

# First-, Second-, and Third-Order Cybernetics for Music & Mediated Interaction

Norbert Herber

# First-, Second-, and Third-Order Cybernetics for Music & Mediated Interaction

## Point of Departure

**"What is musically possible given the capabilities  
of contemporary media technology?"**

*Contemporary media* = web, games, mobile devices

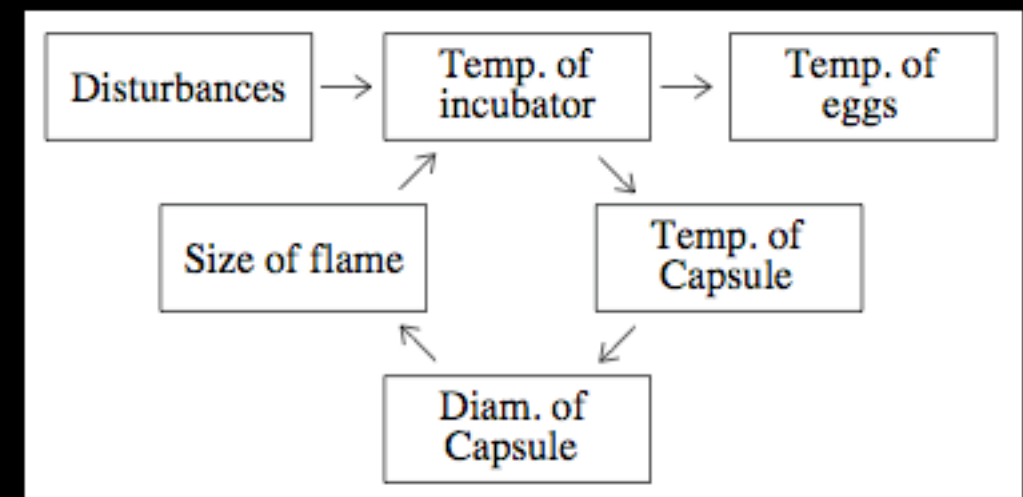
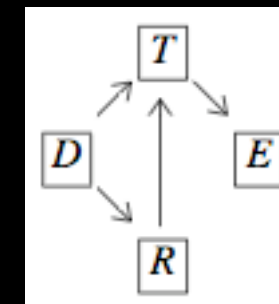
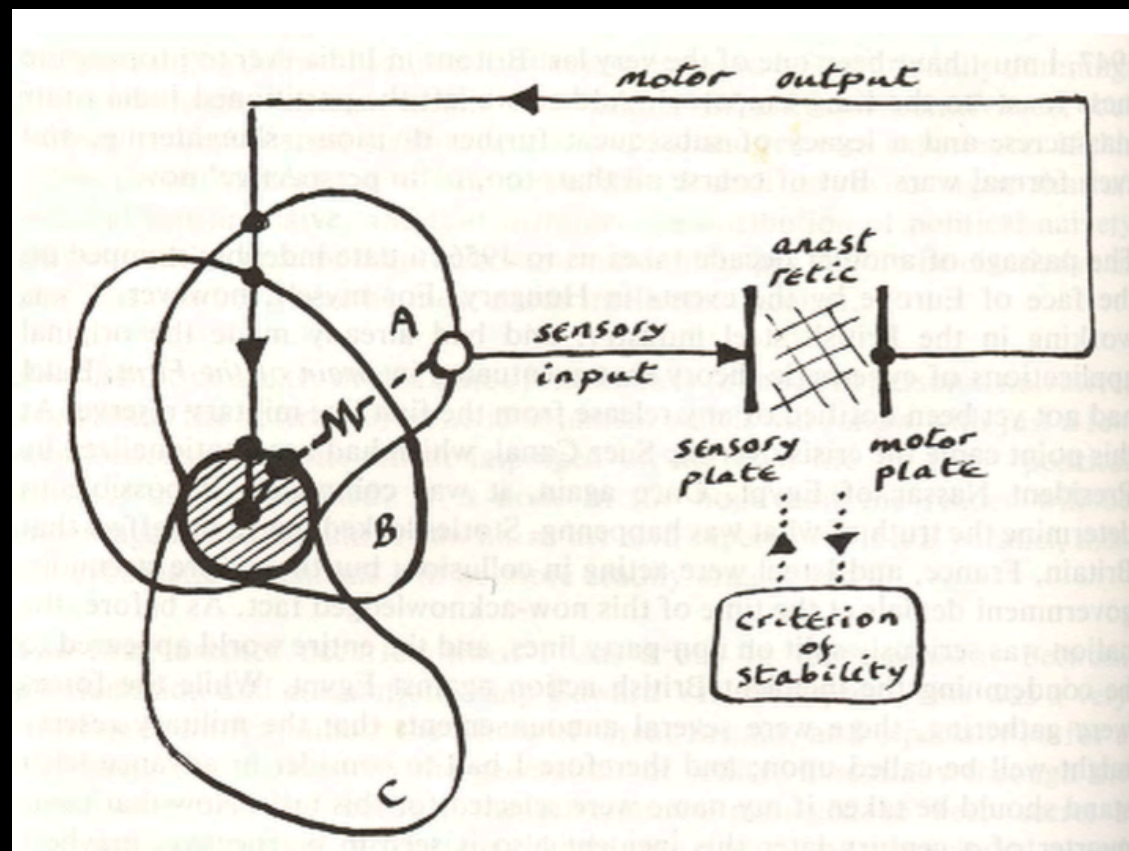
Process more; store less

*Dérive Entre Mille Sons*

# First-, Second-, and Third-Order Cybernetics for Music & Mediated Interaction

## Cybernetics

Regulation, control, and organization



Applications that effect the organization of musical material

# First-, Second-, and Third-Order Cybernetics for Music & Mediated Interaction

## Personal Trajectory: Roy Ascott



Change Painting (ca. 1959)



La Plissure du Texte 1 (1983)



La Plissure du Texte 2 (2010)



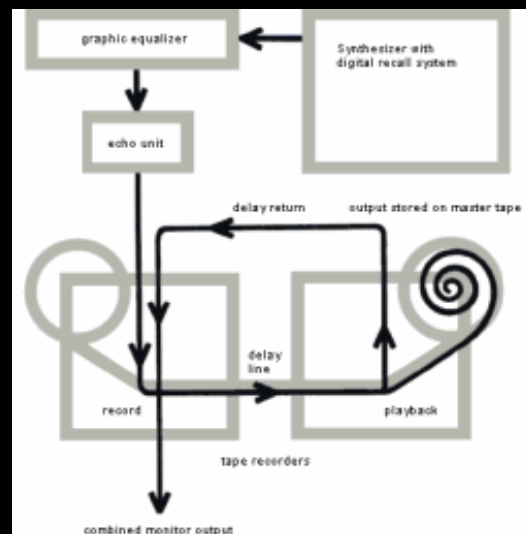
# First-, Second-, and Third-Order Cybernetics for Music & Mediated Interaction

## Personal Trajectory: Brian Eno

(No Pussyfooting) (1973)



Discreet Music (1975)



Music for Airports (1978)



Bloom (2008)



Trope (2009)



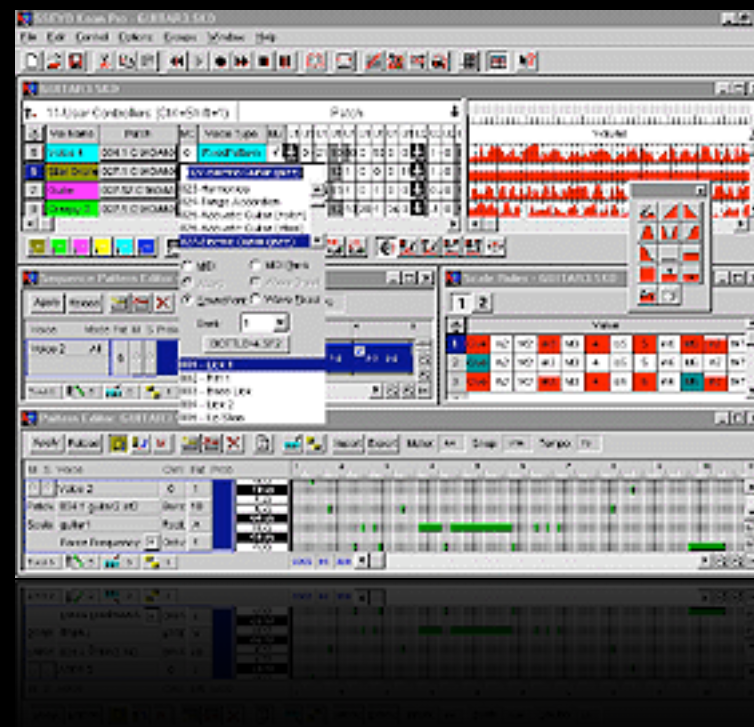
# First-, Second-, and Third-Order Cybernetics for Music & Mediated Interaction

## Personal Trajectory: Brian Eno

### Generative Music

"...the responsibility of the artist becomes inventing a system that produces his work, rather than just producing the work."

–Brian Eno (Darko 2009)



GENERATIVE MUSIC 1  
WITH METROPOLITAN RECORDINGS



BRIAN ENO  
BRIAN ENO

# First-, Second-, and Third-Order Cybernetics for Music & Mediated Interaction

## First-Order (1<sup>o</sup>) Cybernetic Systems

Gordon Pask describes first-order systems as "...classical black boxes and negative feedback..." (1996: 355)

Heinz von Foerster has referred to him, stating that "...the observer enters the system by stipulating the system's purpose" (2003a: 285).



# First-, Second-, and Third-Order Cybernetics for Music & Mediated Interaction

## First-Order (1<sup>o</sup>) Cybernetic Systems

<i><b>TITLE (GENRE)</b></i>	<b>MUSICIAN</b>	<b>1<sup>o</sup> SYSTEM</b>
<i>In C</i> (experimental)	Terry Riley	Elastic structure; sequential progression through the set of 53 phrases
<i>Paragraph 7 of "The Great Learning"</i> (experimental)	Cornelius Cardew	Instructions for piece: "do not sing the same note on two consecutive lines" "sing any note that you can hear" otherwise, "choose you next note freely" (Eno 1976: 3)
<i>Music for Airports</i> "2/1" (ambient)	Brian Eno	Tape phasing structure at intervals of 21" 17" 25" 18" 31" 20" 22"
<i>Dérive Entre Mille Sons</i> (amergent)	Norbert Herber	Generative instruments: Shuffler(), DeckOfCards(), Seq(), End2End(); spatial arrangement of audible zones



# First-, Second-, and Third-Order Cybernetics for Music & Mediated Interaction

## Second-Order (2<sup>o</sup>) Cybernetic Systems

"...the observer enters the system by stipulating his own purpose"

–Heinz von Foerster (2003a: 285)

The observer's purpose is often experimental

A system is, "...not a thing, but a list of variables. This list can be varied, and the experimenter's commonest task is that of varying the list...that gives the required singleness."

– W. Ross Ashby (1956: 40)

# First-, Second-, and Third-Order Cybernetics for Music & Mediated Interaction

## Second-Order (2<sup>o</sup>) Cybernetic Systems

<i><b>TITLE (GENRE)</b></i>	<b>MUSICIAN</b>	<b>2<sup>o</sup> SYSTEM</b>
<i>In C</i> (experimental)	Terry Riley	Phrases composed loosely in key of C; progression advances at performer's discretion
<i>Paragraph 7 of "The Great Learning"</i> (experimental)	Cornelius Cardew	"accidents that are at work" such as "'unreliability' of a mixed group of singers," "beat frequency," "resonant frequency" of the room, "preference" or "taste" of the individual performers (Eno 1976: 4)
<i>Music for Airports "2/1"</i> (ambient)	Brian Eno	Pitched sounds are phased at various intervals to produce shifting tonalities over time
<i>Dérive Entre Mille Sons</i> (amergent)	Norbert Herber	Sound palette assigned to generative instruments and linked to individual sonic zones within a spatial layout

# First-, Second-, and Third-Order Cybernetics for Music & Mediated Interaction

## Emergence

"Much comes from little."  
—John Holland (1998: 2)

Small scale interactions produce unpredictable and unexpected outcomes on a large scale.

Biological & Artificial Life (A-Life)



# First-, Second-, and Third-Order Cybernetics for Music & Mediated Interaction

## A-Life and Biological Life

A-life seeks to synthesize life; real life processes but made of a different substrate

Humberto Maturana & Francisco Varela (1980): *Autopoiesis*

GREEK:

αὐτόσ = self; ποιεῖν = to make (creation or production)

The product of any living thing is itself; there is no separation between the producer and the produced.

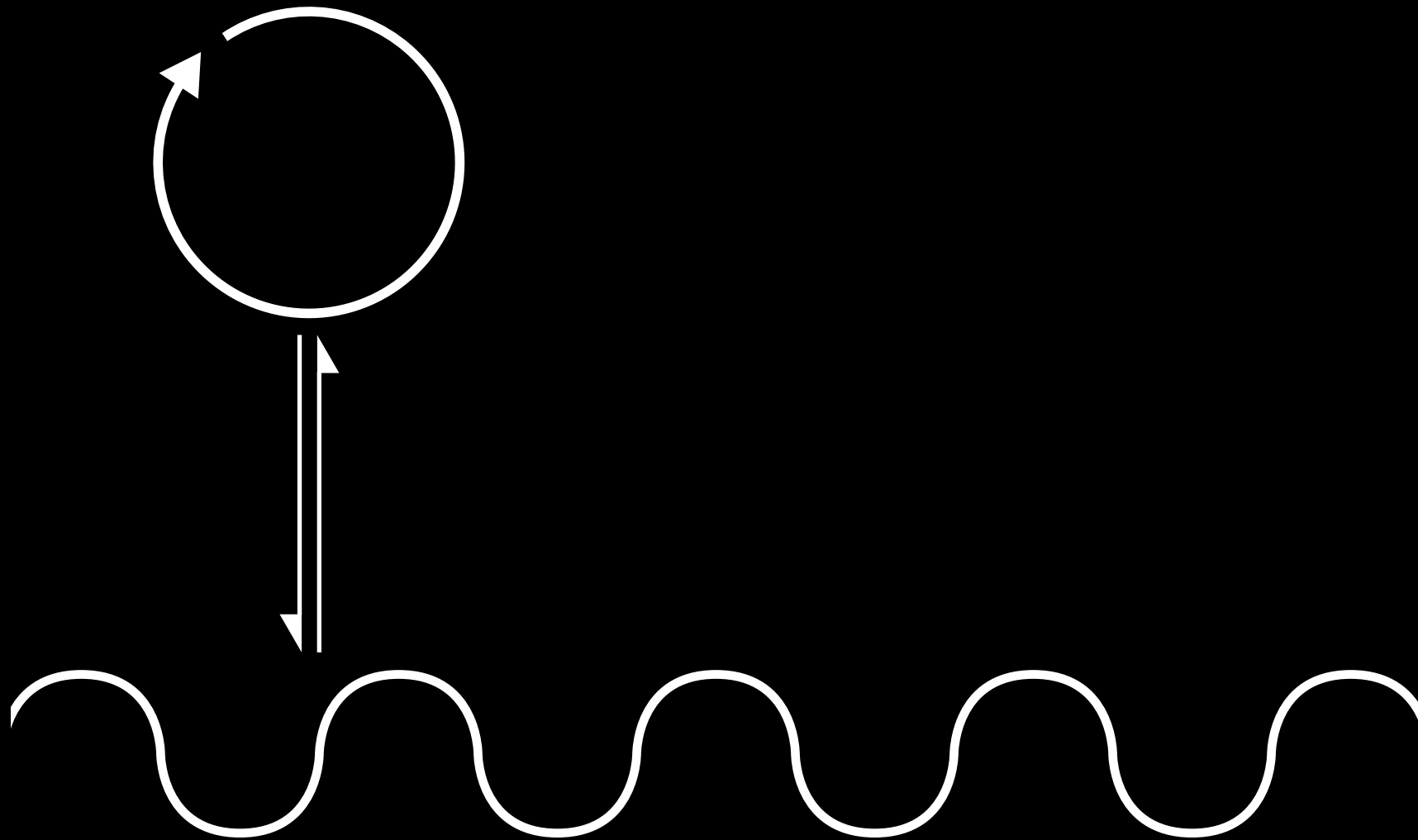
Autopoiesis is a useful concept to describe the unique behavior of emergent systems. But...

...can music or a musical system be autopoietic?



# First-, Second-, and Third-Order Cybernetics for Music & Mediated Interaction

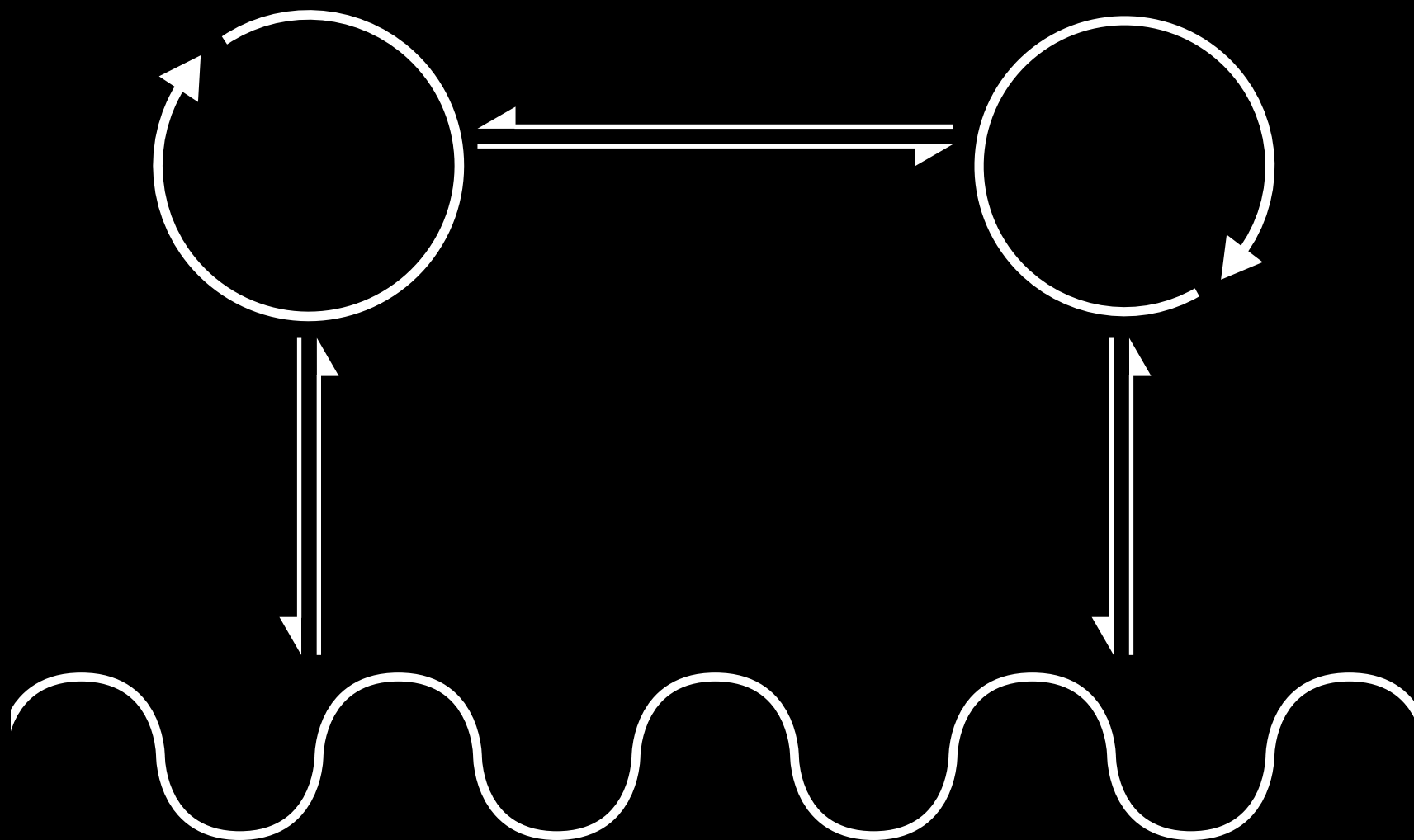
## **Autopoiesis & Reciprocal Perturbations**



# First-, Second-, and Third-Order Cybernetics for Music & Mediated Interaction

## **STRUCTURAL COUPLING**

[by H. Maturana and F. Varela]

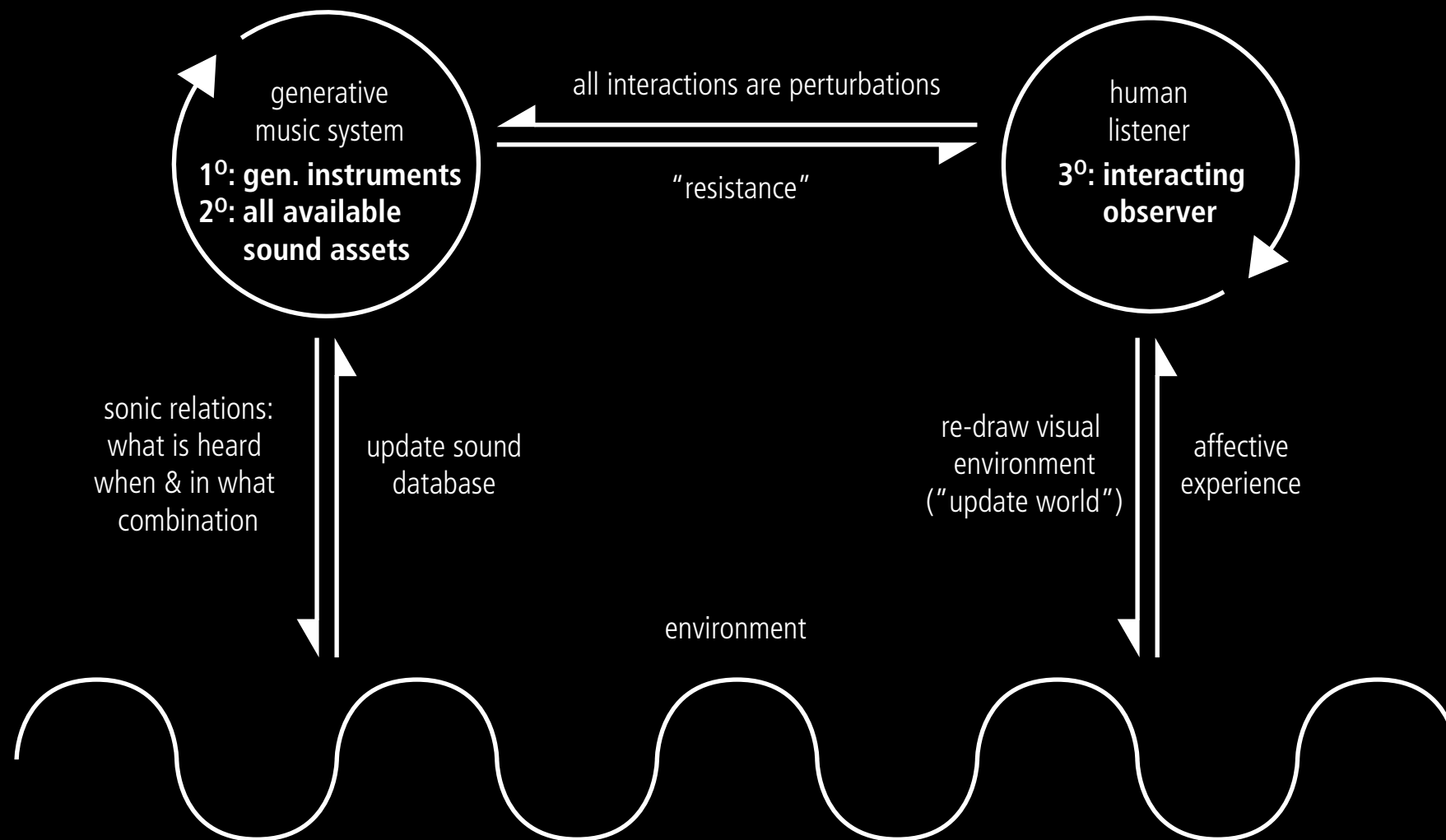


# First-, Second-, and Third-Order Cybernetics for Music & Mediated Interaction

## Third-Order (3<sup>o</sup>) Cybernetic Systems

### STRUCTAURAL COUPLING INTERACTION MODEL

[based on "structural coupling" by H. Maturana and F. Varela & "composition instrument" by Norbert Herber]



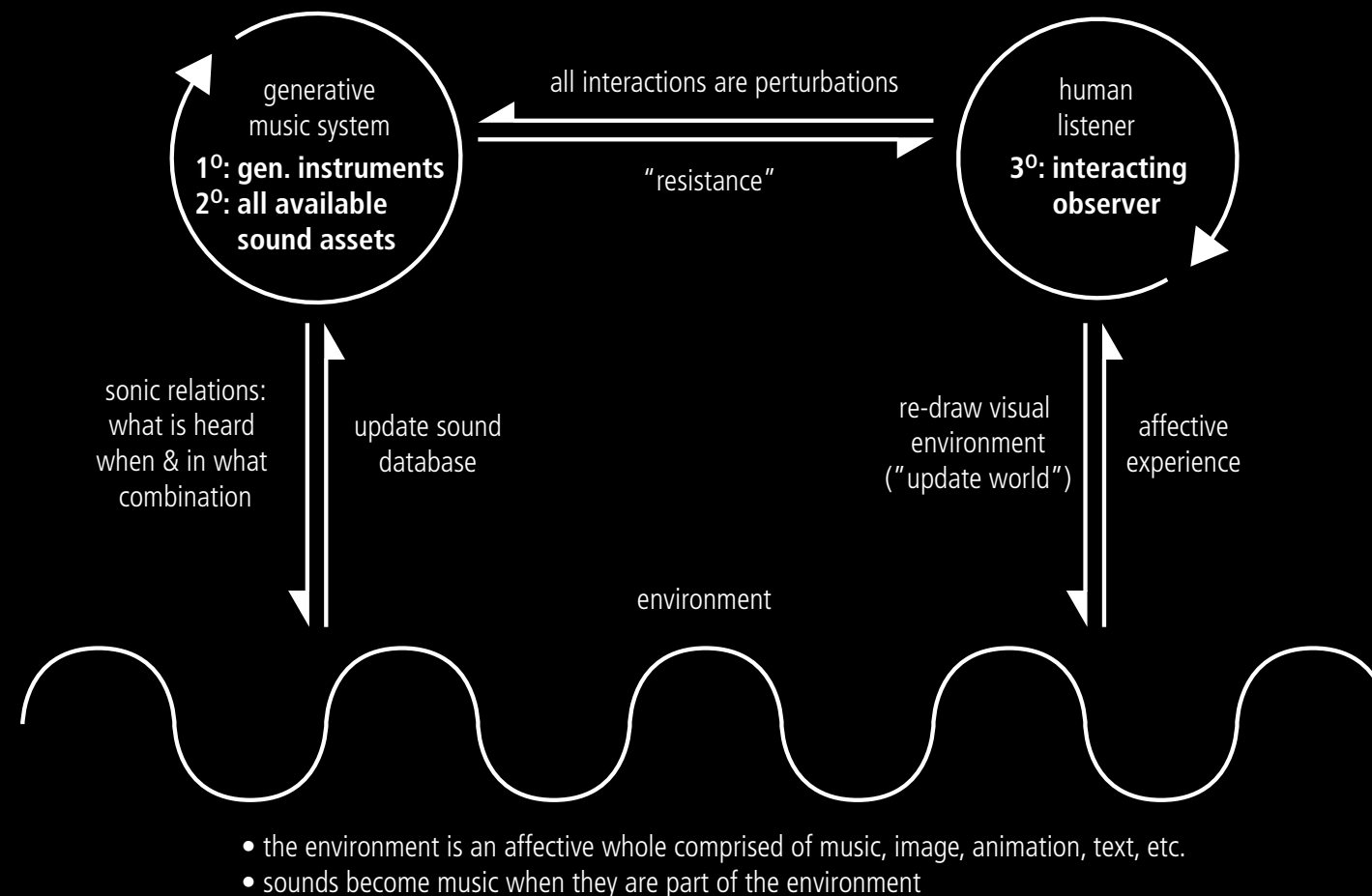
- the environment is an affective whole comprised of music, image, animation, text, etc.
- sounds become music when they are part of the environment

# First-, Second-, and Third-Order Cybernetics for Music & Mediated Interaction

## Third-Order (3<sup>o</sup>) Cybernetic Systems

### STRUCTAURAL COUPLING INTERACTION MODEL

[based on "structural coupling" by H. Maturana and F. Varela & "composition instrument" by Norbert Herber]



"...the environment as we perceive it is our invention"  
—Heinz von Foerster (2003b: 1)



# First-, Second-, and Third-Order Cybernetics for Music & Mediated Interaction

## Third-Order (3<sup>o</sup>) Cybernetic Systems

"The current 'state-of-the-art' is in third-order cybernetics, where the observer is part of **the coevolving system**. This is a more intrinsic (embodied) methodology and shows the ongoing convergence of all the various systemic disciplines, as part of the general world paradigm shift noticed recently towards more integrated approaches to science and life. In 21-st Century systematics, boundaries between systems are only partial and this implies that we must evolve with our systems and cannot remain static outsiders. **Thus our mental beliefs echo our systemic behaviours, we co-create our realities and therefore internal and external realities become one.**"

–Chris Lucas (2001)

# First-, Second-, and Third-Order Cybernetics for Music & Mediated Interaction

## Third-Order (3<sup>o</sup>) Cybernetic Systems

Stafford Beer thought of cybernetics as the science of exceedingly complex systems—of systems that *become* unpredictably—and a science that focused, "... on adaptation, on ways of coming to terms performatively with the unknown."

—Andrew Pickering (2008: 129)

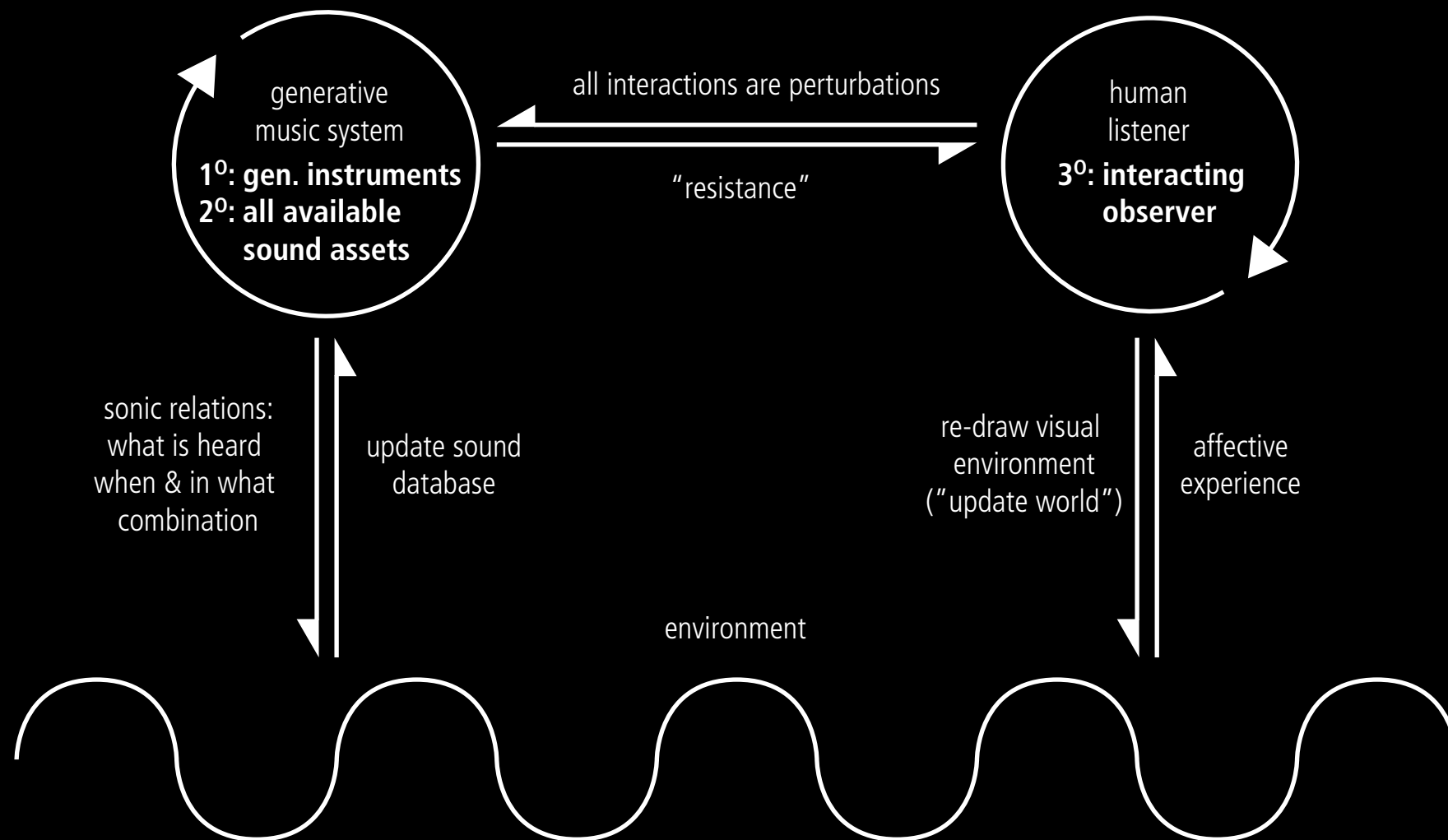


# First-, Second-, and Third-Order Cybernetics for Music & Mediated Interaction

## Third-Order (3<sup>o</sup>) Cybernetic Systems

### STRUCTAURAL COUPLING INTERACTION MODEL

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- the environment is an affective whole comprised of music, image, animation, text, etc.
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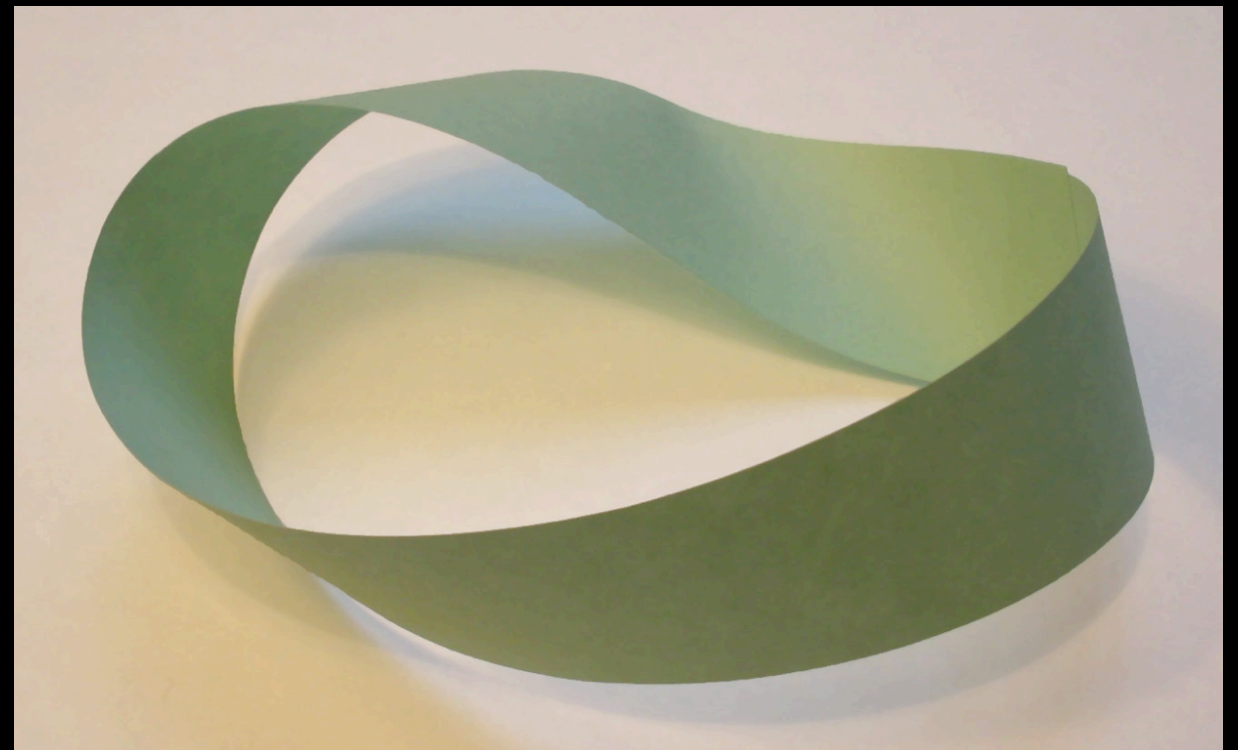
# First-, Second-, and Third-Order Cybernetics for Music & Mediated Interaction

## Third-Order (3<sup>o</sup>) Cybernetic Systems

"We need to have a domain which contextualises the activities of, and relations among, the **participant observer** ontologies of the 2<sup>o</sup> domain... 3<sup>o</sup> cybernetics must be a domain which allows us to come to contextualise this 'subject', with his 'ethical system' and his higher-order 'purpose.' We need to understand his phylogenesis as observer."

–Kenny & Boxer (1990)

Who is the  
participant observer?





# First-, Second-, and Third-Order Cybernetics for Music & Mediated Interaction

## **Amergence and the Poiesist**

Who's doing it? Who is responsible for these processes?

*user* (Norman 1989; Krug 2006)

*participant* (Cornock & Edmonds 1973; Popper 1975)

*partner* (Laurel 2001)

*vuser* (Seaman 1999)

# First-, Second-, and Third-Order Cybernetics for Music & Mediated Interaction

## **Amergence and the Poiesist**

Martin Heidegger: *The Question Concerning Technology*

Heidegger discusses technology's tendency towards  
*revealing* and *enframing*.

Enframing is "... the subjugation of the world to already given  
human ends..." –Andrew Pickering (2008: 131)

# First-, Second-, and Third-Order Cybernetics for Music & Mediated Interaction

## **Emergence and the Poiesist**

"So long as we represent technology as an instrument, we remain transfixed in the will to master it. We press on past the essence of technology. When, however, we ask how the instrumental unfolds essentially as a kind of causality, then we experience this essential unfolding as the destining of a revealing."

**"The question concerning technology is the question concerning the constellation in which revealing and concealing, in which the essential unfolding of truth propriates."**

–Martin Heidegger (1997: 337-8)

Heidegger's **revealing**, **"...points us to a politics of emergence..."**

–Andrew Pickering (2008: 131)

# First-, Second-, and Third-Order Cybernetics for Music & Mediated Interaction

## **Amergence and the Poiesist**

Revealing and Concealing

Effect and Affect

Emergent Music?



# First-, Second-, and Third-Order Cybernetics for Music & Mediated Interaction

## **Amergence and the Poiesist**

Revealing and Concealing

Effect and Affect

~~Emergent Music?~~

Amergent Music

**Emergence** as a characterization of the action involved in reciprocal perturbation, and **Affect** as the emotional impact of this continuous exchange. Each dynamic is necessary to the processes that give rise to the musical experience.

# First-, Second-, and Third-Order Cybernetics for Music & Mediated Interaction

## Amergence and the Poiesist

"There was a time when it was not technology alone that bore the name technē. Once the revealing that brings forth truth into the splendor of radiant appearance was also called technē.

There was a time when the bringing-forth of the true into the beautiful was called technē. **The poiēsis of fine arts was also called technē.**

...What was art—perhaps only for that brief but magnificent age? **Why did art bear the modest name technē? Because it was a revealing that brought forth and made present, and therefore belonged within poiēsis.** It was finally that revealing which holds complete sway in all fine arts, in poetry, and in everything poetical that obtained poiēsis as its proper name."

—Martin Heidegger (1977: 339)

# First-, Second-, and Third-Order Cybernetics for Music & Mediated Interaction

## Amergence and the Poiesist

In works of Amergent music, the person engaged in the experience formerly known as the participant, user, player and so on is more appropriately called the **poiesist**.

A drawing-out or bringing-forth of narrative and adventure:  
*Londontown*

- Online virtual world
- Non-diegetic, character driven music
- Residents' social, economic, familial, and professional experiences are derived from a confluence of prior successes, failures, romances, and intrigues—all the result of their actions in the world.

# First-, Second-, and Third-Order Cybernetics for Music & Mediated Interaction

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IU Students & faculty

Onsite & online guests

A recording will be posted on the IDAH website's brown bag page:  
<http://www.iub.edu/~idah/bb.shtml?n1=bb>

**Contact: [nherber@indiana.edu](mailto:nherber@indiana.edu)**