Interactvity with human and non-human agency

Examples and Discourses
presented by
Prof. Ursula Damm

Jacob von Uexküll

and his Biosemiotics, 1920

*1864	in Keblas, today Mihkli (Estonia) father: mayor of Reval (Tallin) Baltic-German nobility
1884-89	University of Dorpat (Tartu)(Zoology)
1889-1903	Physiologisches Institut der Universität Heidelberg bei (Wilhelm Kühne (1837-1900)
1907	Honorare Doktorate Univ. Heidelberg (Physiologie der Muskeln wirbelloser Tiere „Uexkülls Gesetz“)
1925	Universität Hamburg „Institut für Umweltforschung“ außerordentlicher Prof.
1939	retired
† 1944,	Capri

1892-1903 Naples
Anton Dohrn ‘s Zoological Station

1904-1914:
Beck sur mer
Biaritz
Roscoff
Monaco

The idea of a
„flying aquarium“

Computer Interfaces have been defined by the human and developed a technical environment („Umgebung“) governed by us.

Interface Design or Human Computer Interfaces are designing the perfect **„Umwelt“** for a human beings and therefore heavily anthropocentric.

As a consequence, we life in a world full of man made technology, the so called ‚Anthropocene‘

We are not only surrounded by nature, animals and humans, but also by technical „agents“

- How can we develop devices to acknowledge our **situatedness** and to integrate the body as a means of expression?
- And how works communication on this preconditions?
- I propose to adopt the way how Jakob von Uexküll (Biologist, 1864-1944) studied animals in their environment - **even for technical agents**

Uexküll promoted the term „Umwelt“ in our contemporary understanding*.

**Jakob von Uexkull: A Stroll Through the Worlds of Animals and Men*

To do so, we must first blow, in fancy, a soap bubble around each creature to represent its own world, filled with the perceptions which it alone knows. When we ourselves then step into one of these bubbles, the familiar meadow is transformed. Many of its colorful features disappear, others no longer belong together but appear in new relationships. A new world comes into being. Through the bubble we see the world of the burrowing worm, of the butterfly, or of the field mouse; the world as it appears to the animals themselves, not as it appears to us. This we may call the *phenomenal world* or the *self-world* of the animal.

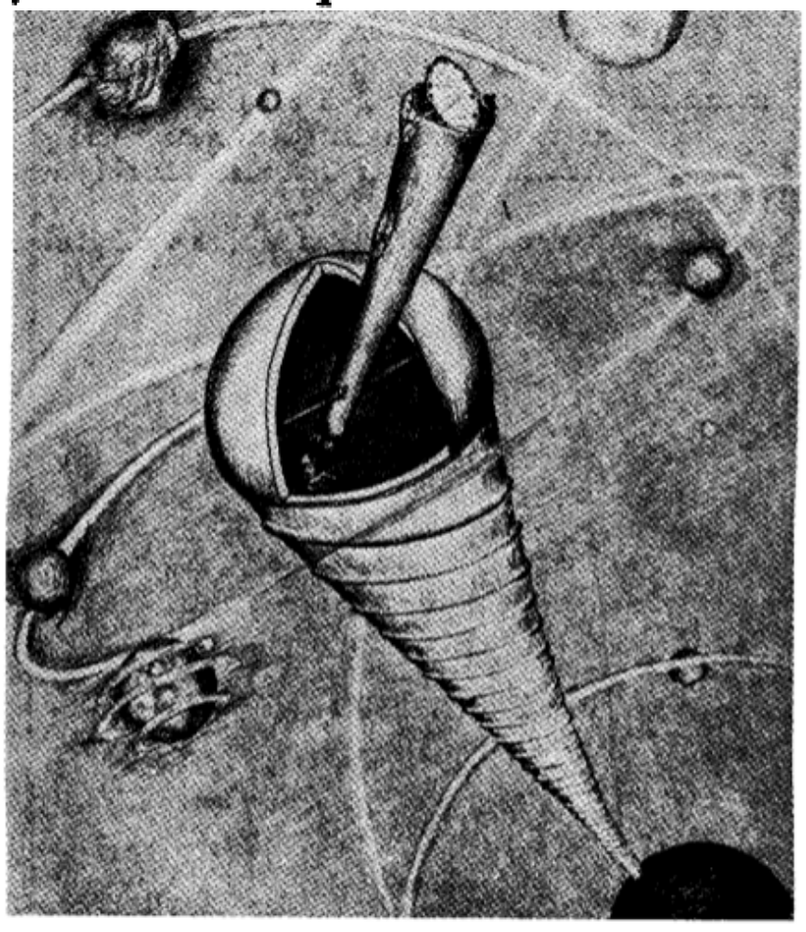


FIG. 53
The astronomer's *Umwelt*

*Jakob von Uexkull: A Stroll Through the Worlds of Animals and Men

After mating, the female climbs to the tip of a twig on some bush. There she clings at such a height that she can drop upon small mammals that may run under her, or be brushed off by larger animals.

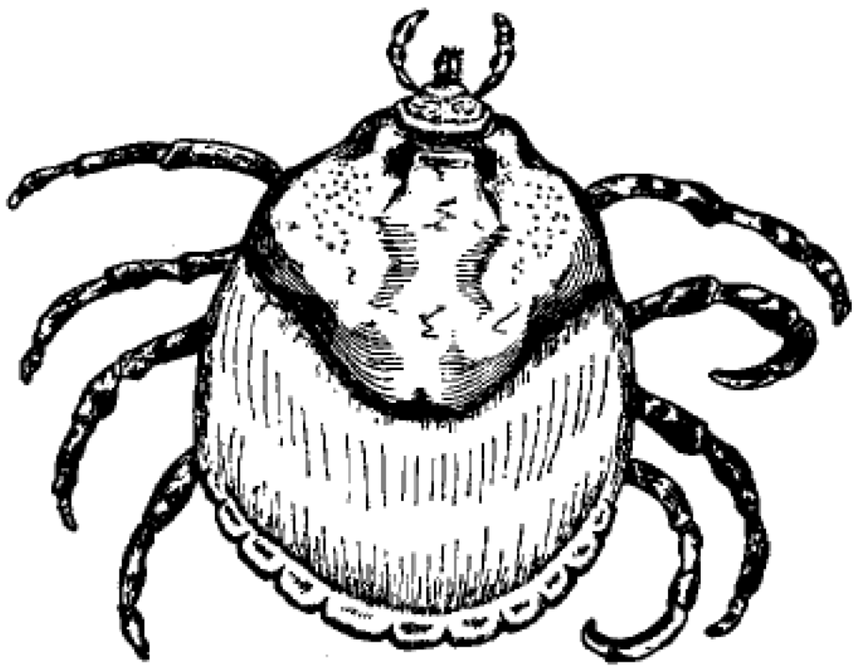


FIG. 1
Tick

The eyeless tick is directed to this watchtower by a general photosensitivity of her skin. The approaching prey is revealed to the blind and deaf highway woman by her sense of smell. The odor of butyric acid, that emanates from the skin glands of all mammals, acts on the tick as a signal to leave her watchtower and hurl herself downwards. If, in so doing, she lands on something warm—a fine sense of temperature betrays this to her—she has reached her prey, the warm-blooded creature. It only remains for her to find a hairless spot. There she burrows deep into the skin of her prey, and slowly pumps herself full of warm blood.

*Jakob von Uexkull: A Stroll Through the Worlds of Animals and Men

The tick hangs motionless on the tip of a branch in a forest clearing. Her position gives her the chance to drop on a passing mammal. Out of the whole environment, no stimulus affects her until a mammal approaches, whose blood she needs before she can bear her young.

And now something quite wonderful happens. Of all the influences that emanate from the mammal's body, only three become stimuli, and those in a definite sequence. Out of the vast world which surrounds the

*Jakob von Uexkull: A Stroll Through the Worlds of Animals and Men

tick, three stimuli shine forth from the dark like beacons, and serve as guides to lead her unerringly to her goal. To accomplish this, the tick, besides her body with its receptors and effectors, has been given three receptor signs, which she can use as sign stimuli. And these perceptual cues prescribe the course of her actions so rigidly that she is only able to produce corresponding specific effector cues.

The whole rich world around the tick shrinks and changes into a scanty framework consisting, in essence, of three receptor cues and three effector cues—her *Umwelt*. But the very poverty of this world guarantees the unfailing certainty of her actions, and security is more important than wealth.

From the example of the tick we can deduce the basic structural traits of the *Umwelt,* which are valid for all animals. However, the tick possesses another most remarkable faculty, which affords a further insight into these worlds.

The lucky coincidence which brings a mammal under the twig on which the tick sits obviously occurs very rarely. Nor does the large number of ticks ambushed in the bushes balance this drawback sufficiently to ensure survival of the species. To heighten the probability of a prey coming her way, the tick's ability to live long without food must be added. And this faculty she possesses to an unusual degree. At the Zoological Institute in Rostock, ticks who had been starving for eighteen years have been kept alive.[3] A tick can wait eighteen years. That is something which we humans cannot do. Our time is made up of a series of moments, or briefest time units, within which the world shows no change. For the duration of a moment, the world stands still. Man's moment lasts ⅛ of a second.[4] We shall see later that the length of a moment varies in different animals. But whatever number we wish to adopt for the tick, the ability to endure a never-changing world for eighteen years

*Jakob von Uexkull: A Stroll Through the Worlds of Animals and Men

is beyond the realm of possibility. We shall therefore assume that during her period of waiting the tick is in a sleeplike state, of the sort that interrupts time for hours in our case, too. Only in the tick's world, time, instead of standing still for mere hours, stops for many years at a time, and does not begin to function again until the signal of butyric acid arouses her to renewed activity.

What have we gained by realizing this? Something extremely significant. Time, which frames all happening, seems to us to be the only objectively stable thing in contrast to the colorful change of its contents, and now we see that the subject sways the time of his own world. Instead of saying, as heretofore, that without time, there can be no living subject, we shall now have to say that without a living subject, there can be no time.

In the next chapter we shall see that the same is true of space: without a living subject, there can be neither space nor time. With this, biology has ultimately established its connection with the doctrine of Kant, which it intends to exploit in the *Umwelt* theory by stressing the decisive role of the subject.

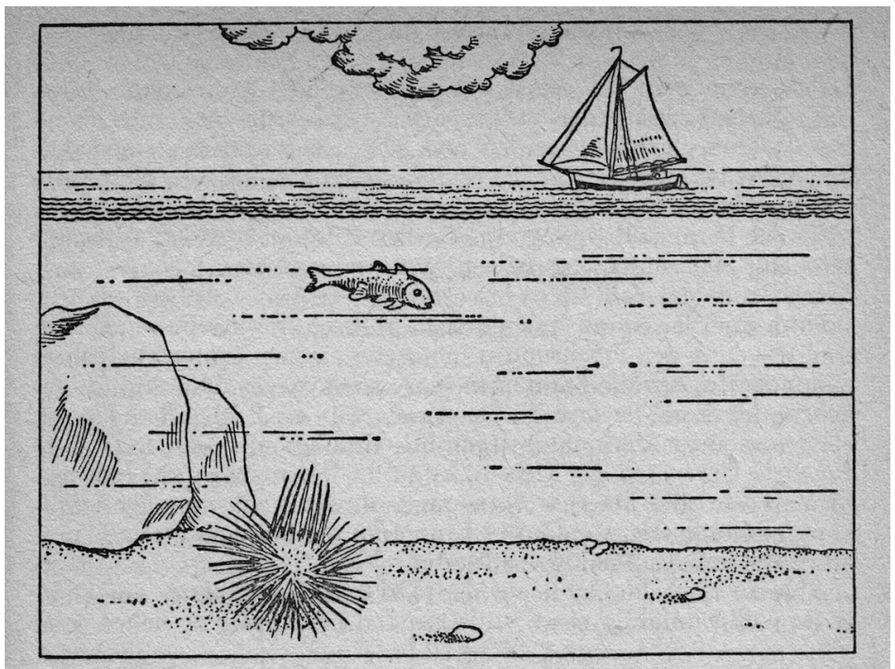


Abb. 19a. Umgebung des Seeigels

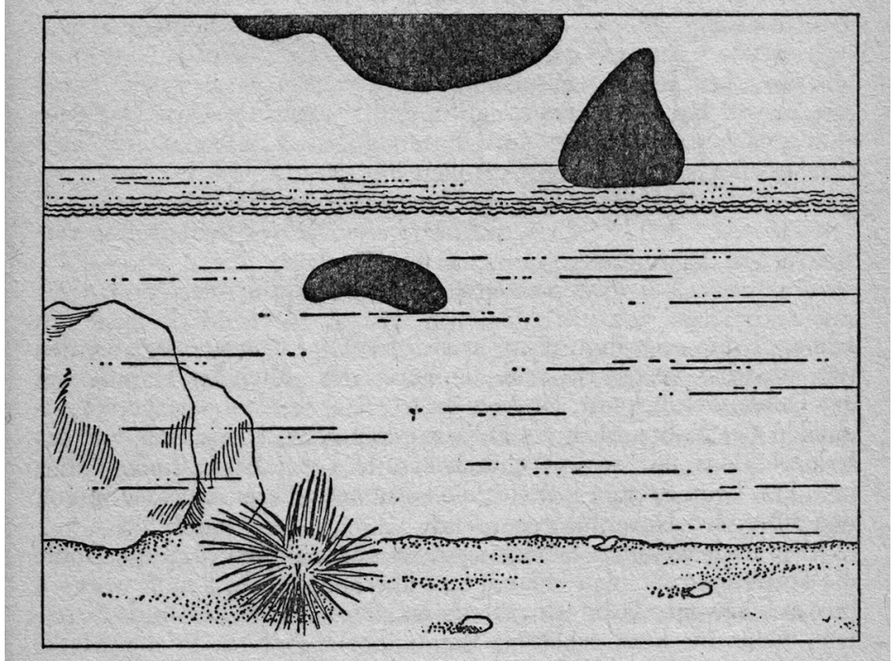
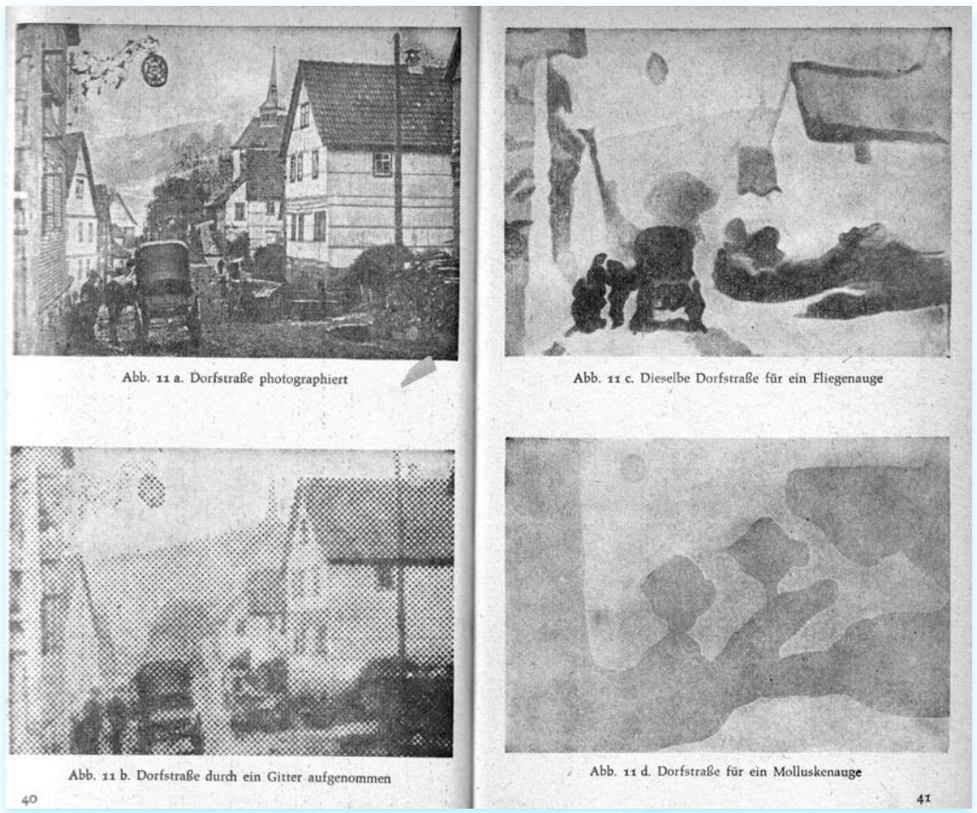


Abb. 19b. Umwelt des Seeigels

*Jakob von Uexkull: A Stroll Through the Worlds of Animals and Men

“subjective space” (Der subjektive Raum) of the animal

Uexküll J. v., Brock F. 1927. Atlas zur Bestimmung der Orte in den Sehräumen der Tiere. –
Zeitschrift für vergleichende Physiologie 5: 167-178.

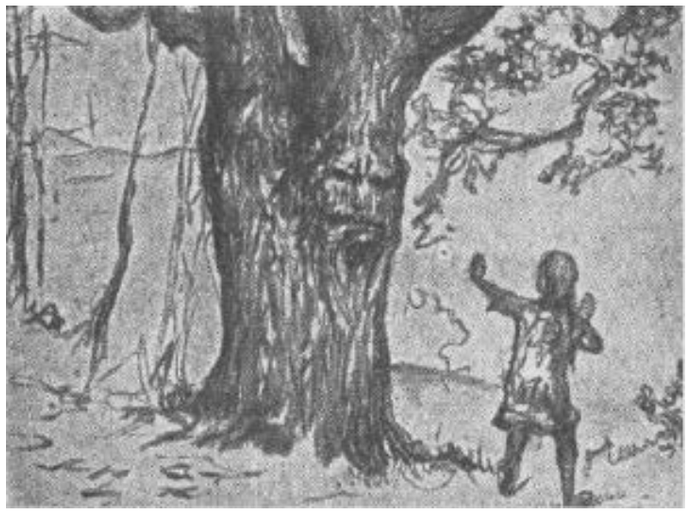


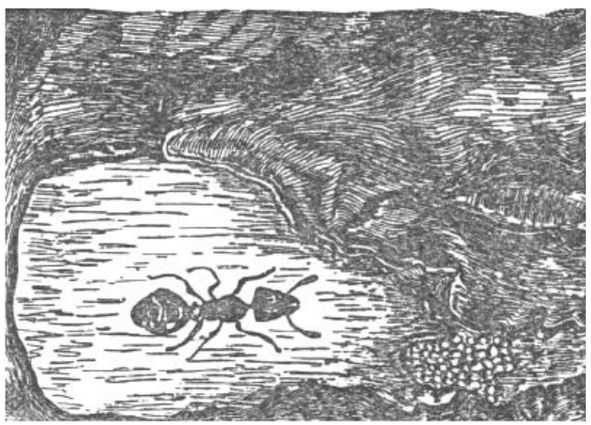
Grid, raster pitch

Pecten

- Photographic image represents the human Sehraum. By using a grids with different pitches of the matrix the resolution of the compound eye of a fly (Musca) or the eye of a mussel (Pecten) was emulated - the pitch of the raster, corresponding to the sensory elements in the eyes of the animals. Dots corresponding to “visual locations in the visual space. “Sehorte”

- In order to eliminate the artifacts of the grid, aquarell paintings of the supposed Umwelten were produced:
Science-based pieces of art





The old oak

- *within the rational ‚Umwelt' of a forester*

„Umwelt“

- *in the magic ‚Umwelt' of a girl*

- *as the booty field of an ant*

- *as protection for the larva of a hive beetle (as well as the egg depository of a horntail)*

Jakob von Uexkull: A Stroll Through the Worlds of Animals and Men

The umwelt is for Uexküll an environment-world which is "constituted by a more or less broad series of elements [called] „carriers of significance“ or“marks" which are the only things that interest the animal

Girogio Agamben, The Open — Man and Animal Stanford 2004

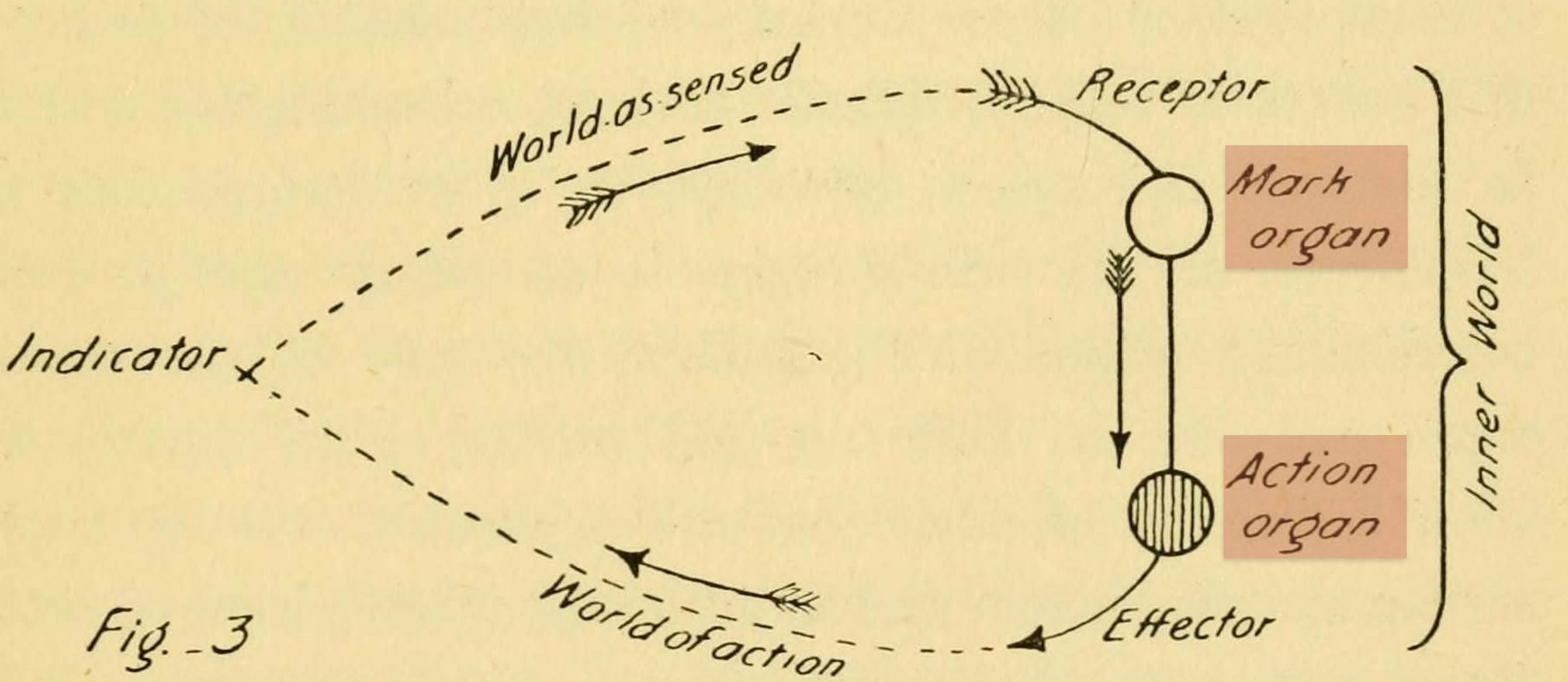


Fig. - 3

Jakob v. Uexküll: Theoretische Biologie 1920 : p 155:

- *„As the diagram shows, the inner world is divided into tow parts;*
  one which receives the impressions, is turned towards the world-as-sensed,
  and the other, which distributes the effects, ist turned towards the world of action.
  Between the mark-organ and action-organ lies the watershed of the whole function-circle.
  The mark-organ and the action-organ are each of them controlled by a rule; the one arranges the impressions in the mark-organ, and so creates the indication: the other arranges the effects produced by the action-organ, and so creates the actions. Both rules are focussed accurately on the indication in the external world, the appearance of which is the signal for the indications to arise, and which has then“to be dealt with.“ The circle forms a unified whole, for, just as in an organism, each part is dependent on the others.

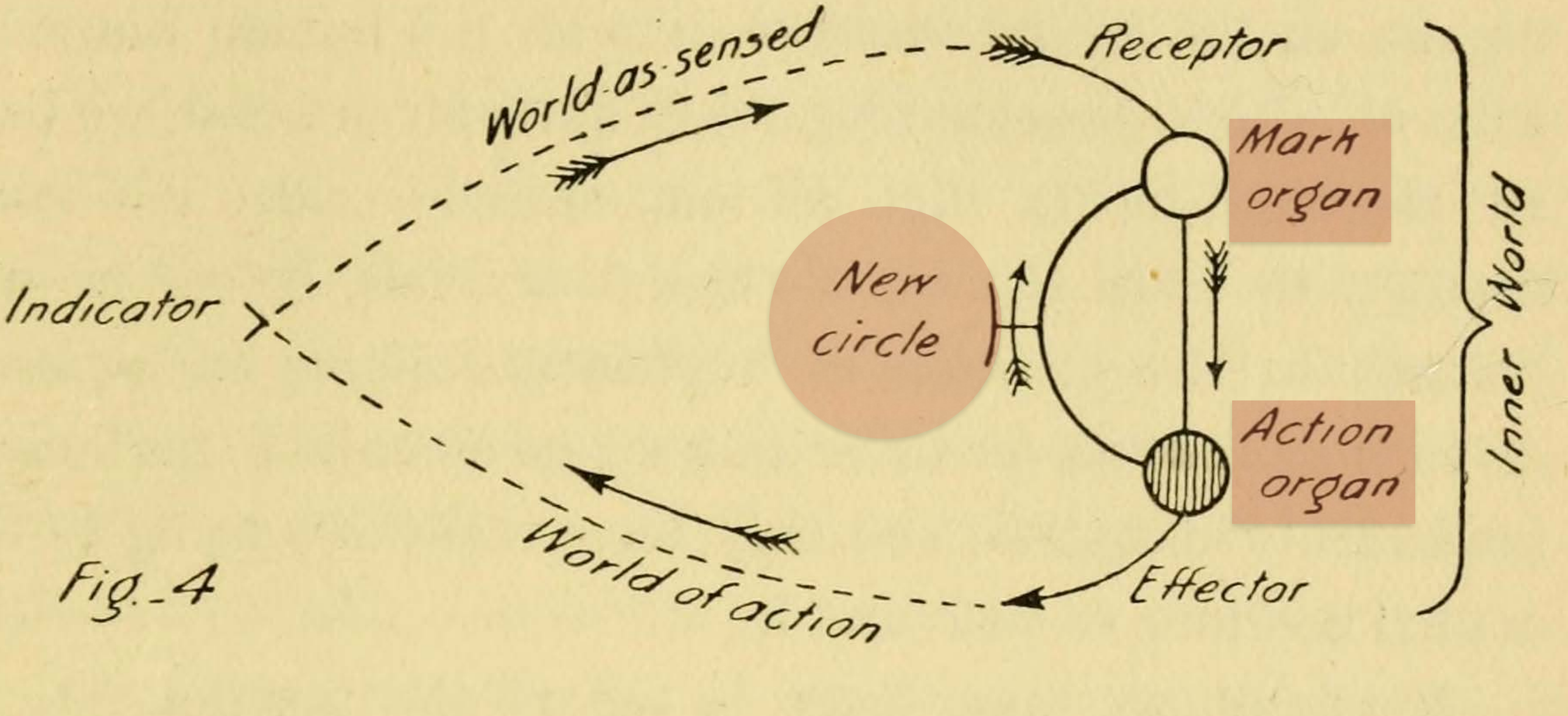


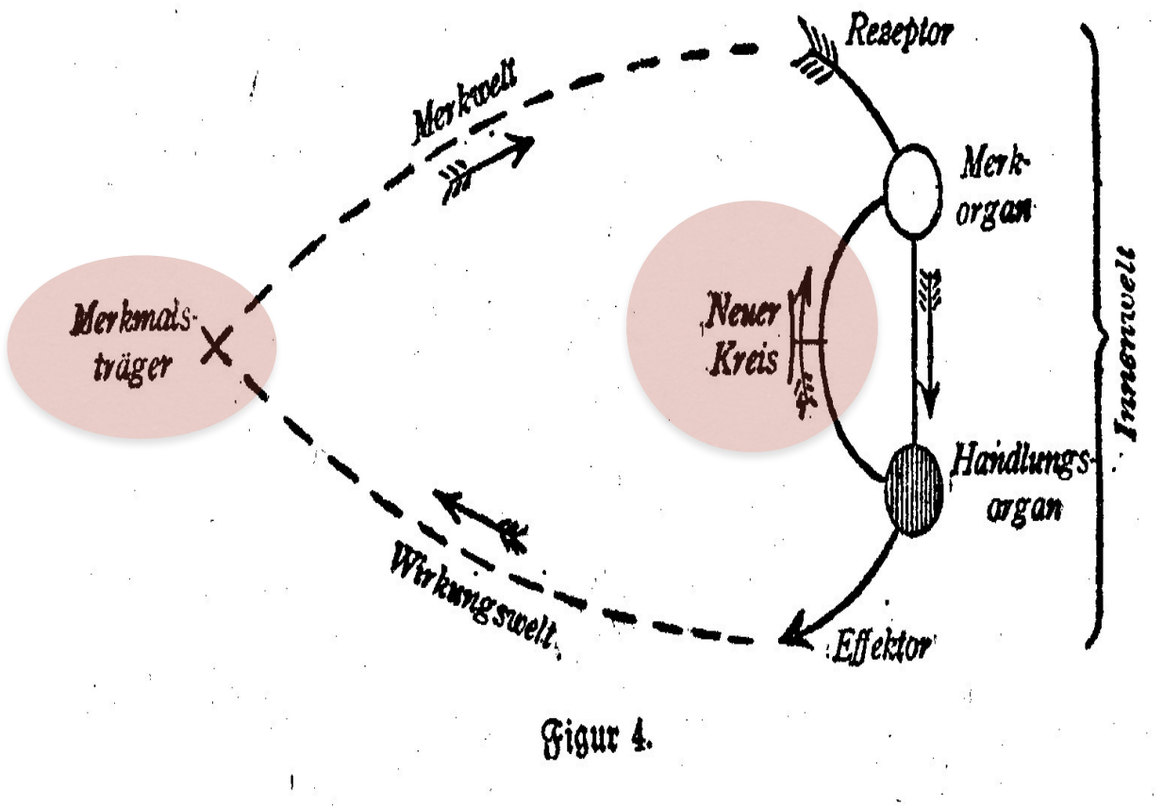
Fig. 4

Jakob v. Uexküll: Theoretische Biologie 1920 : p 116:

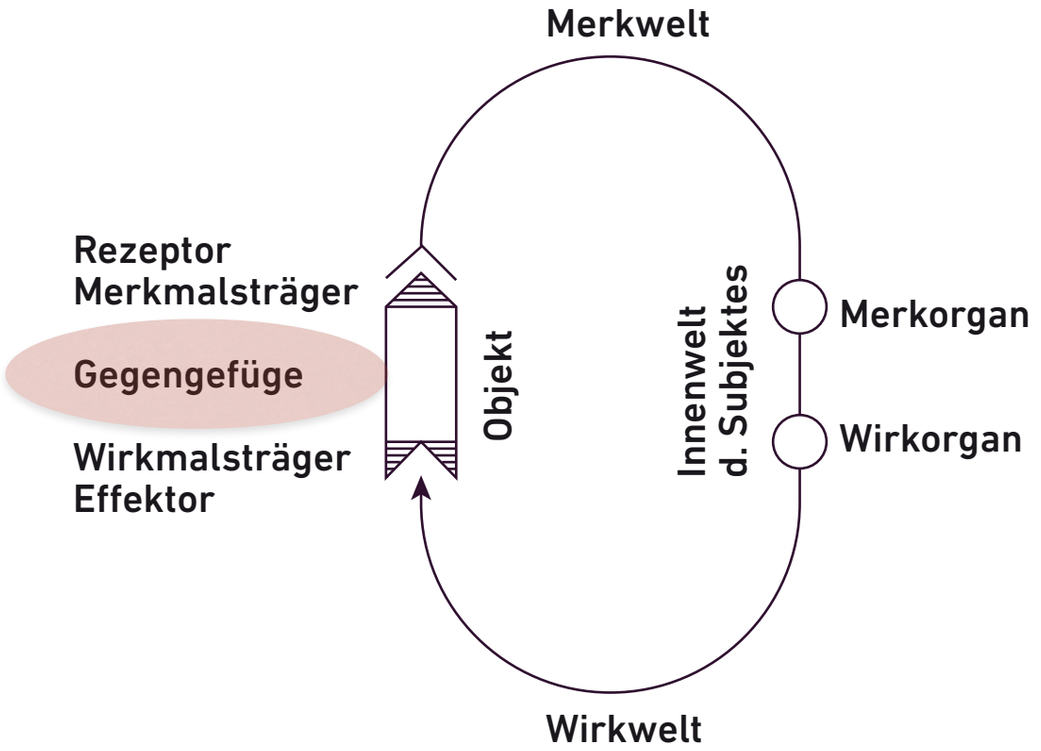
- *„A new circle is introduced within the animal's own central organ, for the support of the external function-circle, and this connects the action-organ with the mark-organ.*

- *In this way, the animal's own action-rule fits in with the indications stimulated from without, and now serves the mark-rule as a skeleton to which it may attach the external indications*

Uexküll generalizes: from function loop to feedback loop



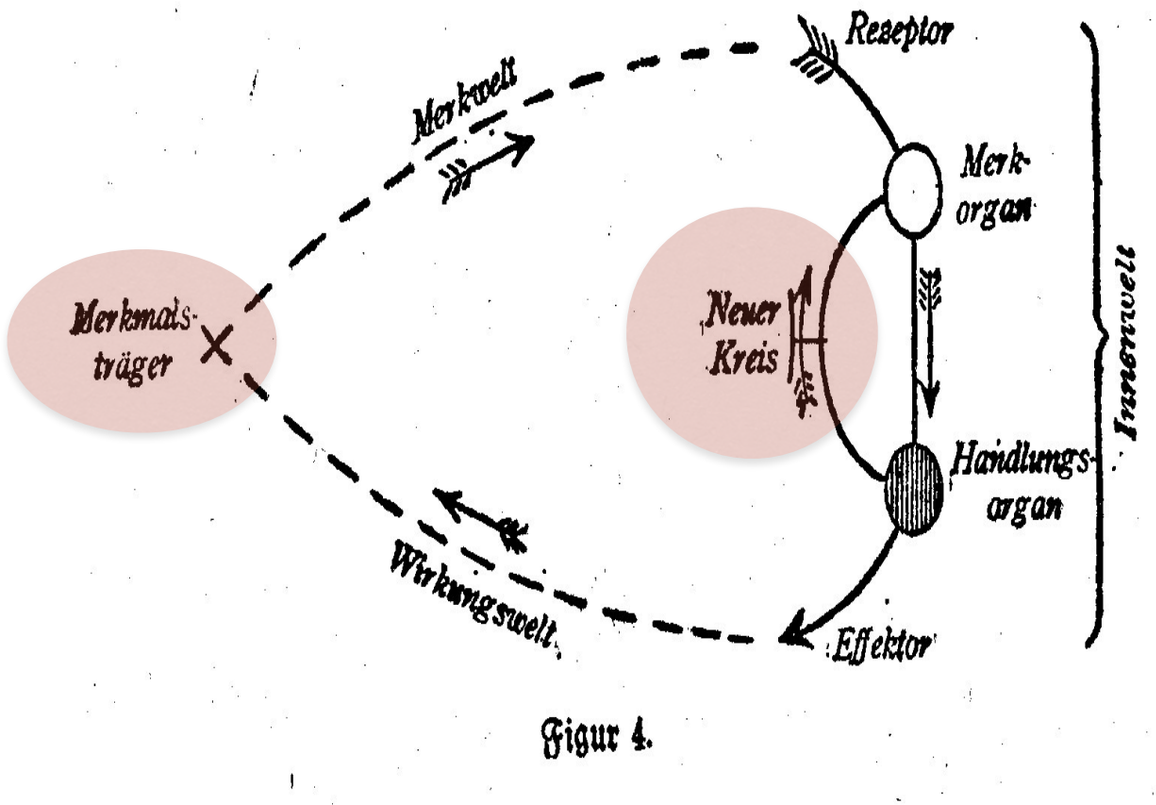
Figur 4.



Biosemiotic Feedback circle, internal **„Umwelt“**

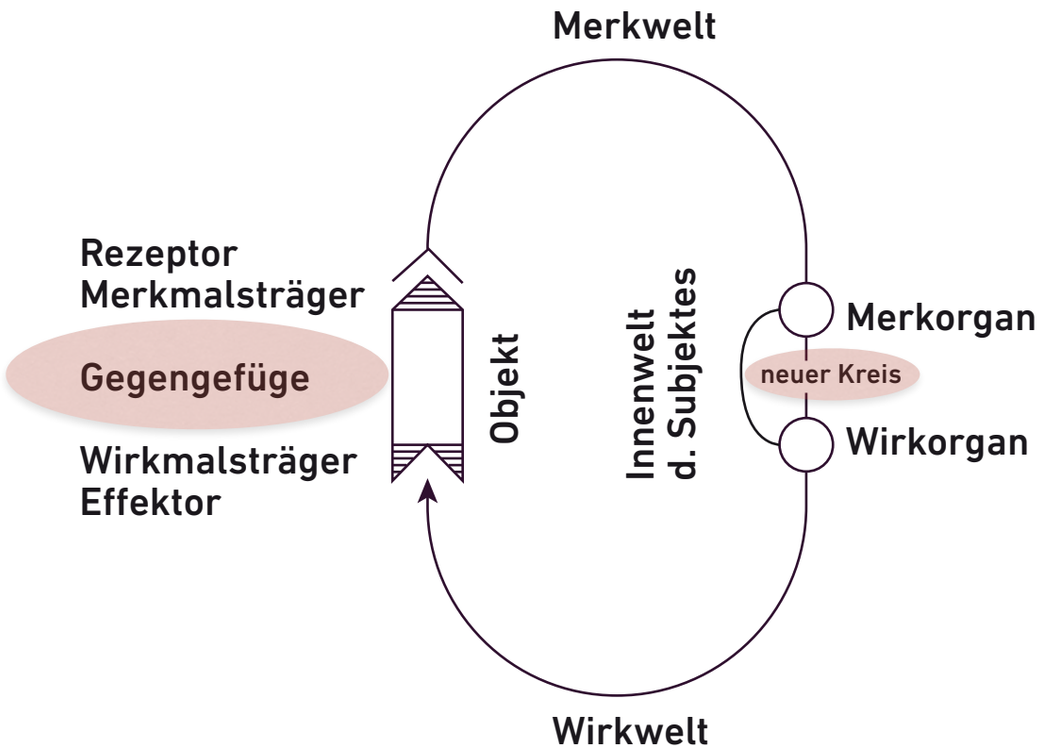
planned Interaction, **„Gegengefüge“**
(counter structure)

Uexküll generalizes: from function loop to feedback loop



Figur 4.

Biosemiotic Feedback circle, internal **„Umwelt“**



planned Interaction, **„Gegengefüge“**
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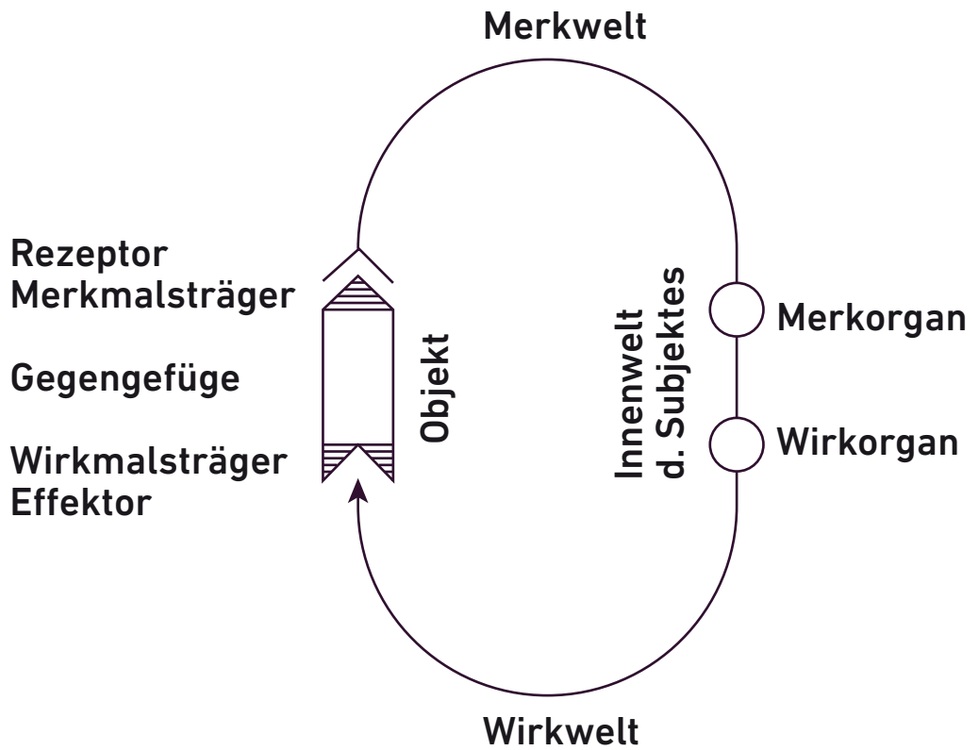
Uexküll generalizes: from function loop to feedback loop

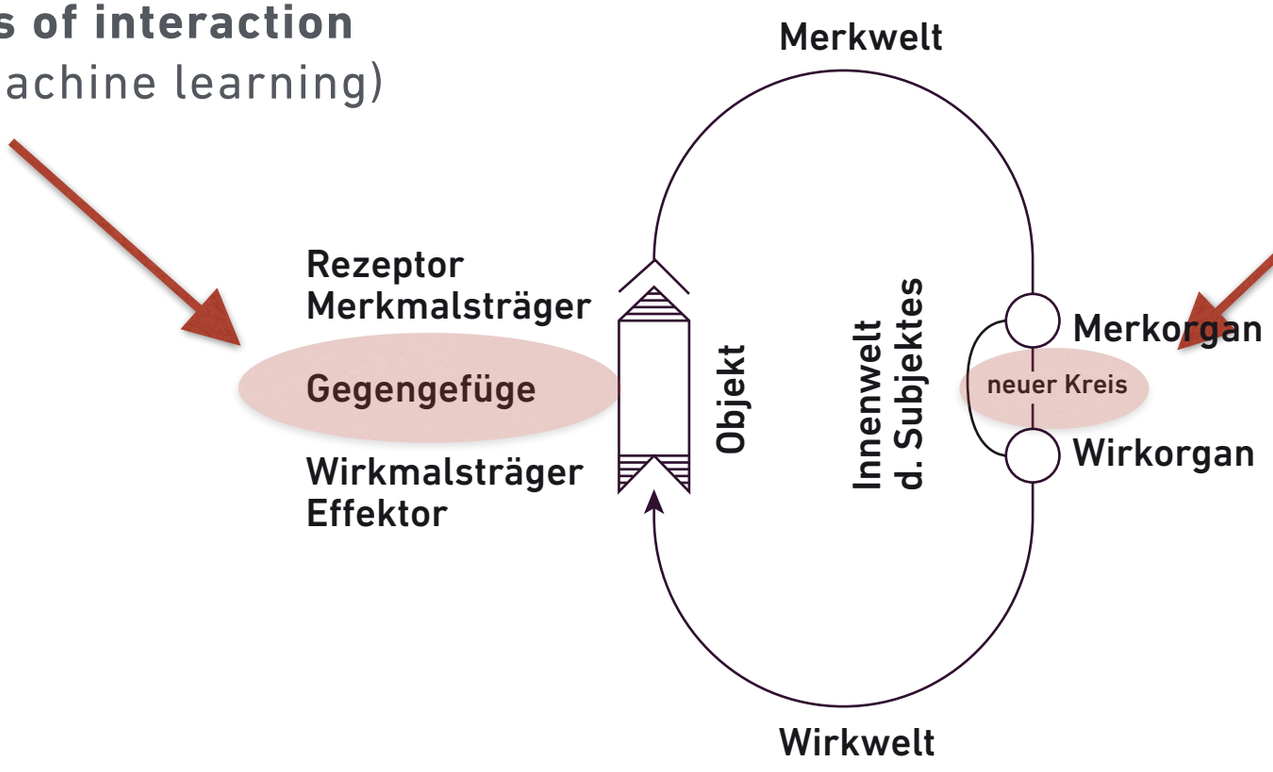


planned interaction, **„Gegengefüge“= counter structure**

Uexküll generalized: from function cycle to feedback loop

the object stores technically memories of interaction
(e.g. by machine learning)

the subject creates through memory a specific inner world



planned interaction, **„Gegengefüge“= counter structure**

Zusammenfassung:

Uexküll: Mensch - bubble - gegengefüge- animal

Shannon: Mensch - media -maschine

Heute:

Mensch - Maschine - Tier/Mensch/techn. Agent (Robot)

developing communication from two sides

what are the prerequisites for the design of interaction?

Claude Shannon

and his Information Theory 1948

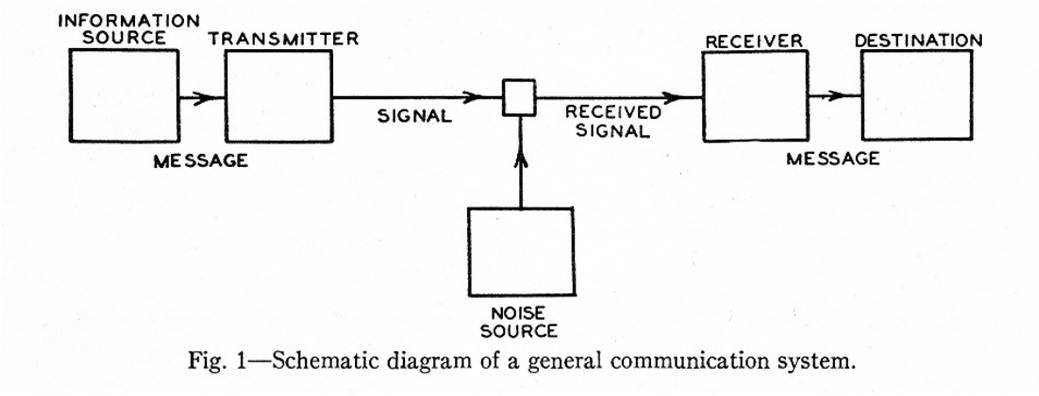
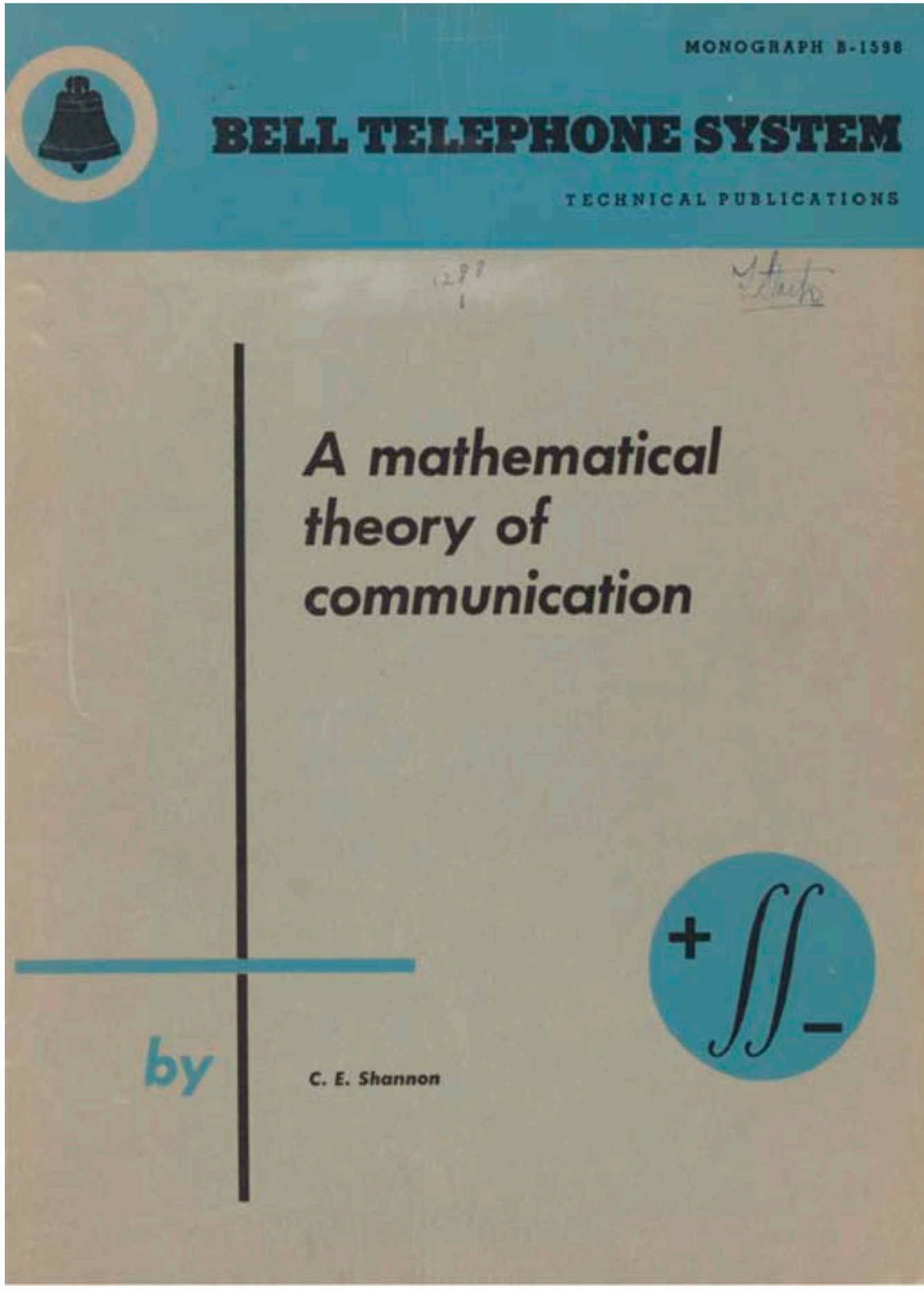


Fig. 1—Schematic diagram of a general communication system.

Image link

„Information theory studies the quantification, storage, and communication of information. It was originally proposed by Claude Shannon in 1948 to find fundamental limits on signal processing and communication operations such as data compression, in a landmark paper titled "A Mathematical Theory of Communication". Its impact has been crucial to the success of the Voyager missions to deep space, the invention of the compact disc, the feasibility of mobile phones, the development of the Internet, the study of linguistics and of human perception, the understanding of black holes, and numerous other fields.“ Wikipedia

The original publication
Monoskop on infomation theory



Claude Shannon

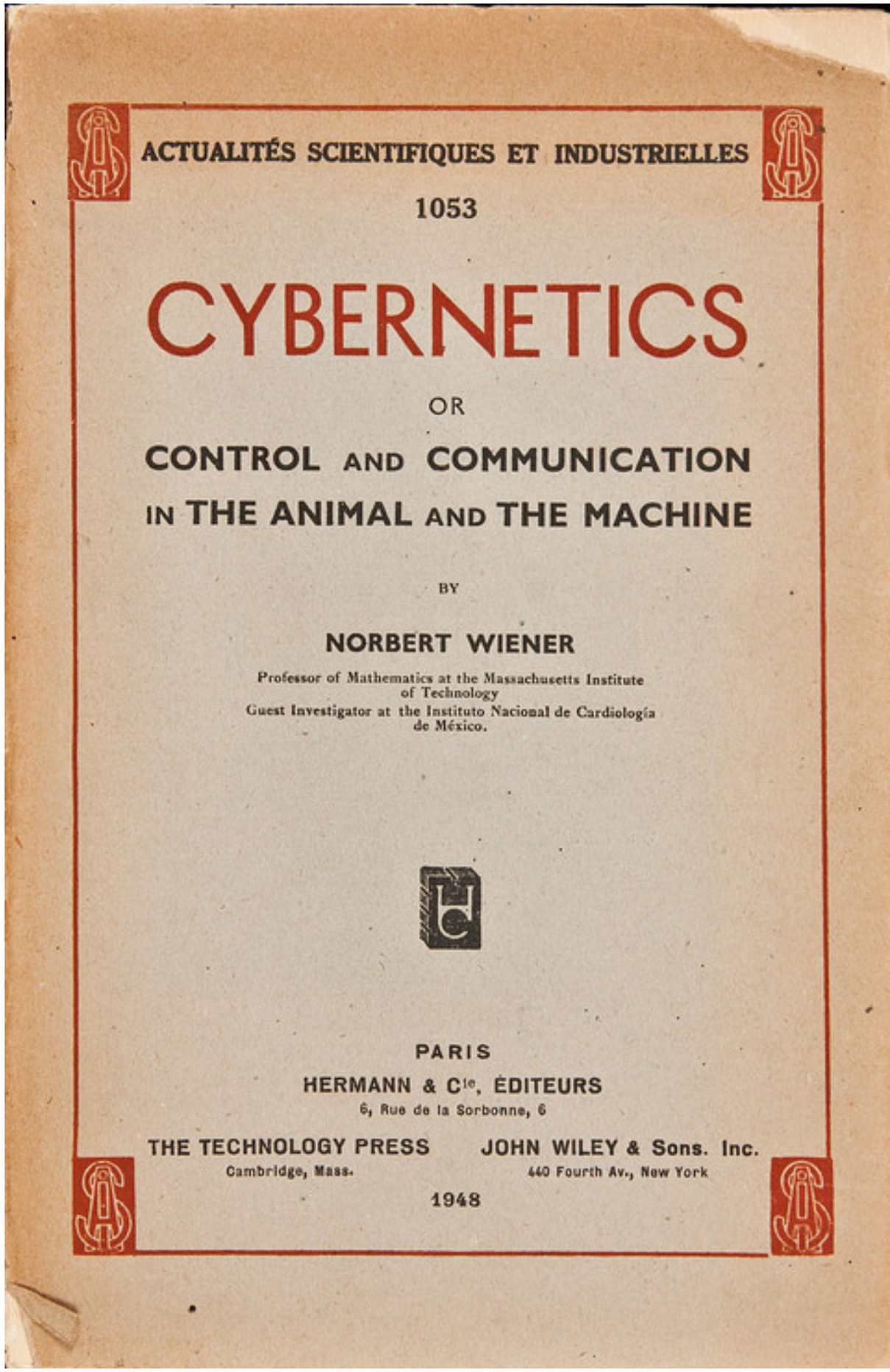
Robots that juggle - a vision for the flow of information

Robots that juggle on an old Stanford
Video of Claude Shannon juggling
Documentary on Claude Shannon and his importance by UCTV
Literature:
Axel Roch: Spielzeug, Leben und die geheime Geschichte seiner Theorie der Information
Gegengestalt 2010

Norbert Wiener

on Cybernetics 1948

[The original publication]


ACTUALITÉS SCIENTIFIQUES ET INDUSTRIELLES

1053

CYBERNETICS

OR

CONTROL AND COMMUNICATION

IN THE ANIMAL AND THE MACHINE

BY

NORBERT WIENER

Professor of Mathematics at the Massachusetts Institute of Technology

Guest Investigator at the Instituto Nacional de Cardiología de México.

PARIS

HERMANN & Cie, ÉDITEURS

6, Rue de la Sorbonne, 6

THE TECHNOLOGY PRESS

Cambridge, Mass.

JOHN WILEY & Sons. Inc.

440 Fourth Av., New York

1948

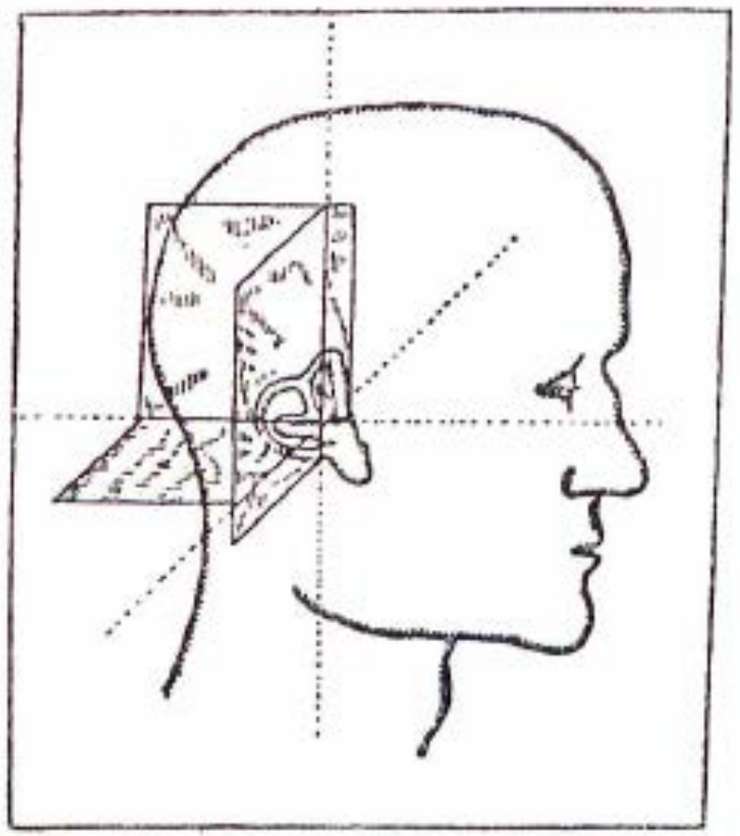
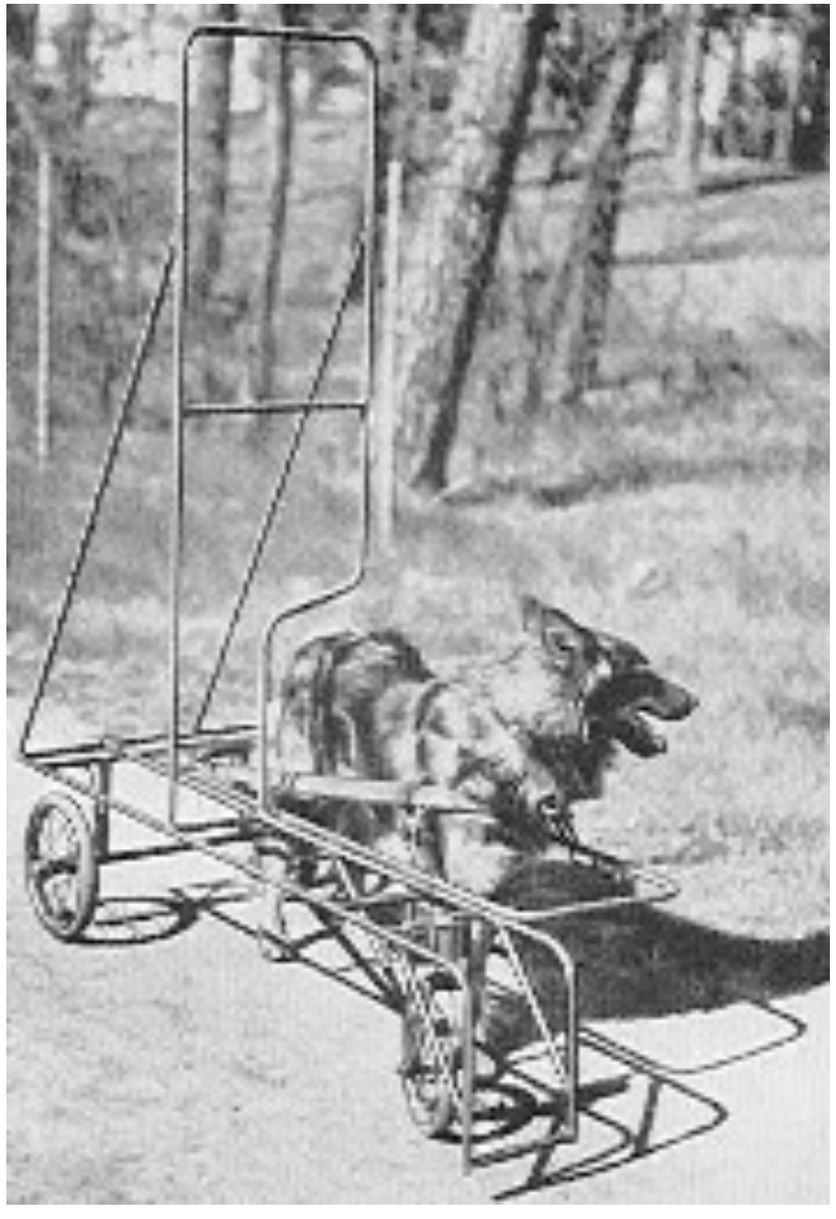


Abb. 1. Bogengänge und das ihnen entsprechende Koordinatensystem des Menschen nach v. Uexküll-Krissat, 1934.

man ad dog have the same „space organ“ with 3 dimensions



The Uexküll „Ausbildungswagen“ for guide dogs

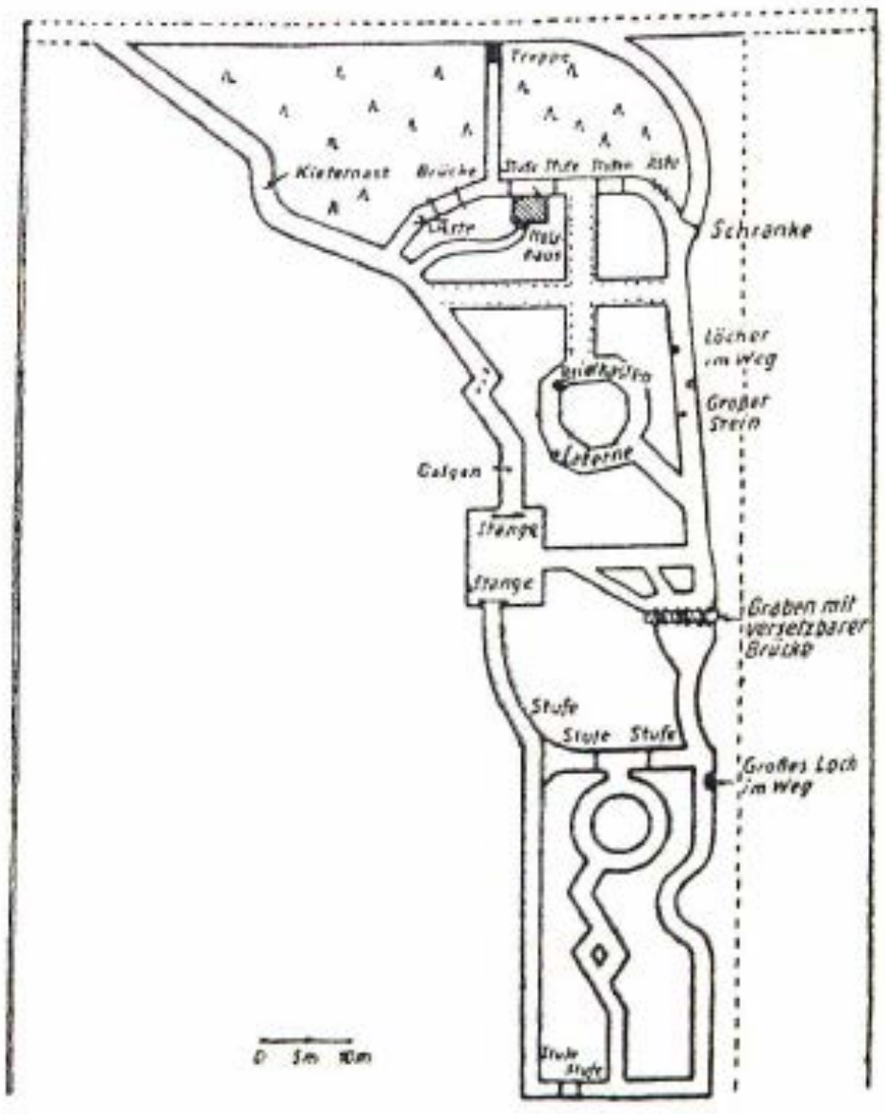
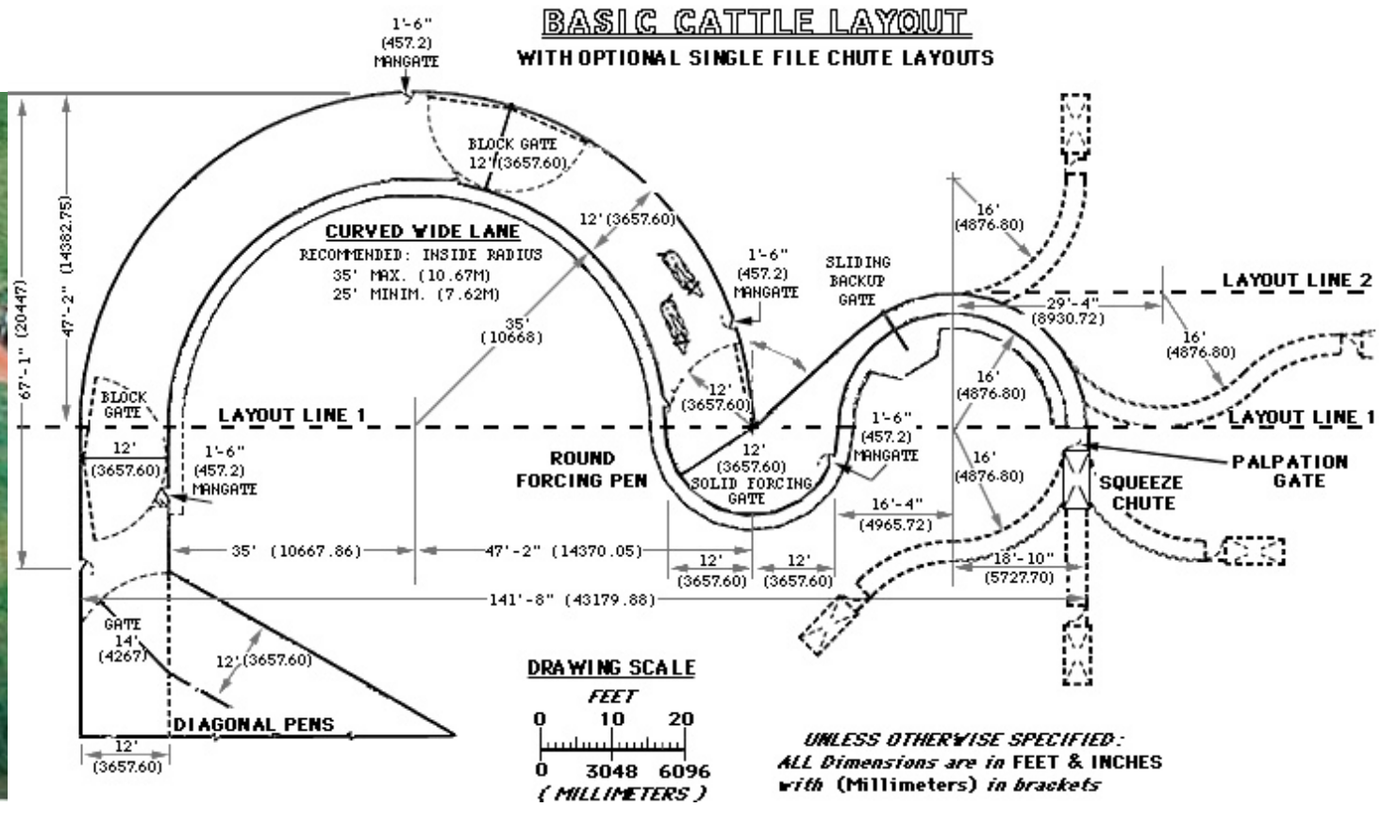


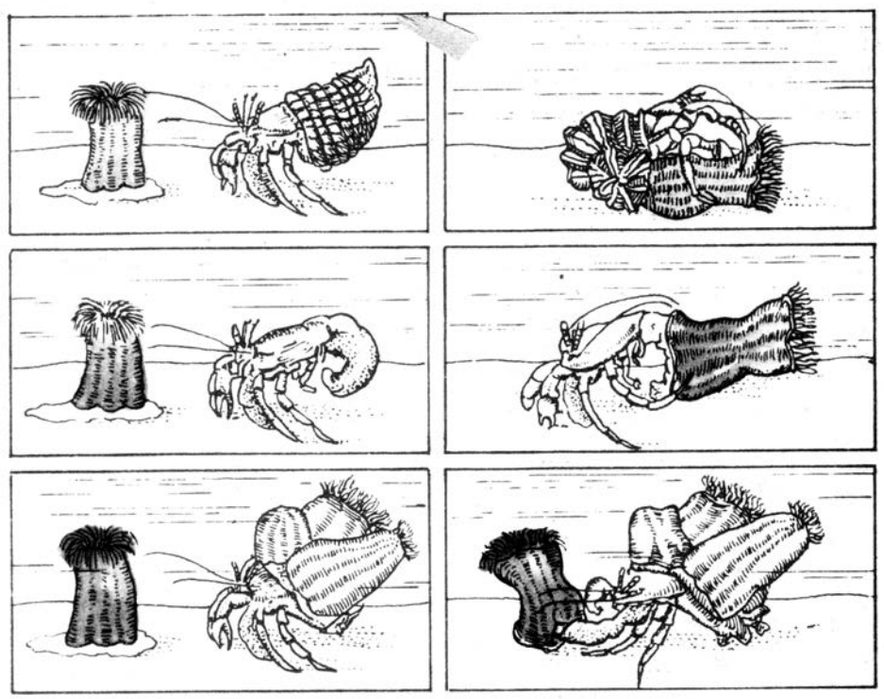
Abb. 3. Beispiel eines Planes für den Brüllschen Hindernisgarten.

Obstacle course for the training of guide dogs



Temple Grandin: Basic Cattle [Sorting] Layout

Friedrich Brock: Interaction of the Hermit crab with the sea anemone (Sagartia).



Farbbild 1 Seerose und Einsiedlerkrebs

F. Brock (1927): Das Verhalten des Einsiedlerkrebses Pagurus arrosor Herbst während des Aufsuchens, Ablösens und Aufpflanzens einer Seerose(...). Roux ‘ Archiv für Entwicklungsmechanik 112
Aus: Uexküll J. von, Kriszat G. 1934

Funktionskreis; Behausung

- 1. crab with a shell house puts the anemone upon its house

- 2. “naked” crab takes the anemone as protector until it finds a shell.

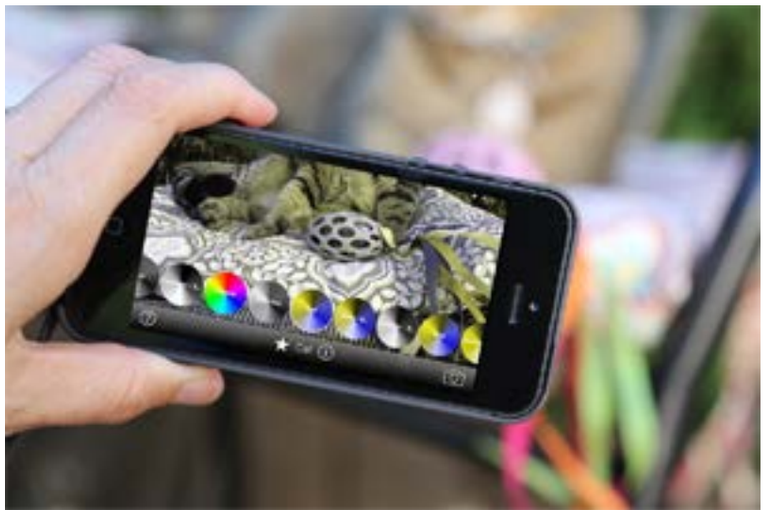
Funktionskreis; Nahrung

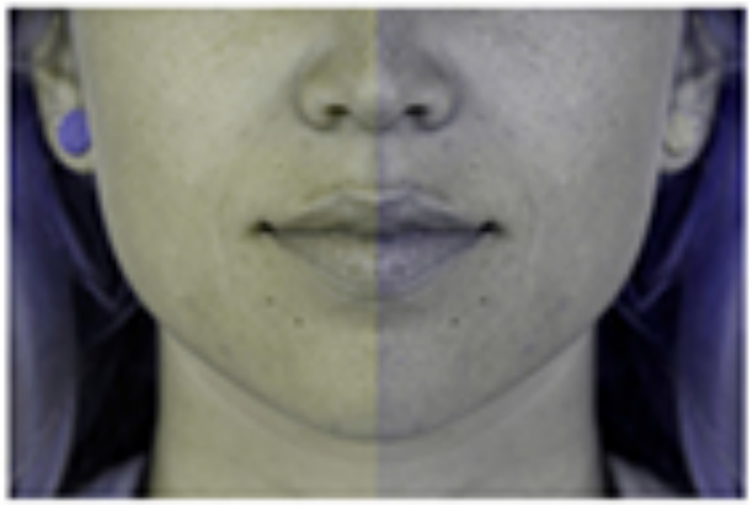
- 3. If the crab is already in symbiosis with anemones, than it interprets the appearance of another anemone as a welcome prey, it starts to feed on the animal.

Lisa Jevbratt

Zoomorph - Software simulating how animals see
Developed with the help of color vision scientists, Zoomorph is software that generates simulations of how various animals see, helping us experience the world through the eyes of another species.

Software filters for video and imaging software and smartphones simulating how animals see. (2013 ongoing)





Photoshop File Edit Image Layer Select Filter Analysis View Window Help (Charged) Sat 5:52:05 PM Lisa Jevbratt

Feather: Anti-alias Style: Normal Width: Height: Refine Edge... Workspace

_cat_vision_simulation.jpg @ 50% (RGB/8*)

- Convert for Smart Filters
- Extract... ⌥⌘X
- Filter Gallery...
- Liquify... ⇧⌘X
- Pattern Maker... ⌥⇧⌘X
- Vanishing Point... ⌥⌘V
- Artistic
- Blur
- Brush Strokes
- Distort
- Noise
- Pixelate
- Render
- Sharpen
- Sketch
- Stylize
- Texture
- Video
- **ZooMorph**
- Digimarc

ZooMorph:
- Amphibians
- Birds
- Fish
- Insects
- **Mammals**
- Marsupials
- Reptiles

Mammals:
- Bats
- **Carnivores**
- Herbivores
- Primates
- Rodents

Carnivores:
- Bears
- Canines
- **Felines**
- Hyenas
- Raccoons
- Seals
- Skunks
- Weasels

Felines:
- Cougar
- Cheetah
- **Domestic Cat**
- Jaguar
- Lion
- Leopard
- Lynx
- Tiger

66.67% Doc: 3.71M/21.9M

jevbratt

Lisa Jevbratt

Dichromat simulations, 2011 © Jevbratt


Hummingbird

„Umwelt“

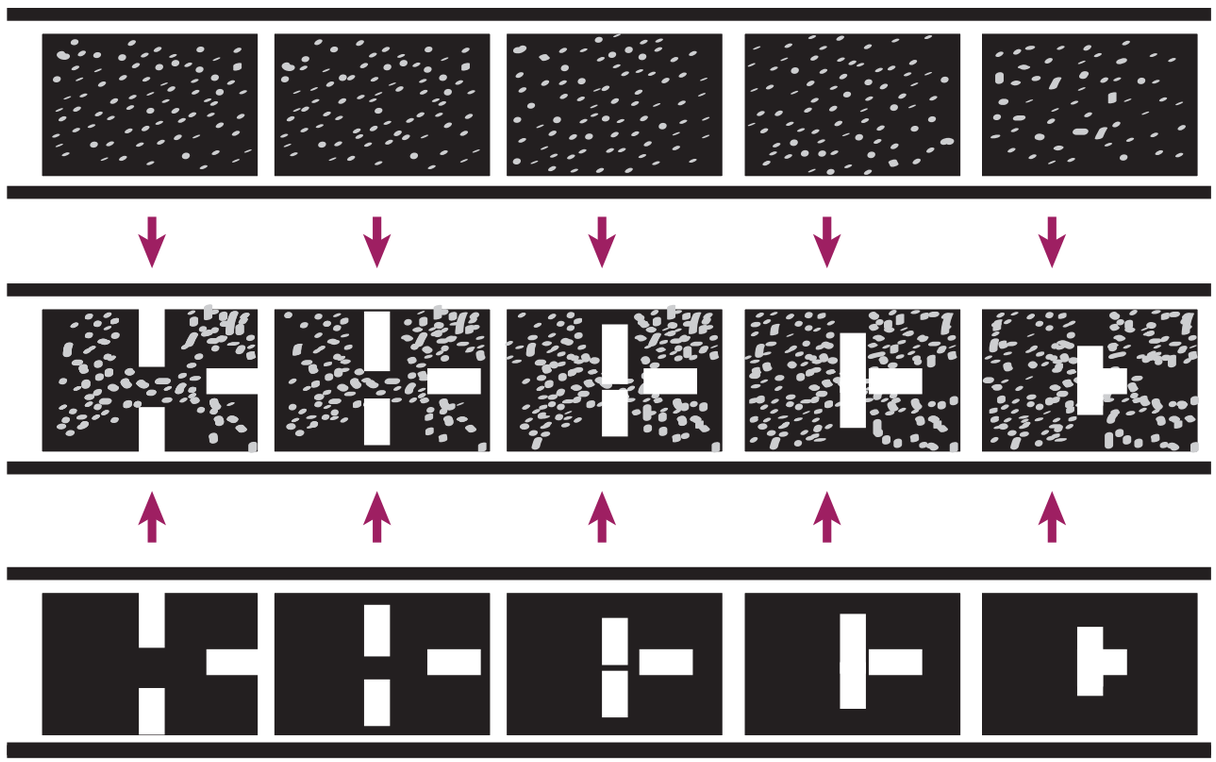
*Uexküll views organisms in terms of **information processing**. He argues every organism has an outer boundary which defines an **Umwelt (German word generally meaning 'environment')**. Rather than the general meaning, Uexküll's concept draws on the literal meaning of the German word, which is 'surround-world', to define the Umwelt as the subjectively perceived surroundings about which information is available to organism through its senses. This is a subjective **weltanschauung**, or "world view", and is therefore fundamentally different from the **black box concept**, which is derived from the objective Newtonian viewpoint.*

http://www.expandedenvironment.org/
Ned Dodington and Michael Benharrosh, 2009

Das Biologische Habitat

zeitliche Prozesse in verschränkter Abhängigkeit

Asynchrone Zeitentwicklung



Zeitachse Selbstorganisation biologischer Agenten

Interaktion entsprechend der Agenten

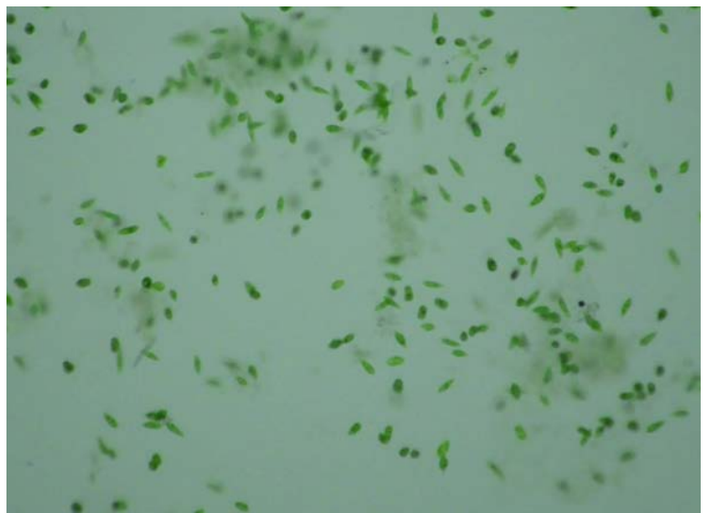
Bildfolge Selbstorganisierende biologische Agenten mit Interaktion zum Motiv (schematisch)

Interaktion entsprechend des Aktivierungsmediums

Zeitachse Motiv (schematisch)

Trägermaterial mit das Bildmotiv aktivierendem Agenten
mögliche Kandidaten:

- **Euglena**
- **Amoeba**



„ [Stafford] Beer's idea was that if one could only couple such an adaptive system to a factory, say, making the factory part of the pond's environment, and vice versa, the health of each could be made to hinge on that of the other, ... Disturbances from the factory might trip the ecosystem into a new configuration, which would in turn perturb the operation of the factory, and if the factory in its new state was still unstable, new disturbances would travel back to the ecosystem —and so on until the pond and the factory achieved a collective state of dynamic equilibrium with each other and their outside environments.“

Andrew Pickering : Ontology and Antidisciplinarity, to appear in A Barry and G Born (eds), interdisciplinarity: reconfigurations of the natural and social sciences 2013

A real-life modular processor? Every element in this pond – weeds, algae, bacteria – is in some sense independent, but also controlled by day length, temperature and rainfall.

„A pond ecosystem, to give a relevant example, adapts to unpredictable changes in its environment by reconfiguring itself—much like a homeostat, though at a much higher level of complexity. Beer understood the function of management as precisely one of adaptation to an always changing environment, and he therefore explored all sorts of possibilities for substituting naturally occurring adaptive systems for human managers.“

Andrew Pickering : Ontology and Antidisciplinarity, to appear in A Barry and G Born (eds), interdisciplinarity: reconfigurations of the natural and social sciences 2013

„Many experiments were made with [Daphnia]. Iron filings were included with dead leaves in the tank of Daphnia, which ingested sufficient of the former to respond to a magnetic field.“

Stafford Beer: Towards the automatic factory, In H. von Foerster & G. Zopf (Eds.), Principles of selforganization: Transactions of the University of Illinois symposium on self-organization, Robert Allerton Park, 8 and 9 June, 1961 [sic: actually 1960] (pp. 25–89). New York: Pergamon.1962, p. 29

„This project failed, not on any point of principal, but on the practical difficulty of coupling nonhuman systems into the world of human affairs—of getting ponds to care about us.“

Andrew Pickering : Ontology and Antidisciplinarity, to appear in A Barry and G Born (eds), interdisciplinarity: reconfigurations of the natural and social sciences 2013

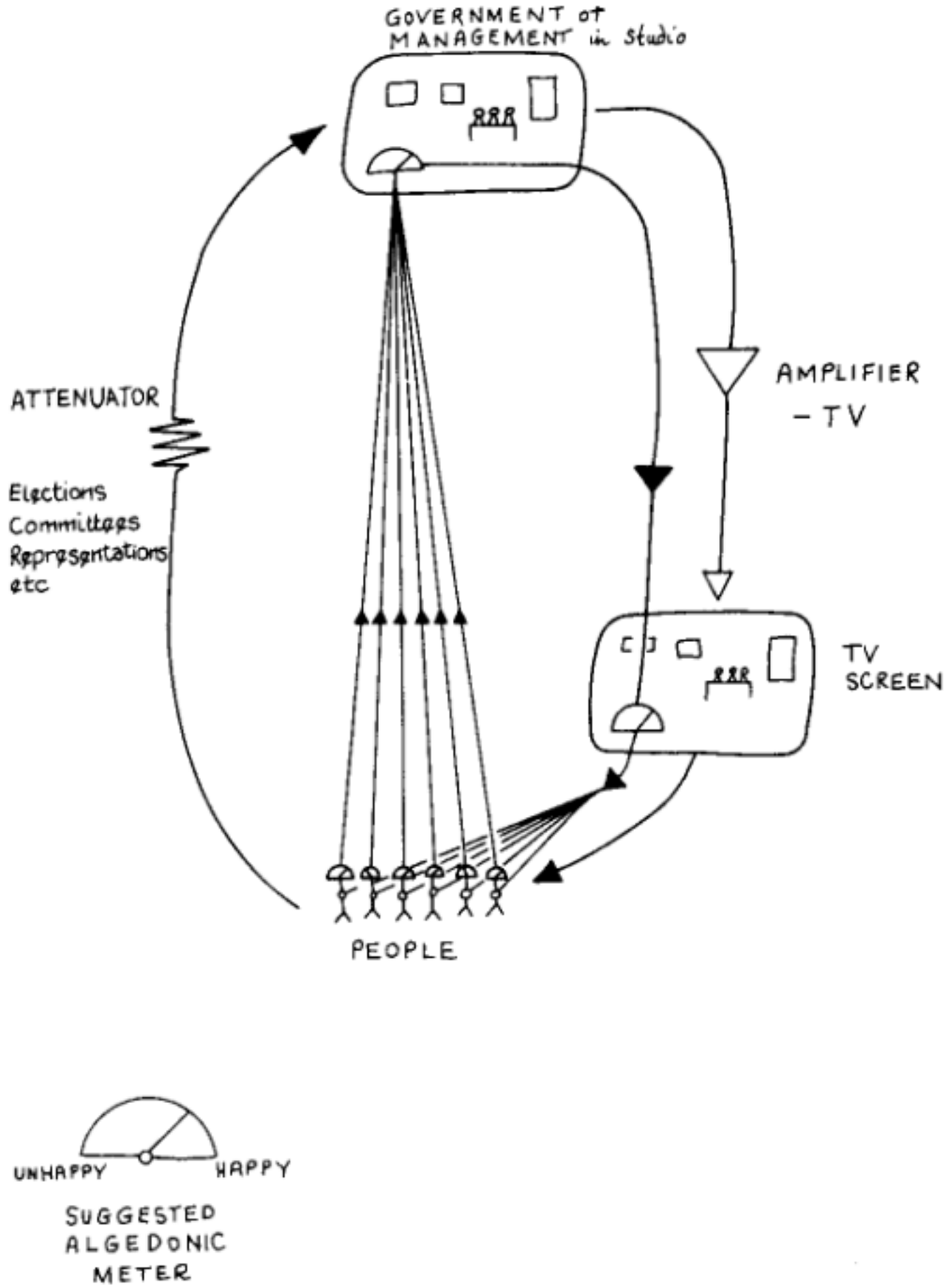


Figure 45

Scheme draw of Cyberfolk made by Stafford Beer

- local feedback at eye-level

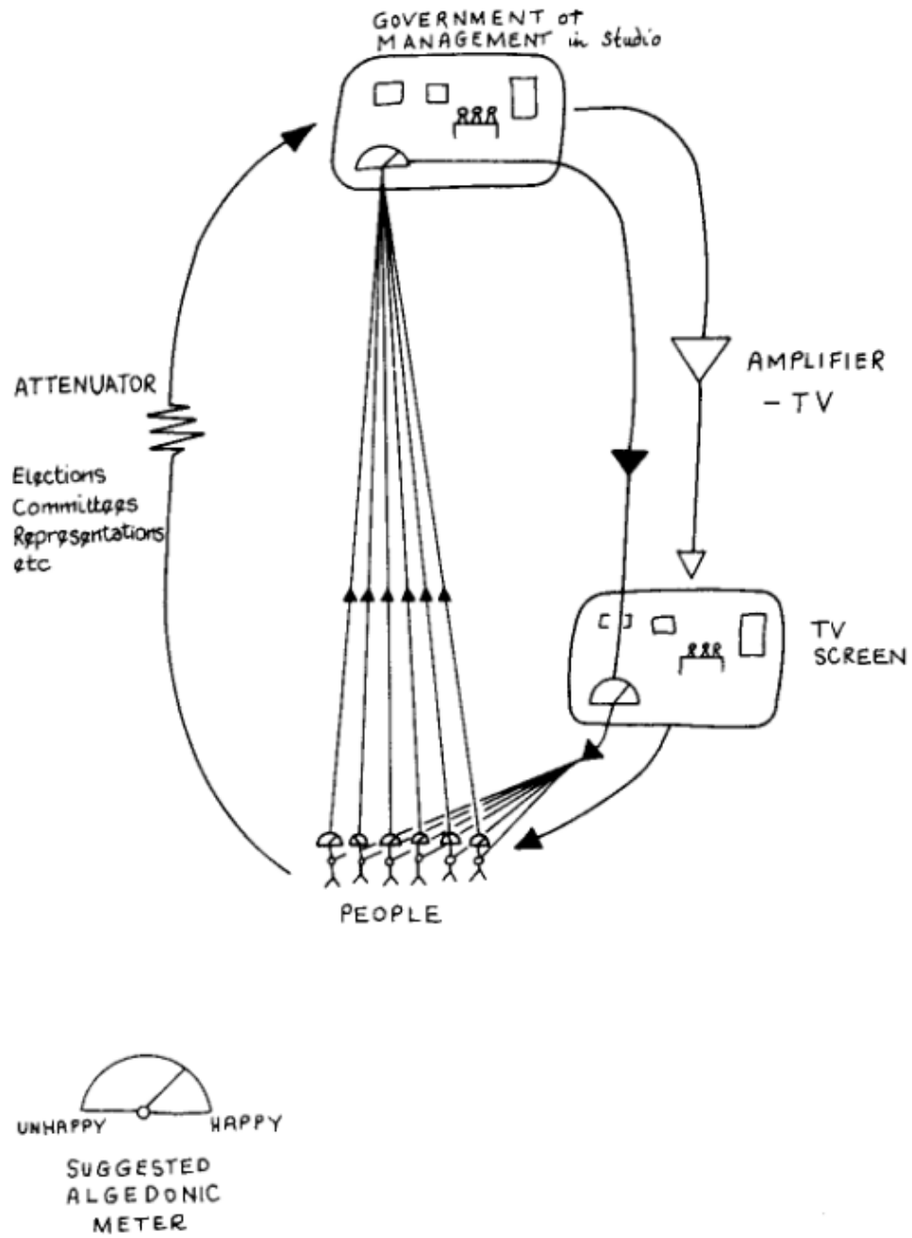
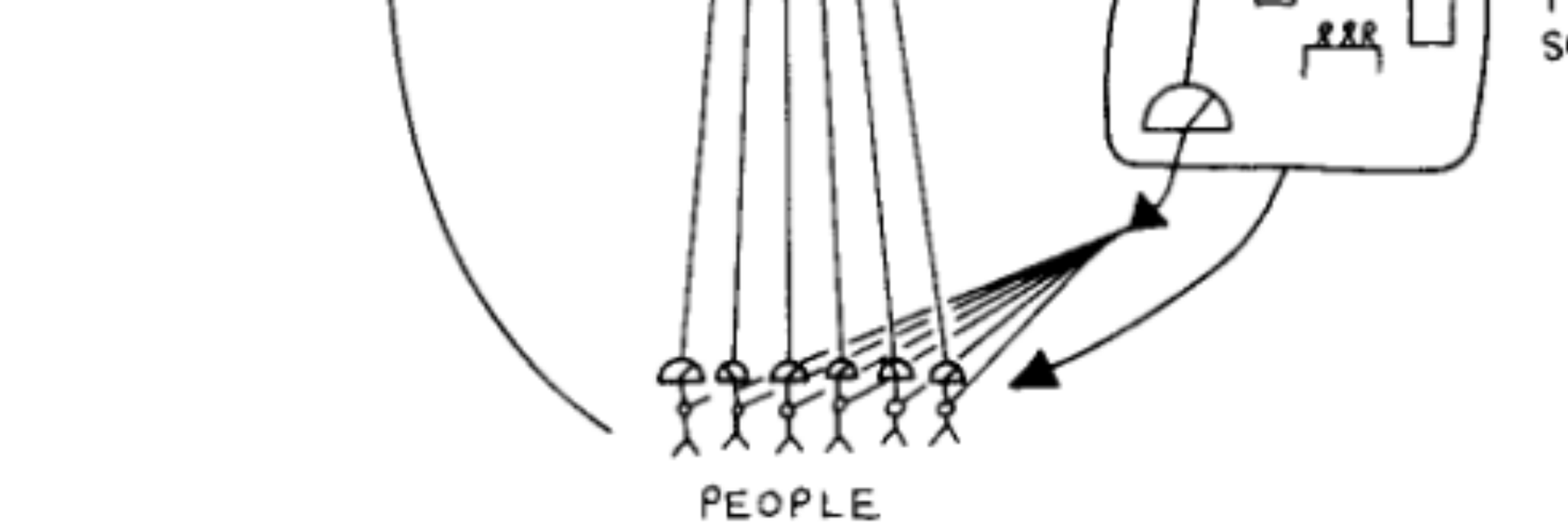


Figure 45

Design eines algedonischen Feedbackloops aus *'From the people to the governement'*, Stafford Beer 1981



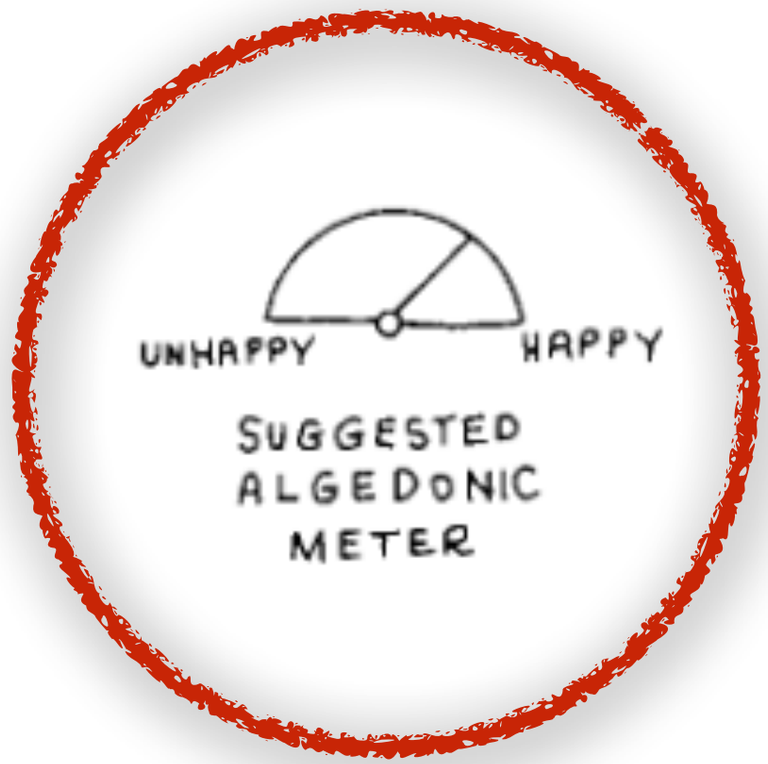


Figure 45

- **immediate, local feedback at eye-level**

considerations on the **situatedness of men, animal and machine**
Directives for the **aesthetics** of a system:

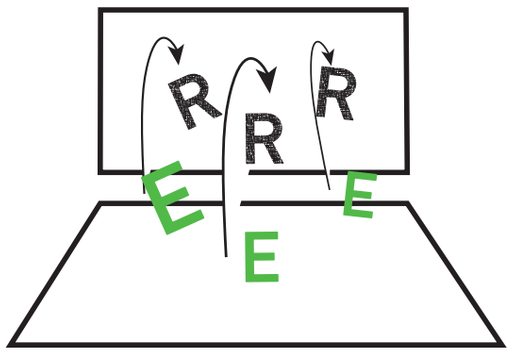
1. prepare for unbiased perception (sensing)
2. transparency of technology involved
3. visibility, comprehnsibility of machine agency concerning others
4. obstain to implement preconceived (unsituated) knowledge
5. proceede in small steps
6. keep the system open for adaptions during the operating process

.

E sei ein räumlich zeitliches Ereignis, unbeeinflusst vom Beobachter (z.B. bewegte Dinge)

R sei eine graphische Repräsentation auf der Video wall

Was ist eine angemessene Visualisierung
um eine Interaktion innerhalb der Plattform
zu unterstützen?



- entwerfe eine virtuelle Repräsentation **R**
- bestimme die Art, wie **R** das Verhalten von **E** unterstützt
- beobachte, wie die Wahrnehmung von **E** durch **R** beeinflusst wird

E sei ein räumlich zeitliches Ereignis, unbeeinflusst vom Beobachter (z.B. bewegte Dinge)

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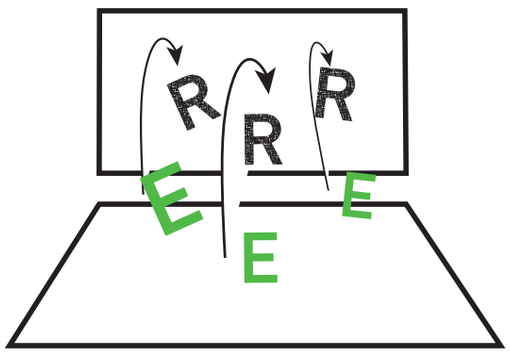

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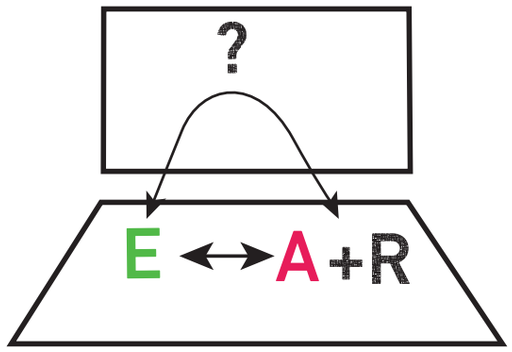
- bestimme die Art, wie **R** das Verhalten von **E** unterstützt
- beobachte, wie die Wahrnehmung von **E** durch **R** beeinflusst wird

Die Interaktion mit dem Agent
ist definiert durch die
Repräsentation R



Beobachte, wie E, A und seine
Repäsentation R sich gegenseitig
beeinflussen

- wähle Form und Ästhetik von **A** um Funktionen von **E** zu verstehen
- veranschauliche die sensorischen Fähigkeiten von **A**
- entwerfe **A** entsprechend den Sensoren von **E**

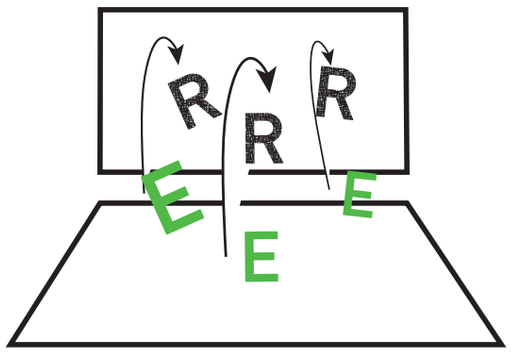
E sei ein räumlich zeitliches Ereignis, unbeeinflusst vom Beobachter (z.B. bewegte Dinge)

R sei eine graphische Repräsentation auf der Video wall

A sei ein Agent (Objekt mit Sensorik und Aktuatoren)

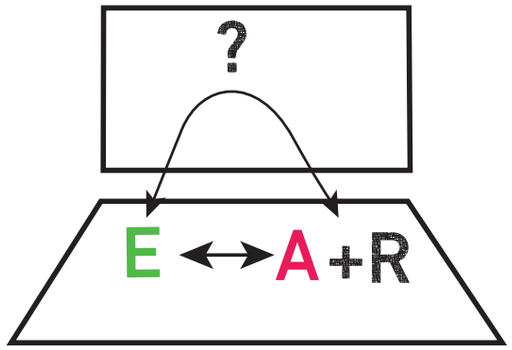
N sei ein Netzwerk, das E im Beobachtungsraum interagiert

Was ist eine angemessene Visualisierung
um eine Interaktion innerhalb der Plattform
zu unterstützen?



- entwerfe eine virtuelle Repräsentation **R**
- bestimme die Art, wie **R** das Verhalten von **E** unterstützt
- beobachte, wie die Wahrnehmung von **E** durch **R** beeinflusst wird

Die Interaktion mit dem Agent
ist definiert durch die
Repräsentation R



Beobachte, wie E, A und seine
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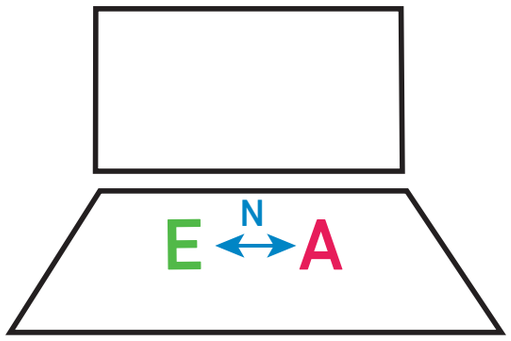
- entwerfe **A** entsprechend den Sensoren von **E**

a network connecting Event E
and the agent

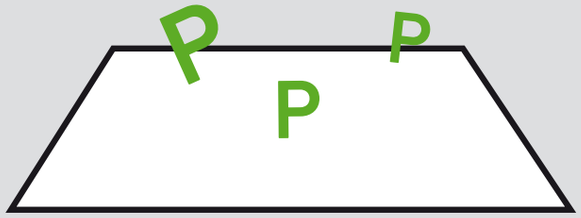
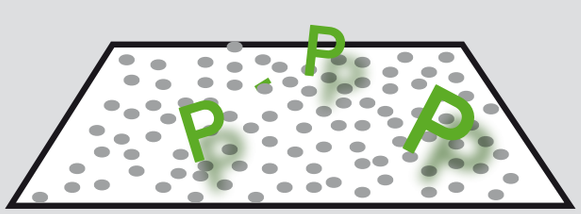
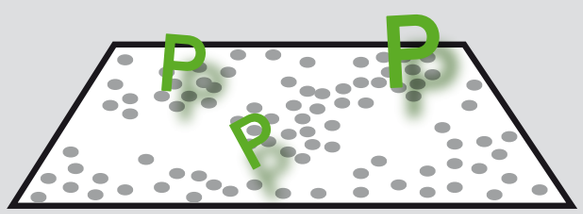


Beobachte, wie das Netzwerk N
das Erscheinungsbild ändert

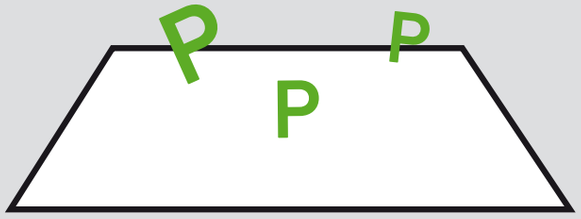
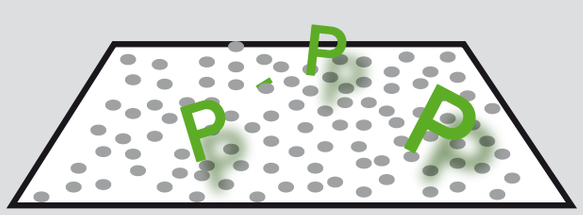
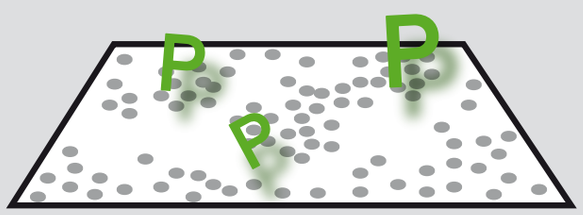
Beschreibe, wie die Eigenschaften von „E“
das Handeln des Agent „A“ beeinflussen

Entwerfe eine Methode der
kontinuierlichen Interaktion

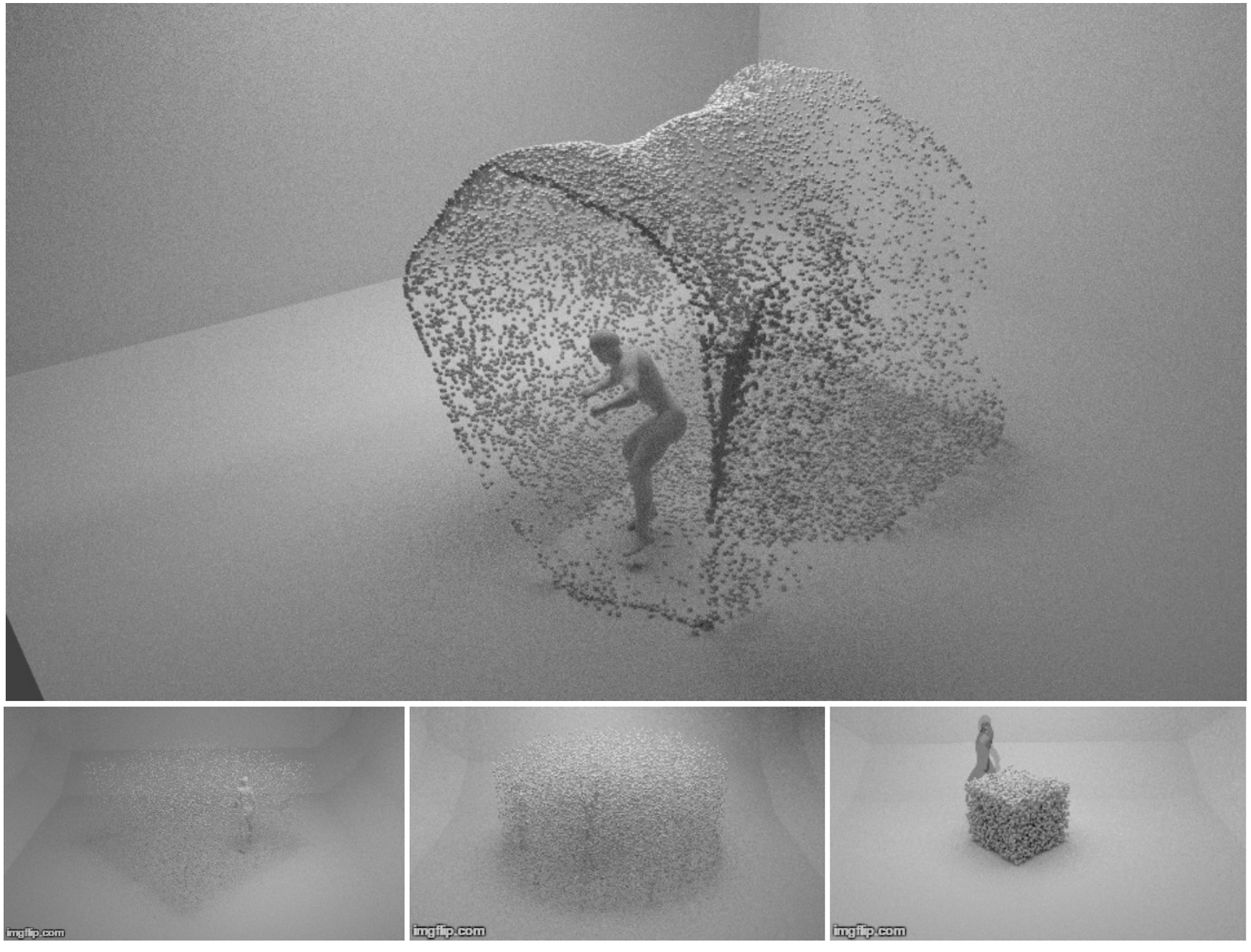
- decisions mediated by an external medium working as a „buffer zone“, if they refer to others and if my work interprets other people or animals

activity of the agents	persons P sojourn in the tracking area	Within the observation zone a „virtual“ environment is simulated	the elements of the „virtual environment“ react on the presence of people
elements present in the setting			

Umsetzung bei **Turnstile,** einem Kunstwerk im öffentlichen Raum:

activity of the agents	persons P sojourn in the tracking area	Within the observation zone a „virtual“ environment is simulated	the elements of the „virtual environment“ react on the presence of people
elements present in the setting			
		example 1: **Trances of movement, generated in the past** example 2: **particle system, organized by the movments df the people**	**Simulation of a feedback of the passangers on the history of the attendence in situ** **Simulated feedback of the pedestrians on a virtual „medium“ in situ**

„media“ are mediating between humans and the machine
-> obstain from (authoritarian) attribution of behavior



Abraham Ornelas, Absolvent der Media Architecture
https://vimeo.com/152612766

Abraham Ornelas, Biometric Architecture
https://vimeo.com/224751981

Universaleverything: **Walking City**

https://universaleverything.com/projects/walking-city

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https://vod-progressive.akamaized.net/exp=1580760846~acl=%2A%2F991017423.mp4%2A~hmac=89db309e5c419b6c41d82eb3cd60a4dff5f71202b7e11fd59f4698813b902e79/vimeo-prod-skyfire-std-us/01/3493/10/267467649/991017423.mp4

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