Gordon Pask before Colloquy was created

In *Cybernetics, Art and Ideas*,  
Jasia Reichardt, ed.,  
Greenwich, CT: New York Graphic  
Society Ltd., 1968, p 91

It is evident that the achievement of the *O* satisfaction goal involves an hierarchy of sub-goals and that communication in pursuit of these sub-goals takes place at various levels. Further, the selection of a main goal (such as *O* satisfaction) involves a still higher level process. Referring back to the list of desiderata, we can check that the male members of the mobile community satisfy all of them.

Consider a female: she also has an *O* drive and a *P* drive. Unless both drives are satisfied (when she becomes inert) the female rotates and searches for a male. According to her drive state, she is receptive to males offering *O* or *P* cooperation or to both. Suppose that she is looking for *O* cooperation and suppose she encountered male I in the state already described, on receipt of his intermittent directional signal, she puts his name 'male I' and his intention '*O* satisfaction' into a short-term memory. Next, she emits the correlated sound which he can recognize and expects to receive the 'energetic' beam of orange light. If this *does* fall on her vertical reflector, *b*, she stops her rotational motion and starts a search, using this reflector, to position the beam on some part of male I that will give rise to a reinforcement signal; her goal is to obtain the conjunction of orange light on her reflector and the reinforcement signal from male I; goal achievement reduces her *O* drive. Her likelihood of achieving this goal in the rather short time allowed for an unreinforced encounter, depends upon the vertical reflector search strategy and this in turn depends upon her previous

of male I), the search. A similar not all males are on *D* and *P* light

In any case, a short time (and reinforcement signal is received, the the female drive is summarized five independent are run asynchronously figures 35, 36 flow-charts of fi

This completes of mobiles.

The really human beings a signs in the mo environment. It with the mobile and ostensibly Further, their c tion. At this lev required of an a

But the mobi effect by dint o

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In any case, the vertical search strategy terminates after a short time (and the rotational search is resumed) if a reinforcement signal is not received from the male. If a signal is received, the vertical search is prolonged possibly until the female drive state has been modified. The whole process is summarized in the accompanying flow-charts. There are five independent systems, three female and two male which are run asynchronously in parallel. The flow-charts of figures 25, 26 and 27 represent a female system and the flow-charts of figures 28 and 29 represent a male system.

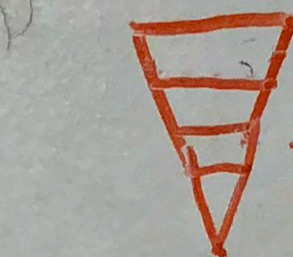
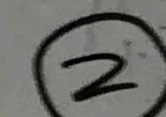
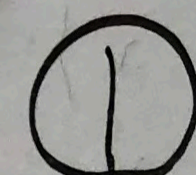
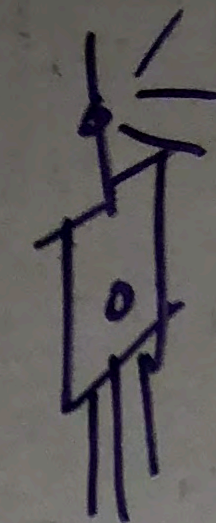
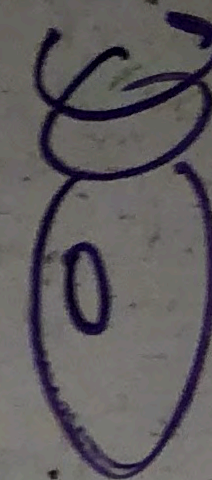
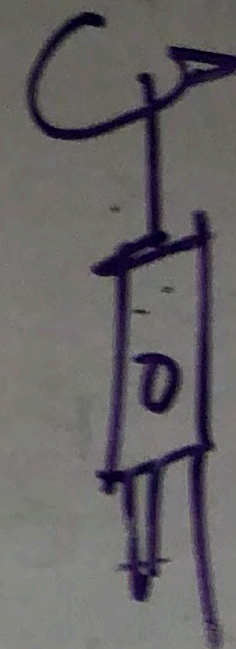
This completes our description of the social environment of mobiles.

The really interesting issue is what happens if some human beings are provided with the wherewithal to produce signs in the mobile language and are introduced into the environment. It is quite likely that they will communicate with the mobiles, for the mobiles are interacting already and extensively define the gambits involved in the process. Further, their community has quite an intriguing organization. At this level alone, the environment has the properties required of an aesthetically potent environment.

But the mobiles produce a complex auditory and visual effect by dint of their interaction. They cannot, of course, interpret these light and sound patterns. But human beings can and it seems reasonable to suppose that they will also aim to achieve patterns that they deem pleasing by interacting with the system at a higher level of discourse. I do not know. But I believe it may work out that way.

<sup>1</sup>The vertical search is the female form of an autonomous process.  
<sup>2</sup>We have cited special cases. The account is, however, readily generalizable to cover all visual conditions of the world.

# Scenario I.



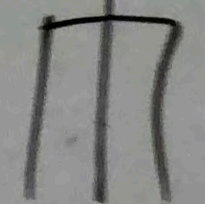
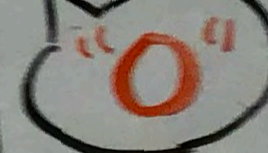
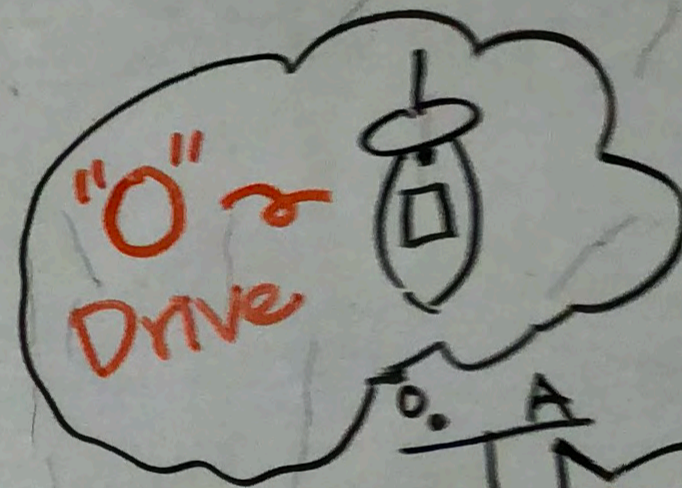
00:00

∩

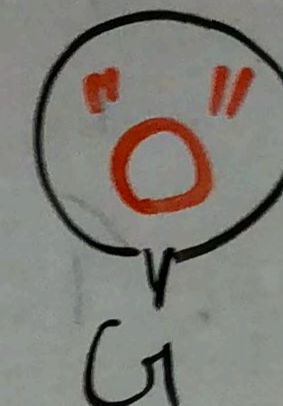
00:05



Male  
G



00:06



180°



270°

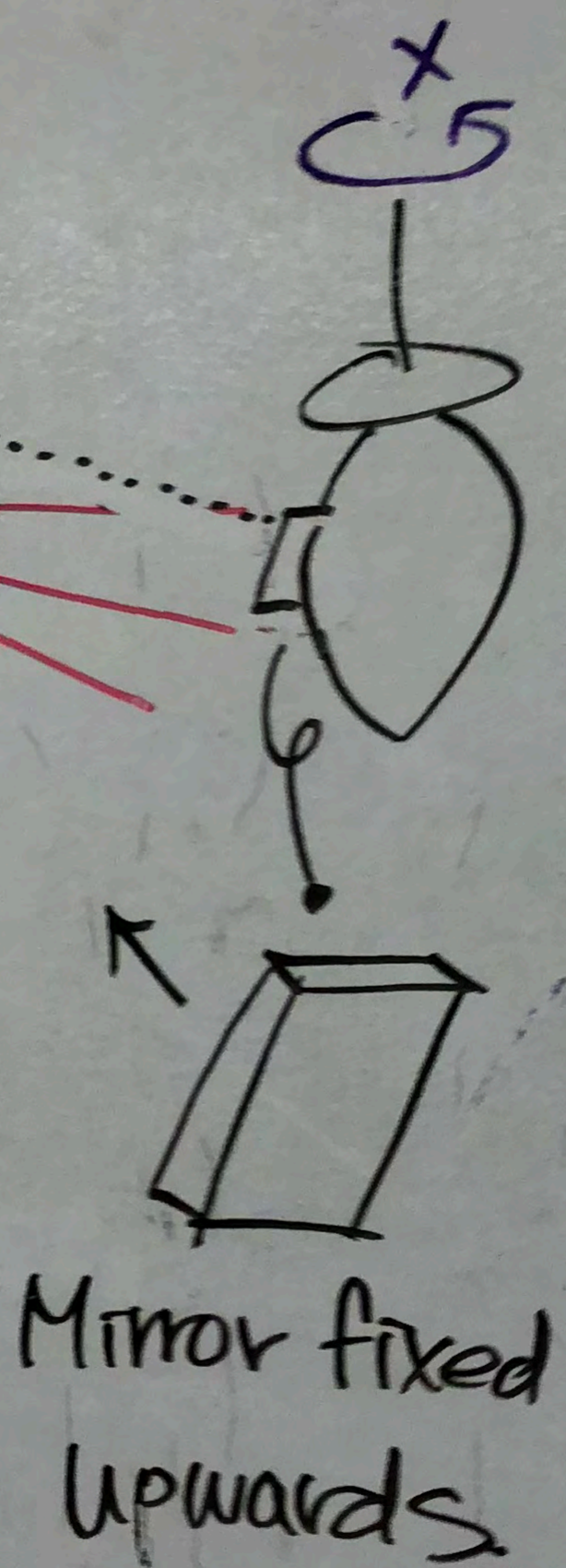
1 sec  
Fixed delay

fix

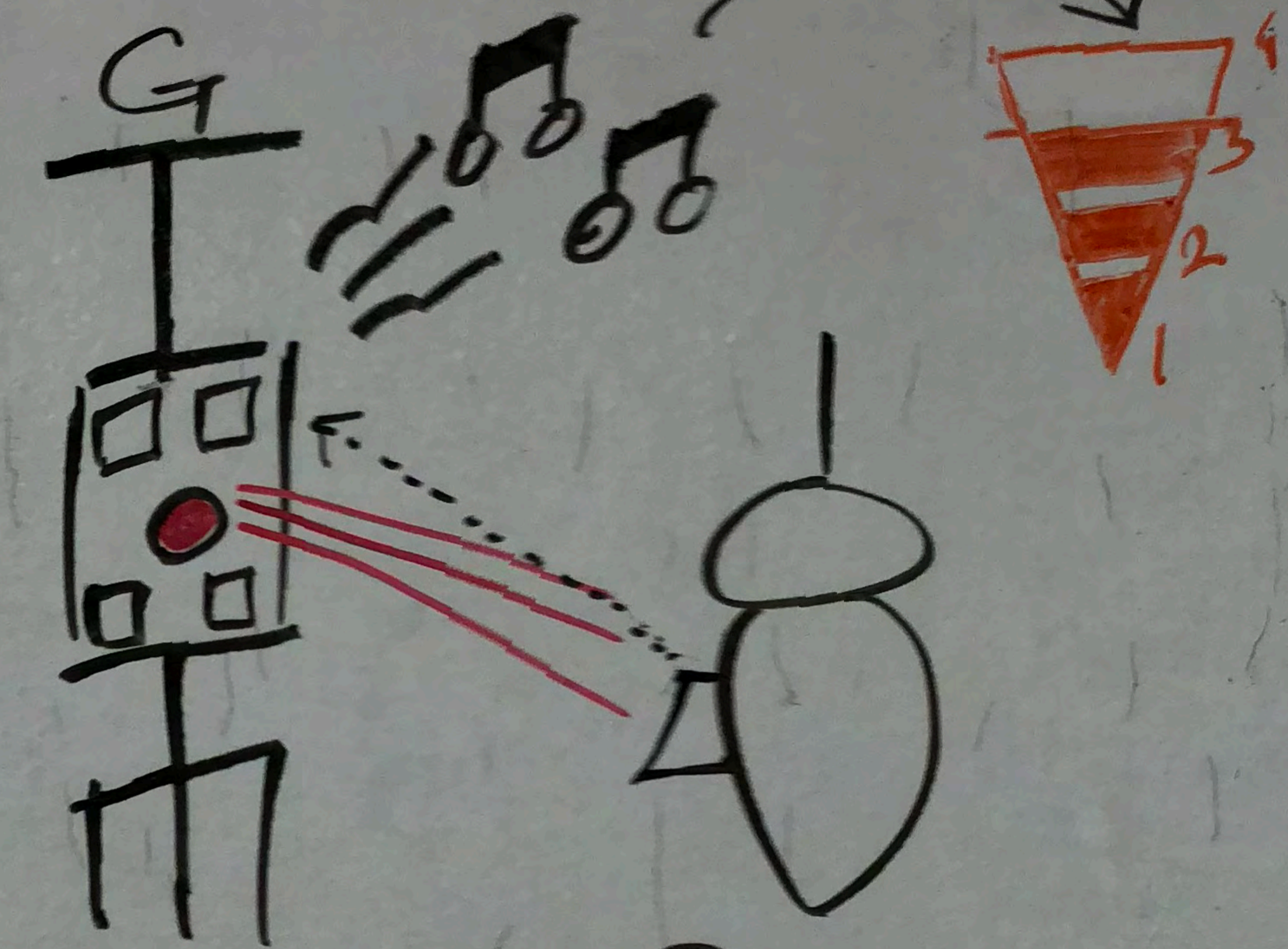
## Extracting scenarios

MFA Studio  
COLLOQUY 2018 Project  
MFA Interaction Design  
College for Creative Studies  
2018

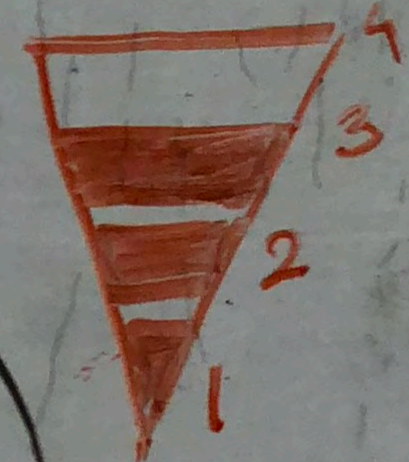
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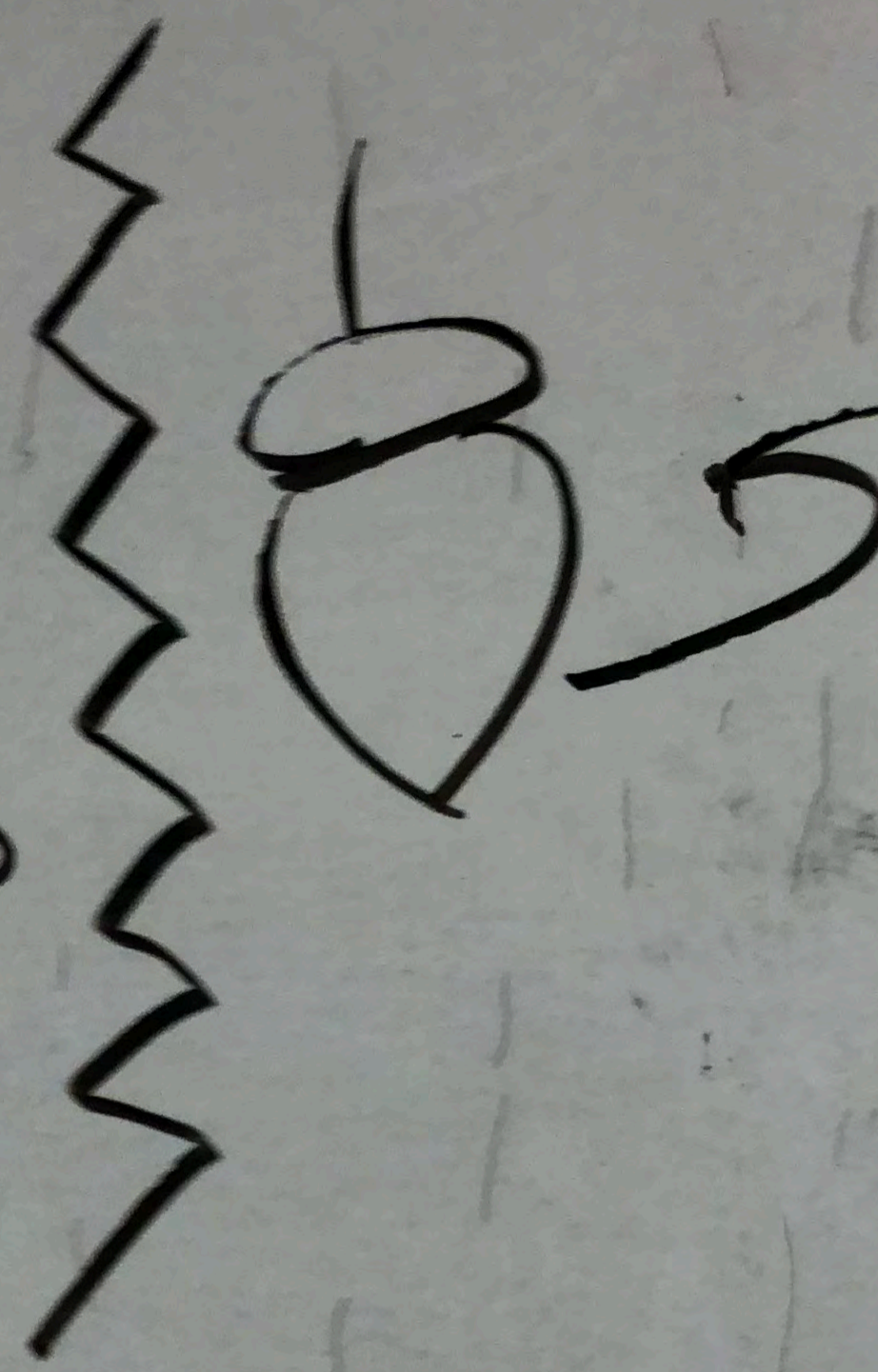
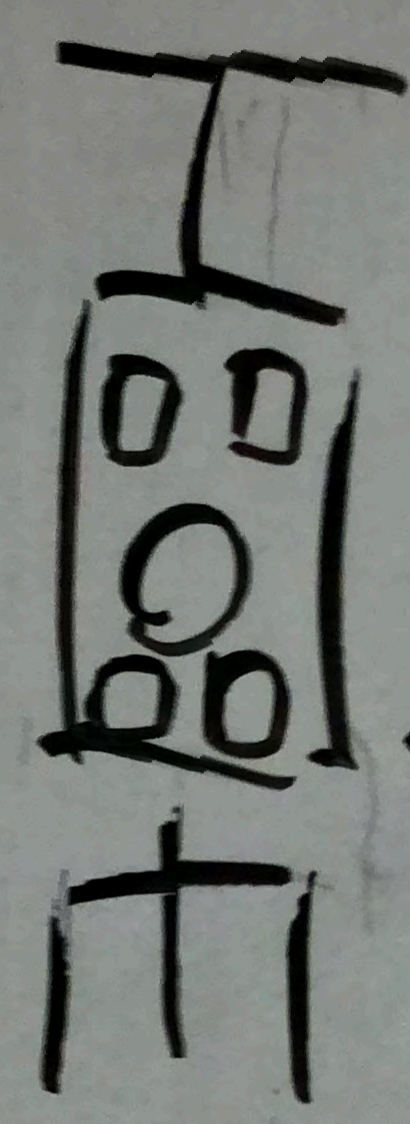
00:14 ~ 00:17



Short-term M  
for Upwards  
Search.



8 00:18





Acting out mobile behaviors  
Students of Studio IV  
MFA Interaction Design  
College for Creative Studies  
2018

## Description of mobile behaviors

“A comment, a case history, and a plan”, written by Gordon Pask before Colloquy was created

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## Interpretation of mobile behaviors

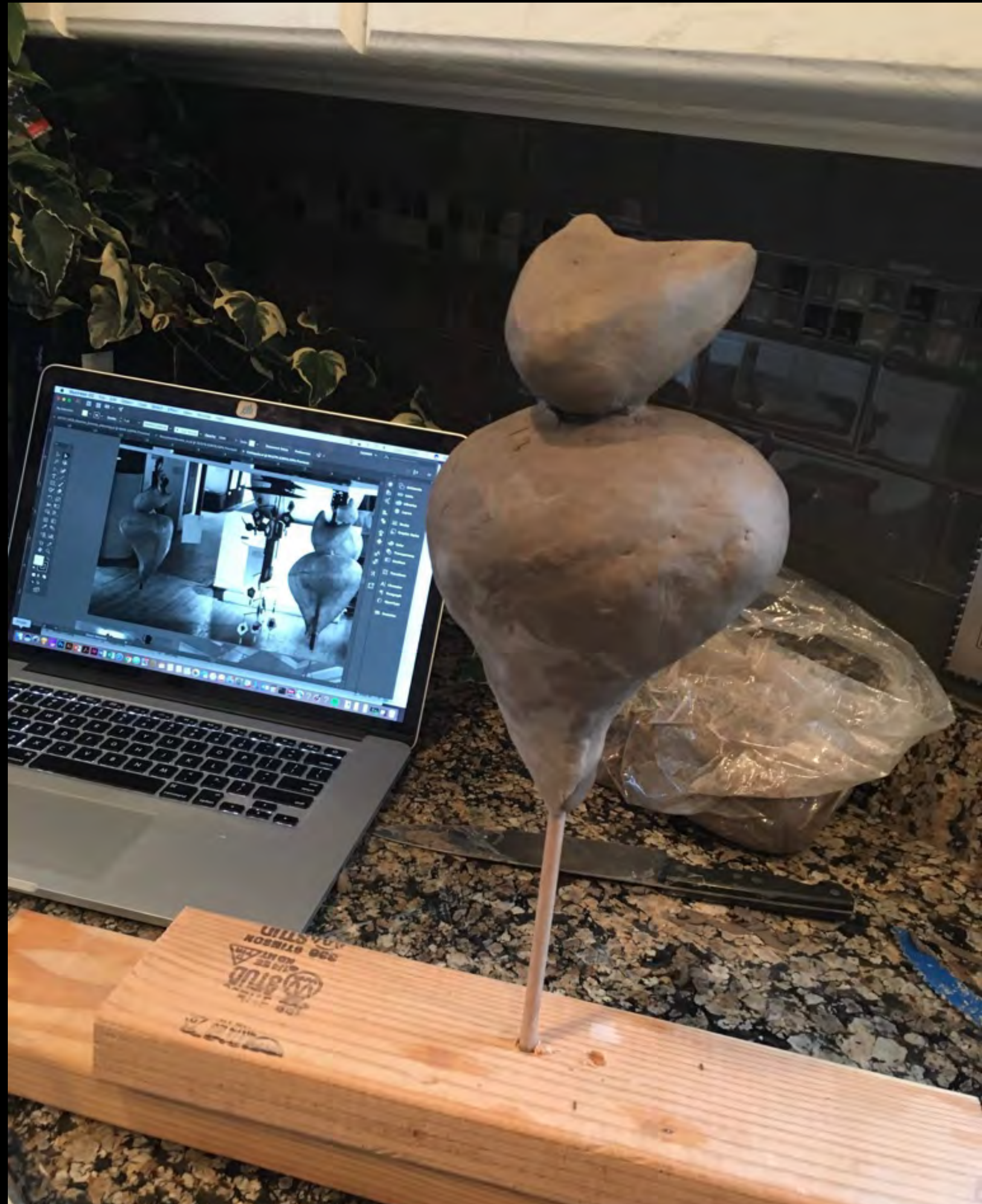
Students of Studio IV—MFA Interaction Design  
2018

Scenario 1 Initial conditions: No female memory as of yet. Male and female have same drive ‘O’ and reinforcement occurs.

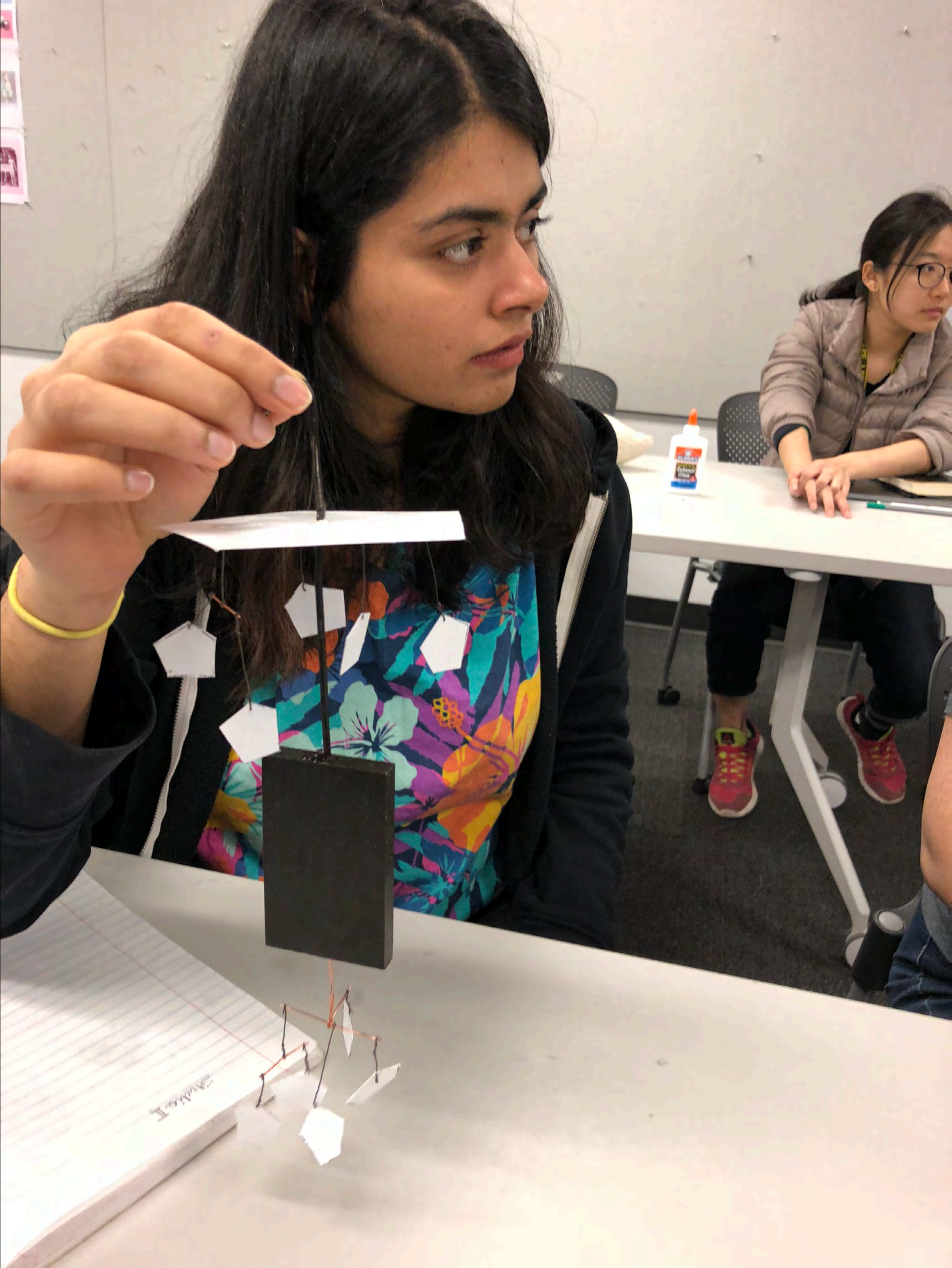
1. Male G has an ‘O’ drive and needs to locate a female that has the same drive. He is flashing his ‘u’ light which is signaling ‘O’. His sound sensor is always active.
2. Male G rotates on its own axis across 180 degrees and two males rotate across 360 degrees. Their ‘u’ lights are flashing.
3. Females rotate back and forth for 90 degrees on their axes.
4. Male G happens come across Female F1 and all of their components (sensors, lights, mirror) face each other for a fraction of a second.
5. Male G's flashing ‘u’ light falls on the photo sensor ‘a’ of F1, which causes F1 to stop. The frequency of the flashing ‘u’ light will convey the drive of male G—which is ‘O’—to F1.
6. The following multiple steps happen in a split second:
  - a. F1 determines if her drive (‘O’) matches Male G's drive, still signaling ‘O’, based on the frequency of flashing of G's light ‘u’.
  - b. F1 confirms that her drive matches Male G's drive; she signals this by a sound.
  - c. Female starts her vertical mirror oscillation.
4. Male G receives the sound and his ‘u’ light becomes B light, which is constant.
5. B light falls on the ‘a’ receptor of F1 and, if it becomes constant enough, she stops her vertical motor search.
6. F1's mirror stops at the upper angle causing light to hit the C receptor, and reinforcement starts to occur.
7. Male G's ‘O’ drive becomes satisfied when the reflection of the B light hits the C receptor for a sufficient period.
8. F1 receives the sound from Male G, indicating the reinforcement succeeded, and lowers her ‘O’ drive by 1 point.
9. F1 places the mirror angle into short-term memory.

They part ways — they rotate again on their own axes.

Building the scale model  
Students of Studio II: Prototyping & Internet of Things  
MFA Interaction Design  
College for Creative Studies  
2018



Building the scale model  
Khyati Shah, Student  
Studio II: Prototyping & Internet of Things  
MFA Interaction Design  
College for Creative Studies  
2018



Building the scale model  
Michael Evans, Instructor  
Studio II: Prototyping & Internet of Things  
MFA Interaction Design  
College for Creative Studies  
2018

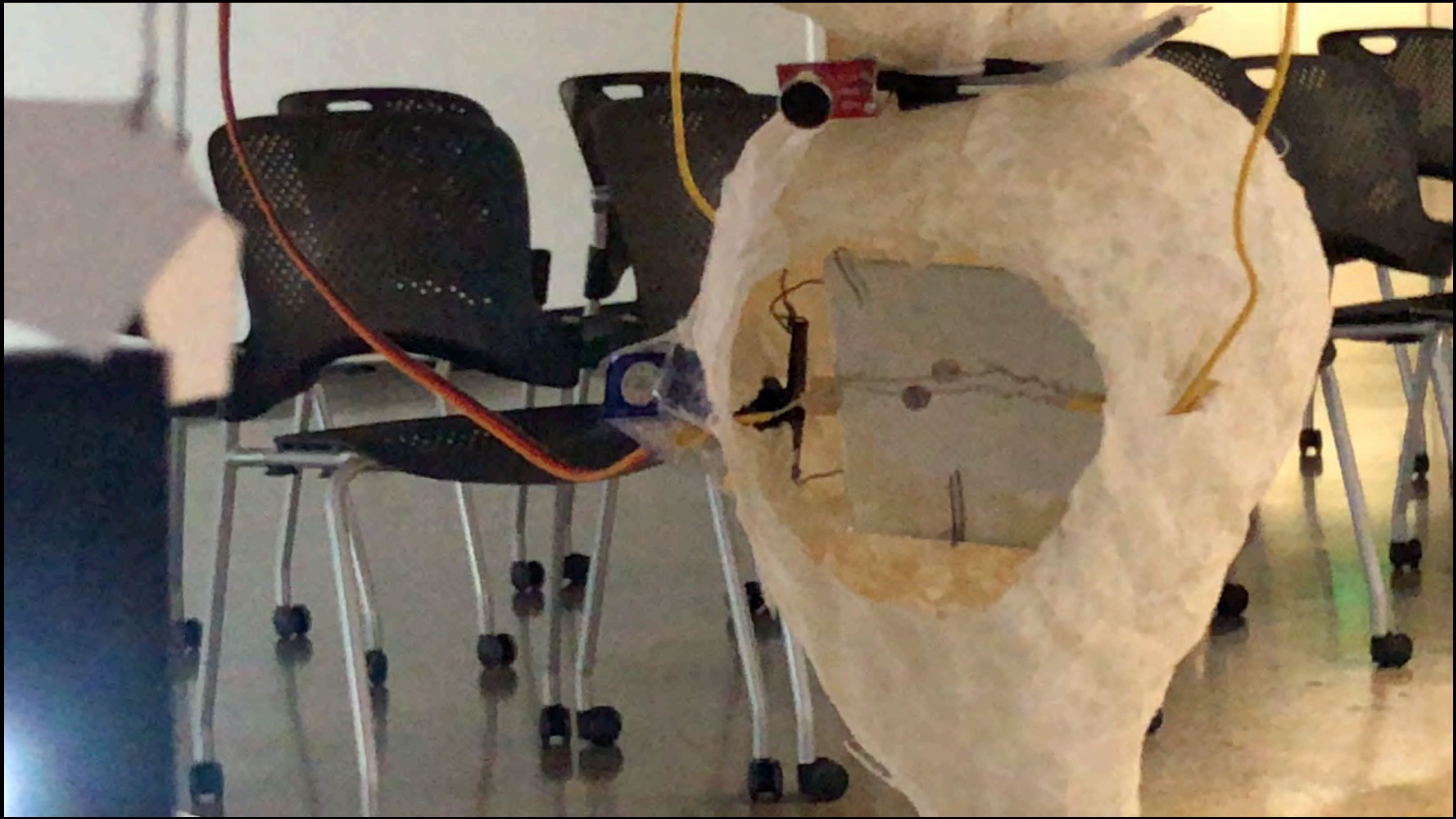


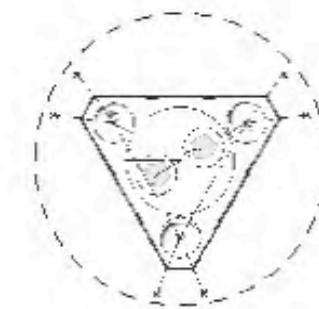
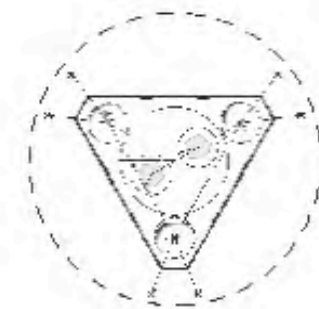
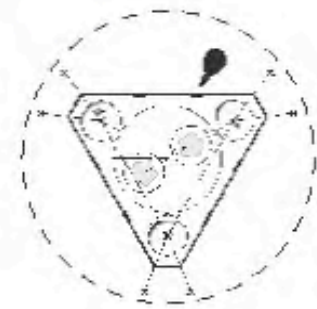
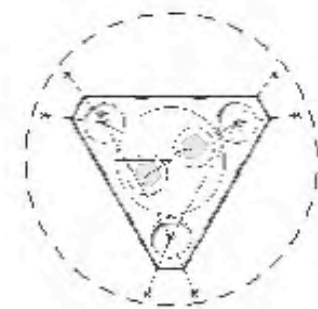
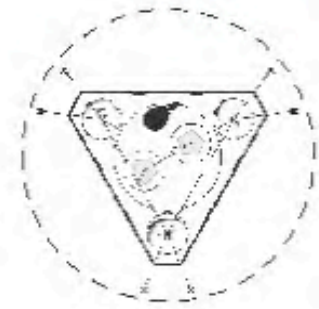
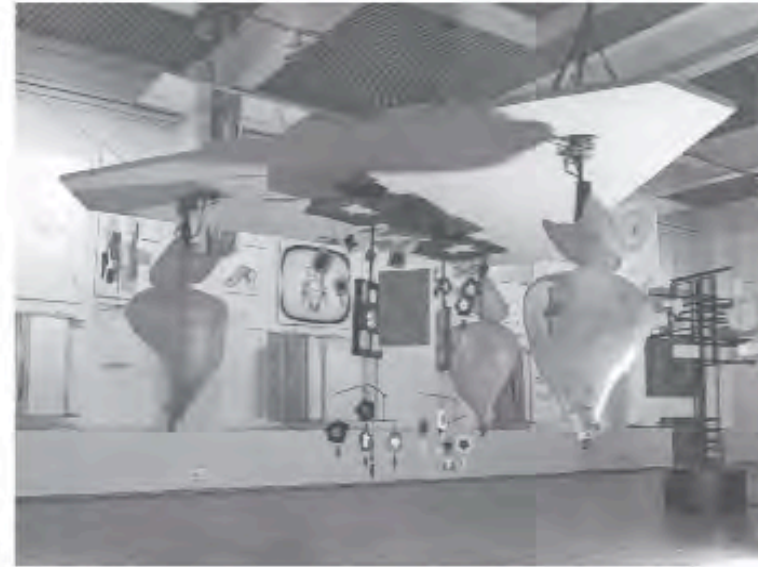
Building the scale model  
Sofia Lewandowski, Student  
Studio II: Prototyping & Internet of Things  
MFA Interaction Design  
College for Creative Studies  
2018



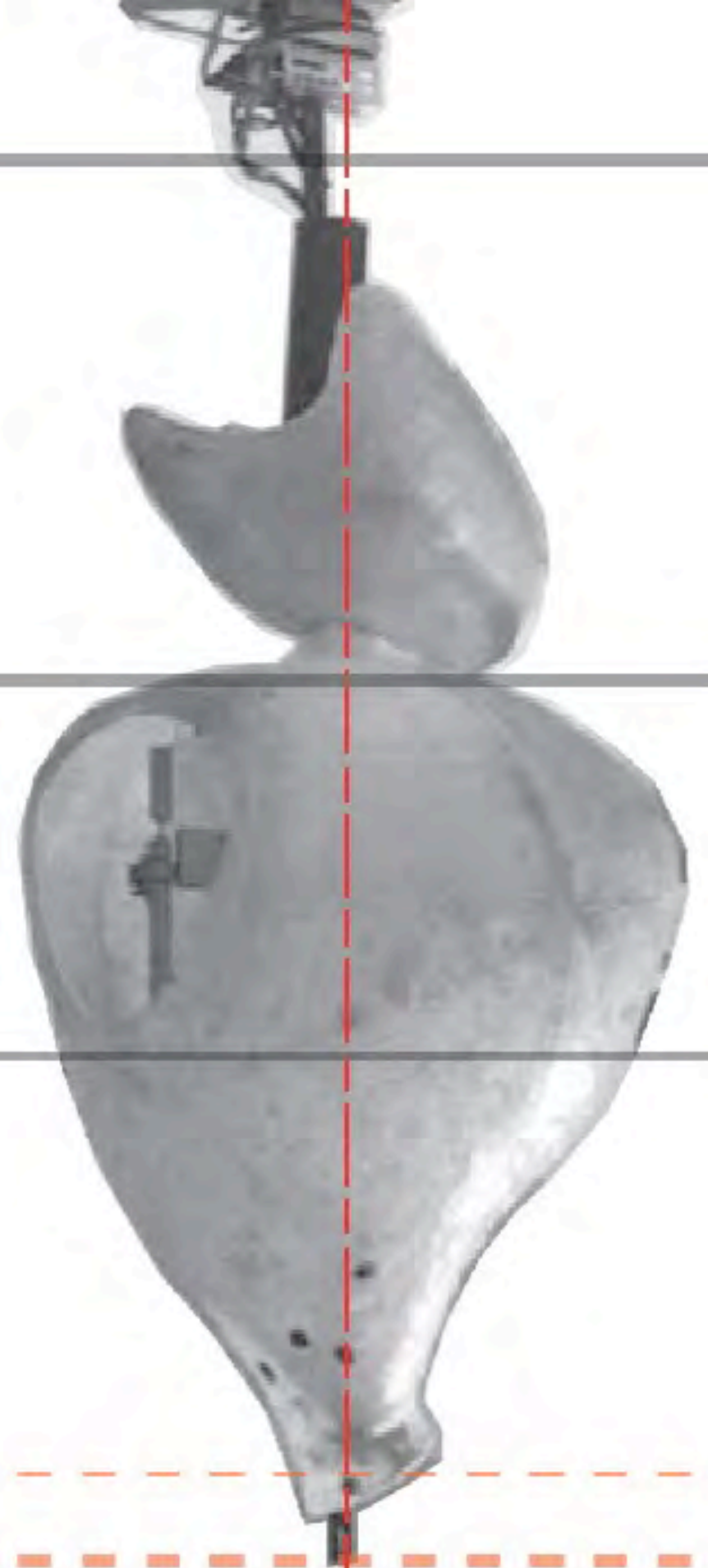
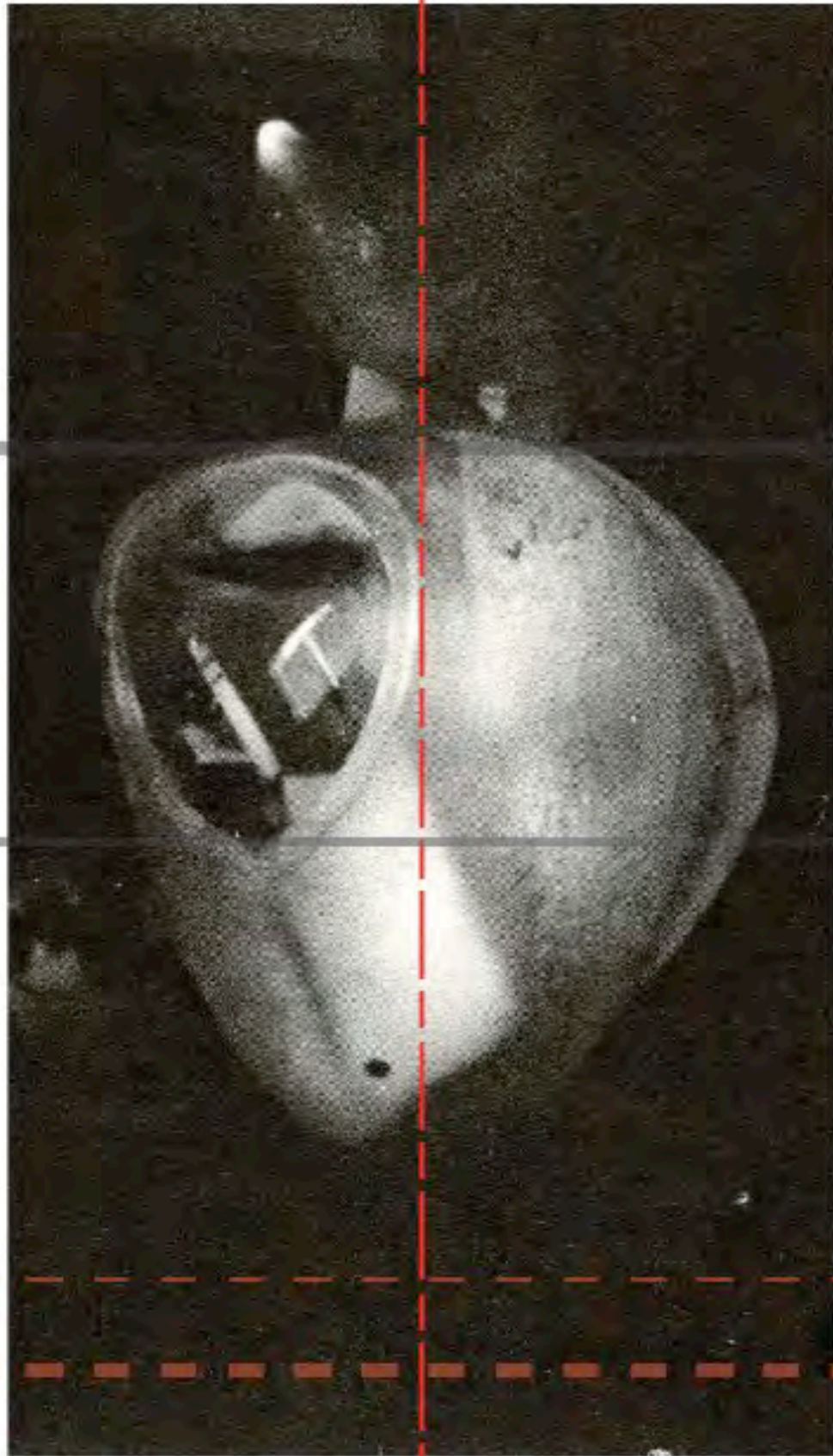
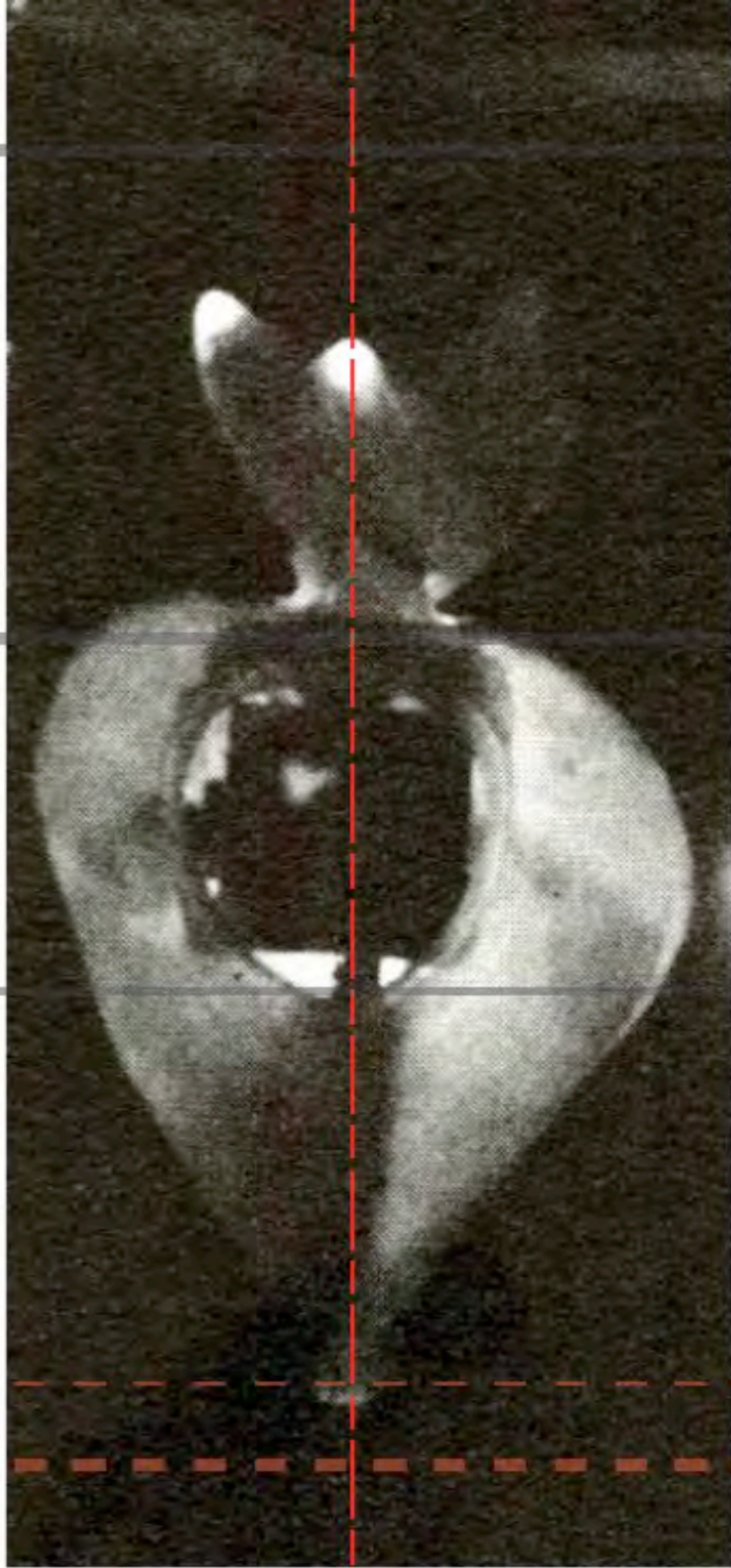
Building the scale model  
Studio II: Prototyping & Internet of Things  
MFA Interaction Design  
College for Creative Studies  
2018

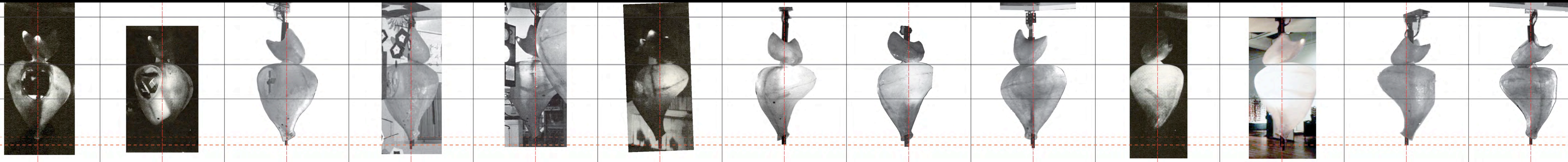


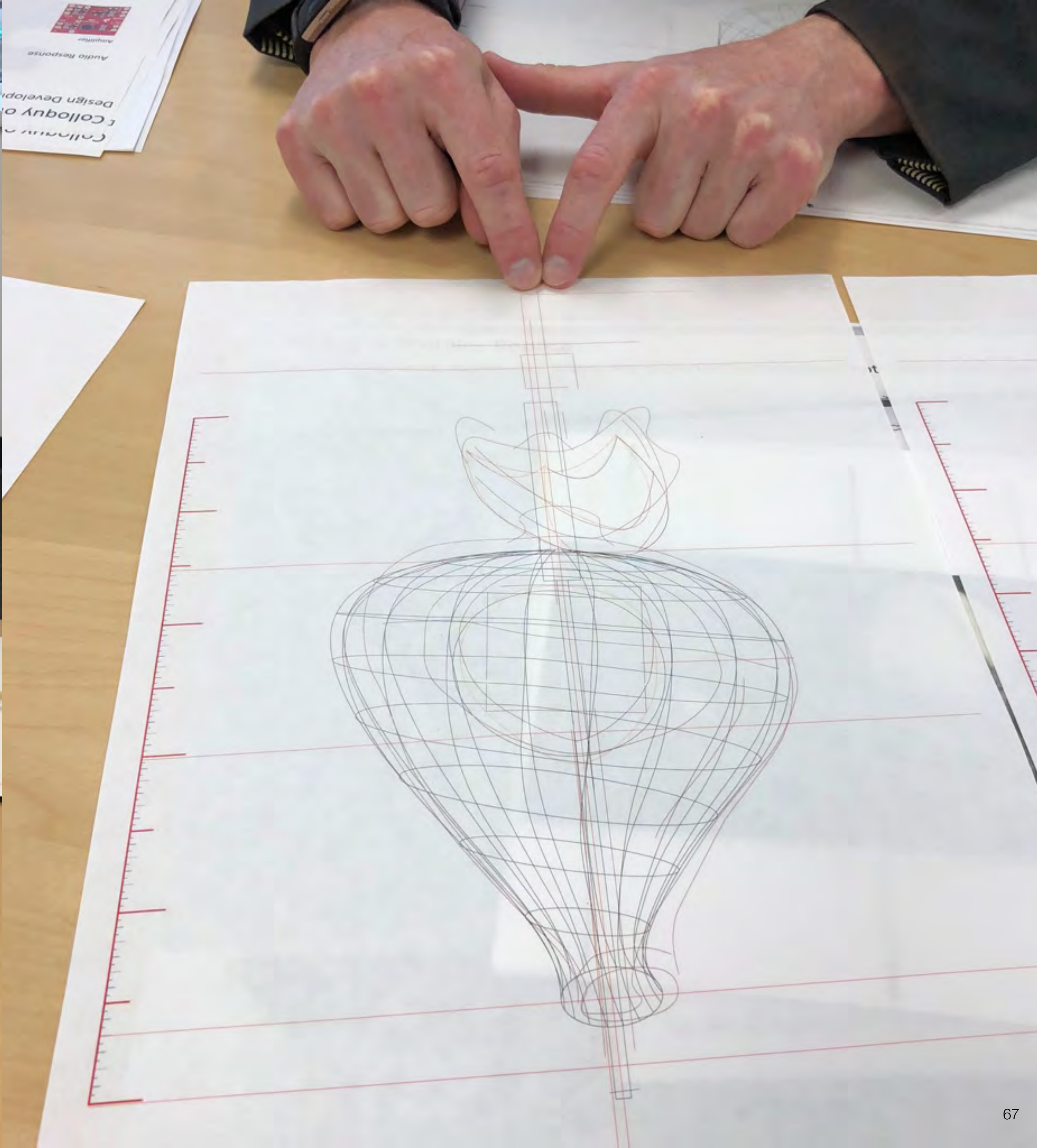
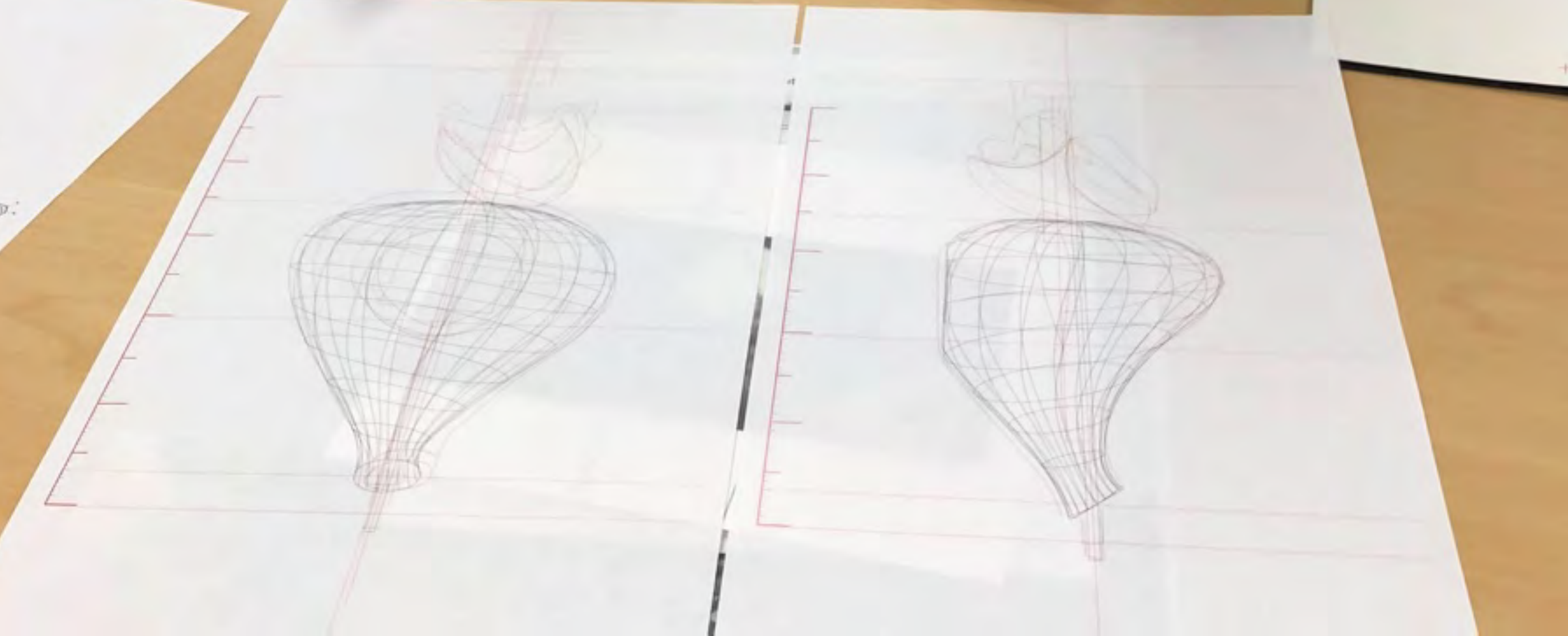






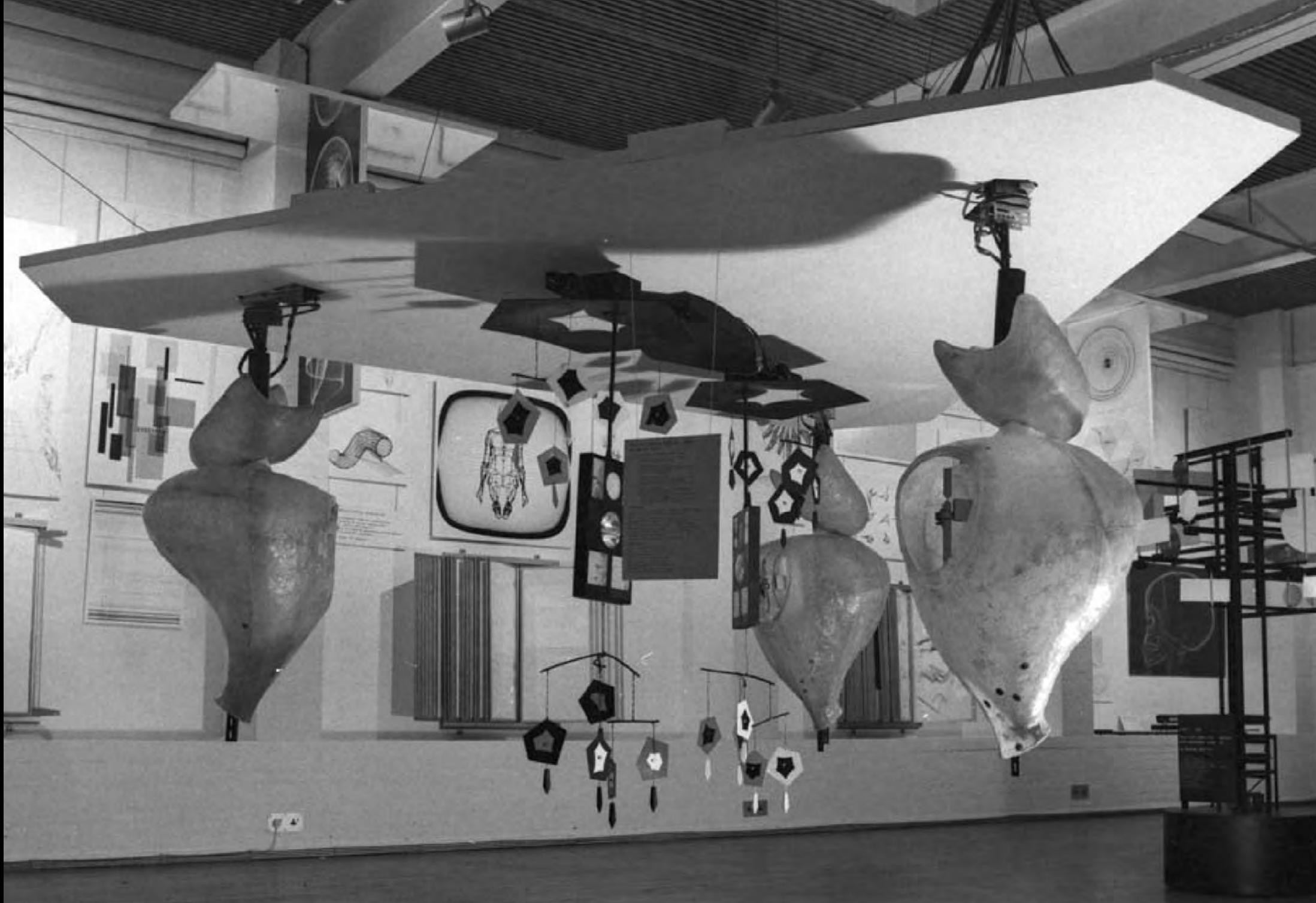




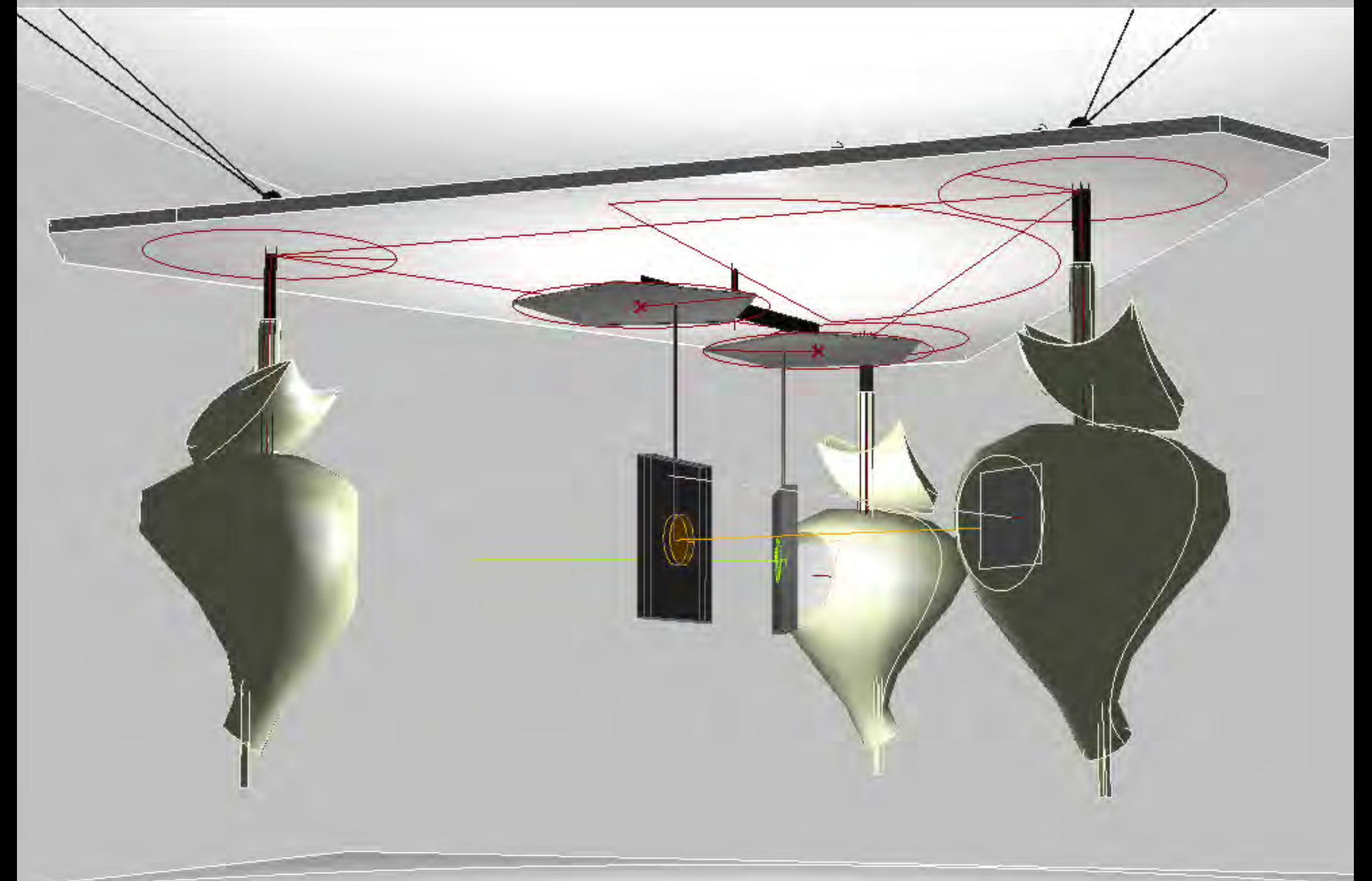




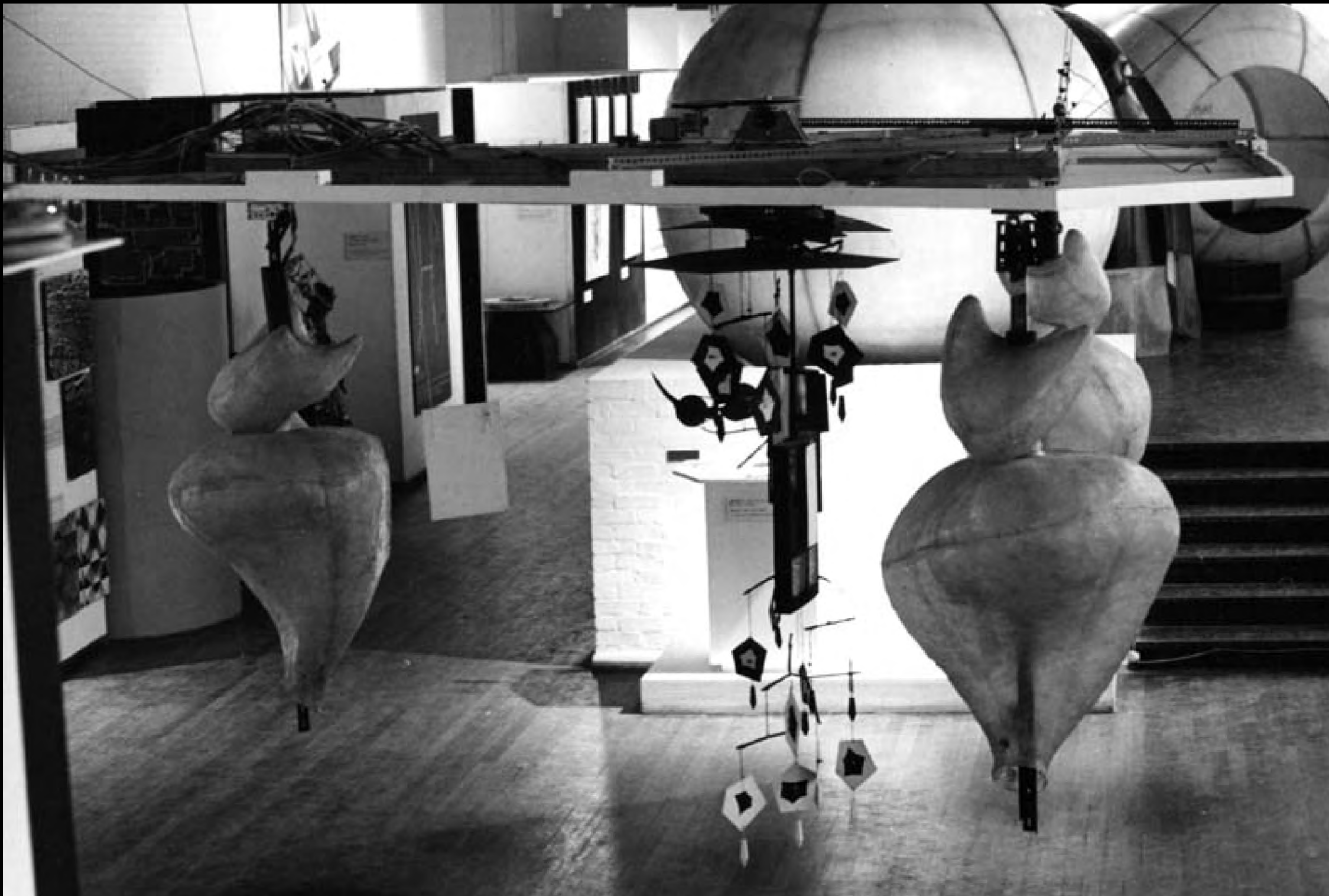
Colloquy of Mobiles  
Gordon Pask  
1968



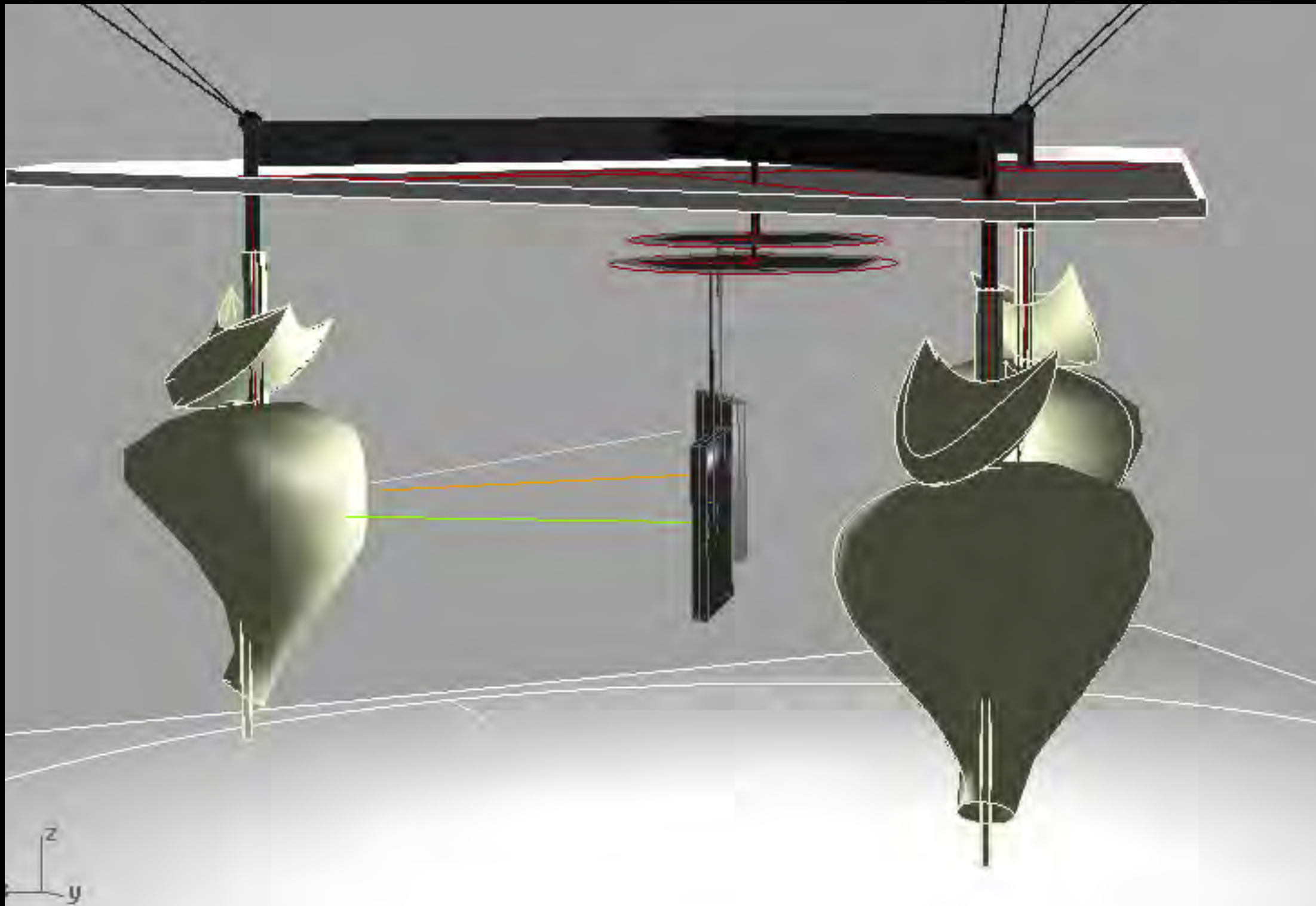
3D Digital Model  
TJ McLeish  
2018



Colloquy of Mobiles  
Gordon Pask  
1968



3D Digital Model  
TJ McLeish  
2018



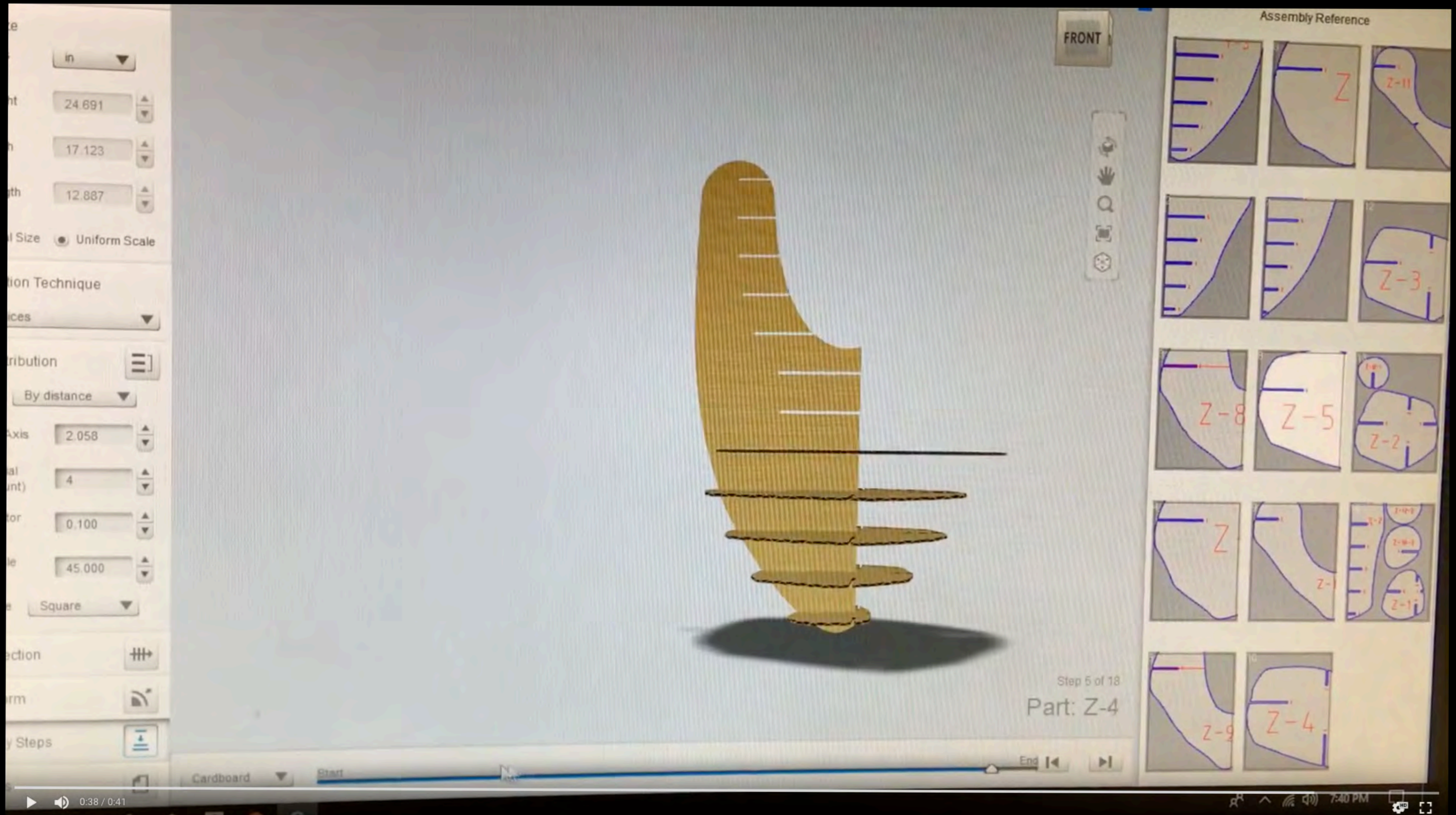


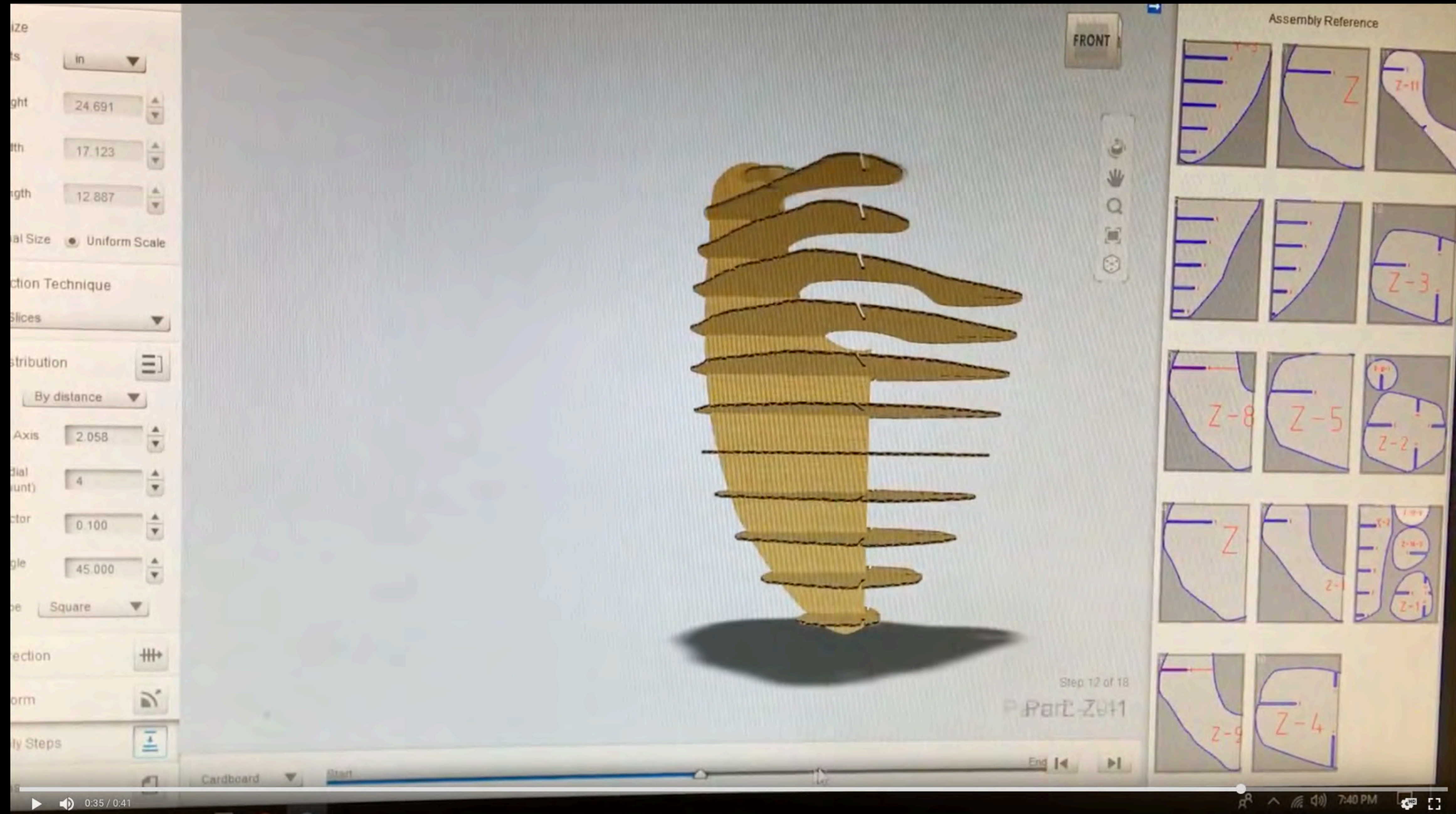
TJ McLeish, Master Fabricator  
Chido Johnson, Sculpture Dept  
College for Creative Studies  
2018



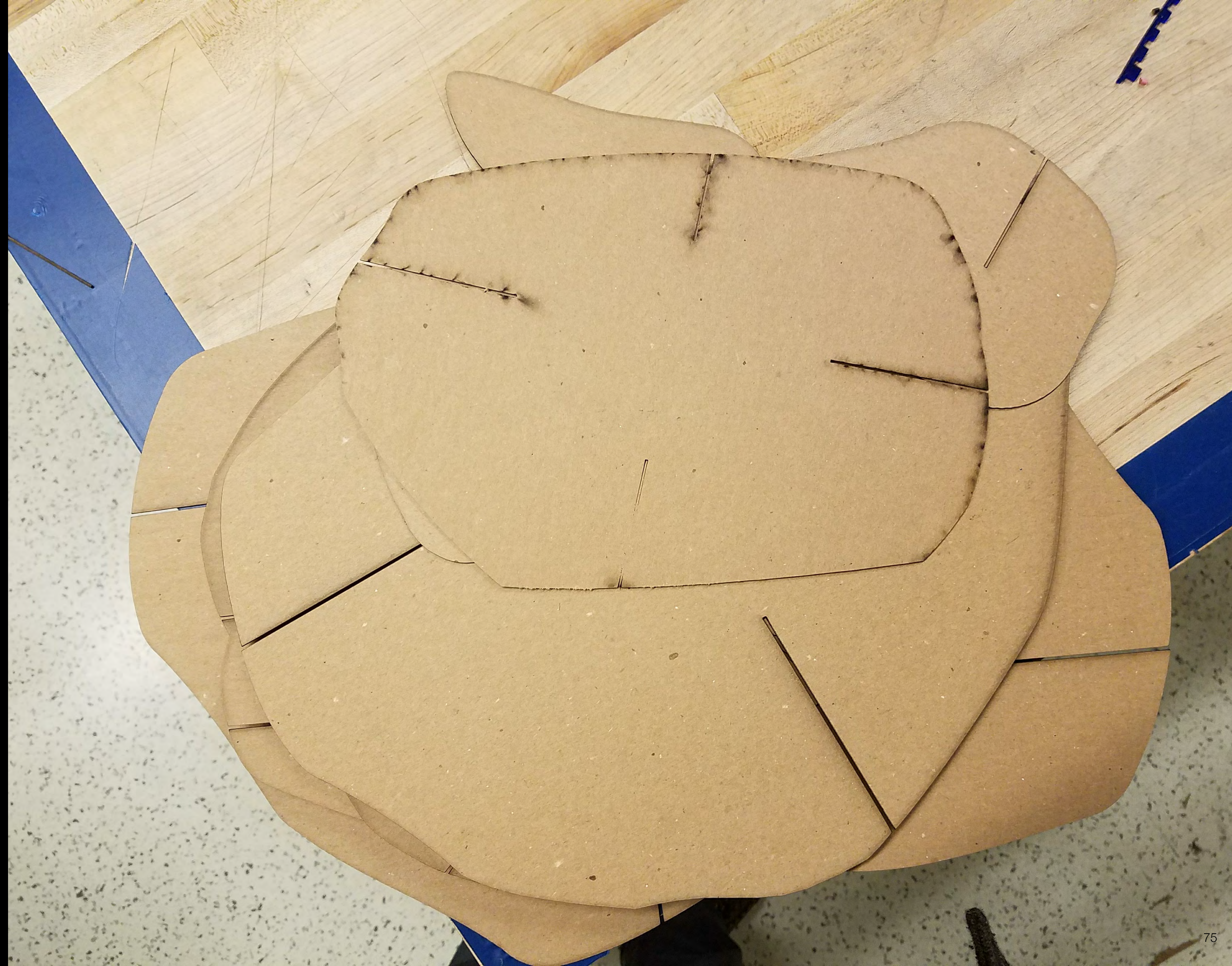
Leith Campbell, Ape Technologies  
TJ McLeish, Master Fabricator  
College for Creative Studies  
2018

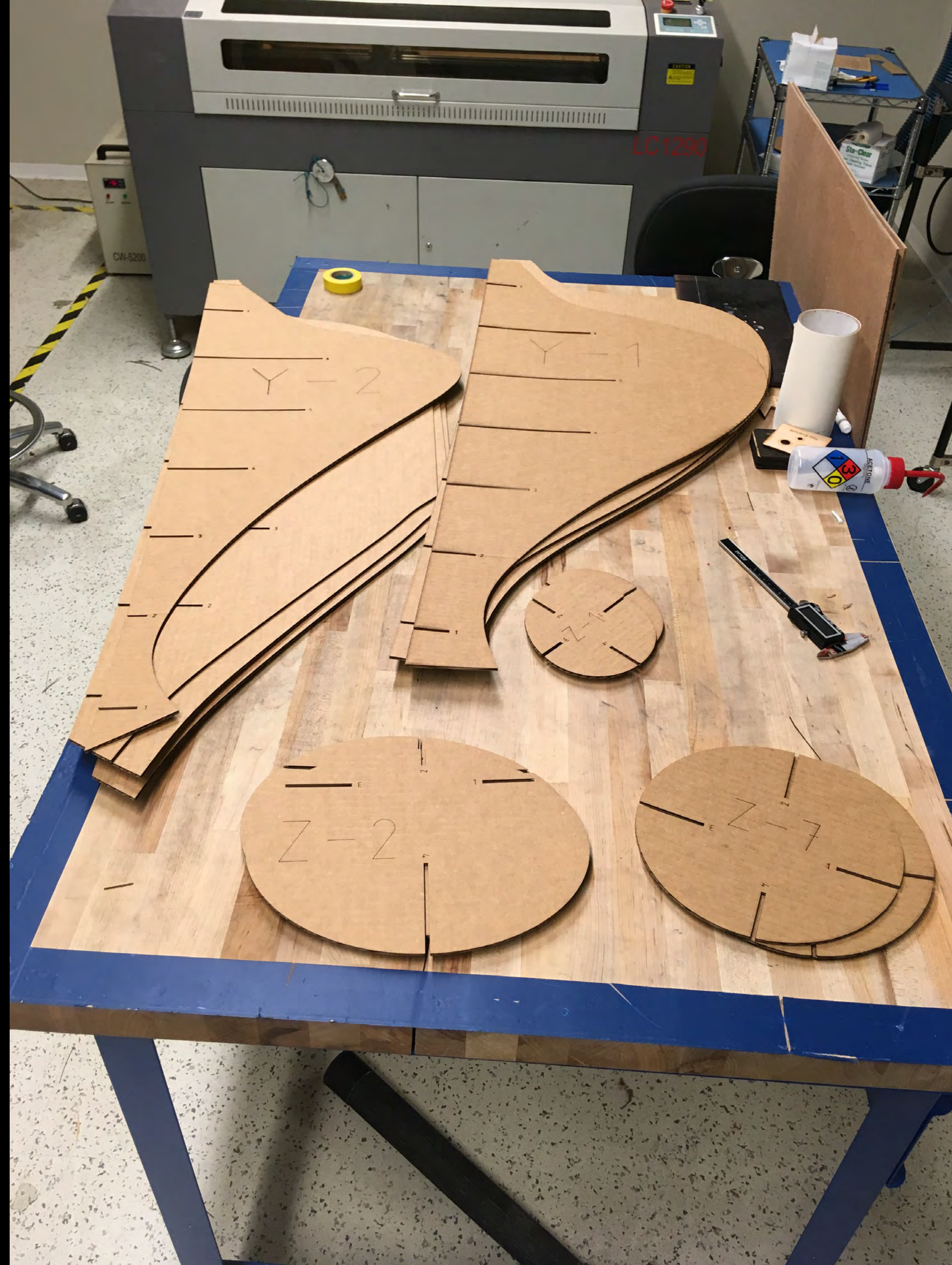






Laser-cut sections  
Female mobiles  
Building Brown Workshop  
Chicago





Laser-cut sections  
Female mobiles  
Building Brown Workshop  
Chicago



Assembling the forms  
Female mobiles  
Building Brown Workshop  
Chicago



Cutting foam to fit the forms  
Female mobiles  
Building Brown Workshop  
Chicago

Assembling and glueing  
Female mobiles  
Building Brown Workshop  
Chicago



Smoothing the foam models  
Female mobiles  
Building Brown Workshop  
Chicago





Smoothing the foam models  
Female mobiles  
Building Brown Workshop  
Chicago





Wrapping before coating with resin  
Female mobiles  
Building Brown Workshop  
Chicago

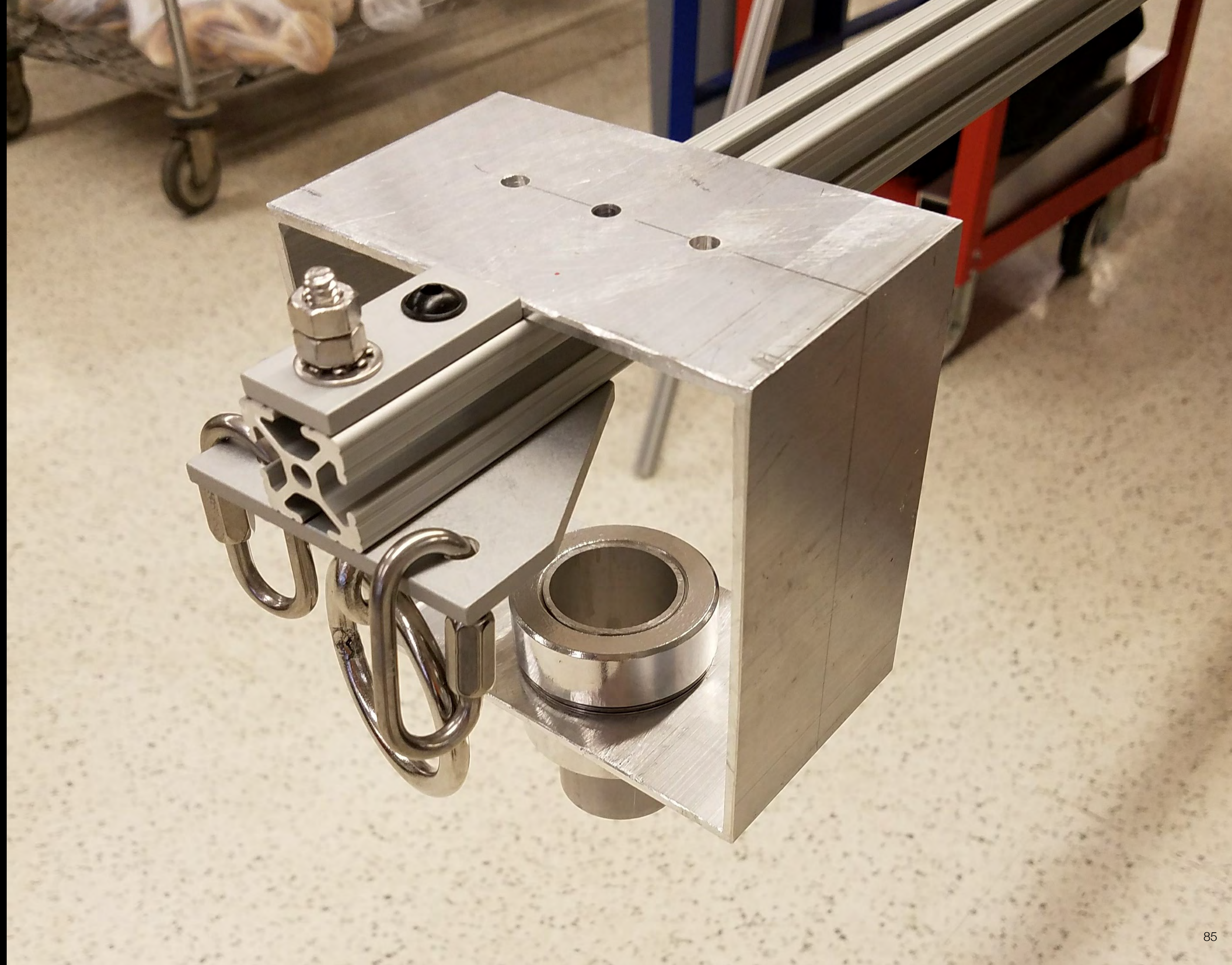


Completed Female mobile  
TJ McLeish, Master Fabricator  
mHub, Chicago



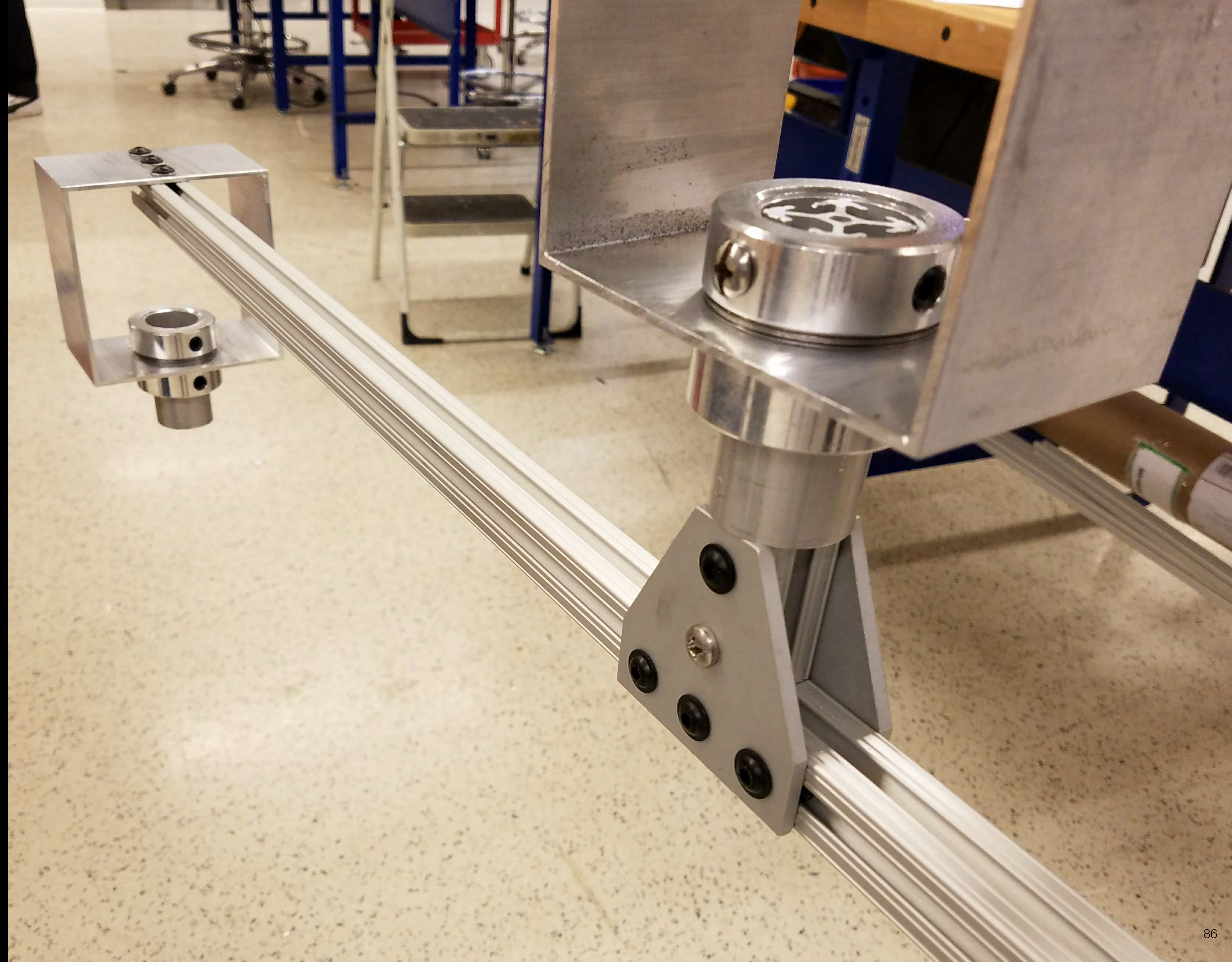
Fabricating the support structure  
Primary material “8020”

Design and fabrication  
by TJ McLeish



Ceiling support hooks

Design and fabrication  
by TJ McLeish



Rotating bar for male mobiles

Design and fabrication  
by TJ McLeish

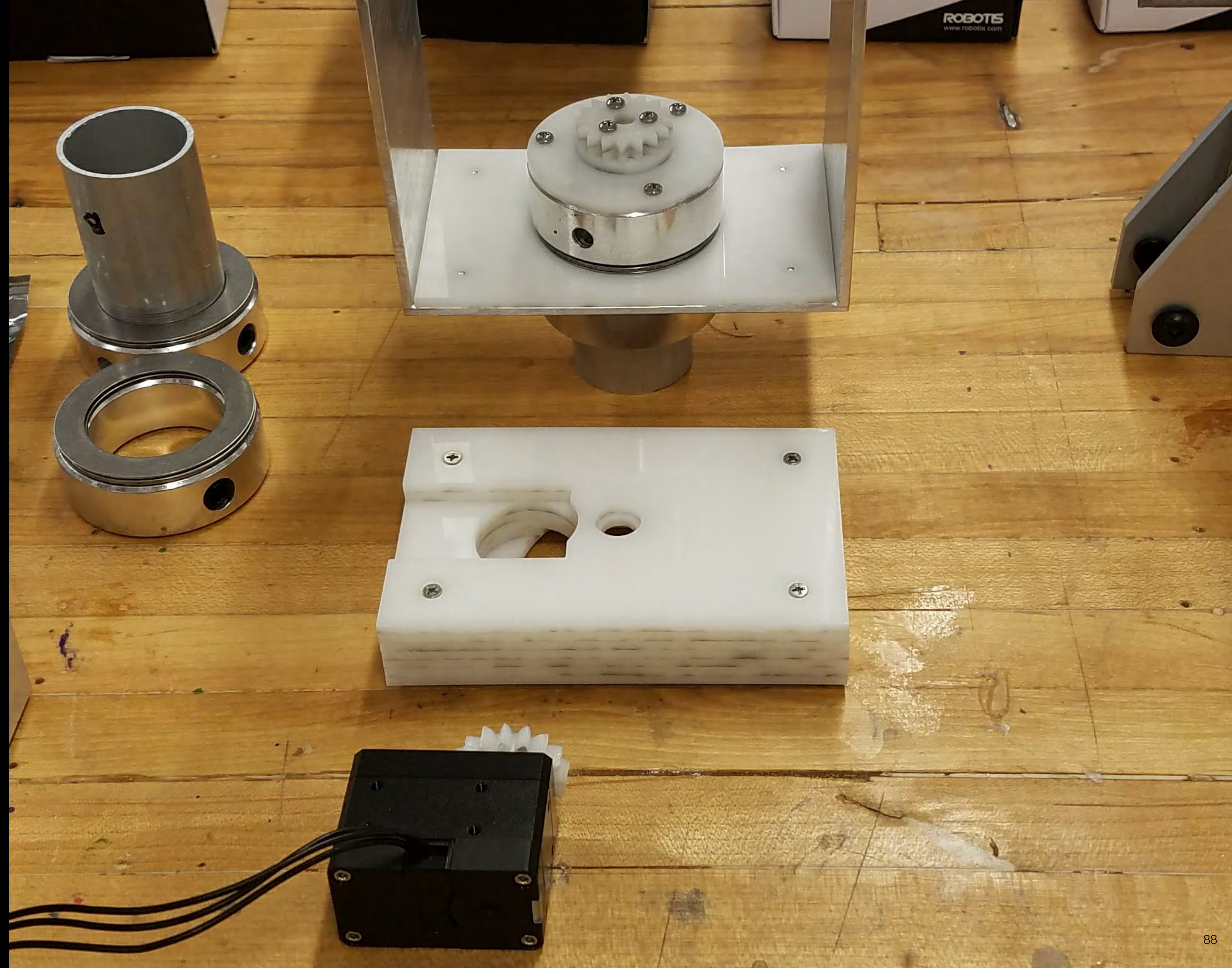
Fabricating the mechanisms  
Laser-cut gear tests with paper

Design and fabrication  
by TJ McLeish



Fabricating the mechanisms  
Servo mount and gearing of Delrin

Design and fabrication  
by TJ McLeish







EXIT

Beginning assembly  
TJ McLeish, Master Fabricator  
Wendy Wu, MFA IxD Class of 2019



Beginning assembly  
Brendon Quinn, MFA IxD Class of 2019  
CCS MFA Interaction Design



Beginning assembly  
MFA IxD Class of 2018 & Class of 2019  
CCS MFA Interaction Design



Raising the structure  
MFA IxD Class of 2018 & Class of 2019  
CCS MFA Interaction Design



Assembling the female mobiles  
TJ McLeish  
Alecia Secord, MFA IxD Class of 2019  
Sofia Lewandowski, MFA IxD Class of 2018  
CCS MFA Interaction Design



Assembling the female mobiles  
TJ McLeish  
Alecia Secord, MFA IxD Class of 2019  
CCS MFA Interaction Design



Hanging the female mobiles  
TJ McLeish  
Alecia Secord, MFA IxD Class of 2019  
Sofia Lewandowski, MFA IxD Class of 2018  
CCS MFA Interaction Design





Installing the female mobiles



Assembling male mobiles  
TJ McLeish  
Gissoo Doroudian, MFA IxD Class of 2018  
CCS MFA Interaction Design



Cutting templates for male mobile parts  
Paul Pangaro, MFA IxD Chair  
MFA Interaction Design  
College for Creative Studies  
2018

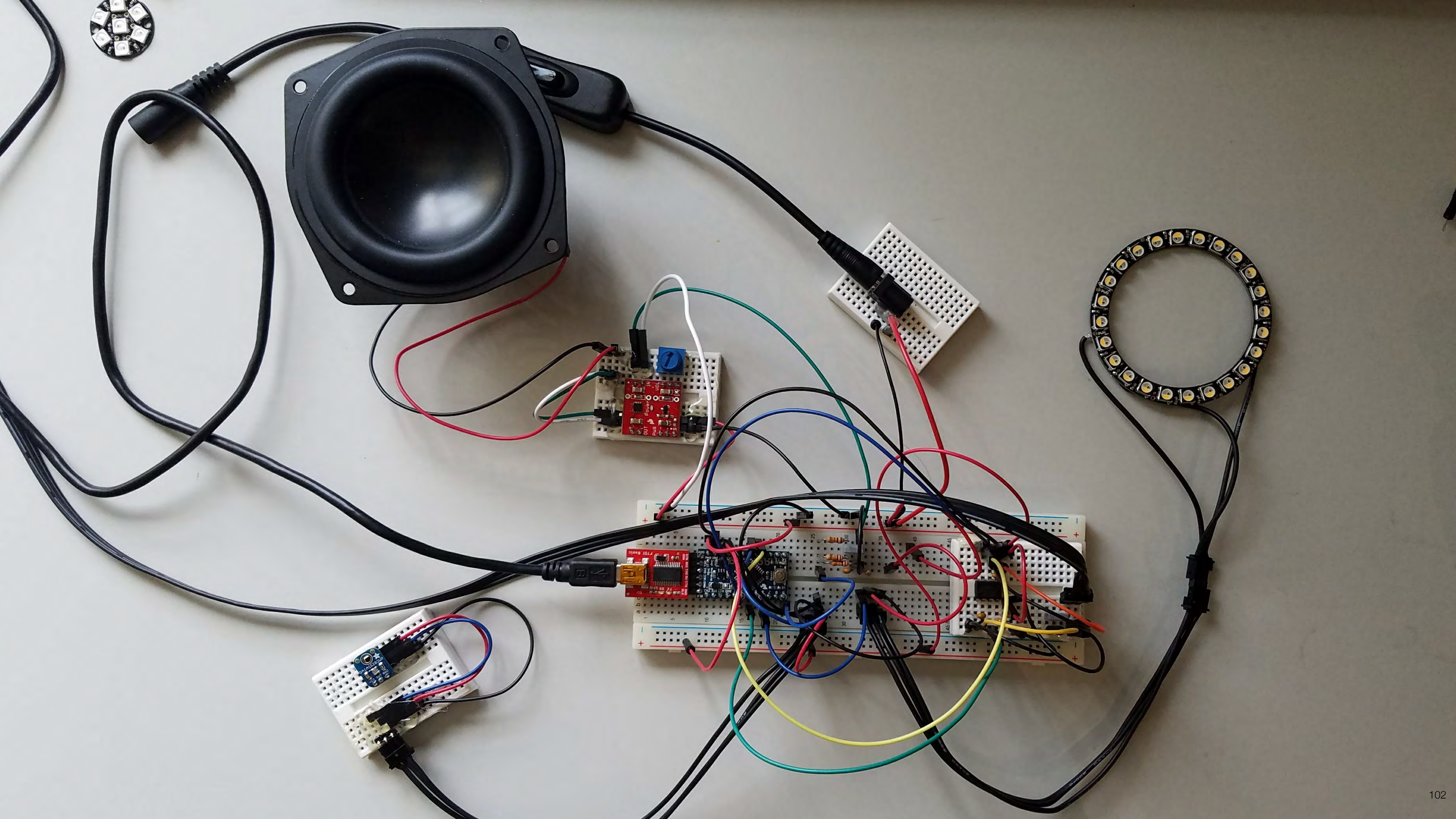


Installing male mobile structure



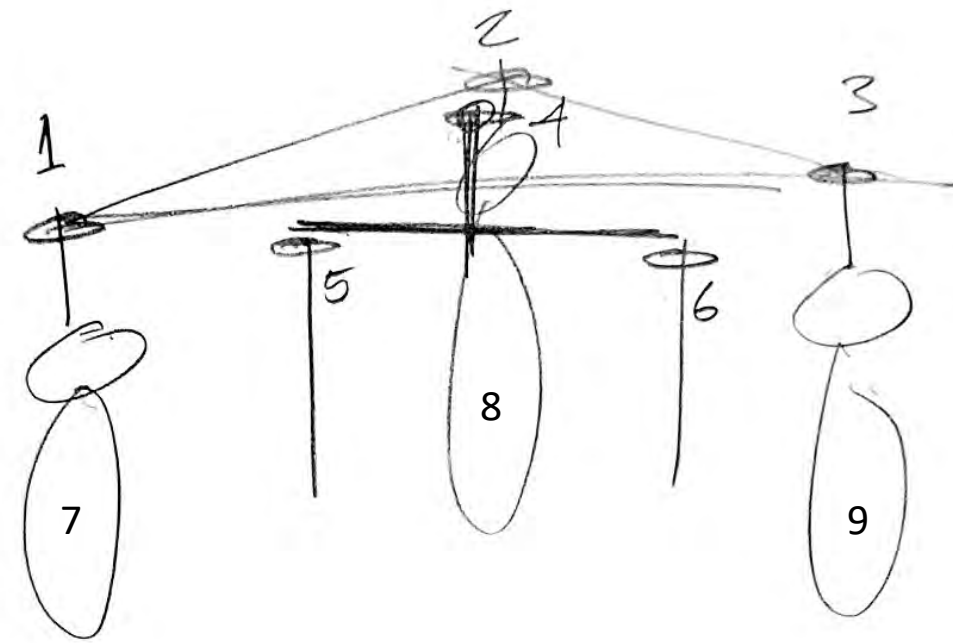
Prototyping & building the electronics  
TJ McLeish





# Colloquy of Mobiles Replica

## Design Development: Prototype / Model Movement and Control of Figures – Servo Motors



Rotation of figures about Z axes.

A total of 9 servo motors drive figures.

- 1 Drive motor for each of 3 Females
- 1 Drive motor for each of 2 Male figures
- 1 Drive motor for Male linkage bar
- 1 Drive motors for each of the 3 Female reflectors

Low torque will be required to turn the lightweight figures about their axes.



MX-106T Stats			
Operating Voltage	14.8V	12V	11.1V
Stall Torque*	102 kg·cm	85.6 kg·cm	81.5 kg·cm
	1,416 oz·in	1,189 oz·in	1,132 oz·in
	10.0 N.m	8.4 N.m	8.0 N.m
No-load Speed	55 RPM	45 RPM	41 RPM
Weight	153g		
Size	40.2 x 65.1 x 46 mm		
Resolution	0.088°		
Reduction Ratio	1/225		
Operating Angle	360° or Continuous Turn		
Max Current	<b>5.2A @ 12V</b>		
Standby Current	<b>55 mA</b>		
Operating Temp	-5°C ~ 85°C		
Protocol	TTL Asynchronous Serial		
Module Limit	254 valid addresses		
Com Speed	8000bps ~ 3Mbps		
Position Feedback	Yes		
Temp Feedback	Yes		
Load Voltage Feedback	Yes		
Input Voltage Feedback	Yes		
Compliance/PID	Yes		
Material	Metal Gears & Engineering Plastic Body		
Motor	Maxon RE-MAX		
Manual Download	MX-106 Manual		
Controller List	USB2Dynamixel		
	CM-530		
	CM-700		
	Arbotix		

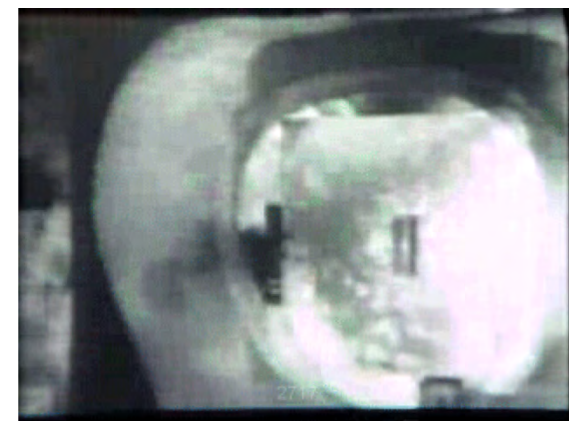
**5.2A @ 12v = 62.4W**  
**62.4W x 9 = 561.6W**  
**561.6W = 4.68A @ 120v AC**

**Estimated MAX power requirement for Motors and Control is 5A @ 120vAC**

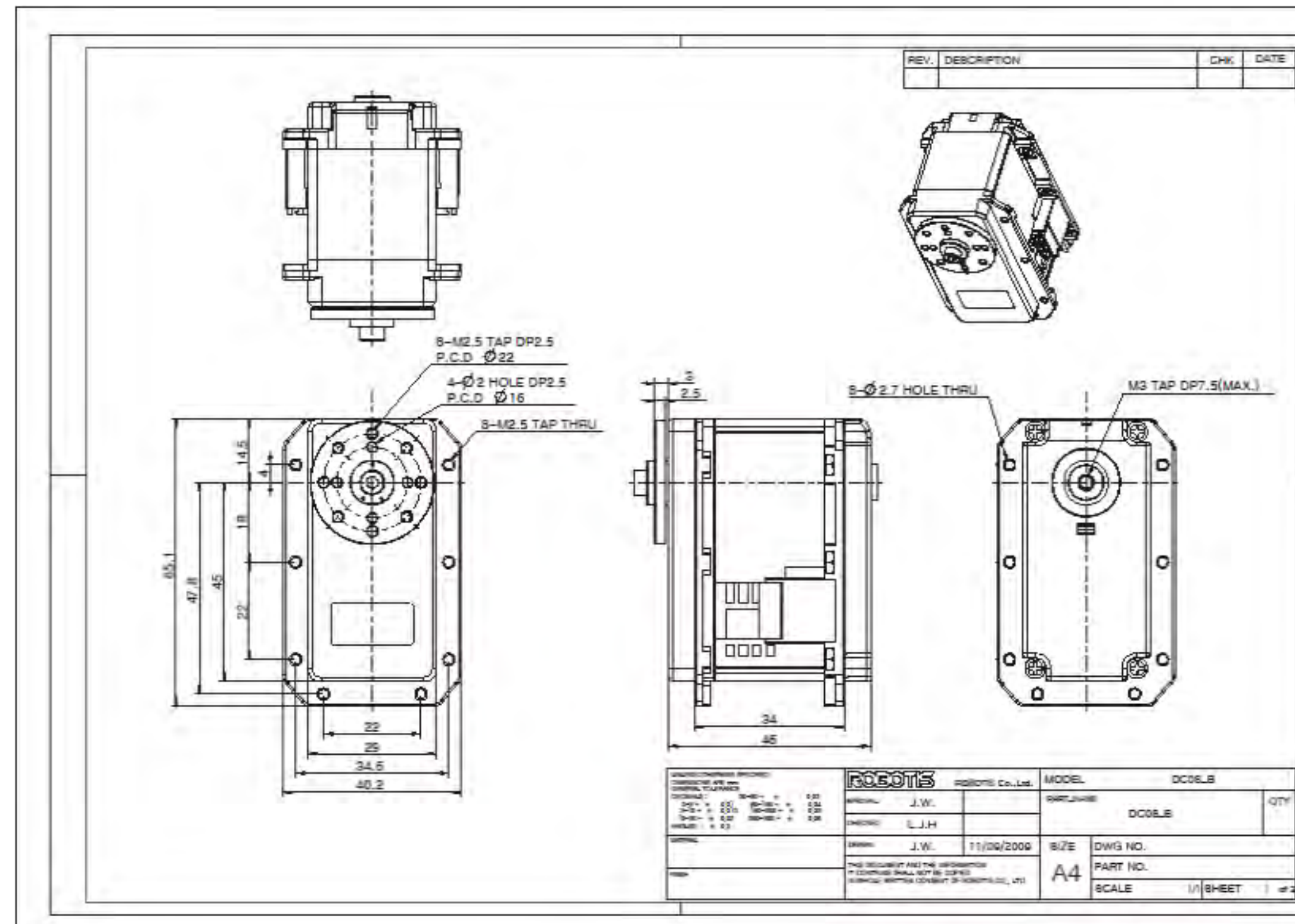
**estimated running power is 1A.**

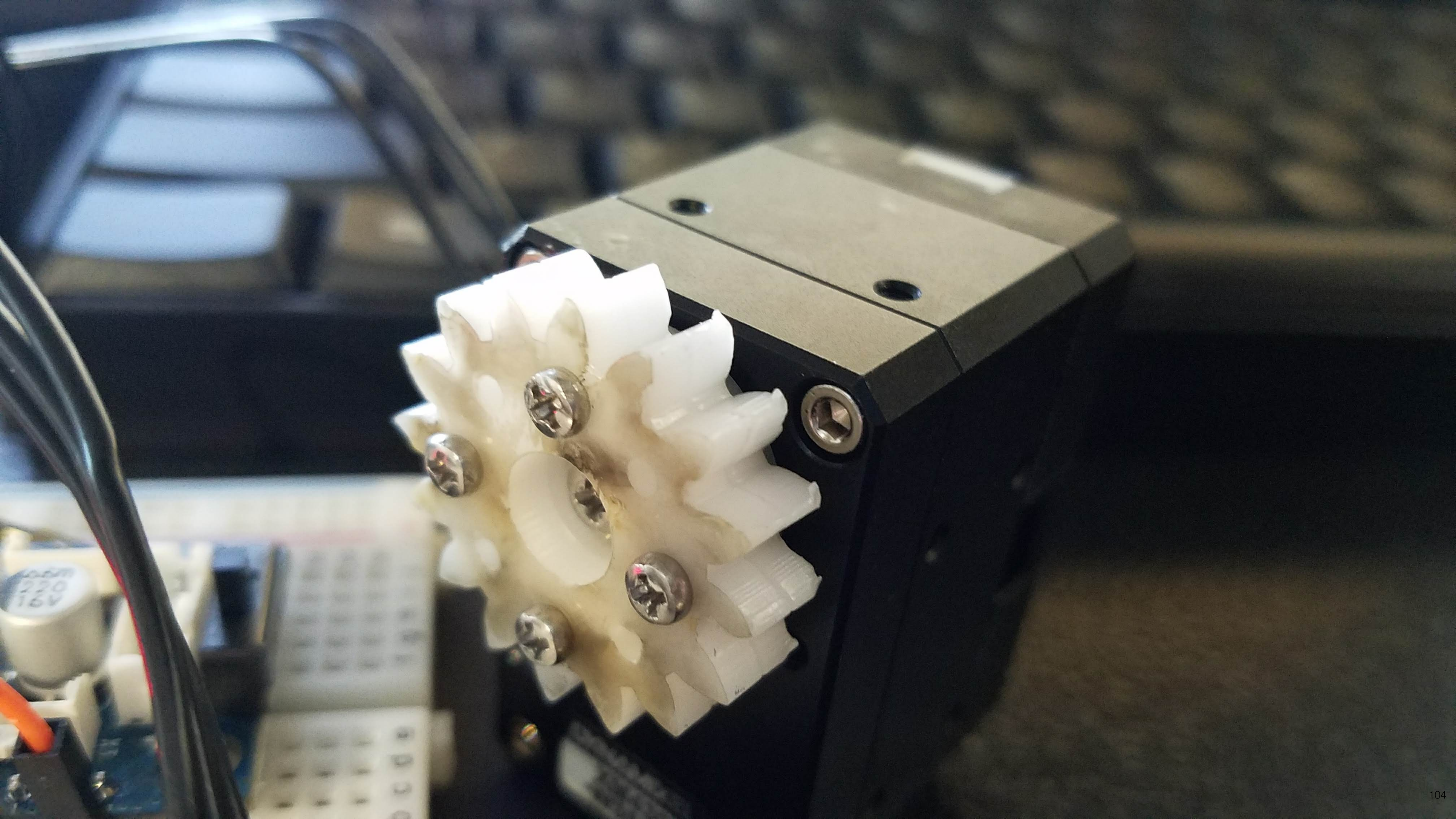


12V 5A switching power supply  
 PRODUCT ID: 352



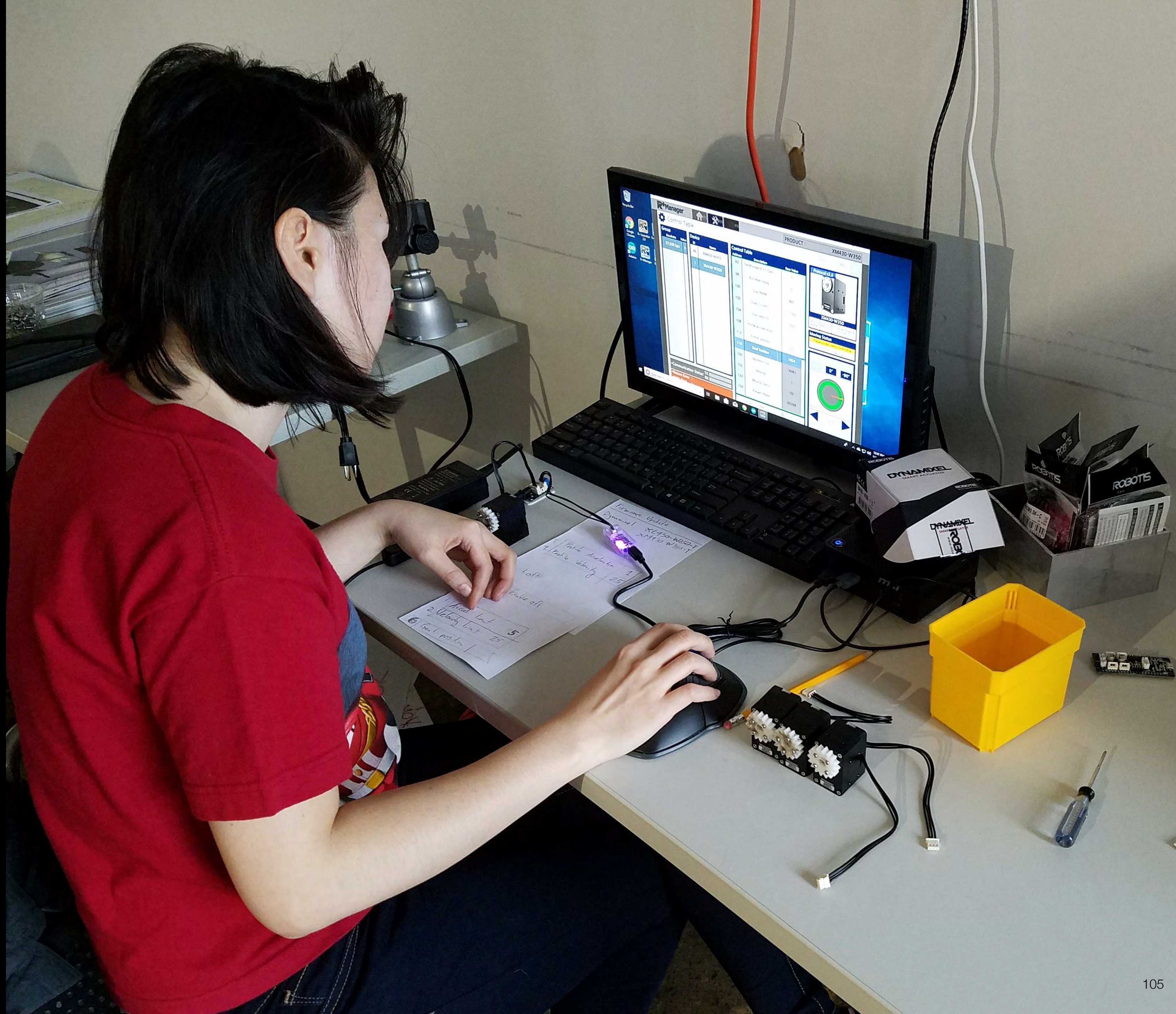
Female reflector



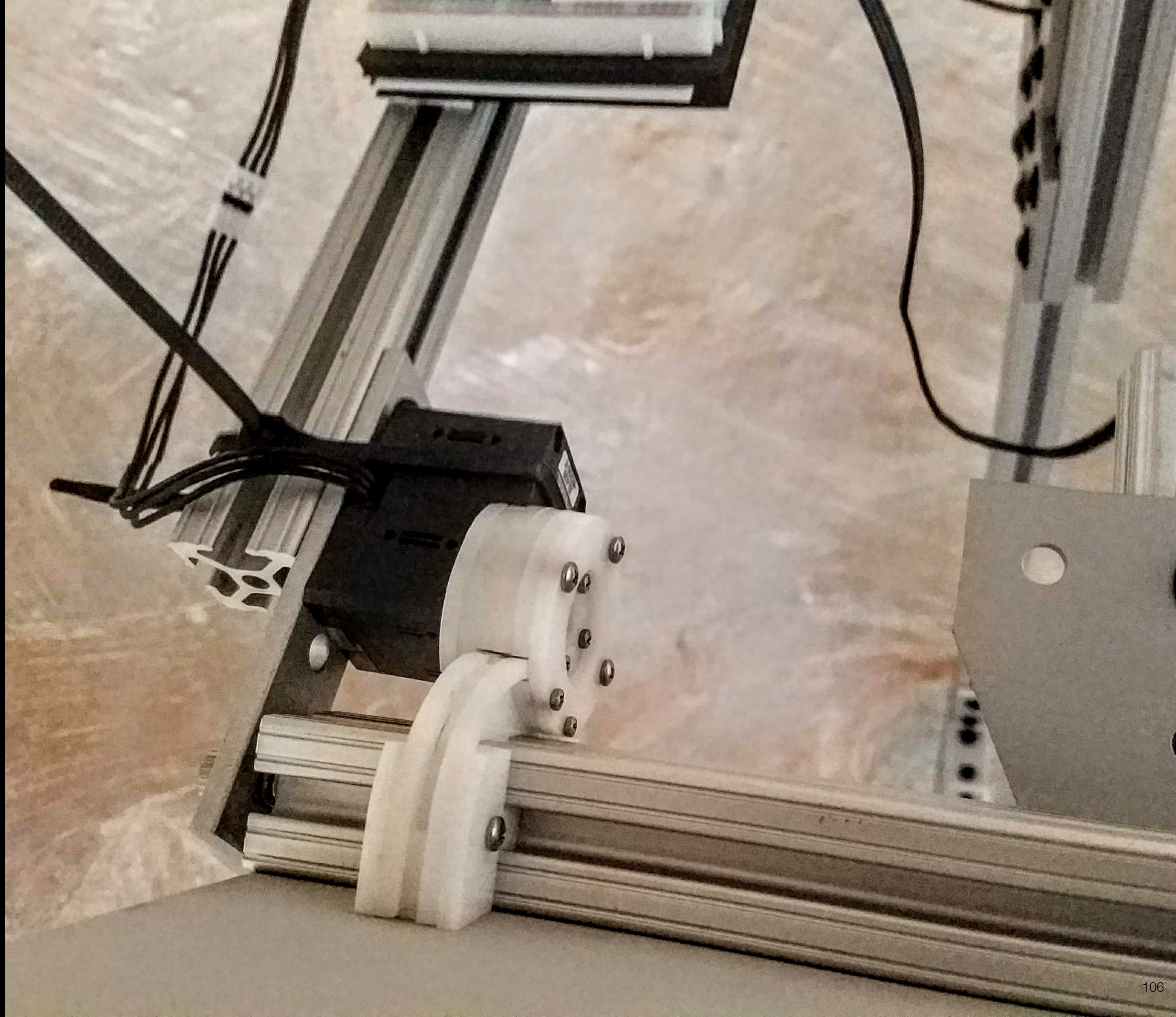




Testing the servo motors & circuits  
Wendy Wu, MFA IxD Class of 2019  
MFA Interaction Design

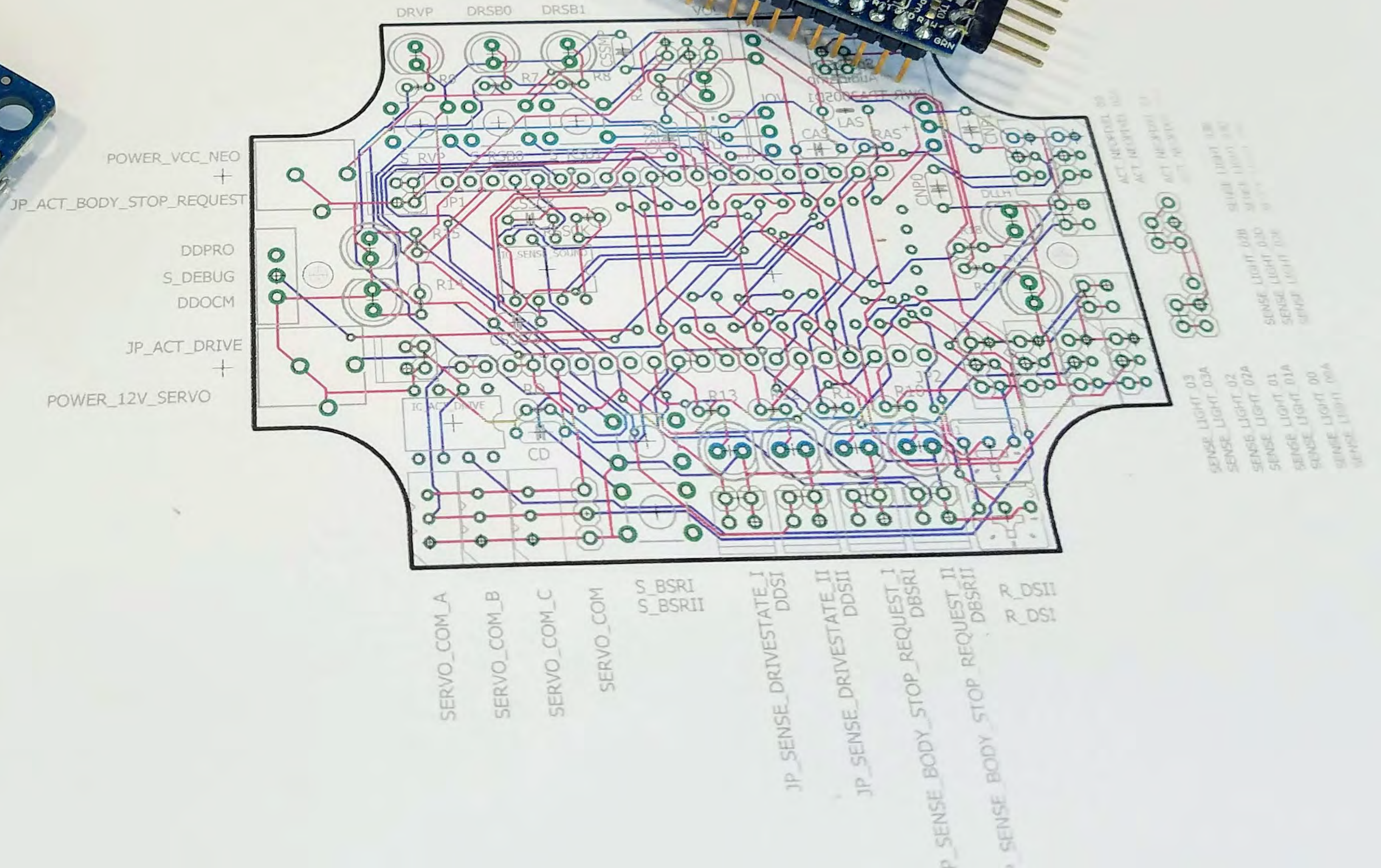
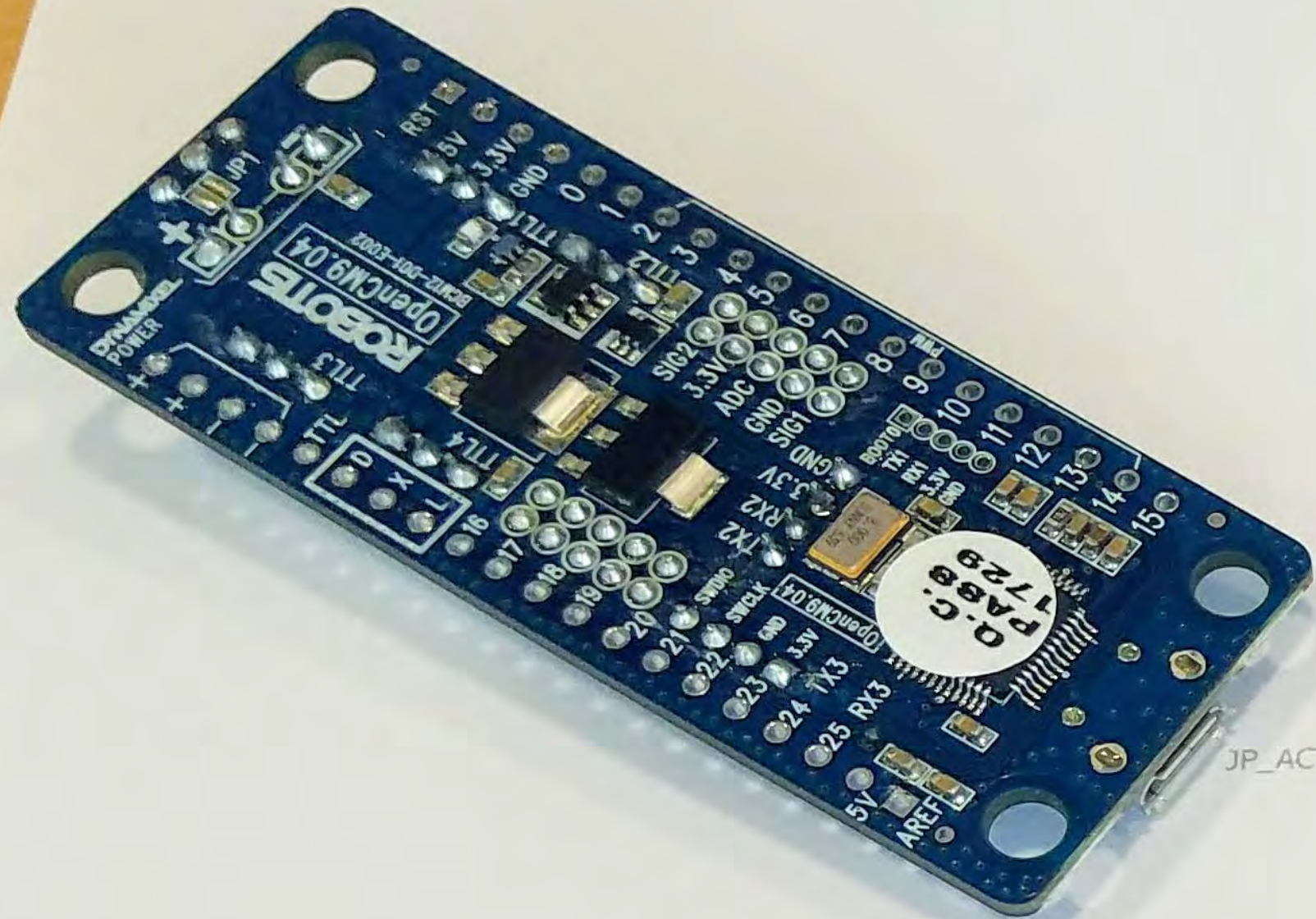


Installing mirror motors



Installing mirror motors  
TJ McLeish







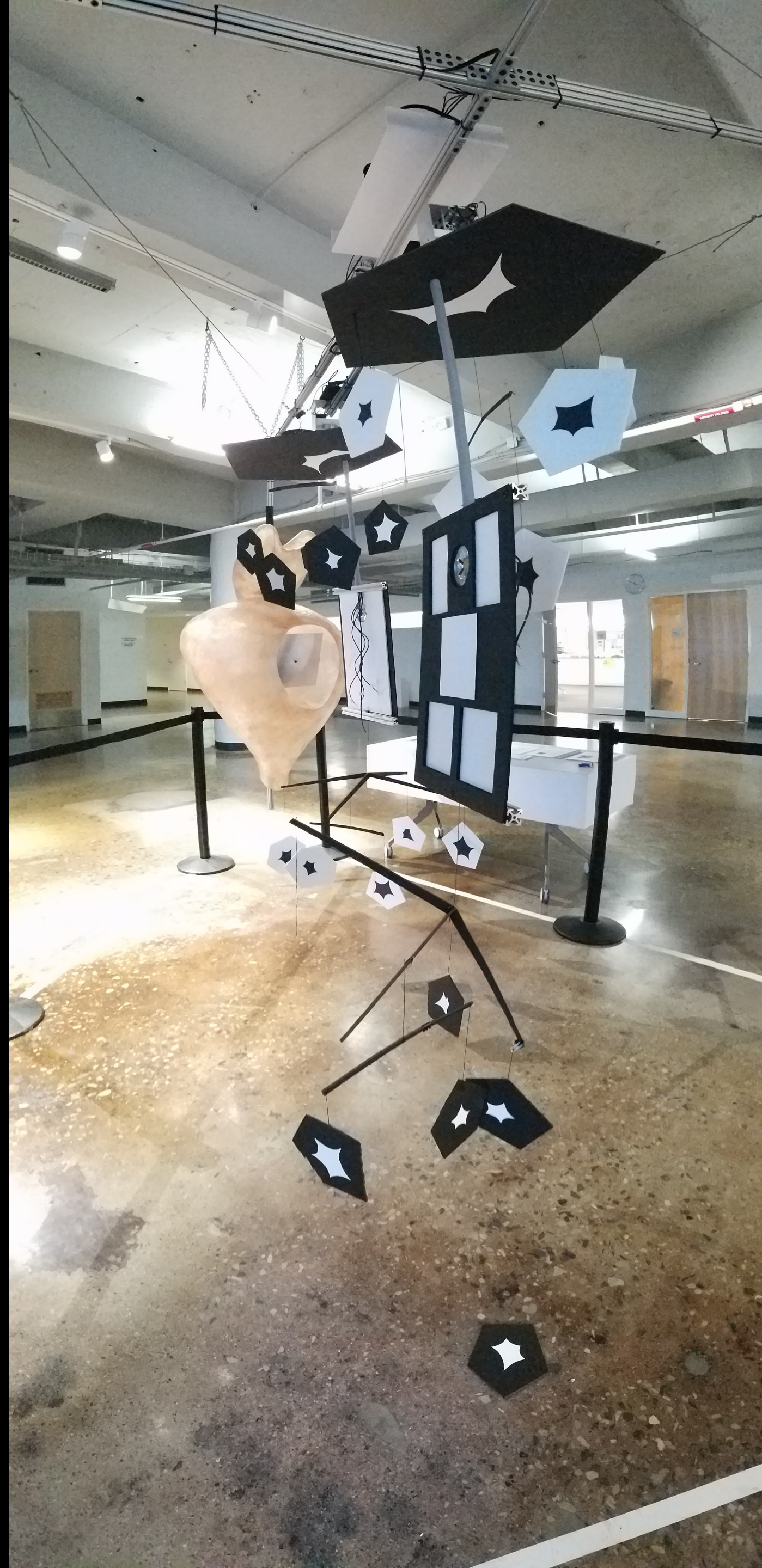
Wiring the mobiles  
TJ McLeish





16 Scale Model

Testing the completed assembly





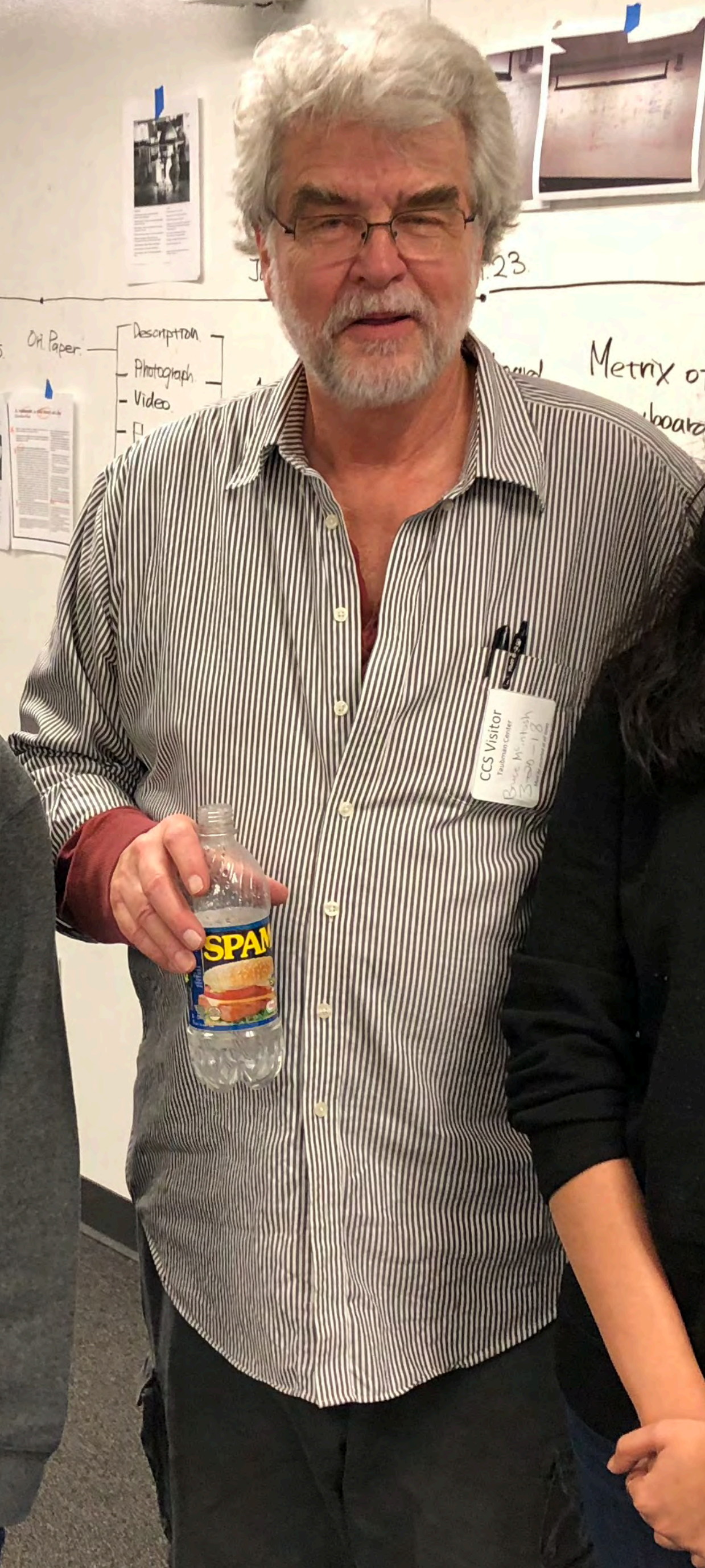
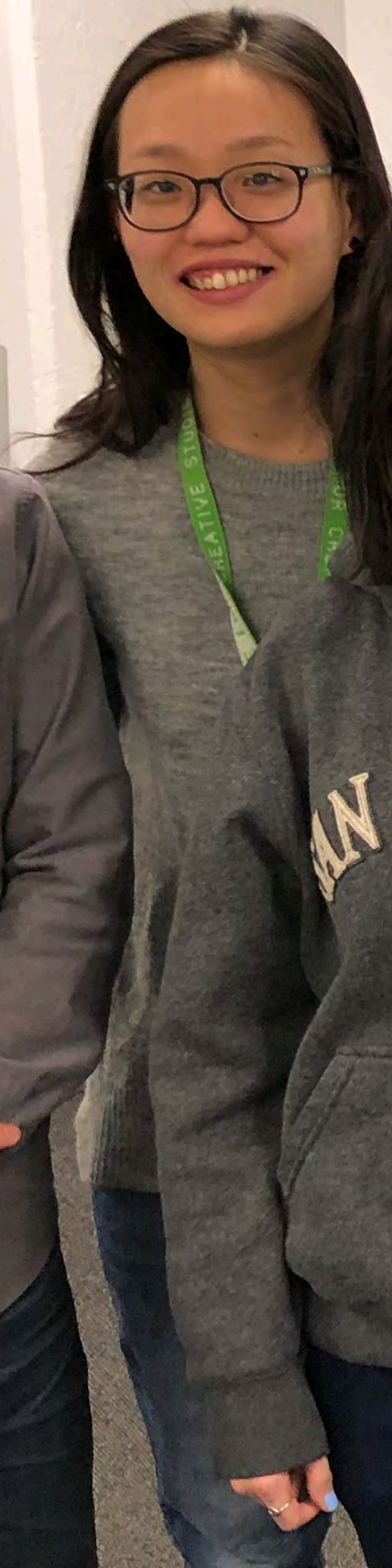
The consultant will fulfill the need for a focused workshop and related phases because of the requirement for students to (a) produce excellent documentation for the benefit of their portfolios, and (b) share the project outcomes in ways that would be useful to other audiences, including other interaction design and media arts students, designers, historians, and artists working in interactive art and media.

# WORKBOOK FOR COLLOQUY 2018 DOCUMENTATION ASSEMBLED BY BRUCE MCINTOSH, FEBRUARY/MARCH, 2018

The consultant has considerable expertise in such workshops and has demonstrated his effectiveness in numerous contexts, including the creation, editing, art direction of *Cybernetics* magazine; and the development of a visual thinking curriculum featured in *Smithsonian* magazine. He has had a distinguished professional career that includes serving as creative director for Steve Jobs' NeXT computer company; a project charged with re-inventing banking for Citibank; art directing and/or editing numerous publications; designing museum exhibits and packaging; and education and community engagement projects.

## COLLEGE FOR CREATIVE STUDIES, DETROIT

**Bruce McIntosh**  
P.O.Box 771 Chama, NM 87520  
Phone 505 692 4069  
bruce\_chama@yahoo.com



2018

Jan

Syllabus

Oil Paper

Description

Photograph

Video

Matrix of

board

variable

autos

Develop 6 scenarios

the

&

auto.

Feb 6.

MFA Student Website  
ColloquyOfMobiles.com  
Spring Semester  
2018

COME AND EXPLORE CONVERSATIONAL MACHINES

# COLLOQUY

In 1968 Gordon Pask's COLLOQUY OF MOBILES comprised sculptural figures that interacted through light and sound, with each other and with the public. COLLOQUY explored the nature of machine-to-machine and person-to-machine conversations in an immersive environment, the first of its kind. In 2018 we replicated COLLOQUY at the College for Creative Studies in Detroit.

[EXPLORE](#)

[ColloquyOfMobiles.com](#)

[Colloquy Project Blog Posts](#)

# Colloquy of Mobiles

Opening the exhibit  
MFA Interaction Design  
College for Creative Studies  
2018

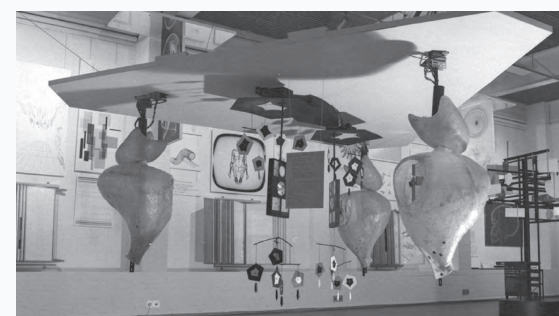
## Colloquy 2018

The **Masters in Interaction Design** department at CCS has undertaken the full scale reproduction of Gordon Pask's seminal interactive work, **Colloquy of Mobiles**.

*The work, then and now, explores:*

- the dynamics of conversing with machines, now occurring every day
- the impact of smart environments, which increasingly effect our lives
- the implications of artificial intelligence, inside of every device we use

## Colloquy 1968



**Colloquy of Mobiles** was designed by Gordon Pask for the ground-breaking 1968 exhibition *Cybernetic Serendipity* at the Institute of Contemporary Arts in London. The installation comprises sculptural figures that move and interact through light and sound, with each other and with the public. *Colloquy* explores cooperative and competitive conversations, machine-to-machine and person-to-machine, in an interactive, immersive environment. Surprising and revolutionary in its day, **Colloquy of Mobiles** has influenced generations of artists and critics.

### ADVISORY BOARD

Amanda Pask Heiler and Hermione Pask, Gordon Pask's daughters • Jasja Reichardt, Curator of *Cybernetic Serendipity* at the ICA in 1968 • Albert Müller, Curator of the Gordon Pask Archive, University of Vienna • Andrew Pickering, Author of *The Cybernetic Brain* • Guilherme Kujawski, Writer, Teacher, and Co-Curator of *Emoção Artificial*, ITAU Cultural • Hugh Dabblerly, Design Planner and Teacher • John Plunkett, Designer and Co-Founder of *Wired Magazine* • Marc Schwartz, Co-founder, *DLECTRICITY* • Vince Carducci, Dean of Undergraduate Affairs, CCS

### FUNDING

We have received \$28,500 from individual donors and are seeking \$6,000 to complete the full-scale **Colloquy of Mobiles**. Additional funding is sought to disseminate thorough documentation as widely as possible under an open-source license, as well as to hold symposia and foster deep conversations on the implications of conversational machines in our lives. Contact us at [colloquy2018@gmail.com](mailto:colloquy2018@gmail.com)

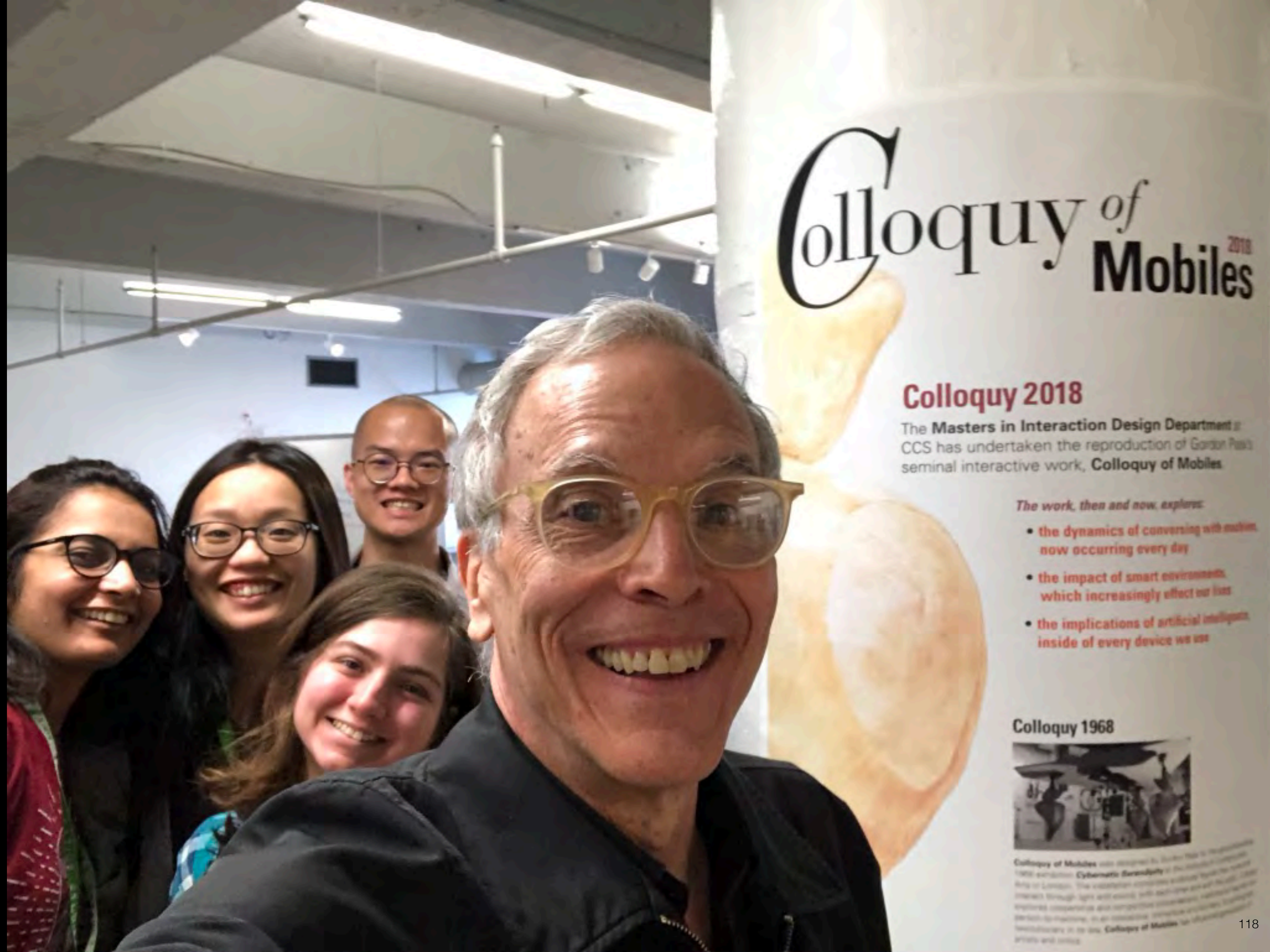
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Opening the exhibit  
Paul Pangaro, MFA IxD Chair  
Students of Class of 2018  
MFA Interaction Design  
College for Creative Studies  
2018



# Colloquy of Mobiles<sup>2018</sup>

## Colloquy 2018

The Masters in Interaction Design Department at CCS has undertaken the reproduction of Gordon Pask's seminal interactive work, **Colloquy of Mobiles**.

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- the dynamics of conversing with machines now occurring every day
- the impact of smart environments which increasingly effect our lives
- the implications of artificial intelligence inside of every device we use

### Colloquy 1968



*Colloquy of Mobiles* was designed by Gordon Pask to demonstrate the 1960s exhibition *Cybernetic Serendipity* at the Institute of Contemporary Arts in London. The installation consisted of a large, complex structure that interacted through light and sound, with each person who used it exploring a unique conversation and experience. The original *Colloquy of Mobiles* is now housed in the *Colloquy of Mobiles* at the University of London.



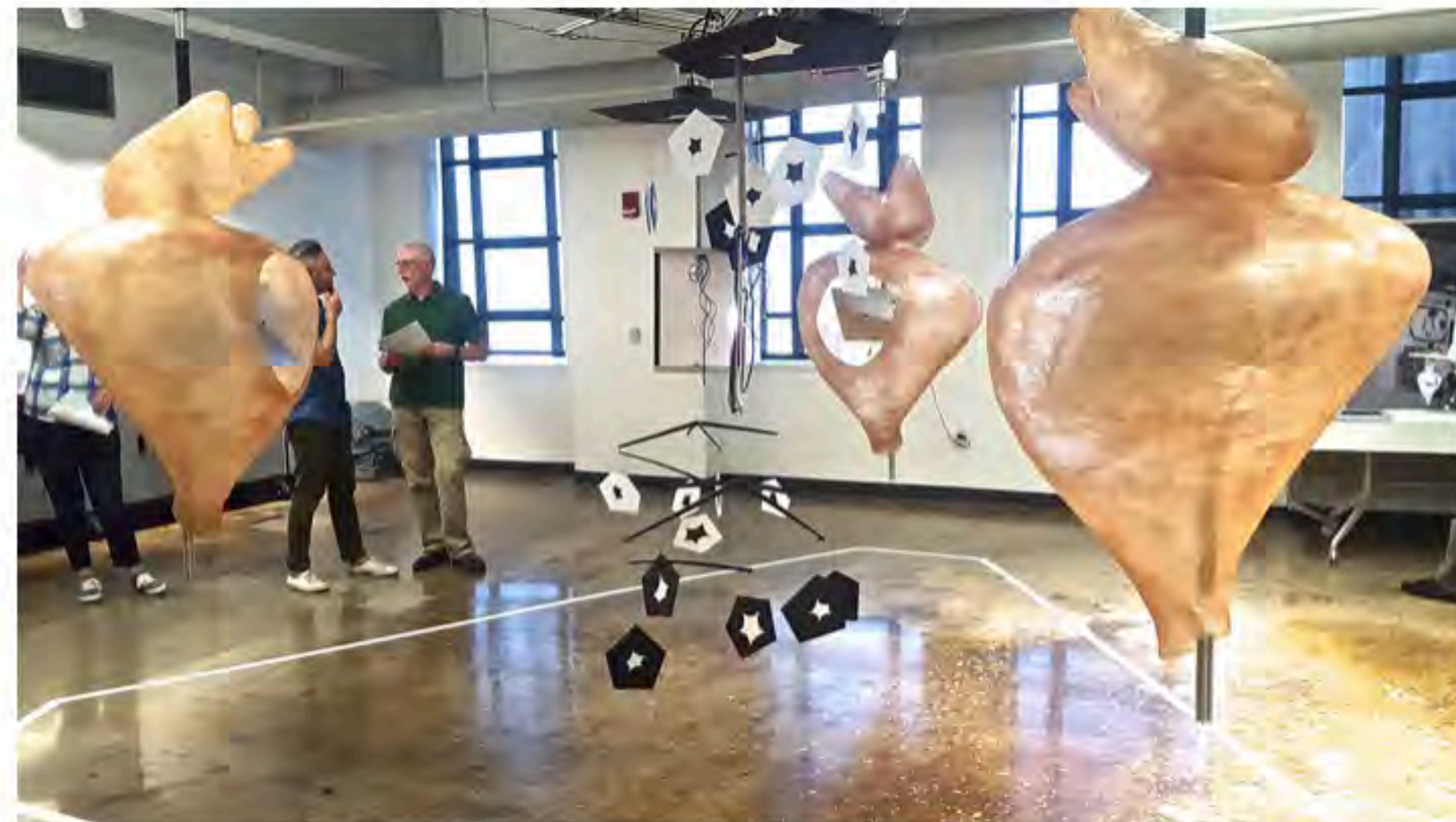
ART

## Interactive, Dancing Machine Sculptures Play Out Courtship Rituals

Interaction Design students at the College for Creative Studies created a function, full-scale replica of Gordon Pask's visionary 1968 installation "Colloquy of Mobiles."



Sarah Rose Sharp June 26, 2018



"Colloquy of Mobiles 2018" at the College for Creative Studies (all photos by the author for Hyperallergic)

DETROIT — Remember the last time you called Siri into action, and instantly large, Venus of Willendorf-like figures rotated gracefully around with graphic, black-and-white mobiles, attempting to win a

### POPULAR

- 1 Joan Miró's Studio Reopens with a Refreshed Perspective
- 2 Required Reading
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- 4 How Criticisms of Roma Have Revealed American Biases
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Press Coverage  
HYPERALLERGIC.com  
June 26, 2018  
2018

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Current State  
Storage in Detroit  
Awaiting Suitors  
December 2018





Current State  
Storage in Detroit  
Awaiting Suitors  
December 2018



Current State  
Storage in Detroit  
Awaiting Suitors  
December 2018

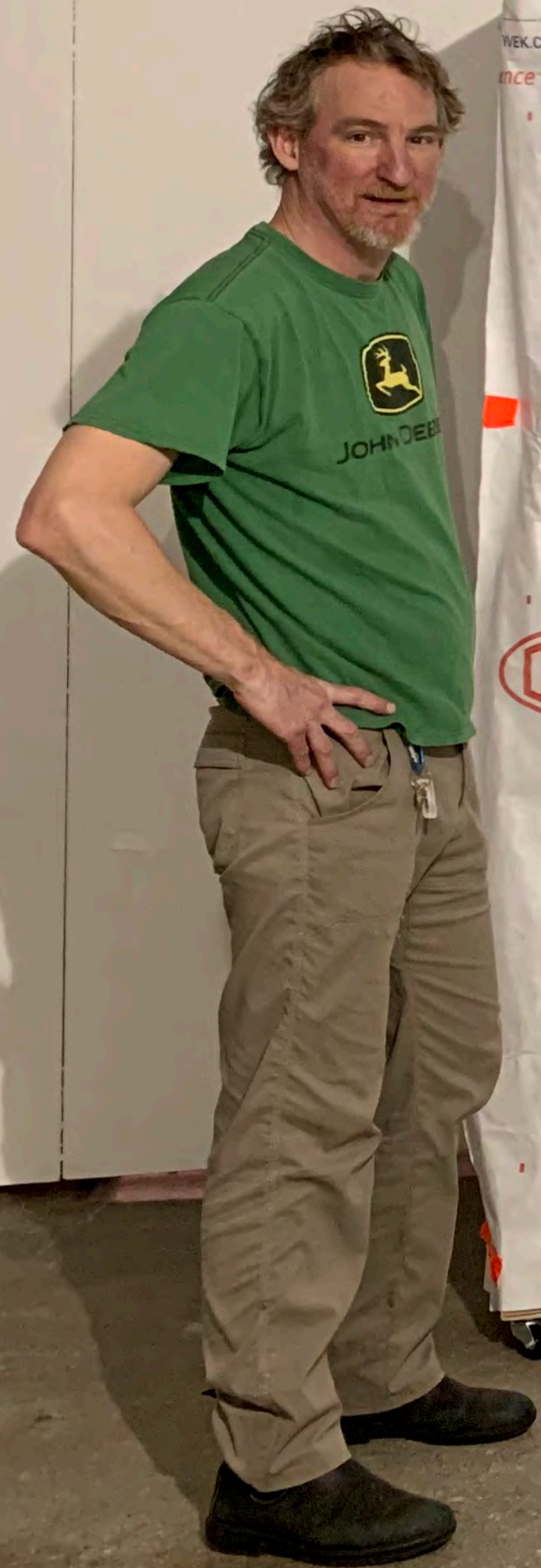


Current State  
Storage in Detroit  
Awaiting Suitors  
December 2018



Current State  
Storage in Detroit  
Awaiting Suitors  
December 2018





261

# Colloquy

A series of informational panels on the left wall. The top panel is titled "The Full Scale Replica" and shows a person working with a large white object. Below it are several smaller panels with images and text. To the right of these panels is a large video screen displaying a person in a white lab coat working with a large white object in a laboratory setting.

A large display board with multiple panels detailing the fabrication process. The panels are titled "Creating a 3D Model", "Fabricating the Female Mollies", and "Building the Structure". Each panel contains images of the physical models and the tools used in their creation.



**Where did Colloquy come from?**

**Where did Pask take it?**

**Where do we take it from here?**

Where did Colloquy come from?

Where did Pask take it?

Where do we take it from here?



# INTERACT

verb: communicate

collaborate

relate

cooperate

merge

mesh

combine

connect

touch

contact

join

# INTERACT

join

network

unite

get across

interplay

touch base

reach out

get the message

interface

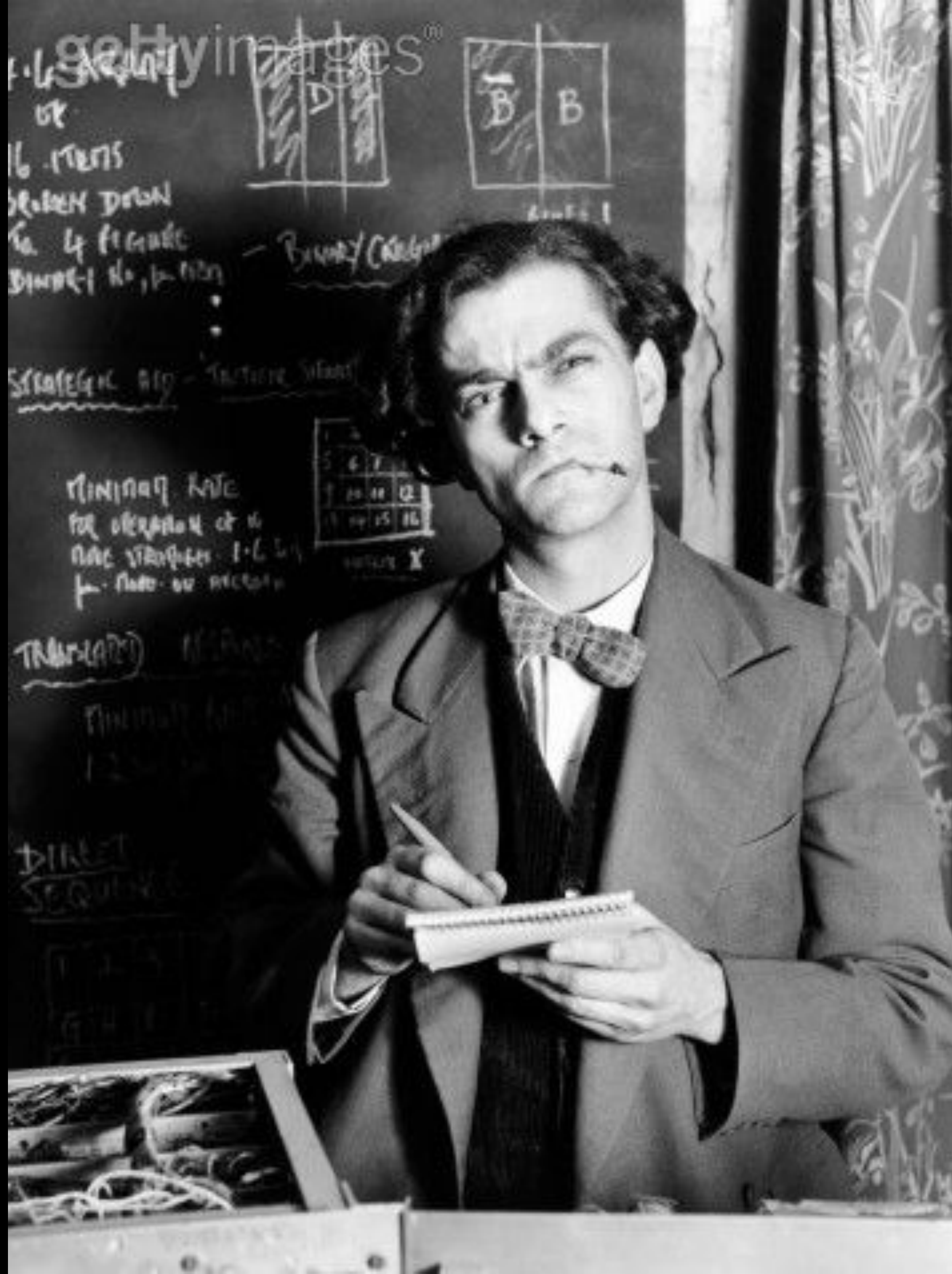
interreact

keep in touch

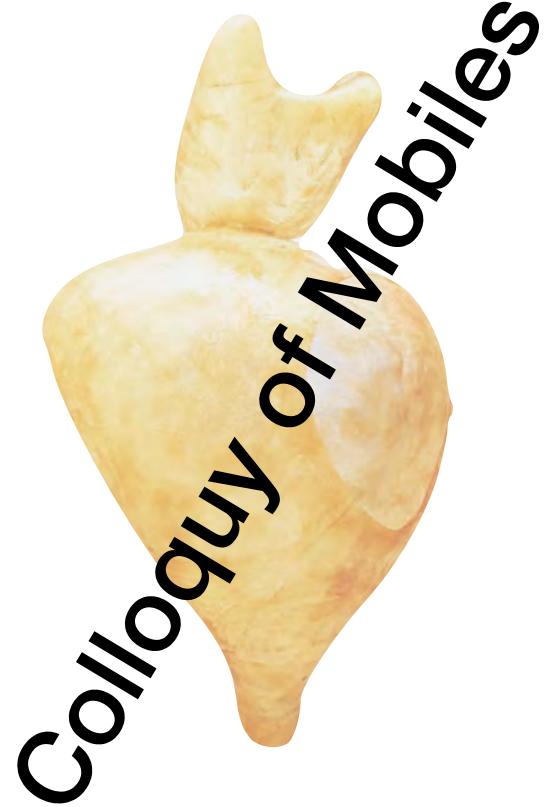
# CONVERSE

Gordon Pask  
Early 1950s

Photo: getty images (R)



# Gordon Pask



1968

# Gordon Pask

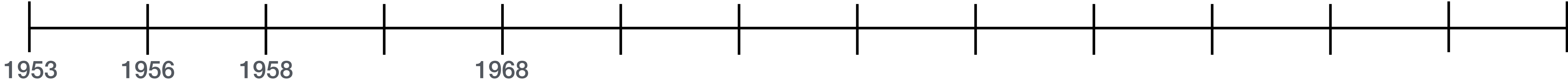
*Musicolour*

*S.A.K.I.*

*Eucrates*



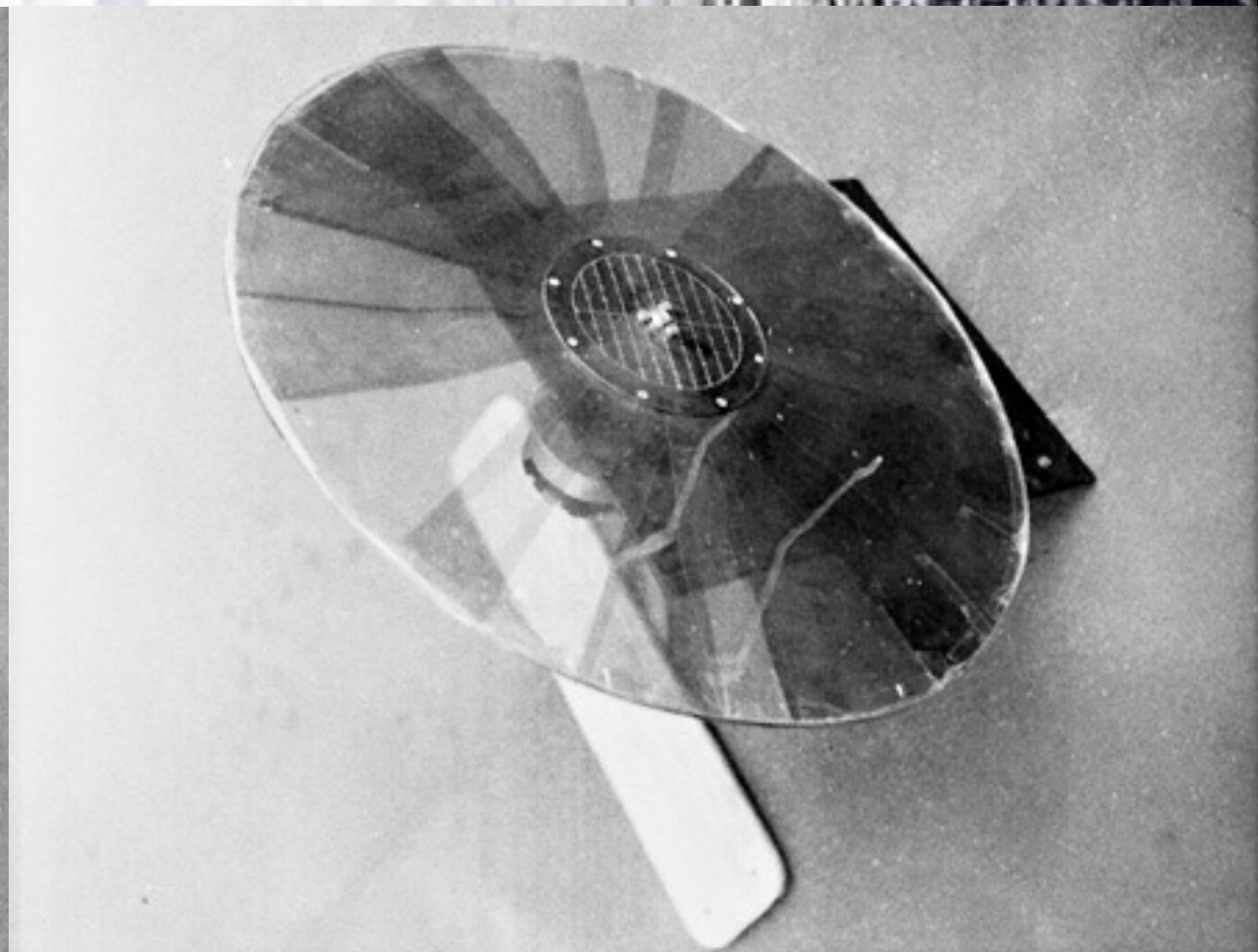
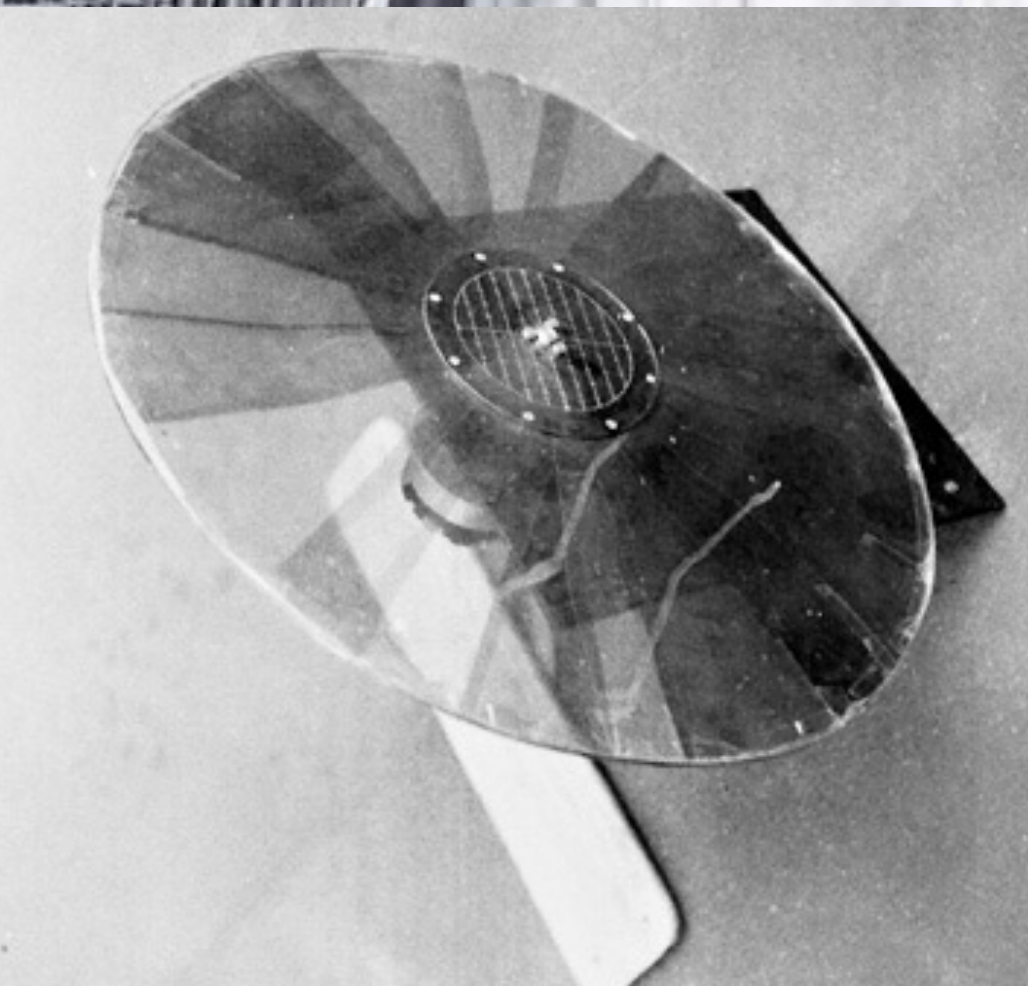
*Colloquy of Mobiles*





Pask installed Musicolour  
in venues around England.



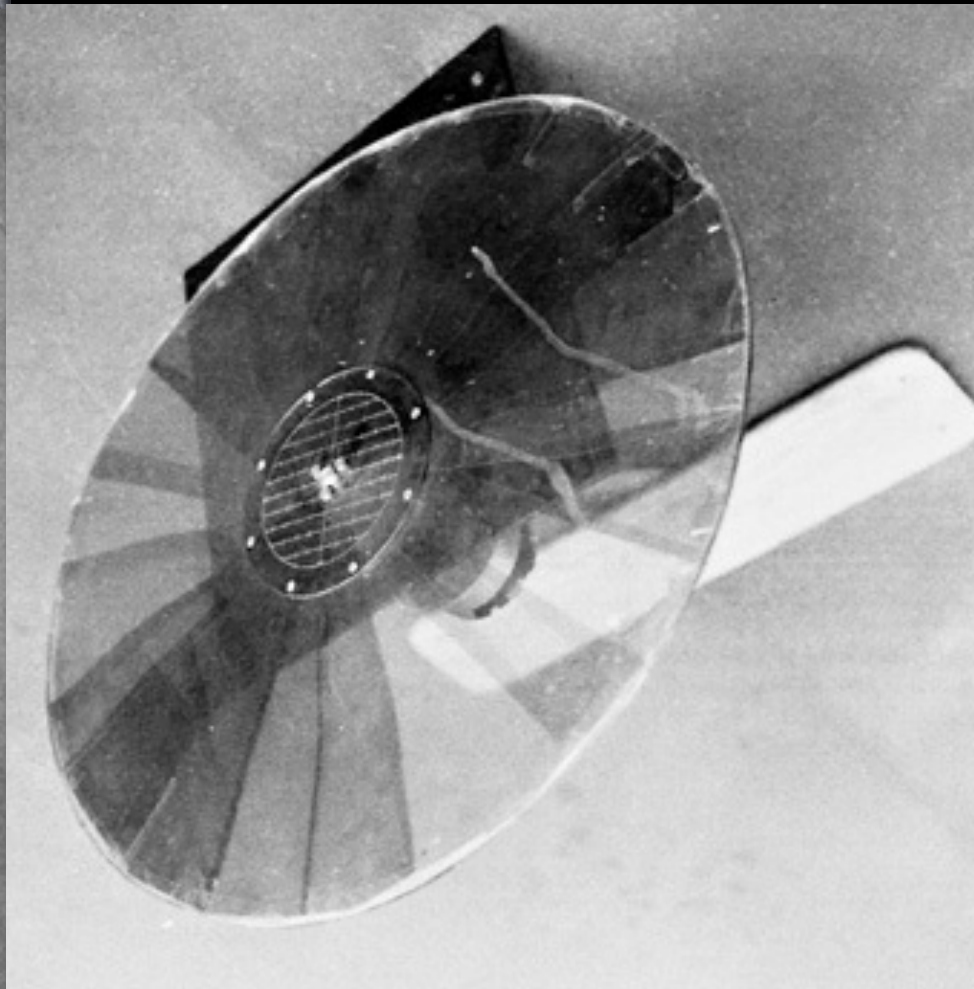
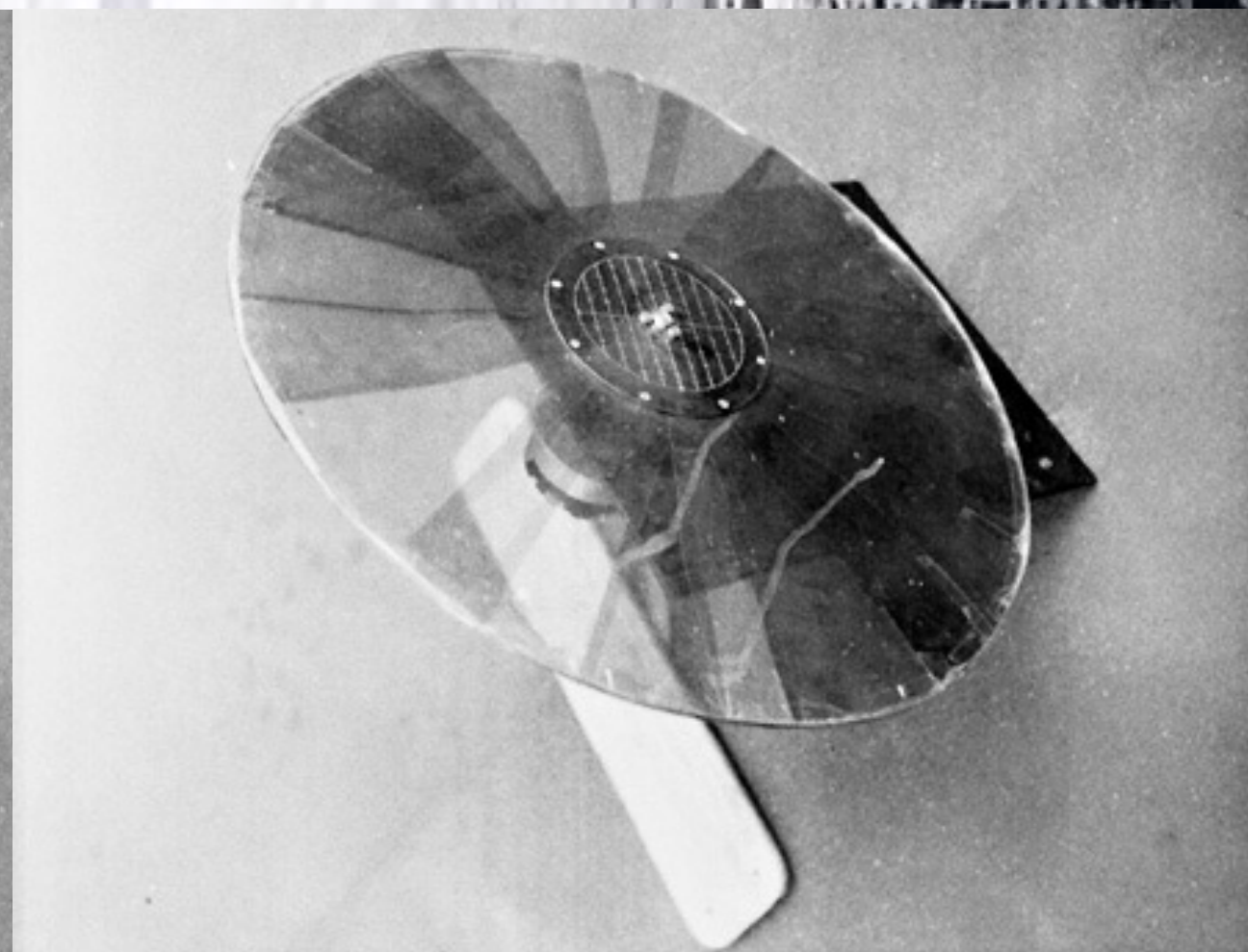
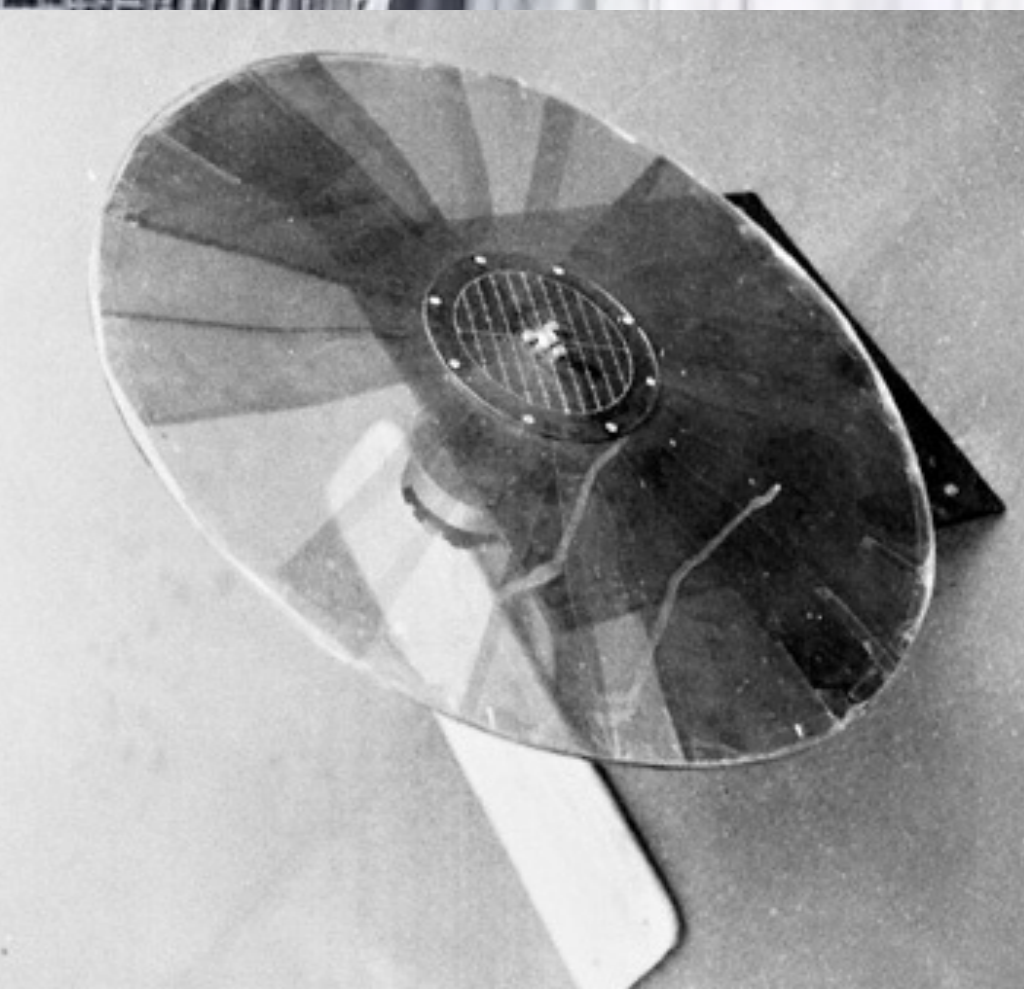






Lights were configured to shine on curtains.

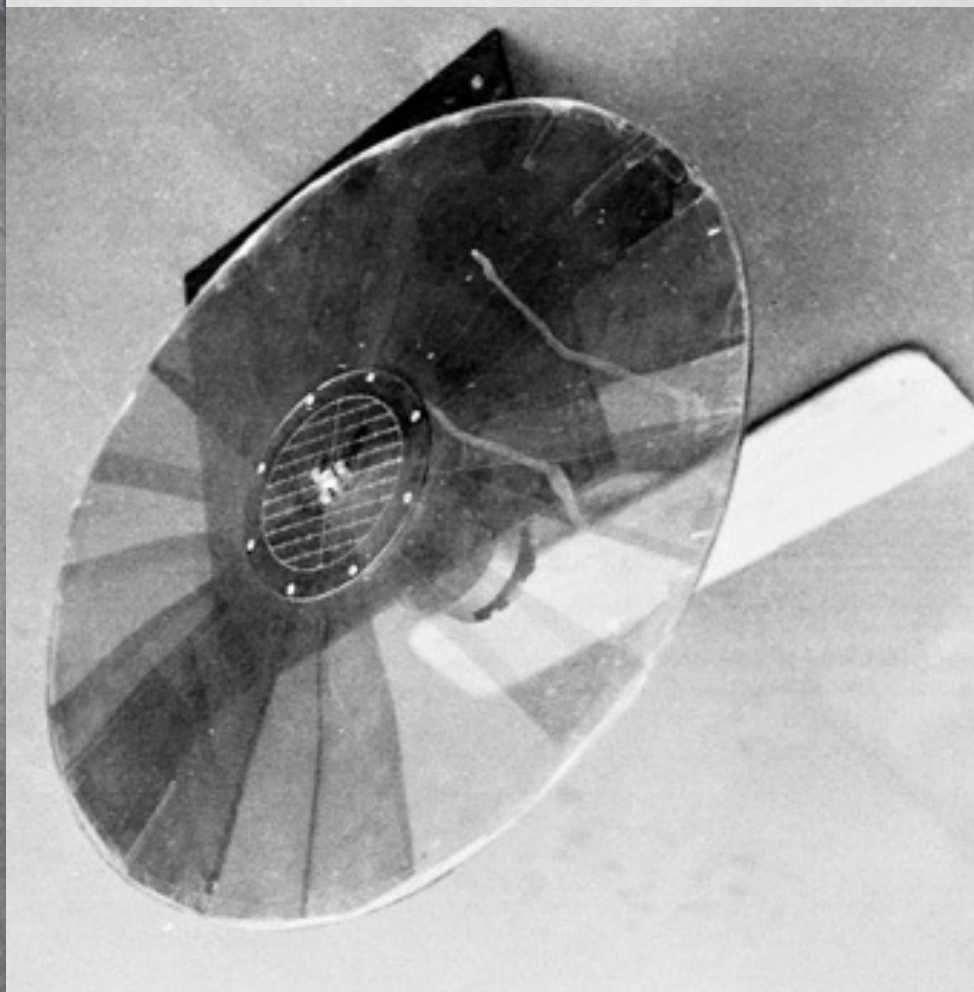
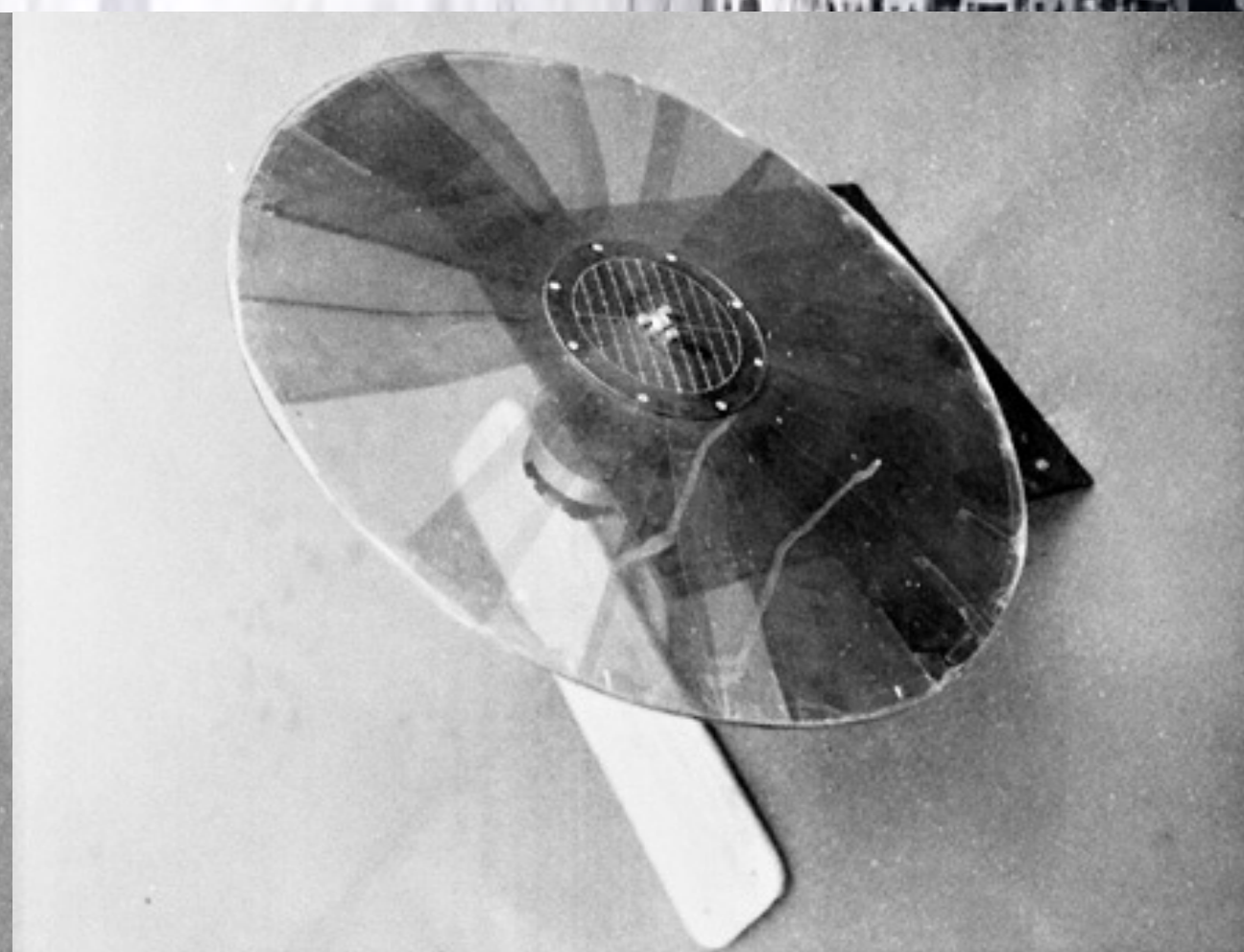
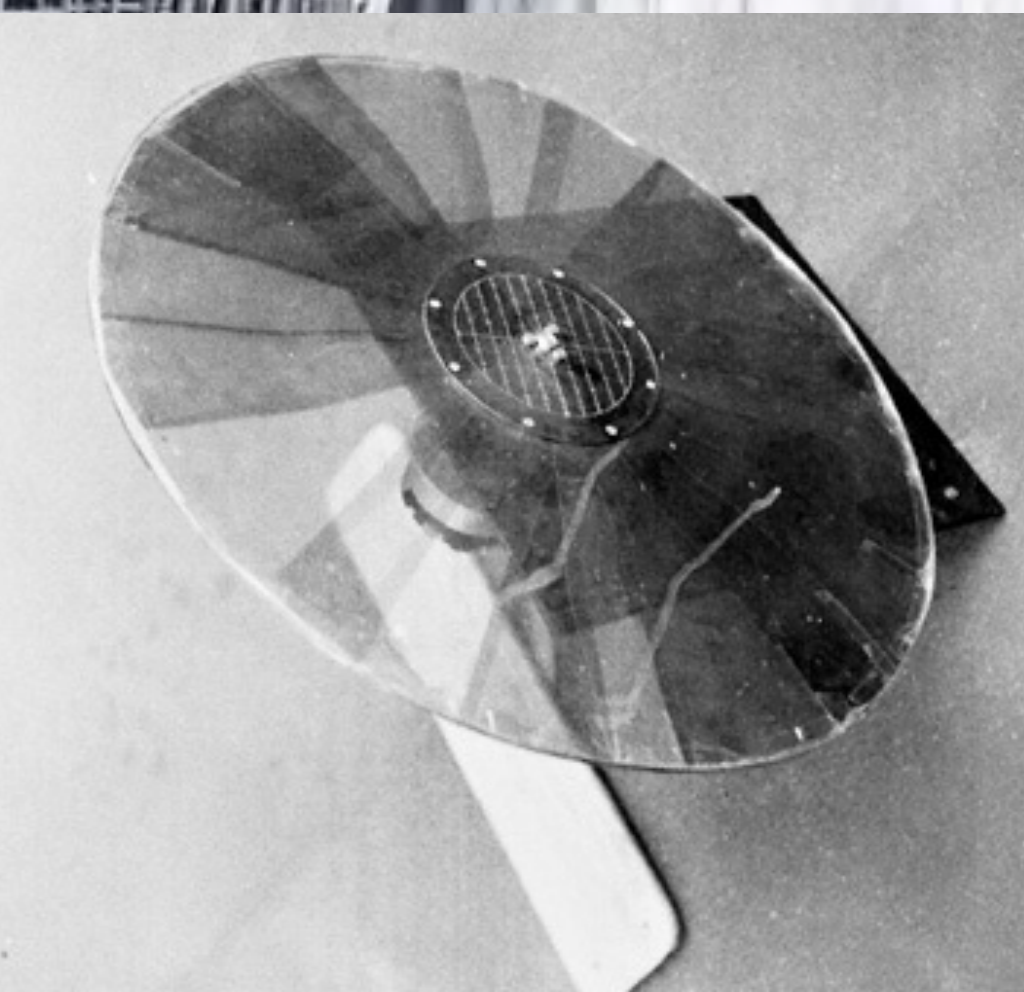
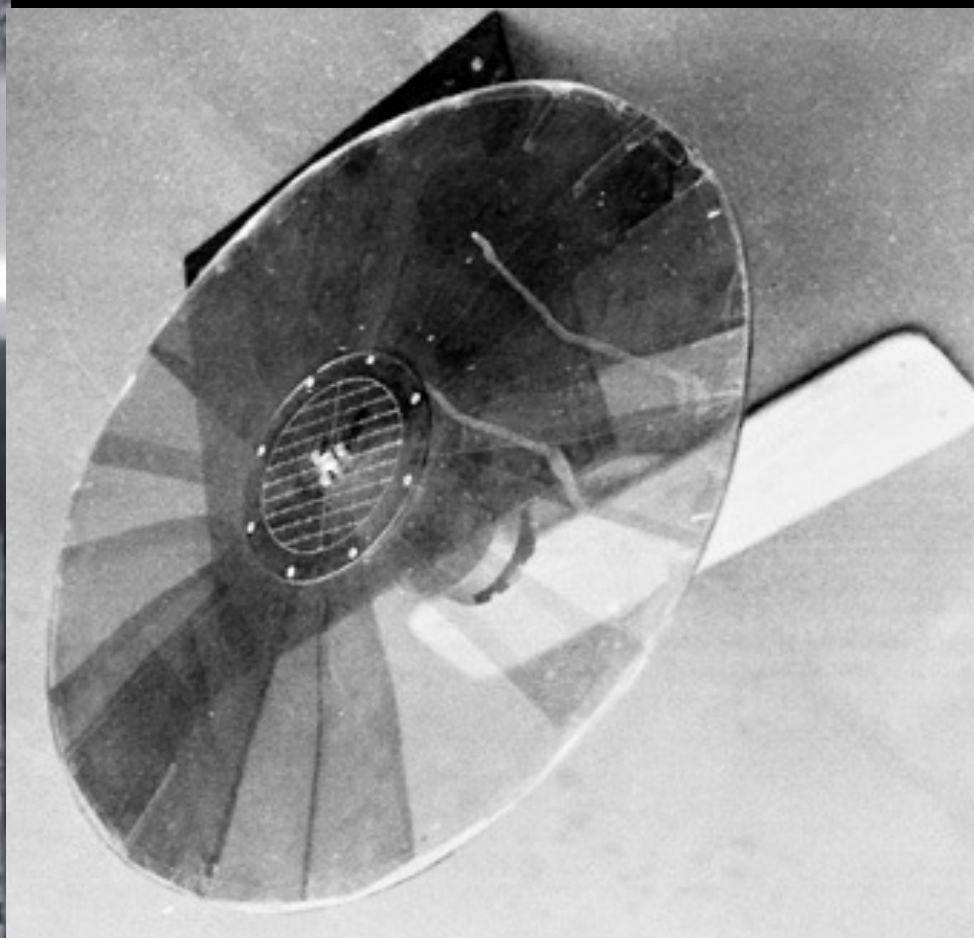
The electronics were bulky and complex and could malfunction or catch fire.

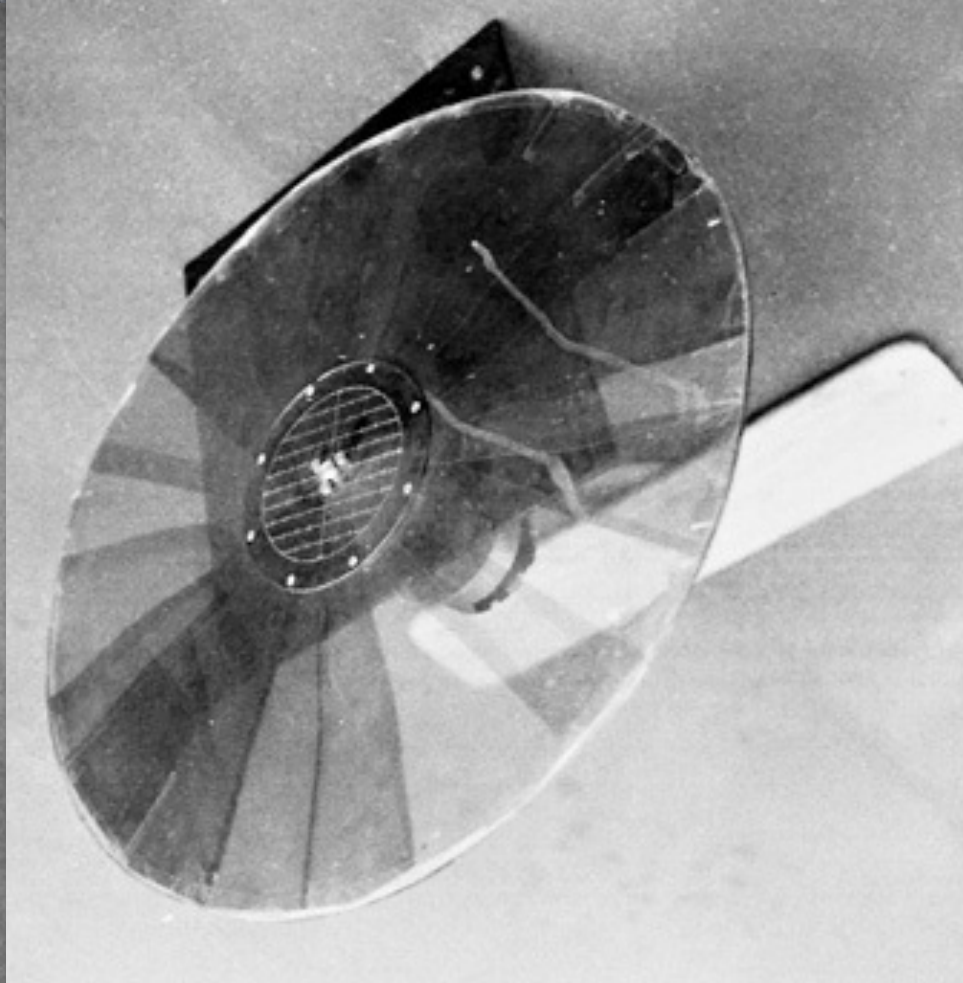
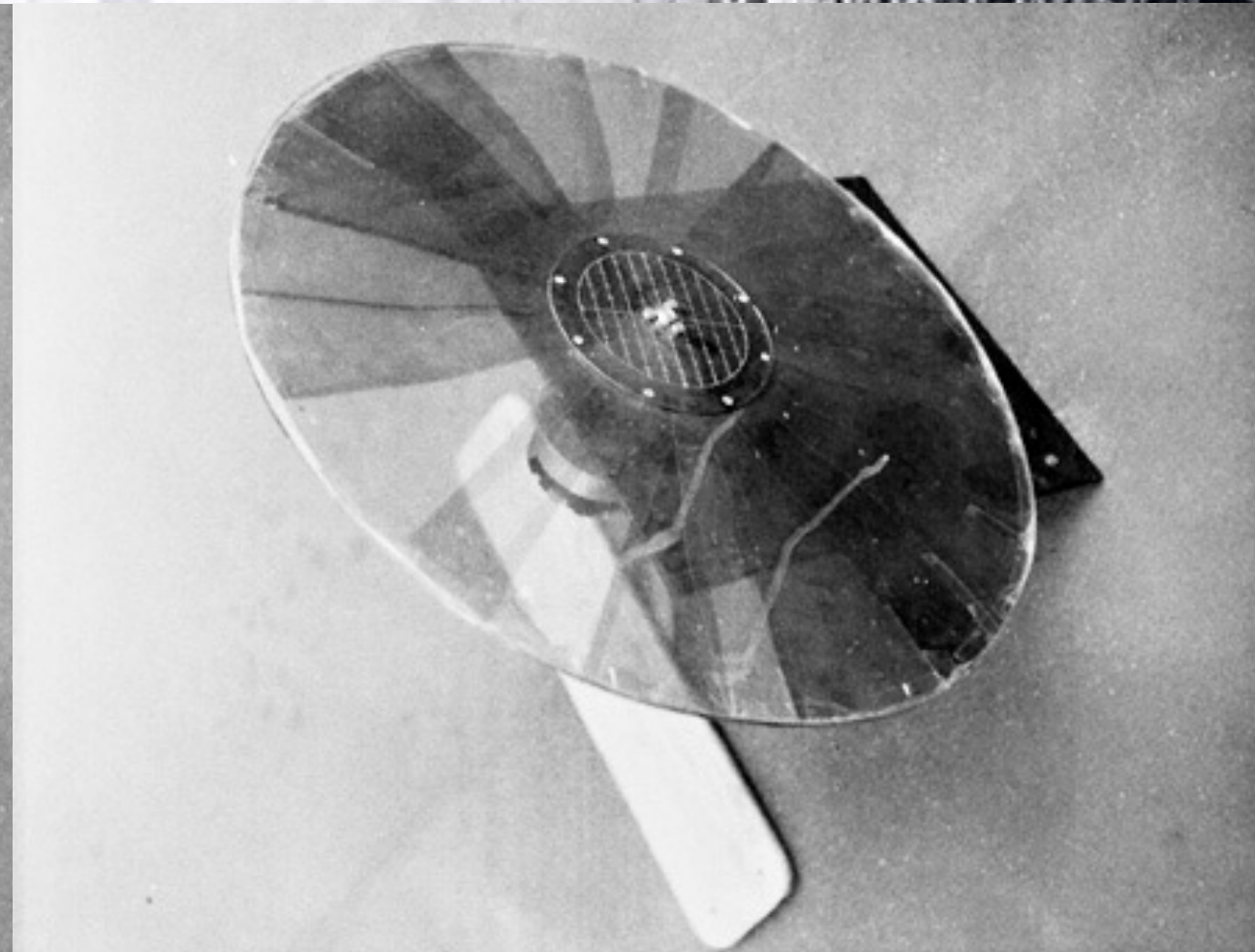
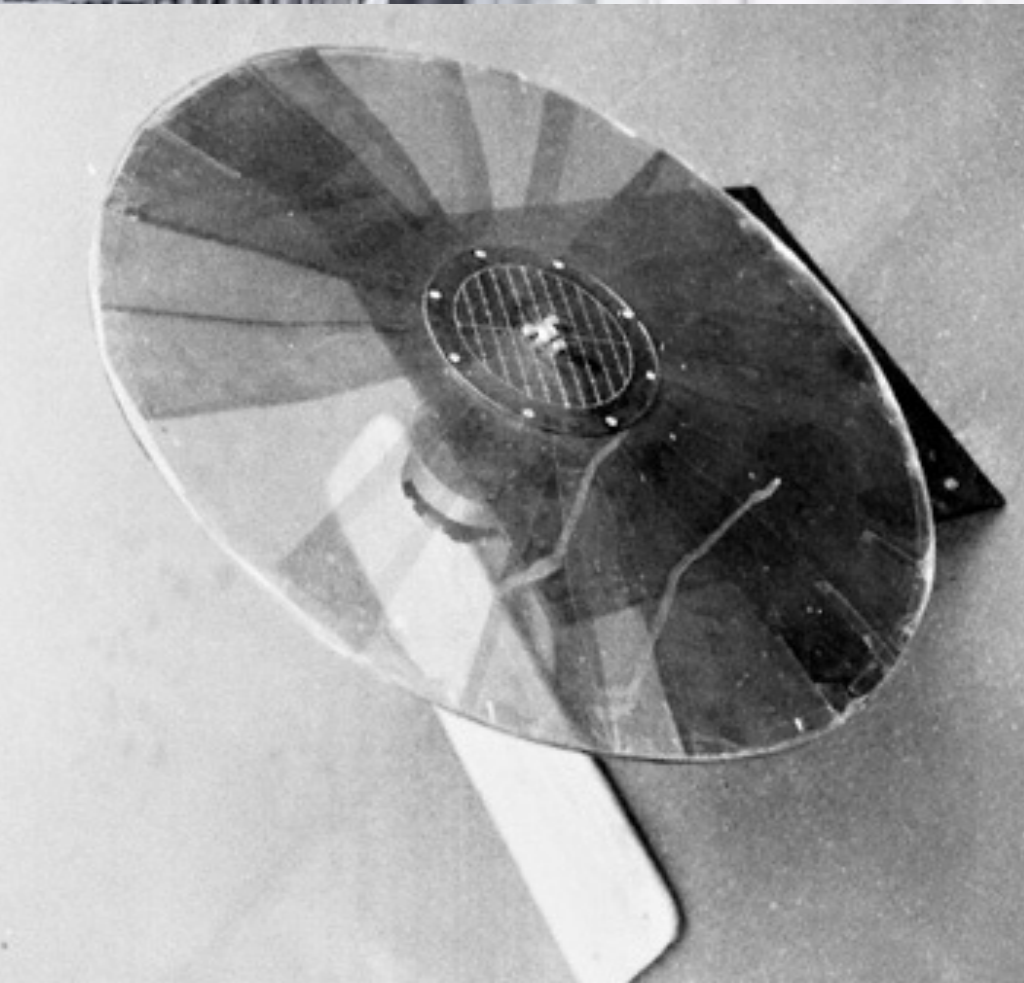
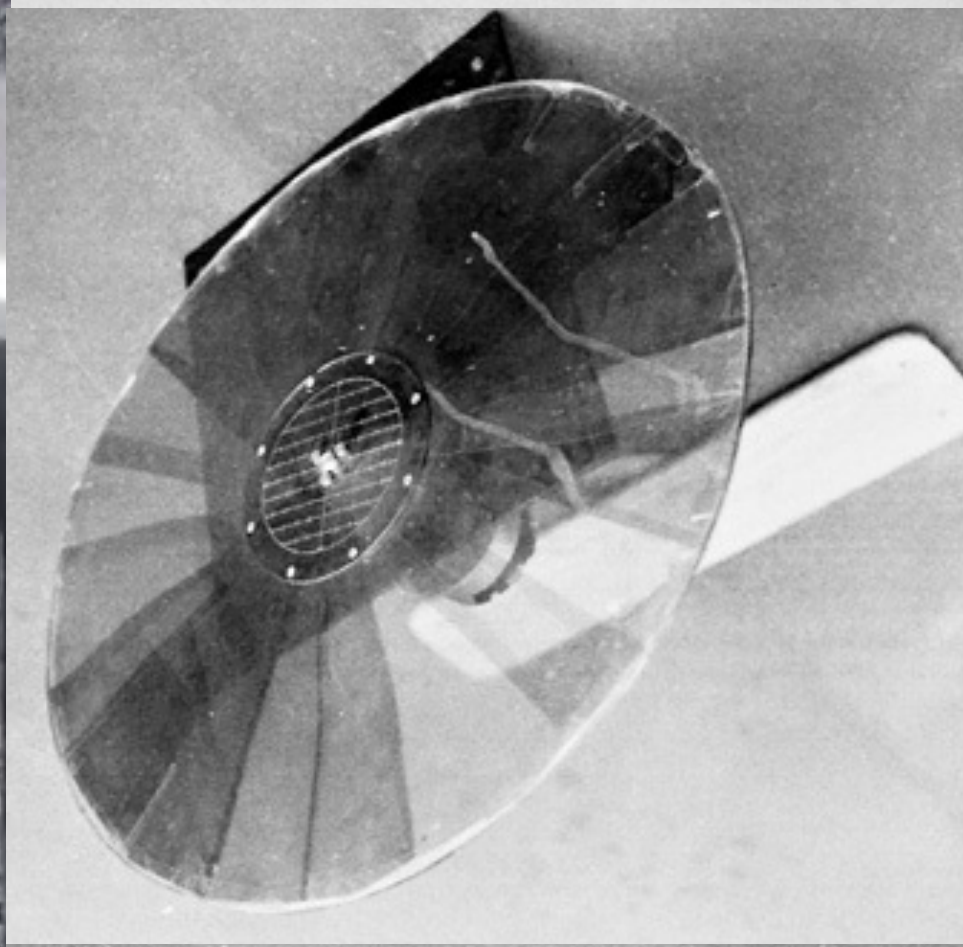
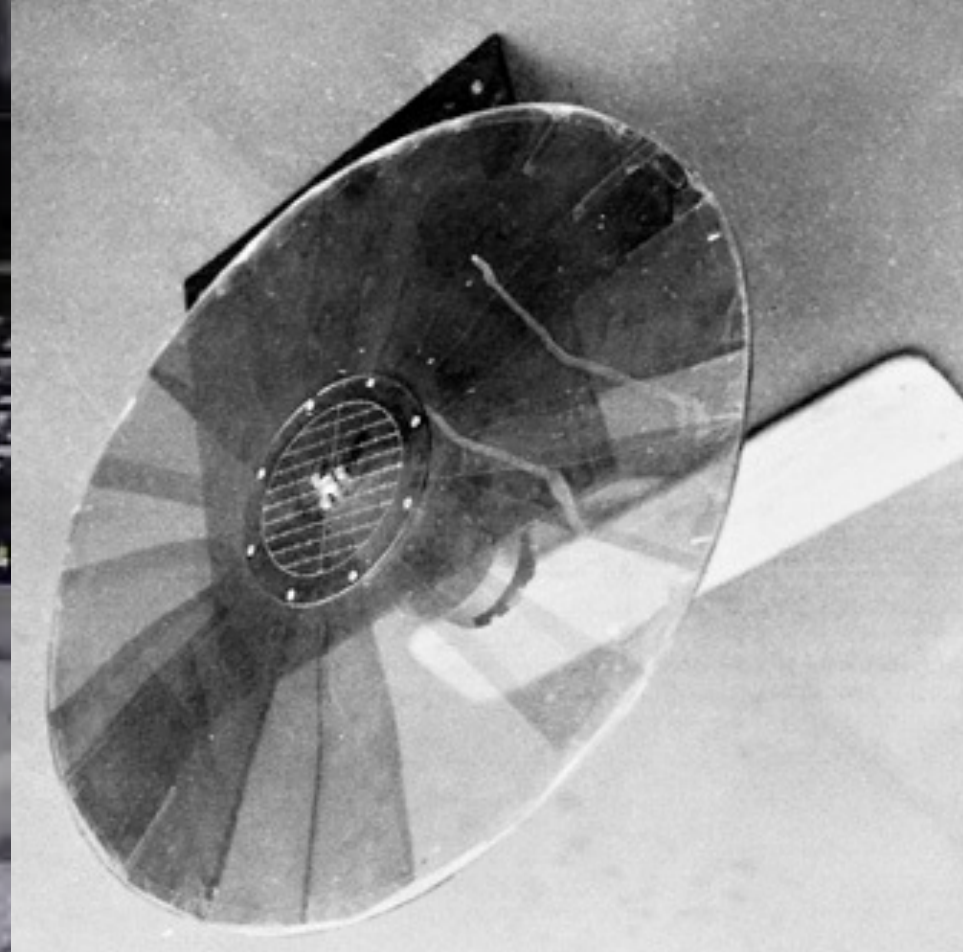




Lights were configured to shine on curtains.

The electronics were bulky and complex and could malfunction or catch fire.

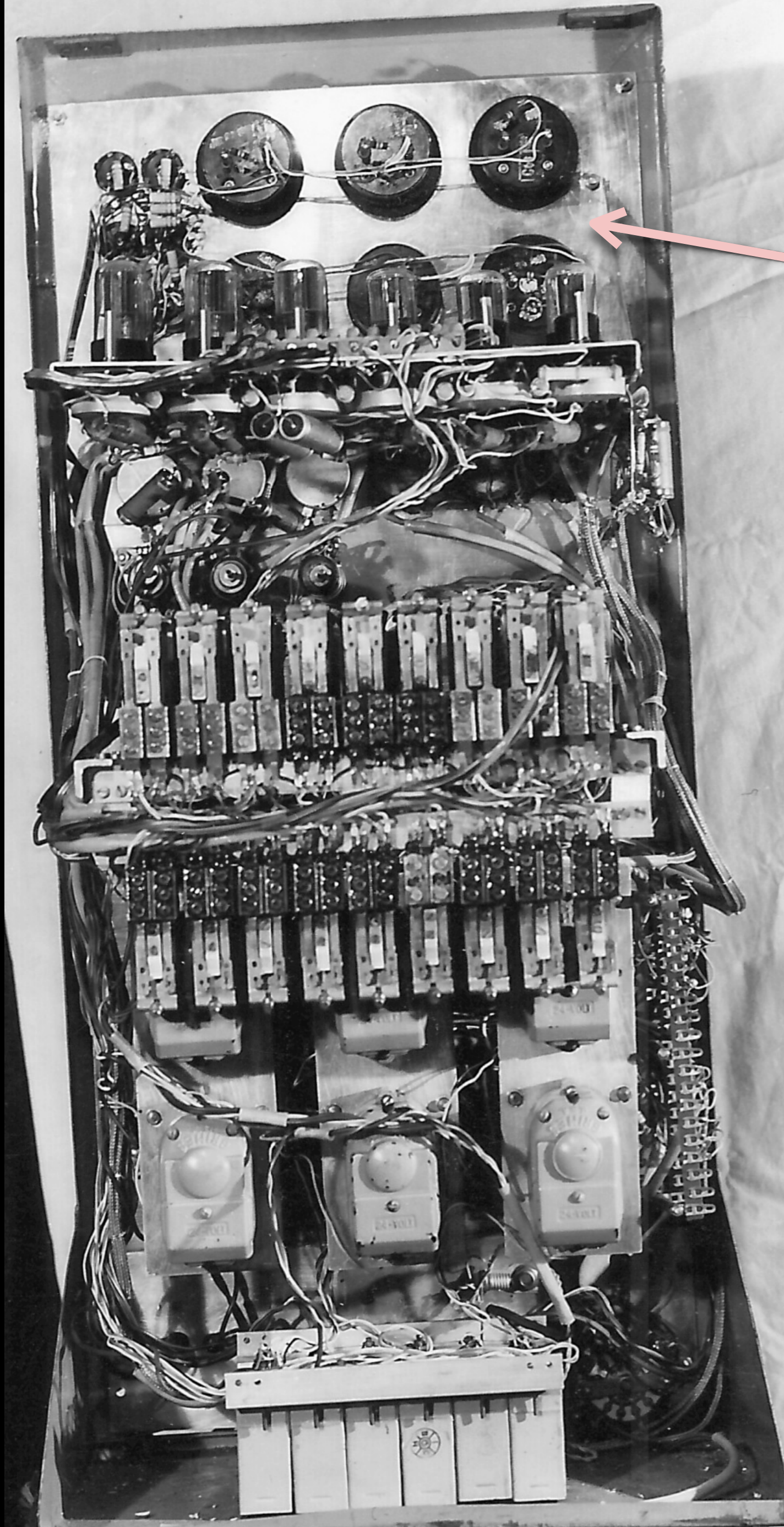




Lights were configured to shine on curtains.

The electronics were bulky and complex and could malfunction or catch fire.

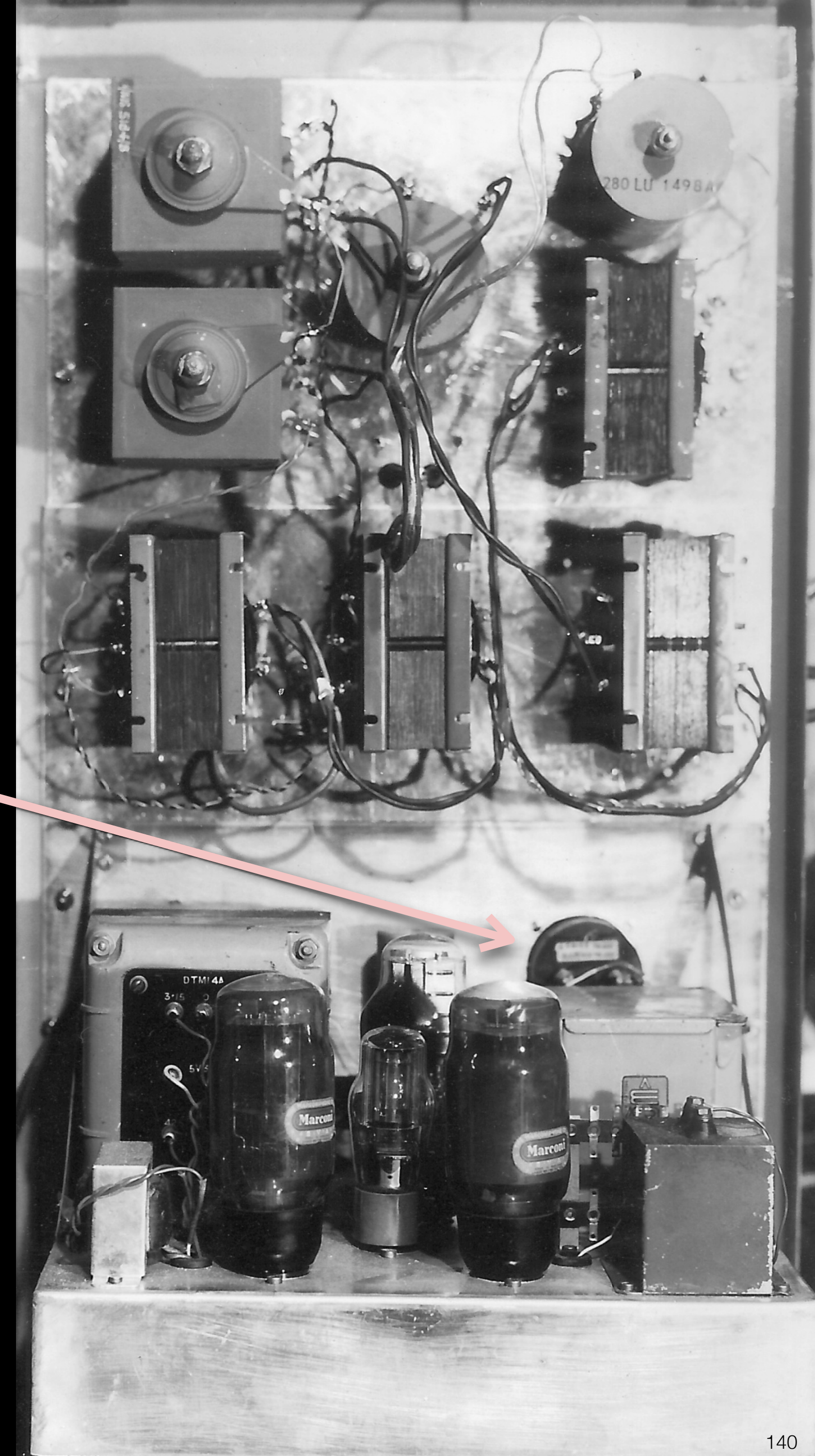
Musicolour Apparatus  
mid-1950s



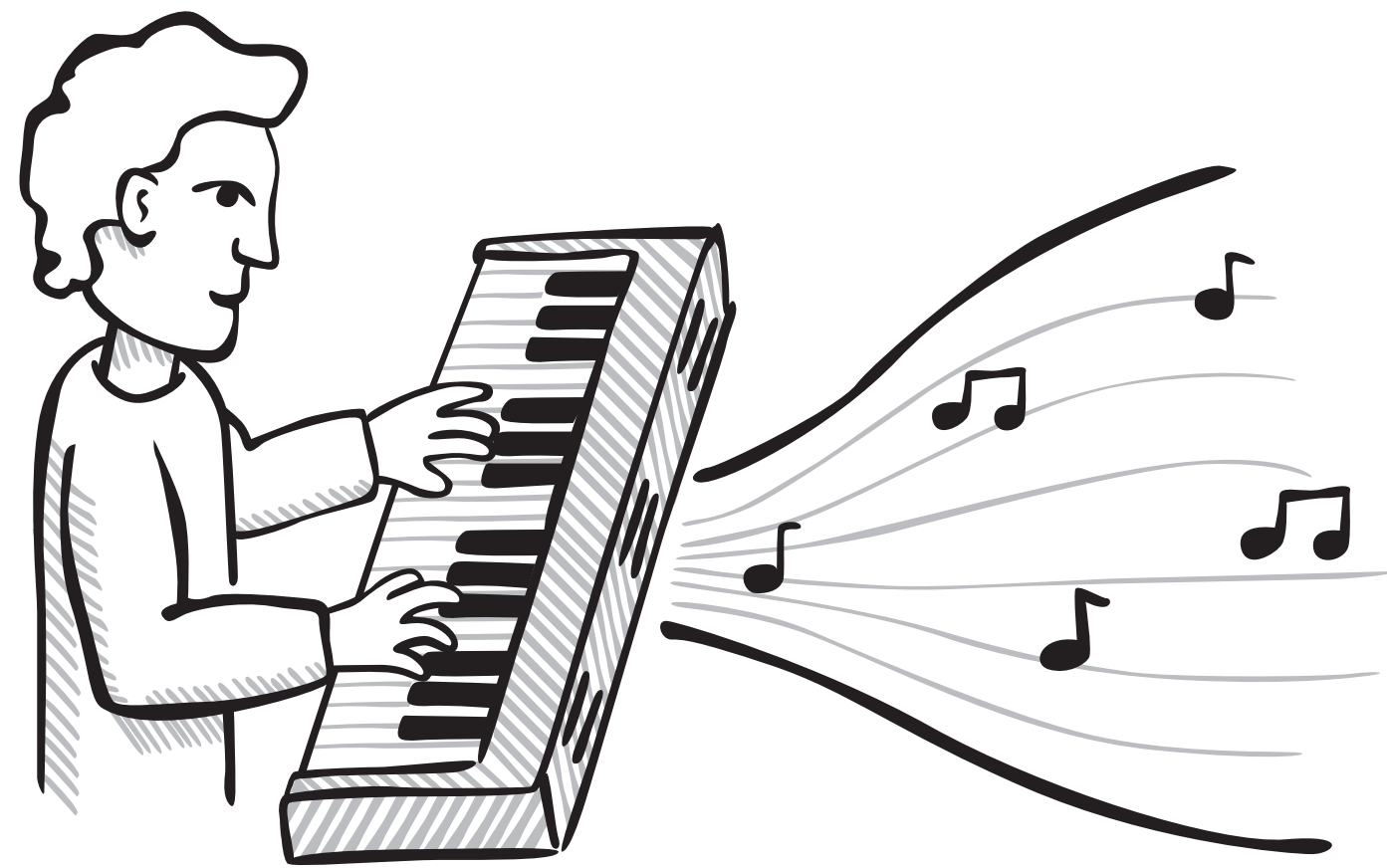
Rear  
View



Front  
View

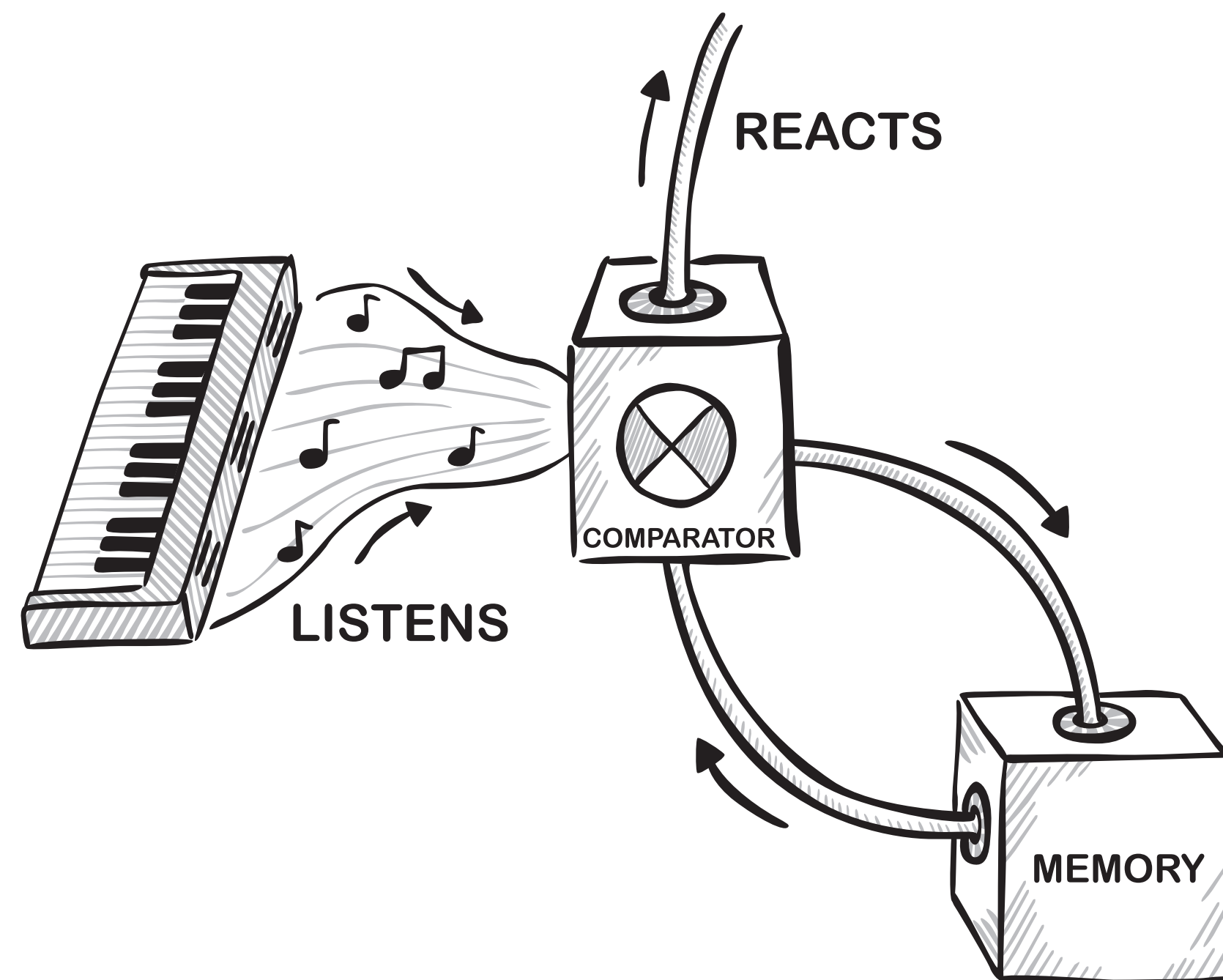


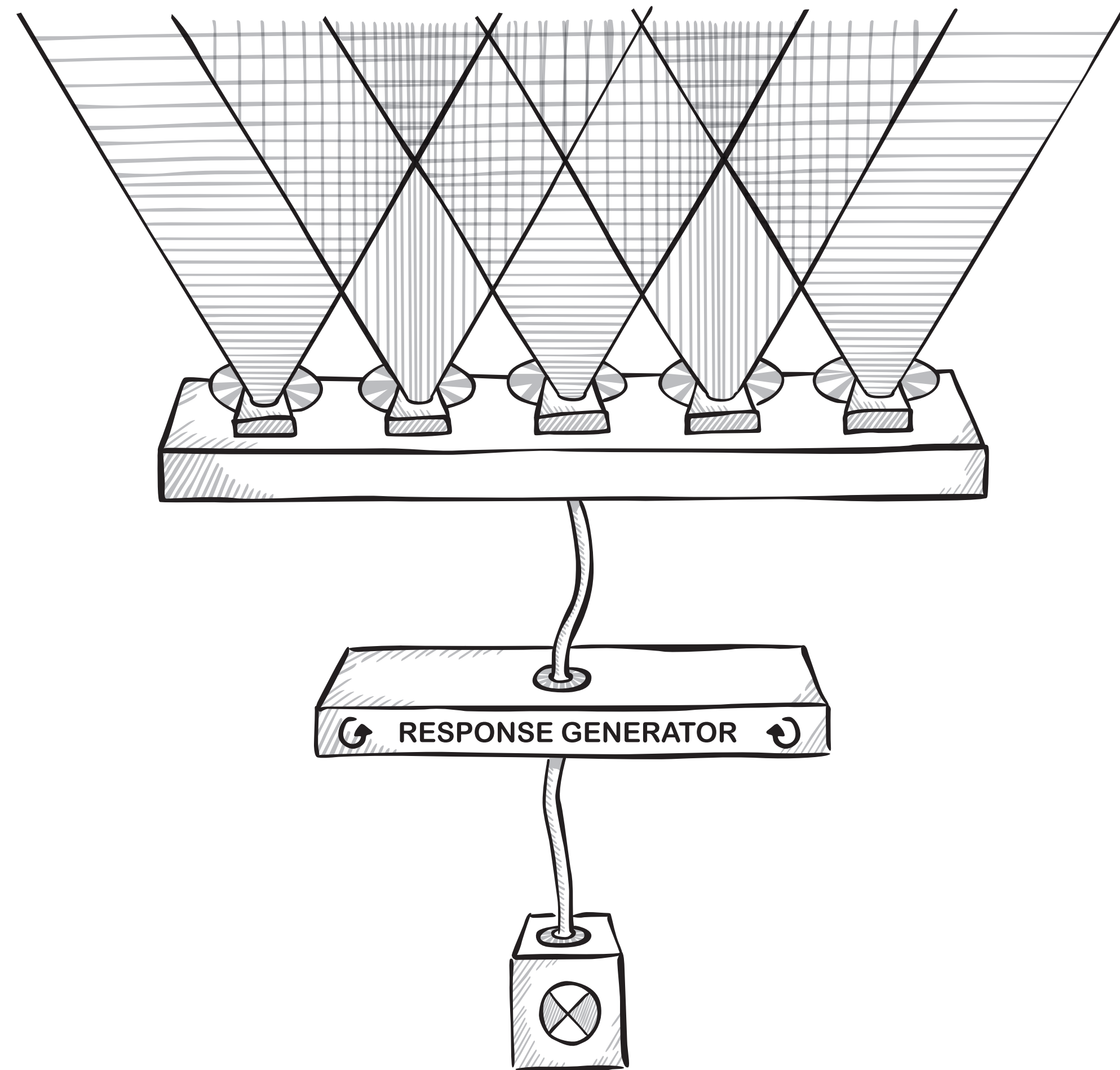
Rear  
View



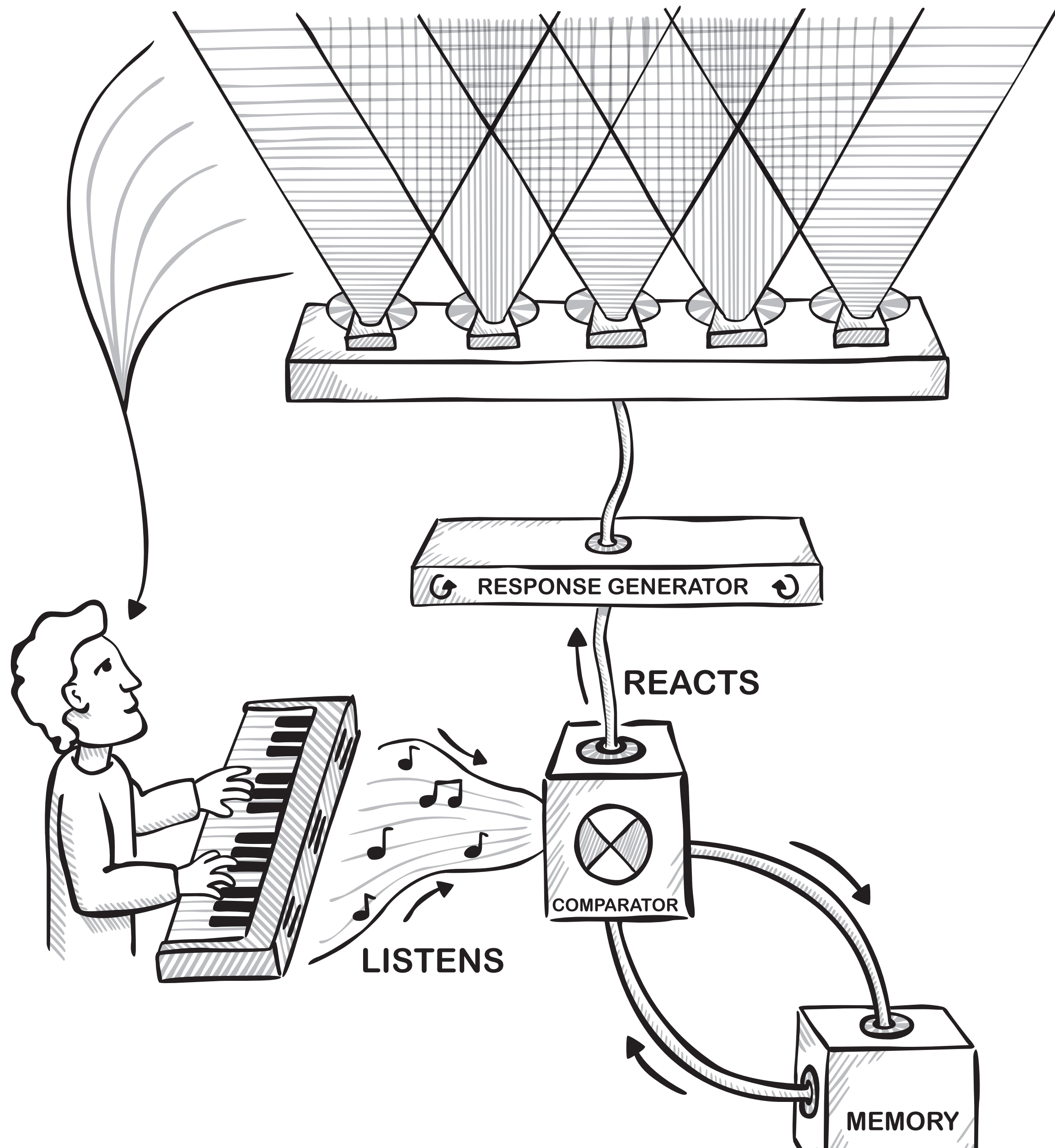
Musicolour  
mid-1950s

Musicolour  
mid-1950s



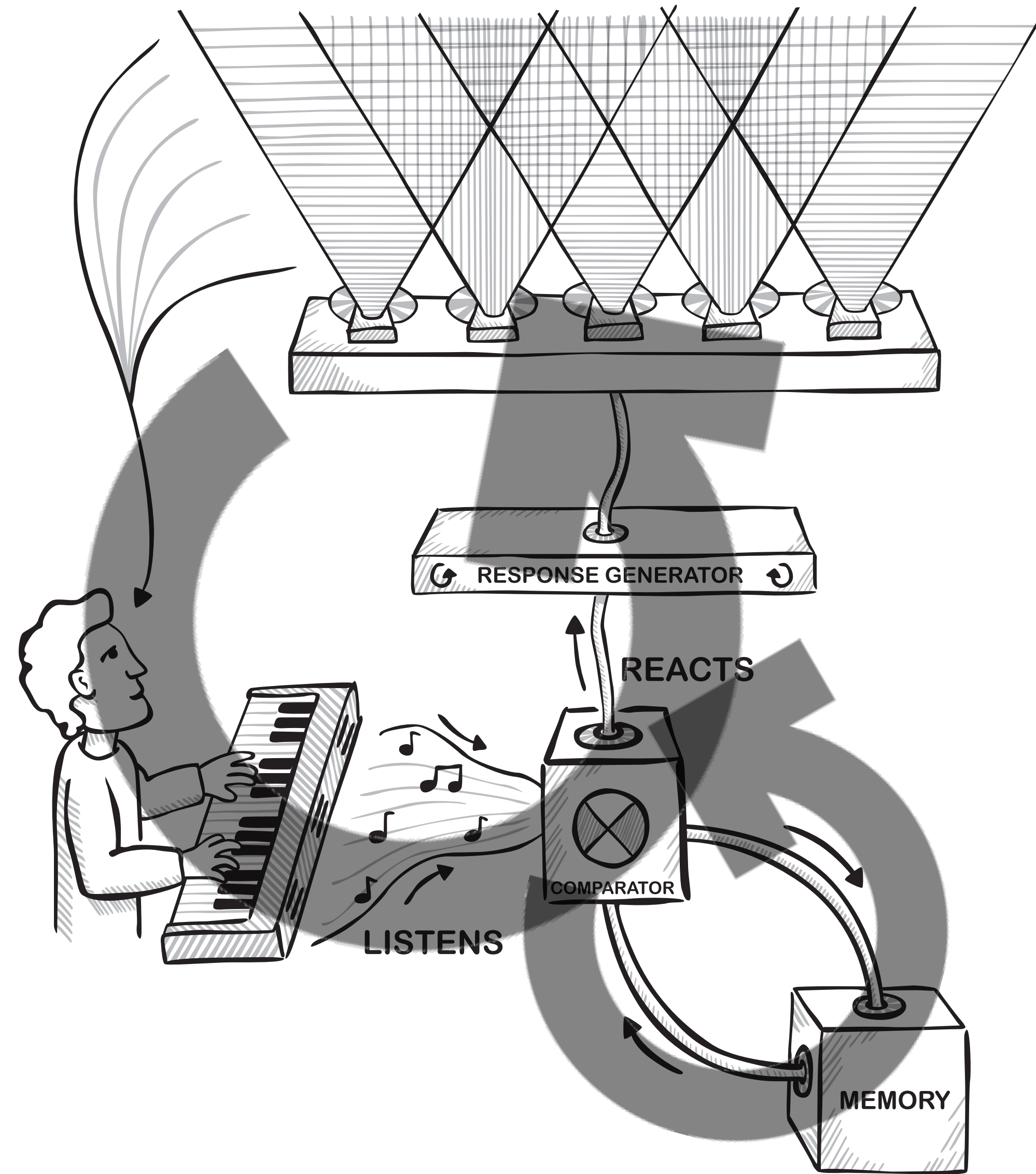


Musicolour  
mid-1950s



Musicolour  
mid-1950s

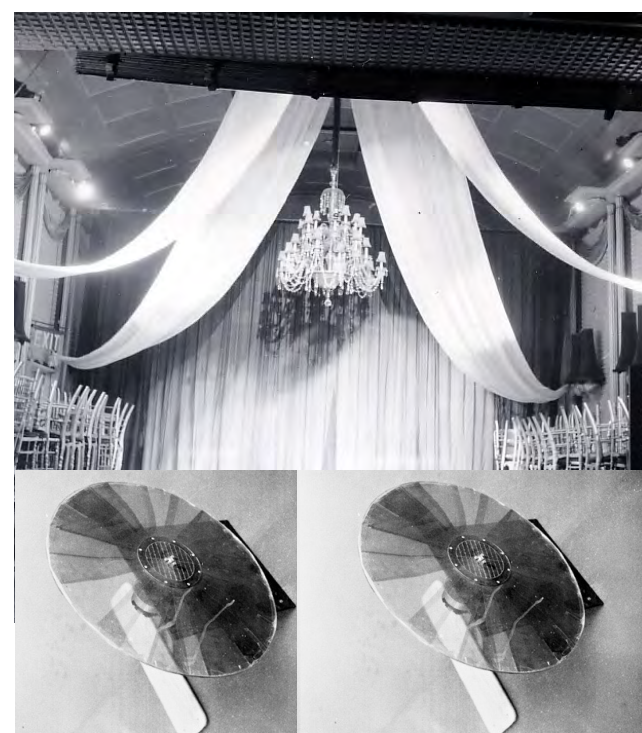




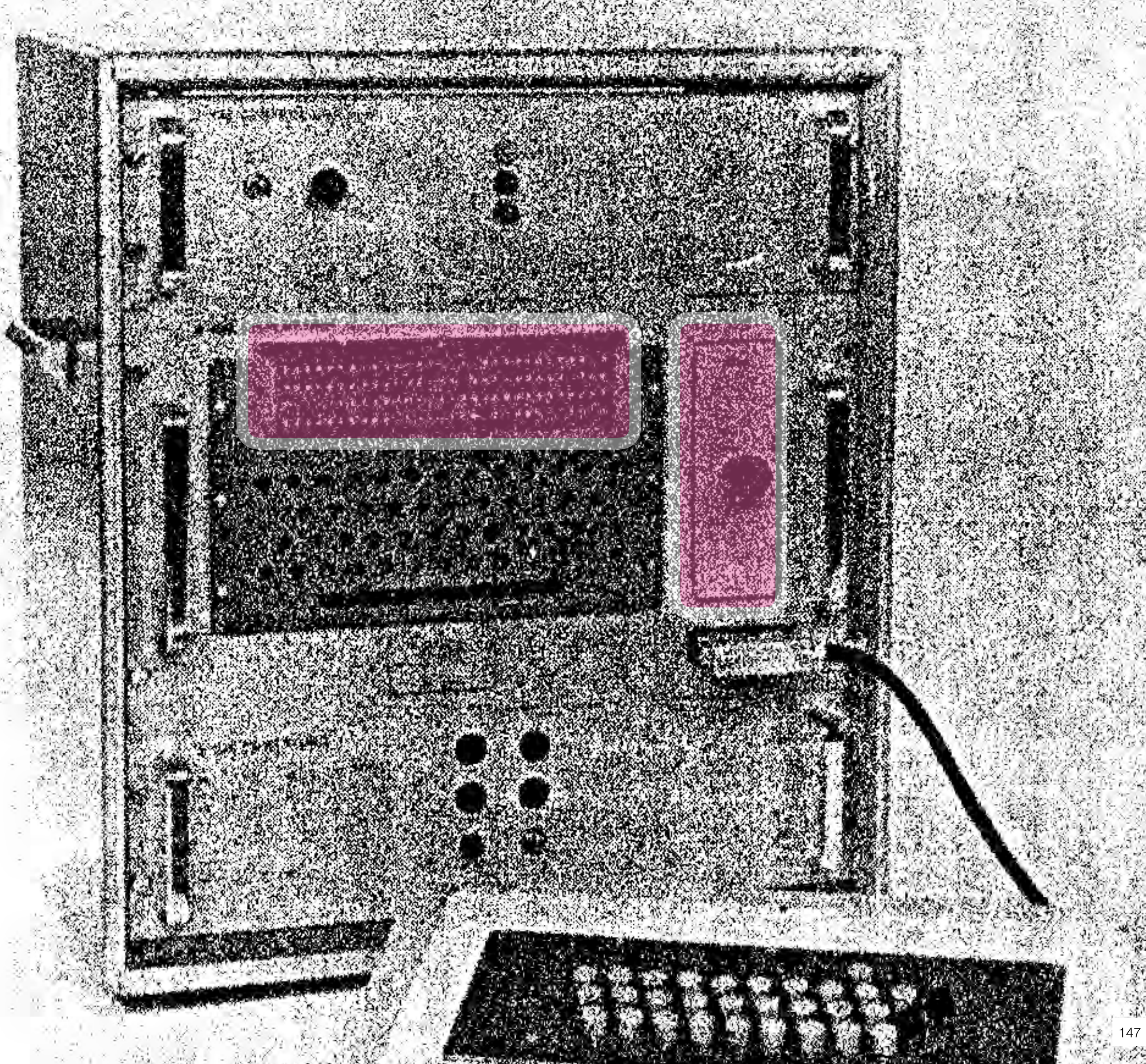
Musicolour  
mid-1950s

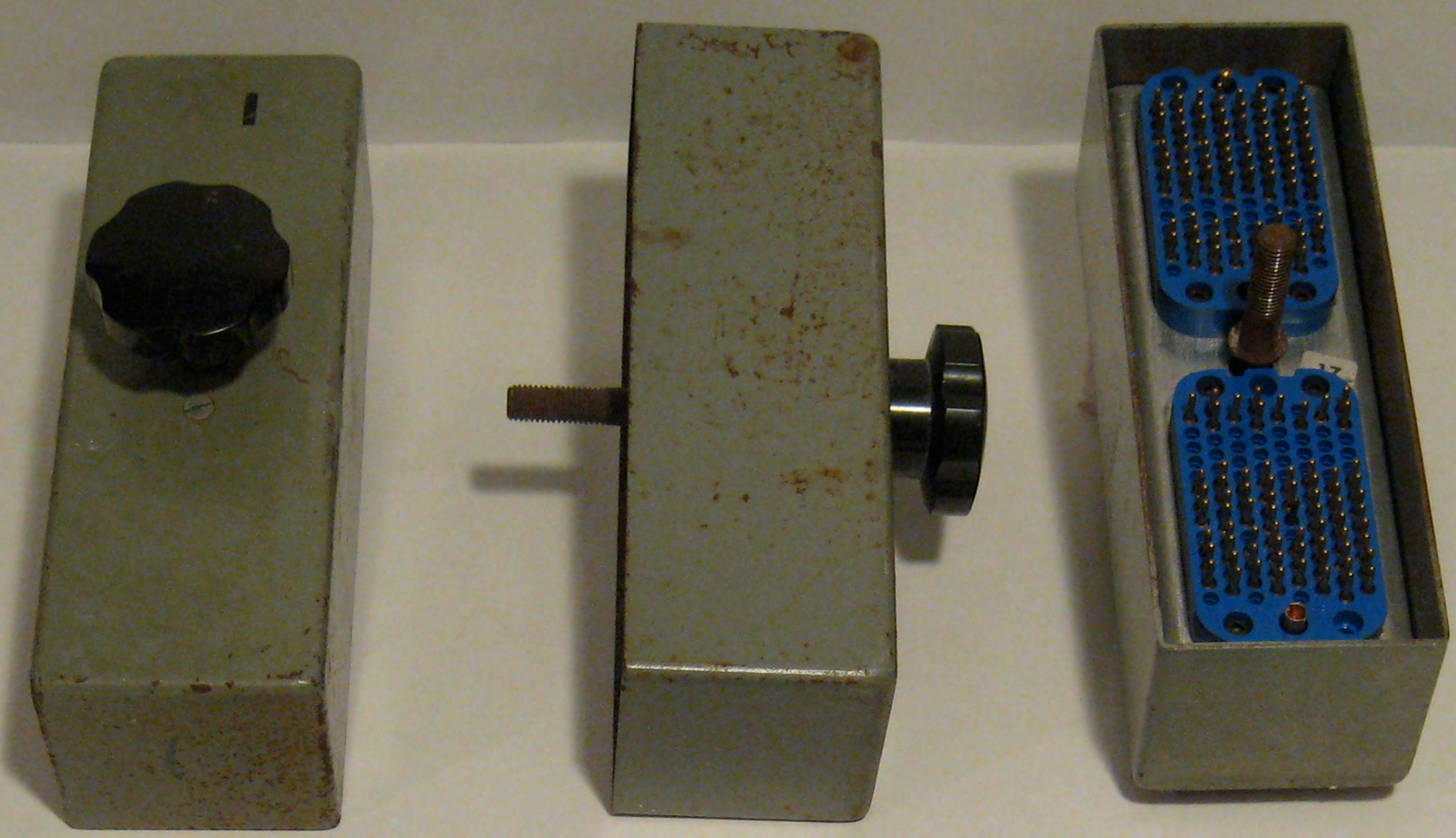
## Paskian Interaction Principle #1 — Novelty Regulation

***Musicolour implements **Novelty Regulation** because it detects repetition, gets “bored”, and changes its responsiveness in order to maintain engagement of participants in a conversation.***



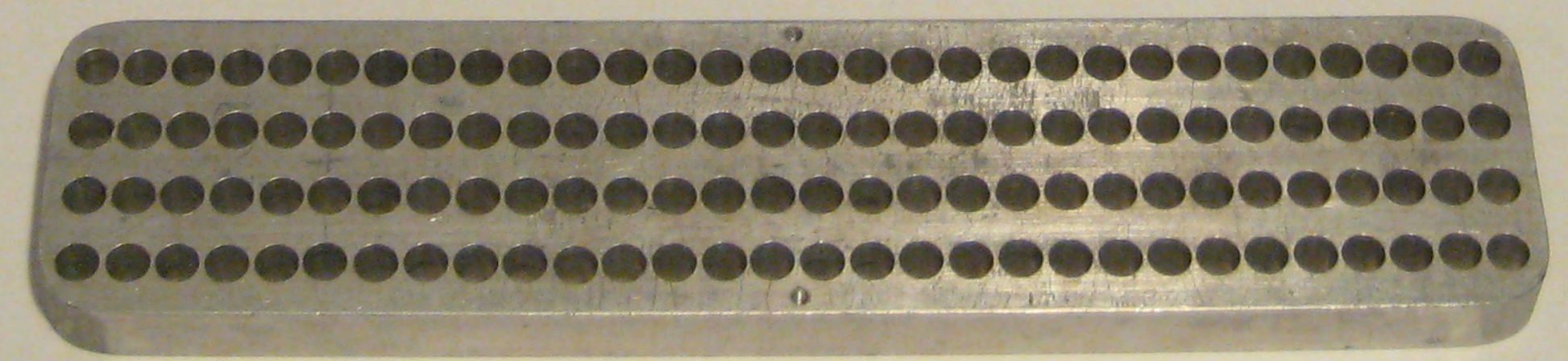
Gordon Pask's S.A.K.I.  
Self-Adaptive Keyboard Instructor  
1956





A 17

●	V	O	W	E	L	5	4	3	2	1	B	U	R	S	T	7	1	0	9	6	M	A	N	G	E	8	2	1	5
●	L	O	C	A	L	6	3	5	2	4	P	I	P	E	D	7	0	8	5	2	R	E	A	M	S	2	8	2	4
●	R	O	G	E	R	7	0	1	2	5	M	E	A	N	S	9	8	4	2	3	C	R	I	M	P	1	8	1	7
●	F	L	O	O	D	8	7	4	2	3	G	I	R	T	H	9	5	8	7	4	W	I	L	L	Y	8	1	2	5



S.A.K.I.  
Programming Modules  
1956

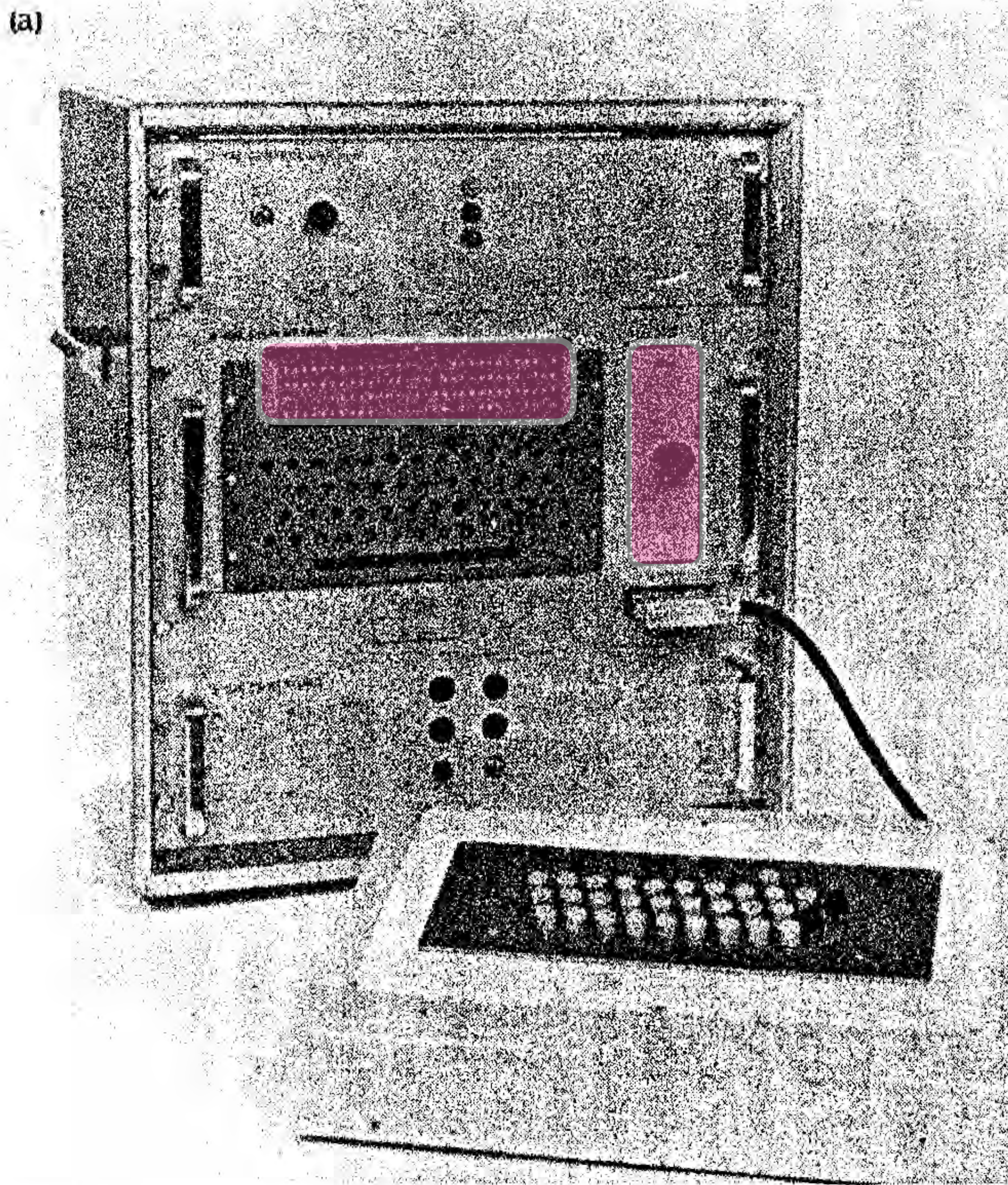
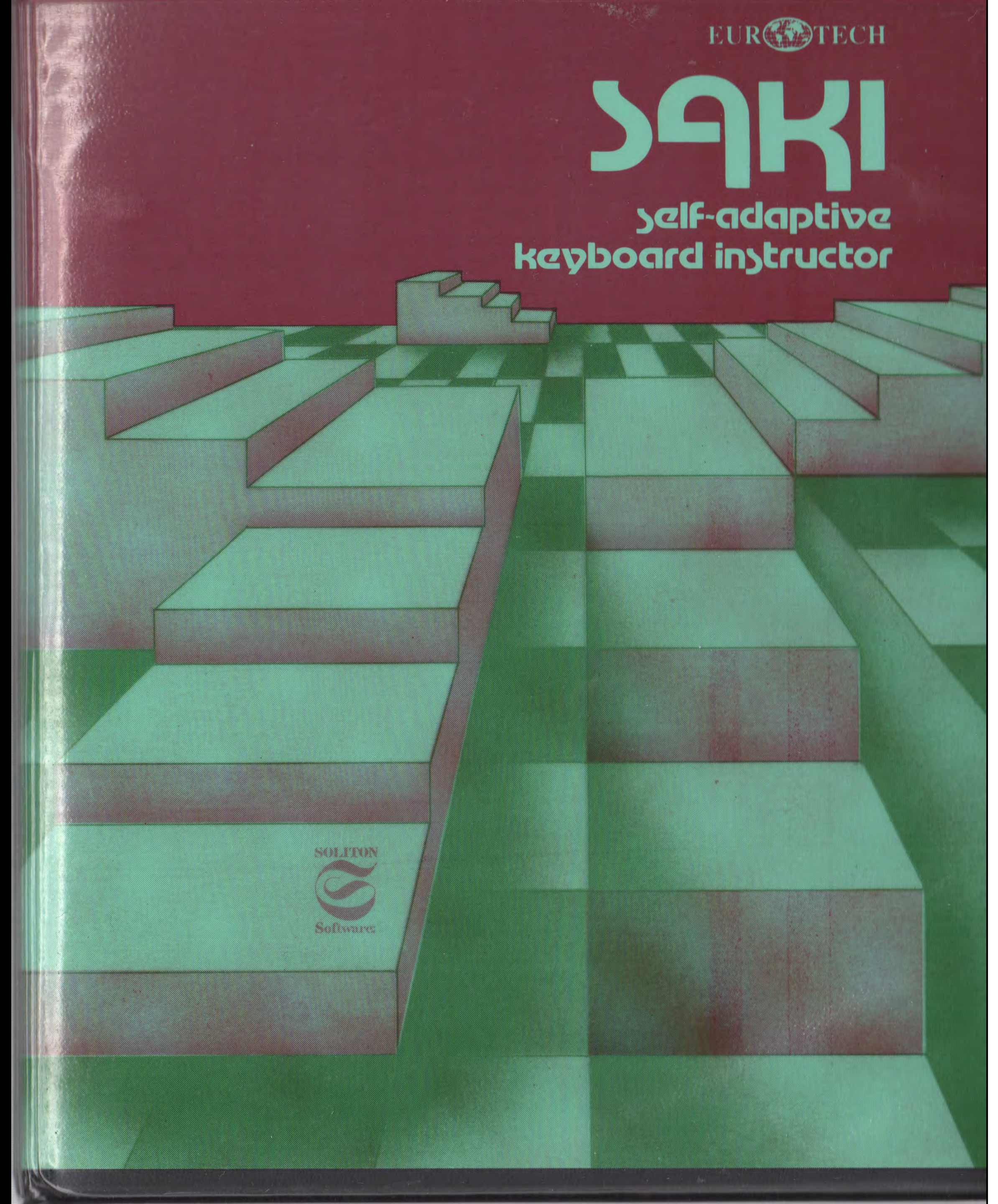


FIG. 2. (a) SAKI (1961) for IBM keyboard (Cybernetic Developments Ltd). Alphanumeric and cueing displays above (as part of machine), the latter in correspondence with the keyboard layout. Recent machines (b) are of similar design but implemented in microprocessor-and-program technology. (b) System Research Developments Ltd microprocessor SAKI machine with optional text-handling capabilities.

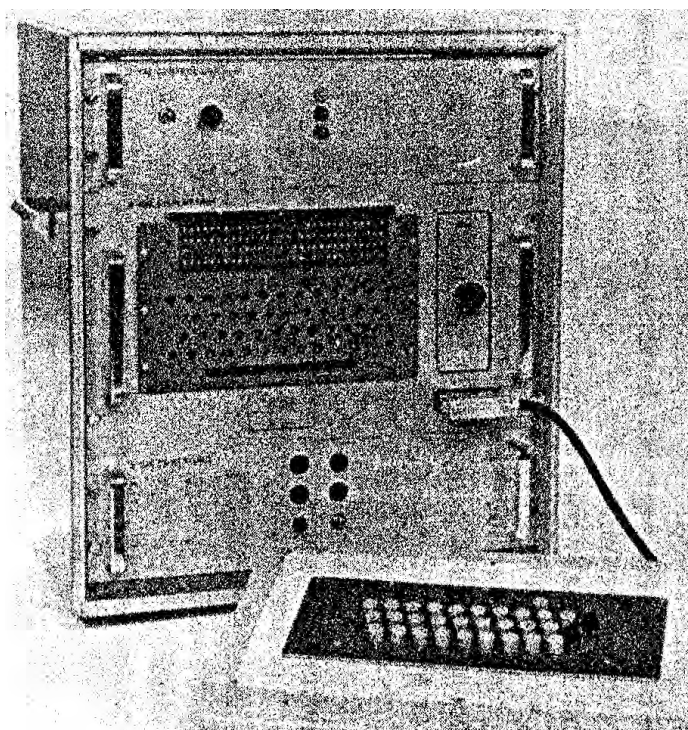


PC version  
Self-Adaptive Keyboard Instructor  
1987

#1 — Novelty Regulation

Paskian Interaction Principle #2 — Uncertainty Regulation

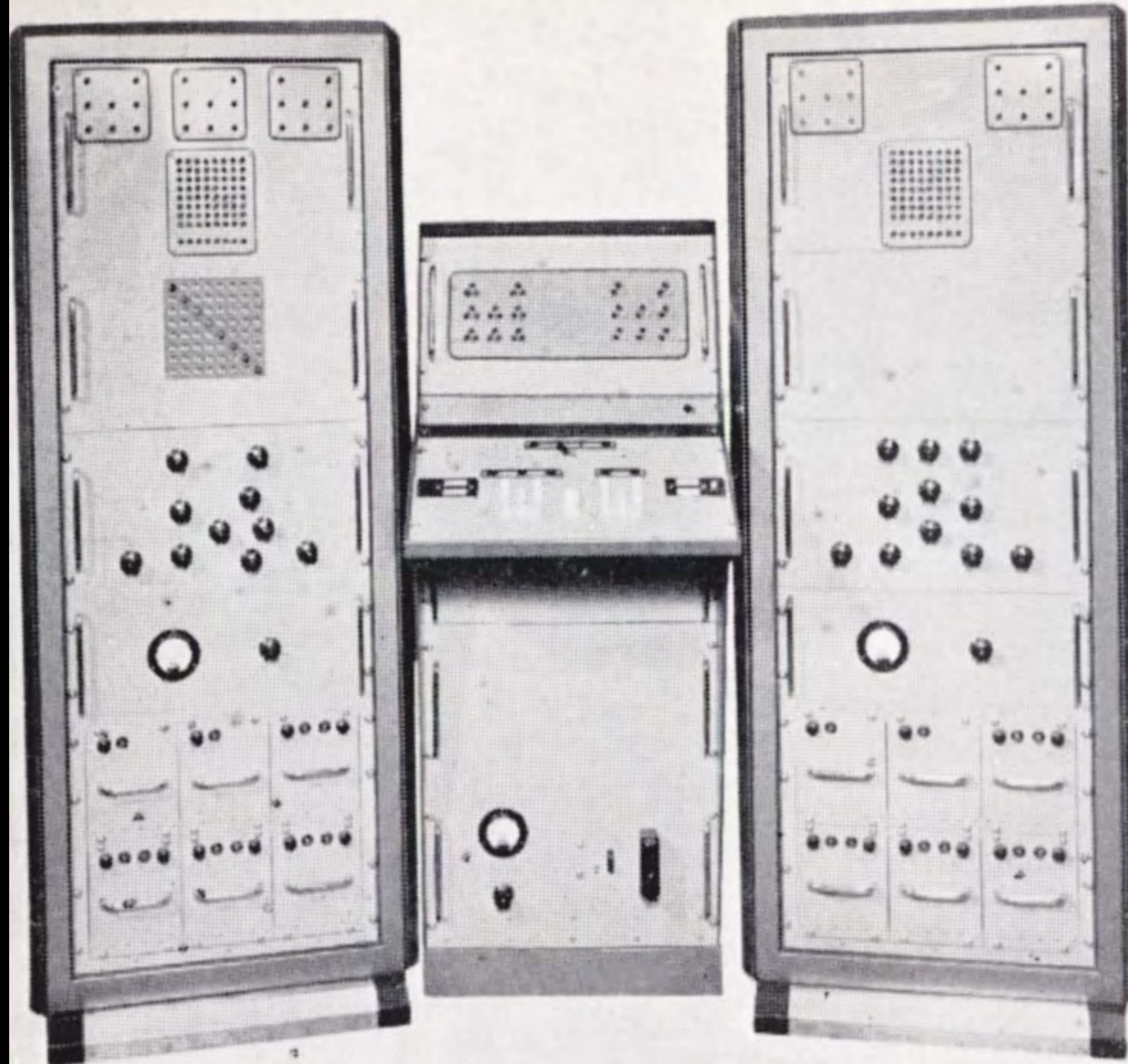
***S.A.K.I. implements **Uncertainty Regulation** because it senses facility and failure, and then calculates how to modulate its responses in order to maintain consistent learning by a participant in a conversation.***



TEACHER  
SIMULATOR

CONTROL  
CONSOLE

PUPIL  
SIMULATOR



Gordon Pask's  
Euclates

1958

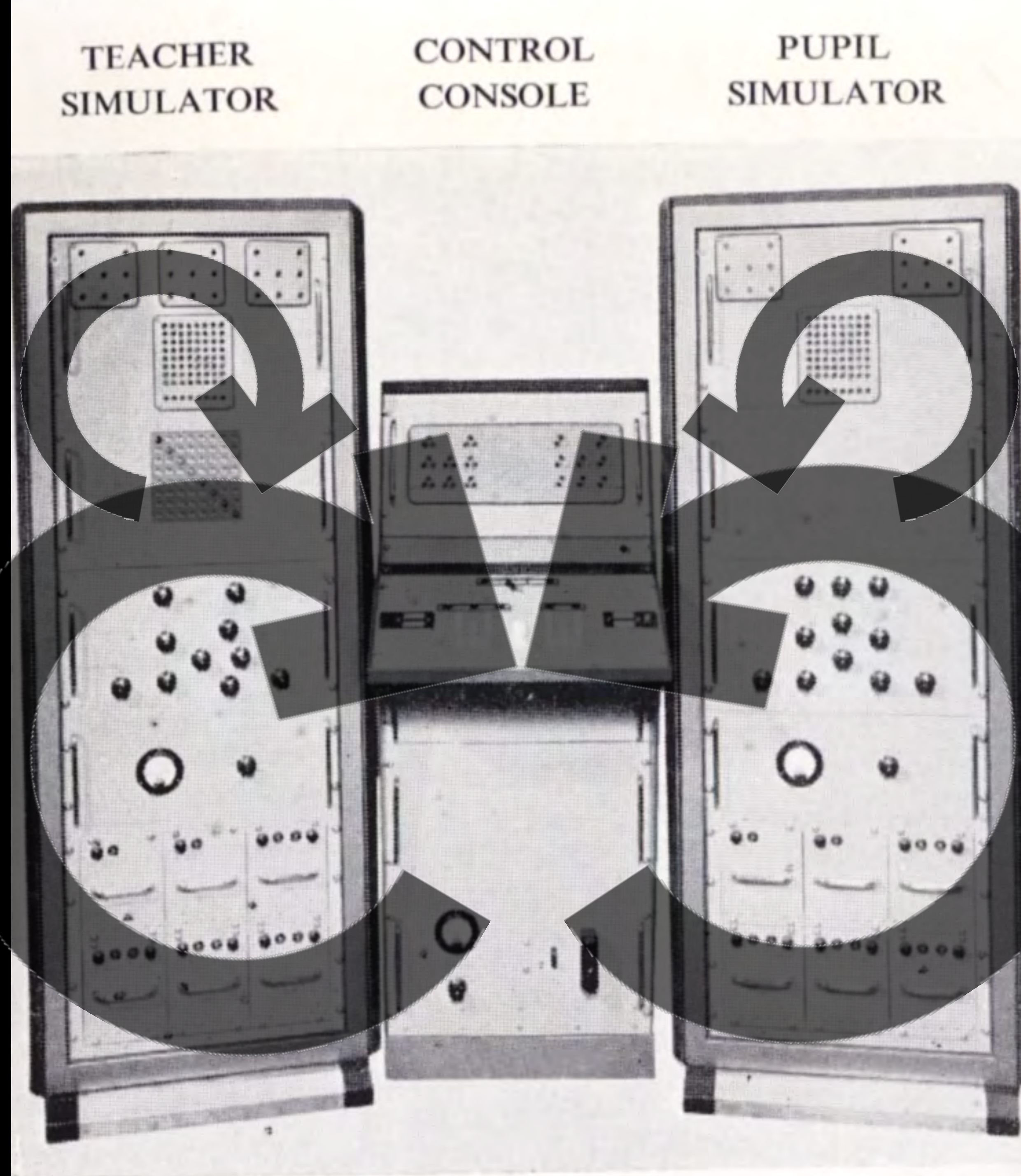
Pask created many  
conversational machines.

Here a teacher-machine  
converses with a pupil-machine.



Gordon Pask's  
Euclates

1958



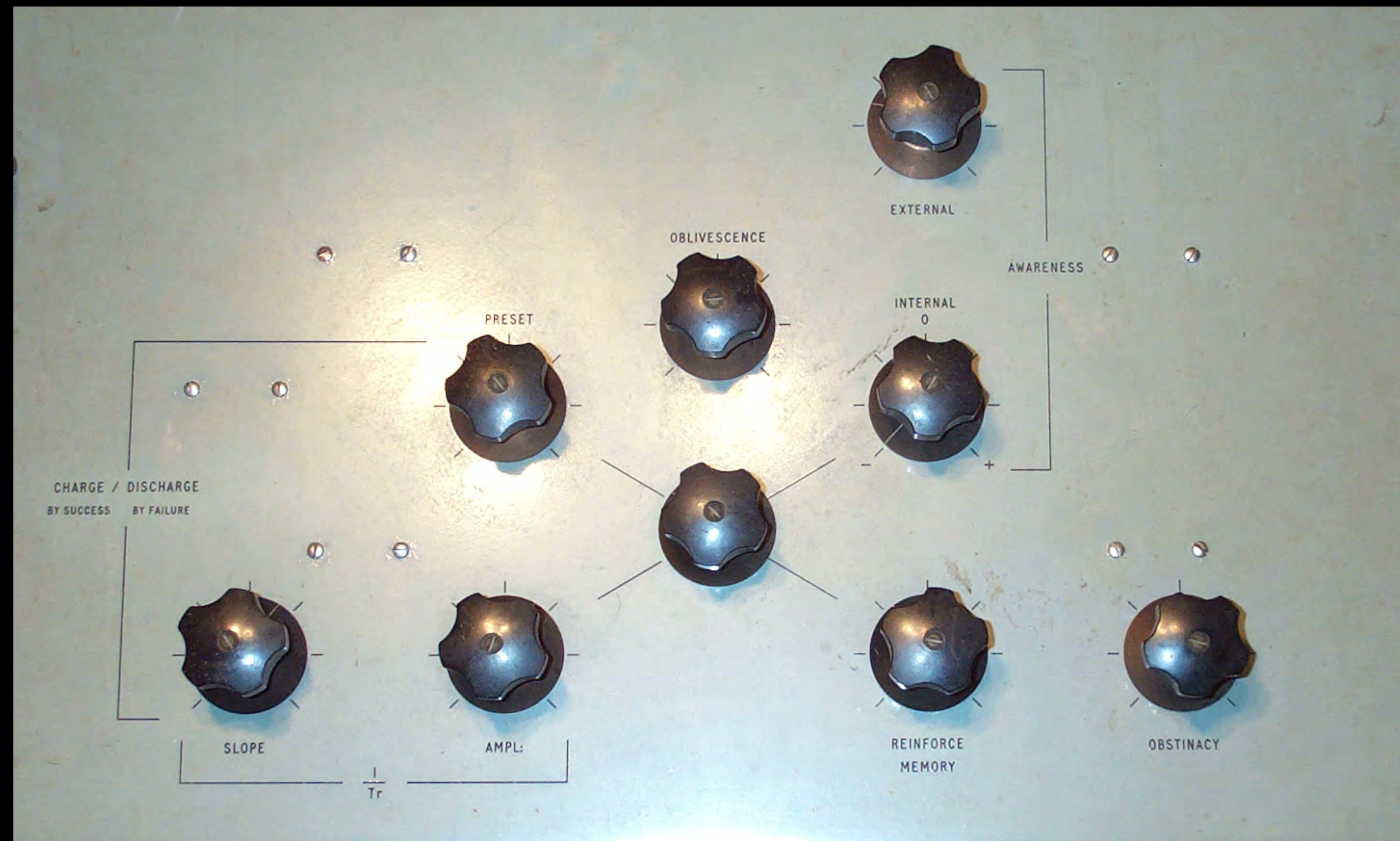
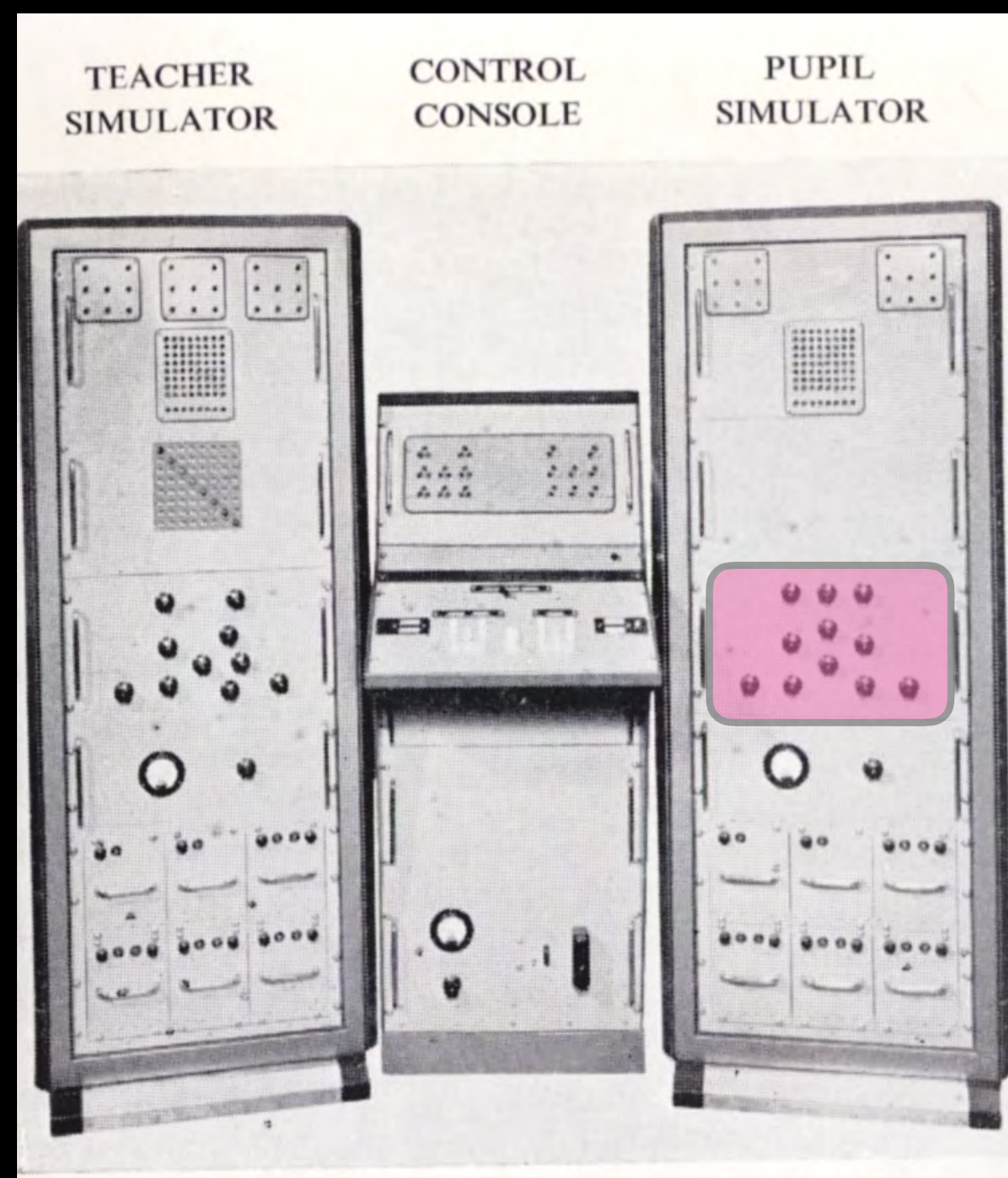
The conversation architecture  
was the same as Musicolour.

One loop applied feedback  
from actions and another  
applied feedback about goals.

Both machines appear to have  
had multiple loops.

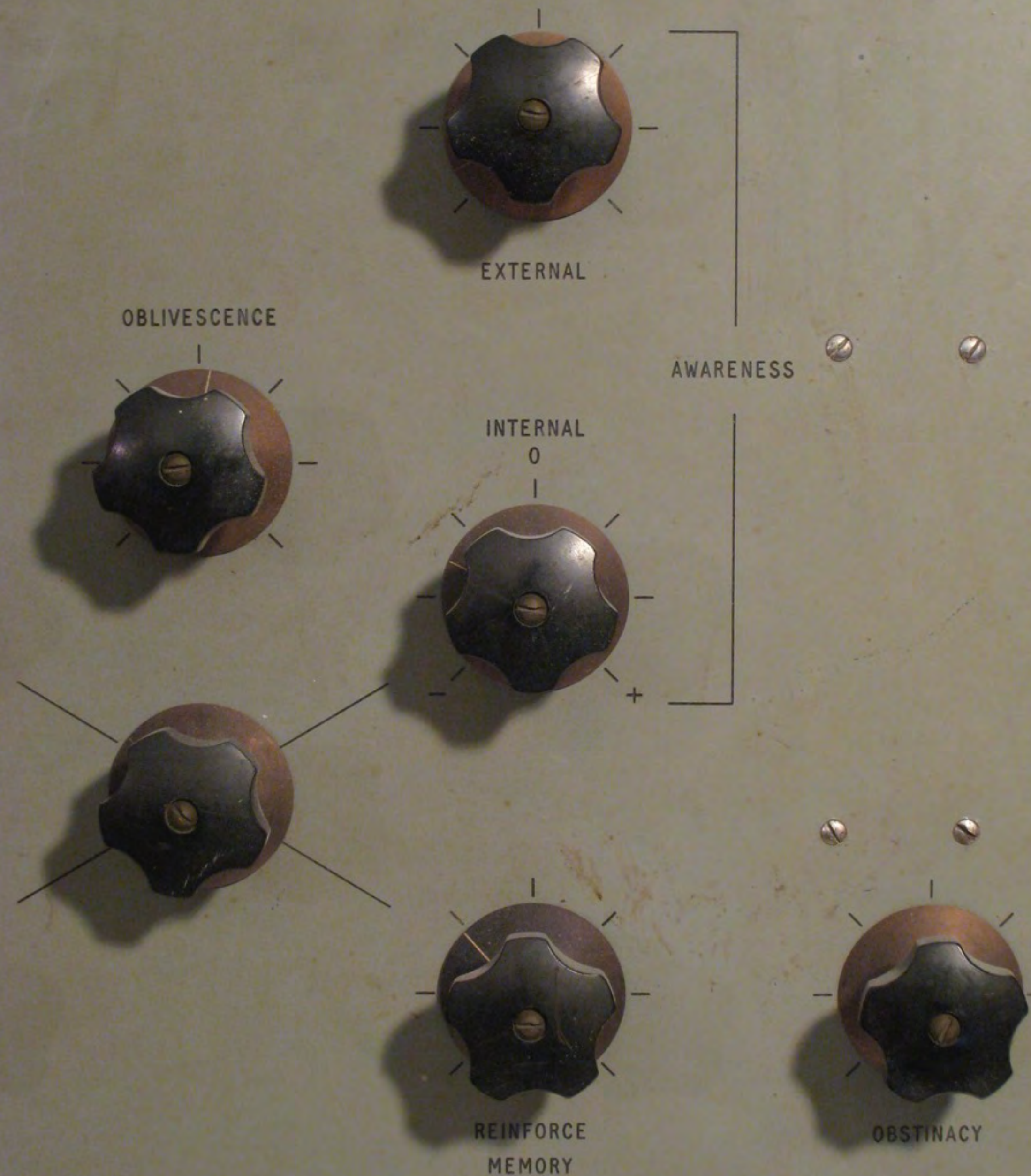
# Gordon Pask's Eucrates

1958



Gordon Pask's  
Eucrates

1958

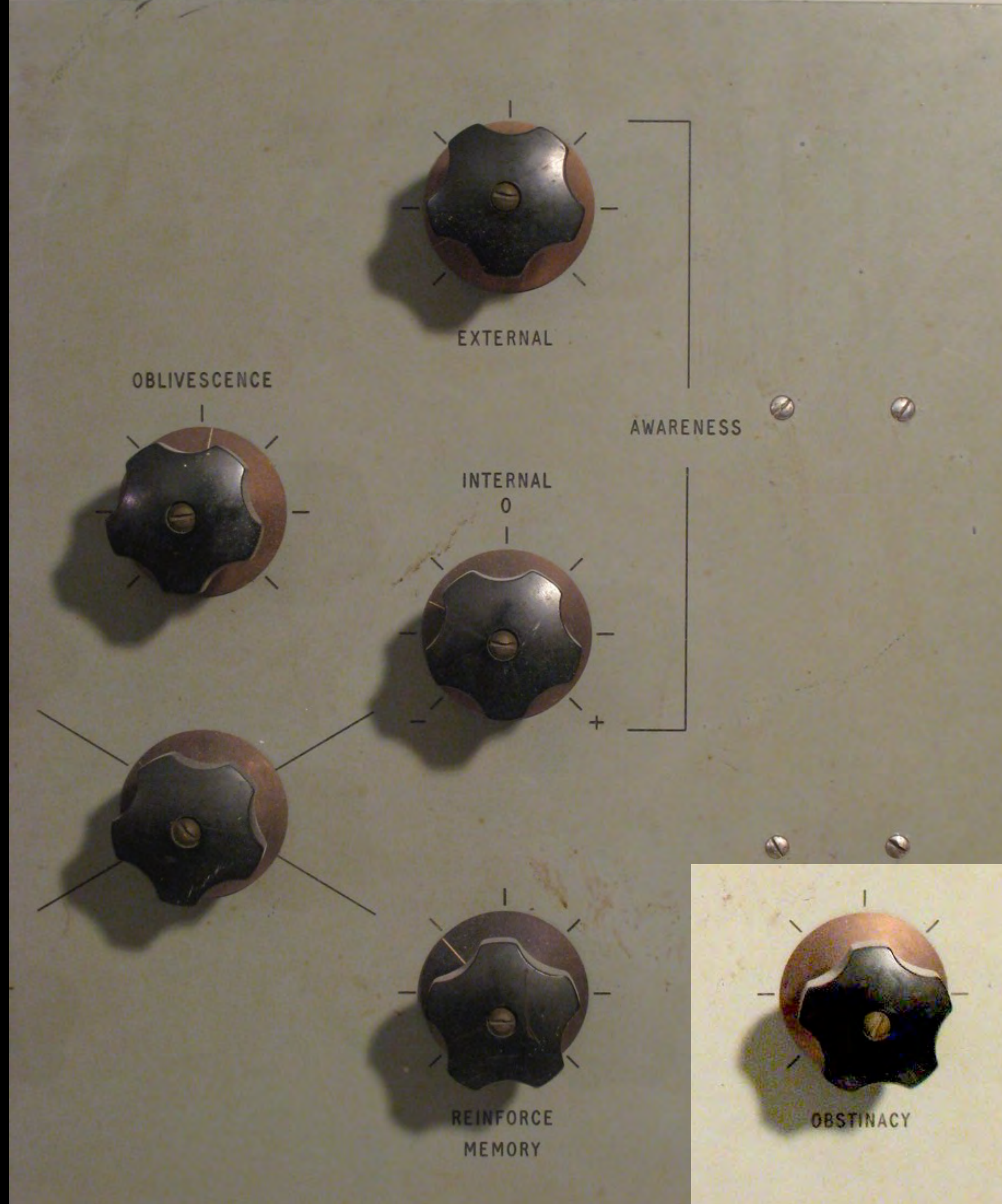


The control panel  
of the pupil-machine  
had a knob to control  
external awareness.

And another knob for  
internal awareness.

Gordon Pask's  
Eucrates

1958



Yet another knob controlled  
the degree of obstinacy.

Gordon Pask's  
Eucrates

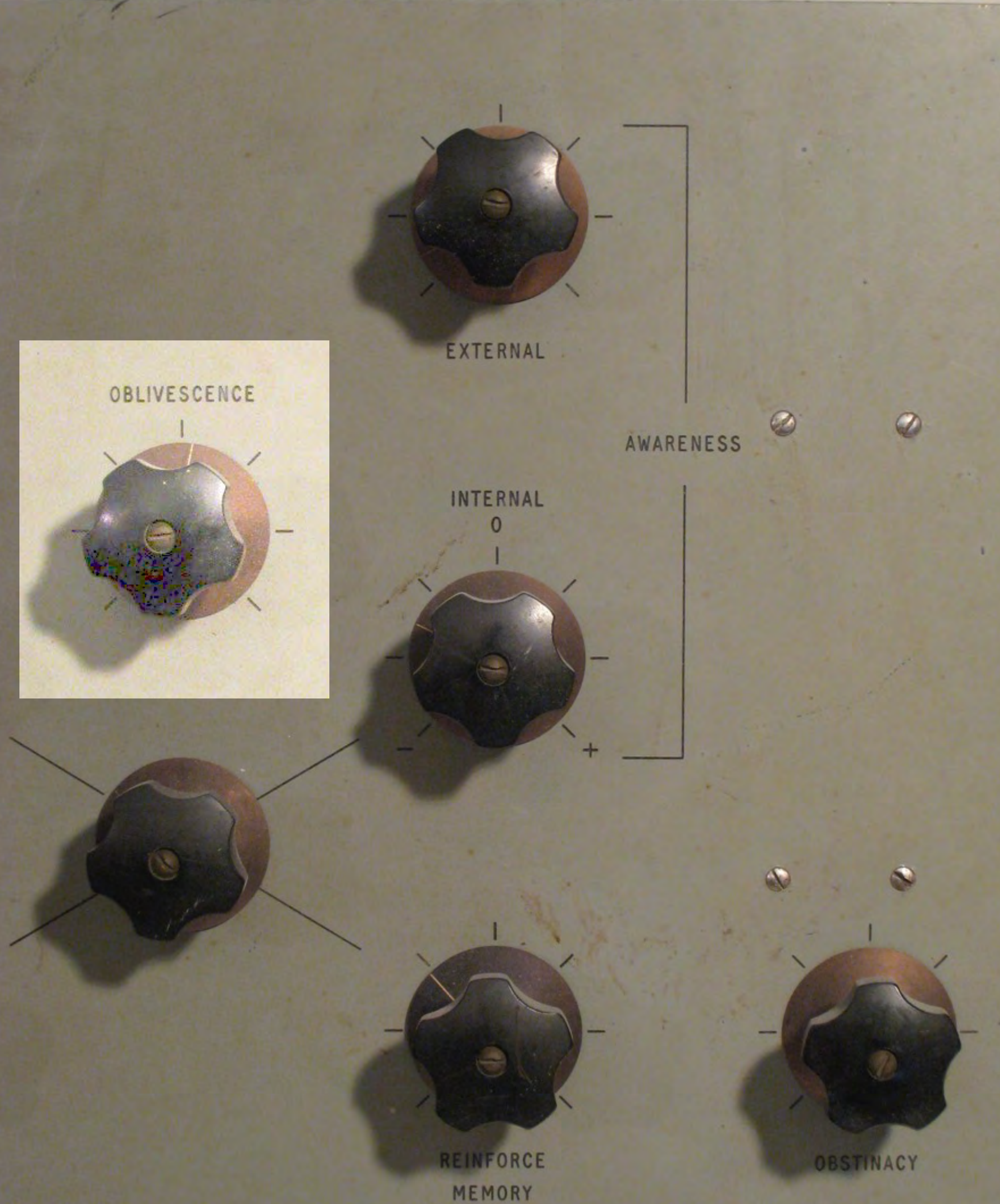
1958



Turning up this knob  
made the pupil-machine  
less willing to learn.

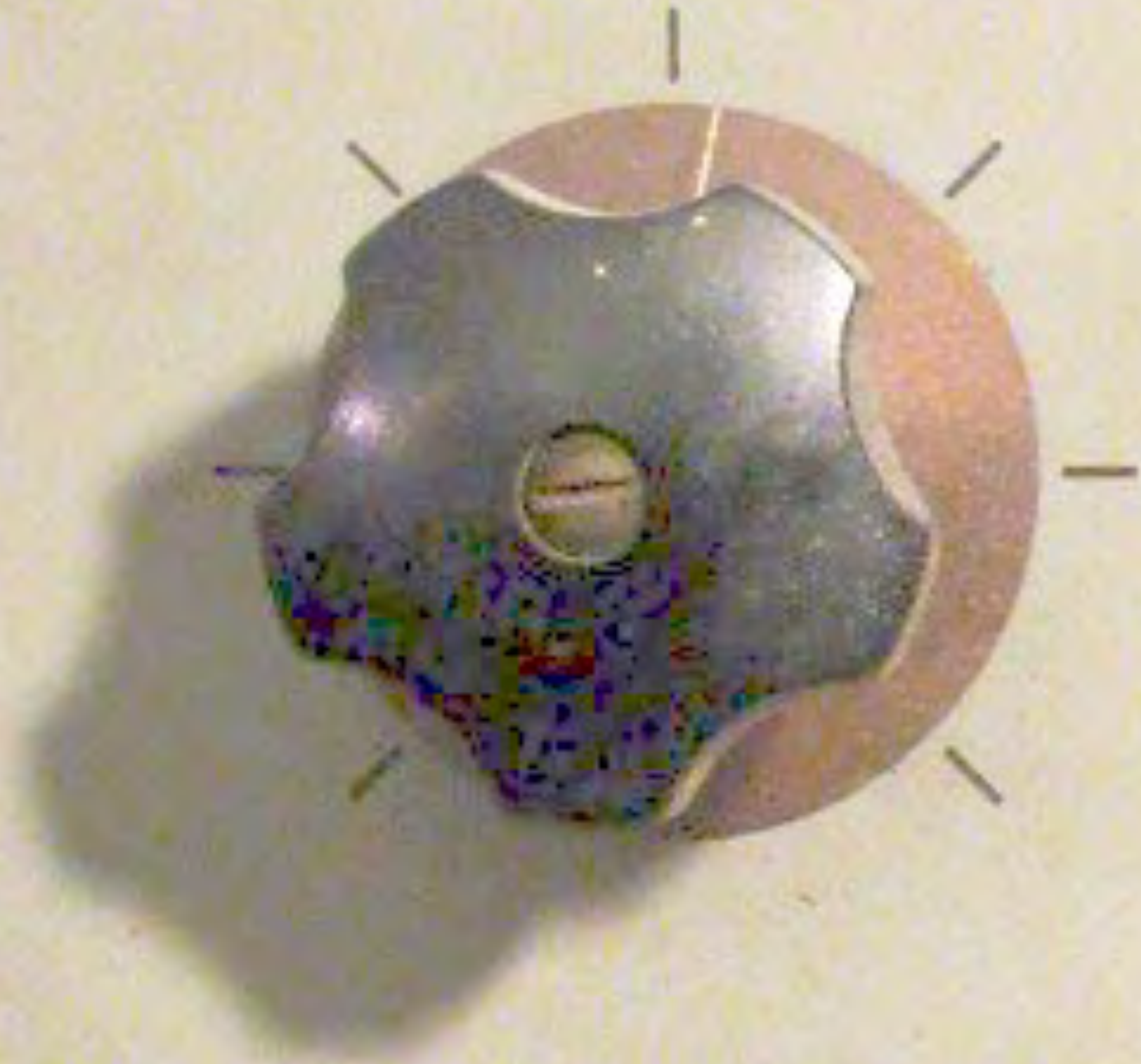
Gordon Pask's  
Eucrates

1958



But there was something  
beyond obstinacy.

# OBLIVESCENCE



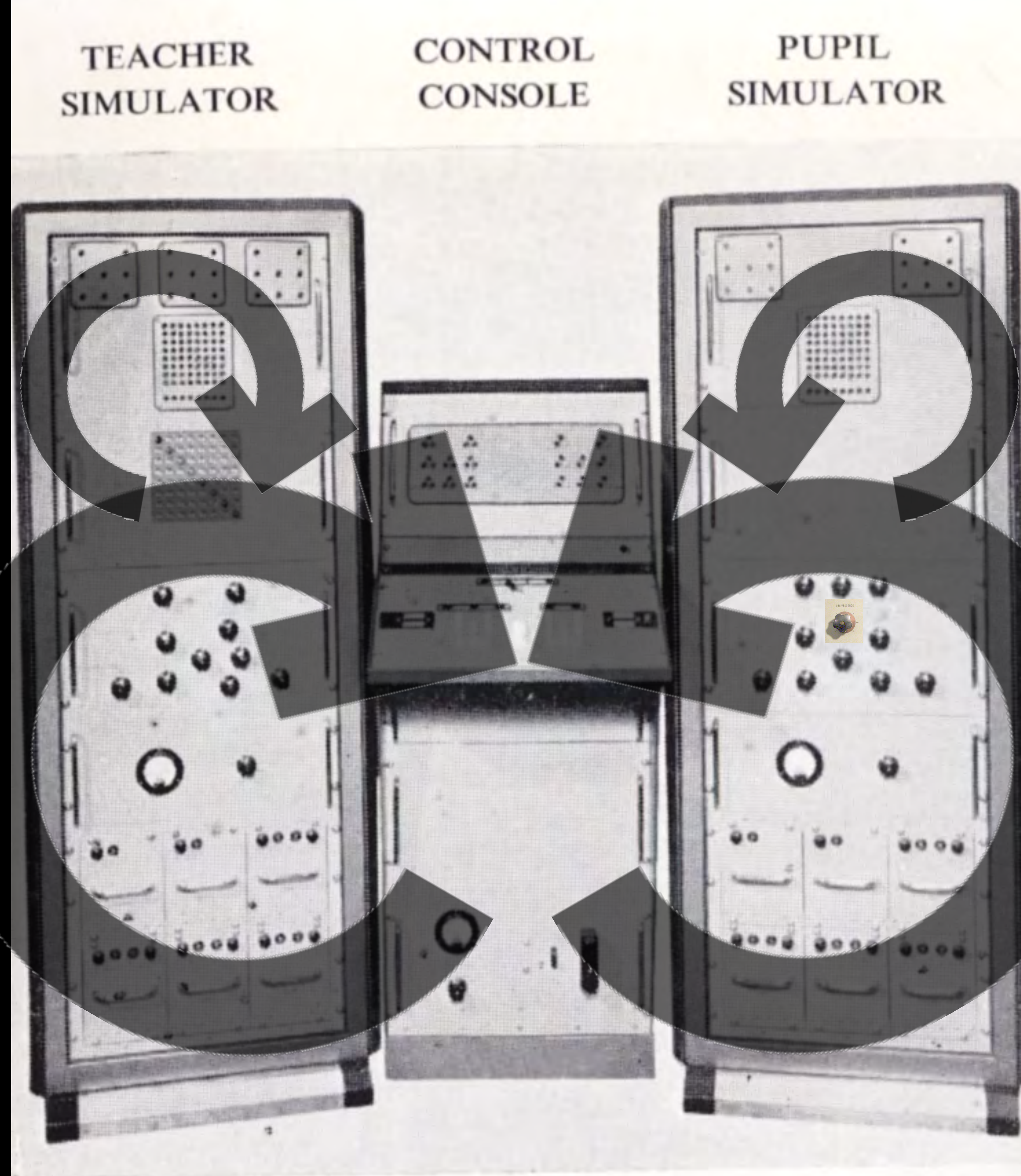
“Oblivescence” means  
“willful forgetfulness.”

Gordon Pask's  
Euclates

1958

Gordon Pask's  
Euclates

1958



A machine conversing  
with a machine

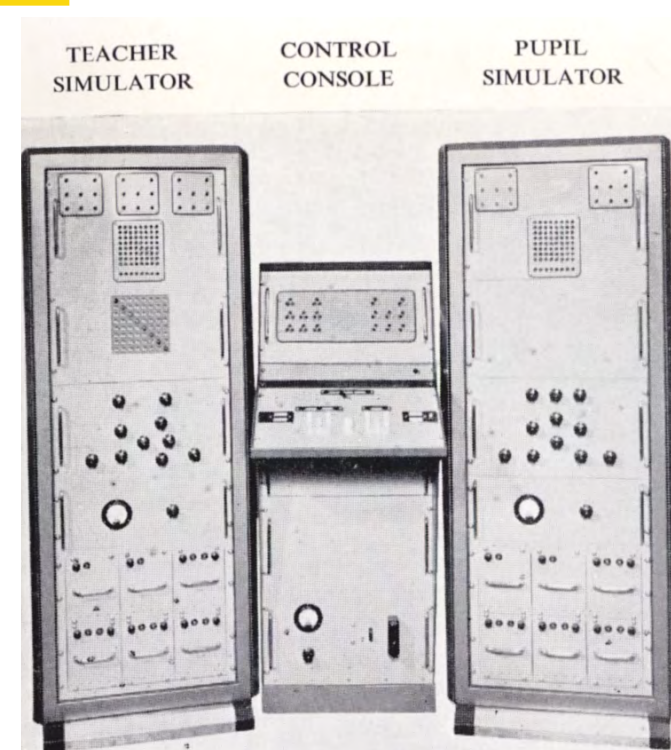


#1 — Novelty Regulation

#2 — Uncertainty Regulation

Paskian Interaction Principle #3 — Autonomy

***Euclates demonstrates machine autonomy as participants process multiple levels of feedback, engage in conversation, and maintain individualized goals (here, of teaching and learning).***



# Gordon Pask

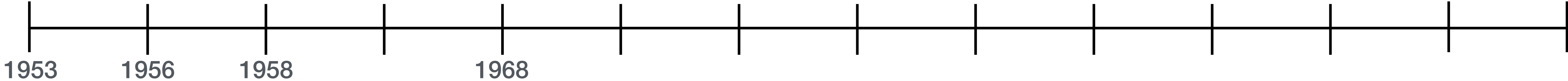
*Musicolour*

*S.A.K.I.*

*Eucrates*



*Colloquy of Mobiles*



# Gordon Pask

*Musicolour*

*S.A.K.I.*

*Euclates*

**Cybernetic Theatre**

*Colloquy of Mobiles*



57

THEATRE WORKSHOP  
&  
SYSTEM RESEARCH

Proposals for a Cybernetic Theatre

Gordon Pask

Proposals for a Cybernetic Theatre  
Gordon Pask  
System Research Ltd.  
Private Monograph, 1964

THEATRE WORKSHOP

&

SYSTEM RESEARCH

---

Proposals for a Cybernetic Theatre

Gordon Pask

## 1. 1. BACKGROUND DATA

The crux of a Cybernetic Theatre is that its audience should genuinely participate in a play. This possibility of participation is a prerogative of the theatre since any realistic feedback from an audience is prohibited by inherent restrictions in the comparable entertainment media of the Cinema and of Dramatic Television.

Surprisingly enough, little advantage has been taken of this one aspect of the theatre in which the medium stands alone, though it is true enough that a great deal of lip service has been paid to the ideal of a participant audience.

My own thoughts in this matter stem from communication models and chiefly concern methods by which the participation of an audience and the control it exerts upon a performance could be substantially increased. I am fascinated by the consequences of a participant system and the wealth of dramatic situations which can be woven in such a fabric, using one or another of the procedures cited in this discussion.

Joan Littlewood has entertained very similar ideas and has instrumented some of them in theatre workshop. But the limitations imposed by present-day theatrical techniques are severe and consequently

Diagram 1: Audience input controls and associated logic

“Proposals for a Cybernetic Theatre”  
Gordon Pask  
System Research Ltd.  
Private Monograph, 1964

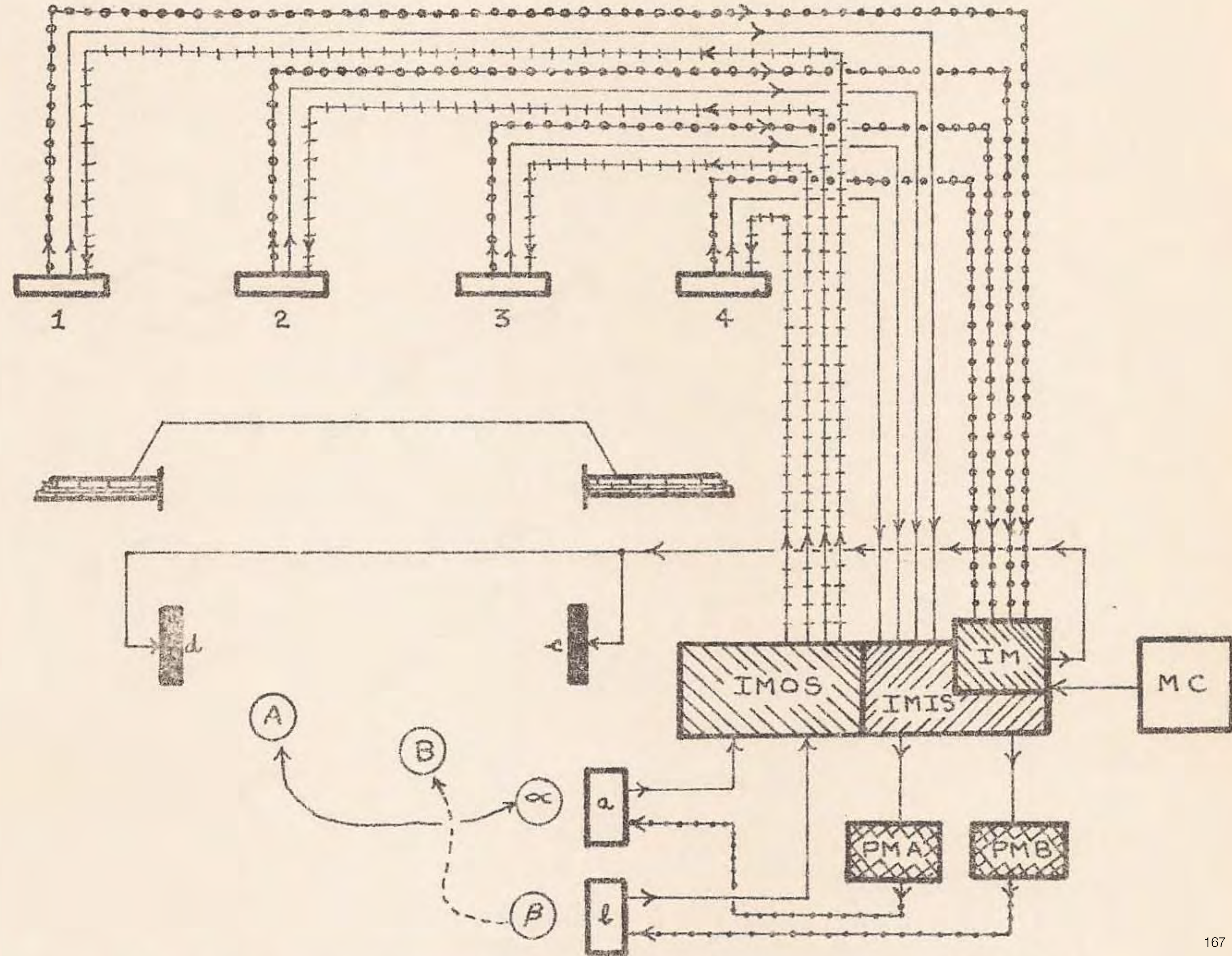
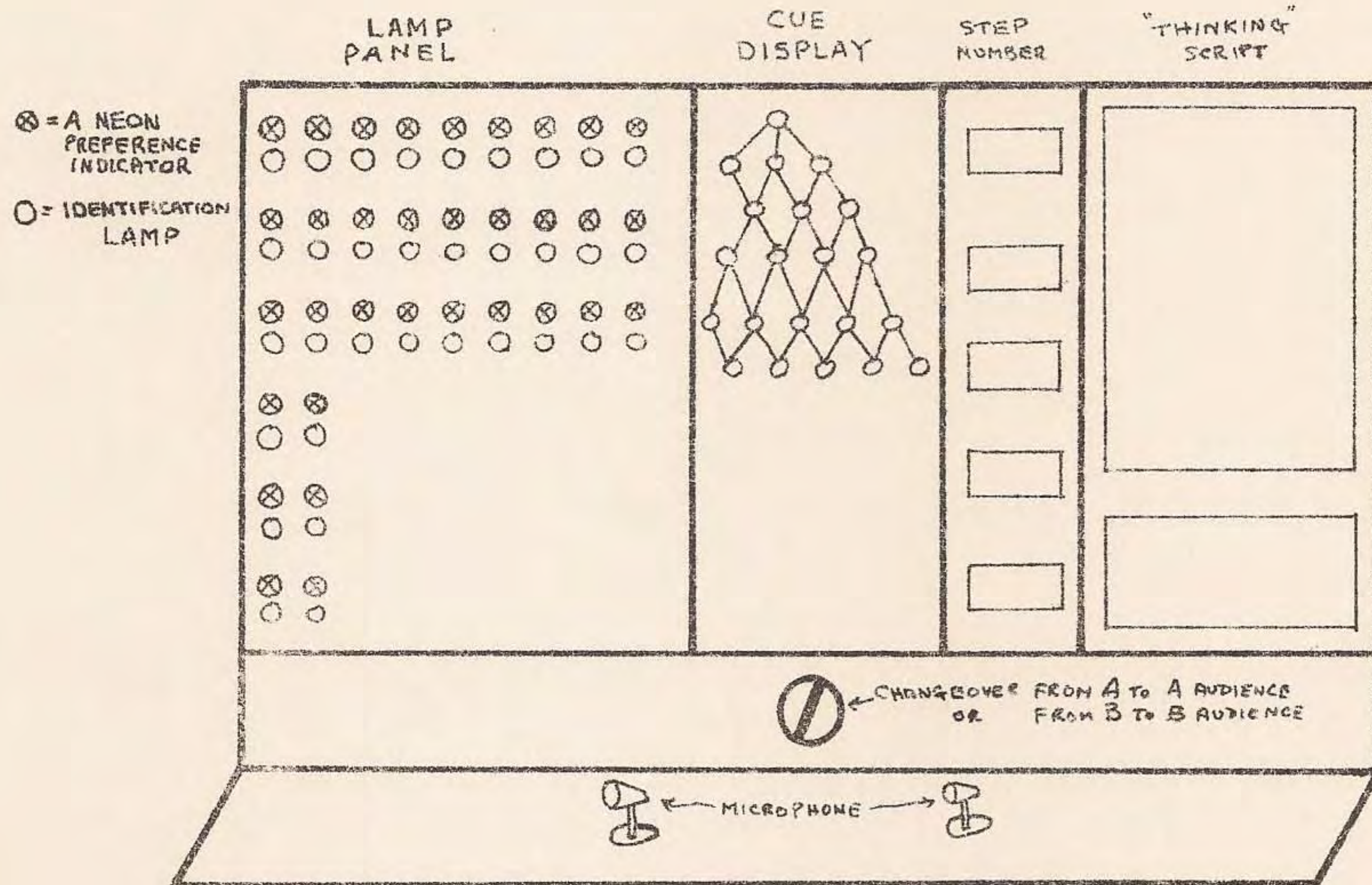


Diagram 2: Back-stage control panel  
 "Proposals for a Cybernetic Theatre"  
 Gordon Pask  
 System Research Ltd.  
 Private Monograph, 1964



a and b display

DIAGRAM 2.



Diagram 3: Back-stage display panel

“Proposals for a Cybernetic Theatre”  
Gordon Pask  
System Research Ltd.  
Private Monograph, 1964

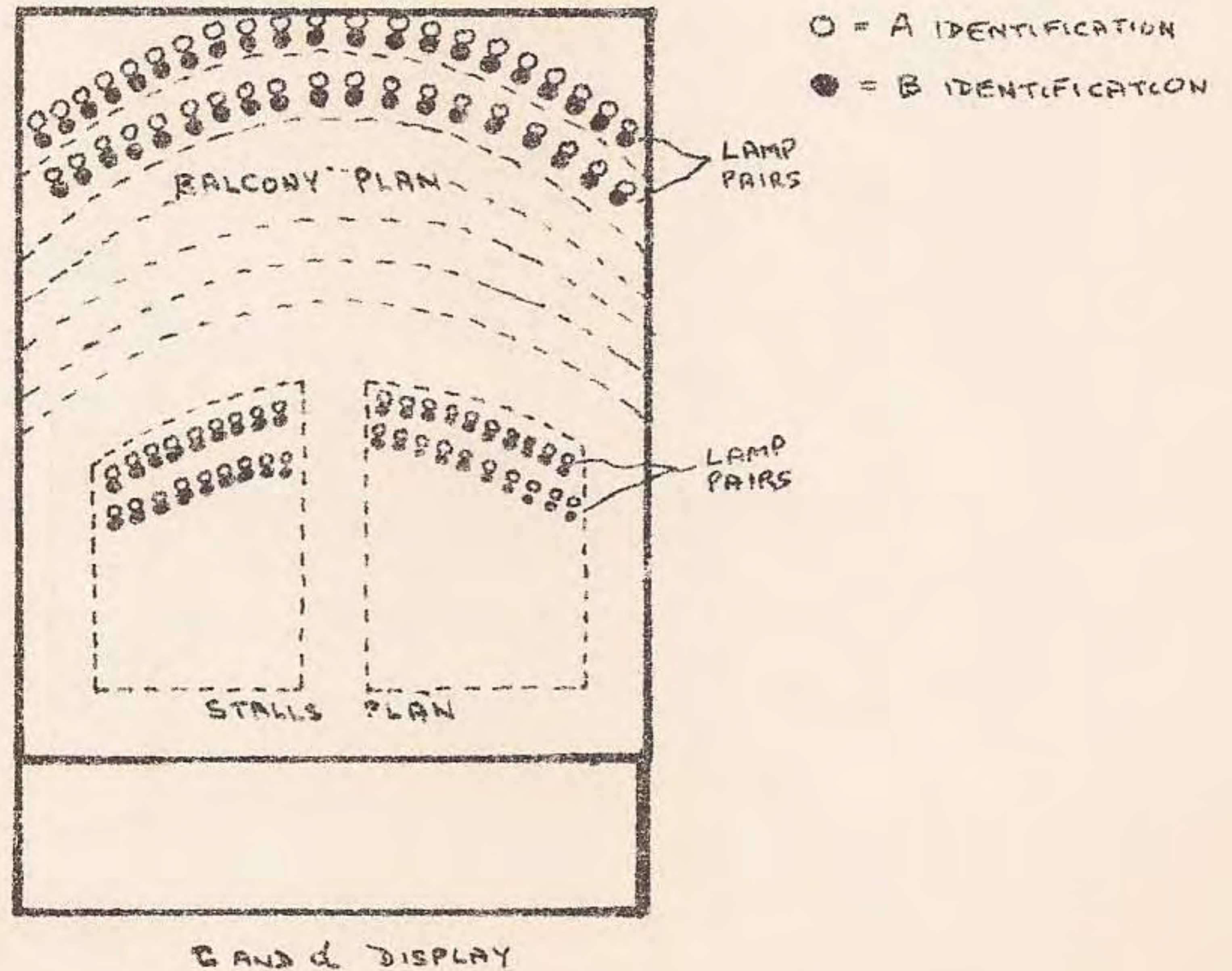


DIAGRAM 3.

Diagram 6: Audience Response Input  
 "Proposals for a Cybernetic Theatre"  
 Gordon Pask  
 System Research Ltd.  
 Private Monograph, 1964

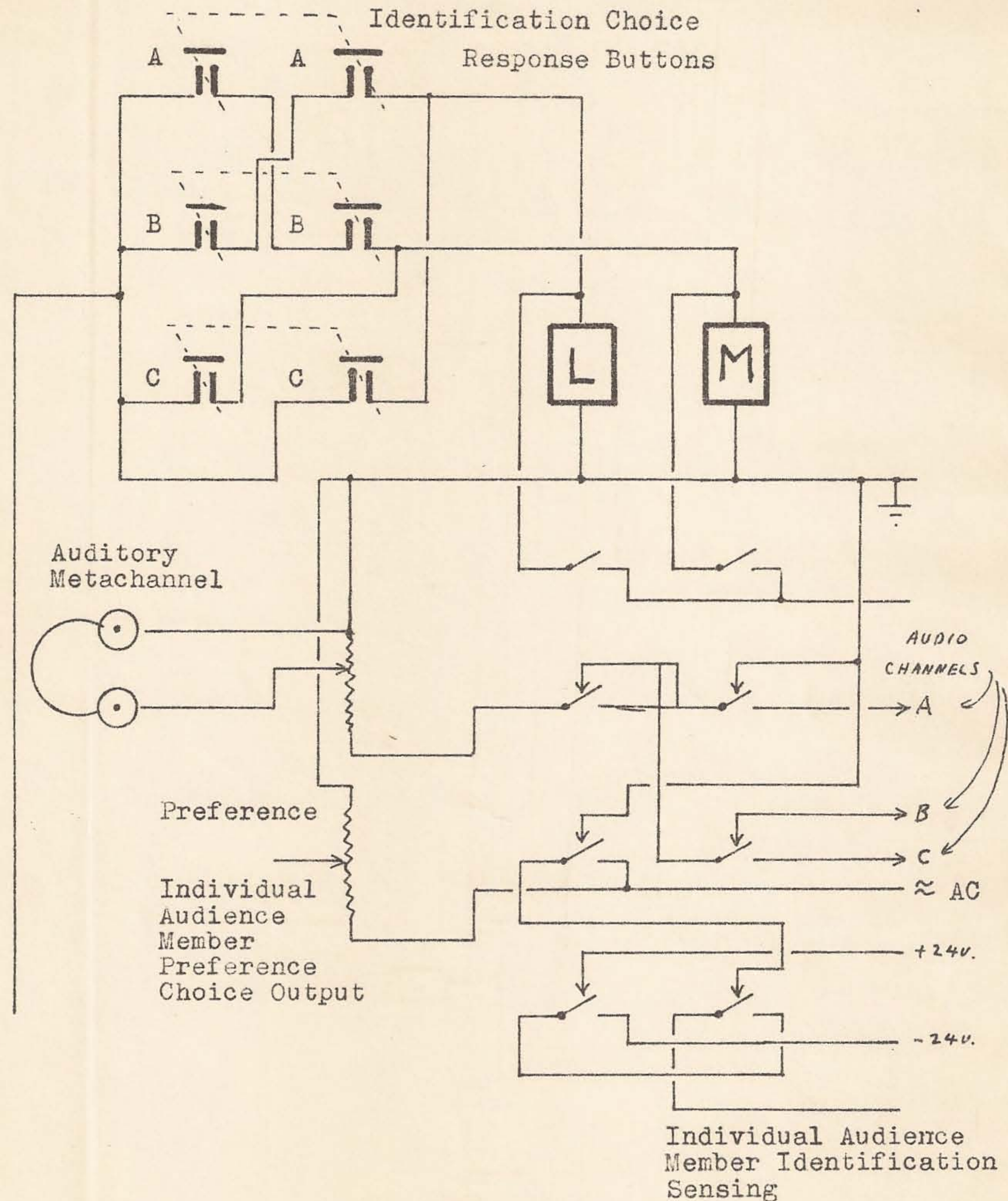


DIAGRAM 6.

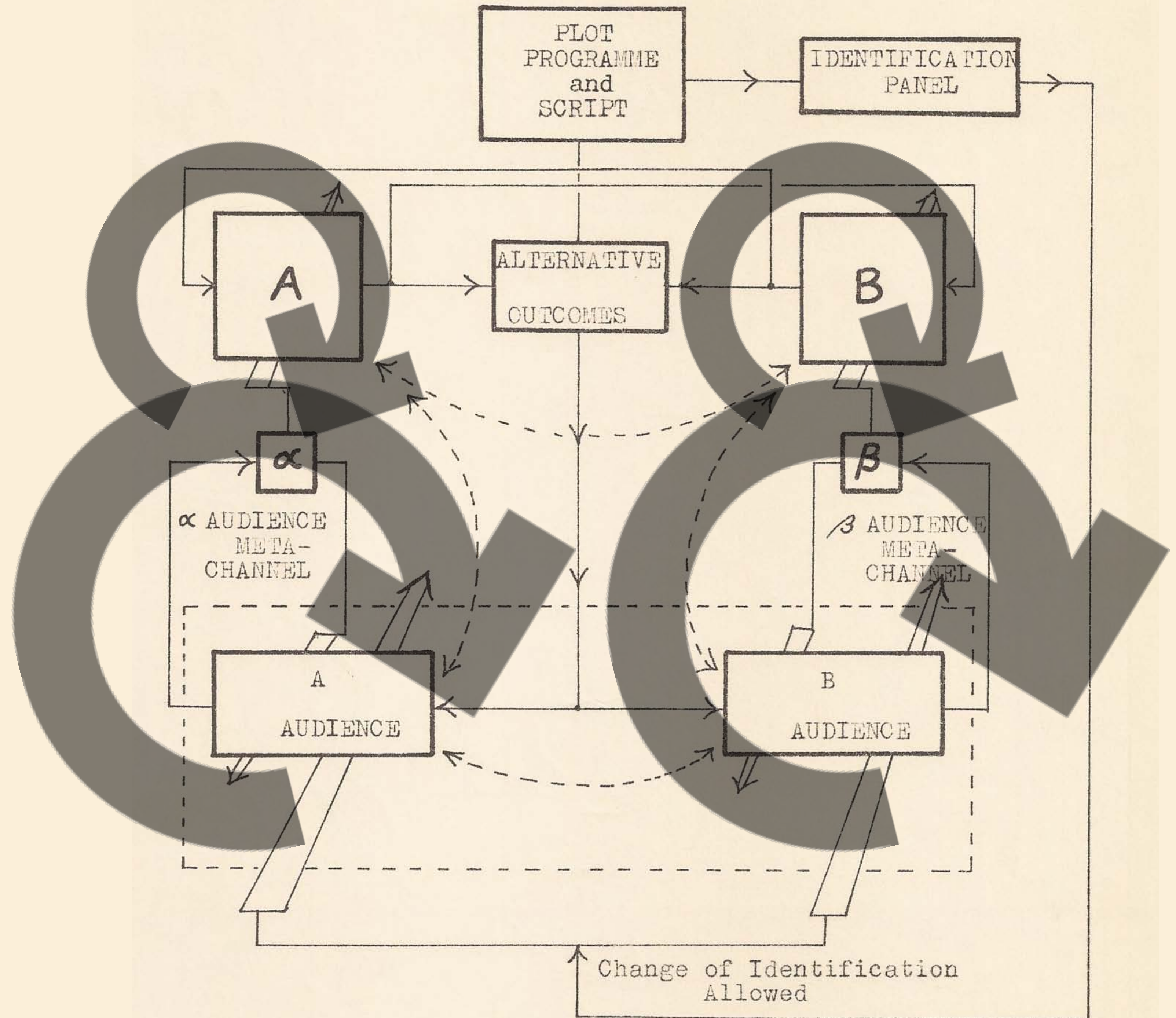


Diagram 10: Interaction architecture

“Proposals for a Cybernetic Theatre”  
 Gordon Pask  
 System Research Ltd.  
 Private Monograph, 1964

# Gordon Pask

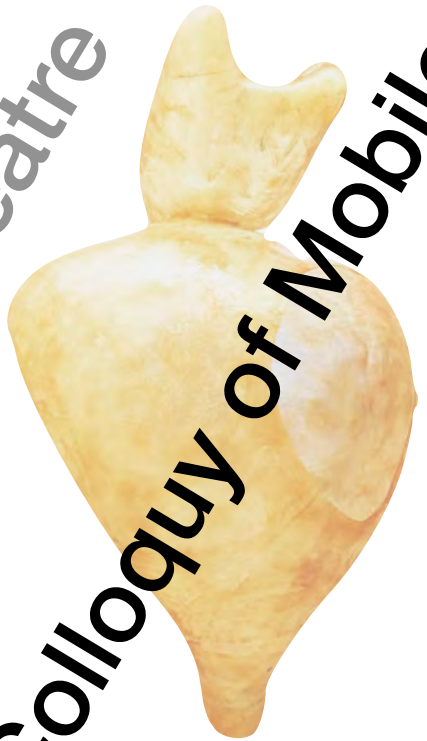
*Musicolour*

*S.A.K.I.*

*Eucrates*

*Cybernetic Theatre*

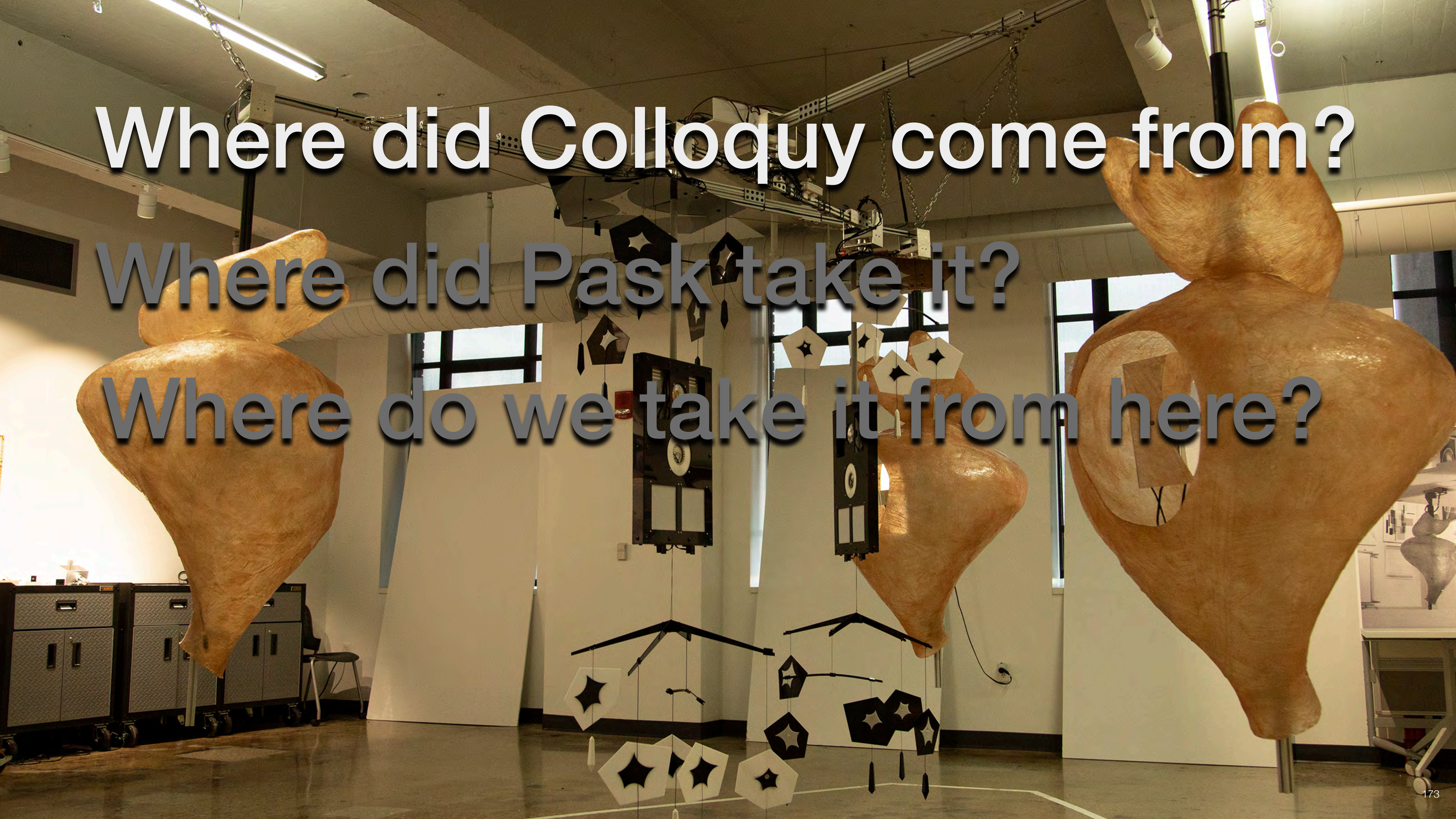
*Colloquy of Mobiles*



Where did Colloquy come from?

Where did Pask take it?

Where do we take it from here?



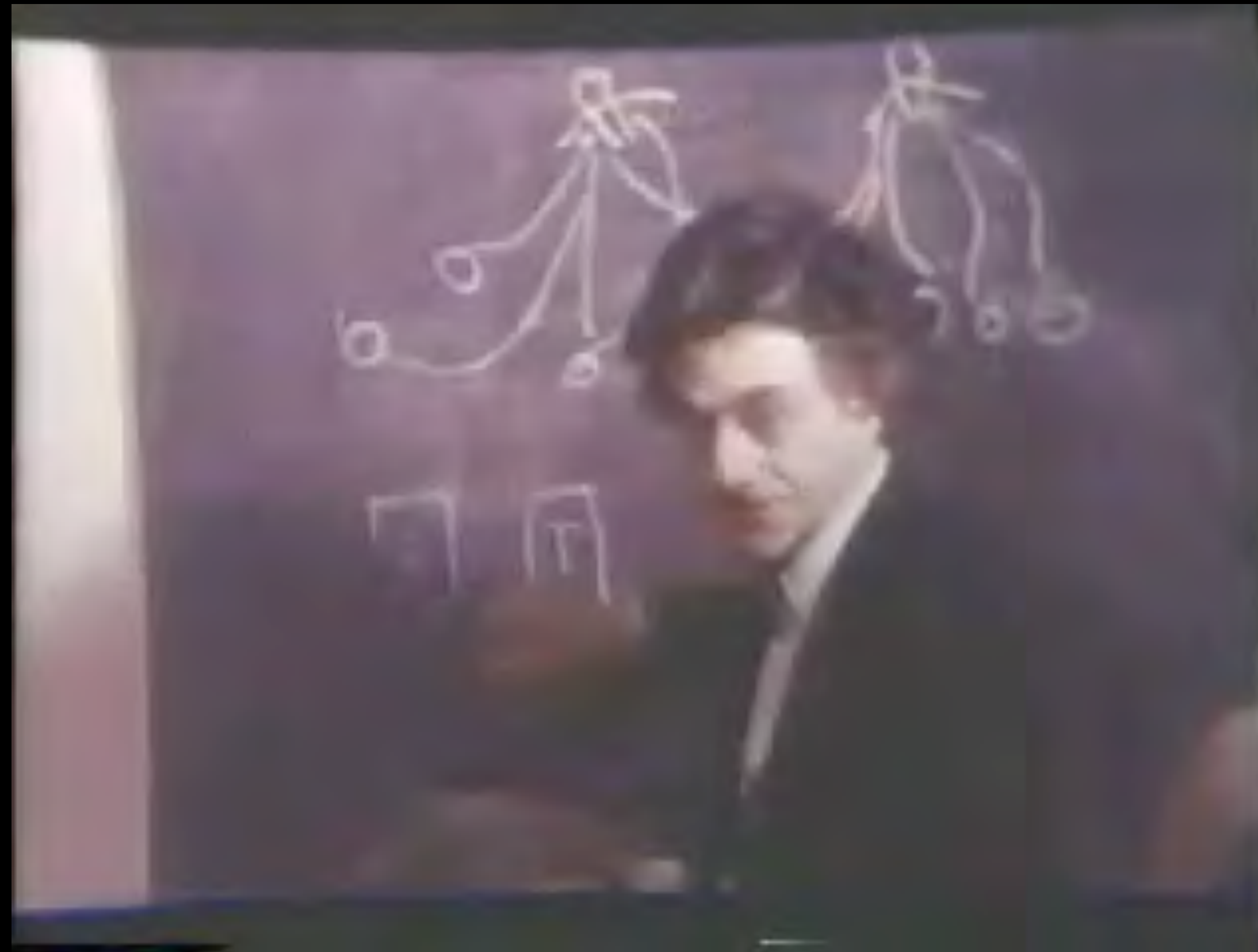


Where did Colloquy come from?

Where did Pask take it?

Where do we take it from here?

In 1975 Pask was the subject of an entire episode of the series **The Experimenters** by the BBC.



[Click for video](#)

GORDON PASK

CONVERSATION,  
COGNITION AND  
LEARNING



A CYBERNETIC THEORY-  
AND METHODOLOGY

ELSEVIER

1975

GORDON PASK

CONVERSATION  
THEORY

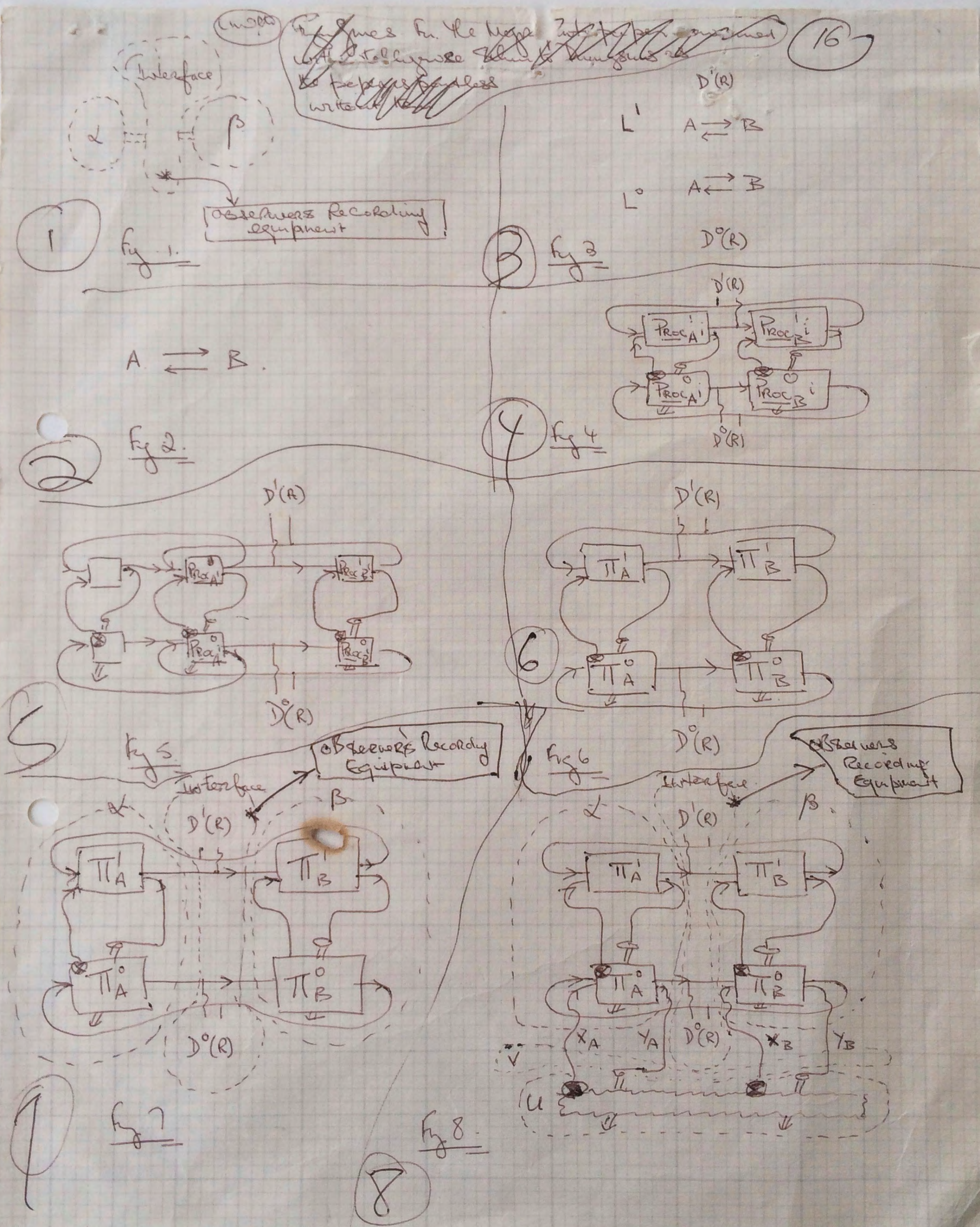


APPLICATIONS IN EDUCATION  
AND EPISTEMOLOGY

ELSEVIER

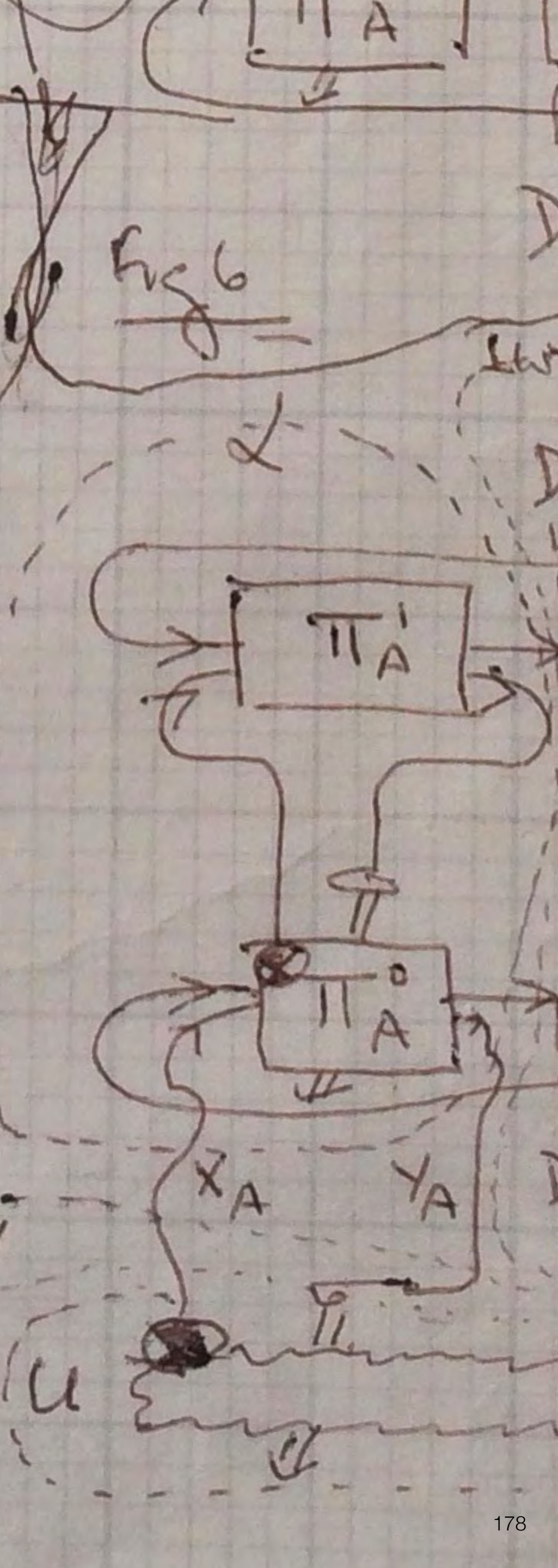
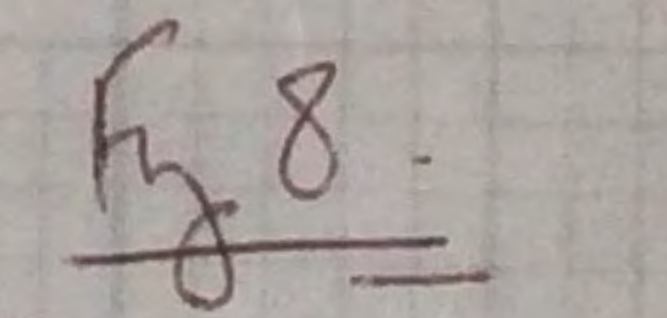
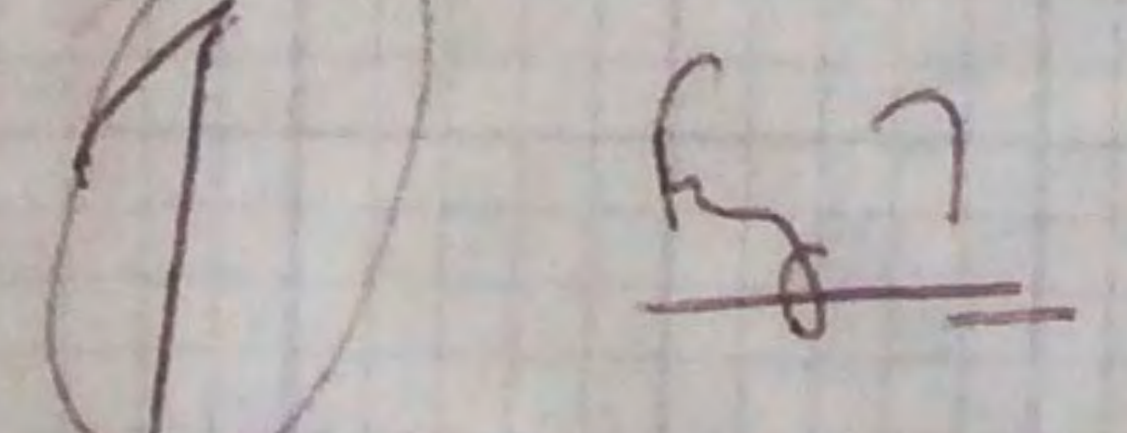
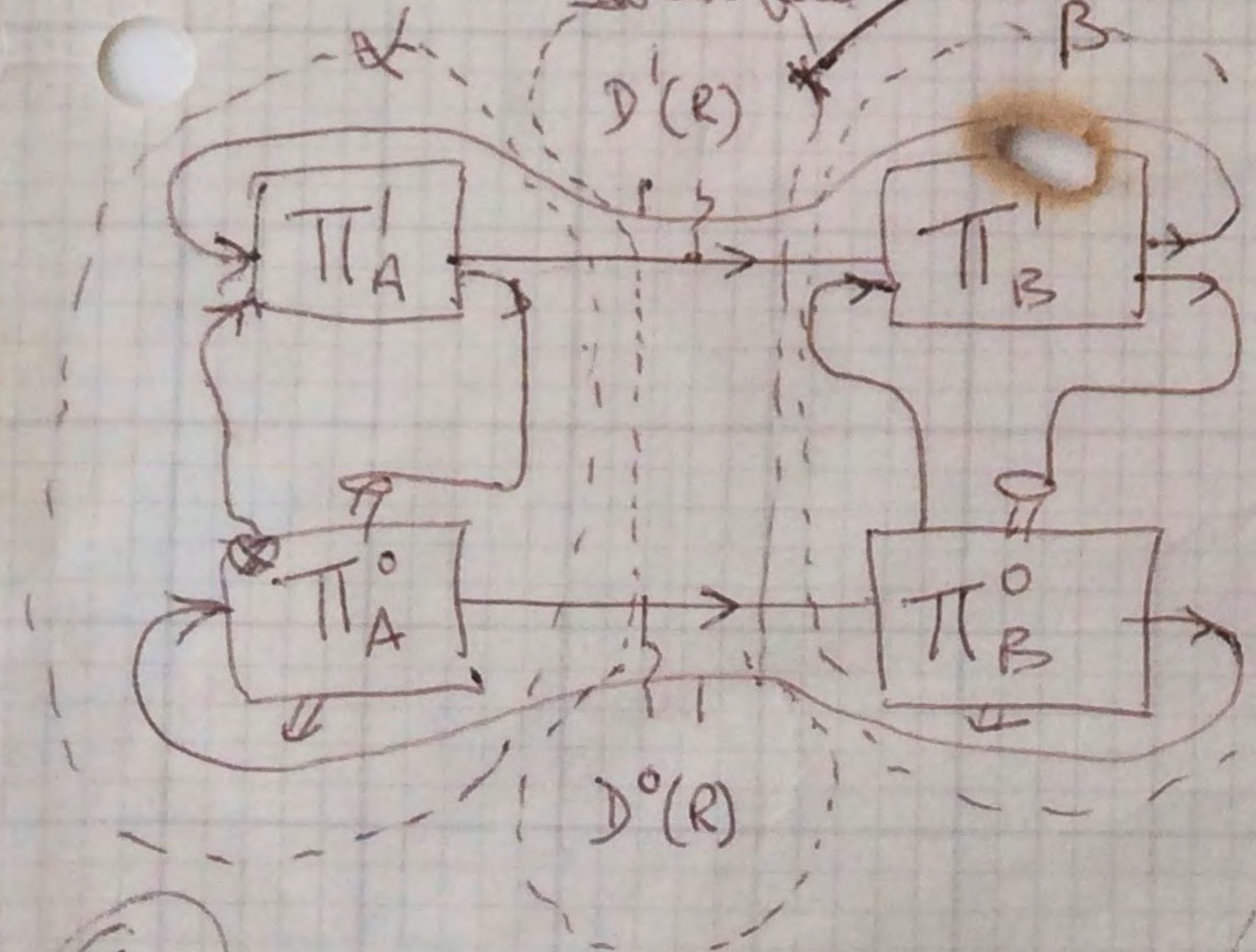
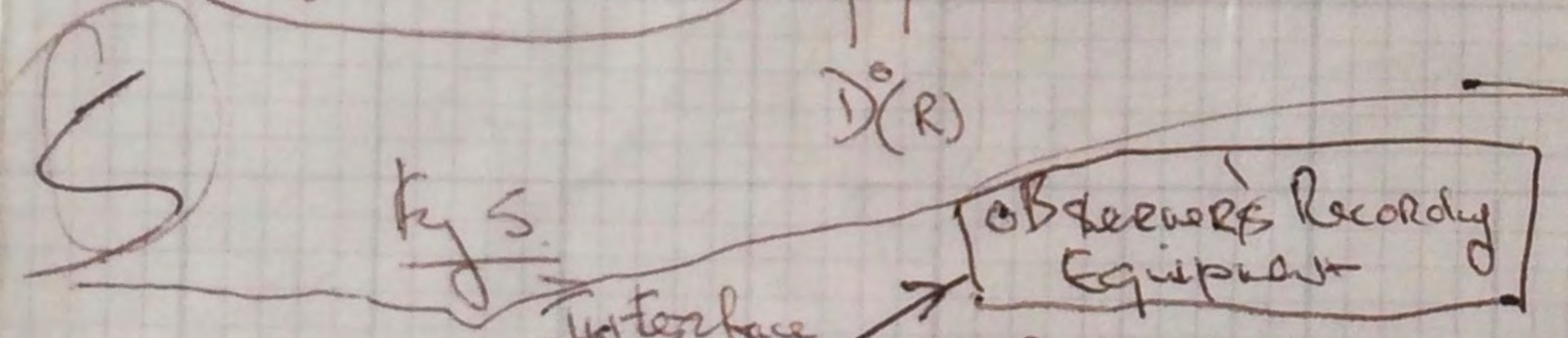
1976





Pask's hand-drawn models of interaction are playful in spirit and rigorously complete.

They capture all types of interactions between participants in a conversation.



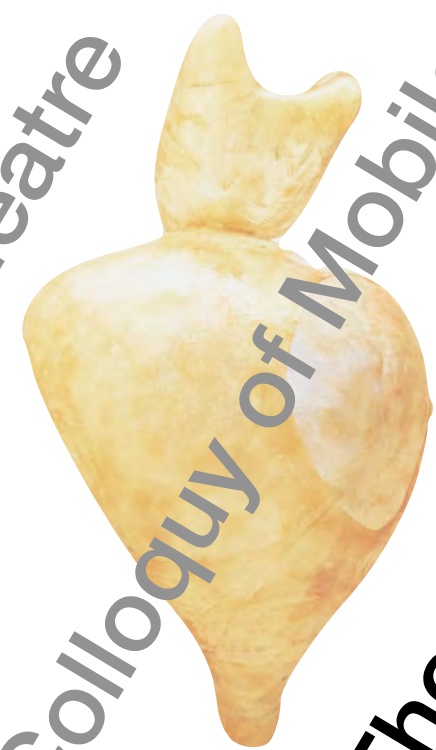
# Gordon Pask

*Musicolour*

*S.A.K.I.*

*Eucrates*

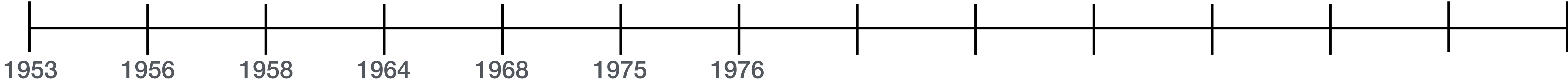
*Cybernetic Theatre*

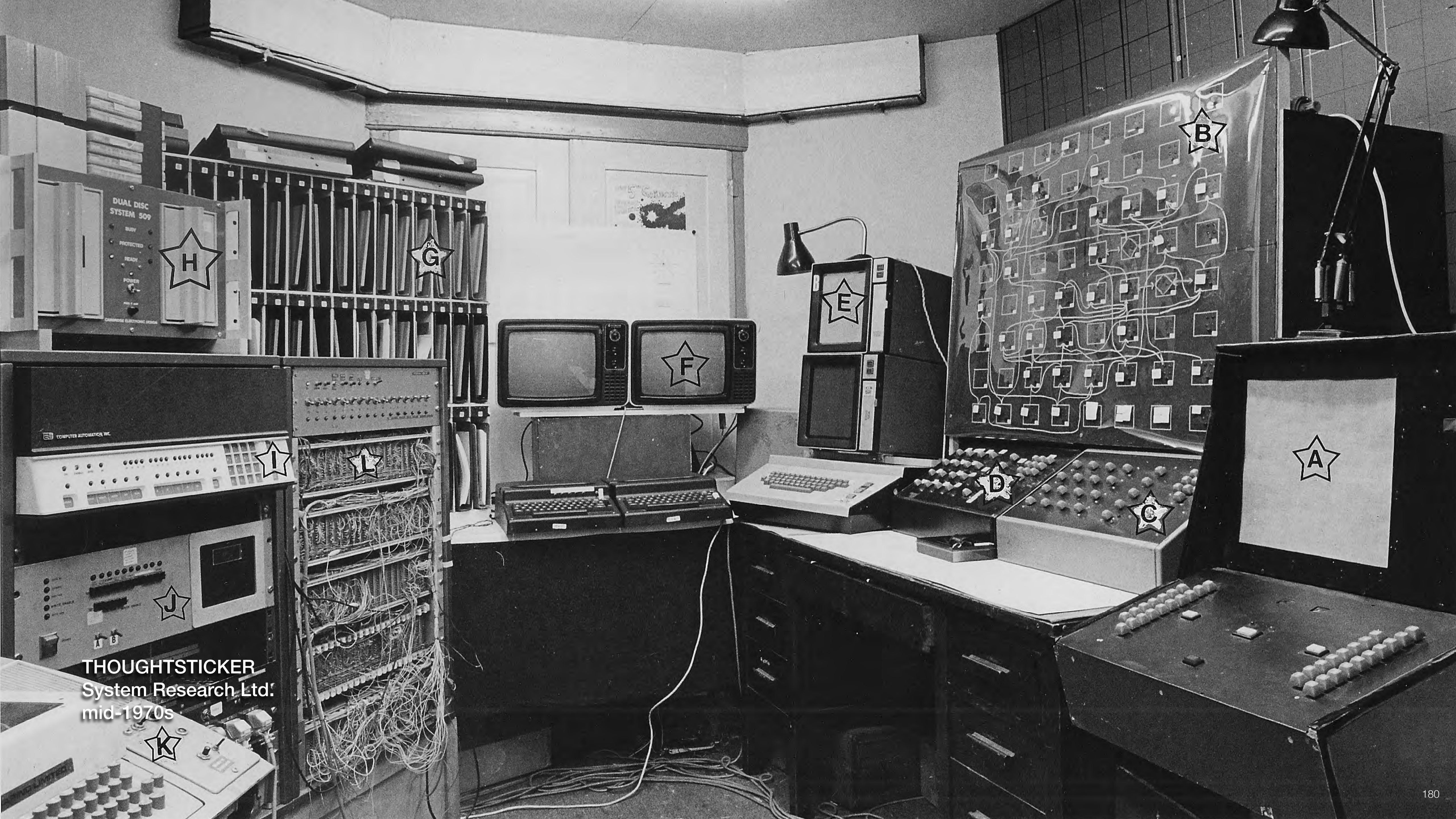


*Colloquy of Mobiles*

*Thoughtsticker*

*Architecture Machine*





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G

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A

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THOUGHTSTICKER  
System Research Ltd.  
mid-1970s

K



Soft

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Nicholas  
Negroponte

Soft Architecture Machines

Negroponte

*Soft Architecture Machines*  
Nicholas Negroponte, ed.,  
MIT Press, 1976

Book Design: Muriel Cooper



# Aspects of Machine Intelligence

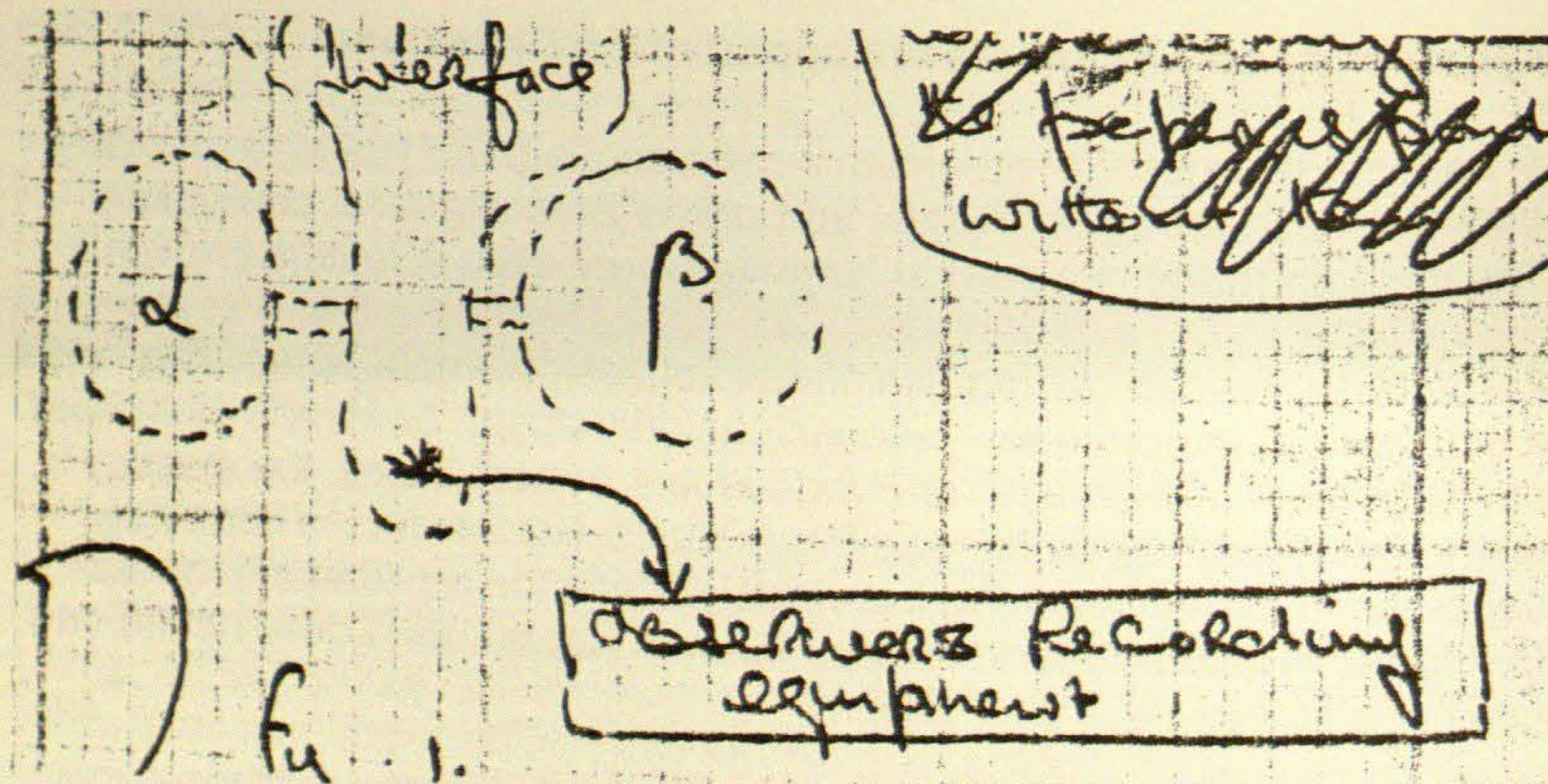
Introduction by Gordon Pask

The current status of mindlike computer programs is summarized, at a philosophical rather than technical level, in the following short but authoritative papers: Minsky (1968), Simon (1966), Turing (1969). Whoever wishes to delve into this subject in greater depth may read the books where these papers are published in their entirety, augmenting them, to obtain comprehensive background, by Ernst and Newell (1969); Ashby (1960); Cohen (1966); Fogel, Owens, and Walsh (1966); Von Foerster and Zopf (1962); Uttley (1959); Von Foerster et al. (1968); McCulloch (1965); Oestreicher and Moore (1968); Amarel (1969); Rose (1970); Minsky and Papert (1969); Feigenbaum and Feldman (1963); Banerji (1969); and Garvin (1970). It is also worth perusing all volumes of the journal *Artificial Intelligence*.

Henceforward, it is assumed either that the reader knows the *kind* of symbolic operations performed by computer programs and other artifacts, that he will study the matter at leisure, or that he will take these operations for granted. With this supposition in mind I shall give a personal and possibly idiosyncratic view of the conditions under which *artificially intelligent* is a properly used term and offer an interpretation of these conditions with respect to *use* of the *architecture machine*. Apart from the pictograms or ikons developed in the text, the only special symbols used are the special brackets  $\langle$  and  $\rangle$  which enclose *ordered* collections of objects; the equality sign  $=$ ; and  $\triangleq$ , which is read as "*defined as equal to*."

## Overview

The contention is as follows: Intelligence is a property that is ascribed by an *external observer* to a *conversation* between *participants* if, and



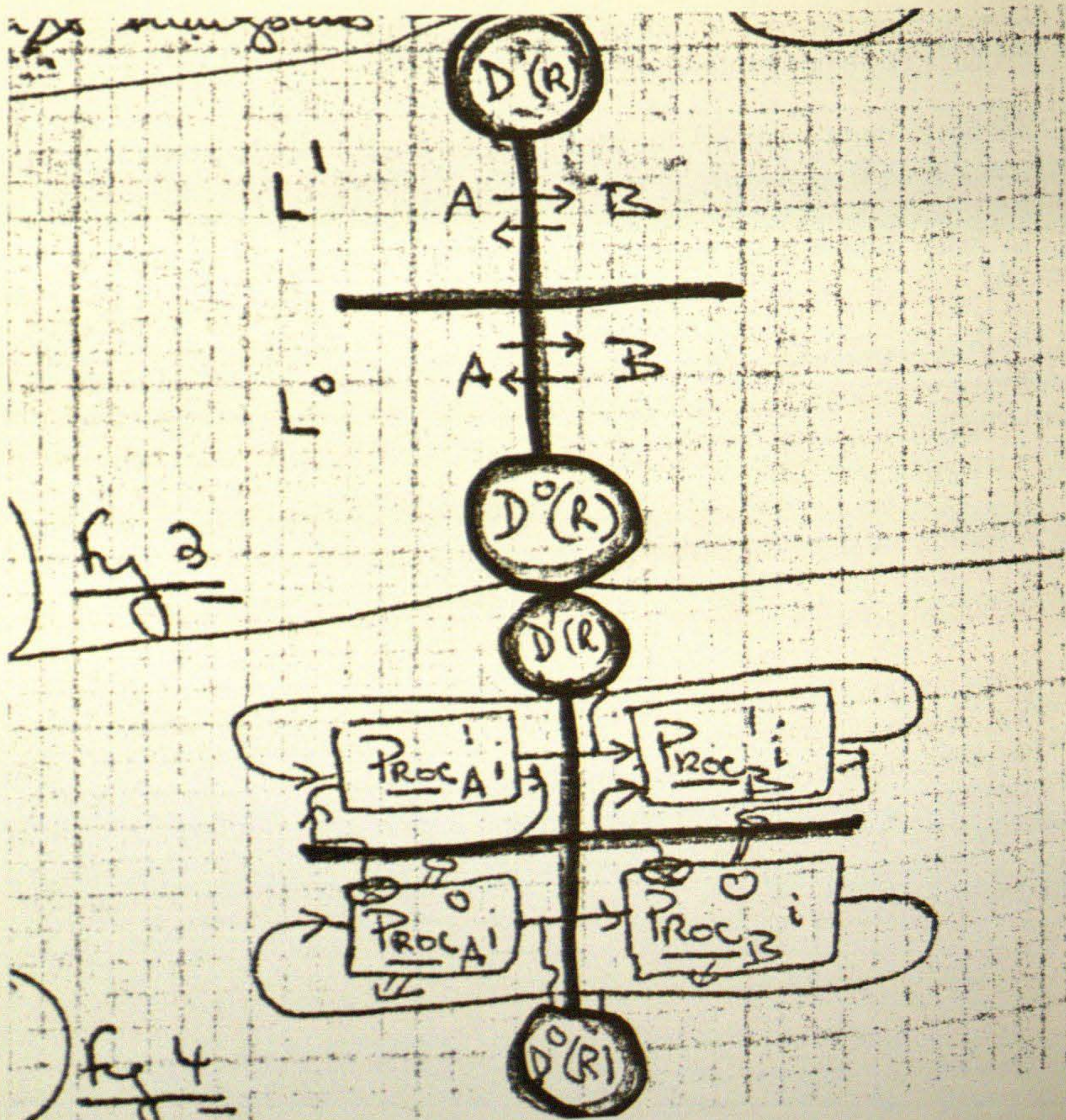
2.1.3. It is crucial to the argument that *all* observations occur at such a spatio-temporally localized interface; the observer's measuring and recording equipment is, in the last resort, bound to it. But the interface is neutral regarding the type of interaction, if any, that takes place across it.

In Figure 1, which introduces the notation for distinguishing *M Individuals*,  $\alpha$  may be a user of the architecture machine regarded as a biological unit and  $\beta$  the architecture machine regarded as a chunk of metal and semiconductor material. But  $\alpha$  may also be a rat and  $\beta$  its experimental environment.

2.2. A *P Individual* is distinguished as a self-replicating and (usually) evolving *organization*. It is respectably and precisely defined in terms of an object language *L* and a relational domain *R* described in *L* by a description *D(R)* with respect to which it *is* self-replicating. Here, self-replication is intended in the abstract sense of the theory of reproductive automata, as originally conceived by von Neumann (1968) and as recently developed by Loefgren (1972).

2.2.1. Though, in general, the domain may be allowed to grow systematically under the control of the given *P Individual*, we confine our attention to cases in which *R* is fixed. Under these circumstances, it is possible to specify domains with the property that if a given *P Individual* is viable (that is, is able to reproduce) on occasion *n*, then it is also viable at any later occasion  $n + r$  (*r* finite) for *R*, in *R*.<sup>2</sup>

2.2.2. It is assumed that a *P Individual* is active or that any conversation in which it is a participant does in fact proceed, that is, for each occasion, some topic relation *R* (a part of *R* or all of it) is actually ostended for



7.2. ♀ means "operates upon according to a hypothesis," and ⊗ means "gives a description (in the language appropriate to the level where the line terminates), which may or may not confirm the hypothesis."

7.3. Thus a complete circuit on one side of  $I$ , starting at ⊗, passing through — to a *Proc*, and returning by way of — and ♀ on the original *Proc* is a *causal coupling*, or, equivalently, it permits *reproduction* of the original *Proc*.

7.4. The unadorned, horizontal connections have a different meaning: they are *inferential couplings*, which, limiting cases apart, entail the notion of choice.

7.5. Hence, any complete circle (such as the line emanating from *Proc<sub>A</sub> i* to *Proc<sub>B</sub> i* and terminating on *Proc<sub>A</sub> i*) may be called a *deductive chain*.<sup>5</sup>

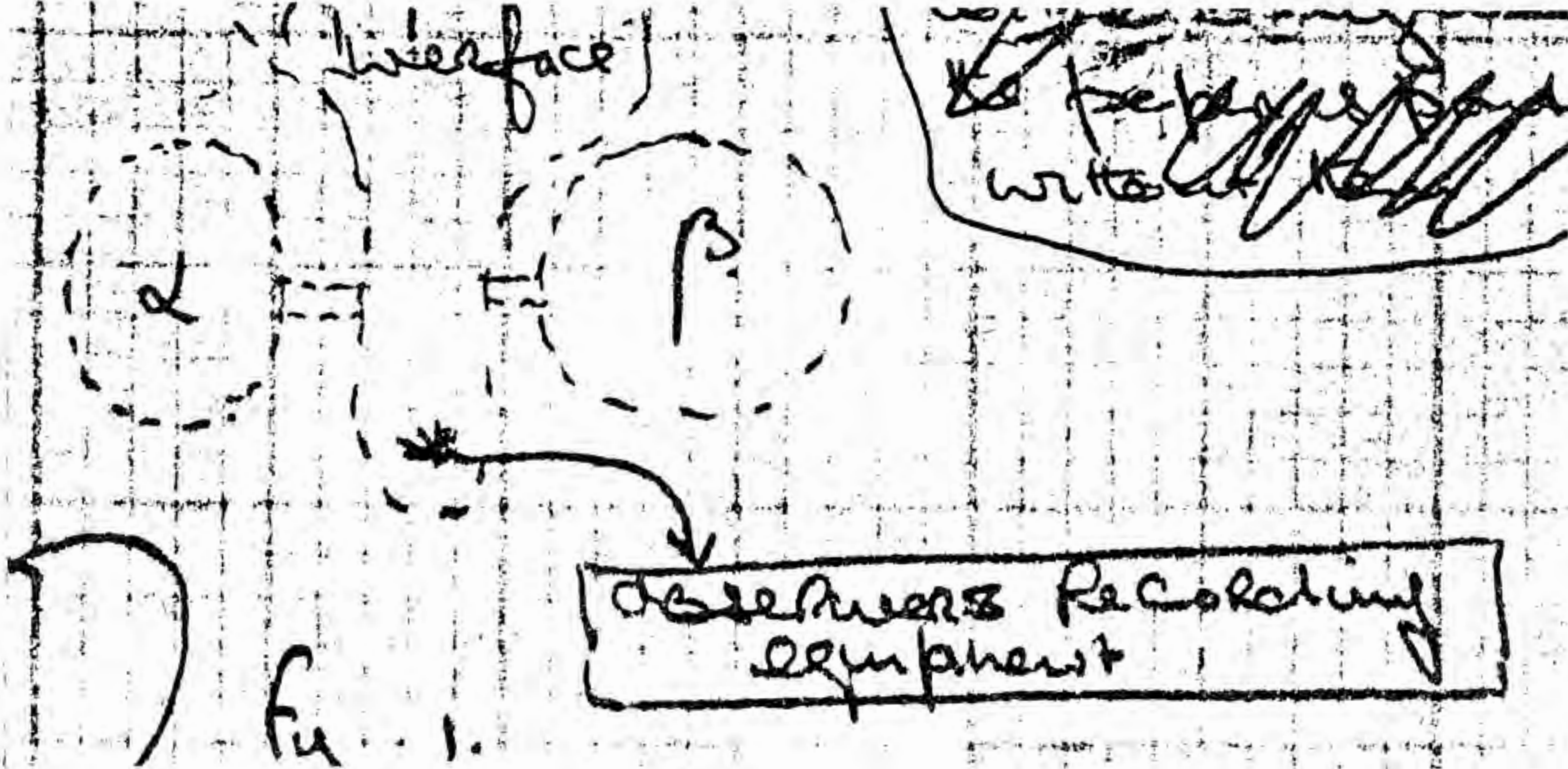
7.6. Finally, the lines to and from  $D'(R)$  and  $D^\circ(R)$  indicate whatever is referenced by the inference, that is, whatever  $R_i$  in  $R$  is ostended by the participants  $A$  and  $B$  on occasion  $n$ .

7.7. Call this ikon (Figure 4) the *conversational paradigm*.

7.8. If one ikon is created by filling the spaces in Figure 3, then (obeying the proper rules) the process can be iterated laterally to yield a further *paradigm*, for example, the ikon in Figure 5. The motivation for doing so is noted in Section 2.1.1 ≙ to represent as much of mind as desired.



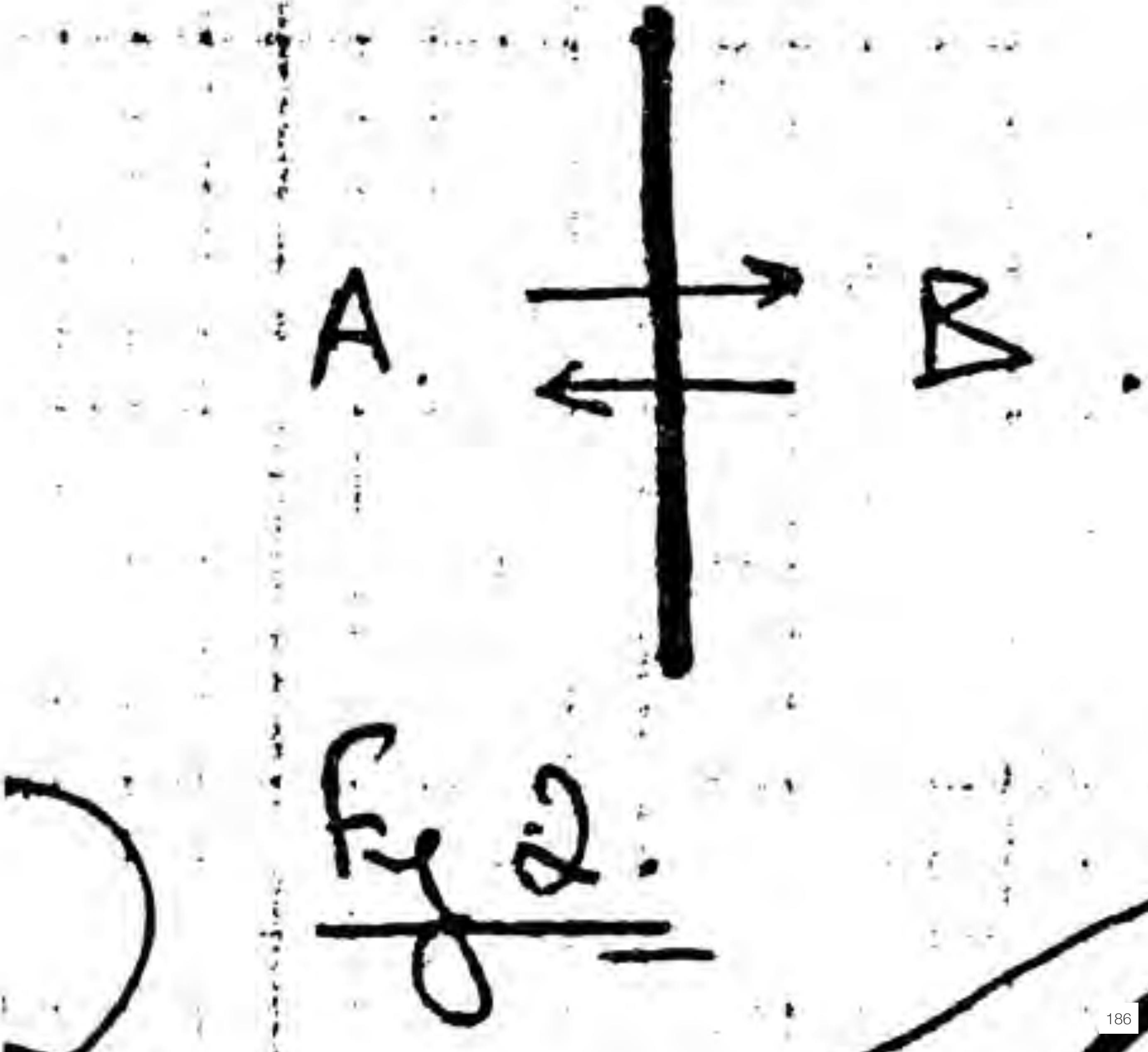
Interactions occur through an interface.



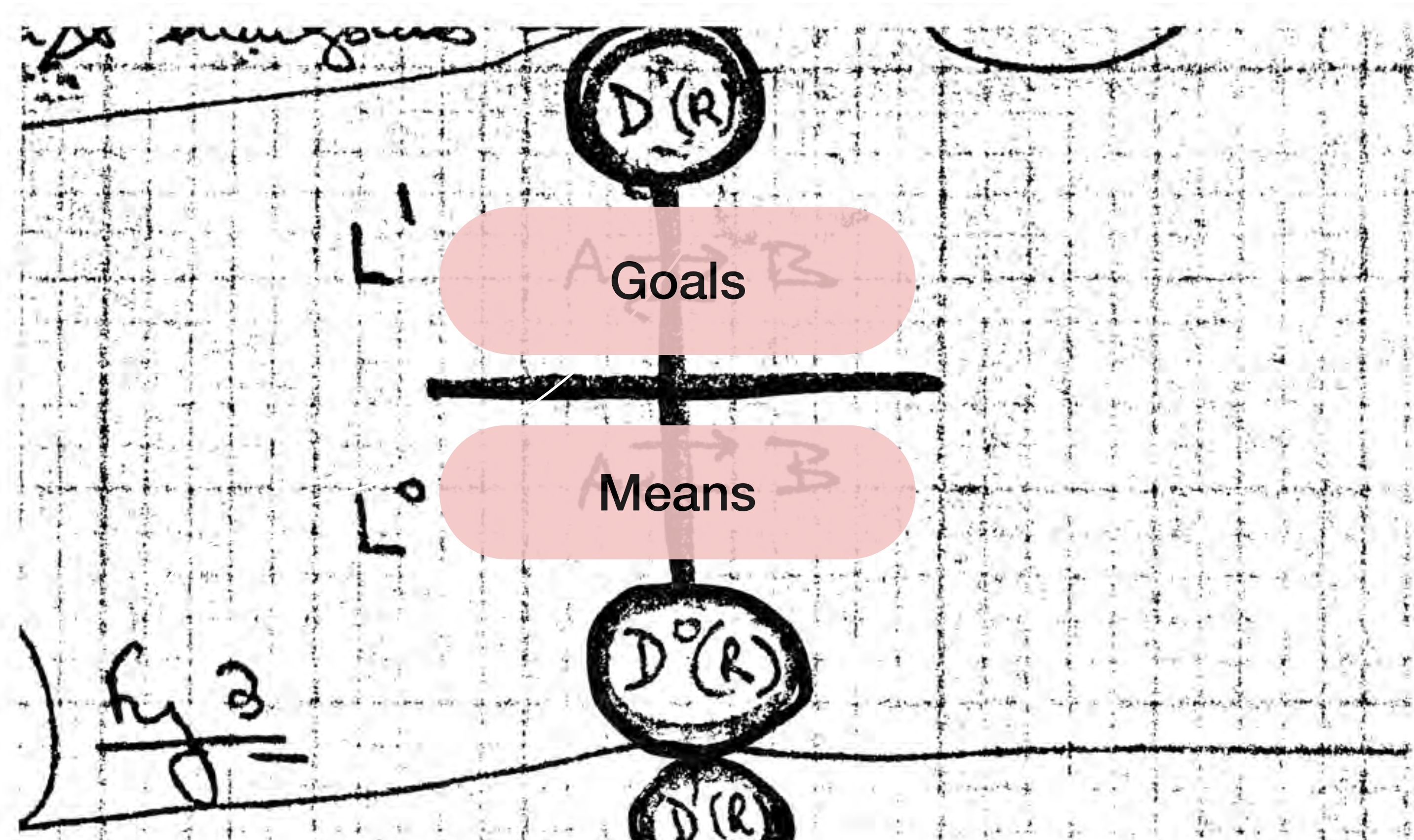
Gordon Pask.  
"Aspects of Machine Intelligence"  
In *Soft Architecture Machines*,  
Nicholas Negroponte, ed., MIT Press  
1976.

# Conversations comprise interactions among participants

Gordon Pask  
“Aspects of Machine Intelligence”  
In *Soft Architecture Machines*,  
Nicholas Negroponte, ed., MIT Press  
1976.

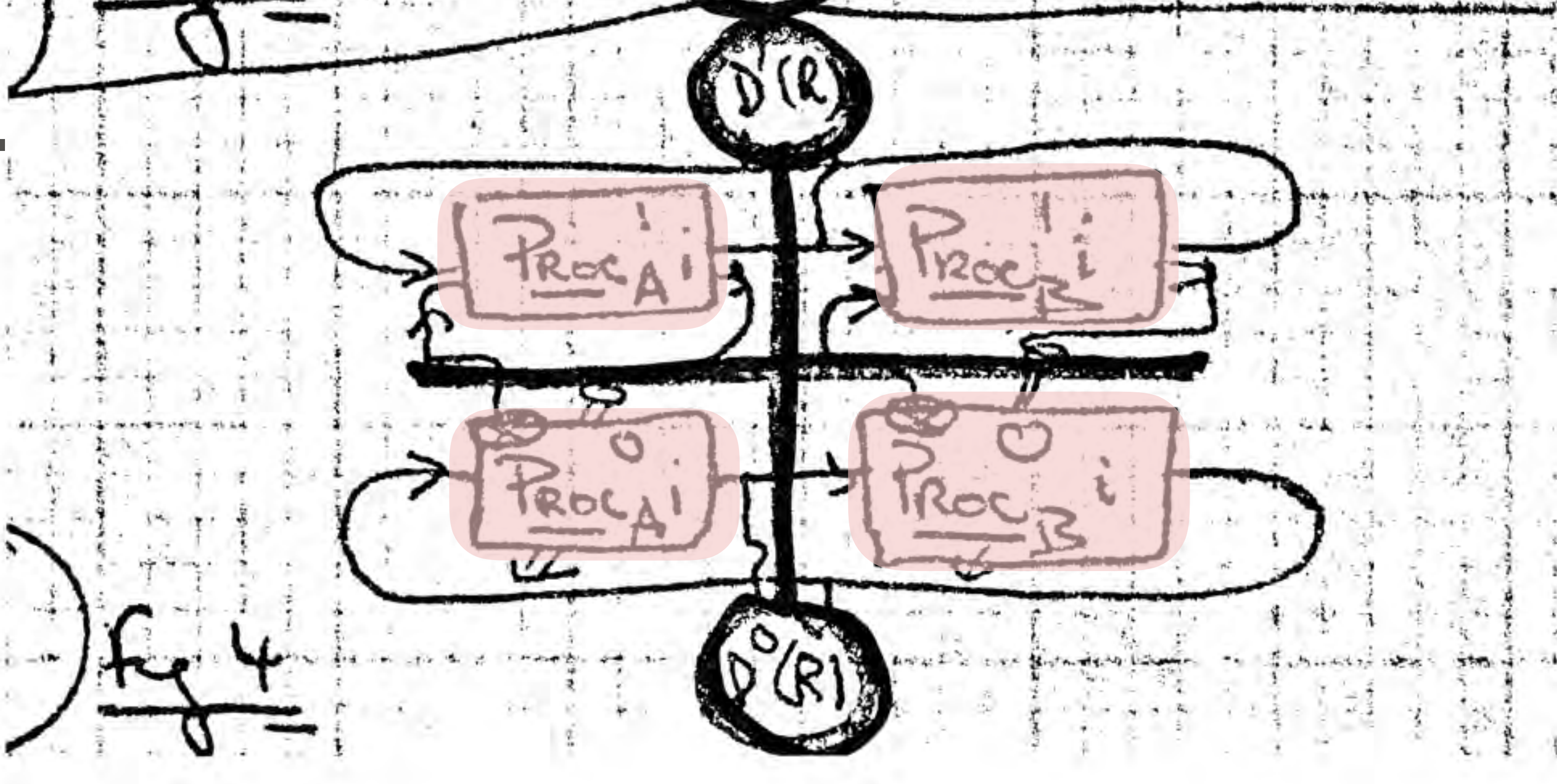


Interactions in a conversation can be observed to have levels of *goals* – and corresponding levels of *means* to achieve them.



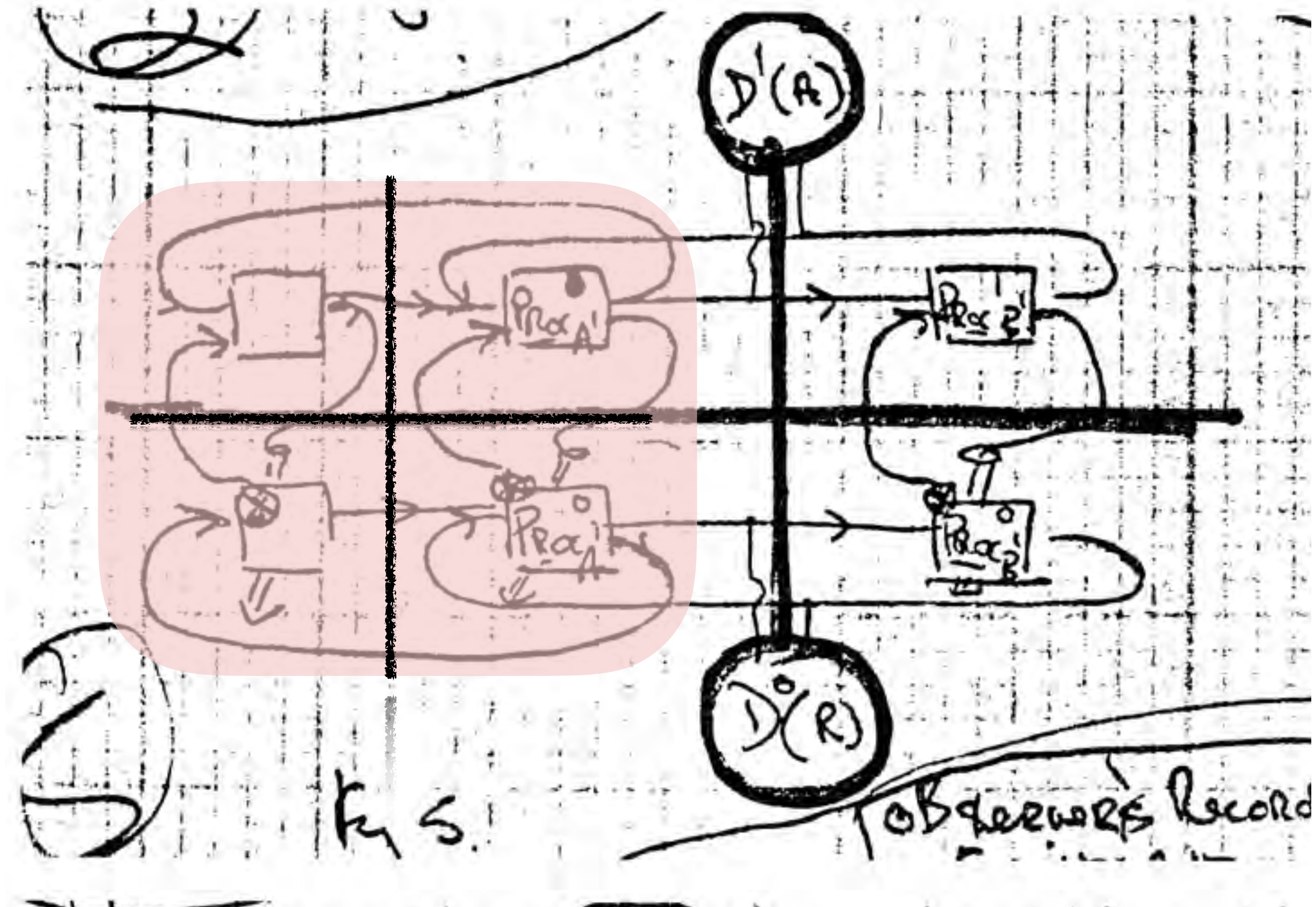
Gordon Pask  
“Aspects of Machine Intelligence”  
In *Soft Architecture Machines*,  
Nicholas Negroponte, ed., MIT Press  
1976.

# Conversations are driven by processes.



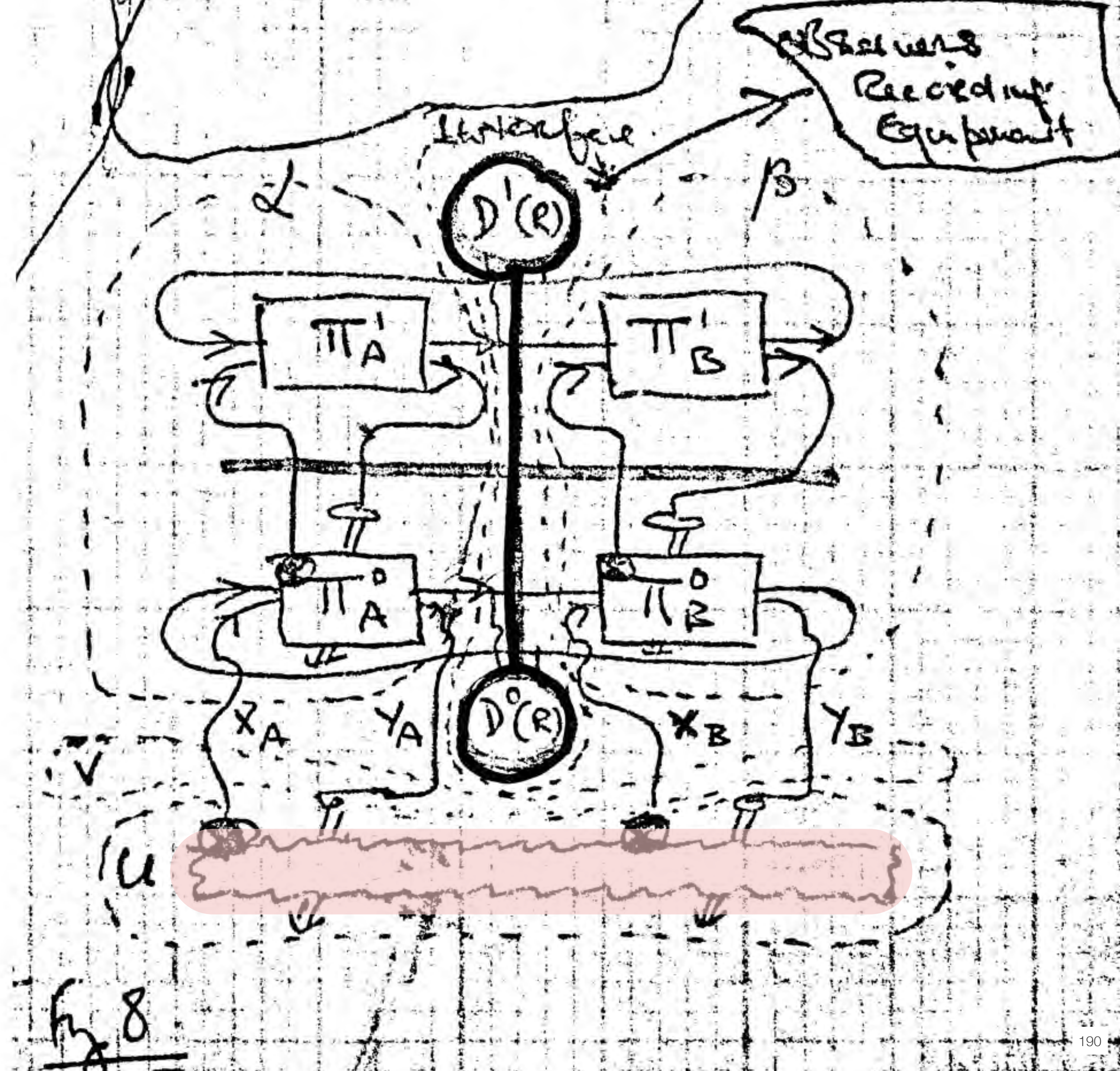
Gordon Pask  
“Aspects of Machine Intelligence”  
In *Soft Architecture Machines*,  
Nicholas Negroponte, ed., MIT Press  
1976.

Conversations may be internal to a participant.



Gordon Pask  
"Aspects of Machine Intelligence"  
In *Soft Architecture Machines*,  
Nicholas Negroponte, ed., MIT Press  
1976.

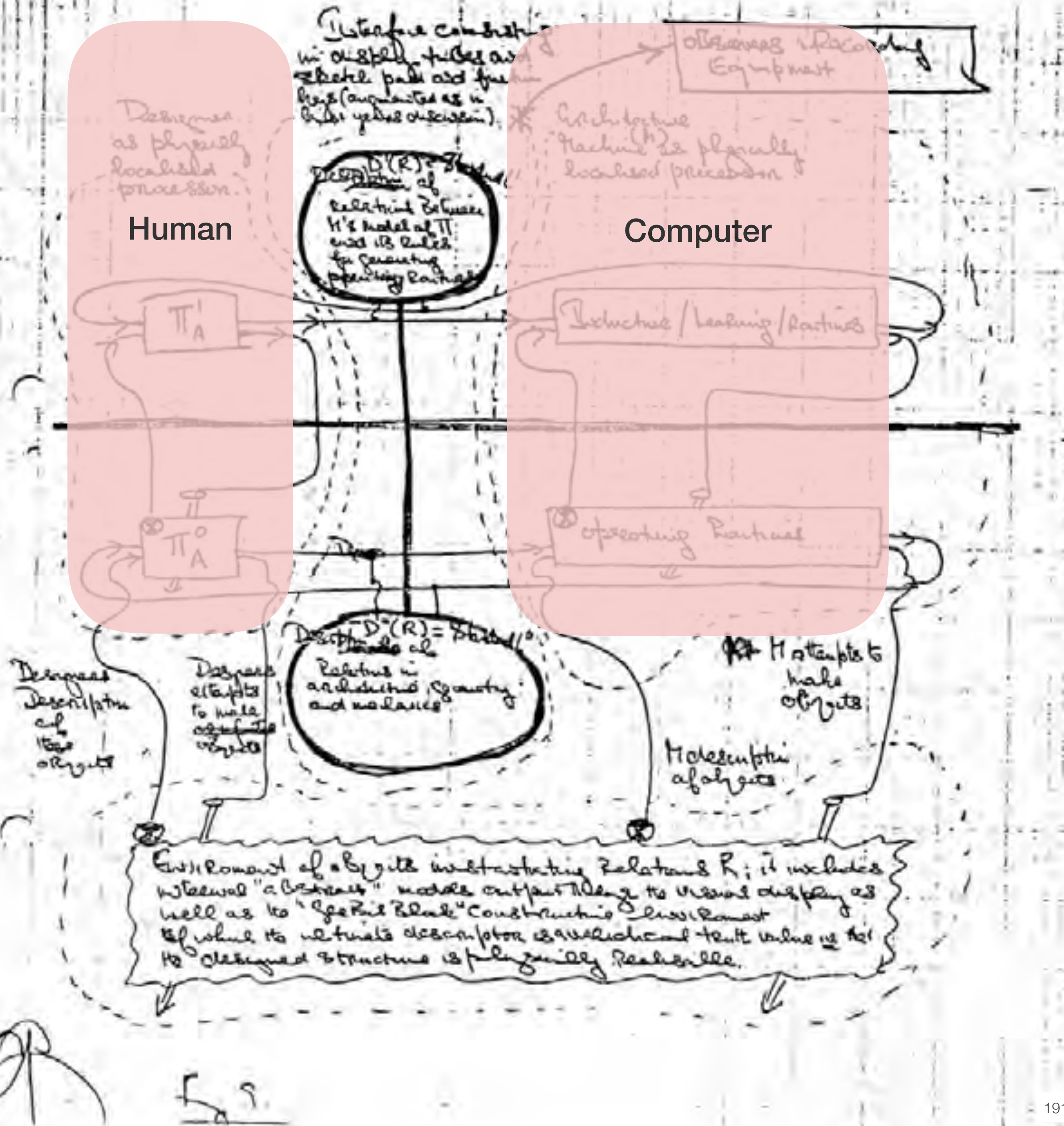
Conversations may result in actions taken in an environment.



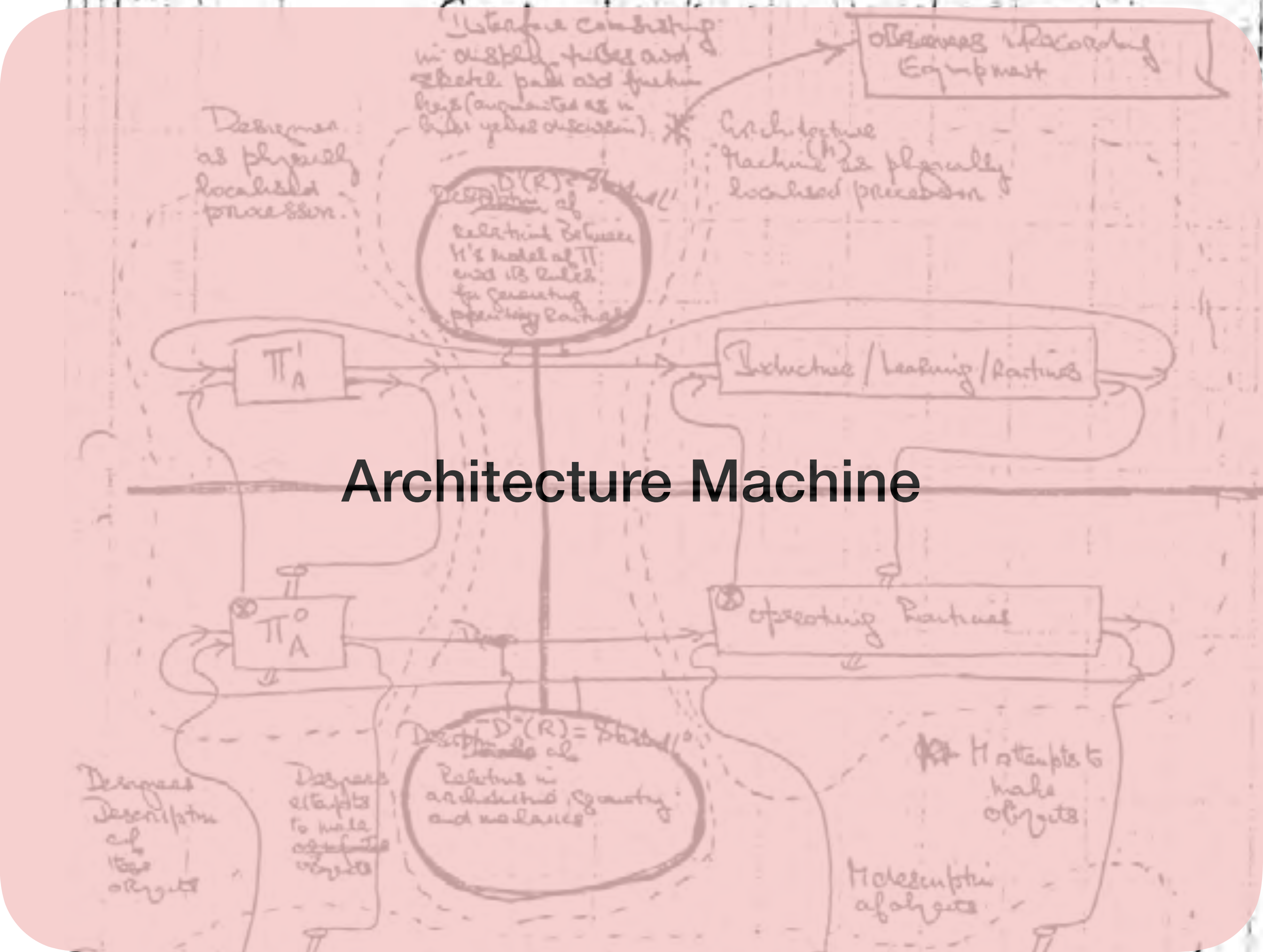
Gordon Pask  
"Aspects of Machine Intelligence"  
In *Soft Architecture Machines*,  
Nicholas Negroponte, ed., MIT Press  
1976.

# A computer can partner with a human in a conversation for design.

Gordon Pask  
 "Aspects of Machine Intelligence"  
 In *Soft Architecture Machines*,  
 Nicholas Negroponte, ed., MIT Press  
 1976.



A computer can partner with a human in a conversation for design.



Architecture Machine

Gordon Pask  
 "Aspects of Machine Intelligence"  
 In *Soft Architecture Machines*,  
 Nicholas Negroponte, ed., MIT Press  
 1976.

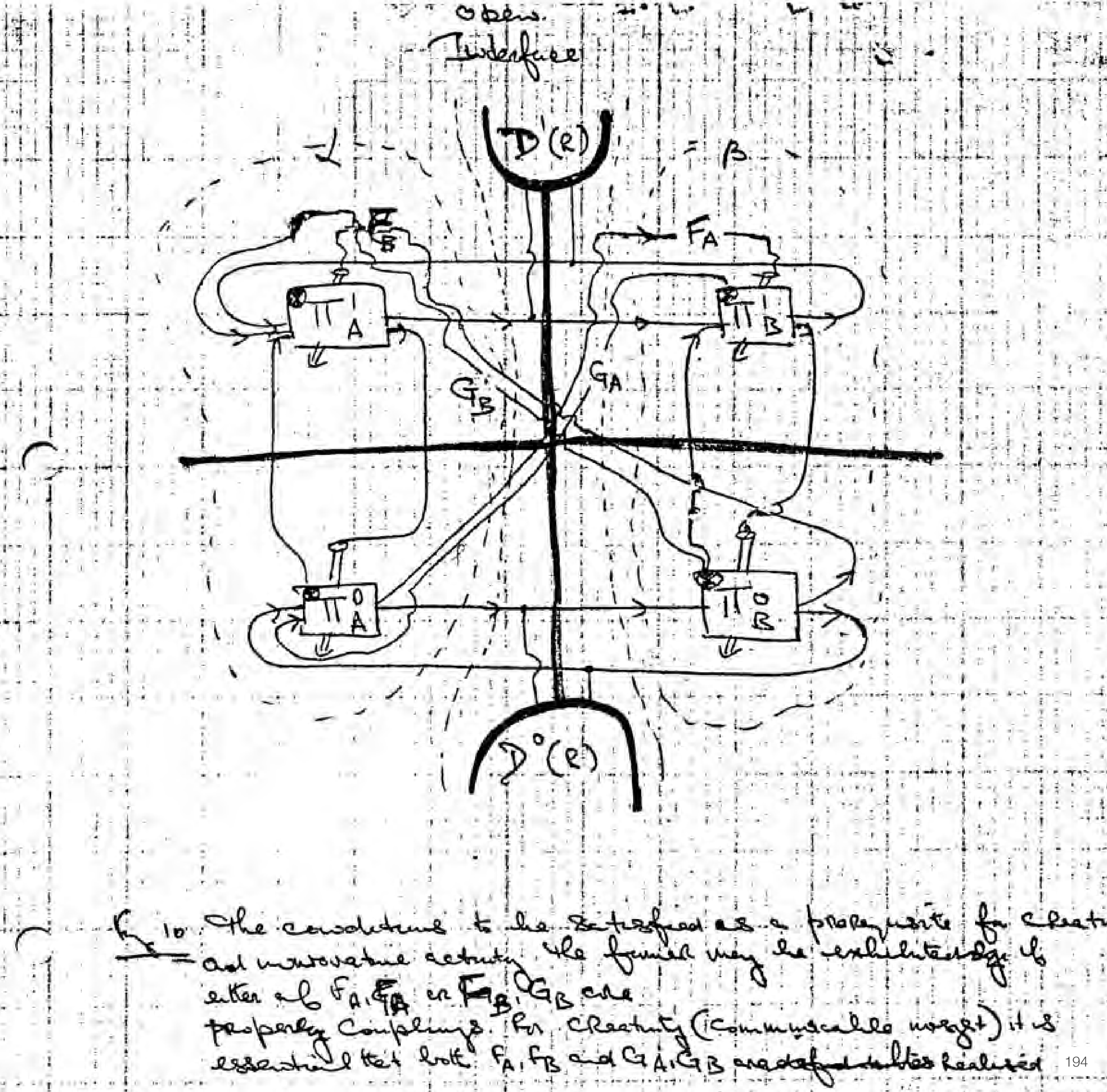
Environment of objects instantiating relations R; it includes internal "abstract" model output along to visual display as well as to "operational" construction environment of which the virtual description is a subcomponent. The value of the designed structure is physically realizable.



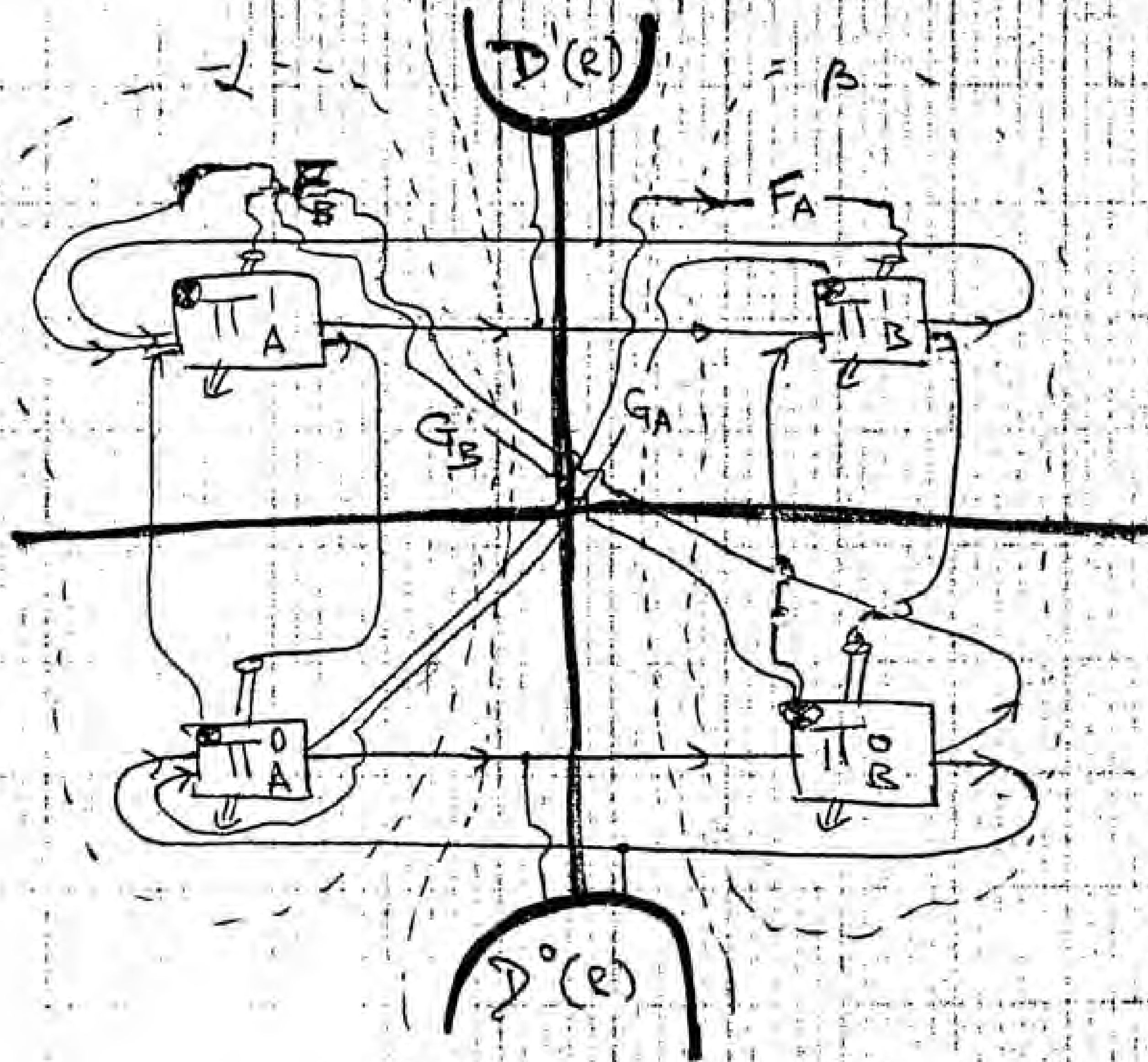


Conversation may be a dance where each participant construes the other to be part of a unified whole.

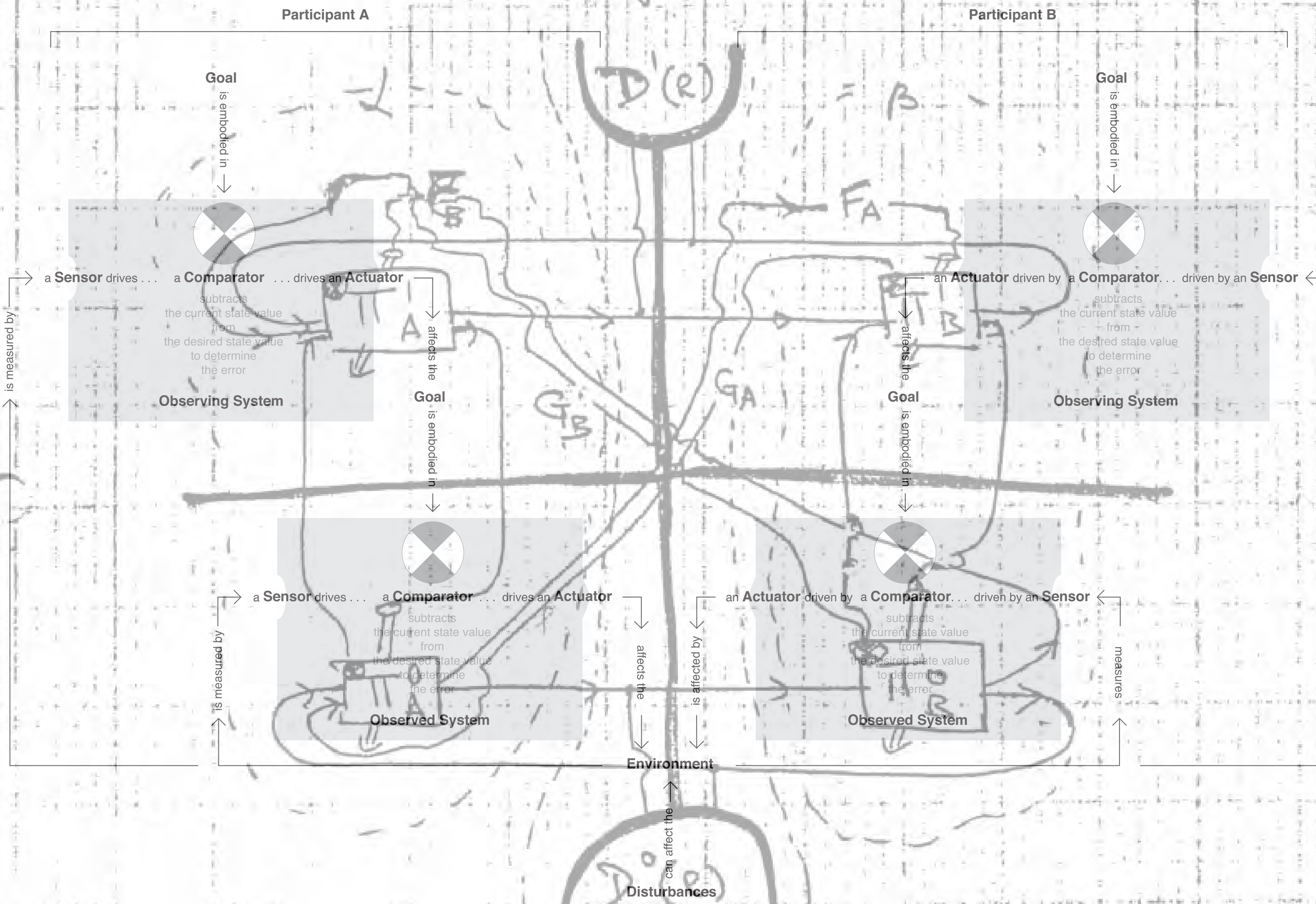
Gordon Pask  
 "Aspects of Machine Intelligence"  
 In *Soft Architecture Machines*,  
 Nicholas Negroponte, ed., MIT Press  
 1976.



Open  
Interface



# Conversation: Formal Mechanism



# Conversation: Formal Mechanism



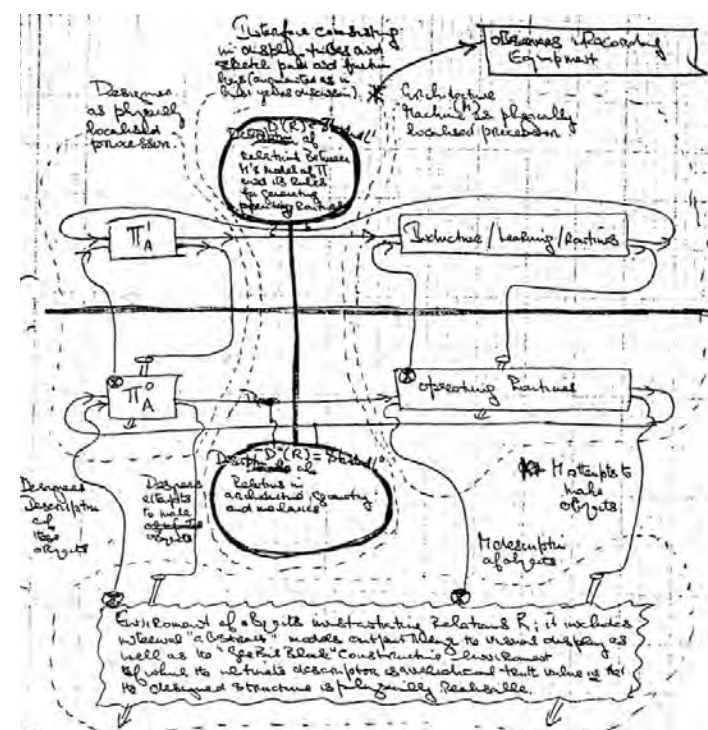
#1 — Novelty Regulation

#2 — Uncertainty Regulation

#3 — Autonomy

## Paskian Interaction Principle #4 — Conversation for Design

***The Architecture Machine proposes a human-computer conversation for design where the machine co-participates in evolving goals as well as methods.***



# Paskian Interaction Principles

- #1 – Novelty Regulation**
- #2 – Uncertainty Regulation**
- #3 – Autonomy**
- #4 – Conversation for Design**

*Paskian Interaction Principles – v1.0 – March 2019*

Gordon Pask in his study  
London  
Late 1980s

Photo: Paul Pangaro





Gordon Pask & Elizabeth Pask  
London  
Late 1980s

Photo: Paul Pangaro

Gordon Pask in his study  
London  
Late 1980s

Photo: Paul Pangaro



Where did Colloquy come from?

Where did Pask take it?

Where do we take it from here?



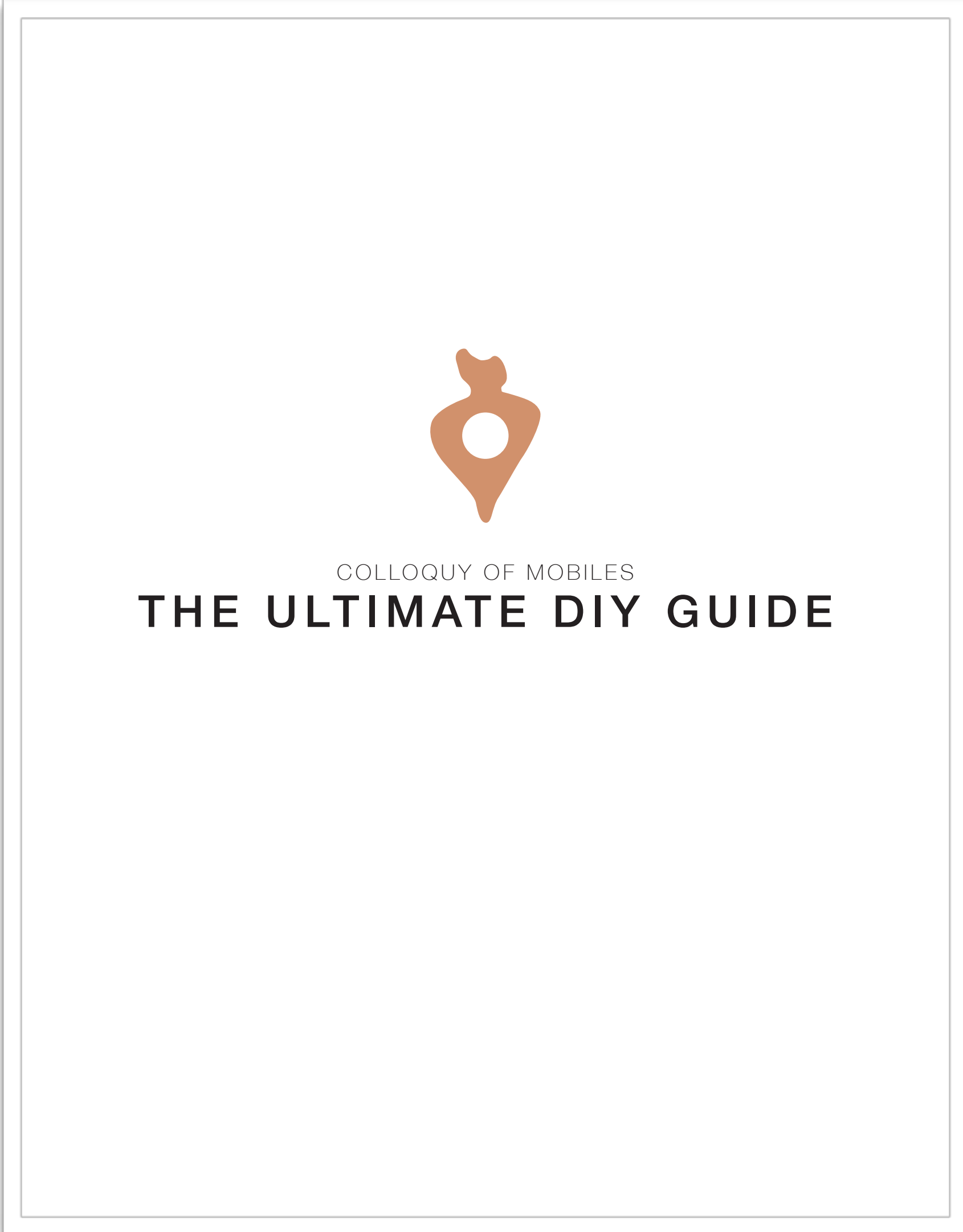
A large, abstract sculpture made of a dark, textured material, possibly wood or stone, is the central focus. It has a rounded, bulbous shape with a small opening at the top. The sculpture is set in a gallery or workshop space with various displays and equipment in the background. The word "Colloquy" is visible on a wall in the background. The text "Where did Colloquy come from?" is overlaid in a light gray font.

Where did Colloquy come from?

Where did Pask take it?

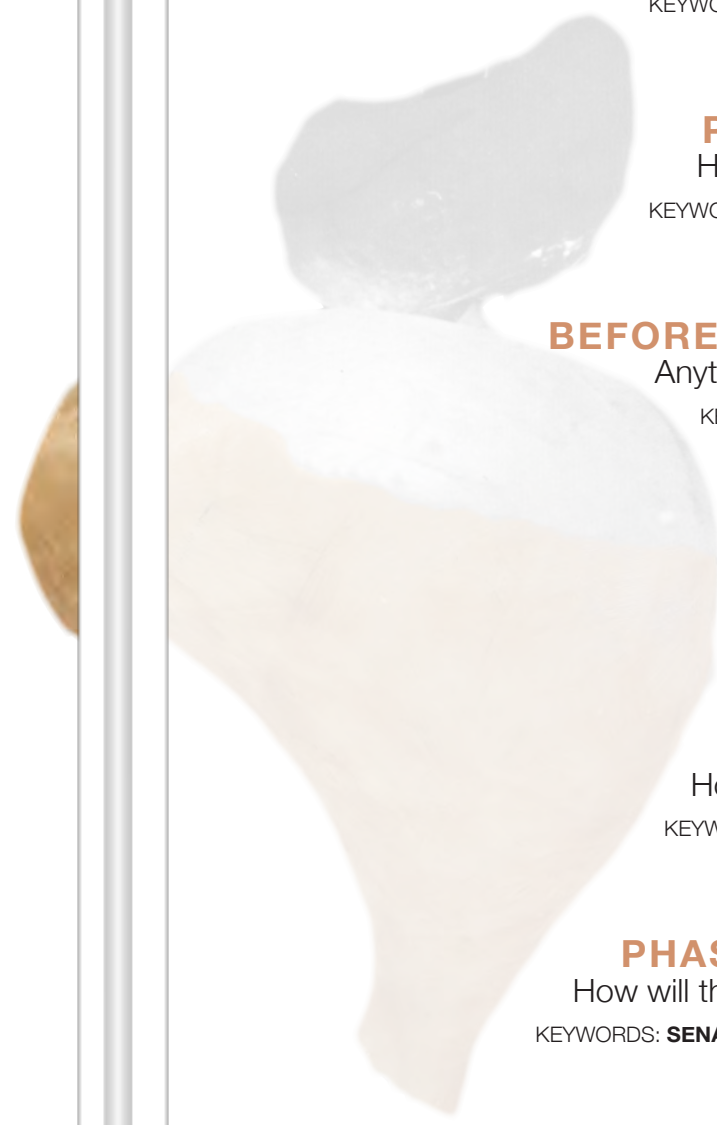
Where do we take it from here?

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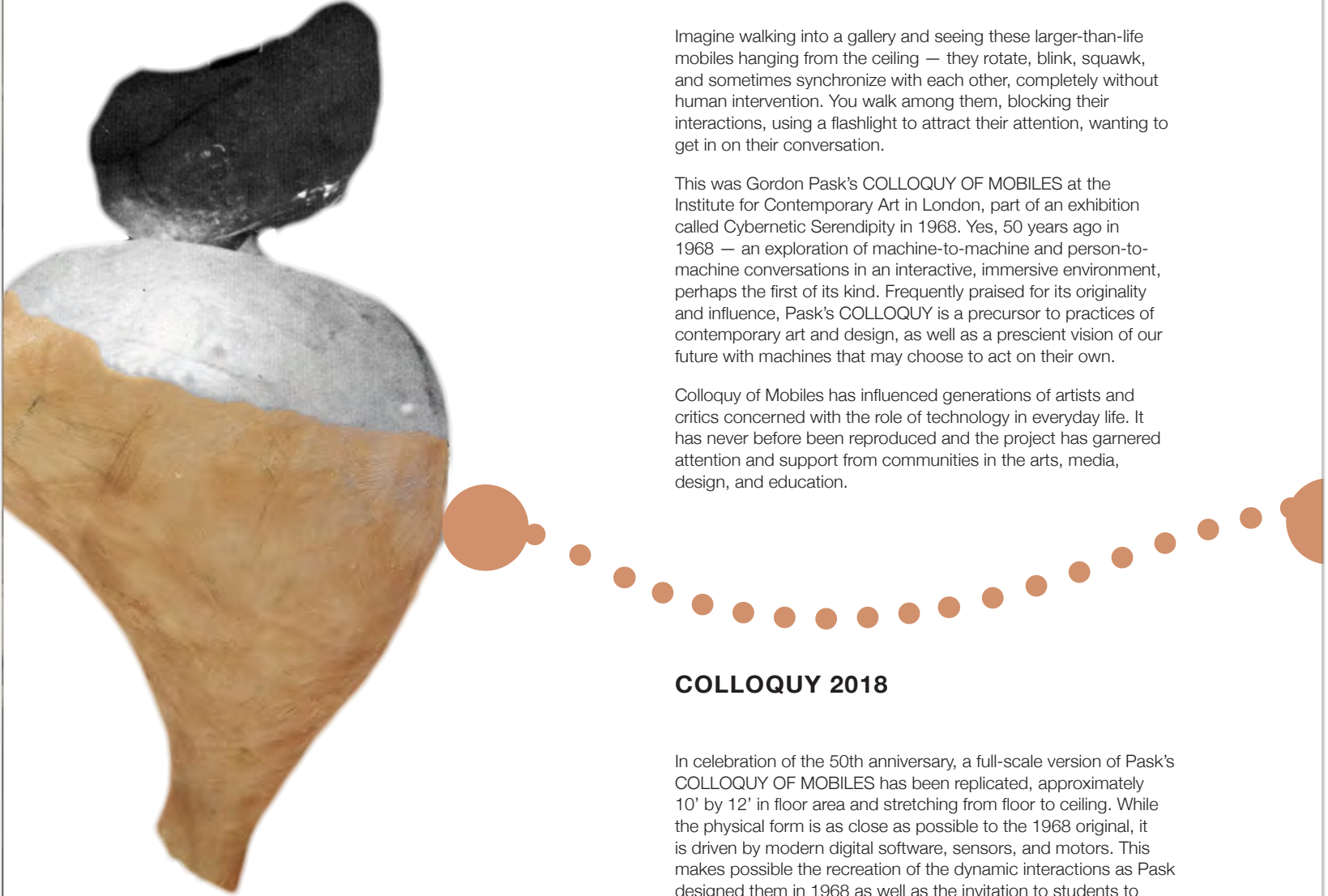
# 1 WHAT IS COLLOQUY OF MOBILES?

## COLLOQUY 1968

Imagine walking into a gallery and seeing these larger-than-life mobiles hanging from the ceiling — they rotate, blink, squawk, and sometimes synchronize with each other, completely without human intervention. You walk among them, blocking their interactions, using a flashlight to attract their attention, wanting to get in on their conversation.

This was Gordon Pask's COLLOQUY OF MOBILES at the Institute for Contemporary Art in London, part of an exhibition called Cybernetic Serendipity in 1968. Yes, 50 years ago in 1968 — an exploration of machine-to-machine and person-to-machine conversations in an interactive, immersive environment, perhaps the first of its kind. Frequently praised for its originality and influence, Pask's COLLOQUY is a precursor to practices of contemporary art and design, as well as a prescient vision of our future with machines that may choose to act on their own.

Colloquy of Mobiles has influenced generations of artists and critics concerned with the role of technology in everyday life. It has never before been reproduced and the project has garnered attention and support from communities in the arts, media, design, and education.



## COLLOQUY 2018

In celebration of the 50th anniversary, a full-scale version of Pask's COLLOQUY OF MOBILES has been replicated, approximately 10' by 12' in floor area and stretching from floor to ceiling. While the physical form is as close as possible to the 1968 original, it is driven by modern digital software, sensors, and motors. This makes possible the recreation of the dynamic interactions as Pask designed them in 1968 as well as the invitation to students to explore what the newest technologies in 2018

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## 2 PROJECT OVERVIEW

### PROJECT PHASE

#### DESIGN

Consult with Domain Experts as Needed  
 Prototype /Model  
 Final Design Spec

#### FABRICATION

Coordination  
 Execution

#### ASSEMBLY /INSTALLATION

On Site Assembly  
 Testing /Punch List

#### EXHIBITION

Continued Support

### PROJECT GOALS

Research, Design, Fabricate, and Install

1. A Full Scale Replica of the Colloquy of Mobiles Installation from 1968.
2. Recreating the Spirit and Aesthetic of the Piece with reasonable accuracy.
3. Integrating as much CCS input as is feasible: Expertise in Arts, Materials, Fabrication, Resources for Fabrication, Machines, Workshops

### PROJECT BUDGET

BUDGET ITEM	MATERIAL COST	LABOR
Oversight labor		\$ 14,400.00
Oversight travel		2,400.00
Armature	\$ 800.00	2,000.00
Mechanics	1,500.00	1,500.00
Wiring Harness	600.00	2,000.00
Sensing	150.00	1,000.00
Actuation	200.00	1,000.00
Computation	350.00	500.00
Communication	100.00	500.00
Software		5,000.00

## 3 BEFORE YOU START

### TERMS YOU SHOULD GET FAMILIAR WITH

#### ARMATURE

the non-digital/electronic components of the installation responsible for structure and visual aesthetics of - the figural components of the piece, the mechanical components [actuation], sensing, and the computational hardware [brains]

#### SENSING

The electromechanical components of the installation that enable the sensing of [at least] light

#### COMMUNICATION

The means of communication amongst computational components

#### MECHANICS

The actuation components of the installation that enable movement of the sculptural elements

#### ACTUATION

The electromechanical components of the installation that enable the generation of [at least] light

#### SOFTWARE

The logic that runs on the computational platform that determines installation behavior and interaction with installation participants both human and machine.

#### WIRING HARNESS

The components of the system that delivers power and signal [if necessary] to the distributed sensing/actuation/and computation components

#### COMPUTATION

The devices that receive input from sensing and generate output to deliver to actuators via communications protocol, as well as communicate with other computational entities

### MATERIALS YOU NEED

- Aluminium Strut, unistrut, perforated angle, fabric, foamcore, thermoplastic, fiberglass, resin impregnated fabric, thermoplastic
- 12v/24v Motors and Servos, motor control boards, gearbox, pulley, belts
- Photoresistor, microphone, spectral analysis, limit switch, thermal imaging device, photodiode, microphone, CO2 sensing, etc.
- LED, incandescent light, speaker
- Microelectronic computers i.e arduino, electron, raspberry pi, intel edison, TI launchpad, LittleBits, etc.
- Antennae, wiring, communications protocol i.e. 3G, WIFI, hardwired, etc.
- Programming language, development tools, API/Libraries used to communicate with hardware





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4 PHASE I – PHYSICAL

CONSTRAINT AND REQUIREMENT

ORIGINAL DESIGN

"The Colloquy covered a floor area of 15 x 12 feet (5 x 4 metres) and consisted of five powered mobiles suspended from powered beams 11 feet (3.75 metres) above the ground. It was therefore big enough for people to walk into and interact with. It was intended for operation in the dark or under fairly dim lighting conditions."

"...all the mobiles were physically identical..."

– MICRO MAN: Computers and the Evolution of Consciousness, Dr. Gordon Pask with Susan Curran, 1982

PLINTH SURFACE CONCERNS

- Fire safety
- Weight
- Structural Stability

ESTIMATED WEIGHTS

Component Weight x Count = Total Weight

Females 50 x 3 = 150

Males 25 x 2 = 50

Plinth 30 x 1 = 30

Structure 75 x 1 = 75

Assembly Total = 300 lbs

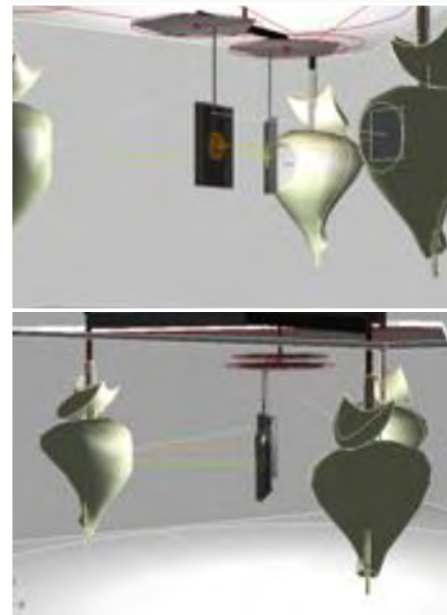
Not To Exceed = 500 lbs

PROCESS

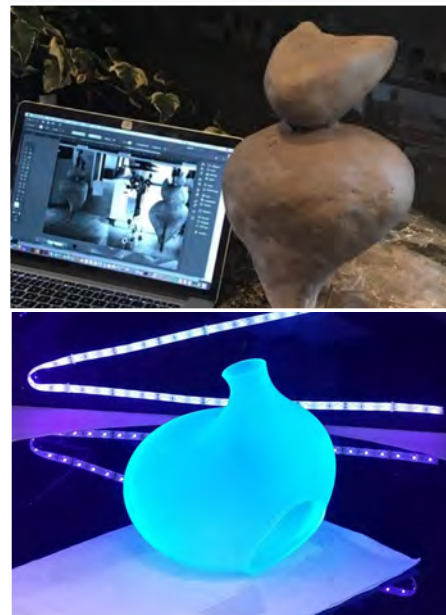
STEP 1  
STUDY THE EXISTING PHOTOS AND  
GENERATE SKETCHES



STEP 2:  
BUILD DIMENSIONALLY ACCURATE CAD  
MODEL WITH PARAMETRIC DIMENSIONS  
AND INTERACTIVITY



STEP 3:  
ITERATE THROUGH PROTOTYPES AT A  
SMALLER SCALE



STEP 4:  
CREATE A FULL-SCALE REPLICA



## 5 PHASE II – MECHANIC & ELECTRONIC

### MOVEMENT AND CONTROL OF FIGURES

#### SERVO MOTORS

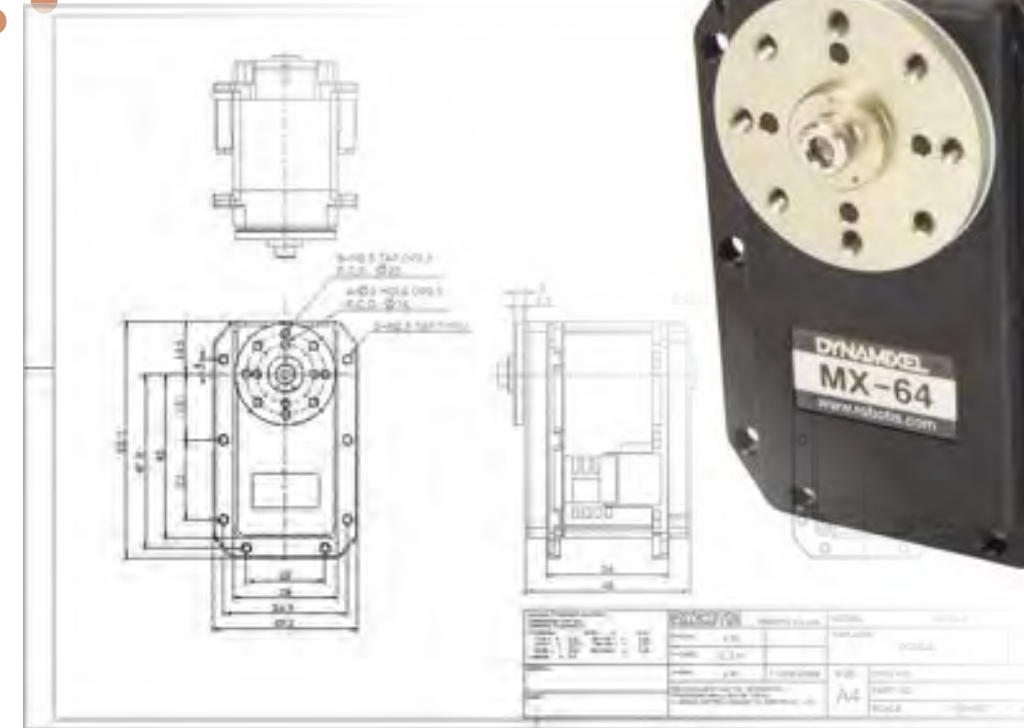
A total of 9 servo motors drive figures.

- 1 Drive motor for each of 3 Females
- 1 Drive motor for each of 2 Male figures
- 1 Drive motor for Male linkage bar
- 1 Drive motors for each of the 3 Female reflectors

Low torque will be required to turn the lightweight figures about their axes.

Estimated MAX power requirement for Motors and Control is 5A @ 120vAC estimated running power is 1A.

A total of 6 motors drive figures. 1 Drive, motor for each of 3 Female and 2 Male figure, and 1 drive motor for Male linkage bar.



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### SENSING

#### AUDIO TRANSCIEVER

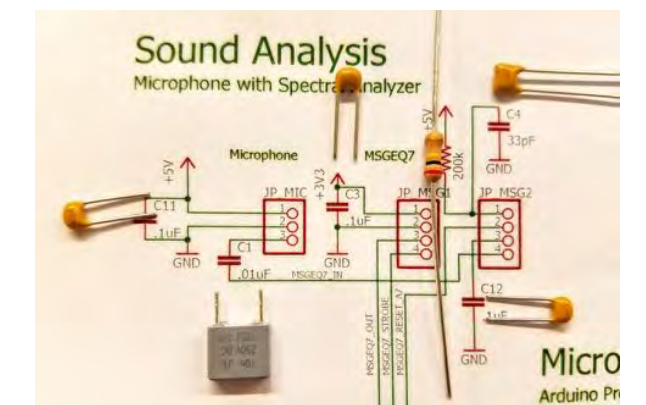
Use of the tone() function will interfere with PWM output on pins 3 and 11 (on boards other than the Mega).

It is not possible to generate tones lower than 31Hz.

Determine configuration of microphone and speaker for audio transciever.

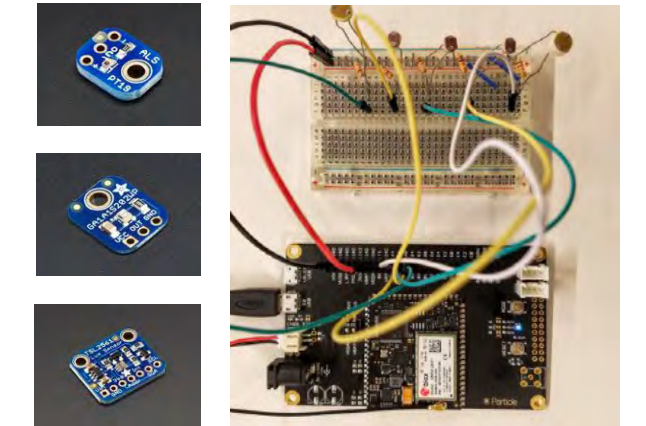
Use a standard cell phone microphone and a 7 band spectral analyzer to cluster sounds heard and build signal models.

Use a standard speaker to transmit sounds generated by the microcontroller.



#### INTERMITTENT SIGNAL LIGHT

Servo motors have three wires: power, ground, and signal. The power wire is typically red, and should be connected to the 5V pin on the Arduino board. The ground wire is typically black or brown and should be connected to a ground pin on the Arduino board. The signal pin is typically yellow, orange or white and should be connected to a digital pin on the Arduino board. Note that servos draw considerable power, so if you need to drive more than one or two, you'll probably need to power them from a separate supply (i.e. not the +5V pin on your Arduino). Be sure to connect the grounds of the Arduino and external power supply together.



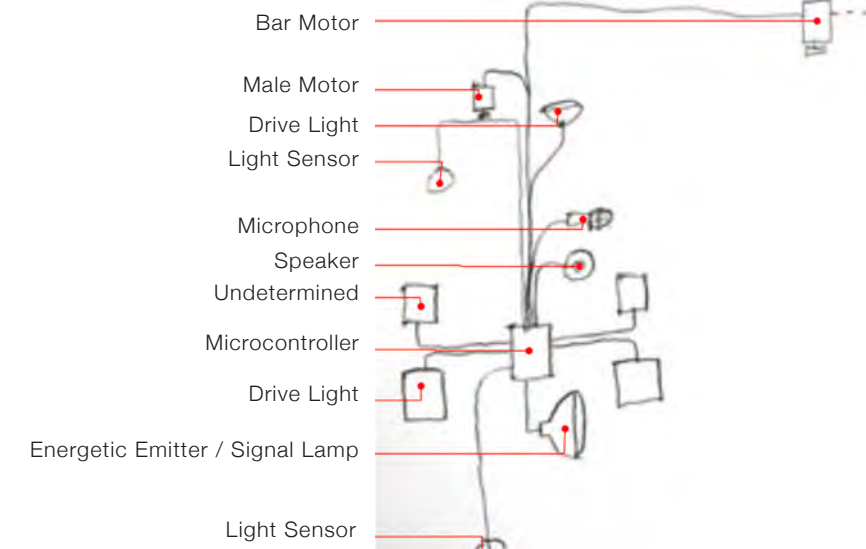
07

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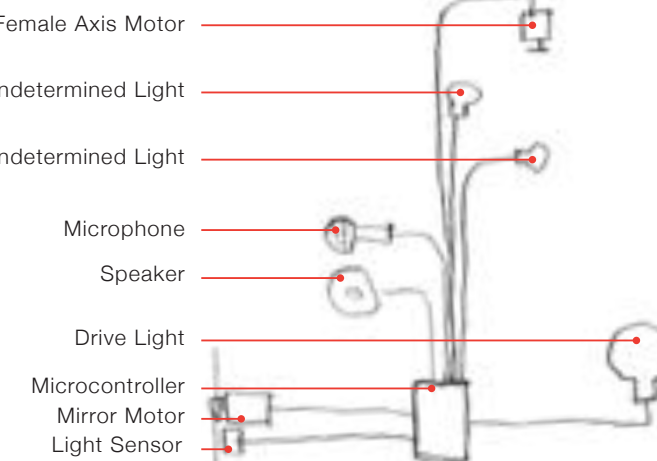
## 5 PHASE II – MECHANIC & ELECTRONIC

### WIRING AND ACTUATION

#### MALE SENSING AND ACTUATION



#### MALE SENSING AND ACTUATION

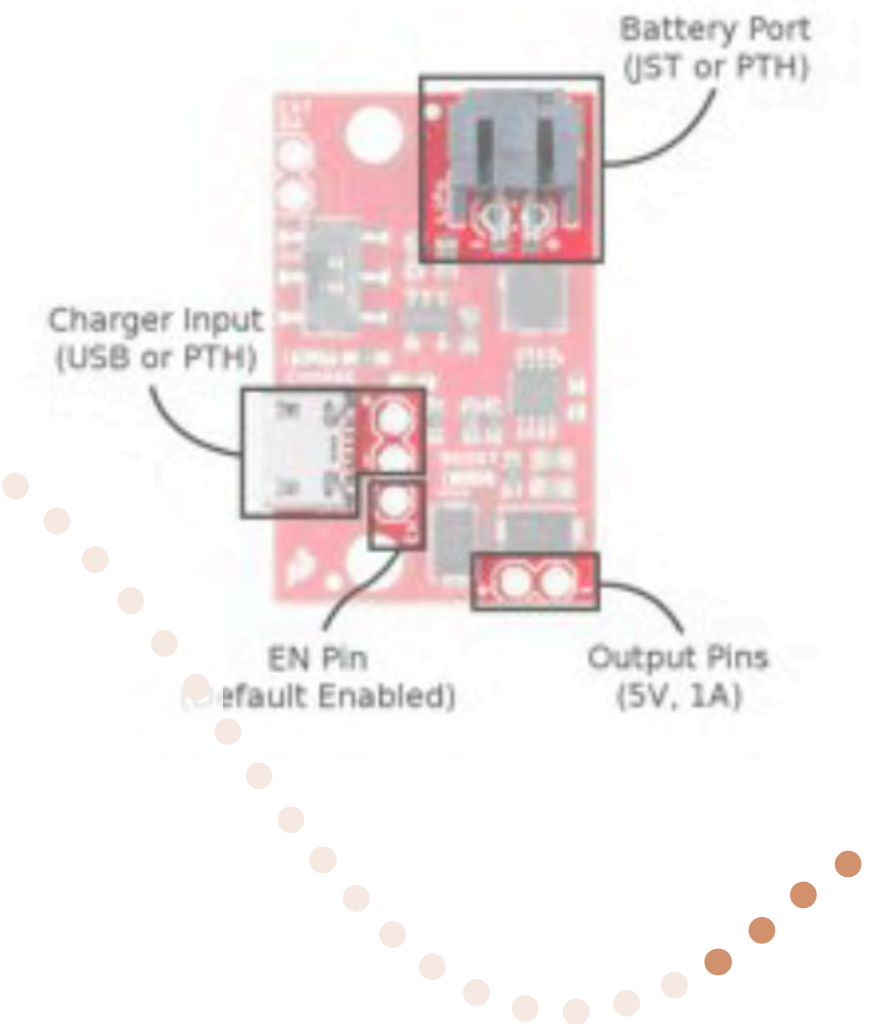


### MICROCONTROLLER SYSTEM

#### REQUIRED MATERIAL

USB Power, USB Data, Ethernet Data  
Ethernet Power, Power Socket that wont  
come loose, Phone connector for sensor  
data, WIFI, Screw clamp connectors, Power  
bus, Plastic insulation electrical conduit

micoUSB connectors come loose,  
connection seems poor for moving parts,  
RJ45 connections are fairly secure



SparkFun Qwiic Adapter



Qwiic Cable - 500mm



Qwiic JST Connector - SMD 4-pin

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Colloquy of Mobiles: A DIY Guide

## 6 PHASE III – ALGORITHM

**MALE DESCRIPTION**

1. The Male mobile has two 'drives', O and P (associated with orange and puce colored light)
2. The Male drive state is indicated visually by an upper display, A.
3. The Male's main goal is to satisfy (or reduce) the O and P 'drives' which normally build up over time.
4. The Male can do so, in the case of O, by projecting an intense beam of orange light from its central part, B, in such a way that it falls upon receptors in its upper part; C;
5. In the case of P satisfaction the Male must project an intense beam of pure light from B in such a way that it falls on receptors in the lower part, D.
6. In order to achieve this goal it must elicit the co-operation of a Female who, unlike the Male, is provided with a vertically positionable reflector capable of taking the beam from B and reflecting it back either to D or C.
7. D and C are free-moving members loosely coupled to the main mobile body.

**MALES MOTION**

Males engage in motion that:

1. Rotates the bar linkage, Z
2. Rotates itself about its point of suspension.

**MALE SCENARIO**

1. Male I sends out an intermittent directional visual signal which serves to identify it as 'male I' and its desire as 'O satisfaction'.
2. Male I moves according to (1) and (2) above (unless Male I) is blocked by Male II) seeking a co-operative and receptive female (the females are normally in rotational motion, seeking males)
3. Should the directional signal fall on the receptor a of a female who is willing to co-operate, she produces an identifying sound in synchrony with the intermittent light signal.
4. Male I detects the correlation between the female and his light signal and stops his motion (unless he is prevented from doing so by male II).

Male I triggers off an autonomous energetic event which consists in shining an intense orange light, for at least a minimum interval, in the direction of the located female.

The immediate result is an increase in the Male I O drive.

6. Male I anticipates subsequent reinforcement (which he will achieve
7. if the female behaves appropriately and if the free moving part, C, is appropriately positioned during at least some of this behavior).

Reinforcement, which substantially reduces the O drive, is obtained if the O goal is satisfied; that is, if orange light falls on receptor in C.

**MALES DRIVE STATE**

The Male Drive States Are:

1. 'upper limit  $\geq$  drive O > drive P  $\geq$  lower limit' which induces an O satisfaction search;
2. 'upper limit  $\geq$  drive P > drive O  $\geq$  lower limit' which induces a P satisfaction search;
3. '(lower limit > drive O) and (lower limit > drive P)' the male is satisfied and indifferent;
4. '(drive O > upper limit) and (drive P > upper limit)' which induces a search for either O or P satisfaction.

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Colloquy of Mobiles: A DIY Guide

**FEMALE DESCRIPTION**

1. A Female has an O drive and a P drive.
2. Unless both drives are satisfied (when she becomes inert) the Female rotates and searches for a Male.
3. According to her drive state, she is receptive to males offering O or P cooperation or to both.

**FEMALE SCENARIO**

1. On receipt of his intermittent directional signal, the Female puts his name 'Male I' and his intention 'O satisfaction' into a short-term memory.
2. The Female emits the correlated sound which the Male can recognize
3. The Female expects to receive the 'energetic' beam of orange light.
4. If this does fall on her vertical reflector, b, she stops her rotational motion and starts a search, using this reflector, to position the beam on some part of Male I that will give rise to a reinforcement signal.
5. The Female's goal is to obtain the conjunction of orange light on her reflector and the reinforcement signal from Male I.
6. Female goal achievement reduces her O drive.

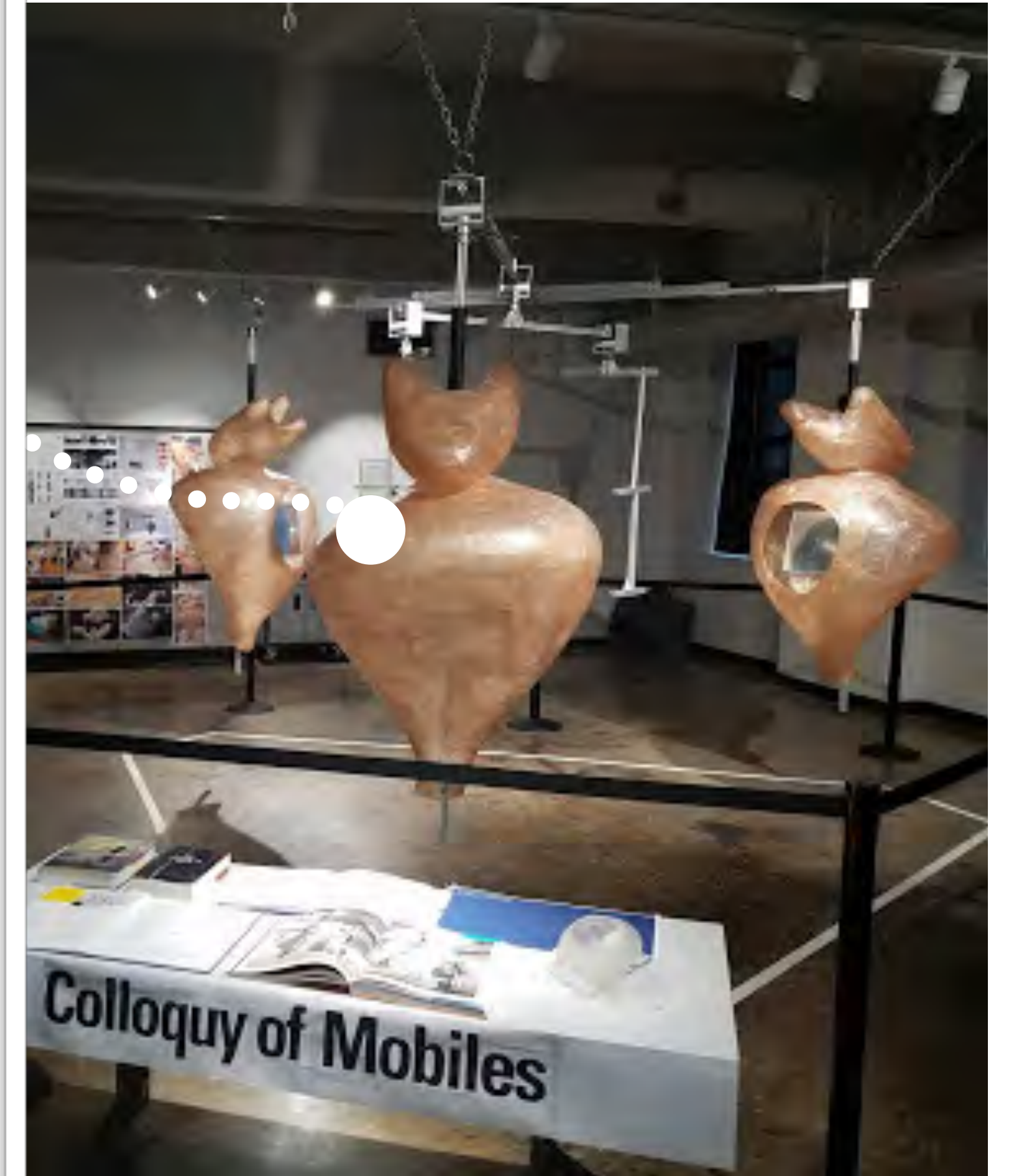
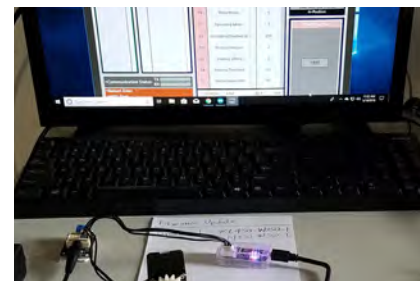
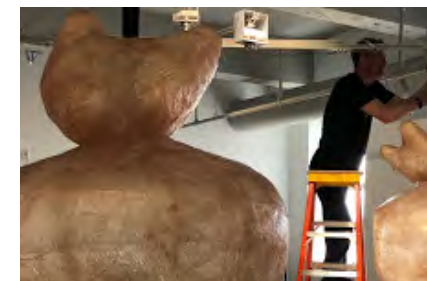
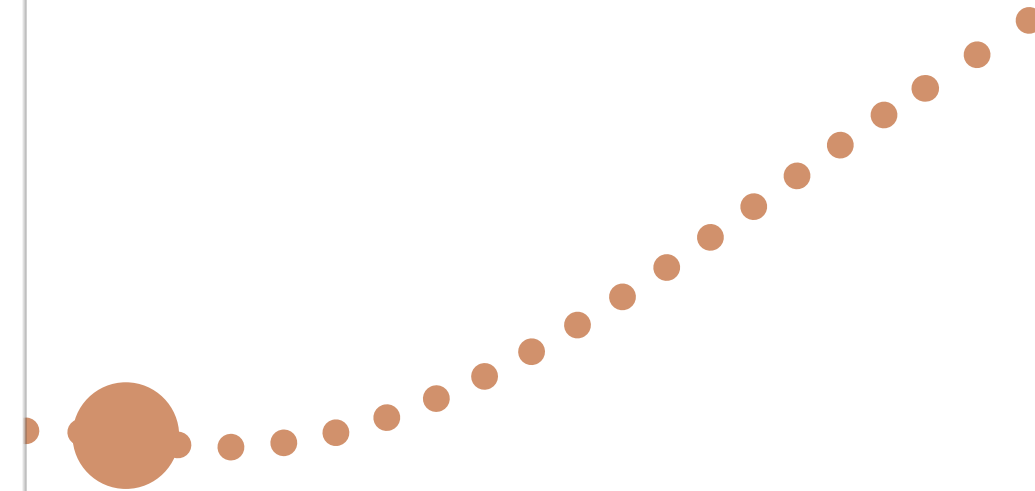
**FEMALE VARIABLES**

NAME	TYPE	DESCRIPTION
$\mu$	number	female drive variable
$\Delta\mu$	NA	not used
$d\mu$	number	increment for increasing female drive during search
$\delta\mu$	number	increment for lowering female drive during reinforcement
y	number	[lower] limit on variable $\mu$
MA	enum	memory for orange
MB	enum	memory for puce
F	boolean	reinforcement variable, evaluated by the male
t	NA	not used
$\Delta t$	number	fixed delay, sleep for a duration

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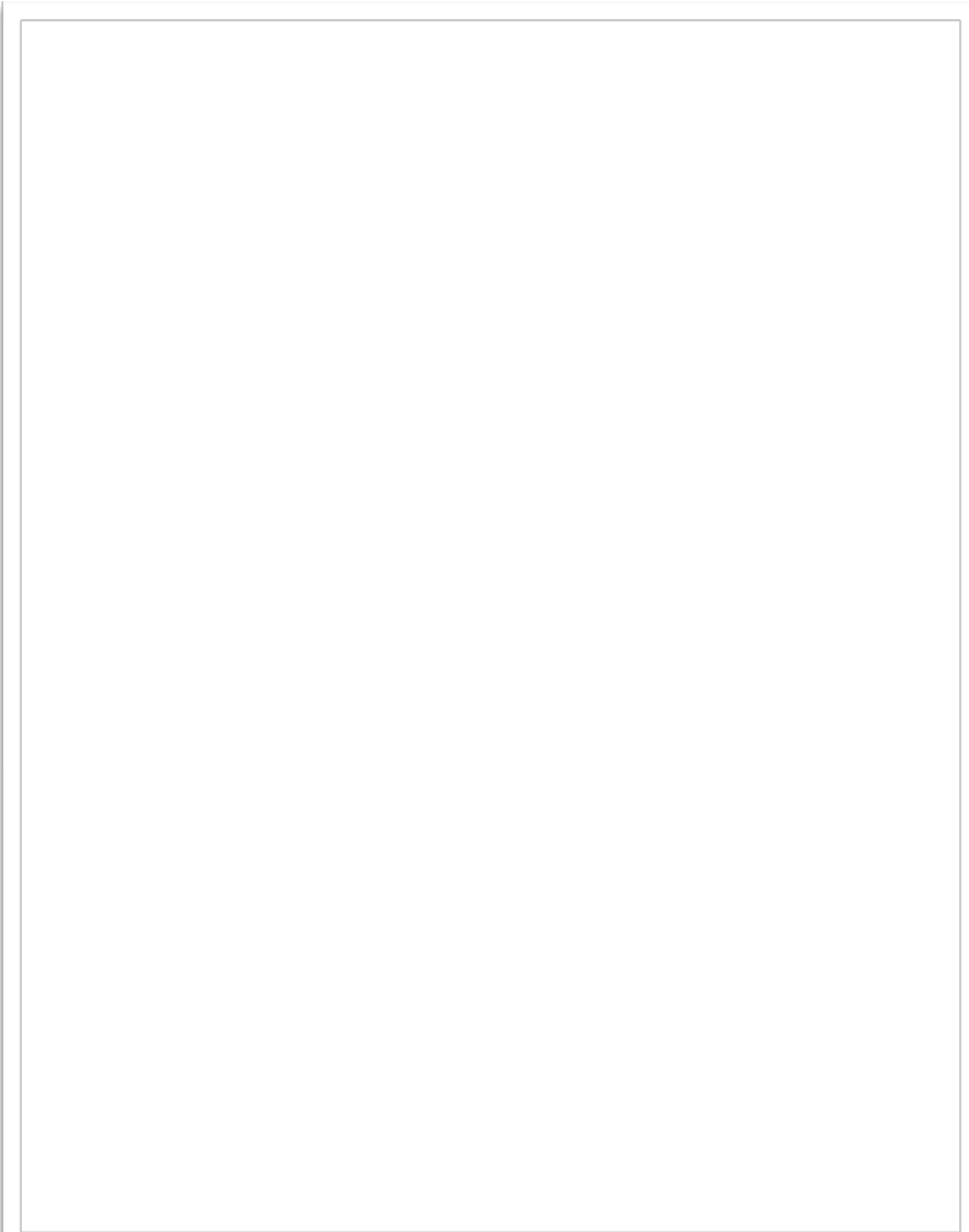
## 6 PHASE IV – ASSEMBLY



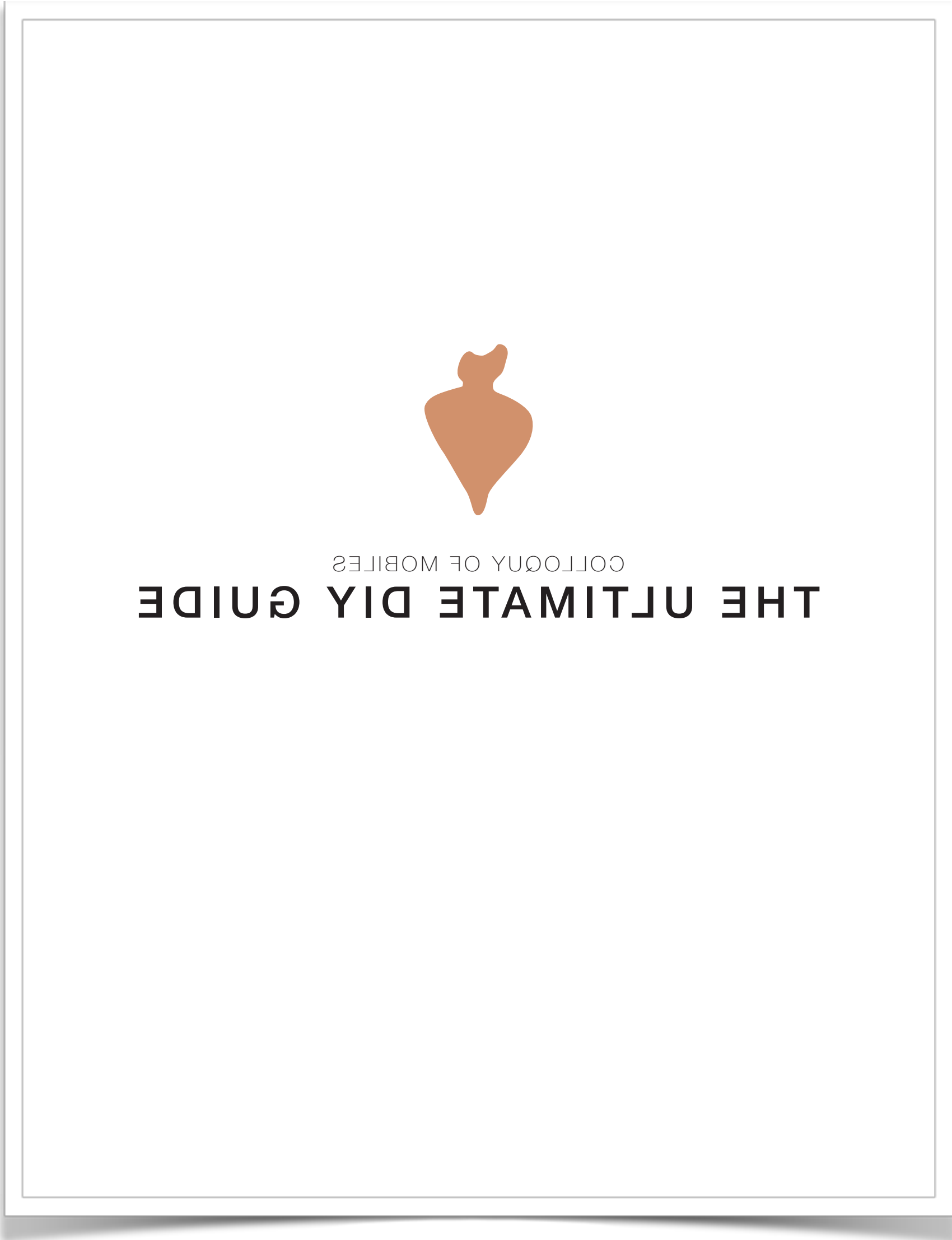
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**HELVETICA NEUE**  
2018.12.05  
PITTSBURGH, PA

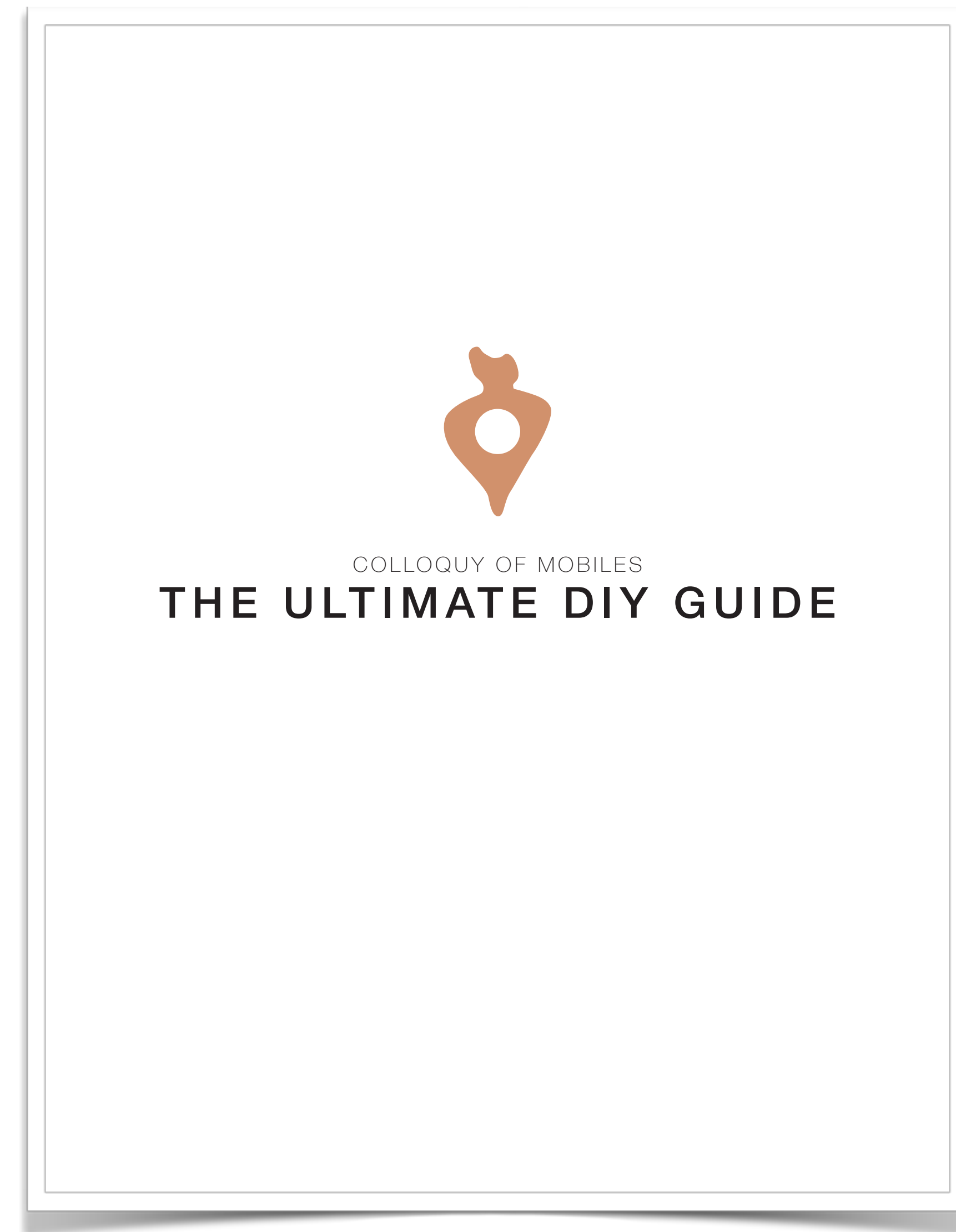


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**Student, Carnegie Mellon**

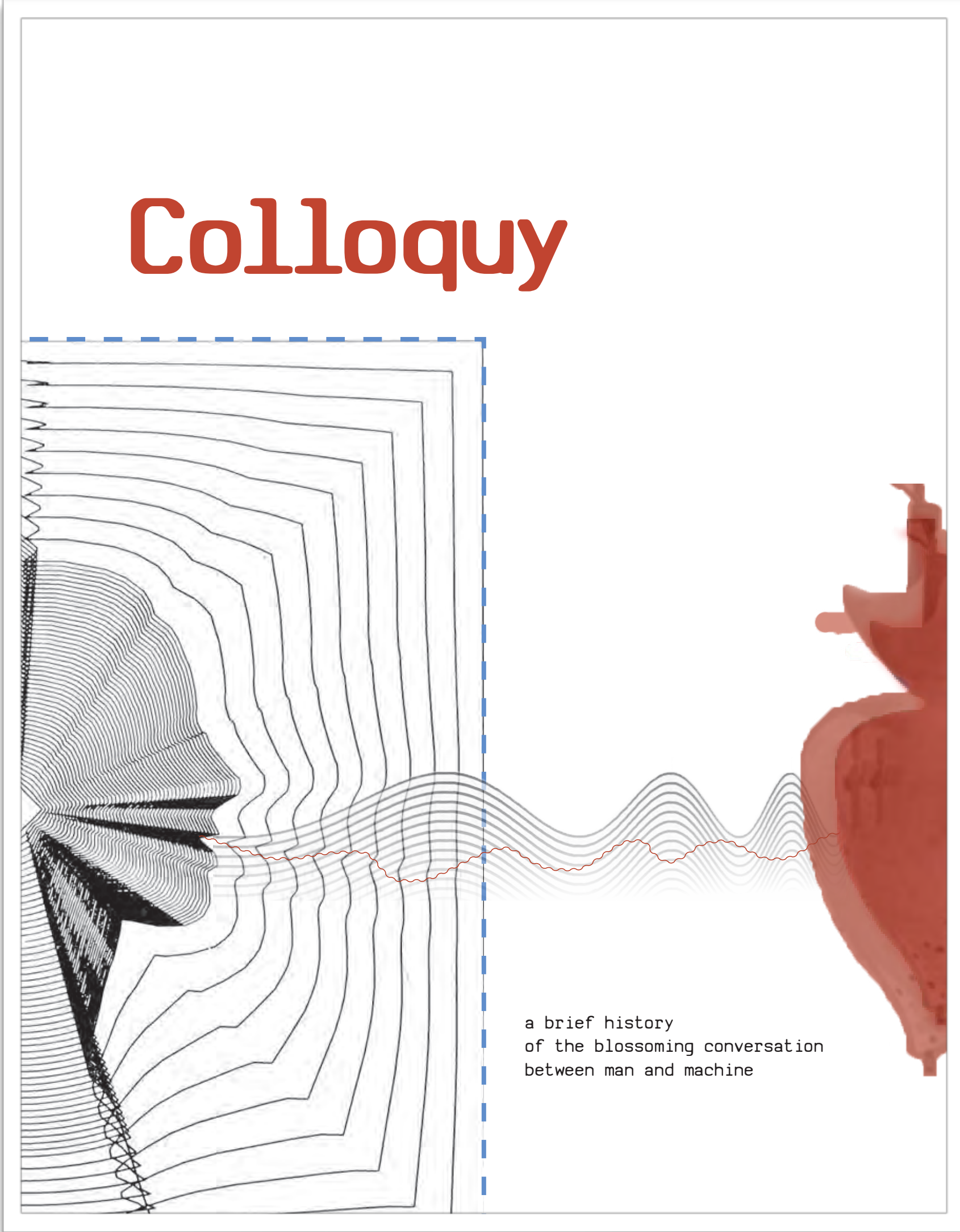
**Course in Document Design**  
**Karen Kornblum Berntsen, Faculty**  
**Human-Computer Interaction Institute**  
**Carnegie Mellon University**  
**2018**



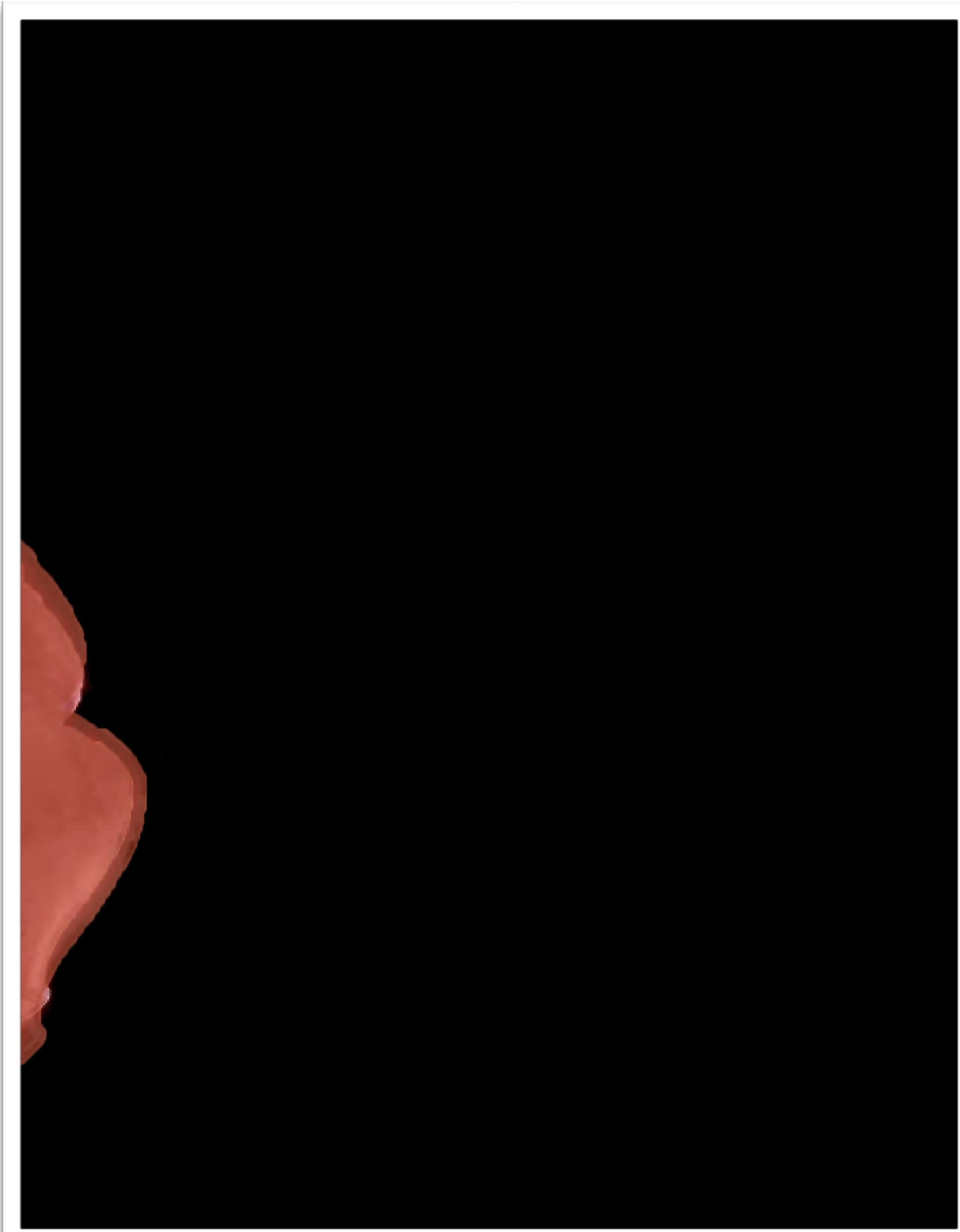


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Course in Document Design  
Karen Kornblum Berntsen, Faculty  
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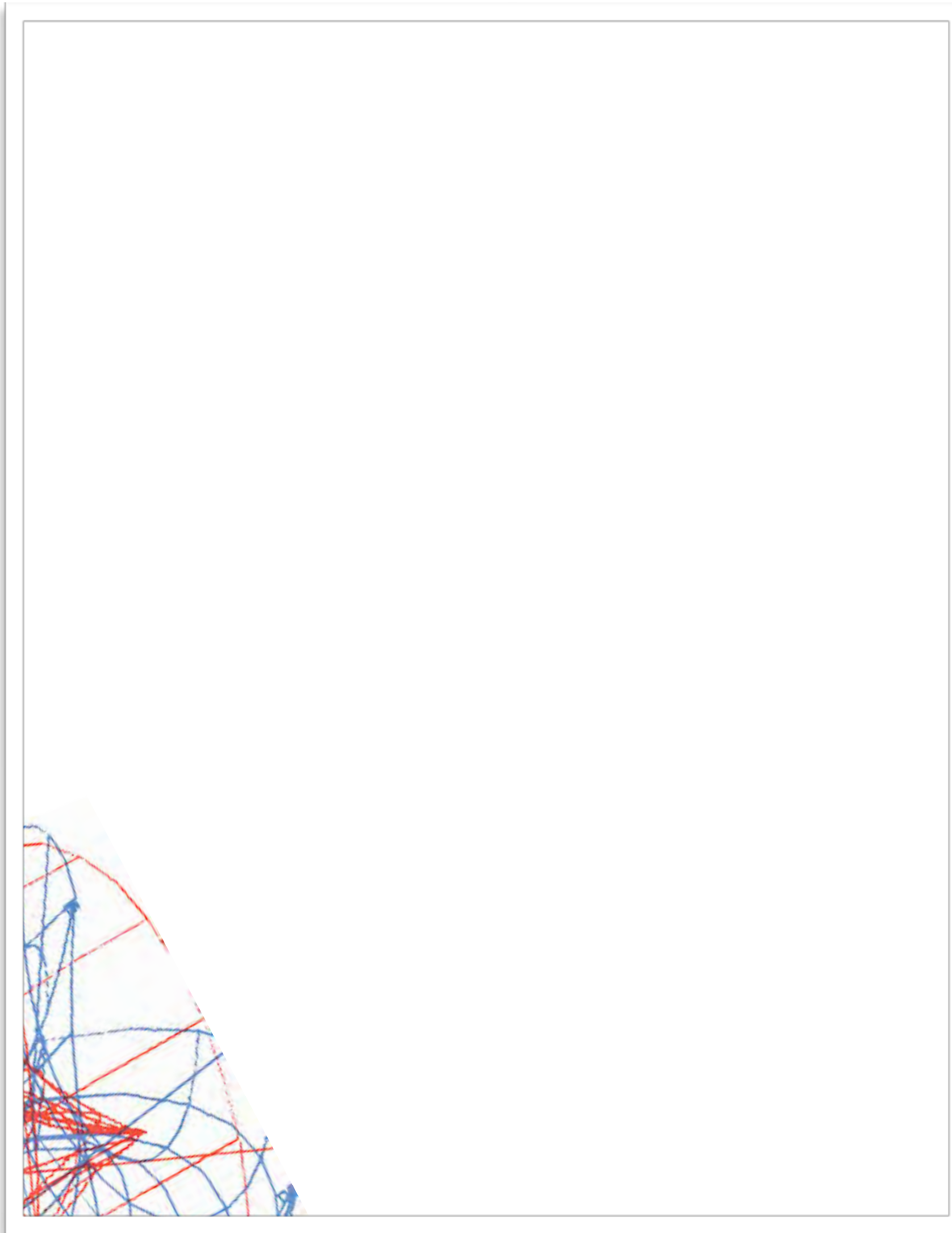
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1940s

# 1: Inception of Cybernetics

“ Messages between man and machines  
are destined to play an ever-increasing part in society. ”

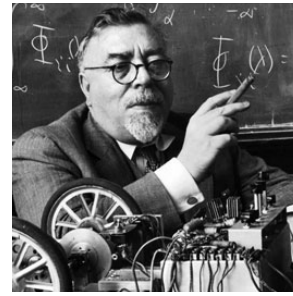
— NORBERT WIENER

**C**olloquy of Mobiles is rooted in cybernetic theory. In order to understand Colloquy, we must begin with a deep understanding of the origins of cybernetics. Cybernetics is defined as the science of communications and automatic control systems in both machines and living things. It is a concept that dates back many, many centuries. Cybernetics as a concept in society has been around at least since Plato used it to refer to government, thousands of years ago. However, the term cybernetics was lost for some time before it was reborn in the 1940s to define the a field of study regarding humans and machines. Let's take a look at the origins of this amazing and complex discipline so we can see how Colloquy came to be.

# Gaby Gayles

## Student, Carnegie Mellon

1940s



Norbert Wiener

### FOUNDING FATHERS

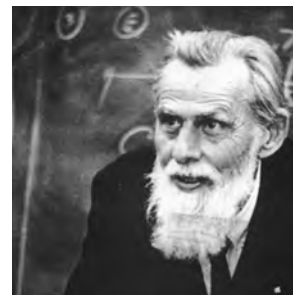
Generally speaking, cybernetics was born in 1948, when the American mathematician Norbert Wiener, the pioneer of modern cybernetics, published a book under that title. The name soon became a fashion in the West, where even science is an object of fashion.

Weiner became world famous from his work in cybernetics, but he was not the only important figure in the origin of the field. Warren Sturgis McCulloch was also a founding father. He was an American neurophysiologist and cybernetician, known for his work on the foundation for certain brain theories and his contribution to the cybernetics movement. He organized the Macy Meetings that founded the trans-disciplinary field of cybernetics.



Margaret Mead

Margaret Mead was a world-renowned scholar who revolutionized anthropology. She was also heavily involved in the founding of cybernetics. Heinz von Forrester was a physicist with a charismatic personality who was deeply involved as well. Von Forrester ran the renowned Biological Computer Lab in Urbana. He influenced generations of cyberneticians.



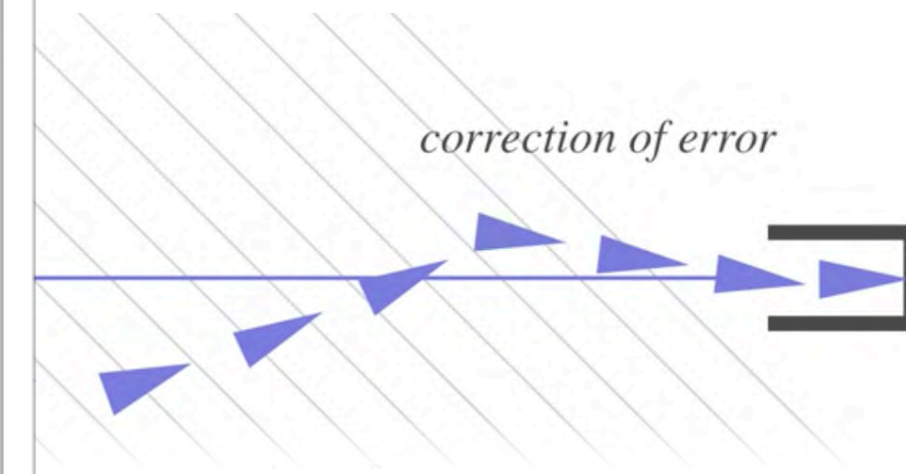
Warren McCulloch

### PREHISTORY OF MODERN CYBERNETICS

**A cultural obsession.** Humans have long obsessed about machines that could think and make decisions on their own. The idea of playing God and creating mechanical life predates the invention of the computer by many centuries. Early Jewish folklore recounted the tale of the golem, a shapeless clay figure brought to life by humans. The Greeks invented Hephaestus, the divine blacksmith, who created automata out of bronze. The Czech playwright Karel Čapek gave us R.U.R. (Rossum's Universal Robots), a story about a factory manufacturing artificial workers that popularised the word "robot" when it was staged in the US in 1920.



Heinz Von Forrester



**The art of steering.** Cybernetics is all about changing internal state to respond to external stimuli, as demonstrated by the above diagram.

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1950s

## 2: Rise of Gordon Pask

“Man is always aiming to achieve some goals  
and he is always looking for new goals.”

— GORDON PASK

**G**ordon Pask was an English author, inventor, educational theorist, cybernetician and psychologist. He had his own research approach before learning about the field of cybernetics. A second, generation cybernetician, Pask made significant contributions to the field during his lifetime. He rose to prominence in the 1950s after developing several conversational machines. Pask is best known for his development of a communication framework called Conversation Theory.

4 Colloquy

### EARLY CONVERSATIONS WITH MACHINES

Born 1928 in Derby, Pask studied Chemistry, Sciences and Psychology at Liverpool Technical College and the University of London. He was obsessed with the way humans and machines communicate, and developed a number of early works that explored this topic, garnering notable success.

**Musicolor.** Pask's first interactive machine was called Musicolor, developed in 1950s. An adaptive machine, Musicolor transformed music live into projected light and changed its behaviour when the music was too monotonous. Musicolor tracked the input of the performer based on its own evolving concept of novelty. The performer observed the lighting on the scrims and became engaged in a conversational loop that demanded the performer's novelty—otherwise Musicolor would stop reacting, shut down its lights, and get “bored”.

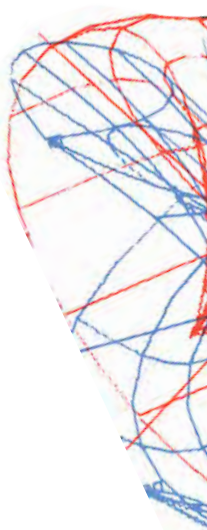
**Adaptive Teaching Machine.** The conversation architecture was the same as Musicolor. One loop applied feedback about actions, and the other applied feedback about goals. The control panel of the pupil machine had a knob to control internal awareness and a knob to control external awareness. Another knob controlled degree of obstinacy. Turning up this knob made the pupil machine less willing to learn.

### THE FOUNDATION FOR CONVERSATION THEORY

Building these early machines played a central role in the development of a conceptual framework that resulted in his major achievement: Conversation Theory. The fundamental idea of the theory was that learning occurs through conversations about a subject matter which serves to make knowledge explicit. Conversations can be conducted at a number of different levels. Conversation Theory would not have been possible without constructing Musicolor and the Adaptive Teaching Machine, which laid the foundation for this great intellectual achievement and Pask's lasting legacy.



**Teaching Machine** Gordon Pask programs his adaptive teaching machine in October of 1956.



The Rise of Gordon Pask 5

Gaby Gayles  
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1968

### 3: Cybernetic Serendipity

“Where in London could you take a hippy,  
a computer programmer,  
and a ten-year-old schoolboy,  
and guarantee that each  
would be perfectly happy for an hour  
without you having to lift a finger to entertain them?”

— THE EVENING STANDARD

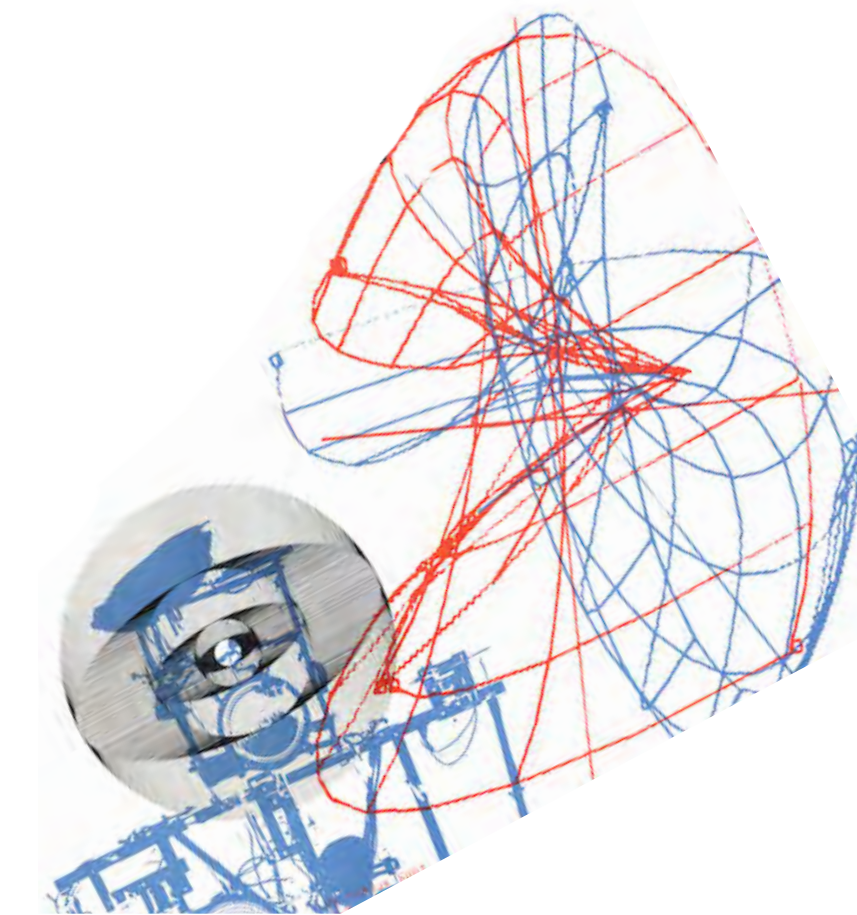
**C**ybernetic Serendipity was an exhibition of cybernetic art curated by Jasia Reichardt. The impact of the pioneering exhibition Cybernetic Serendipity at London's Institute of Contemporary Arts in 1968 should not be underestimated. It is still considered to be the benchmark computer art exhibition.

6 Colloquy

#### THE FIRST OF ITS KIND

Cybernetic Serendipity (CS) was the first comprehensive international exhibition in Britain devoted to exploring the relationship between new computing technology and the arts. There had been exhibitions of machines before, but CS was the first gallery show of its type. Uniquely in the UK in a gallery setting, it featured collaborations between artists and scientists, and showed these to be on an equal footing. The breaking down of barriers between disciplines was an important factor.

**A Part of the Counterculture.** CS was facilitated and inspired by a postwar spirit of optimism in the positive power of new technologies. A time of great upheaval, this period witnessed a variety of radical experiments that challenged societal and professional expectations, overturned traditional hierarchies, explored new media and materials, and formed alternative communities and new ways of living and working together. During this moment, artists, architects, and designers began a search for a new kind of utopia, whether technological, ecological, or political, and with it offered a critique of the existing society. Science and technology was seen as the engine of progress, a driving force for industrial innovation and incredible economic prosperity.

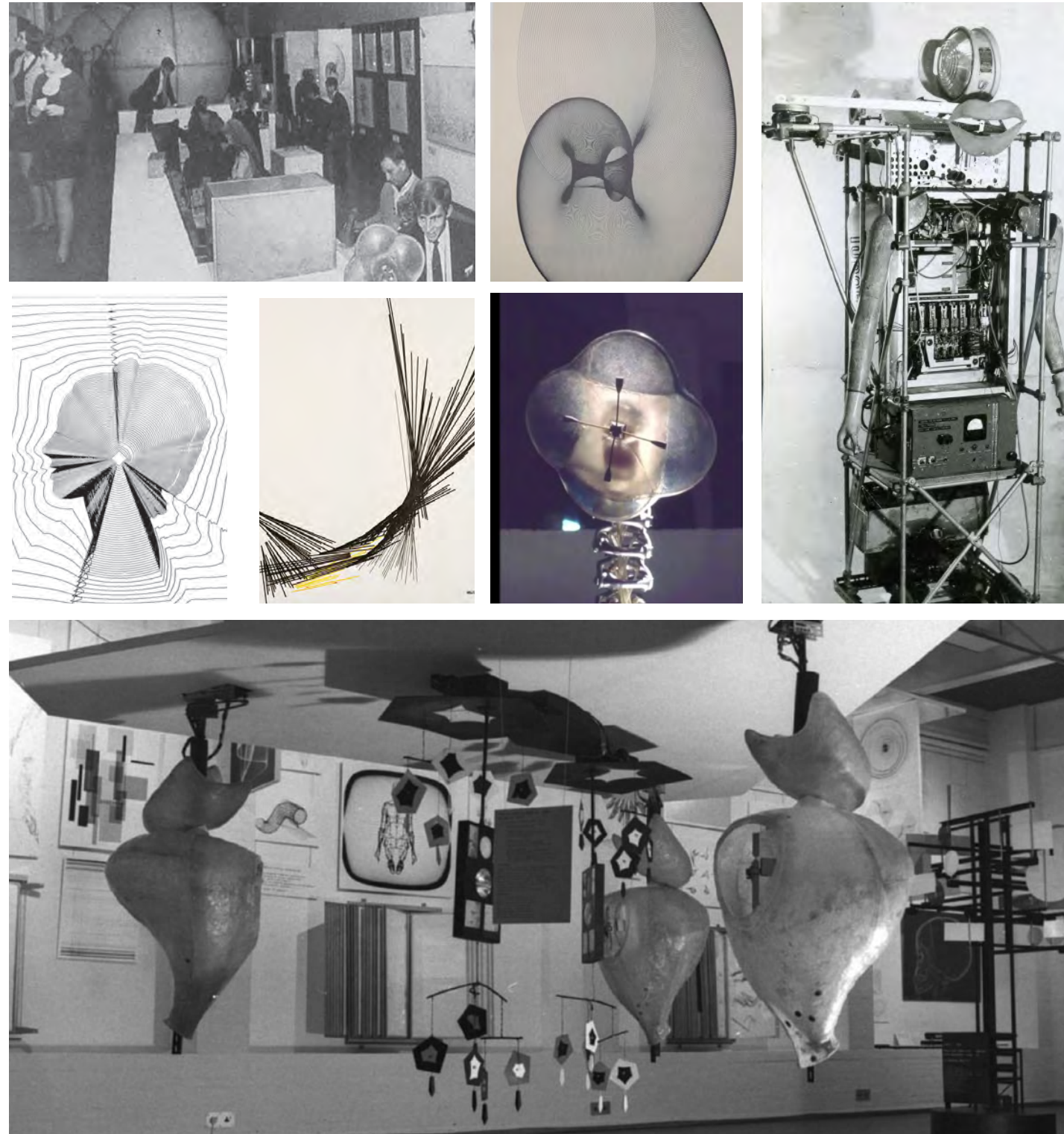


**An iconic image.** This original art was used on the 1968 posters advertising Cybernetic Serendipity.

Cybernetic Serendipity 7

Gaby Gayles  
Student, Carnegie Mellon

1968



**The many art pieces of Cybernetic Serendipity** *The was a huge variety of computer art at CS, but the most well-known was Gordon Pask's Colloquy of Mobiles, seen in the lower most photograph.*

8 Colloquy

**Merging of Art and Science.** The breaking down of barriers between disciplines was an important factor. Machines were shown alongside artworks and no differentiation was made between object, process, material or method, nor between the backgrounds of makers, whether art-school educated or not. One of the aims of CS was to show the scope of what was possible, emphasising the optimistic and celebratory nature of the project. It was made for all audiences, from children to hippies to computer scientists. Truly, this revolutionary exhibit was for everyone.

### COLLOQUY OF MOBILES

We now return to Gordon Pask. Pask's interactive cybernetic work Colloquy of Mobiles was exhibited at CS. This large-scale reactive and educable sculptural installation is now seen as a precursor to human-machine interaction. It was the most awe-inspiring and revolutionary piece of cybernetic art at the Exhibit. Frequently praised for its originality and influence, Pask's COLLOQUY is a precursor to practices of contemporary art and design, as well as a prescient vision of our future with machines that may choose to act on their own.

**Humans and Machines Converse.** Colloquy of Mobiles creates a human environment that contains conversational machines, a condition that is now part of everyday life. Colloquy allows gallery audiences to participate in immersive, real-time interactions that are surprising and provocative. The experience of moving among the mobiles of the installation and engaging them via sound, speech, body movements, and facial expressions, offers a rational as well as emotional sense of what it means to live among machines that converse.

**Courting of Machines.** Imagine walking into a gallery and seeing these larger-than-life mobiles hanging from the ceiling — they rotate, blink, squawk, and sometimes synchronize with each other, completely without human intervention. You walk among them, blocking their interactions, using a flashlight to attract their attention, wanting to get in on their conversation. Half the machines were male, and half were female. They were engaged in a courting process with each other. Each had drives they were trying to satisfy.

Cybernetic Serendipity 9

Gaby Gayles  
Student, Carnegie Mellon



female form

**Commenting on Gender Roles.** Pask explicitly explored gender stereotypes in appearances and behaviors. The male mobiles interact to compete and sometimes cooperate for the females' attention. A male's attention is represented by a bright light that may serendipitously hit the mirror inside a female and be reflected back to the same male—at which point they halt their random rotations and focus on each other. Get it? It is impossible not to see that the entire work exudes satirical commentary on the clichés of roles and behaviors. Yet Pask himself consistently interacted with all others as equals, no matter their occupation or gender. He was known for saying, "You guys—meaning gentleman guys and lady guys...", foreshadowing today's natural gender fluidity by half a century.



male form

## 4: Remaking History



“Machines are everywhere,  
and machines are talking to machines everywhere.”

— PAUL PANGARO

Indeed, Colloquy of Mobiles in 1968 was revolutionary for its time. Pask's immersive and semi-interactive installation was remarkably oracular in terms of modeling a human environment containing conversational machines — now such a quotidian part of life in developed countries that we rarely notice it. This incredible exhibit was replicated in 2018 by Design program at the College for Creative Studies in Detroit. Rebuilding this revolutionary exhibit was a revolution in itself, and it has new meaning in today's technology-filled society.



Gaby Gayles  
Student, Carnegie Mellon



2018

REPLICATING COLLOQUY 2018

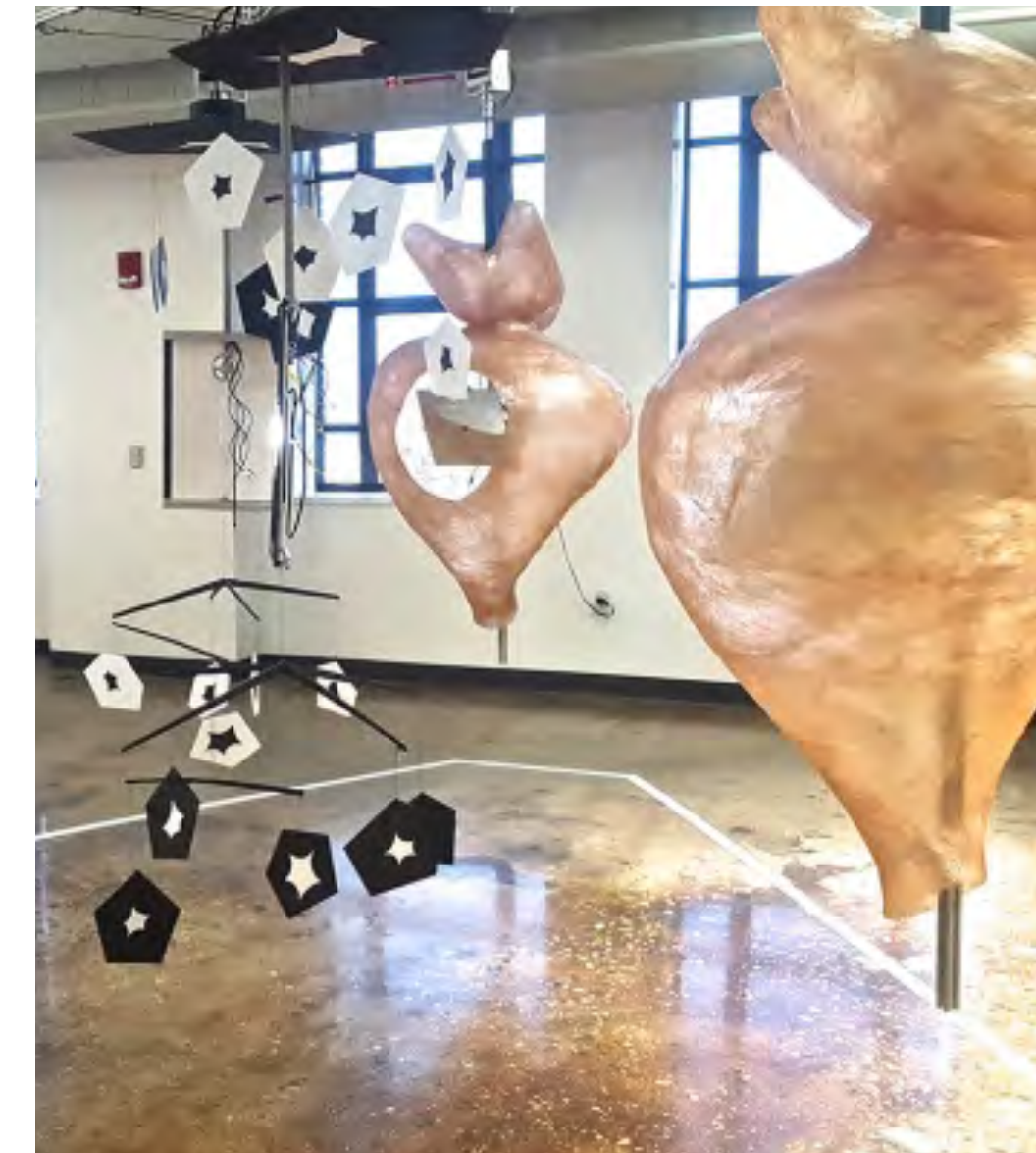
**How it began.** With the 50th anniversary of the Colloquy approaching and the ever-increasing conversation between humans and machines in today's society, Paul Pangaro, chair of MFA Interaction Design at College for Creative Studies in Detroit, decided it was time to replicate a full-scale version of Pask's seminal piece. It was replicated in conjunction with studio design courses in the Masters of Interaction Design program. While the physical form of the replica was as close as possible to the 1968 original, it was driven by modern digital software. The piece is the cumulative presentation of the MFA cohort in Interaction Design, under the direction of Associate Professor and Chair of MFA Interaction Design Paul Pangaro.

**Process.** CCS students have mined the historical materials on The Colloquy and built a repository of understanding to share with the world. Students in IxD Studio IV: Immersive Interactive Experiences created a detailed script of how the mobiles interact, a necessary step before coding the Colloquy's 1968 interactions. In IxD Studio II: IoT & Prototyping, students constructed a 1/6-scale model of the original (see images below). With student work as a foundation, our Master Fabricator TJ McLeish has specified dimensions, structure, and operation and has built the full-scale replica. This massive effort involves 3D CAD models of all the components, tech specs of motors and lights and electronics, and management of the fabrication and assembly of the whole installation.

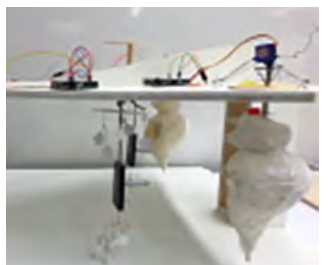
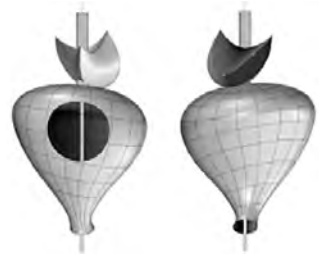
SIGNIFICANCE TODAY & TOMORROW

**Commentary on Ubiquitous Computing.** The playfully physical nature of Pask's forms in Colloquy 2018 powerfully draws the viewer's awareness to the now omnipresent conversation between machines and people. The experience of moving among the mobiles of the installation and engaging them via voice, body movements, and facial expressions will offer a rational as well as emotional sense of what it means to live among machines that converse. The project changes how we feel about going home to voice interfaces such as Siri and Alexa, Cortana and Google Home, and how we experience living among smart machines in the future.

**The persistence of gender roles.** While Pask's original work was meant to highlight gender stereotypes of the 1960s, his message remains pertinent today. In 2018, the sexual analogy is still just as incisive as ever, commenting on the rigid roles still males and females play in society.



Colloquy of Mobiles 2018 is on display at the Taubman Center at College for Creative Studies (460 West Baltimore, Detroit, Michigan) for the foreseeable — but ultimately unknowable — future.



**Making the Mobiles.** The mobiles were first rendered in a computer program before being constructed out of calyx, foam core, and finally fiberglass.



Gaby Gayles  
Student, Carnegie Mellon

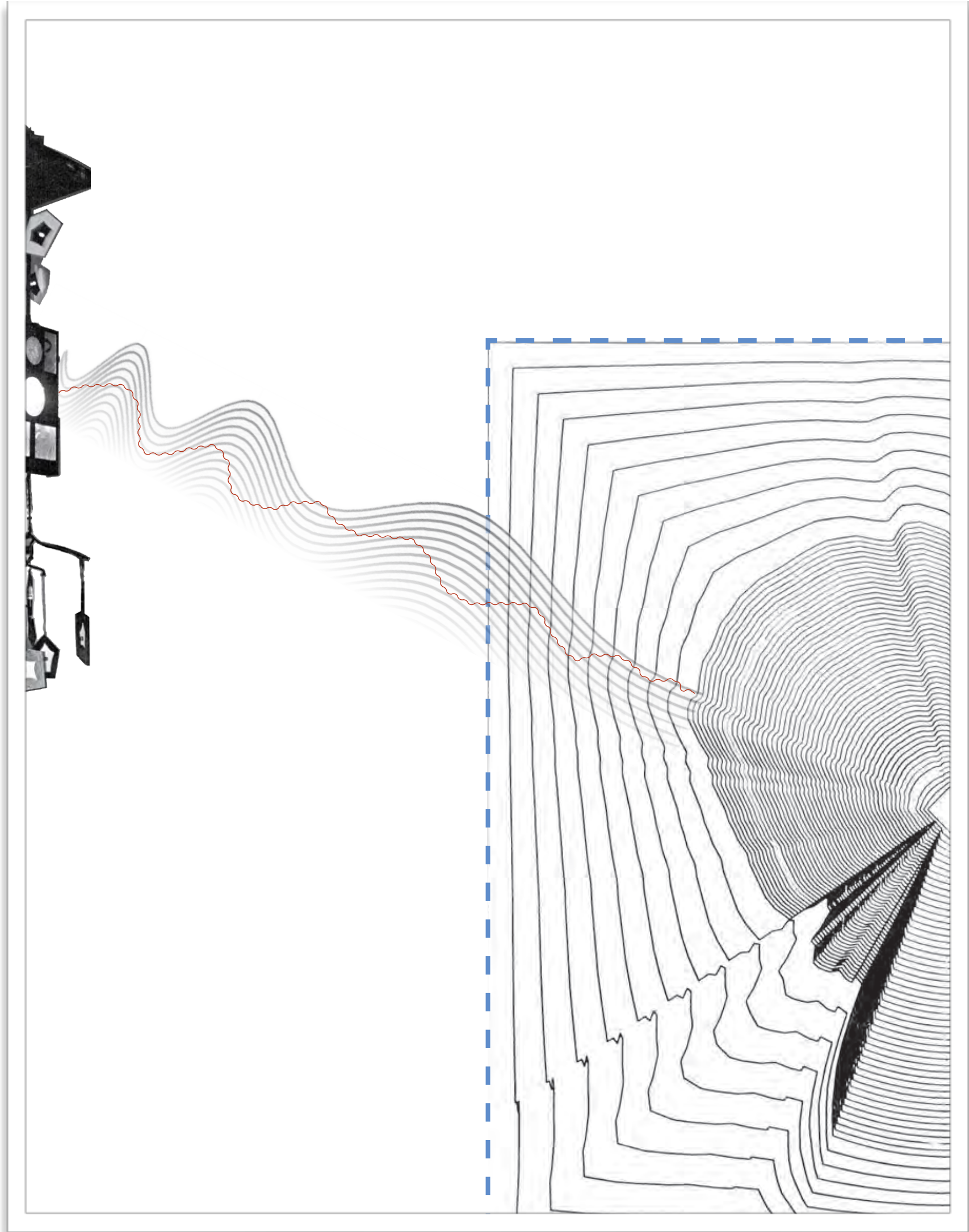


Colloquy

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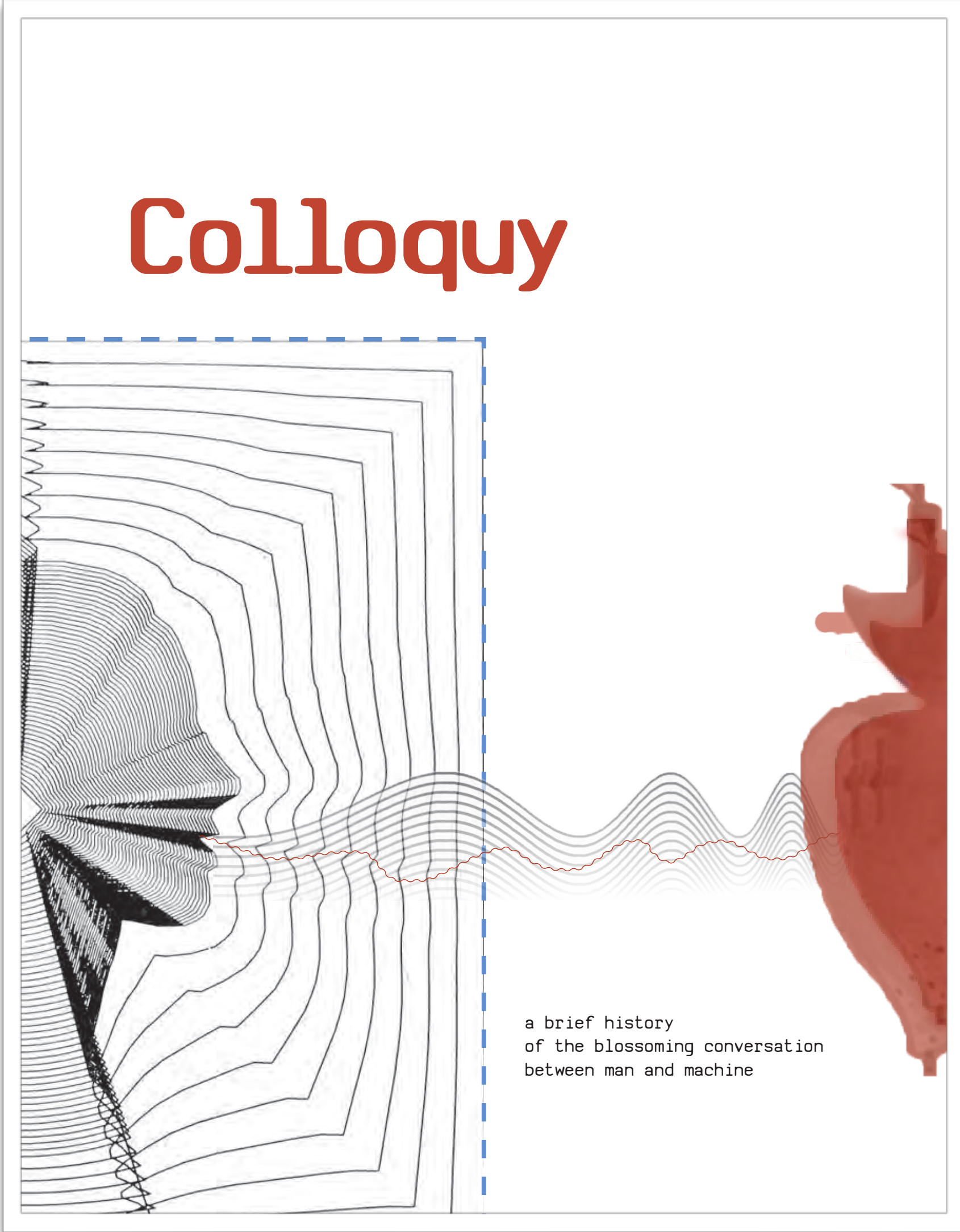


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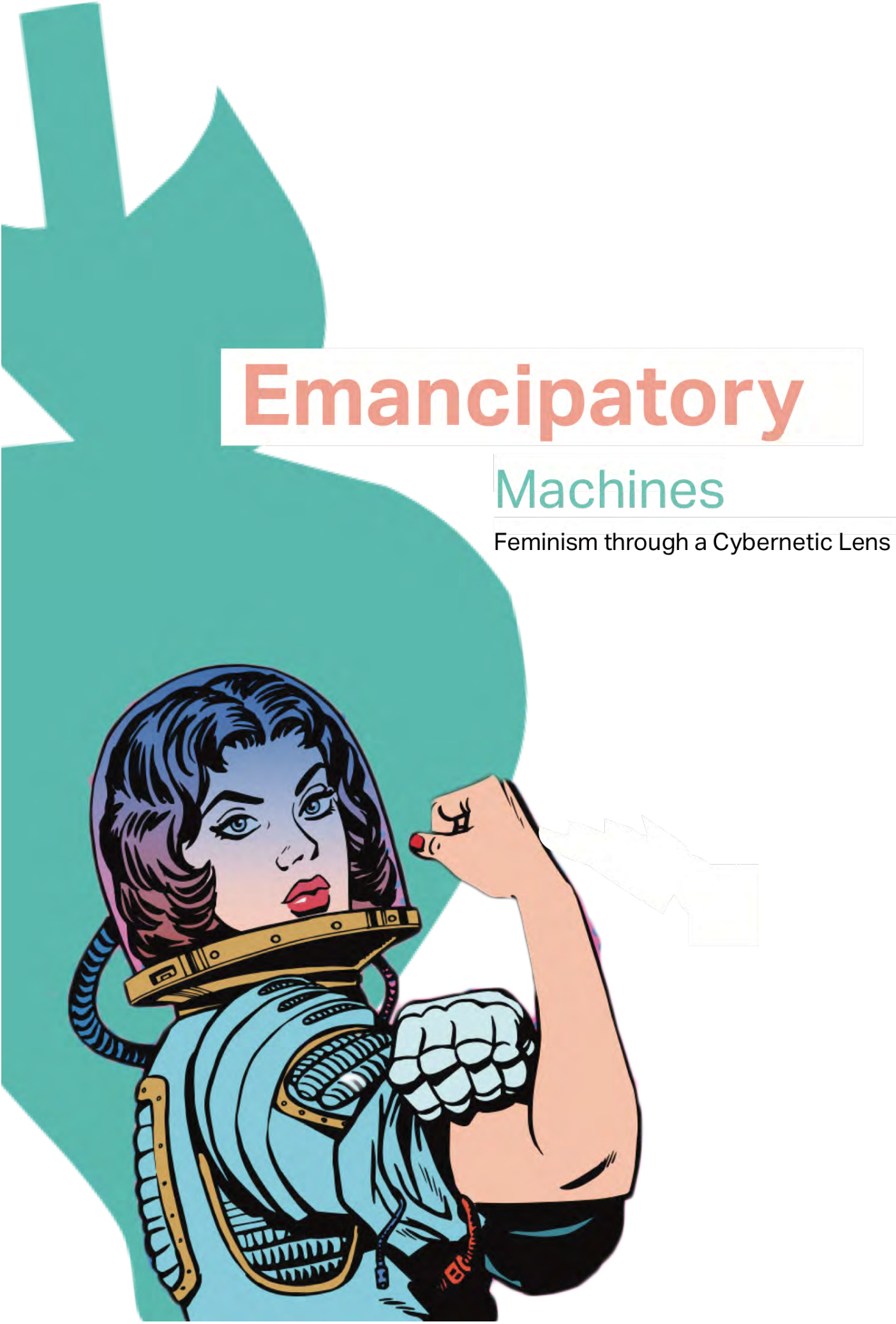
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Human-Computer Interaction Institute  
Carnegie Mellon University  
2018

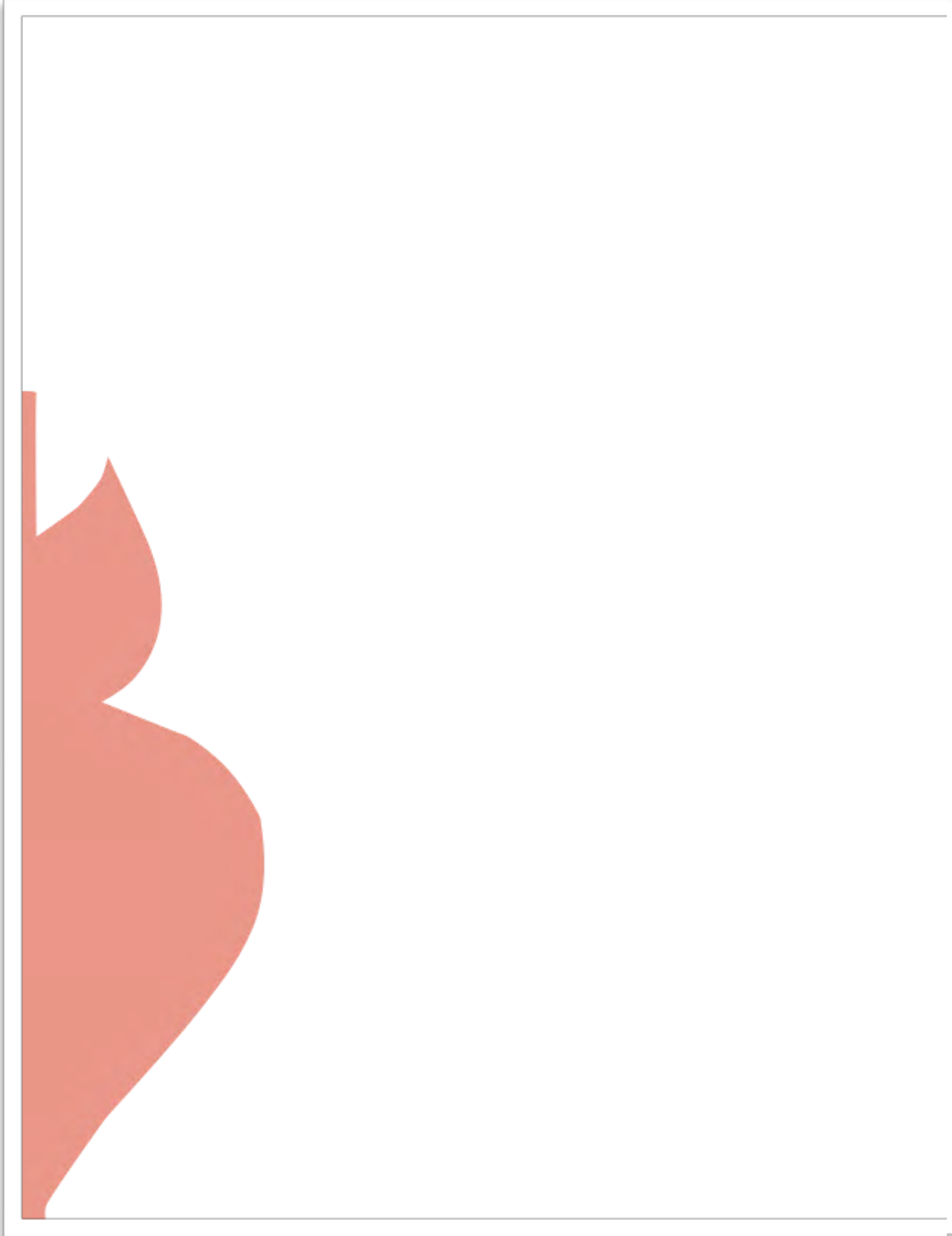


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2018



**Molly Vierhile**  
**Student, Carnegie Mellon**



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Molly Vierhile  
Student, Carnegie Mellon

# 1968

Feminist  
Counterculture



*Feminism was a collection of movements that interacted with many major political movements, one being the counterculture movement during the 1960s. The second wave of feminism began in the 1960s, which was during the time of the counterculture movement. Feminism involved establishing and defending equal political, economic, and social rights for women.*

Molly Vierhile  
Student, Carnegie Mellon



The 1960's quickly became known as an era of breaking boundaries through marches and protests.

Feminism was a collection of movements that interacted with many major political movements, one being the counterculture movement during the 1960s. The second wave of feminism began in the 1960s, which was during the time of the counterculture movement. Feminism involved establishing and defending equal political, economic, and social rights for women.

During the Vietnam War, many women who were active in the anti-war movements were "subsumed into a paradigm that suggests that, sometime in the late 1960s, women activists left the antiwar struggle for the new feminist cause...whose diverse constituent

A icon that quickly became the face of the feminist movement.



groups shared the idea of liberation from male authority." The variety of personal, organizational, and theoretical lessons learned from the anti-war movements profoundly influenced the visions and motivations of women to free themselves from the gender norms of society. "Feminists often thought of themselves as revolutionaries rejecting a fundamentally unequal and corrupt power establishment in favor of participatory democracy whereby all the voiceless and suppressed could gain a measure of control over their own lives." Male dominance being an evident part of society during the 1960s, feminism showed the women's way of diverting from the "normal" labels of men and women.

American women were limited in almost every aspect of their lives in opposition to men. They were expected to marry early and make a family, devoting their lives to homemaking. As wives, women would spend an average of about 55 hours

“The Sixties were an explosion of **puerile irresponsibility** and fashionable rebellion, the wellspring of today's **ubiquitous identity politics**, debased **high culture**, **sexual permissiveness** and censorious **political correctness**.”

— Bruce Bawer, Author

per week on domestic chores. Men had full advantage over the marriage while women had no rights. Women were fully subject to their husbands by a system called "head and master laws," where women had no legal rights to any of the husband's earnings. The 38 percent of American women who worked in 1960 were largely limited to jobs as teacher, nurse, or secretary.

Radical women sought to construct community institutions based on democratic participation during the counterculture. Not only did Betty Friedan influence women to dismantle the prevailing system, she also moved women to participate on a public and political level. A variety of other issues including reproductive and sexuality rights these women faced brought about a series of marches and protests where women publicized the need for radical change from gender discrimination.

The second wave of feminism which began during the counterculture movement continued on until the 1990s, encouraging women to believe that political issues were their personal issues as well. Betty Friedan, a leading figure during the feminist movement, published a book named "The Feminine Mystique." In this book, she captured the frustration and despair that college educated housewives feel. Friedan shocked the nation as she contradicted the accepted wisdom of women being content in the work at home. Overall, the feminist movement influenced American society by encouraging women to challenge the gender norms of society and unite to fight for their independent rights for women.



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# 1968

## Cybernetic Commentary

*The English cyberneticist Gordon Pask conceived the "Colloquy of Mobiles" for the 1968 exhibition "Cybernetic Serendipity" held at the ICA in London. It was a reactive, educable, computer-based system composed of five mobiles. Pask designed the "Colloquy of Mobiles" as a social system. At the same time, the form of communication that he conceived referred unmistakably to a sexual analogy: hung from the ceiling were two "males" and three "females".*



“Pask’s installation challenged the **social system** that existed in 1968, where **men and women** didn’t have **equal rights.**”  
—Rutuja Jog, MFA Student

### Cybernetics and Counterculture


Cybernetics connected with counterculture on several levels. Perhaps the most obvious was an interest in the brain and the mind, which led to experiments in the effects of strobes and bio-feedback. At another level, cybernetics was, as Pickering notes, simply “odd”—with its chemical and biological computers, synthetic brains, and interactive art pieces—developed largely outside traditional academic and corporate sponsorship, on an “amateur” basis in their practitioner’s free time. Yet, at a more fundamental level, cybernetics also questioned basic assumptions about how we organize the world. As Pickering notes, cybernetics challenged conventional dualism with experiments that “threaten the modern boundary between mind and matter, creating a breach in which engineering, say, can spill over into psychology, and vice versa.” Pickering further argues

an alternative that is holistic and “revealing” in its stance—a stance that is “open to possibility.” Turner notes, “Brand came to appreciate cybernetics as an intellectual framework and as a social practice; he associated both with alternative forms of communal organization.” Brand traveled between—and connected—several communities: cybernetics, computing, and, of course, counterculture.


Cybernetics became popular just as computers were beginning to be used to make images. Two exhibits featured related work. First Cybernetic Serendipity: The Computer and the Arts at the ICA in London in 1968 included Pask’s Colloquy of Mobiles as well as Beer’s stochastic analog machine (SAM), and a few months later The Machine as Seen at the End of the Mechanical Age at MoMA in New York featured works from Experiments in Art and Technology (E.A.T.), including a piece by Jeff Raskin.

Molly Vierhile  
Student, Carnegie Mellon

6 EMANCIPATORY MACHINES



Left: A male figure is composed of lights and mirrors to activate a female's drive. Right: A female colloquy model from 1968 is molded after women's natural curves.



### Theory and Praxis

With its systems-based approach, cybernetics integrated context and relationships, pushing design beyond its object-based approach. The original cybernetic frame of systems and goals and then the second-order cybernetic frame of subjectivity and conversation give rise to a view of design as concerned with much more than the form of objects. Pask noted, "a building cannot be viewed simply in isolation. It is only meaningful as a human environment. It perpetually interacts with its inhabitants, on the one hand serving them and on the other hand controlling their behavior. 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." What Pask said about architecture also applies to design for human-computer interaction. A software program interacts with its "users," serving them and yet also constraining their behavior. Software, too, only makes sense when framed as part of larger systems that include humans. These larger systems are what interaction designers design.

7

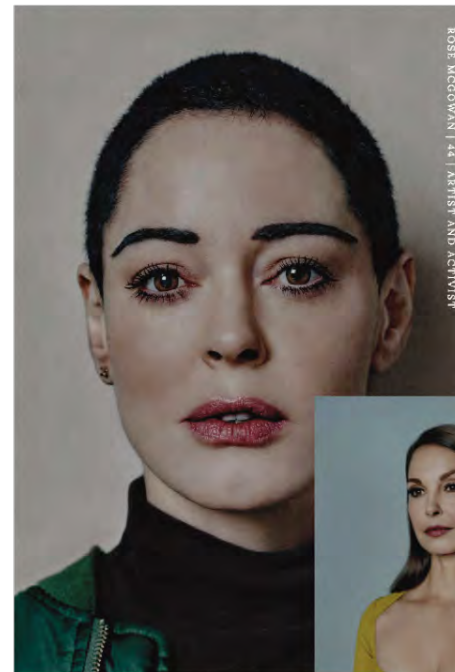
# 2018

## Toxic Masculinity



Like the "problem that has no name," the disquieting malaise of frustration and repression among postwar wives and homemakers identified by Betty Friedan more than 50 years ago, this moment is born of a very real and potent sense of unrest. Yet it doesn't have a leader, or a single unifying tenet. The hashtag #MeToo, which to date has provided an umbrella of solidarity for millions of people to come forward with their stories, is part of the picture, but not all of it.

Molly Vierhile  
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ROSE MCGOWAN | ARTIST AND ACTIVIST



PHOTO: JEFF FORD/GETTY IMAGES

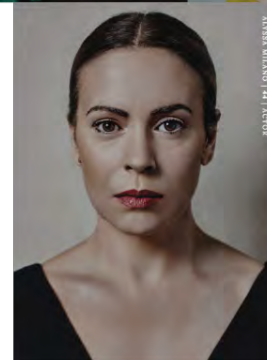


PHOTO: JEFF FORD/GETTY IMAGES

McGowan (top left), Judd, & Milano: 3 actresses who bravely sparked the #MeToo movement in Hollywood after speaking out against misogynistic producer Harvey Weinstein.

“We’re *running out of time.*  
I don’t have time to *play nice.*”

— Rose McGowan, Artist & Activist

Silence Broken

This reckoning appears to have sprung up overnight. But it has actually been simmering for years, decades, centuries. Women have had it with bosses and co-workers who not only cross boundaries but don’t even seem to know that boundaries exist. They’ve had it with the fear of retaliation, of being blackballed, of being fired from a job they can’t afford to lose. They’ve had it with the code of going along to get along. They’ve had it with men who use their power to take what they want from women. These silence breakers have started a revolution of refusal, gathering strength by the day, and in the past two months alone, their collective anger has spurred immediate and shocking results: nearly every day, CEOs have been fired, moguls toppled, icons disgraced. In some cases, criminal charges have been brought.

Emboldened by Judd, Rose McGowan and a host of other prominent accusers, women everywhere have begun to speak out about the inappropriate, abusive and in some cases illegal behavior they’ve faced. When multiple harassment claims bring down a charmer like former Today show host Matt Lauer, women who thought they had no recourse see a new, wide-open door. When a movie star says #MeToo, it becomes easier to believe the cook who’s been quietly enduring for years.

The women and men who have broken their silence span all races, all income classes, all occupations and virtually all corners of the globe. They might labor in California fields, or behind the front desk at New York City’s regal Plaza Hotel, or in the European Parliament. They’re part of a movement that has no formal name. But now they have a voice.



Above: protestors participate in the Women's March on Washington, 2017.

“I always thought maybe things could change for my *daughter.*  
I never thought things could change for *me.*”

— Megyn Kelly, Journalist

This was the great unleashing that turned the #MeToo hashtag into a rallying cry. The phrase was first used more than a decade ago by social activist Tarana Burke as part of her work building solidarity among young survivors of harassment and assault. A friend of the actor Alyssa Milano sent her a screenshot of the phrase, and Milano, almost on a whim, tweeted it out on Oct. 15. “If you’ve been sexually harassed or assaulted write ‘me too’ as a reply to this tweet,” she wrote, and then went to sleep. She woke up the next day to find that more than 30,000 people had used #MeToo. Milano burst into tears.

Women were no longer alone. “There’s something really empowering about standing up for what’s right,” says Fowler, who has grown comfortable with her new reputation as a whistle-blower. “It’s a badge of honor.”

Discussions of sexual harassment in polite company tend to rely on euphemisms: harassment becomes “inappropriate behavior,” assault becomes “misconduct,” rape becomes “abuse.” We’re accustomed to hearing those softened words, which downplay the pain of the experience. That’s one of the reasons why the Access Hollywood tape that surfaced in October 2016 was such a jolt. The language used by the man who would become America’s 45th President, captured on a 2005 recording, was, by any standard, vulgar. He didn’t just say that he’d made a pass; he “moved on her like a bitch.” He didn’t just talk about fondling women; he bragged that he could “grab ‘em by the pussy.”

Molly Vierhile  
Student, Carnegie Mellon



So it was not entirely surprising that 2017 began with women donning “pussy hats” and marching on the nation’s capital in a show of unity and fury. What was startling was the size of the protest. It was one of the largest in U.S. history and spawned satellite marches in all 50 states and more than 50 other countries.

Barely two months later, Fox News cut ties with Bill O’Reilly after the New York Times reported that he and the company had spent \$13 million to settle claims against him from five women. Wendy Walsh, a psychologist and former guest on the network, was one of the first women to share her story about the star anchor—but she was initially reluctant to go on the record. “I was afraid for my kids, I was afraid of the retaliation,” she says. “I know what men can do when they’re angry.”

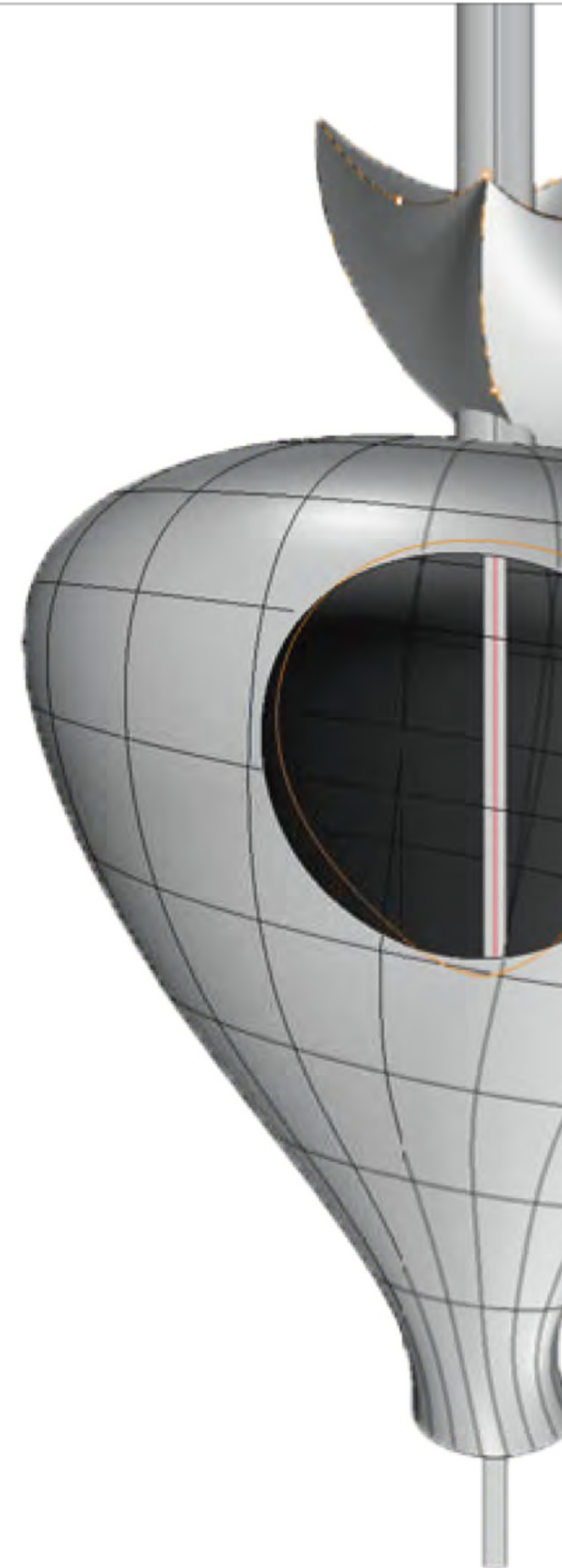
Eventually she allowed her name to be used. “I felt it was my duty,” Walsh says, “as a mother of daughters, as an act of love for women everywhere and the women who are silenced, to be brave.”

The downfall of O’Reilly, who has denied all allegations of harassment, would prove to be just the beginning of the reckoning in media and entertainment. In June, Bill Cosby was brought to trial on charges that he had drugged and sexually assaulted a woman named Andrea Constand, one of nearly 50 women who have accused Cosby of sexual assault over several decades. Although the case ended in a mistrial—it is scheduled to be retried in April—the fact that it happened at all signaled a shift in the culture, a willingness to hold even beloved and powerful men accountable for past misdeeds.

# 2018

## Colloquy Reimagined

*Despite massive changes in everyday living—sensors everywhere, voice interactions, and artificial intelligence inside of every social network and internet commerce platform—there has been little public debate about the societal and ethical questions presented to designers of these systems. Colloquy 2018 will provoke designers of software, devices, products, and services, across a wide spectrum of industries impacting all aspects of our daily life, to imagine and to debate the opportunities and challenges of pervasive, conversational machines.*



Molly Vierhile  
Student, Carnegie Mellon



Female forms in Colloquy 2018 embody Pask's principles defined in the original exhibition.

### Colloquy Reimagined

Whether operating in its original 1968 mode or an updated 2018 mode, we want Colloquy to allow gallery audiences to participate in immersive, real-time interactions that are surprising and provocative—in Pask's phrasing, to experience "an aesthetically potent environment". In 2018 the experience of moving among the mobiles of the installation and engaging them via sound, speech, body movements, and facial expressions—hypothetically using enhanced 2018 technology—would offer a rational as well as emotional sense of what it means to live among machines that converse. We want the Colloquy 2018 Project to change how we feel about going home to voice interfaces such as Siri and Alexa, and how we experience living among smart machines.

“This installation depicts the situation where a man and a woman would

The mobiles consist of independent, life-sized sculptural figures (so-called "male" and "female") that move and interact with each other, and with the public, through light and sound. The female forms, in particular, are deeply compelling—their shapes likened to everything from sea creatures to the human heart. This organic quality hints at the educational value of Colloquy in the present day, one suffused with smart environments, which was not the case 50 years ago.

The biggest challenge to remaking Pask's Colloquy of Mobiles is the fabrication of the so-called "female mobiles." Three large translucent forms, nearly 5 feet high, are extraordinary and other-worldly. They rotate and glow and react to other mobiles and to the humans moving among them with light and sound.

accomplish their goals through an equilibrium of **independence and interdependence.**"  
- Rutuja Jog, MFA Student



Master fabricator T.J. McLeish poses in front of his creation: Colloquy 2018.

Equally remarkable is the rich career of their designer, Yolanda Sonnabend, who worked at the Royal Ballet in London for over 30 years. Her stage designs for the director and choreographer of the Royal Ballet involved "his more abstract" works. How fitting that she would work with Gordon Pask on the visual design of the Colloquy—for choreography it surely is. Sonnabend once said, "Design is visualization of emotions." Her female mobiles exude emotion, for they are voluptuous, outrageous, fantastical. The male mobiles designed by Pask are complementary and equally fantastical. I wish we could overhear the conversations between Pask (world-class scientist, artist) and Sonnabend (world-class stage designer, painter).

In their design collaboration on Colloquy 50 years ago, Sonnabend and Pask explicitly explored gender stereotypes in appearances and behaviors. The male mobiles interact to

compete and sometimes cooperate for the females' attention. A male's attention is represented by a bright light that may serendipitously hit the mirror inside a female and be reflected back to the same male—at which point they halt their random rotations and focus on each other. Get it? It is impossible not to see that the entire work exudes satirical commentary on the clichés of roles and behaviors. Yet Pask himself consistently interacted with all others as equals, no matter their occupation or gender. He was known for saying, "bu guys—meaning gentleman guys and lady guys..."—foreshadowing today's natural gender fluidity by half a century.

Molly Vierhile  
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Course in Document Design  
Karen Kornblum Berntsen, Faculty  
Human-Computer Interaction Institute  
Carnegie Mellon University  
2018

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*what's the greatest lesson a woman should learn?*

that since day one, she's already had everything  
she needs within herself. it's the world that  
convinced her she did not.

- rupi kaur

**Typefaces**

Aktiv Grotesk, designed by Dalton Maag Ltd.

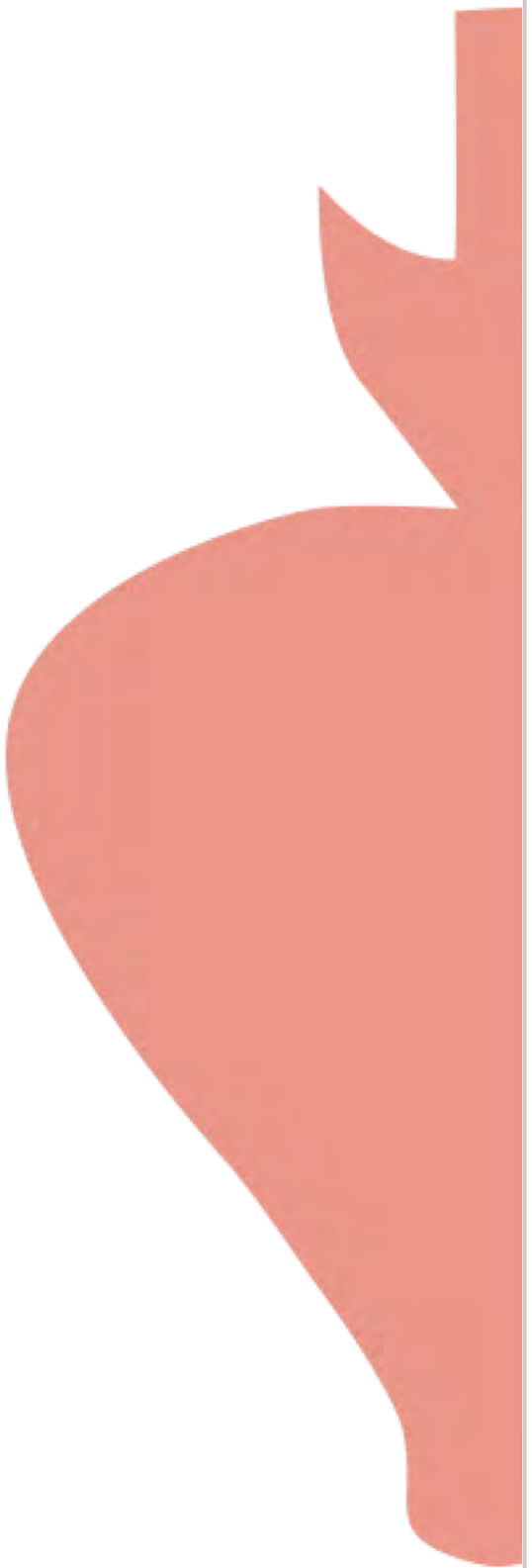
**Printing**

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December 5, 2018

Handset paper

1 copy



# Less Interference / More Dance!

## Why does conversation matter?

- ***to act together, we must reach agreement***
- ***to reach agreement, we must have an exchange***
- ***to hold an exchange, we must have shared language.***

To cooperate and collaborate requires conversation.



# What may follow from conversation?

- *shared history*
- *relationship*
- *trust*
- *respect*
- *unity.*

All these require conversation.

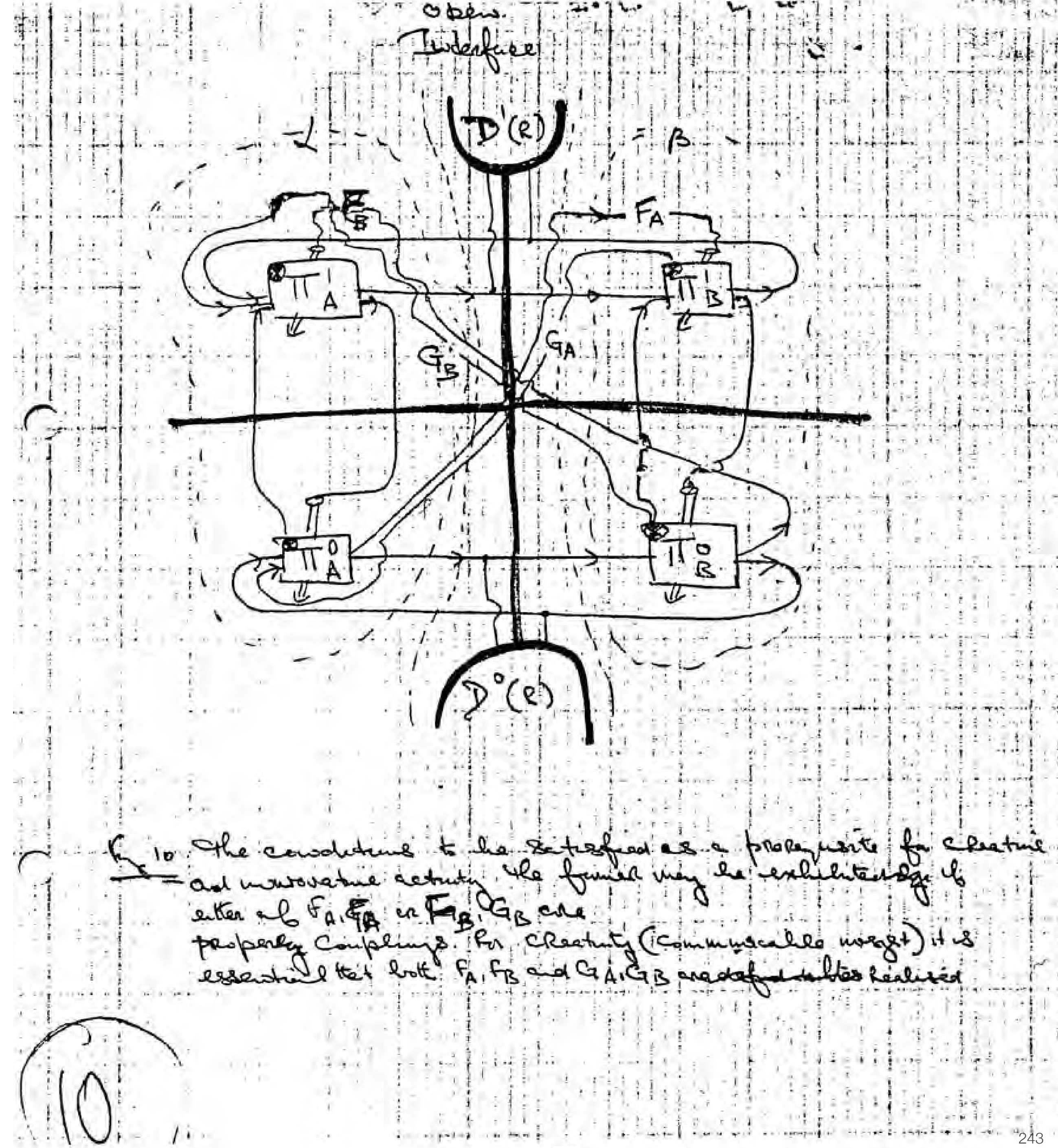
# What does conversation enable?

- ***community***
- ***commerce***
- ***culture***
- ***government***
- ***society.***

All these **demand** conversation.

# Dance of Shared Creativity

**Fig 10. The conditions to be satisfied as a prerequisite for creative and innovative activity. The former may be exhibited if either of  $F_a$ ,  $G_a$  or  $F_b$ ,  $G_b$  are proper couplings. For creativity (communicable insight) it is essential that both  $F_a$ ,  $G_a$  and  $F_b$ ,  $G_b$  are realised**



# Less Interference / More Dance!

Alexa, define a “**good conversation**”?

- *stays sensitive to your context & language*
- *engages you — keeps continuity in the exchange*
- *leads to agreements — even agreements-to-disagree*
- *enables coordination — acting together with others.*

Alexa, why can't AI + today's “Conversation Interfaces” do these things?

Cortana, define a “**great conversation**”?

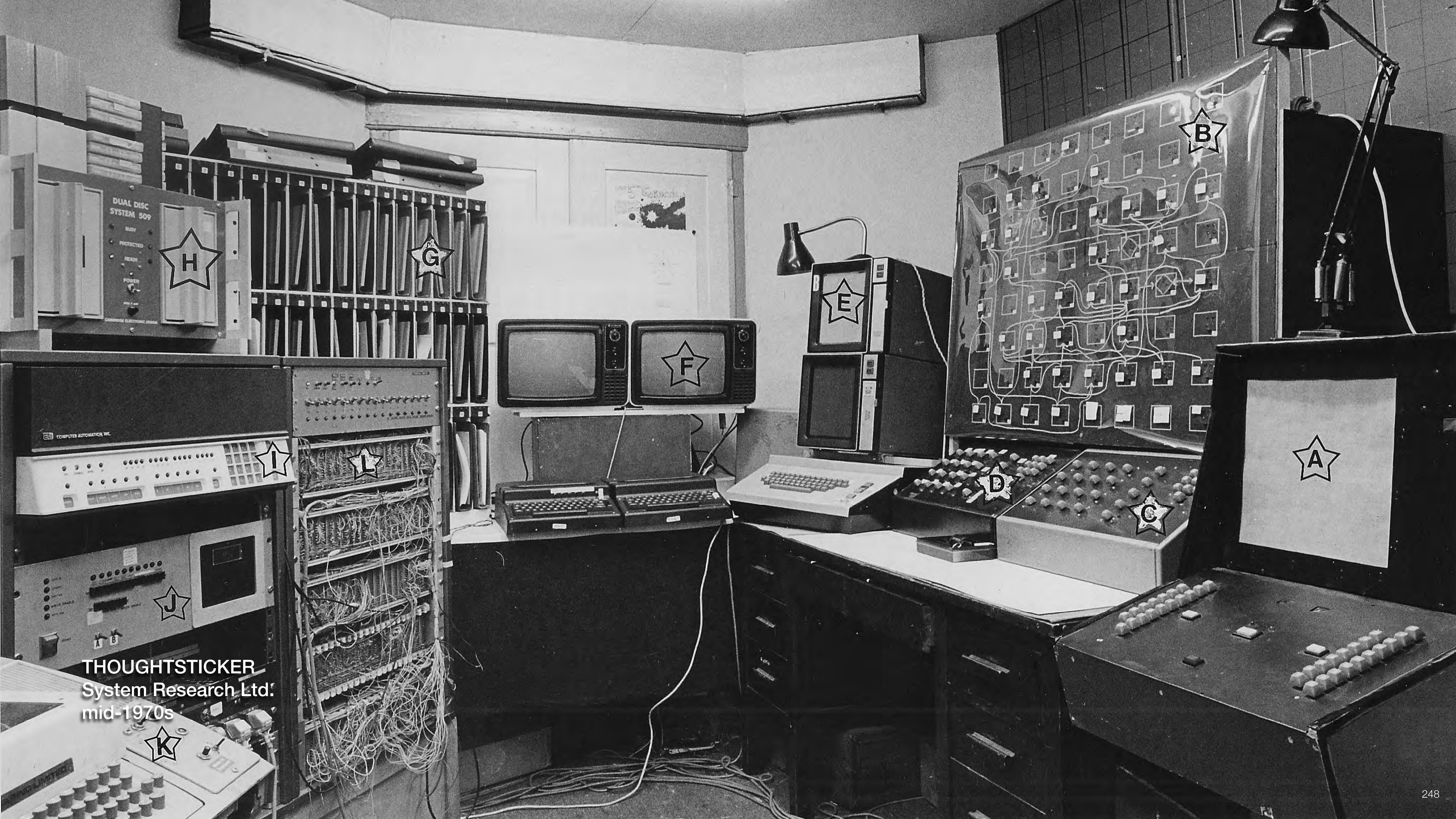
- *tells you things you enjoy learning – delights you*
- *is surprising – energizes you*
- *goes places you didn't expect to go – is generative*
- *evolves in ways you couldn't evolve on your own.*

Cortana, why can't AI + today's “Conversation Interfaces” do these things?

## Siri, what makes a “*great conversational partner*”?

- *asks great questions*
- *offers different ways to achieve your goal*
- *collaborates with you to define new goals*
- *helps you to be what you want to be... or **to become.***

Siri, will Conversational Interfaces become great conversational partners?



THOUGHTSTICKER  
System Research Ltd.  
mid-1970s



# Gordon Pask

*Musicolour*

*S.A.K.I.*

*Eucrates*

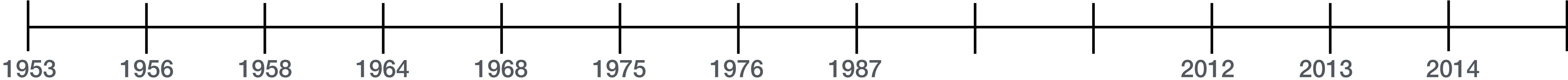
*Cybernetic Theatre*



*Colloquy of Mobiles*

*Thoughtsticker*

*Architecture Machine*



*Thoughtsticker*

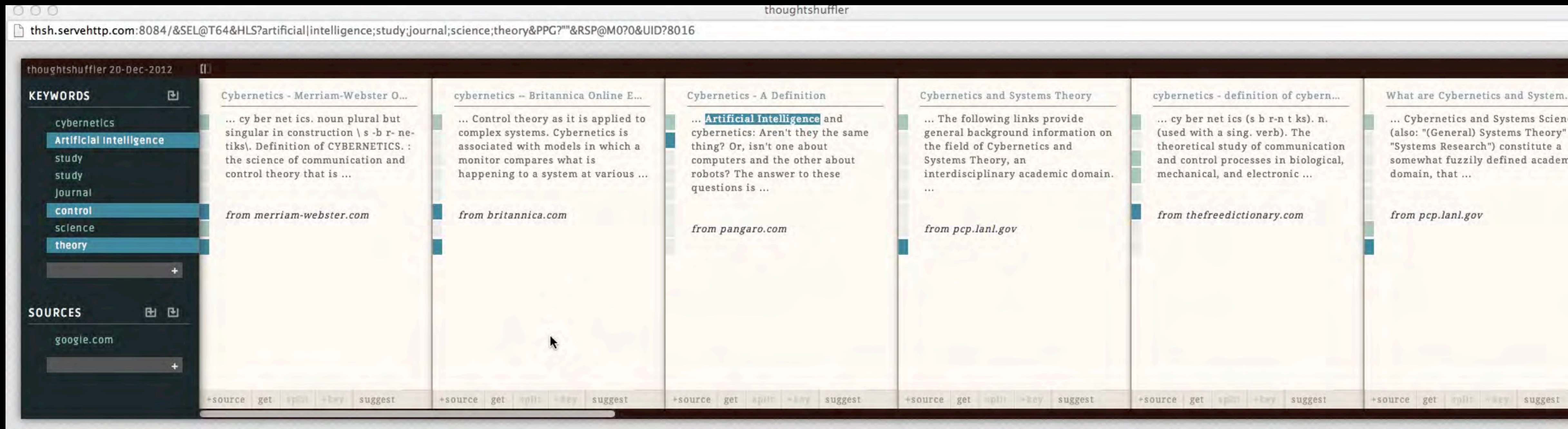
*ThoughtShuffler*

*thoughtshuffler iOS*

*Streamfully*

<p style="text-align: center;"><b>Tutorial</b></p> <p>This is a tutorial to help you become familiar with Zmacs. The tutorial software is called THOUGHTSTICKER and has been developed by PANGARO Incorporated.</p>	<p><b>Associated Topics:</b></p> <p>HELP PANGARO THOUGHTSTICKER <b>Tutorial</b> Zmacs</p>
<p style="text-align: center;"><b>User Serialist in Explore Mode</b></p> <p style="text-align: right;">Next More ( 1/2 ) Which?</p> <p style="text-align: right;">Back Jump List Other</p>	

Thoughtsticker  
Ph.D. Dissertation  
Paul Pangaro  
1987



ThoughtShuffler  
UI design and coding by Jeremy Scott Diamond  
UX & heuristics by Paul Pangaro  
2012



+chrysler building +mural +Edward Trumbull

Terms	Count
chrysler building	25
mural	16
Edward Trumbull	
ADD TERM...	

SUGGEST MORE... or OTHERS

Sources	Count
pinterest.com	4
google.com	70
ADD SOURCE...	
TRY gonyc.about.com	6
allposters.com	3
designyourwall.com	1
popartuk.com	3
tripadvisor.com	5
wikipedia.org	3

SUGGEST MORE...

### Chrysler Building, 1 Sheet Mini-Mural By Henri Silberman Wall



New York Photography Mini Wall **Mural** (1 Sheet): The **Chrysler building** is one of the most infamous landmarks in New York and now you can turn it into a stunning feature for your wall. This beautiful black and white photograph was taken by [popartuk.com](http://popartuk.com)

### deco and nouveau on Pinterest | Chrysler Building, Murals and



Gorgeous, if tiny, detail from **Edward Trumbull's** spectacular **mural** "Transport and Human Endeavor." This brilliant painting is displayed on the ceiling of the lobby of New York's **Chrysler building**, the second-best skyscraper in the world. More [Chrysler Building, Murals and Oyster Bar](#)

### Talk:The Chrysler Building - Wikipedia, the free encyclopedia

Groundbreaking took place on September 19, 1928. When Van Alen began construction of the **Chrysler Building**, he planned to have the building stand 925 feet tall. At the same time that the **Chrysler Building** was being built, former partner H. Craig Severance was working on building the Bank of Manhattan.

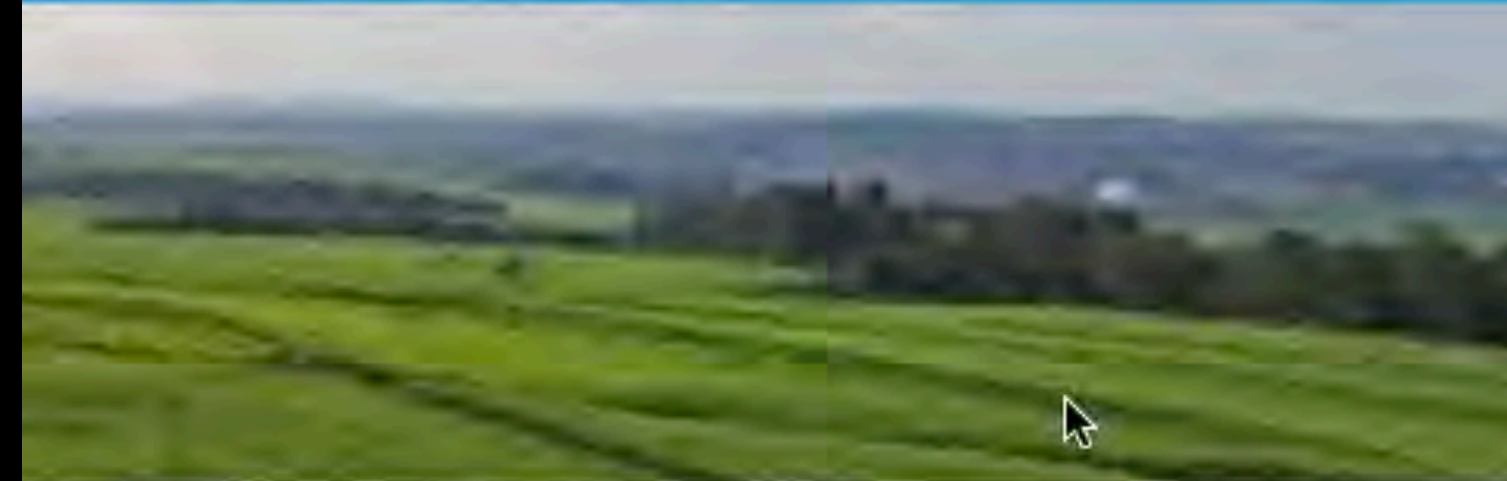
[wikipedia.org](http://wikipedia.org)

### Chrysler Building lobby ceiling mural - Picture of Chrysler



Having seen the **Chrysler Building** from various points around Manhattan, including the top of the Empire State Building, I had to take a look inside. It is my favourite building in NYC and I was not disappointed. The lobby has beautiful art deco features which [tripadvisor.com](http://tripadvisor.com)

**national geographic, fracking,  
Hydraulic fracturing, water, oil, sand**



**March 2013 National Geographic  
Cover Story: "America Strikes Oil..."**

nysfrackingunplugged.wordpress.com

In his article entitled "America Strikes **Oil**: The Promise and Risk of **Fracking**," Edwin Dobb, a Berkeley Graduate School of Journalism lecturer and **National Geographic** contributing writer, focuses **fracking** activities in North Dakota.

thoughtshuffler v3 iOS  
UX by Miriam Simun  
UI by See-ming Lee  
concept & heuristics by Paul Pangaro  
2013



NEW YORKER

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# THE NEW YORKER



## 🔗 KING OF CLICKBAIT

- The ability to make things go viral felt like the closest that we could get to having a human superpower.”

He offered practical tips: “Facebook should be eighty per cent of your effort, if you’re focussed on social media”; “Try to change every comma to a period”; “Use lists whenever possible. Lists just hijack the brain’s neural circuitry.” Behind me, two women in their fifties took notes on legal pads.



### RELATED

**Facebook: The World’s Biggest Direct-Market...**  
In a conference call after the release of this week’s earnings, she gave a couple of examples of how it is gradually displacing

**Can Benefit Corporations Work?**  
Yet the desire to balance profit and purpose is arguably a return to the model that many American companies once followed. Henry

Streamfully  
UI by Barbara de Wilde & John Katagawa  
UI coding and AWS coding by John Katagawa  
UX & heuristics by Paul Pangaro  
2014

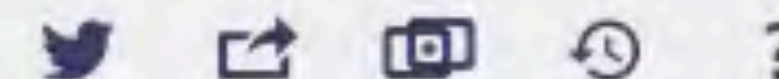
qz.com

## Starbucks is finally going to show US coffee drinkers what a “flat white” is. Prepare for controversy – Quartz

1/1/2015, 7:00:26 AM

Starbucks is introducing the “flat white” to its coffee menus across the US on Jan. 6, reports Eater. It’s a little surprising it took this long; the drink has been available for years in the UK and Australia, which both consume far less coffee per capita than the US. (It’s also a popular drink with New Zealanders, whose coffee consumption is on par with that of Americans.)

But good coffee is more about quality than quantity, is it not? Though the US is the birthplace of Starbucks, the most

[thoughtstacks.com/m/#t](http://thoughtstacks.com/m/#t)

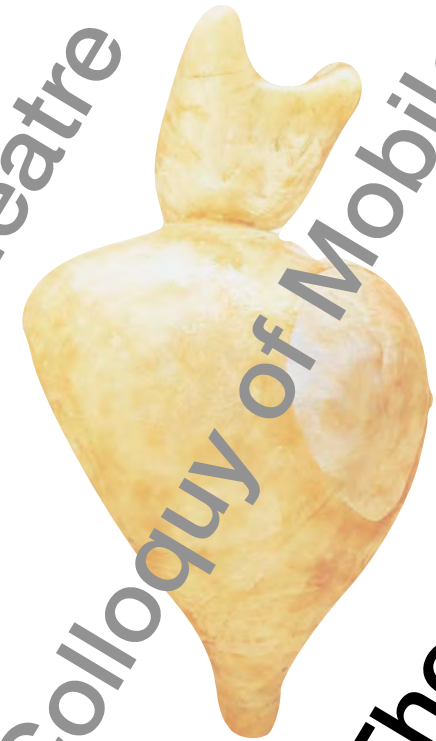
# Gordon Pask

*Musicolour*

*S.A.K.I.*

*Eucrates*

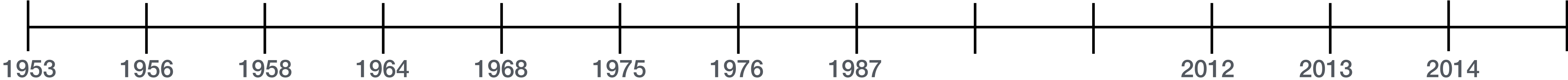
*Cybernetic Theatre*



*Colloquy of Mobiles*

*Thoughtsticker*

*Architecture Machine*



*Thoughtsticker*

*ThoughtShuffler*

*thoughtshuffler iOS*

*Streamfully*



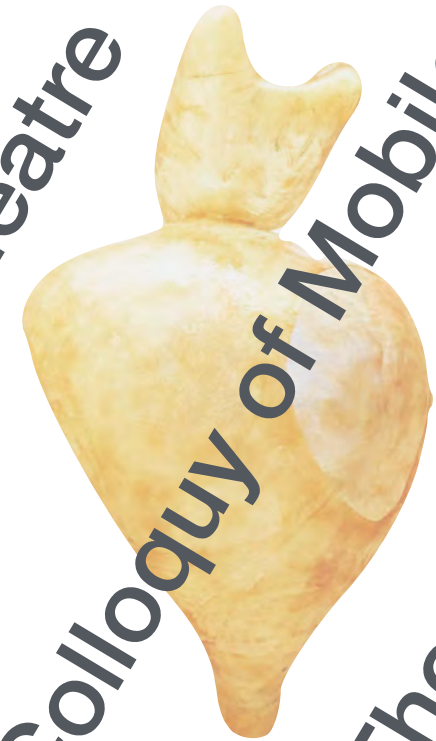
# Gordon Pask

*Musicolour*

*S.A.K.I.*

*Eucrates*

*Cybernetic Theatre*



*Colloquy of Mobiles*

*Thoughtsticker*

*Architecture Machine*

1953 1956 1958 1964 1968 1975 1976 1987 2007 2009 2012 2013 2014 2017

*Thoughtsticker*

*Designing Engagement*

*Poetry Machine*

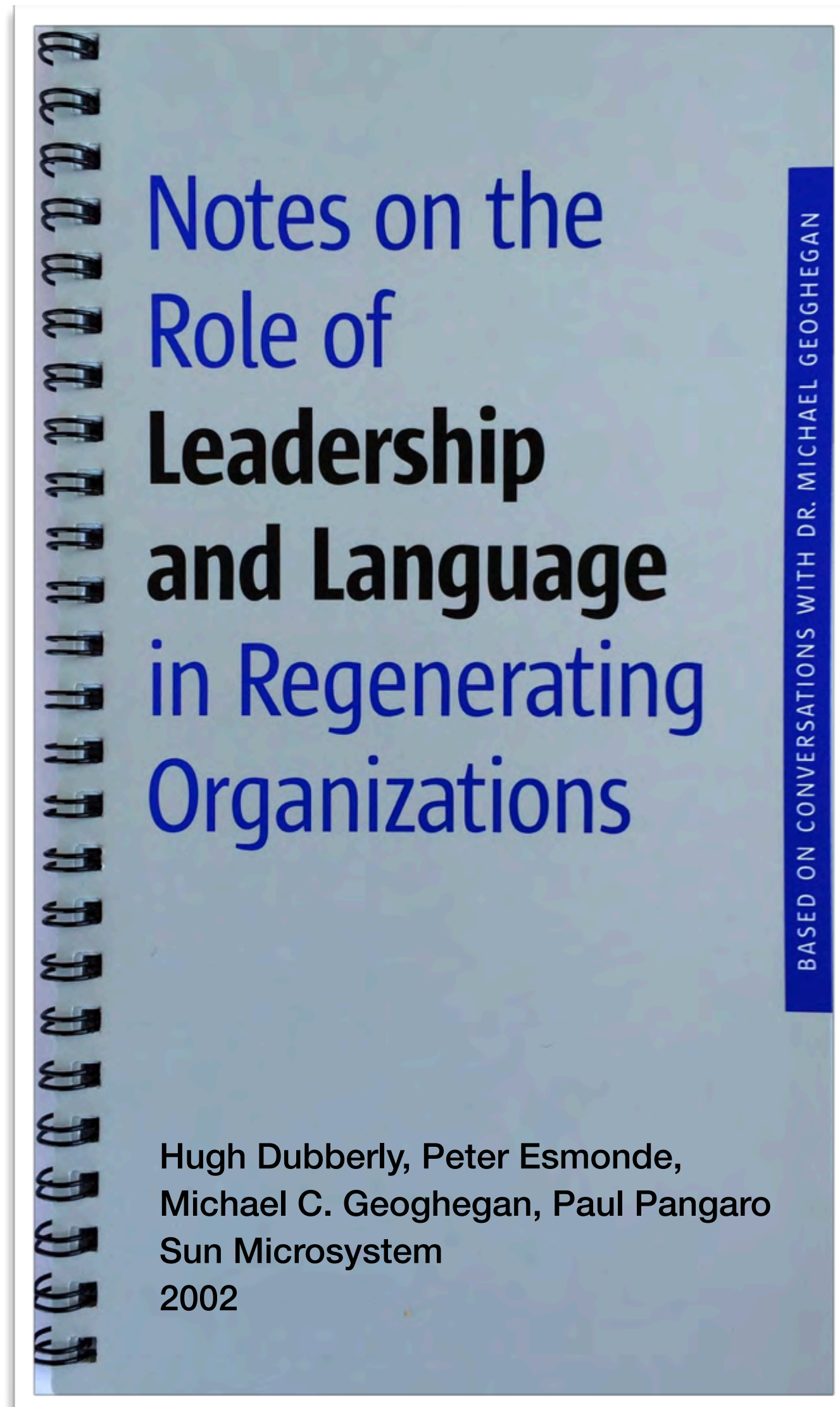
*ThoughtShuffler*

*thoughtshuffler iOS*

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*Conversations for Design*

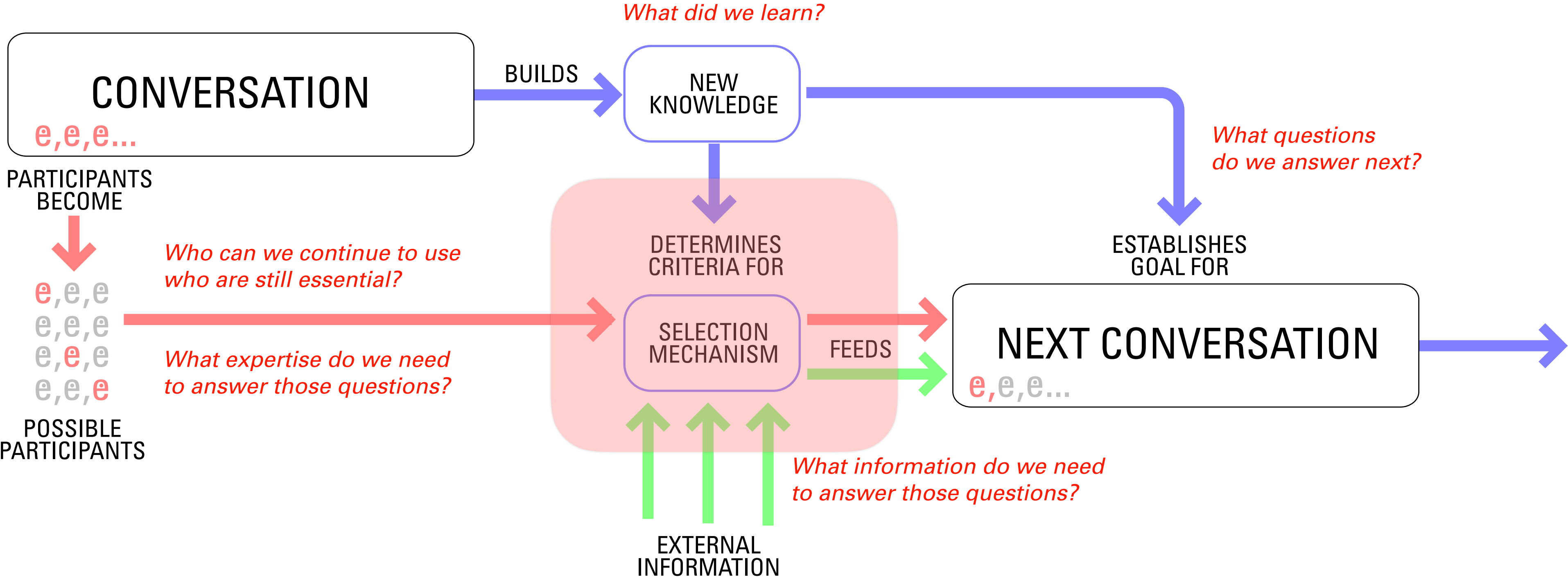
# Designing Engagement / Conversations for Organizational Change



An organization  
is its **language**.

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

# Designing Engagement / Cadence of Conversations



Paul Pangaro  
 Modeling Engagement Project  
 Ogilvy & Mather, New York  
 2007

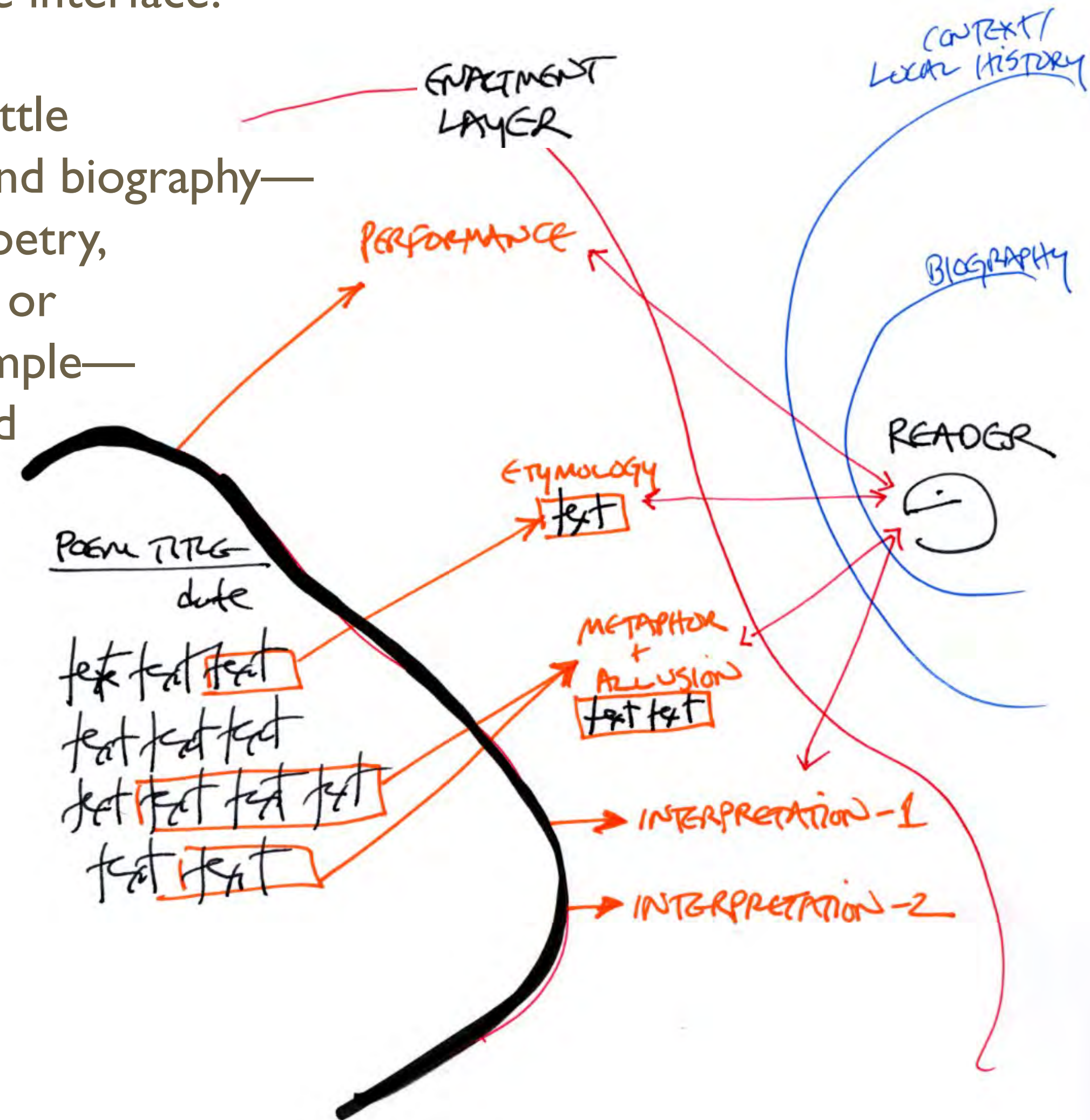
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# Enacting Poetry

poetrymachine's storehouse of enactments creates a dynamic software interface.

if poetrymachine knows a little about a reader's context and biography—level of experience with poetry, purpose in seeking poetry, or prior poems read, for example—it can create a personalized enactment layer by choosing specific elements of enactment to present to that specific reader.

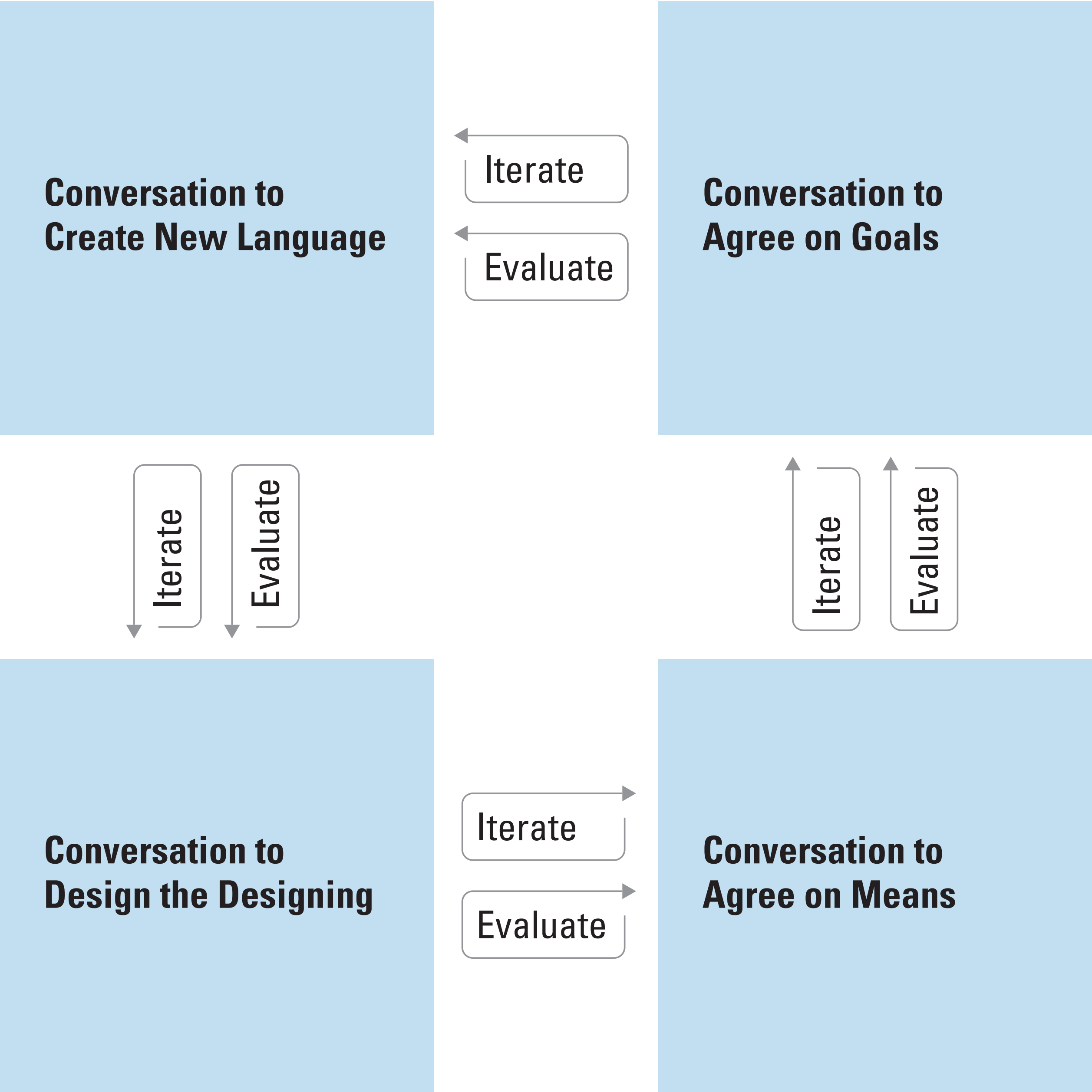
the enactment layer enables a dialog that connects poem & reader, poet & reader, reader & self.



Paul Pangaro  
Poetry Machine Project  
Poetry Foundation, Chicago  
2009

[Click for PDF](#)

# Design as Conversation



Paul Pangaro  
“Designing Our World:  
Cybernetics as Conversation for Action”  
Heinz von Foerster Lecture,  
University of Vienna  
2017

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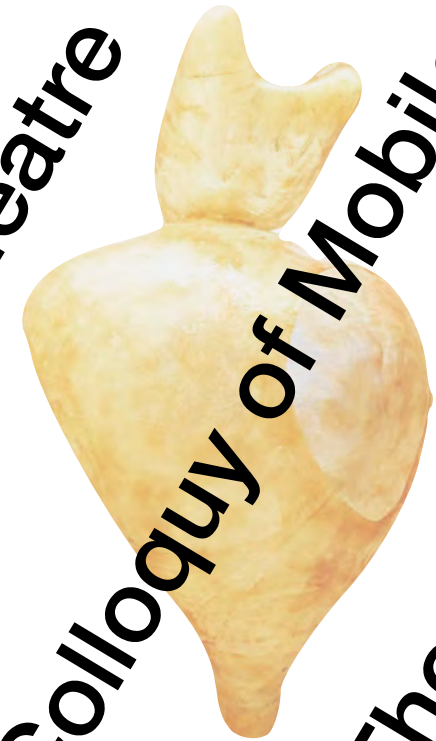
# Gordon Pask

*Musicolour*

*S.A.K.I.*

*Eucrates*

*Cybernetic Theatre*



*Colloquy of Mobiles*

*Thoughtsticker*

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*Poetry Machine*

*ThoughtShuffler*

*thoughtshuffler iOS*

*Streamfully*

*Conversations for Design*

# **Less Interference / More Dance!**

## **A. Declare our Intentions**

# A. Declare our Intentions

## Intention #1 — Build cooperative interfaces

***Conversation is a **cooperative interface** when sequences of coherent interactions enable participants to evolve their points-of-view such that understanding and agreement may arise.***

*Intentions of Interactions for Conversation v2.0 — November 2018*

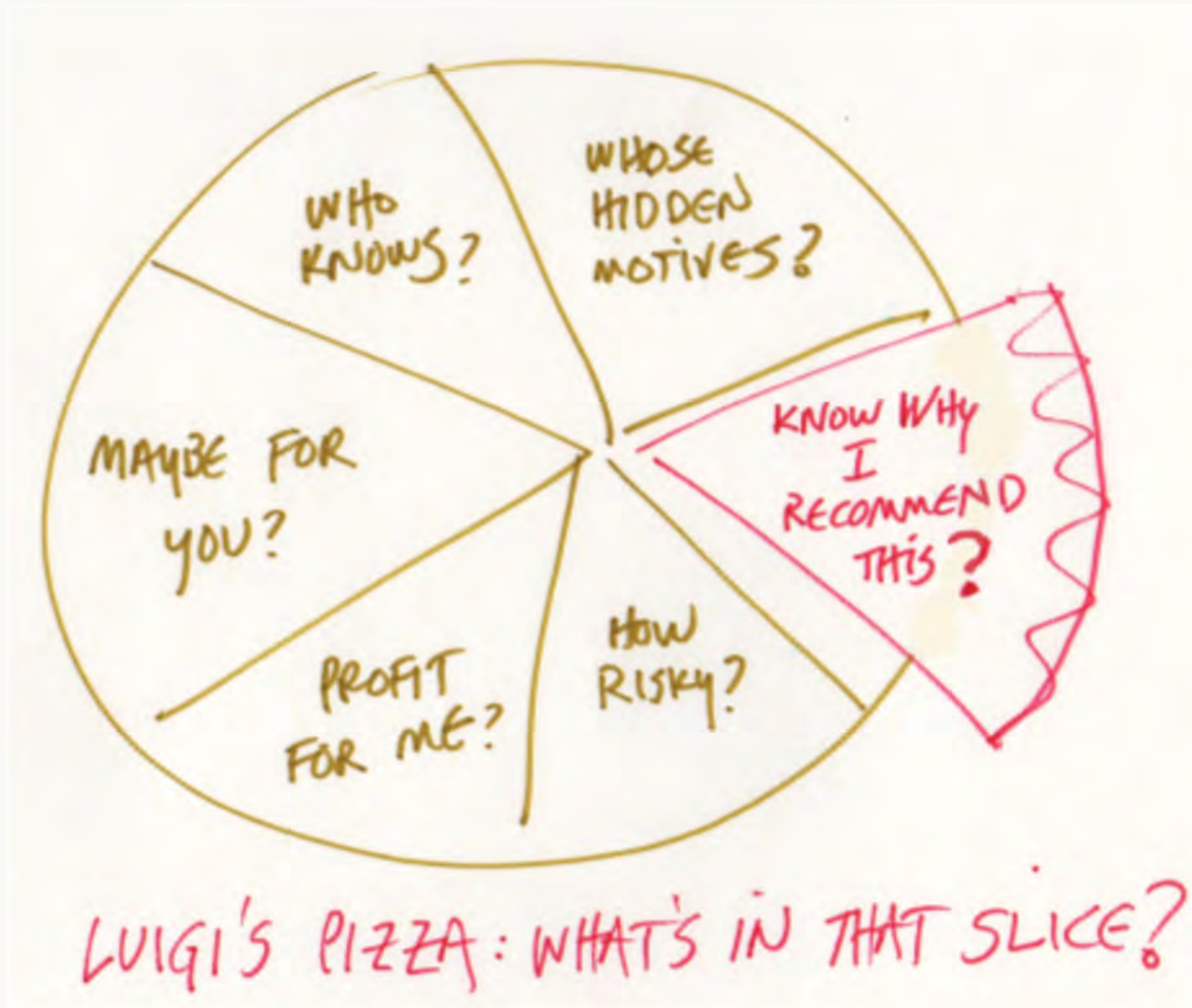


# Luigi's Pizza – A Parable about Human Conversation



<https://ccsmfa.blog/2016/11/08/lugis-pizza-a-parable/>

# Luigi's Pizza – A Parable about Interfaces



<https://ccsmfa.blog/2016/11/08/luigis-pizza-a-parable/>

# A. Declare our Intentions

## Intention #2 — Build ethical interfaces

***Conversation is an **ethical interface** when there is reliable transparency of action & intent — what + why — such that trust may arise over time.***

*Intentions of Interactions for Conversation v2.0 — November 2018*

There are many different ways you can use our services – to search for and share information, to communicate with other people or to create new content. When you share information with us, for example by creating a [Google Account](#), we can make those services even better – to show you more relevant search results and ads, to help you connect with people or to make sharing with others quicker and easier. As you use our services, we want you to be clear how we're using information and the ways in which you can protect your privacy.

Our Privacy Policy explains:

- What information we collect and why we collect it.
- How we use that information.
- The choices we offer, including how to access and update information.

We've tried to keep it as simple as possible, but if you're not familiar with terms like cookies, IP addresses, pixel tags and browsers, then read about these [key terms](#) first. Your privacy matters to Google so whether you are new to Google or a long-time user, please do take the time to get to know our practices – and if you have any questions [contact us](#).

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When you use our services or view content provided by Google, we automatically collect and store certain information in [server logs](#). This includes:

- details of how you used our service, such as your search queries.
- telephony log information like your phone number, calling-party number, forwarding numbers, time and date of calls, duration of calls, SMS routing information and types of calls.

### • Internet protocol address.

- device event information such as crashes, system activity, hardware settings, browser type, browser language, the date and time of your request and referral URL.
- cookies that may uniquely identify your browser or your Google Account.

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When you use Google services, we may collect and process information about your [actual location](#). We use various technologies to determine location, including IP address, GPS, and other sensors that may, for example, provide Google with information on nearby devices, [Wi-Fi access points](#) and cell towers.

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Information we collect when you are signed in to Google, in addition to information we

- [Uncheck](#) whether your profile name and profile photo appear in shared endorsements that appear in ads.

You may also set your browser to block all cookies, including cookies associated with our services, or to indicate when a cookie is being set by us. However, it's important to remember that many of our services may not function properly if your cookies are disabled. For example, we may not remember your language preferences.

## Information you share

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Many of our services let you share information with others. Remember that when you share information publicly, it may be indexable by search engines, including Google. Our services provide you with different options on [sharing and removing your content](#).

## Accessing and updating your personal information

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Whenever you use our services, we aim to provide you with access to your [personal information](#). If that information is wrong, we strive to give you ways to update it quickly or to delete it – unless we have to keep that information for legitimate business or legal purposes.

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## Information we share

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- suspend or terminate your account access.
- access or retain information stored as part of your account.
- receive your account information in order to satisfy applicable law, regulation, legal process or enforceable governmental request.
- restrict your ability to delete or edit information or privacy settings.

Please refer to your domain administrator's policies for more information.

### • For external processing

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We use information collected from cookies and other technologies, like [pixel tags](#), to improve your user experience and the overall quality of our services. One of the products we use to do this on our own services is Google Analytics. For example, by saving your language preferences, we'll be able to have our services appear in the language you prefer. When showing you tailored ads, we will not associate an identifier from cookies or similar technologies with [sensitive categories](#), such as those based on race, religion, sexual orientation or health.

Our automated systems analyze your content (including emails) to provide you personally relevant product features, such as customized search results, tailored advertising, and spam and malware detection.

We may combine personal information from one service with information, including personal information, from other Google services – for example to make it easier to share things with people you know. Depending on [your account settings](#), your activity on other sites and apps may be associated with your personal information in order to improve Google's services and the ads delivered by Google.

We will ask for your consent before using information for a purpose other than those that are set out in this Privacy Policy.

## Compliance and cooperation with regulatory authorities

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We regularly review our compliance with our Privacy Policy. We also adhere to several [self regulatory frameworks](#), including the EU-US and Swiss-US Privacy Shield Frameworks. When we receive formal written complaints, we will contact the person who made the complaint to follow up. We work with the appropriate regulatory authorities, including local data protection authorities, to resolve any complaints regarding the transfer of personal data that we cannot resolve with our users directly.

## Changes

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Our Privacy Policy may change from time to time. We will not reduce your rights under this Privacy Policy without your explicit consent. We will post any privacy policy changes on this page and, if the changes are significant, we will provide a more prominent notice (including, for certain services, email notification of privacy policy changes). We will also keep prior versions of this Privacy Policy in an archive for your review.

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- [Play Books](#)
- [Payments](#)
- [Fiber](#)
- [Project Fi](#)
- [G Suite for Education](#)
- [YouTube Kids](#)
- [Google Accounts Managed with Family Link](#)

For more information about some of our most popular services, you can visit the [Google Product Privacy Guide](#).

## Other useful privacy and security related materials

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Further useful privacy and security related materials can be found through Google's [policies and principles pages](#), including:

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  - [technologies we use for advertising](#).
  - [how we recognize patterns like faces](#).
- A [page](#) that explains what data is shared with Google when you visit websites that use our advertising, analytics and social products.
- The [Privacy Checkup](#) tool, which makes it easy to review your key privacy settings.
- Google's [safety center](#), which provides information on how to stay safe and secure online.

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We provide personal information to our [affiliates](#) or other trusted businesses or persons to process it for us, based on our instructions and in compliance with our Privacy Policy and any other appropriate confidentiality and security measures.

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- We review our information collection, storage and processing practices, including physical security measures, to guard against unauthorized access to systems.
- We restrict access to personal information to Google employees, contractors and

# A. Declare our Intentions

## Intention #3 — Humane Interface

***Conversation is an **humane interface** when any participant may influence its direction such that cooperation and collaboration may arise.***

*Intentions of Interactions for Conversation v2.0 — November 2018*

**Designers, can we enable conversation for others — can we *design for conversation*? Enable interactions that...**

- *are cooperative, humane, and ethical*
- *create conditions for great conversations*
- *increase the number of choices open to all*
- *help us to be what we want to be... or become.*

Where do we look for direction?

# Less Interference / More Dance!

A. Declare our Intentions

**B. Riff on Pask**

## **B. Riff on Pask**

### **Proposal #1 – Incorporate Paskian Interaction Principles**

- #1 – Novelty Regulation**
- #2 – Uncertainty Regulation**
- #3 – Autonomy**
- #4 – Conversation for Design**



## B. Riff on Pask

### Proposal #2 — Build a Metric of Conversationality

***Calculate the relative quality of a conversation — its novelty, momentum, and milestone agreements — to draw human attention to generative interactions.***

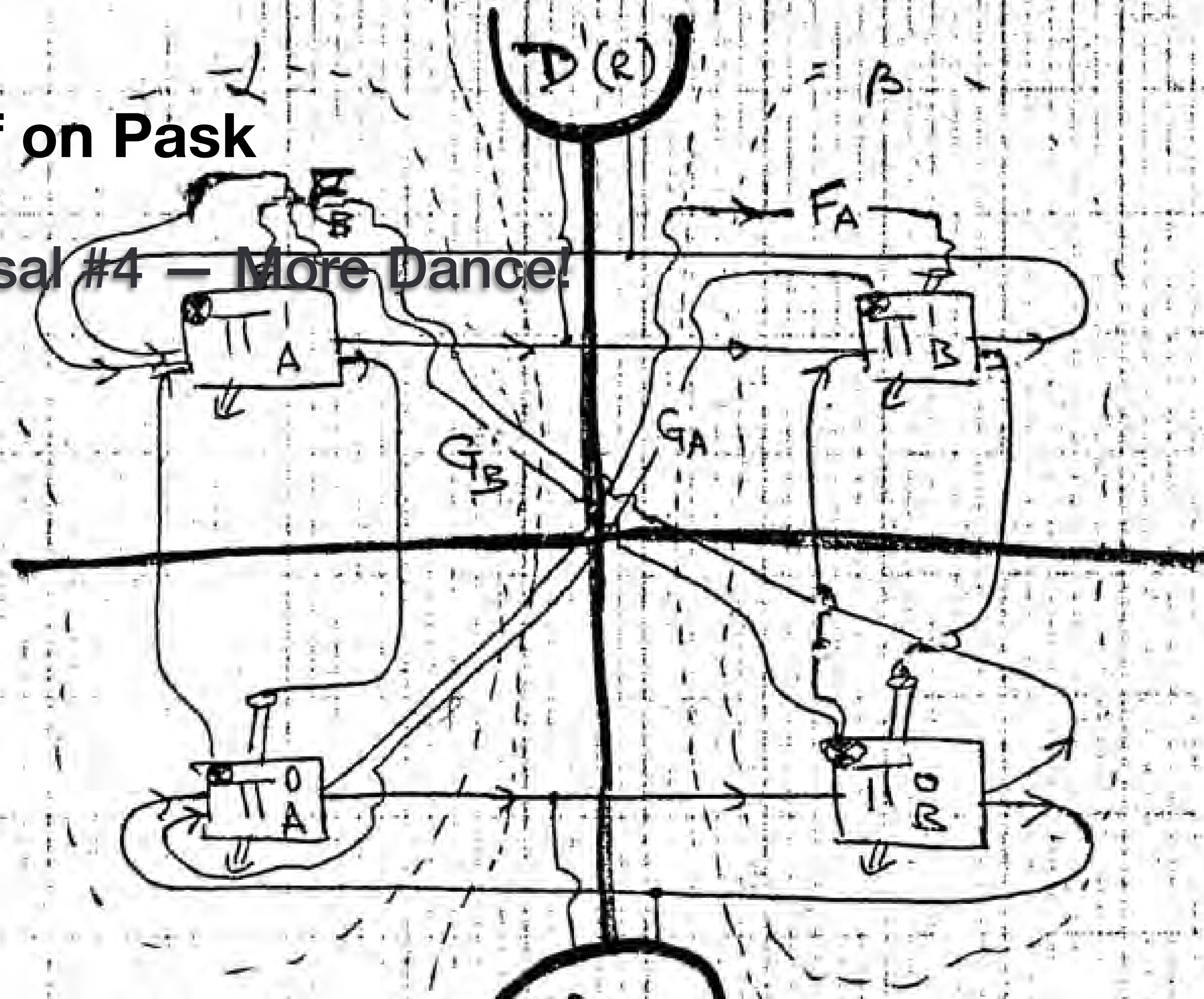
## B. Riff on Pask

### Proposal #3 — Build a Question Engine

***Compute relevant and novel questions that invite a generative conversation for design such that new and valid choices are explored.***

# B. Riff on Pask

## Proposal #4 – More Dance!





**Less Interference / More Dance!**



# Less Interference / More Dance!





# Thank you.

Paul Pangaro  
[pangaro.com/lasg2019/](http://pangaro.com/lasg2019/)  
[ppangaro@cmu.edu](mailto:ppangaro@cmu.edu)

Living Architecture Systems Group Symposium  
OCADU, Toronto  
March 2019

# Thank you.

## Special Thanks to:

TJ McLeish

Philip Beesley

Melanie Neves

Sascha Hastings

Hugh Dubberly

Karen Kornblum Berntsen

Pooja Upadhyay

College for Creative Studies

In 2018 we live among machines talking to machines, machines talking to people, and people talking to people through machines.

Yet that is Pask's Colloquy—how could he have foreseen our world as it is today?

From 1968 he chides us with his vision of rich, humane interaction—organic and analog, immersive and unpredictable, conversational and emergent.

Would that today's digital interactions have even some of those properties.

Colloquy of Mobiles appeared 50 years ago as an apparition from a distant future. Living in that future, what future shall we build from here?



# COLLOQUY 2018 Advisory Board

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Thank you.

Paul Pangaro

[pangaro.com/lasg2019/](http://pangaro.com/lasg2019/)

[ppangaro@cmu.edu](mailto:ppangaro@cmu.edu)

Living Architecture Systems Group Symposium

OCADU, Toronto

March 2019

# Appendices



Paul Pangaro

[pangaro.com/lasg2019/](http://pangaro.com/lasg2019/)

[ppangaro@cmu.edu](mailto:ppangaro@cmu.edu)

Living Architecture Systems Group Symposium

OCADU, Toronto

March 2019

# Less Interference / More Dance!

***“I shall act always so as to increase the total number of choices.”***

— Ethical Imperative, Heinz von Foerster

# Less Interference / More Dance!

***“If you desire to see, learn how to act.”***

— Aesthetic Imperative, Heinz von Foerster

# Less Interference / More Dance!

## Second-order Design = Design for Conversation

**The goal of second-order design is to facilitate the emergence of conditions in which others can design — to create conditions in which conversations can emerge — and thus to increase the number of choices open to all.**

— Dubberly & Pangaro, *Cybernetics and Design: Conversations for Action*, 2019

**Macy Conferences**

Gregory Bateson

J.C.R. Licklider

Warren McCulloch, Chair

Margaret Mead

Walter Pitts

Claude Shannon

**Heinz von Foerster**

John von Neumann

**Norbert Wiener**

R.D. Laing

Ivan Sutherland

**BCL**

**Ross Ashby**

**Humberto Maturana**

**Gordon Pask**

Charles Eames

Grey Walter

Buckminster Fuller

# Social Graph of Cybernetics

and how it connects computing, counterculture, and design

**MIT**  
Vannevar Bush  
Julian Bigelow

## Macy Conferences

Gregory Bateson  
J.C.R. Licklider  
Warren McCulloch, Chair  
Margaret Mead  
Walter Pitts  
Claude Shannon

**Heinz von Foerster**  
John von Neumann  
**Norbert Wiener**

Arturo Rosenblueth

Bertrand Russell

Cedric Price

R.D. Laing

**SRI, NLS**  
Douglas Engelbart

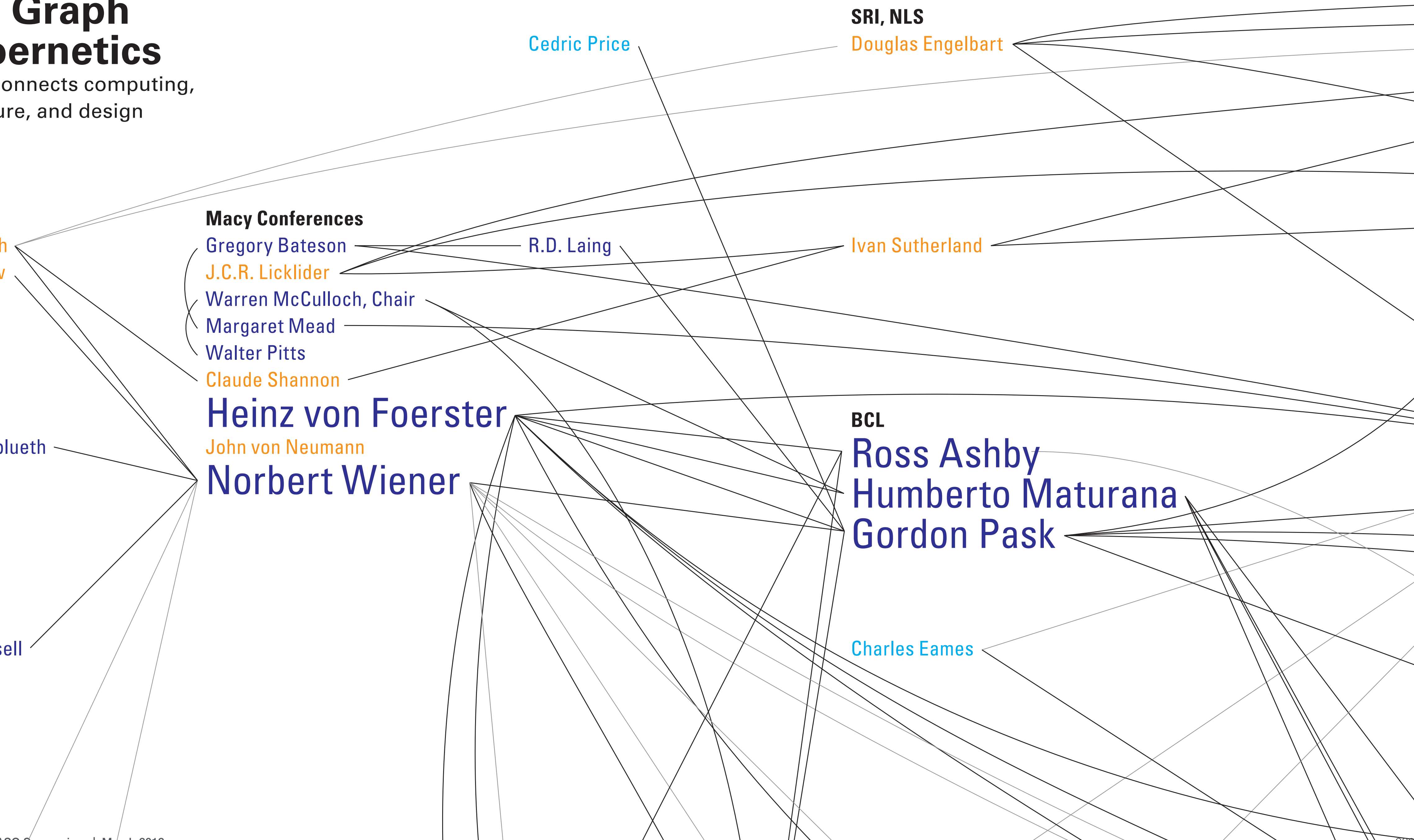
Ivan Sutherland

**BCL**  
**Ross Ashby**  
**Humberto Maturana**  
**Gordon Pask**

Charles Eames

Grey Walter

Buckminster Fuller

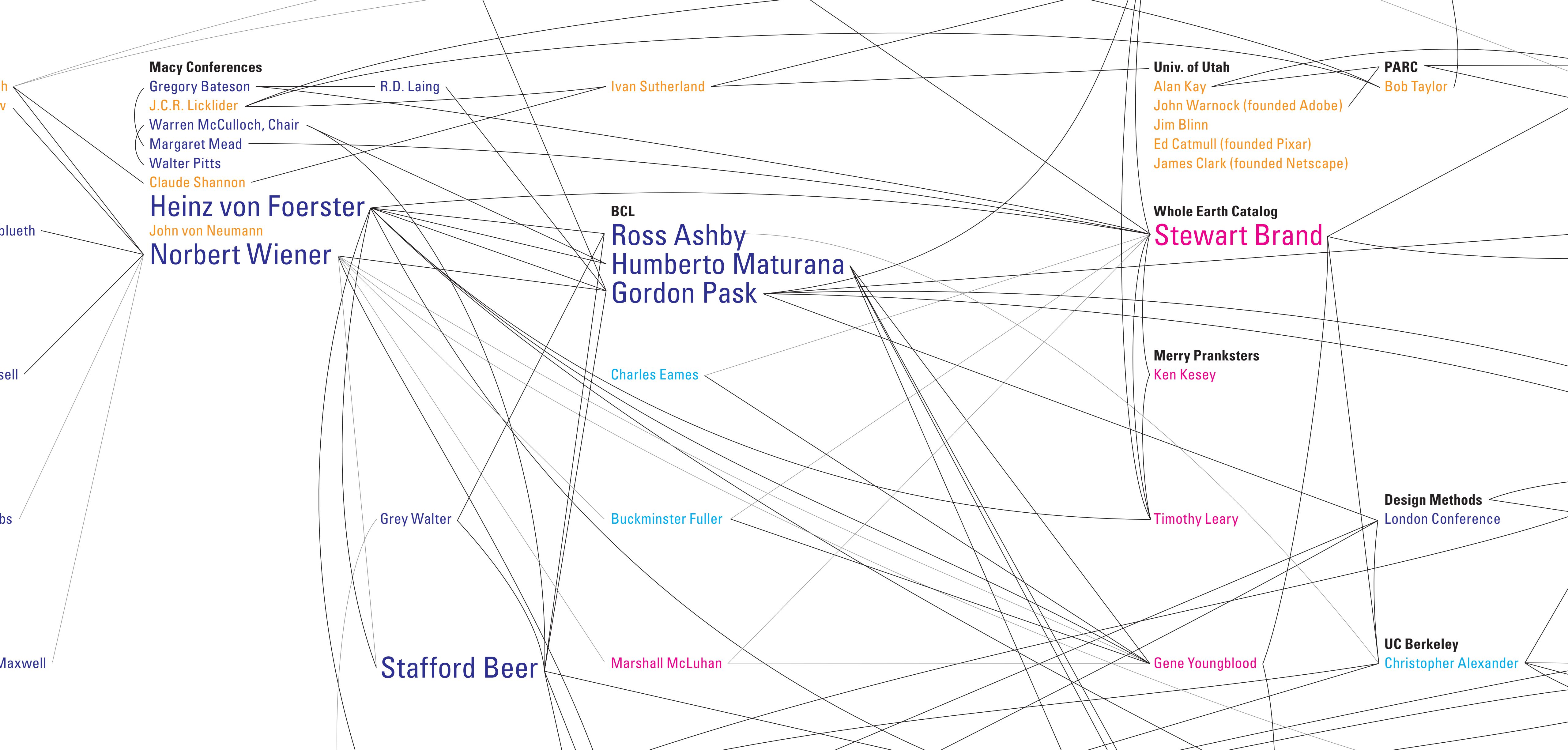


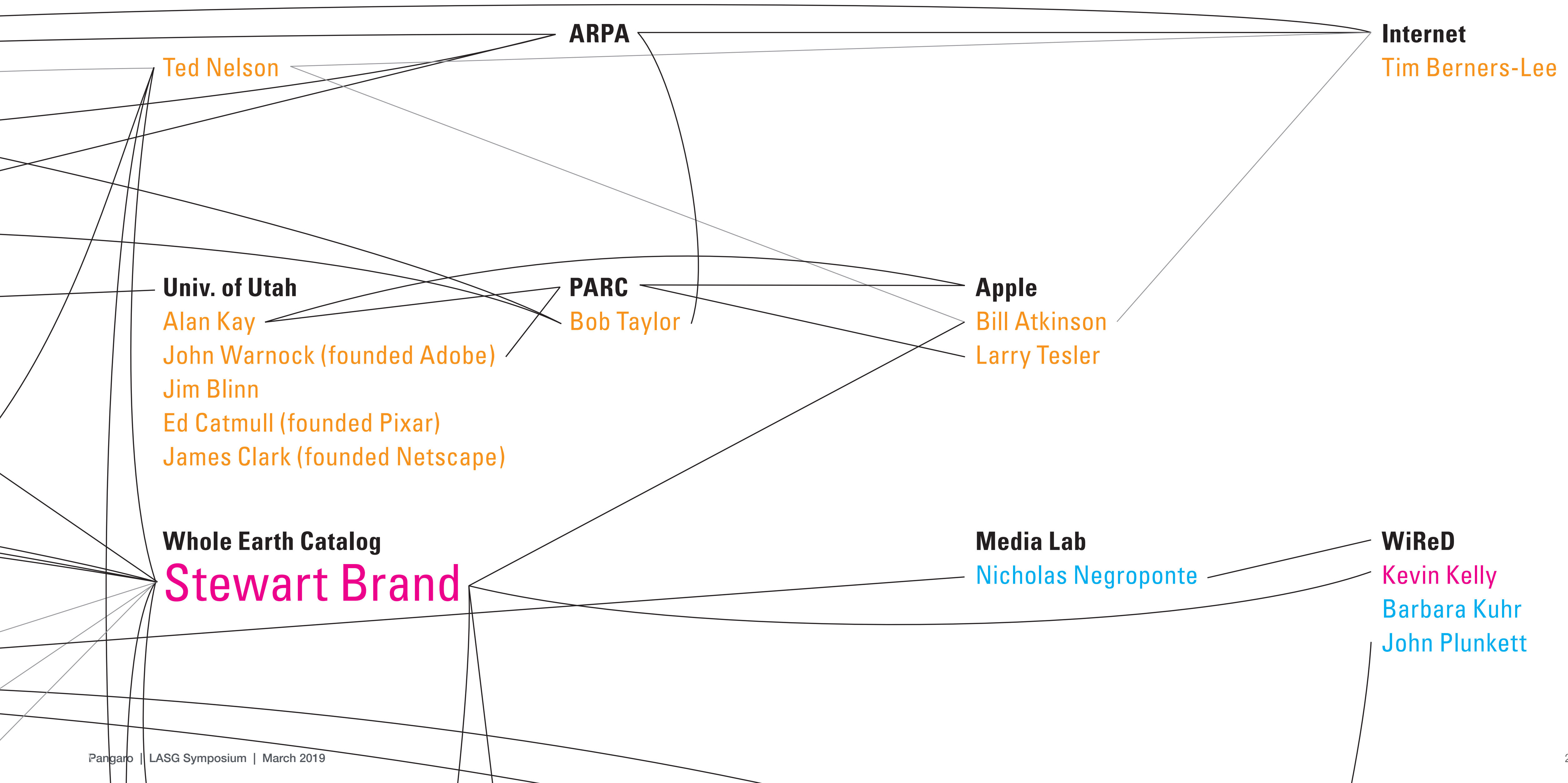


# Graph

## bernetics

connects computing,  
culture, and design





**ARPA**

**Internet**

Ted Nelson

Tim Berners-Lee

**Univ. of Utah**

**PARC**

**Apple**

Alan Kay

Bob Taylor

Bill Atkinson

John Warnock (founded Adobe)

Larry Tesler

Jim Blinn

Ed Catmull (founded Pixar)

James Clark (founded Netscape)

**Whole Earth Catalog**

**Media Lab**

**WiReD**

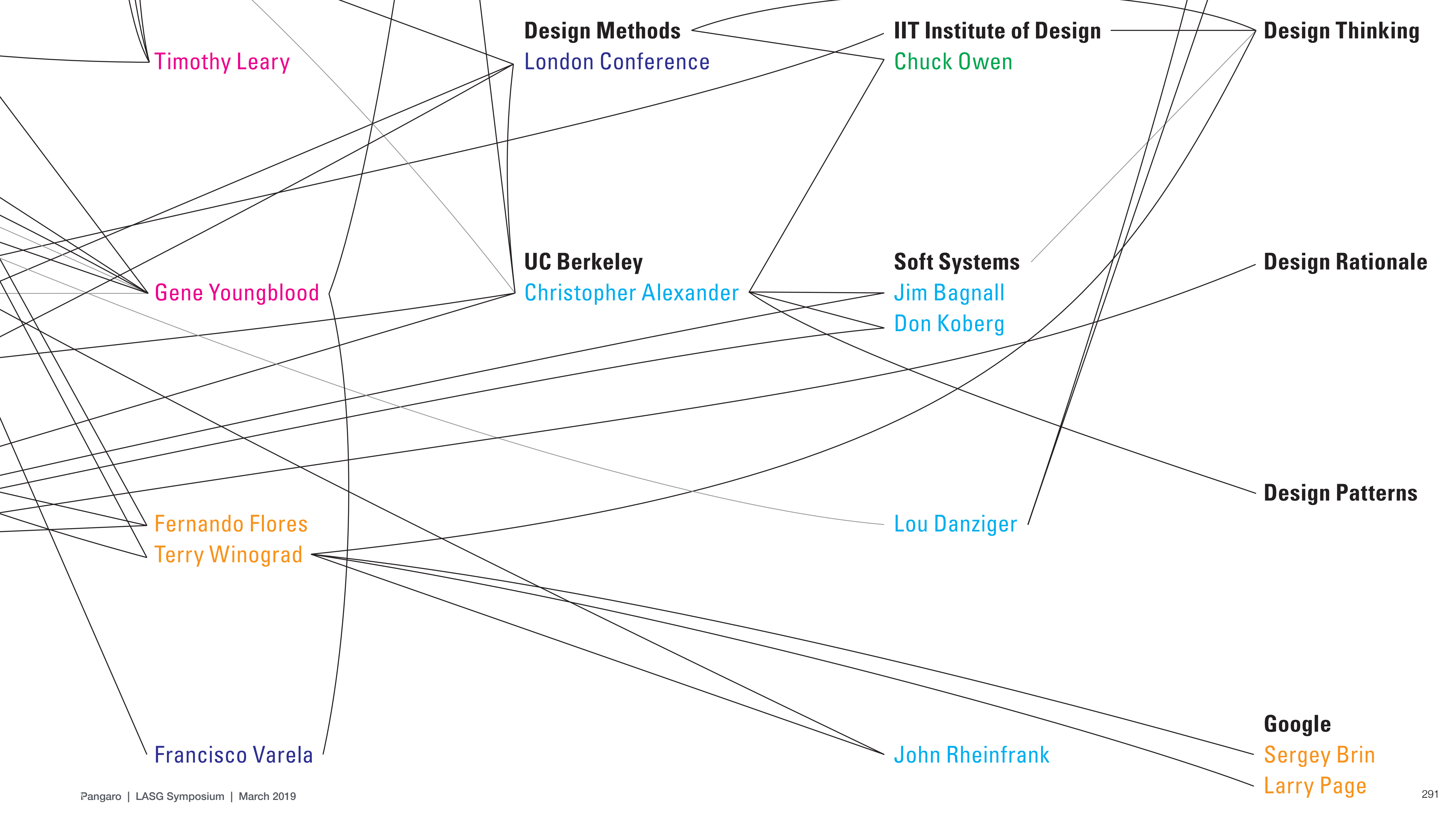
**Stewart Brand**

Nicholas Negroponte

Kevin Kelly

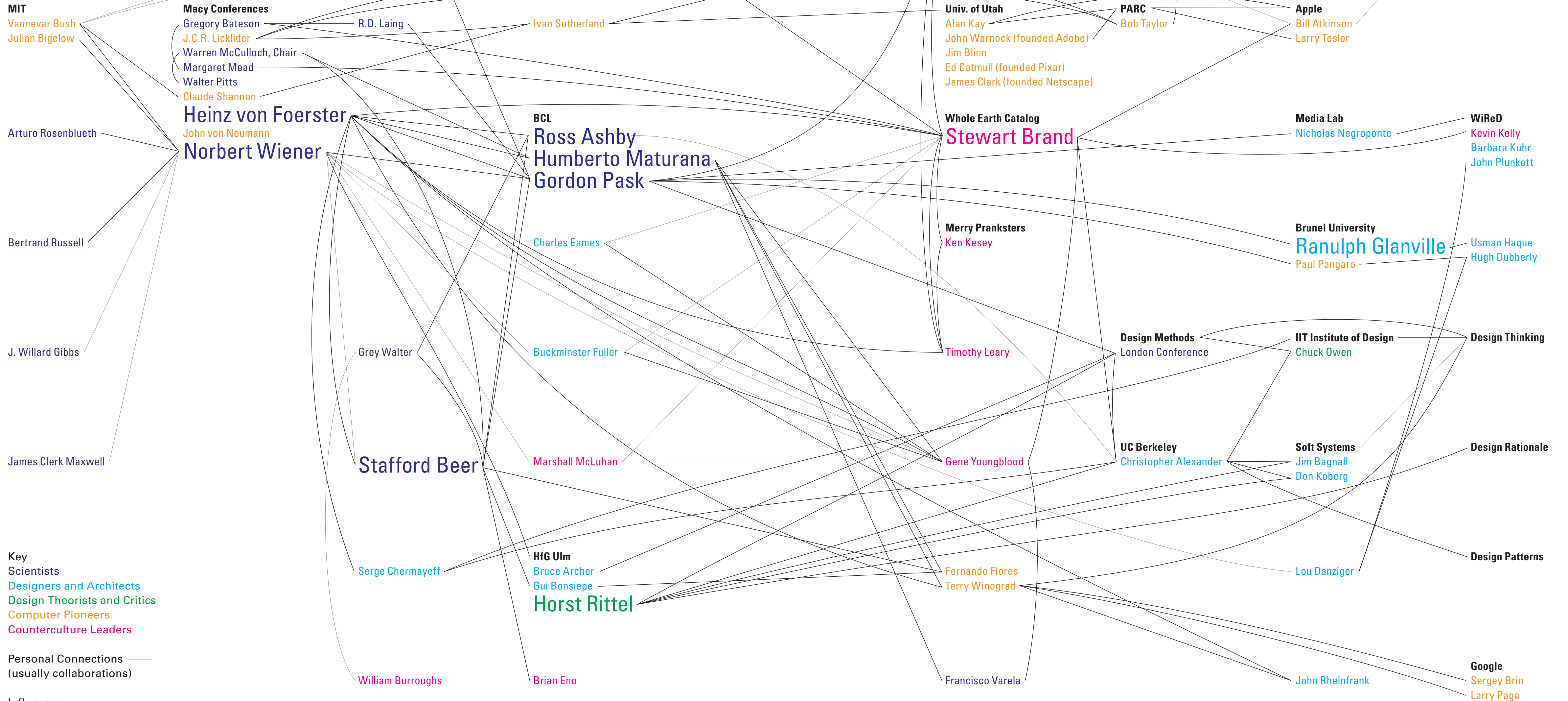
Barbara Kuhr

John Plunkett



# Social Graph of Cybernetics

and how it connects computing, counterculture, and design



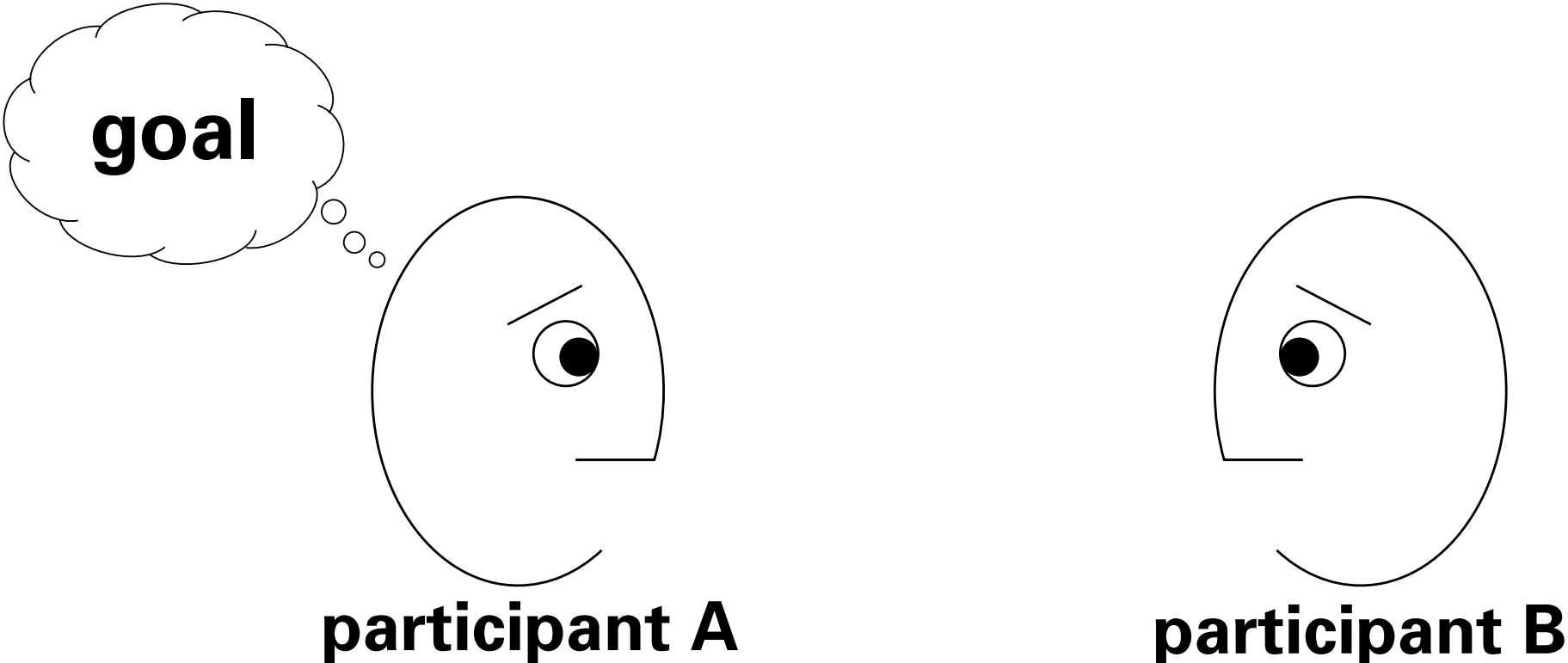
- Key
- Scientists
- Designers and Architects
- Design Theorists and Critics
- Computer Pioneers
- Counterculture Leaders

Personal Connections  
(usually collaborations)

Influences  
(usually publications)

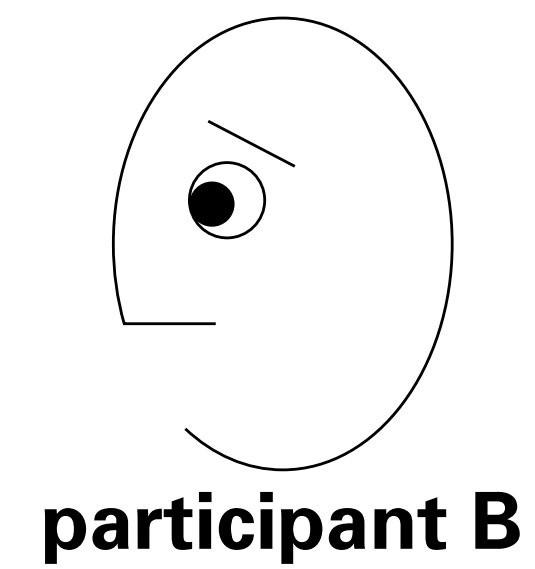
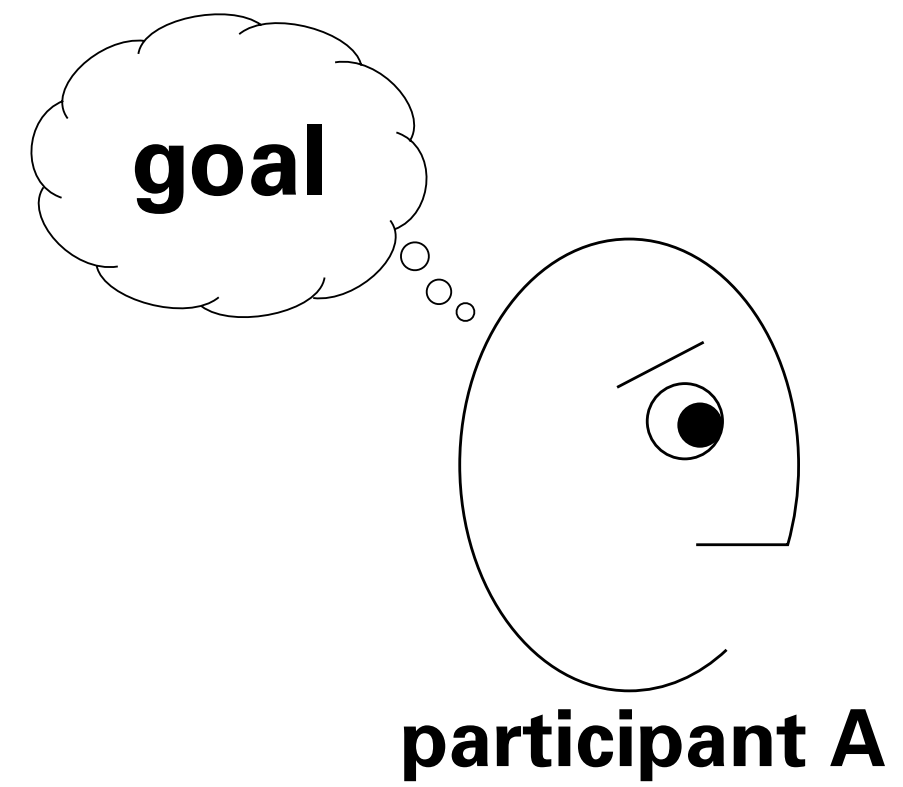
Interactive version at  
<http://cybergraph.dubberly.com/>

# Conversational Frame

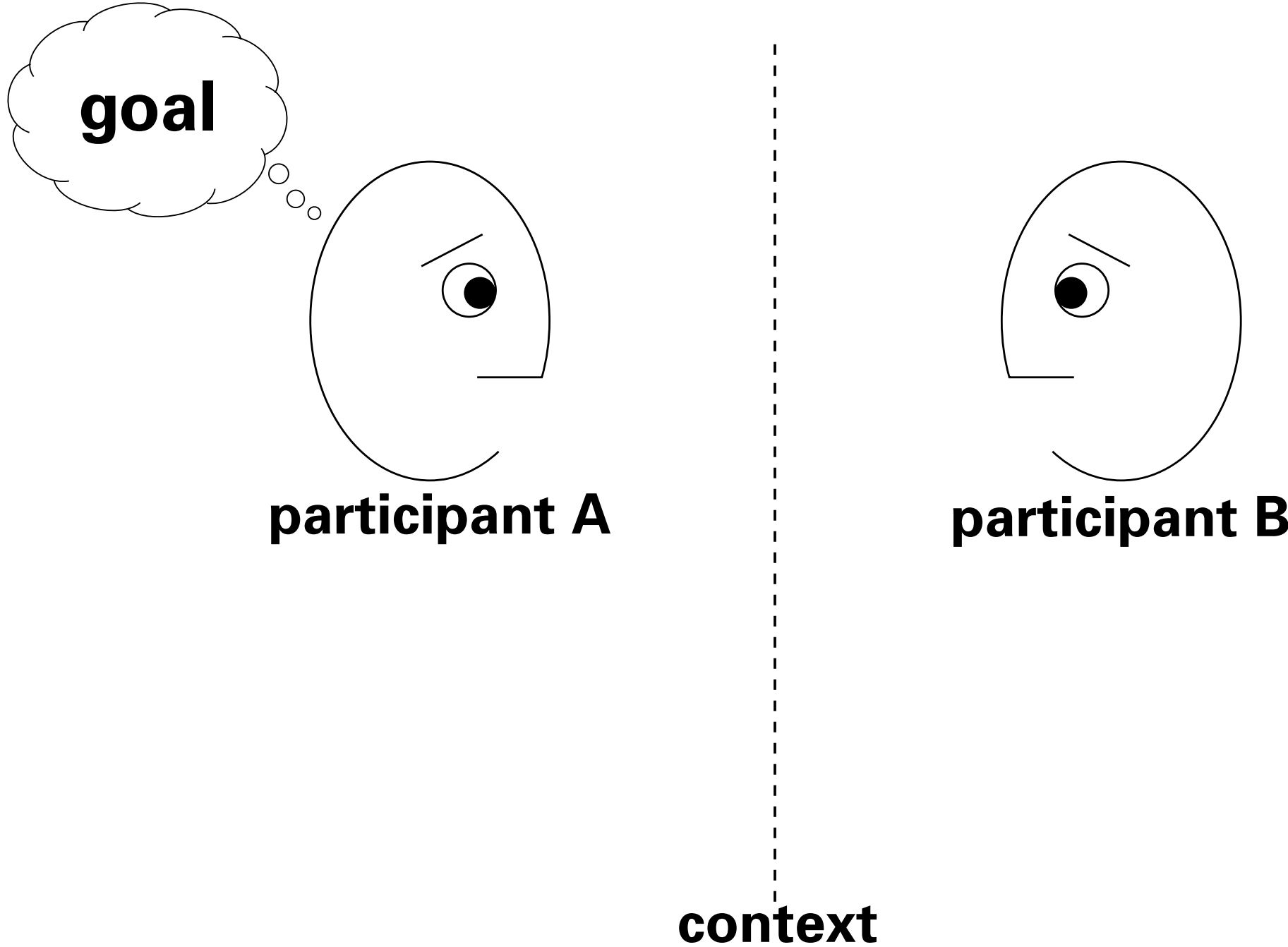


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# A participant has a goal.

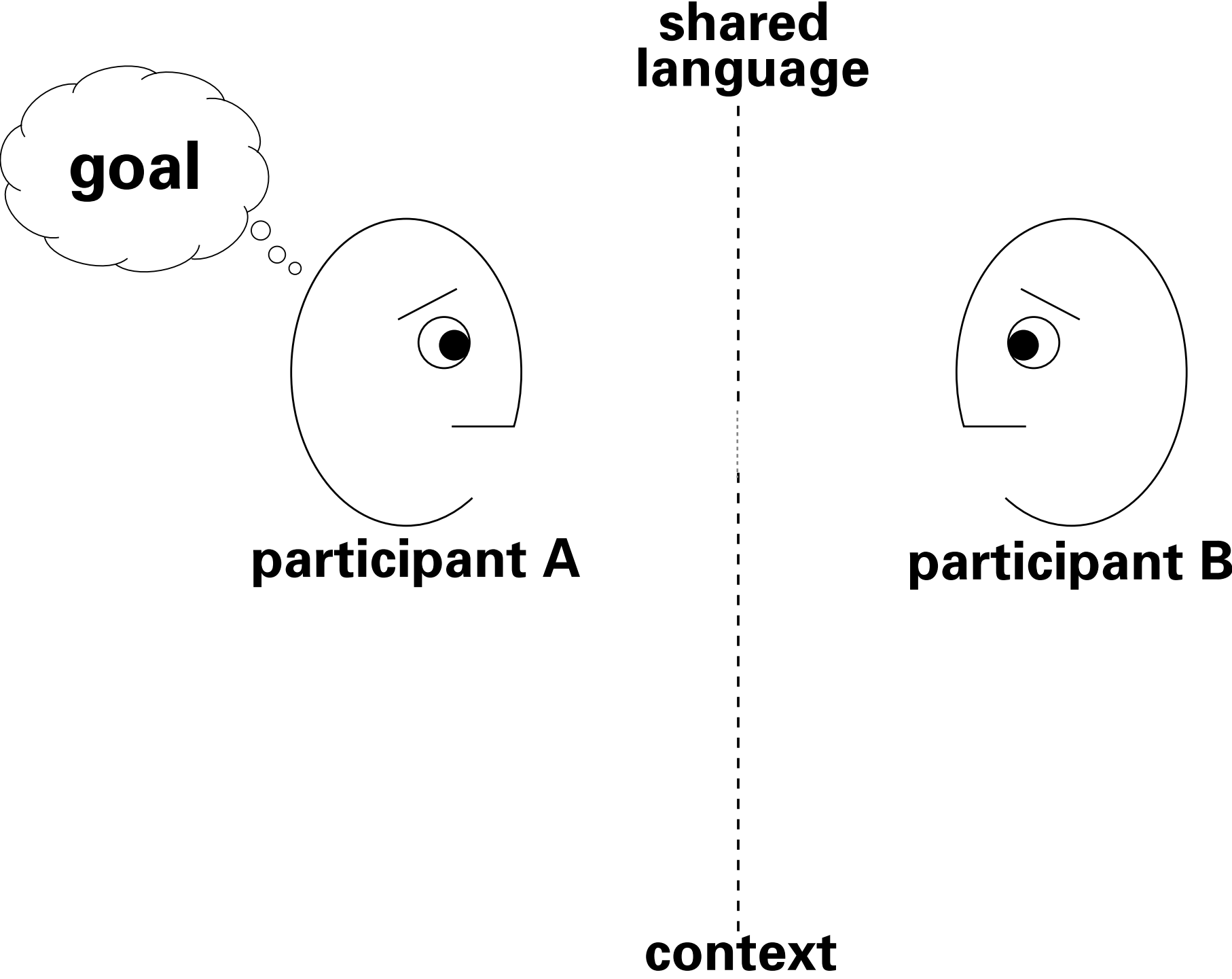


# Chooses a context.



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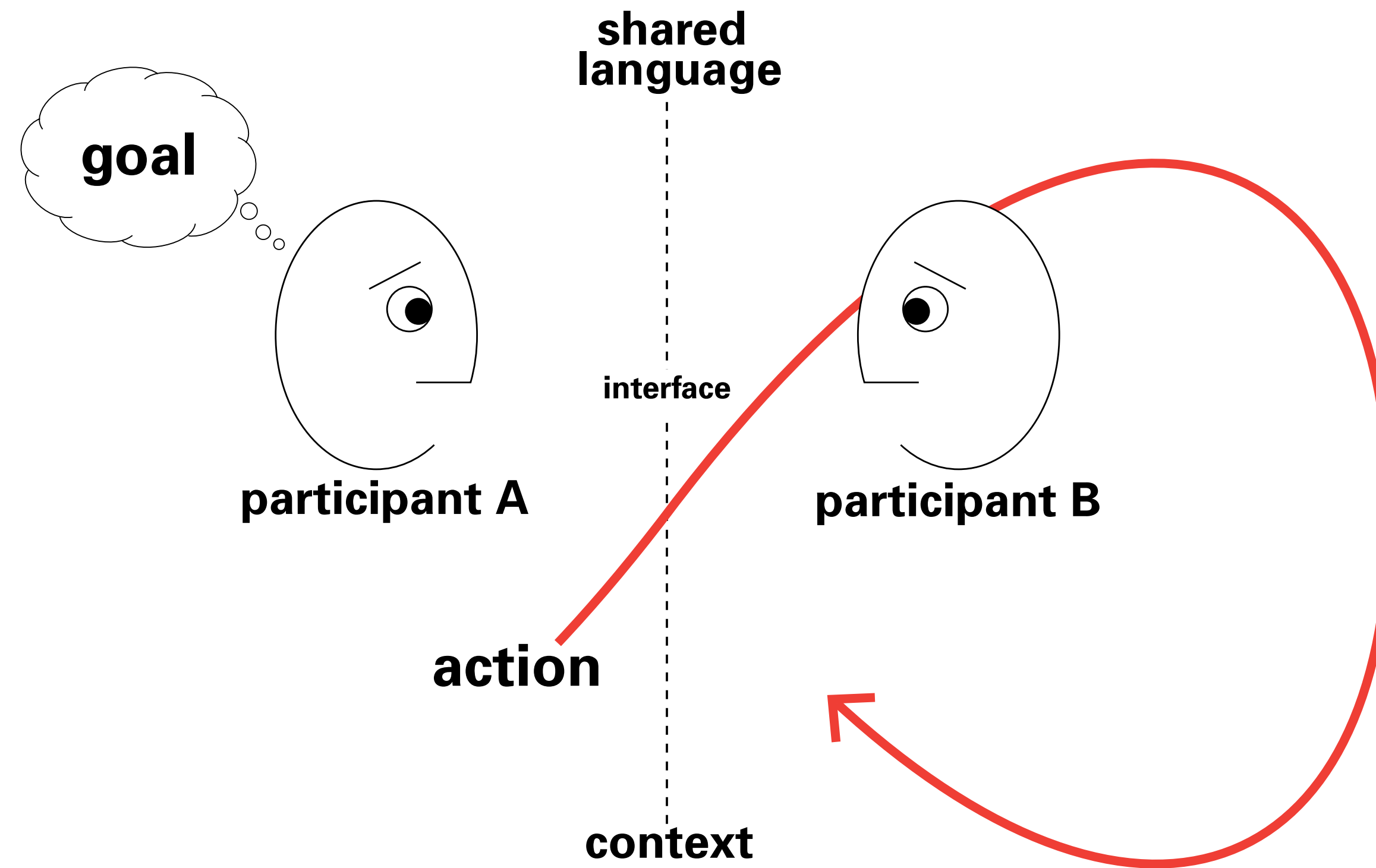
# Chooses a language.



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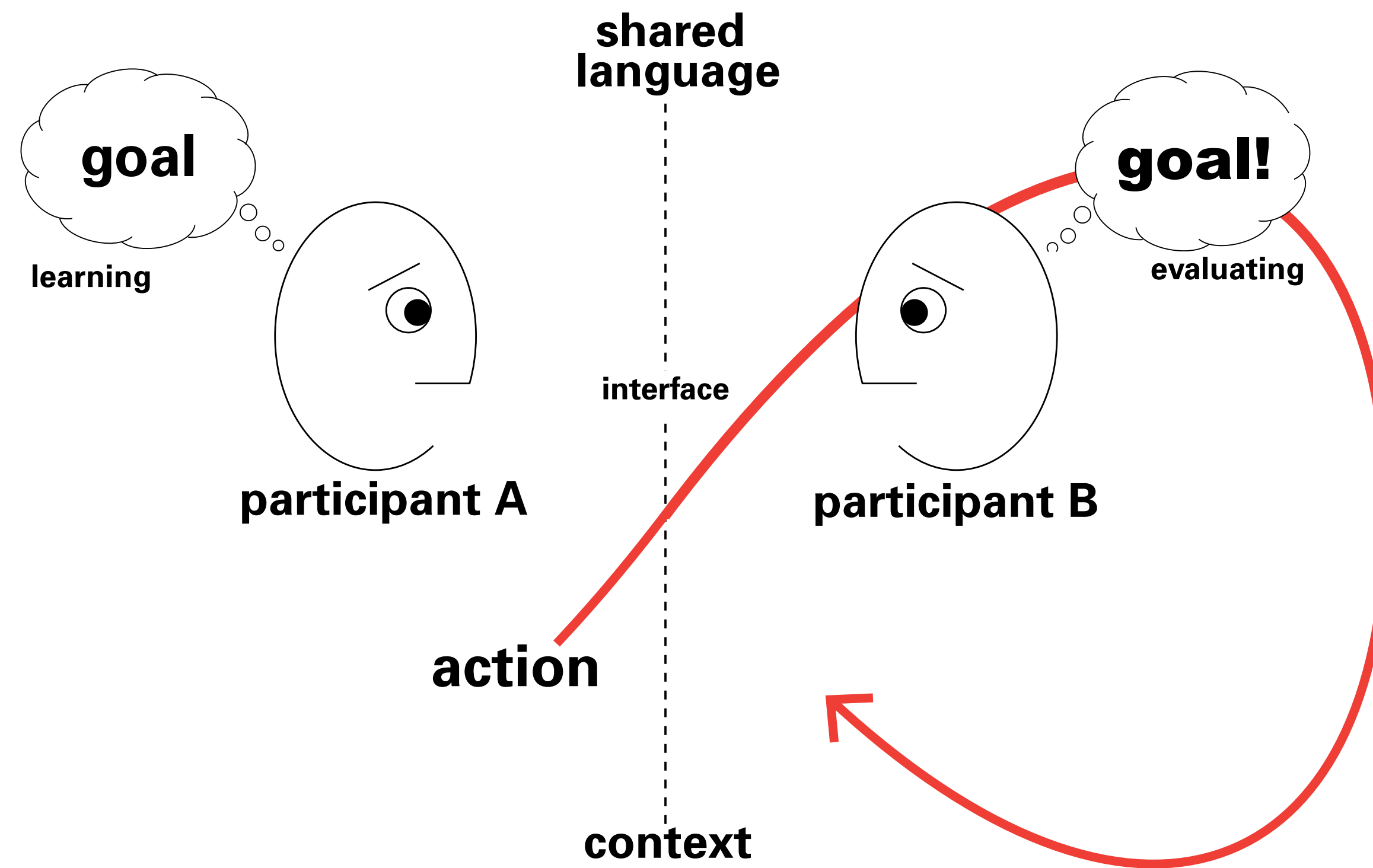


# Begins an exchange.



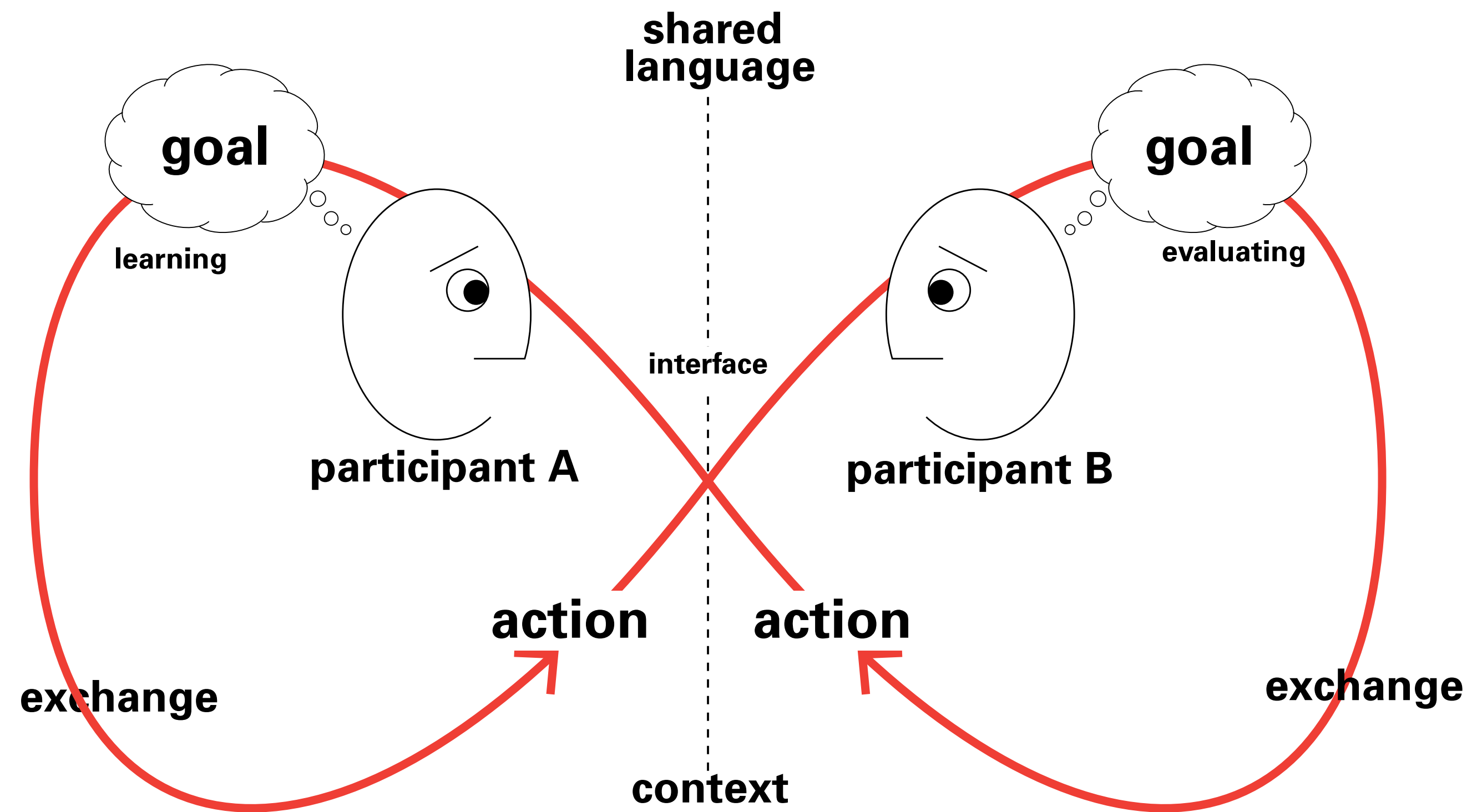
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# May evoke a response...



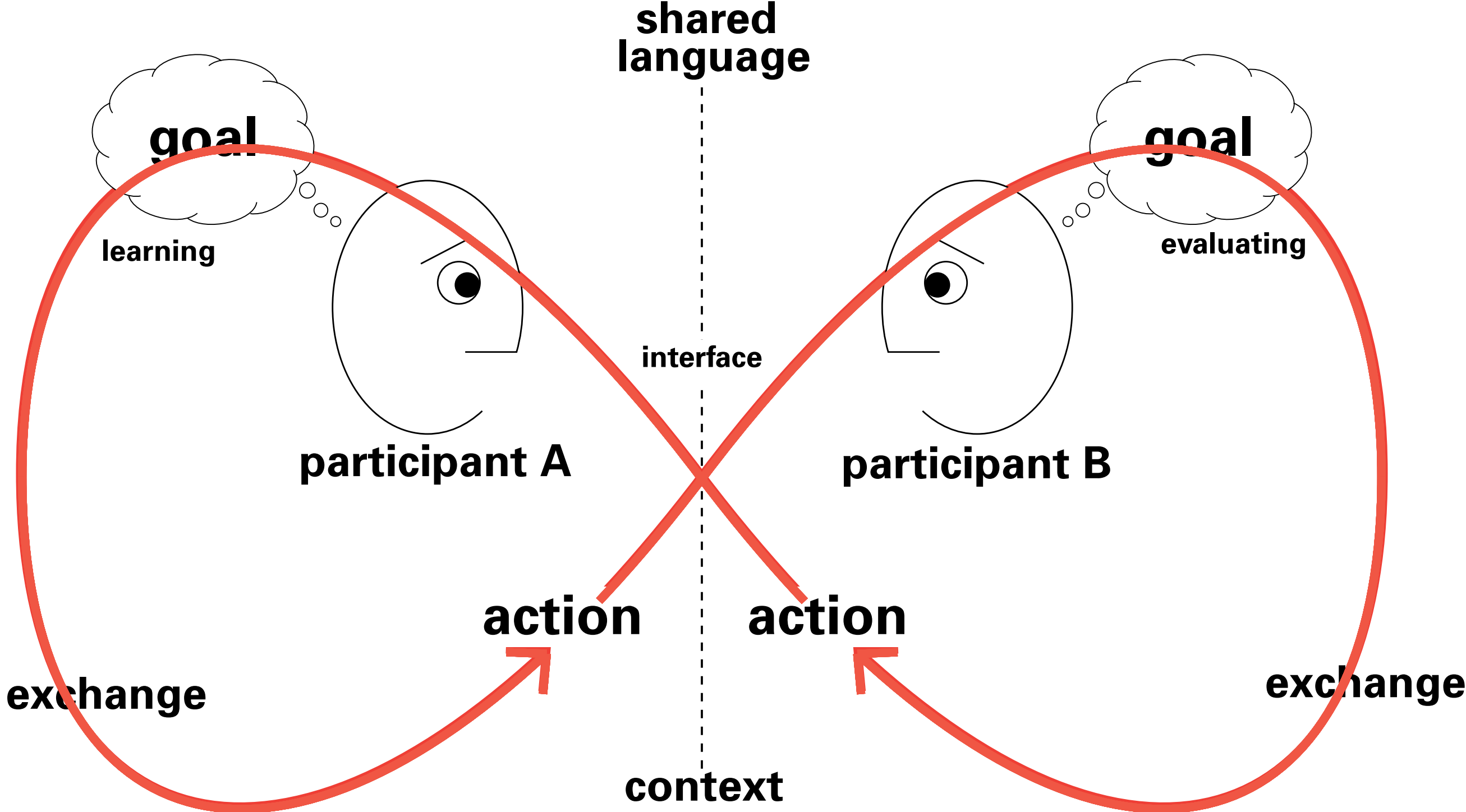
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... and a reaction that evokes a reaction...



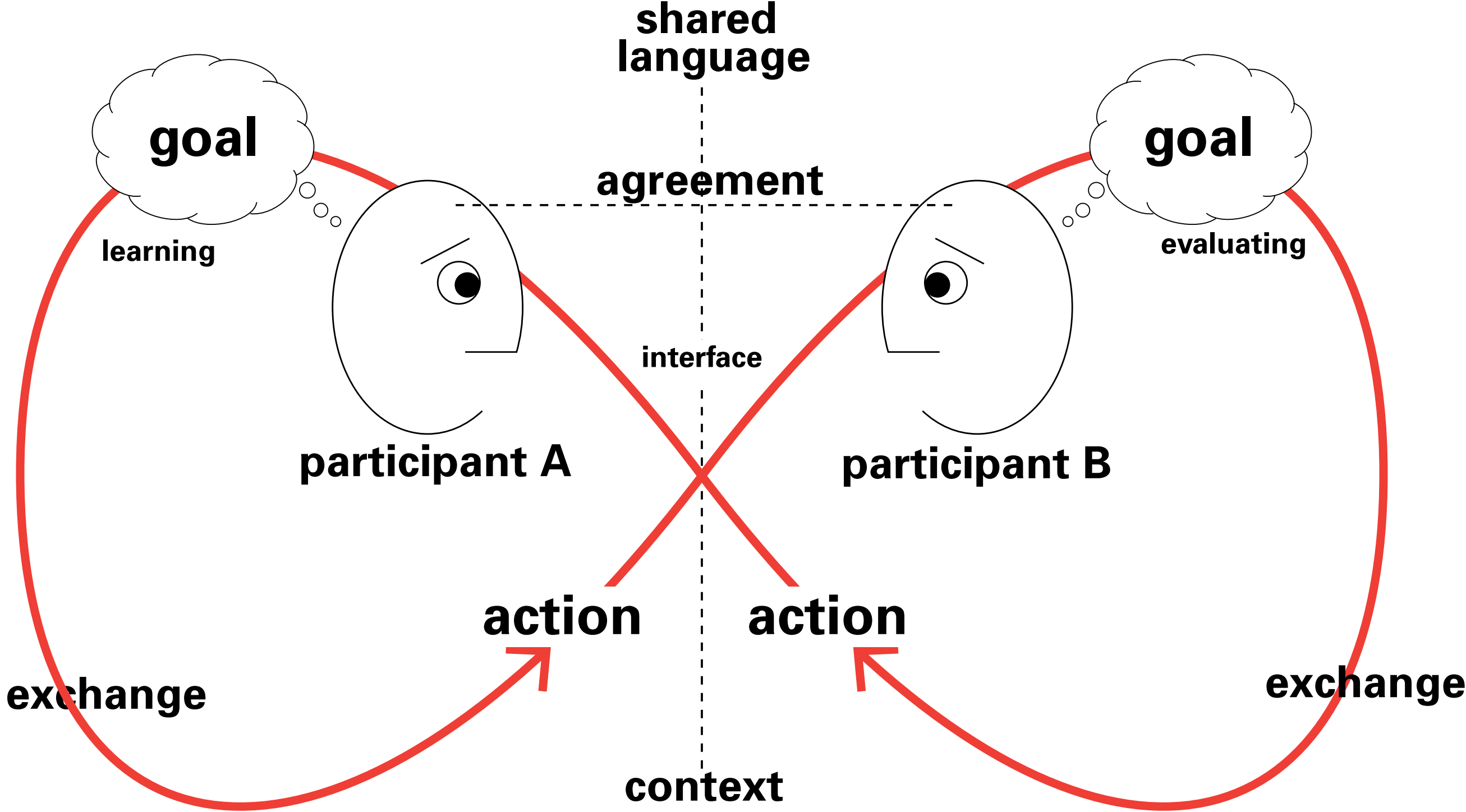
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# The engagement may continue.



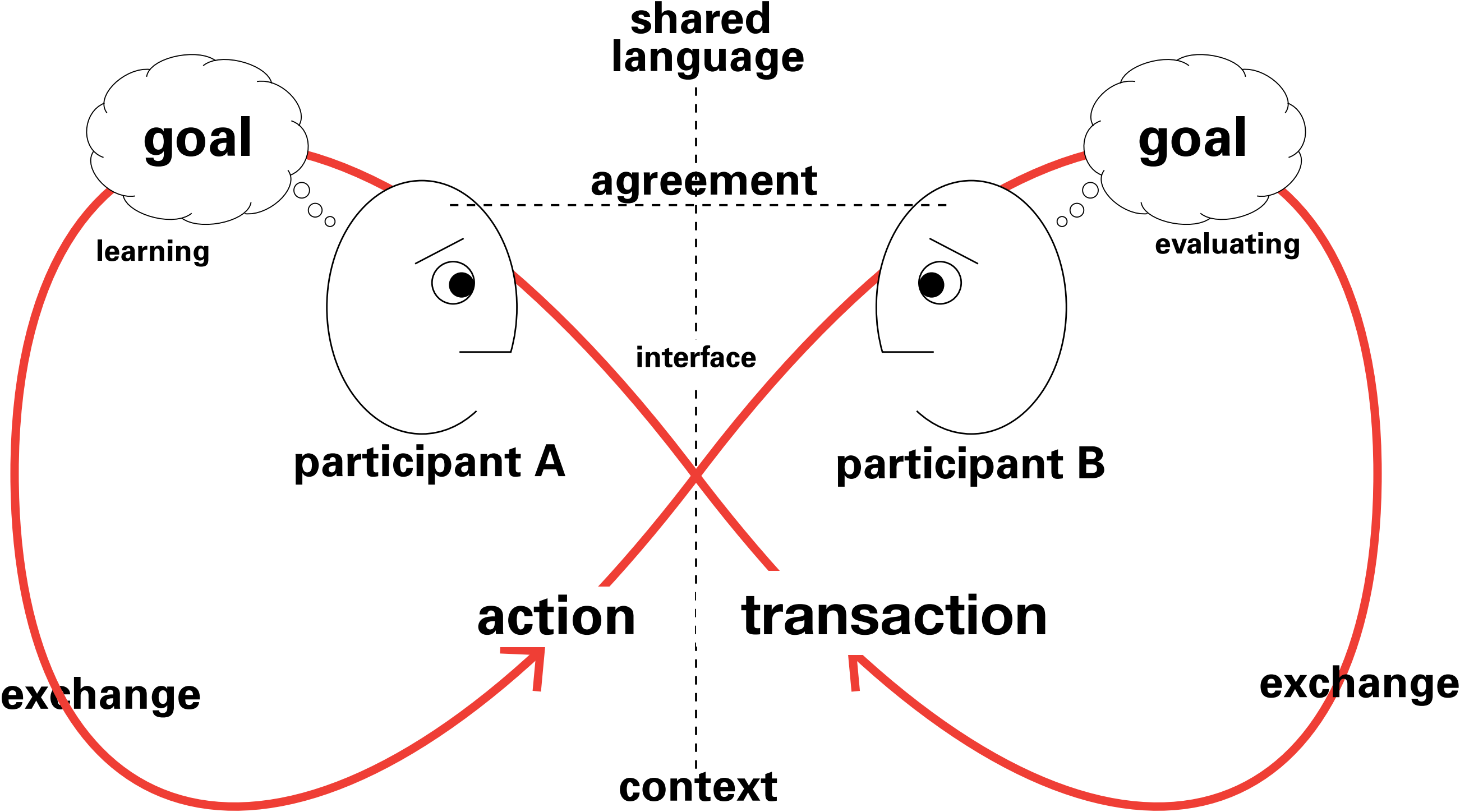
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# An agreement may be reached.



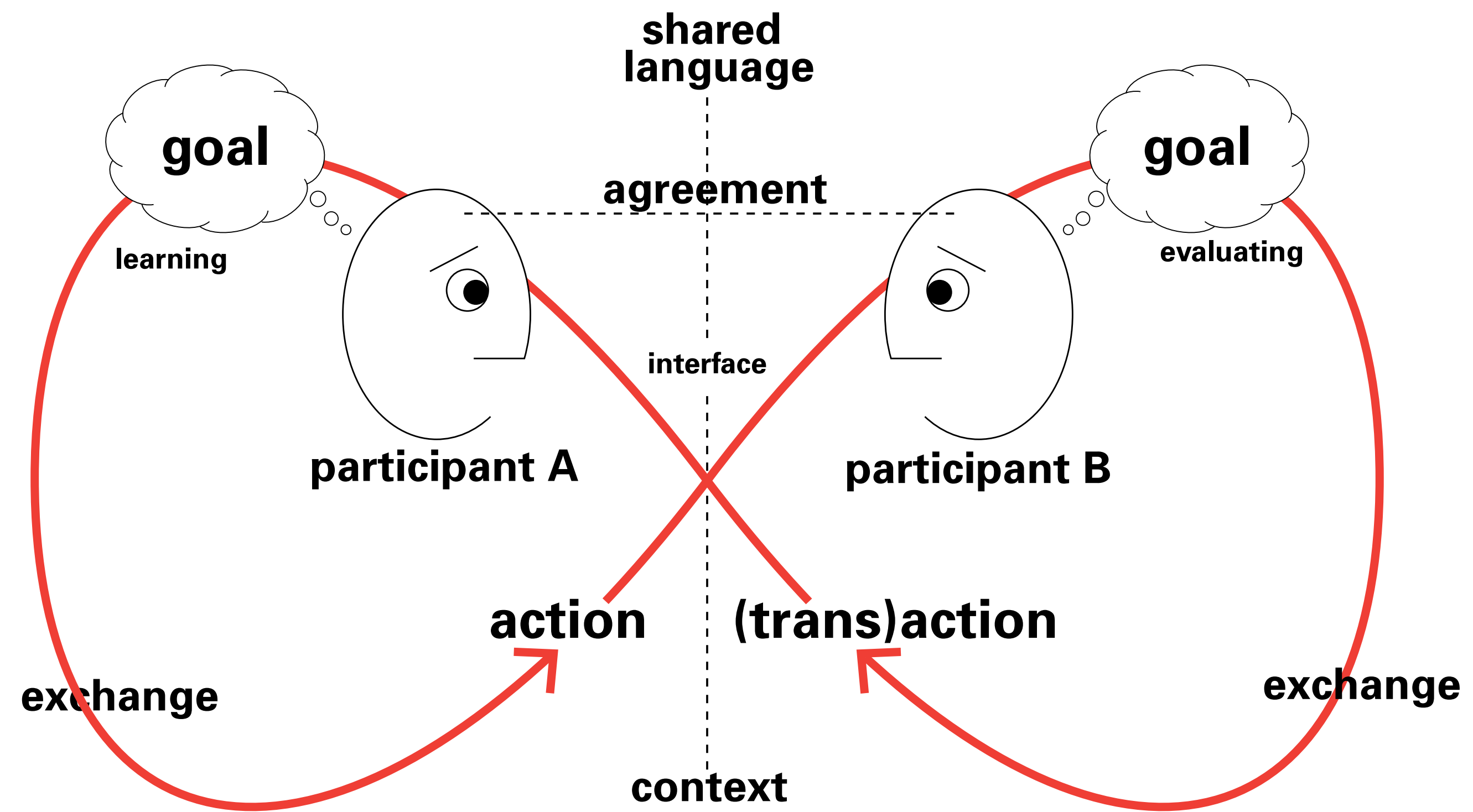
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# A transaction may occur.



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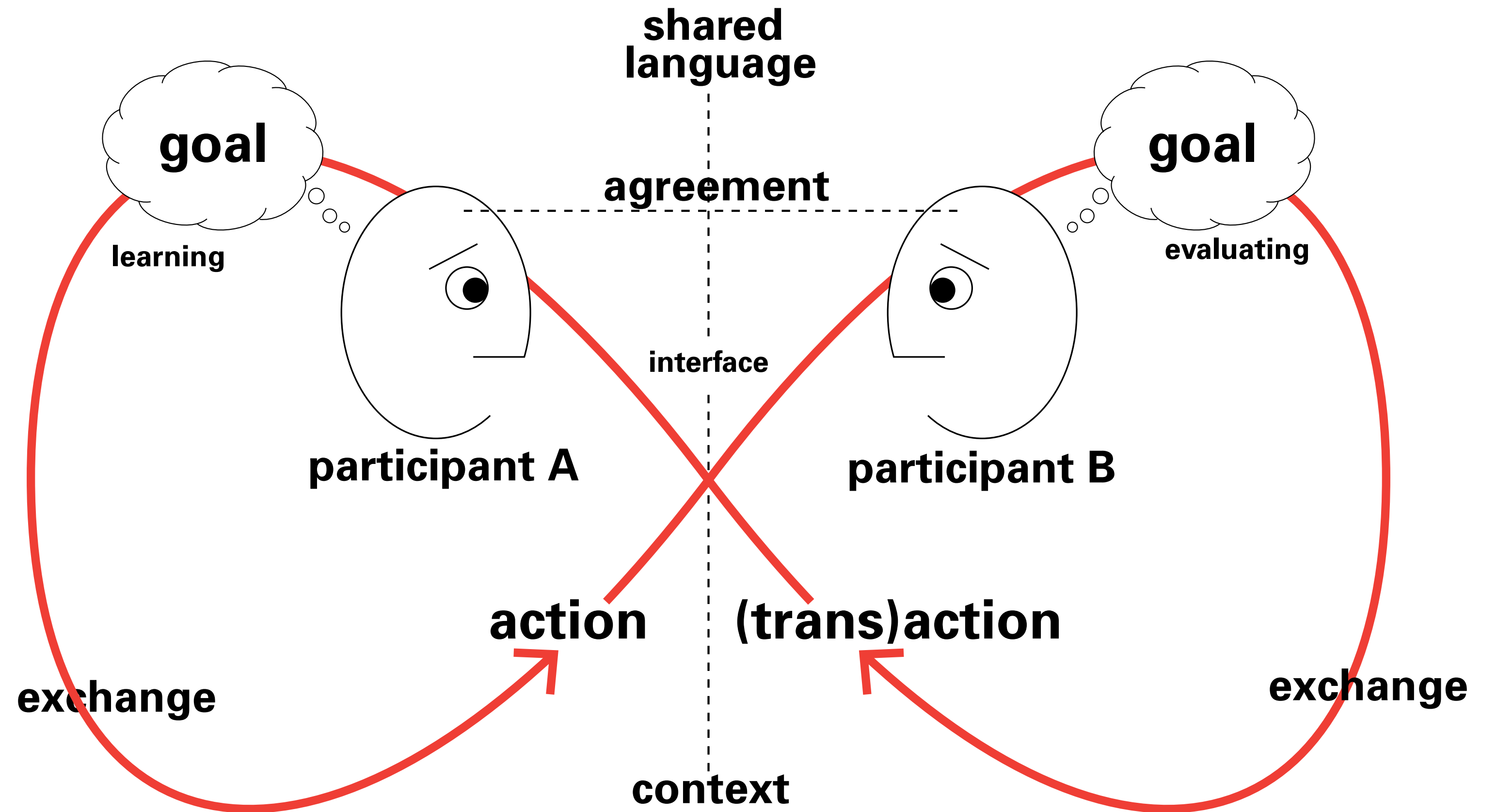
# Conversation Model



See also Pangaro: *Economy of Insight*

# Conversation Model— C-L-E-A-T

**C** – Context  
**L** – Language  
**E** – Engagement  
**A** – Agreement  
**T** – Transaction





**We believe cybernetics offers a foundation for 21st-century design practice, with this rationale:**

— Dubberly & Pangaro, “Cybernetics and Design: Conversations for Action”, 2019

## **If design, then systems:**

- The prominence of digital technology in daily life cannot be denied (or reversed).  
Digital technology comprises systems of systems (Internet of Things).
- Design has expanded from **giving-form** to **creating systems** that support interactions.  
Human interactions span thinking and acting, whether mundane or metaphysical.

**We must model and tame this complex mesh of mechanisms.**

**Therefore: systems literacy is a necessary foundation for design.**

**If design, then systems.**

**If systems, then cybernetics:**

- Digital interactions comprise reliable connections, communication, and feedback.  
Human interactions comprise purpose, feedback, and learning.
- The science of communication and feedback, interaction and purpose, is cybernetics.

**We must model communication and intention in a common frame.**

**Therefore: cybernetics is a necessary foundation for design.**

**If design, then systems.**

**If systems, then cybernetics.**

**If cybernetics, then second-order cybernetics:**

- Framing “wicked challenges” requires articulating human values and viewpoints. Values and viewpoints are subjective.
- Designers must offer a persuasive rationale for our subjective viewpoints.
- Modeling subjectivity is the province of second-order cybernetics.

**We must embrace values and subjectivity at the heart of designing.**

**Therefore: second-order cybernetics is a necessary foundation for design.**

**If design, then systems.**

**If systems, then cybernetics.**

**If cybernetics, then second-order cybernetics.**

**If second-order cybernetics, then conversation:**

- Taming “wicked challenges” must be grounded in argumentation.
- Argumentation requires conversation so that participants may understand and agree.
- Agreement is necessary for collaboration and effective action.

**We must embrace argumentation and collaboration to the heart of 21st-century design.**

**Therefore: conversation is a necessary foundation for design.**

**If design, then systems.**

**If systems, then cybernetics.**

**If cybernetics, then second-order cybernetics.**

**If second-order cybernetics, then conversation.**

— Dubberly & Pangaro, “Cybernetics and Design: Conversations for Action”, 2019



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