Consciousness and Imagination—Propositional Music and Illusions of Form



Is the ultimate origin of pure imagination accessible to us? Probably not, and consciousness may be more fundamental than awareness.

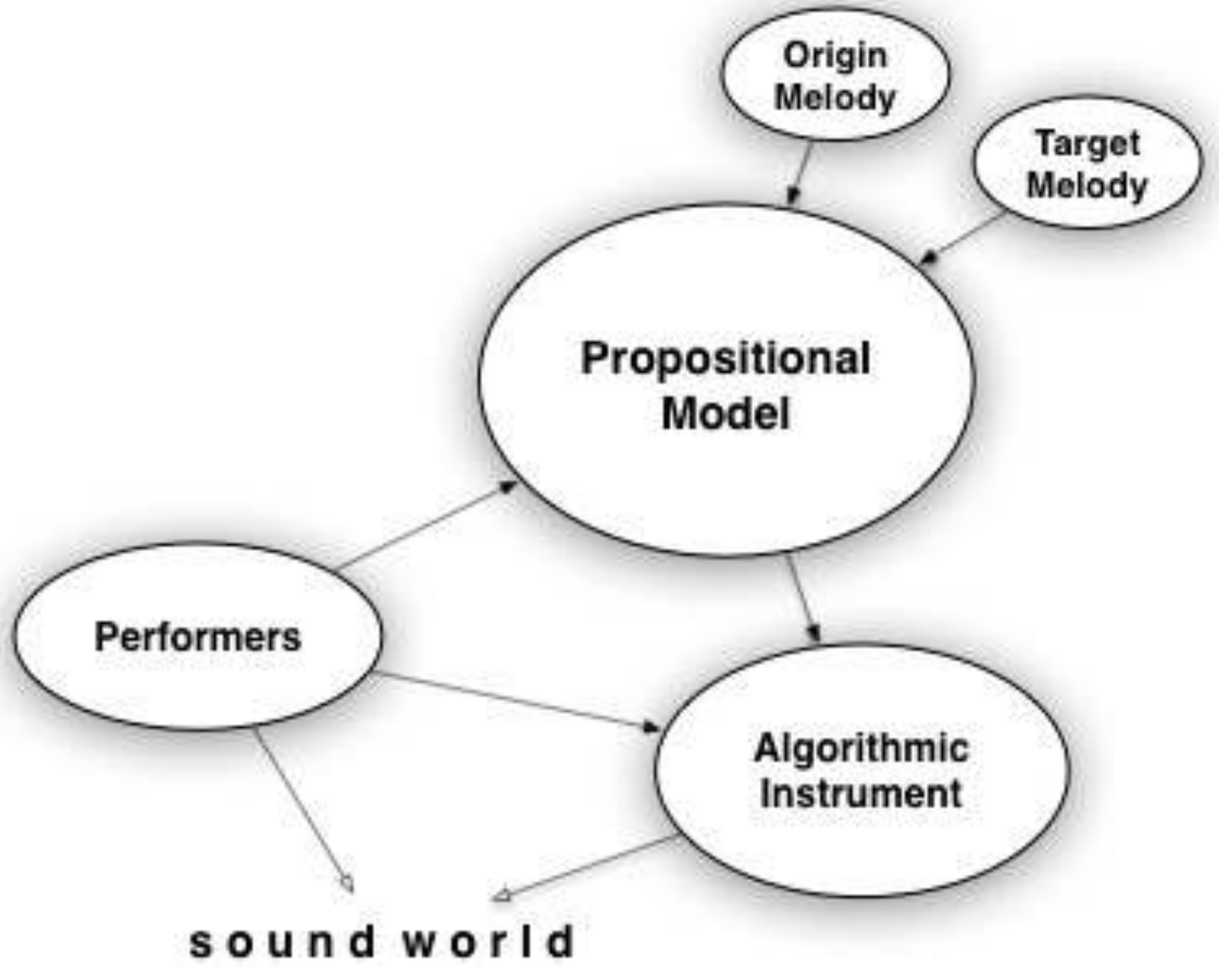
David Rosenboom
davidrosenboom.com

The Science of Consciousness
2026

Copyright © David Rosenboom **2026**
All rights reserved.

Propositional Music

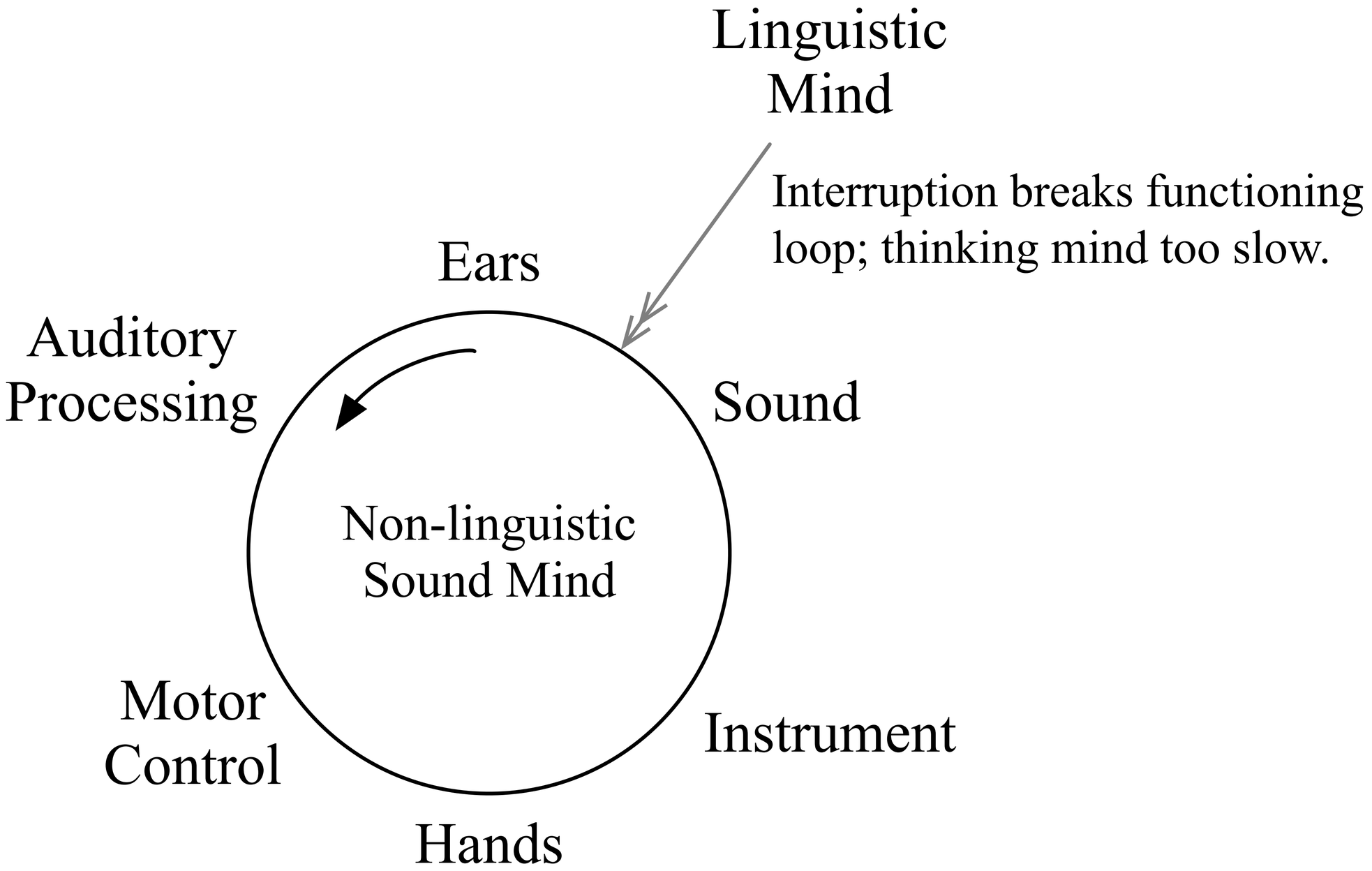
1984-1985



Playing the Propositional Model in *Zones of Influence.* (Two melodies, Origin and Target, provide musical DNA to seed the Model.)



ImproTech Philadelphia 2021


Linguistic
Mind
Interruption breaks functioning
loop; thinking mind too slow.
Ears
Auditory
Processing
Sound
Non-linguistic
Sound Mind
Motor
Control
Instrument
Hands

Creative propositional schema for consciousness-intelligence-awareness-mind:

Proposition: *Consciousness* is a languaged metaphor for the necessary condition of apparent beingness, without knowable origin.

Proposition: *Intelligence* is a field phenomenon, with consciousness as its fundamental substrate, in which *islands of order* with *relational properties* may emerge offering opportunities for experiecing *awareness*. We might refer to this as the dynamics of an *Intellisphere*.

Proposition: *Awareness* is localized, a phenomenon of self-referential extraction that may or may not involve *linguistic mind*.

Proposition: *Minds*—not only residing in singular brains—are engines that extract awareness from relational properties among islands of order.

Proposition: *Non-linguistic thinking* is fundamental to *imagination*, the engine of creativity.

Essential tension to universe—combinatorial world building:

Proposition: *Essential tension* is a languaged metaphor for the necessary condition of dimensionless emergence.

Proposition: Essential tension is the medium of opportunity for differentiable virtual *knots*.

Proposition: Virtual knots are self-referential forms with degrees of *persistence*.

Proposition: Virtual knots have *relational properties*.

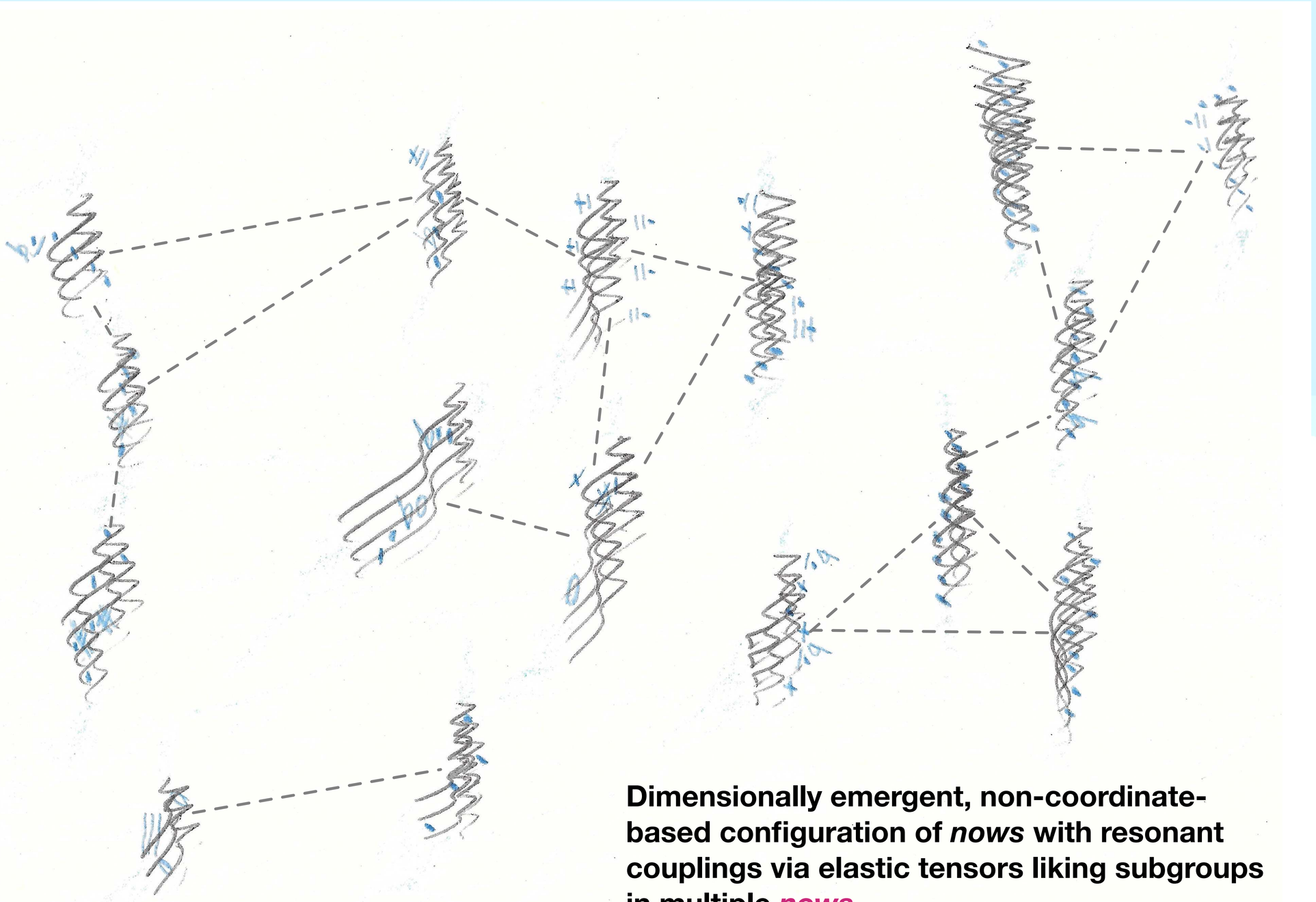
Proposition: Relational properties with degrees of persistence are the *potential for transformation* with concomitant *emergent dimensionality*.

Proposition: Relations among knots may form *bounded combinations*, *bounded distributions*, or *bounded permutations*, which introduce *lexicographic order* and forms of *nows*.

Proposition: Boundaries may be *fuzzy*, pointing to regions without sharp delineations, like islands of order with moving shores.

Proposition: Creating boundaries does not obviate *interconnectedness*. Bohm and Hiley remind: “The notion of a separate organism is clearly an abstraction, as is also its boundary.”

Natural Scores
2016



Dimensionally emergent, non-coordinate-based configuration of *nows* with resonant couplings via elastic tensors liking subgroups in multiple *nows*.

Future Travel
1981





D A V I D R O S E N B O O M

F U T U R E T R A V E L

SIDE ONE

1.	**STATION OAXACA**	(3:26)
2.	**TIME ARROYO**	(5:14)
3.	**CORONA DANCE**	(4:10)
4.	**NAZCA LITTOFF**	(2:20)
5.	**DESERT NIGHT TOUCH DOWN**	(5:10)

SIDE TWO

1.	**PALAZZO**	(8:17)
2.	**NOVA WIND**	(14:59)

SIDE THREE

1.	**FUTURE TRAVEL PATTERNS**	(18:01)

SIDE FOUR

1.	**FUTURE TRAVEL M.U.S.I.C.**	(22:22)

"There is compatibility between local universes and global Universes. These are artifact points of view."

Sides three and four contain previously unreleased music: a set of continuous dance-like cyclical forms made during the development of *Future Travel* and a live improvised performance of *Nova Wind* recorded at a festival called Marvelous Unlimited Sounds in Concert, San Francisco, 1982.

Liner notes by DAVID ROSENBOOM.
www.davidrosenboom.com

Mastered by DAVID ROSENBOOM.
Cut by ANDREAS KAUFFELT at Schnittstelle.

LP originally released in 1981 on:
STREET RECORDS SRA-062
Expanded 2LP edition:
BLACK TRUFFLE RECORDS 2024 BT120

Copyright ©℗ David Rosenboom and
the David C. Rosenboom 2013 Trust 2024

FUTURE TRAVEL is a journey in sonic imagery. It is set sometime in the future and its starting point is Earth. The traveler, whose point of view we imagine, is a spirit being, representing the first awareness of a new form of consciousness to which humans have evolved. At an earlier point in the evolution of the Earth human beings had become aware of the unstoppable momentum of the course which they had set and the unlikelihood of their surviving. Consequently, attention was turned towards learning to direct the process of their own evolution to a new form. This form is a macroscopic one, a large-scale organism, to which all individual entities of earlier Earthly forms contributed. The first awareness of this new form of existence is beginning now.

Each piece on this album has its origins in a unique system for control of proportional structures in music, known as "In the Beginning". This system is modeled in the form of computer programs that help the composer apply it in real-time musical situations. The programs, in turn, communicate with sound generating circuitry and performance input devices, like keyboards and touch sensors. An "intelligent" instrument is thereby created which has both software and hardware components. The instrument responds to performing actions in ways that allow the composer to control both structural aspects of his music and the genesis of each individual sound event.

The sounds of this album were created primarily with TOUCHÉ®, a computerized keyboard instrument utilizing digital sound generation, and a 300 SERIES music system by Buchla & Associates.

Musical programming by DAVID ROSENBOOM using the languages, PATCH-IV and FOIL.

Other instruments appear as follows:
Station Oaxaca: violin, pod rattles, Tibetan cymbals & tambourine
Corona Dance: Syrian dumbek, rototom, hand clapping & African mbira
Palazzo: piano & Ghanian sankoguis
Nova Wind: piano & violin

All compositions, performances, texts & production by DAVID ROSENBOOM.

Engineering & special electronic processing by KATHERINE MORTON.

Recorded and mixed at Zentropa Studios, San Francisco, 1981.

All compositions published by David Rosenboom Publishing (BMI).

Thanks to Executive Producer JOSE CRUZ, whose very special support has made this project possible.

Texts in *Station Oaxaca*, *Desert Night Touch Down*, & *Nova Wind* are read by JACQUELINE HUMBERT.

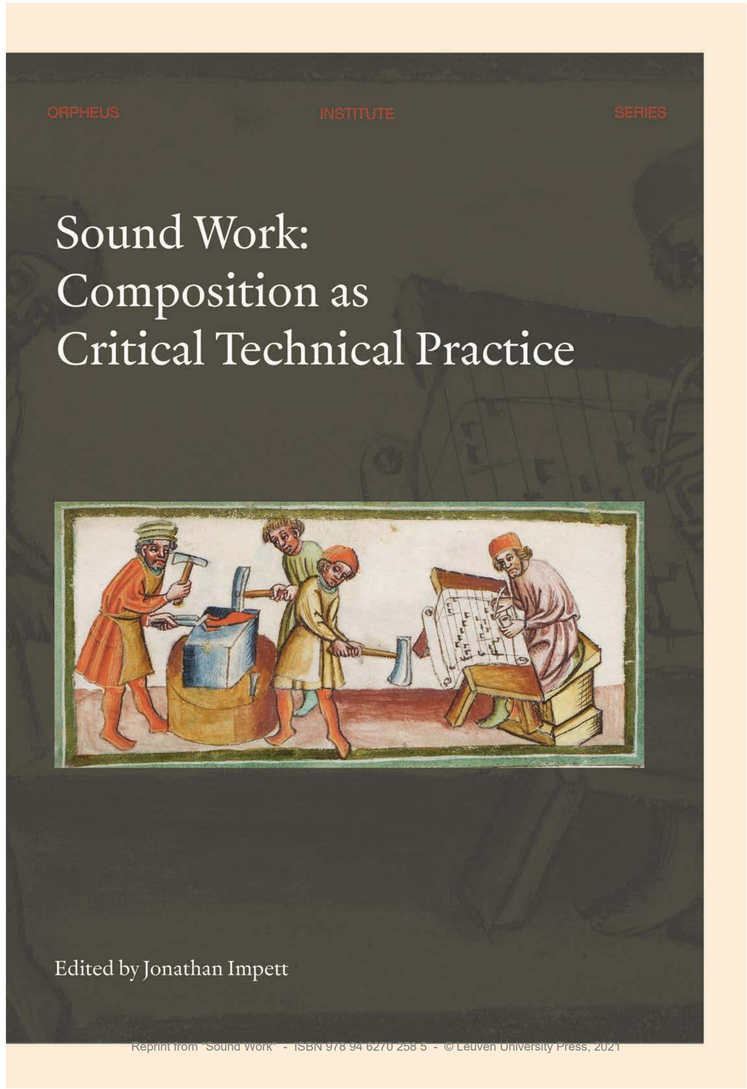
Art Direction by THOMAS L. WESCHLER.
Cover art by GARY GRIMSHAW.
Design of 2024 version by LASSE MARHAUG.

Time Arroyo
from
Future Travel





2022



Reprint from "Sound Work" - ISBN 978 94 6270 258 5 - © Leuven University Press, 2021

Illusions of Form

David Rosenboom
Composer, Valencia, CA

Frameworks

Extraction

Perceiving forms enacts *extraction*. Forms are extracted by perceivers that are themselves extractions marked by closed boundaries within environments (brains, algorithms, or other natural or artificial machinations). Perceiving forms involves extracting differentiable entities from continuously emerging and evolving phenomena that can be stored and referred to as parts of the fine structures of particular *nows*, each with its synthesised past and projected future (Rosenboom 2018b). In cognition, the boundaries of forms are extracted from interactions among exogenous inputs and endogenous syntheses of representations suitable for storage. Histories and perceived time are extracted from resyntheses. Perceiving forms also engenders perceiving *perceiving forms* and perceiving *perceiving perceiving forms*, up to Nth-order, recursive, self-referential frameworks, which also include extracting the forms of perceived perceivers (von Foerster 1984, 2014). Perceiving and cognising forms are active, imaginative, creative processes (Rosenboom 2014a).

In 1967, at the University of Illinois in Urbana-Champaign (UIUC), I was fortunate to be a student in a graduate seminar offered by the great composer and systems theorist Kenneth Gaburo called Studies of 20th Century Theoretic Systems. The fifth lecture in that class was titled "An Incipient Theory of Structure" (K. Gaburo 1976). It was a reading, indeed a performance, in which many repetitions of the word "extraction" were juxtaposed against a large variety of terms, statements, gestures, and vocalisations. At several points in the presentation, a specific juxtaposed statement was delivered, "At this point (or at some previous point or points) some of the previous statements may have collected relationally to form a group or groups. If so, each element in each collection would have been extracted, recursively, from its ordered place. In addition, each collection would have been an extraction, recursively, from all statements given" (ibid., [3]).

At the end of the performance, a series of six inferences were presented, each investigating specific contextual conditions for relations among elements in the long list of juxtapositions to form groups. The final inference presented a proposition: "The five statements, i.e., inferences ONE through SIX, satisfy the minimal conditions for an incipient theory of structure, and are, in themselves, an extracted group from the Universal set of statements which could be made regarding the structure of this composition, as well as those which should be

https://davidrosenboom.com/writings

Illusions of Form

- Frameworks
  - Extraction
  - Propositional music—models
  - Qualities of change—form as cognitive synthesis
  - Intelligence?—Recursive reflexivity and critical practice
  - Concurrent complexities—adaptation and dynamics
  - Representation and notation—mappings and semantics
  - Deviant resonances—interfaces and instruments
  - Thinking composition into being—as situating—as invitation

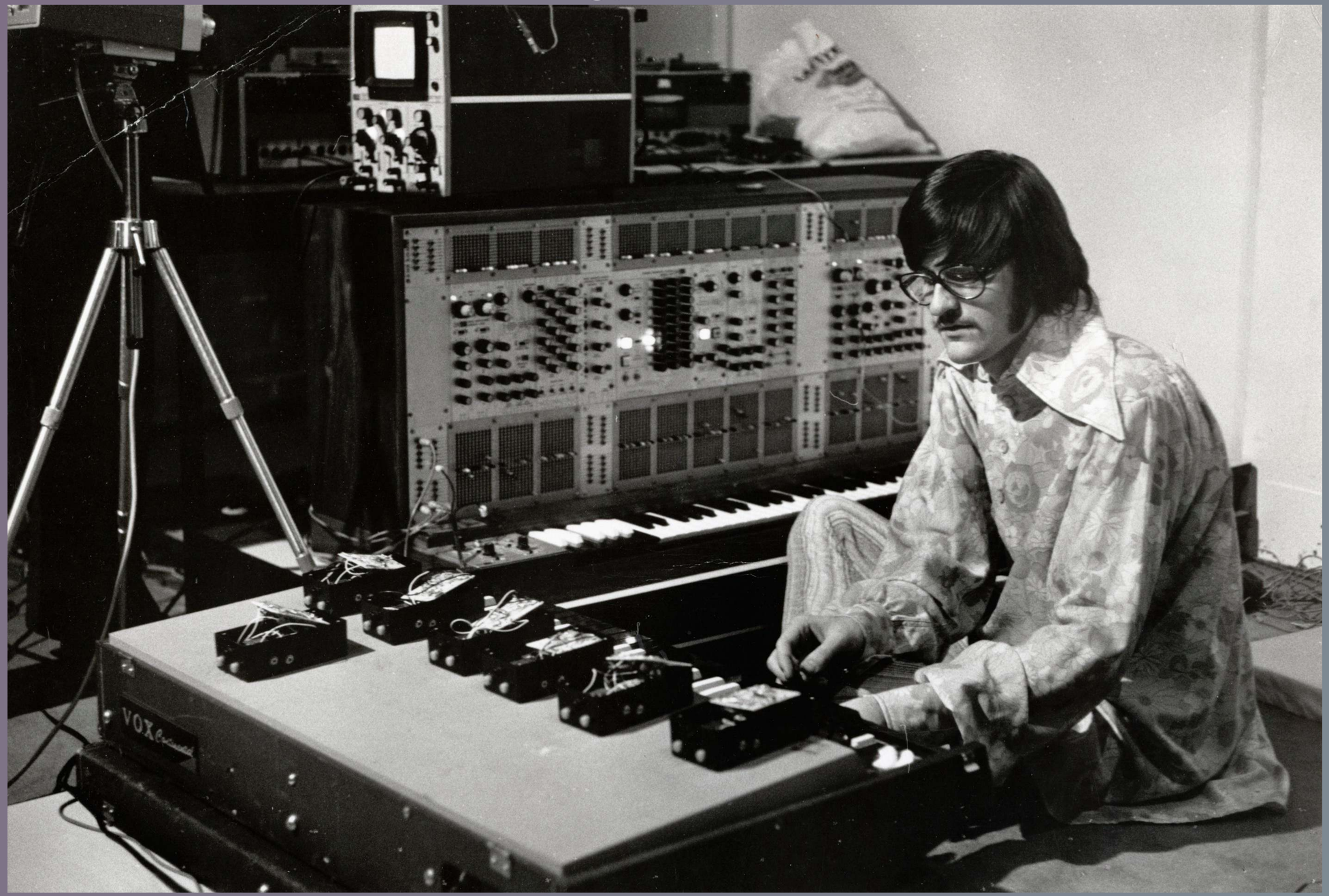
Forms are extracted by perceivers that are themselves extractions marked by closed boundaries within environments.

Forms may be viewed as acts of cognitive synthesis, neuro-aesthetic emergences, spawning propositional models of invented worlds within which unique compositional discoveries may emerge.

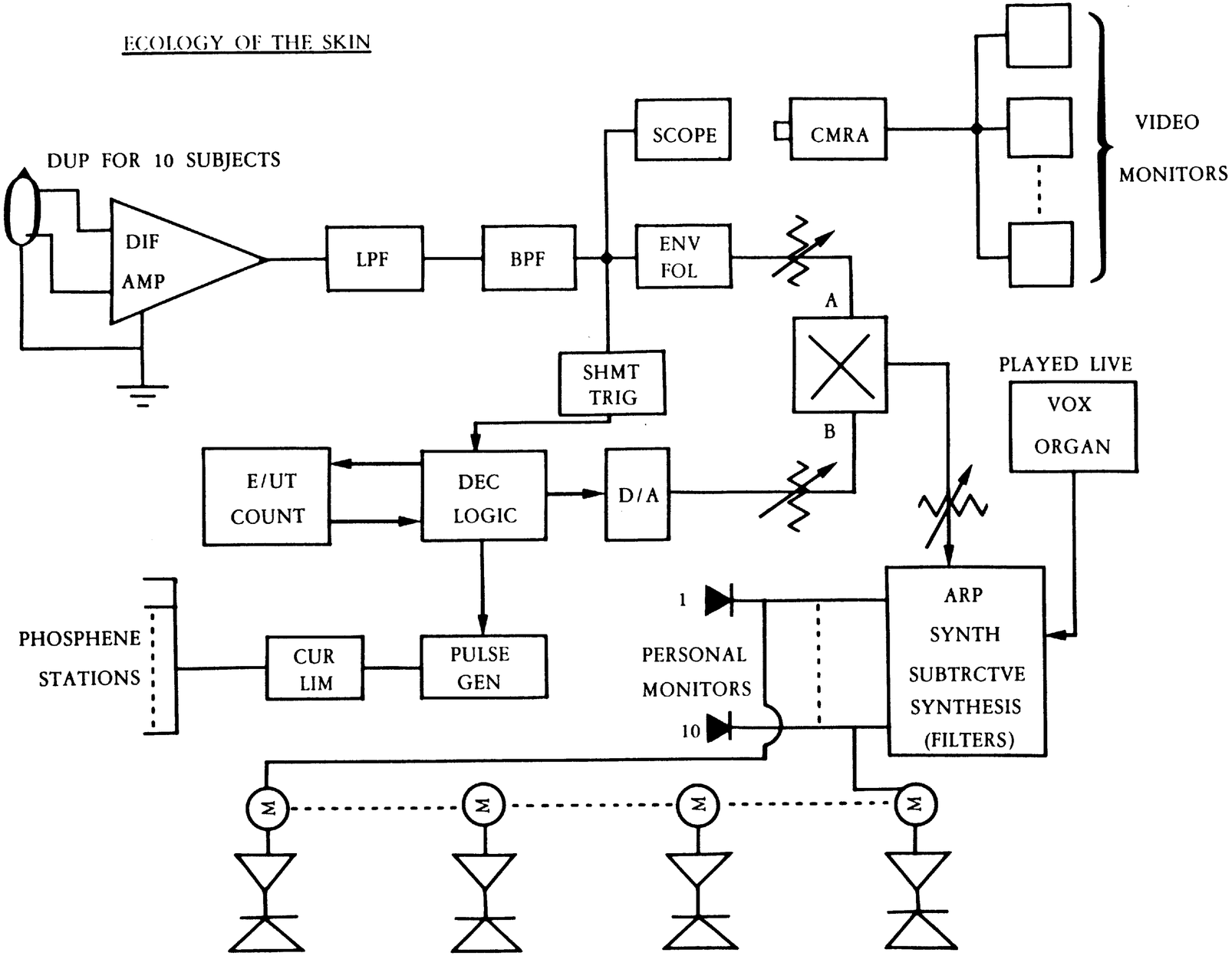
Excerpts from Neuromusic Background

Active Imaginative Listening as Performance

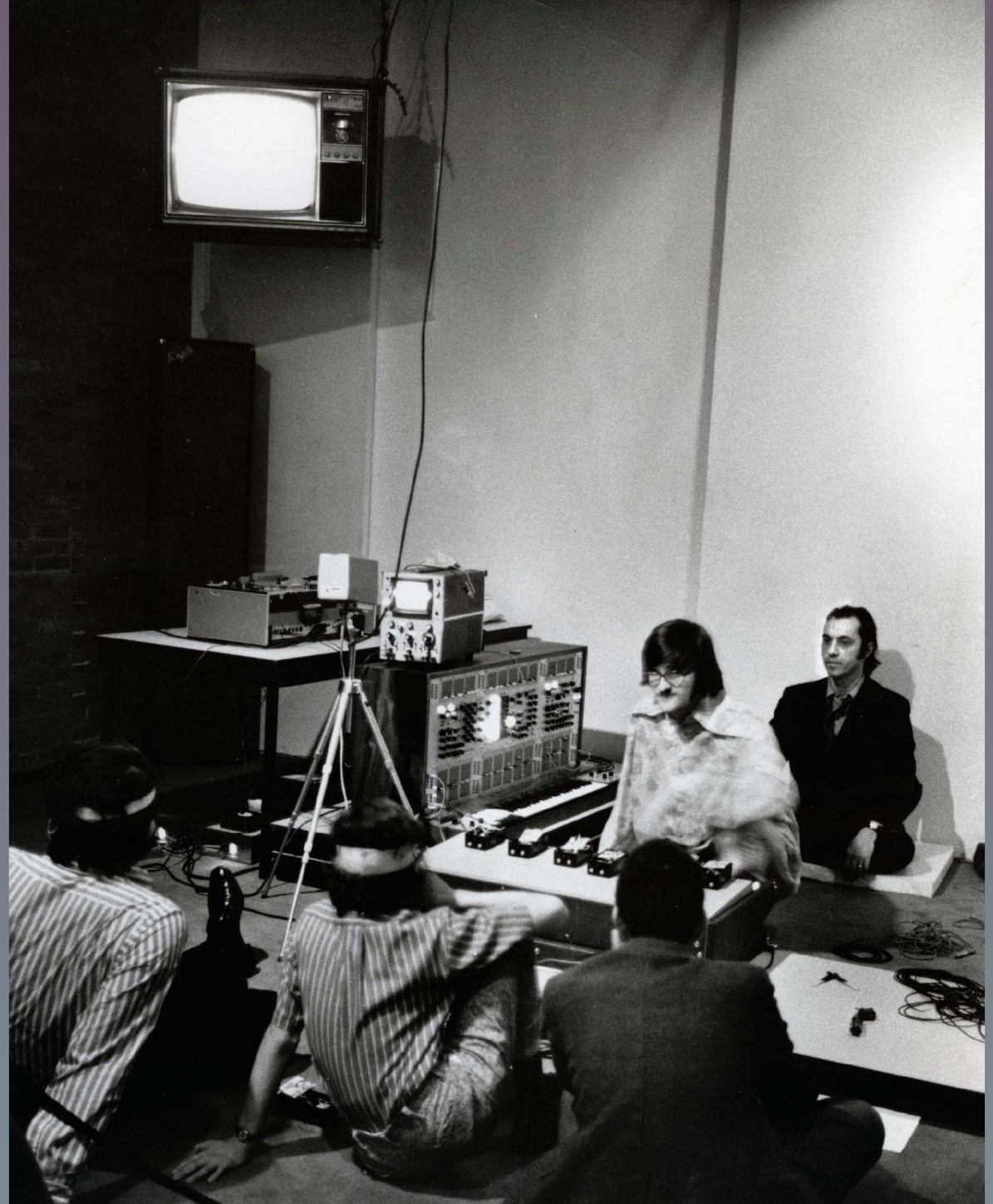
Ecology of the Skin

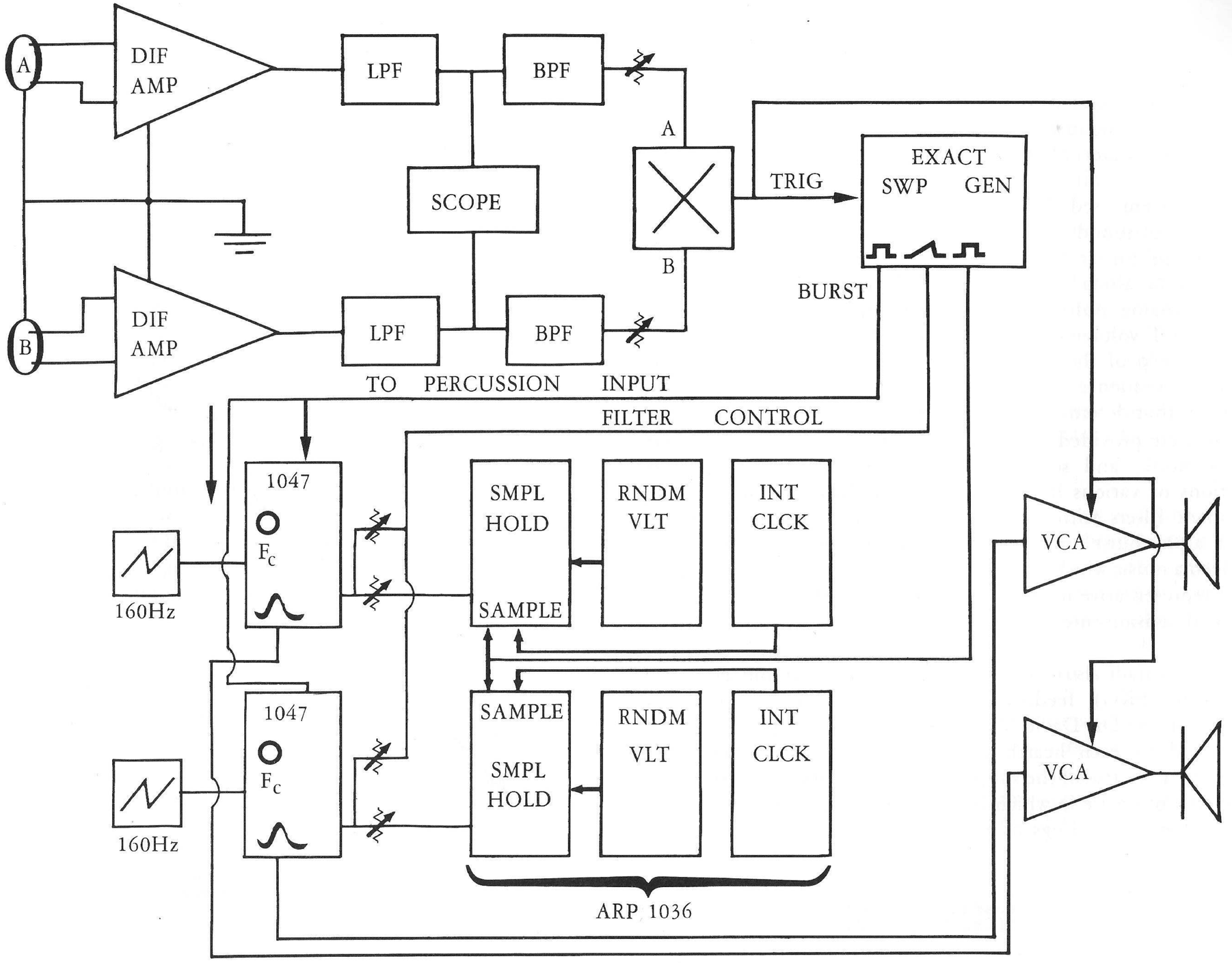


1970, Automation House, Intermedia Institute, New York



Ecology of the Skin (1970)

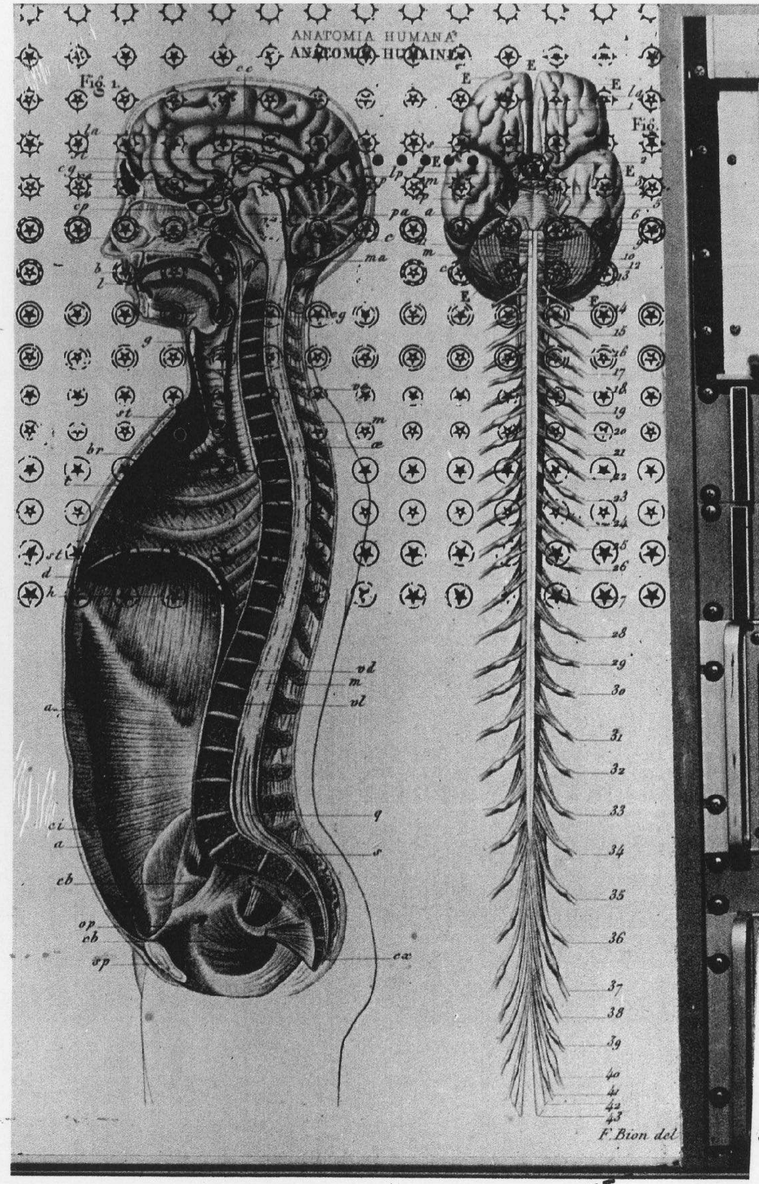


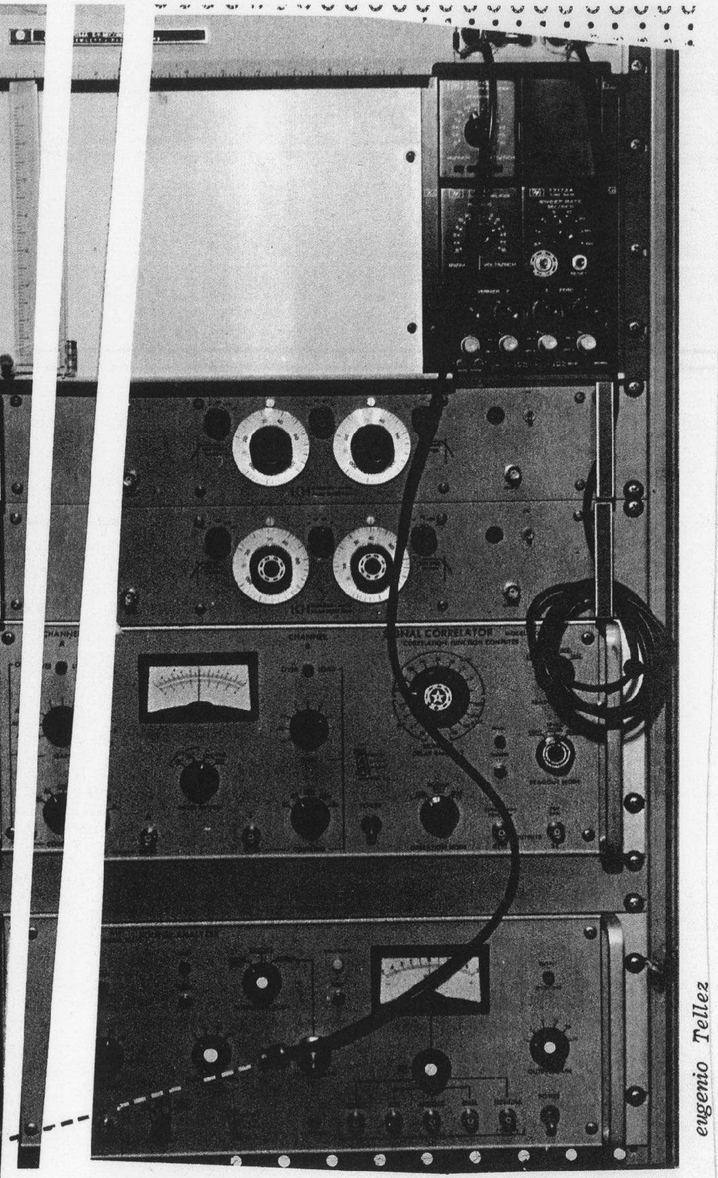

A
DIF AMP
LPF
BPF
A
SCOPE
TRIG
EXACT SWP GEN
B
BURST
B
DIF AMP
LPF
BPF
TO PERCUSSION INPUT
FILTER CONTROL
1047
F_C
160Hz
SMPL HOLD
SAMPLE
RNDM VLT
INT CLCK
VCA
1047
F_C
160Hz
SAMPLE
SMPL HOLD
RNDM VLT
INT CLCK
VCA
ARP 1036

John, Yoko, Chuck, Mike and David

Mike Douglas Show
1972







brainwave music

david rosenboom

eugenio Tellez

Vinyl
1972

CD
2000

Double Vinyl
2019l



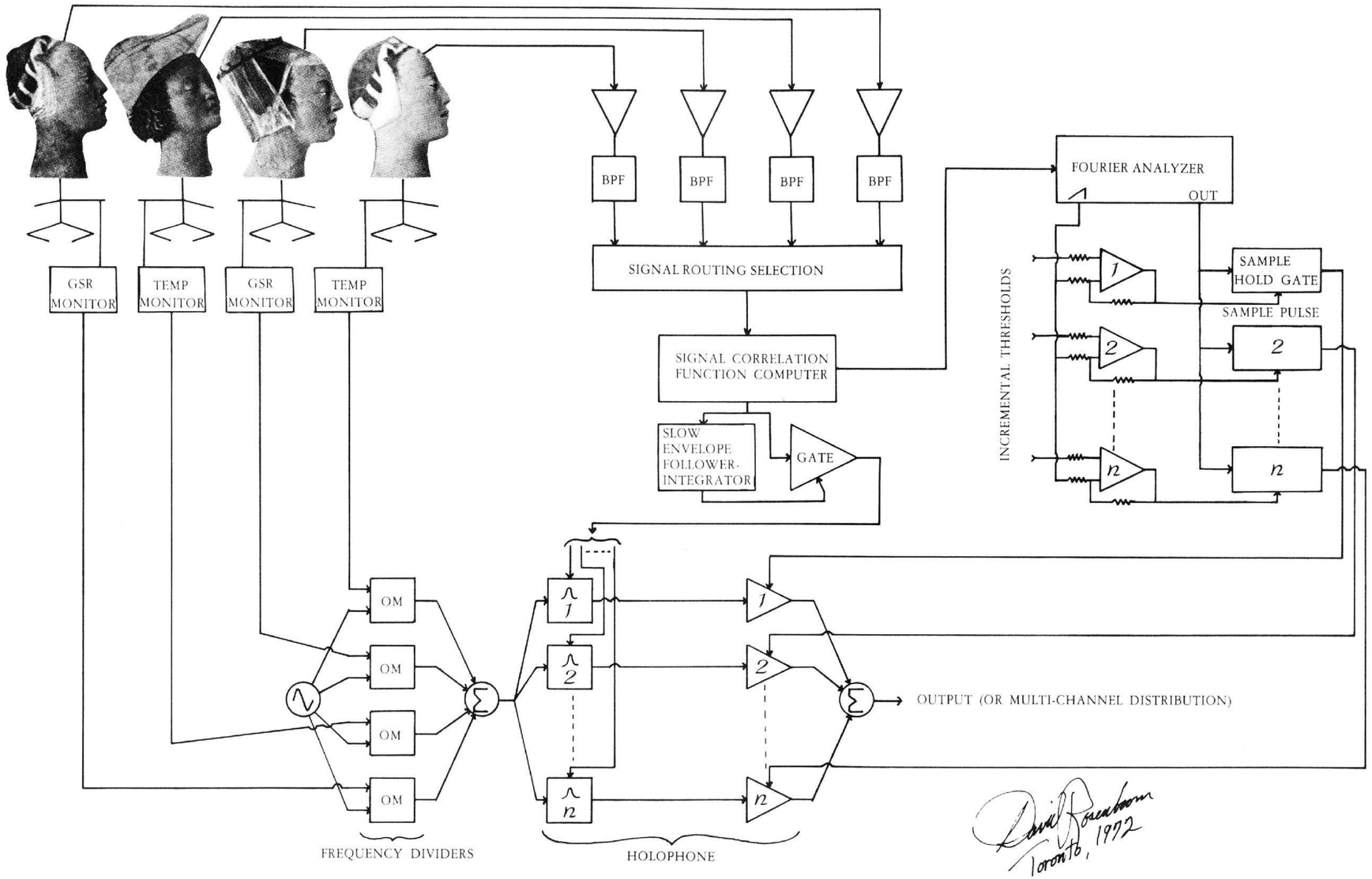
BIOFEEDBACK AND THE ARTS :
results of early experiments

edited by david rosenboom

aesthetic research centre of canada

1974-1975

Portable Gold and Philosophers' Stones (Music from Brains in Fours)



LEONARDO

INTERNATIONAL SOCIETY FOR THE ARTS, SCIENCES AND TECHNOLOGY

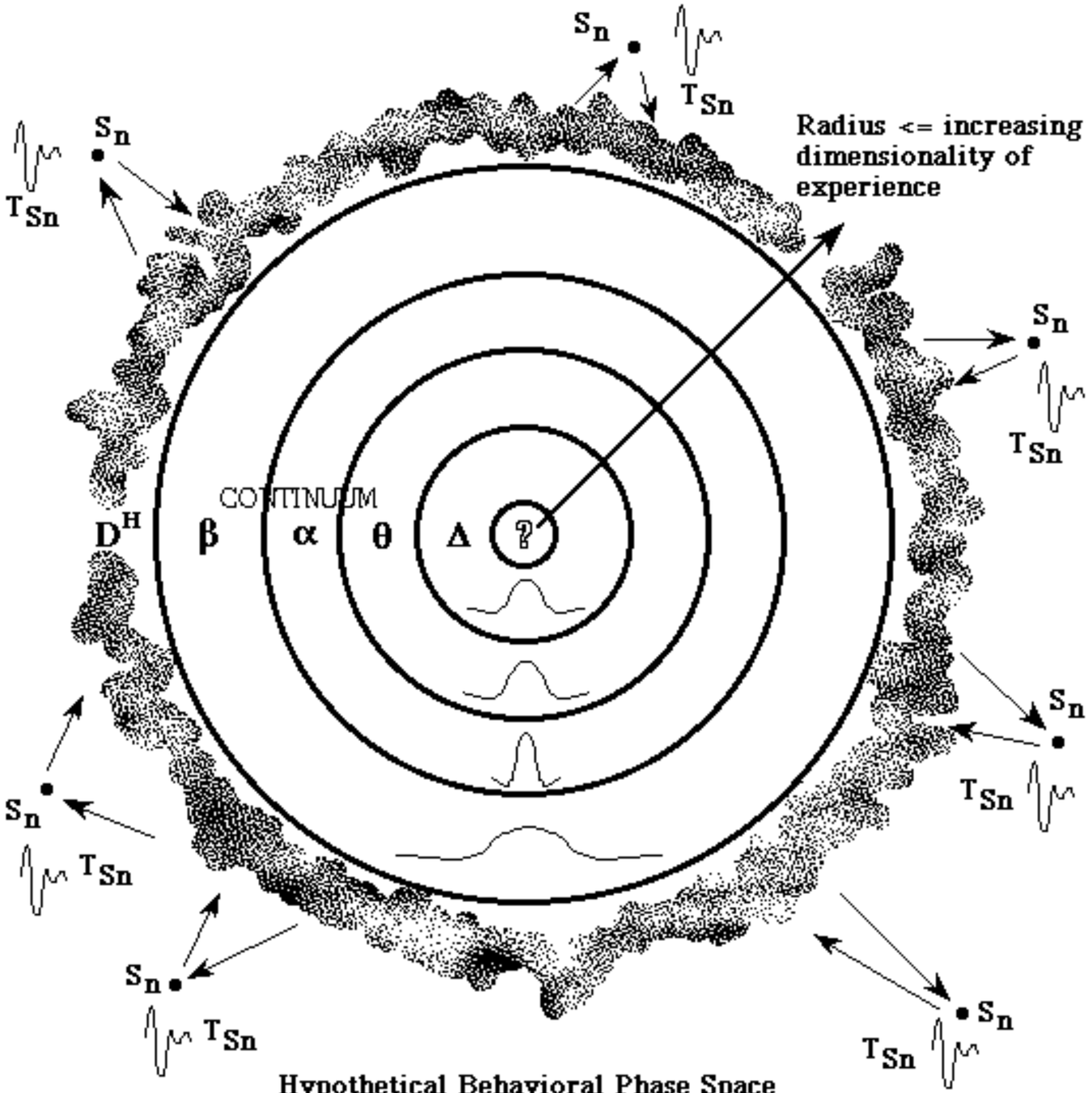
EXTENDED MUSICAL INTERFACE WITH THE HUMAN NERVOUS SYSTEM

David Rosenboom

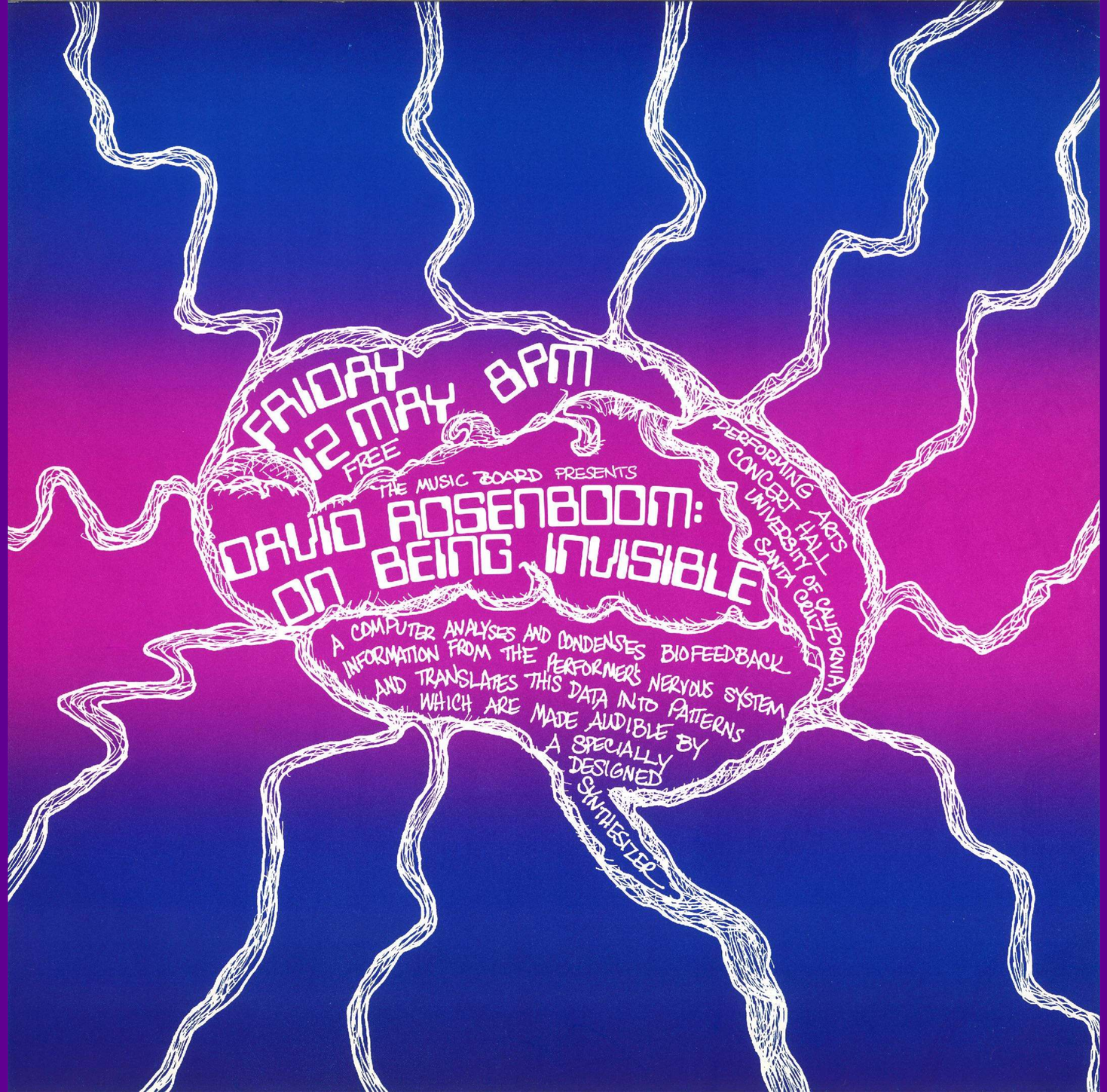
1990

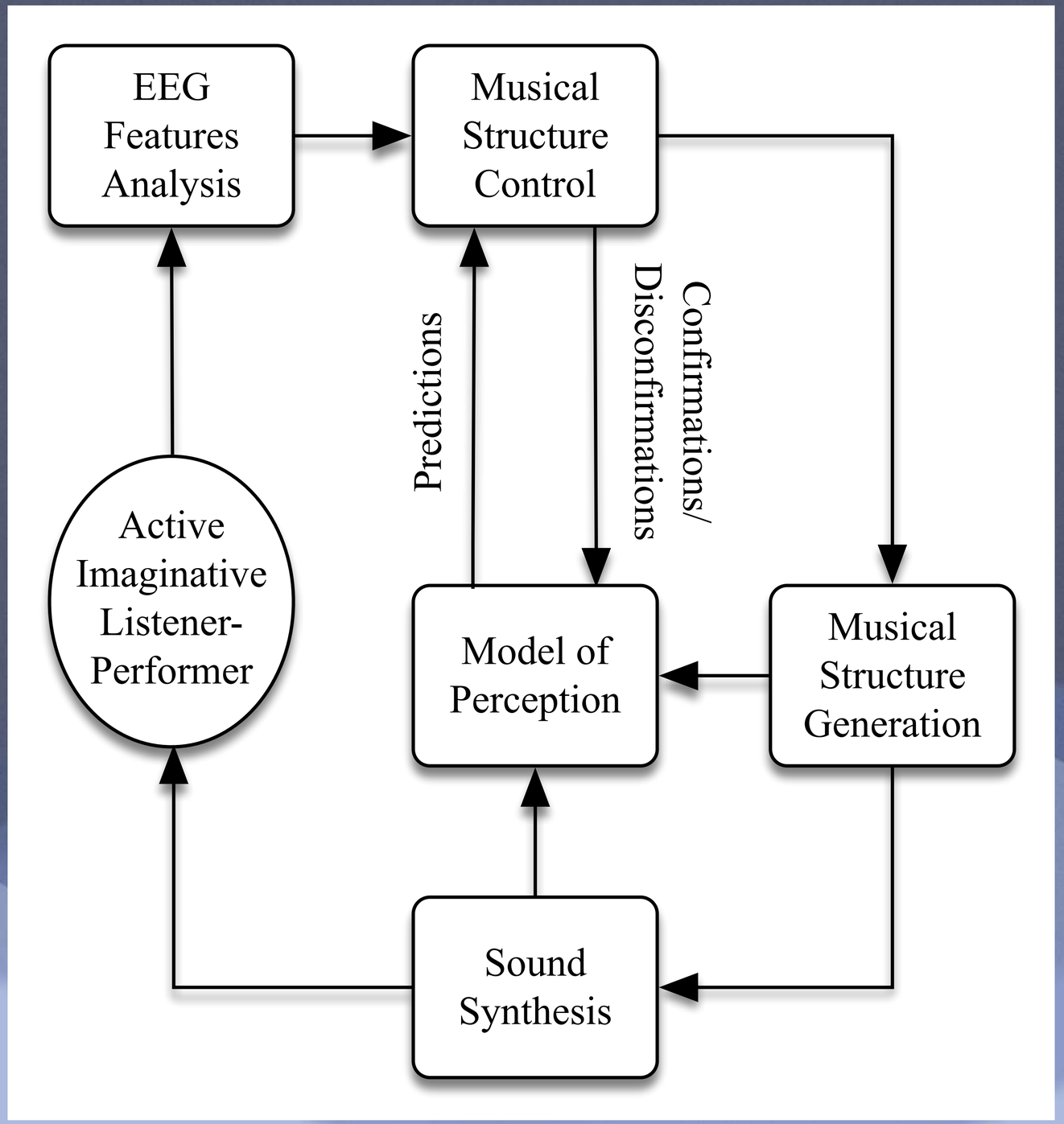
Updated
1997
https://davidrosenboom.com/writings

I S A S T
Leonardo Monograph Series


Sn
TSn
Radius <= increasing dimensionality of experience
CONTINUUM
DH
β
α
θ
Δ
?
Hypothetical Behavioral Phase Space

On Being Invisible
1976-1977




EEG Features Analysis
Musical Structure Control
Predictions
Confirmations/ Disconfirmations
Active Imaginative Listener-Performer
Model of Perception
Musical Structure Generation
Sound Synthesis

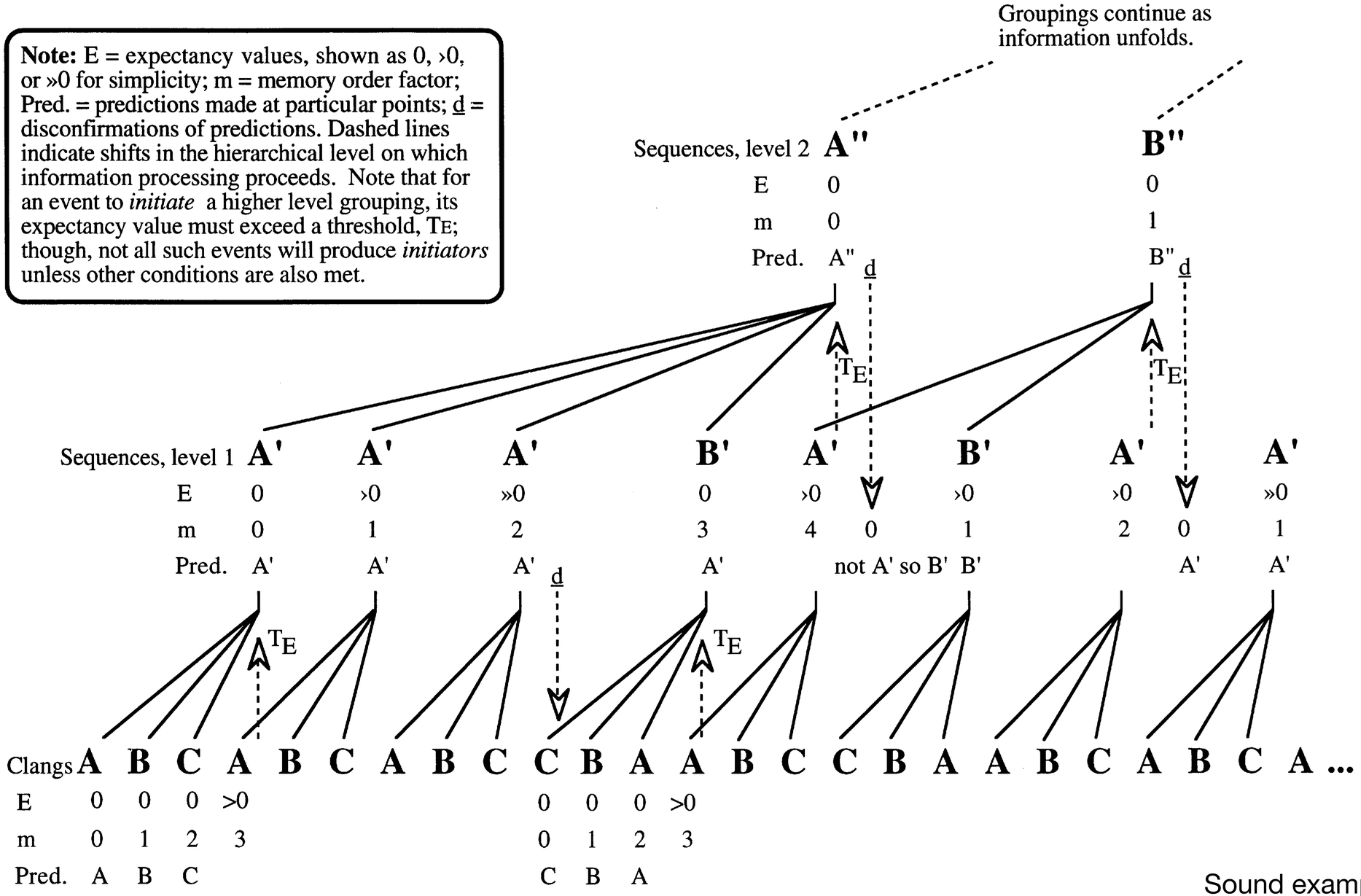


Illustration of the *Hierarchical Structure Builder* Operating on a Simple String of Events

Sound example: area of relatively complex pattern buildup

On Being Invisible II

(Hypatia Speaks to Jefferson in a Dream)

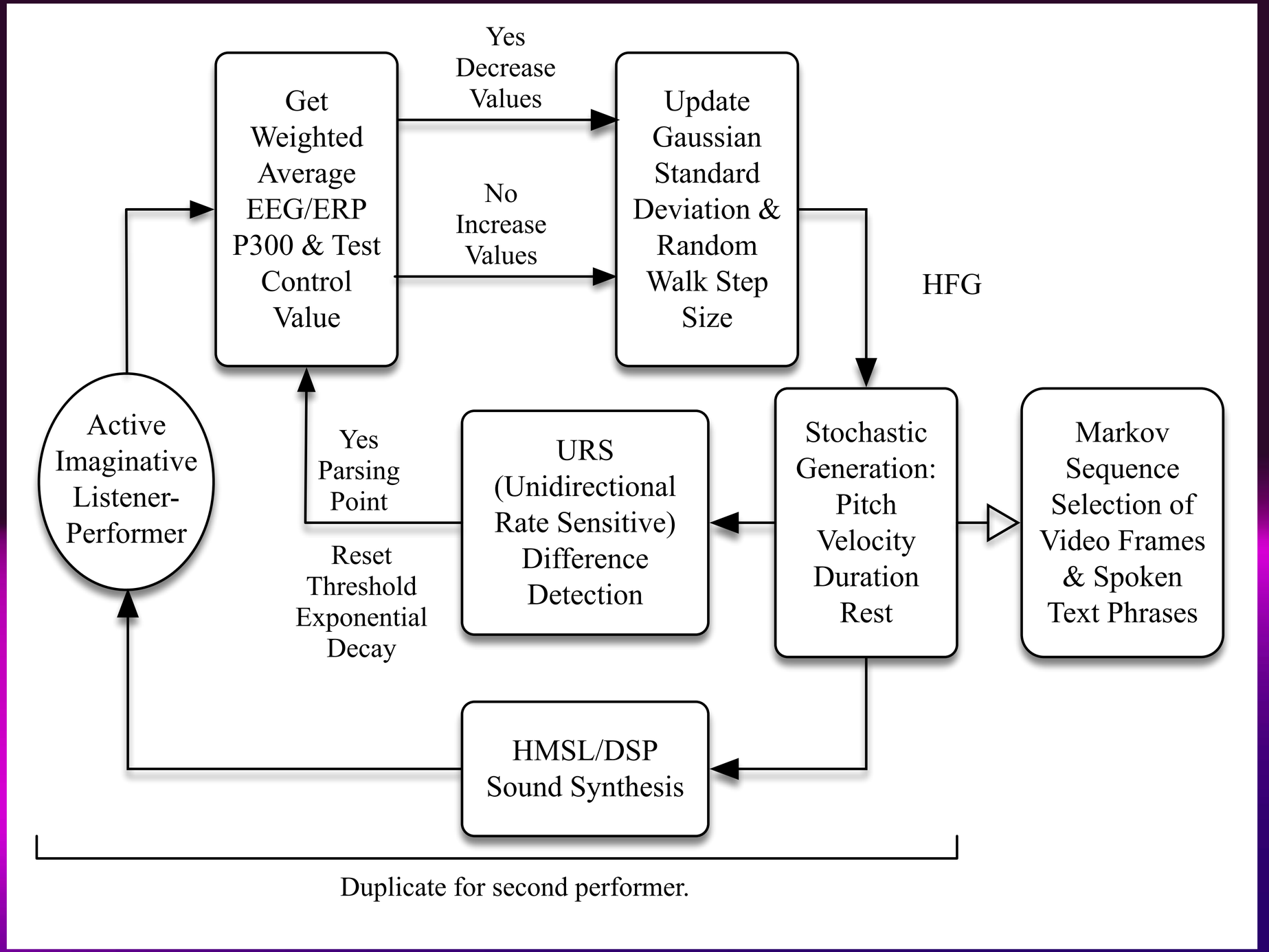
Self-organizing Opera

1994



On Being Invisible II (Hypatia Speaks to Jefferson in a Dream)

1994



On Being Invisible II (Hypatia Speaks to Jefferson in a Dream)

Self-organizing Opera

Part 1: In the Beginning…Reasoned Mind

. . . In the beginning
. . . there is reasoned mind.
. . . We continue, thinking of two-ness, like the polar qualities of a
global consciousness becoming self-aware for the first time.
. . . The new awareness contemplates endurance, having somehow
survived the great rundown of entropy.
. . . Now, space itself, has become charged with the activity of
thought, the vacuum genesis of self-organization.

Part 2: Evolution with Singular Events

Phrases inserted at will, according to the progress of the improvisation and the phrases spoken by the sampled voices. They invoke dichotomous ideas about slavery, their hypocrisies, and a quote from Jefferson about the mathematics of miscegenation.

Part 3: Logan's Speech

Quotes from Cherokee chief, Logan, spoken in his own defense in 1775. Narrator's text parallels circumstances of Hypatia's brutal murder by Christian zealots in CE 415 with senseless murders by colonists of Logan's family and many in his tribe in the 1770s. Multimodal sensory environment becomes increasingly dense and complex.

Part 4: Philosophical Musings with a Sense of Reminiscing

. . . Believing that faith is everything
. . .—and the more incomprehensible the
proposition, the more merit in its faith—
. . . the inquisition of public opinion
. . . overwhelms in practice,
. . . the freedom asserted
. . . by the laws in theory.



PERSPECTIVE ARTICLE
published: 22 August 2014
doi: 10.3389/fnins.2014.00251

Active imaginative listening—a neuromusical critique

David Rosenboom*

The Herb Alpert School of Music, California Institute of the Arts, Valencia, CA, USA

Edited by:
Jonathan B. Fritz, University of Maryland, USA

Reviewed by:
Edgar Elliott Coons, New York University, USA
Diego Minciacchi, University of Florence, Italy

****Correspondence:***
David Rosenboom, The Herb Alpert School of Music, California Institute of the Arts (CalArts), 24700 McBean Parkway, Valencia, CA 91355-2340, USA
e-mail: david@calarts.edu

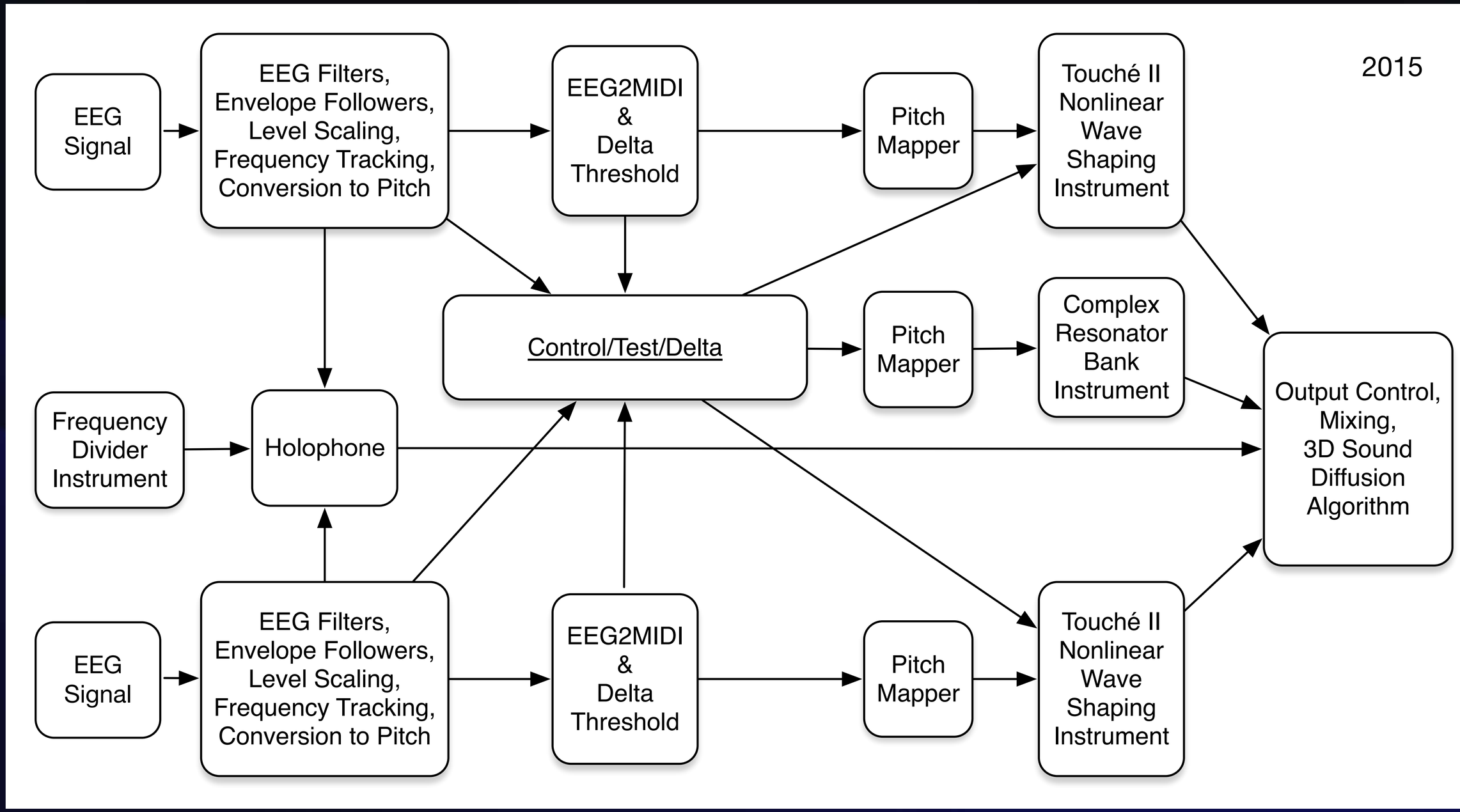
The parallel study of music in science and creative practice can be traced back to the ancients; and paralleling the emergence of music neuroscience, creative musical practitioners have employed neurobiological phenomena extensively in music composition and performance. Several examples from the author's work in this area, which began in the 1960s, are cited and briefly described. From this perspective, the author also explores questions pertinent to current agendas evident in music neuroscience and speculates on potentially potent future directions.

Keywords: biofeedback, brain-computer music interface, music neuroscience, neuromusic, propositional music, self-organizing musical forms

Portable Gold and Philosophers’ Stones (Deviant Resonances)

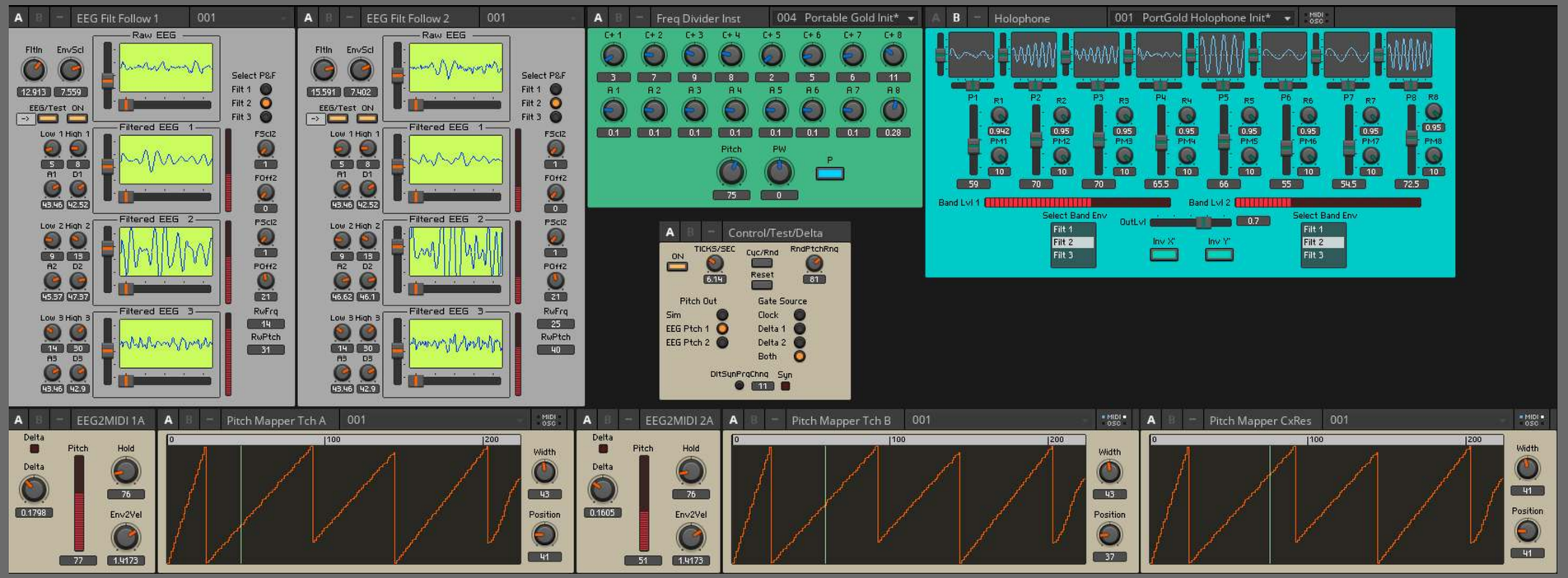


2025

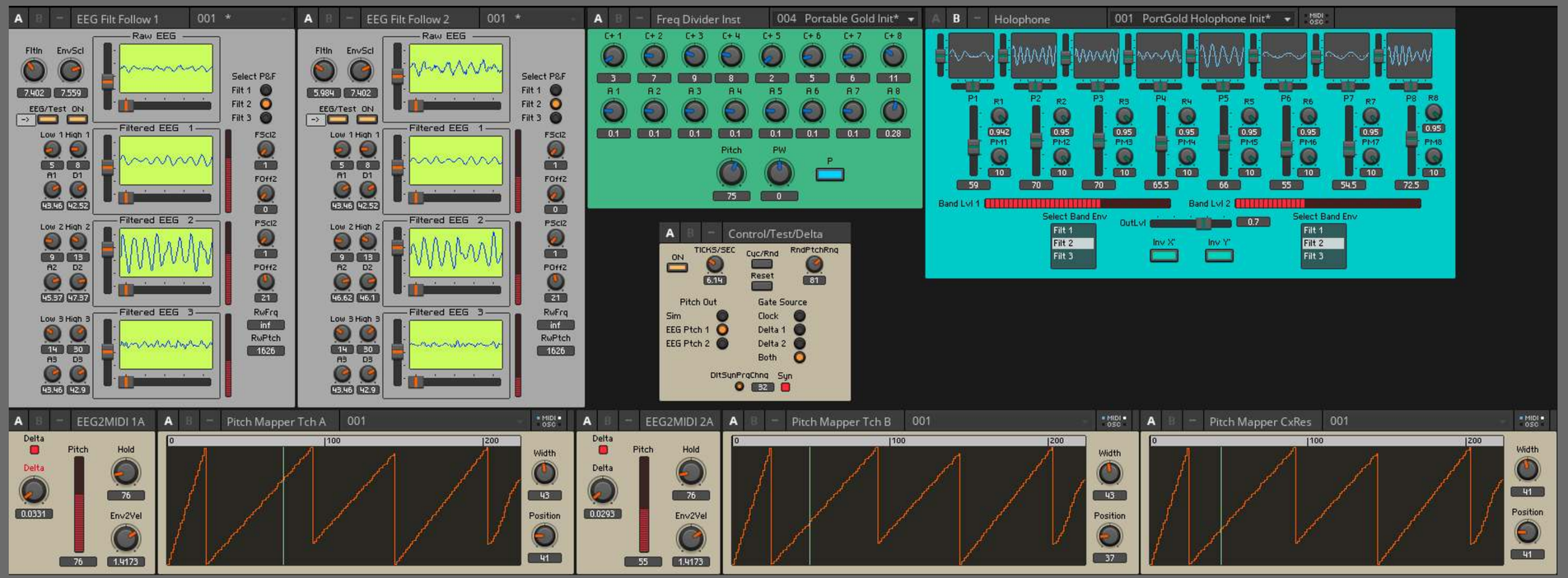

2015
EEG Signal
EEG Filters, Envelope Followers, Level Scaling, Frequency Tracking, Conversion to Pitch
EEG2MIDI & Delta Threshold
Pitch Mapper
Touché II Nonlinear Wave Shaping Instrument
Control/Test/Delta
Pitch Mapper
Complex Resonator Bank Instrument
Frequency Divider Instrument
Holophone
Output Control, Mixing, 3D Sound Diffusion Algorithm
EEG Signal
EEG Filters, Envelope Followers, Level Scaling, Frequency Tracking, Conversion to Pitch
EEG2MIDI & Delta Threshold
Pitch Mapper
Touché II Nonlinear Wave Shaping Instrument

2015

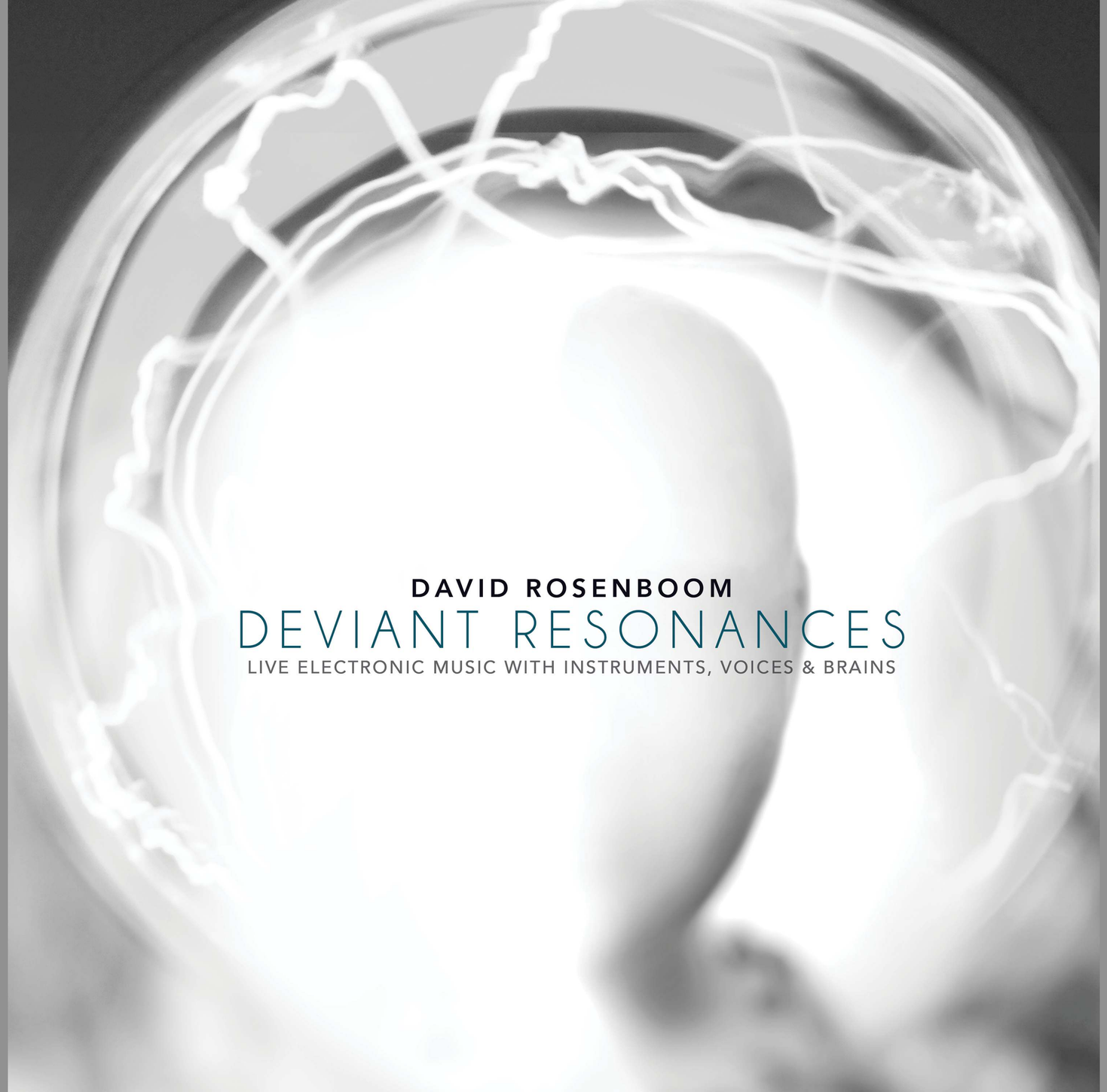
State 1
independent



State 2
simultaneous



Ravello Records (2019)



Ringing Minds



David Rosenboom,
Tim Mullen &
Alexander Khalil

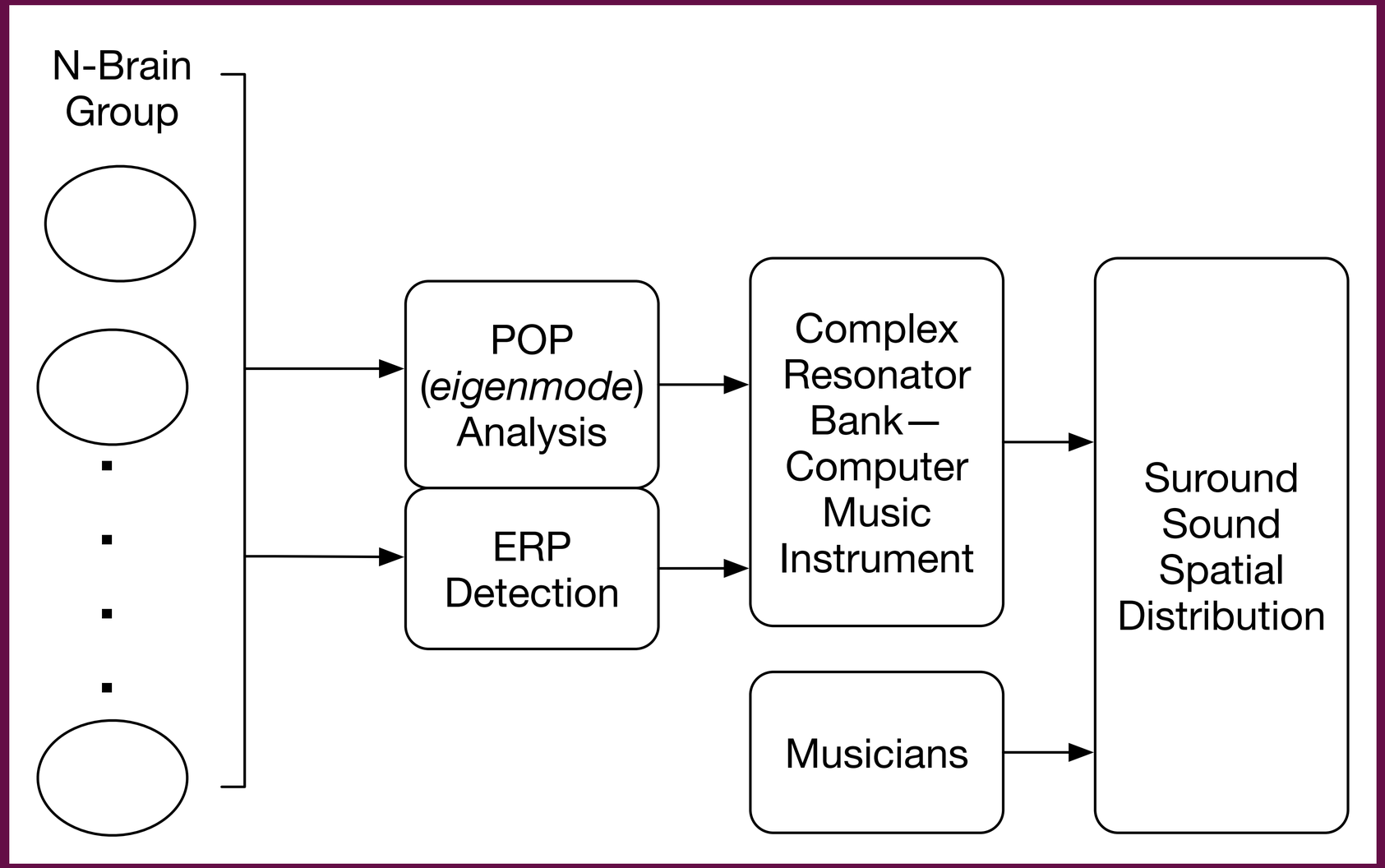
Whitney Museum of American Art & ISSUE Project Room, New York, 23 May 2015

Active Imaginative Listening



the new performing

Ringing Minds



2014

Simplified System Outline

Ringing Minds



Complex Resonator Bank—Sonification Instrument Panel

Param.	Mapping from (POP/ERP analysis)	Mapping to (electronic music instrument)
K	Index number for a POP	Index number for corresponding resonator
F_k	Frequency of the K^{th} POP	Index into a table of scale gamuts from which the pitch of the K^{th} resonator is obtained
D_k	Damping time for the K^{th} POP	Decay time for the K^{th} resonator
A_k	Excitation of the K^{th} POP	Amplitude for the K^{th} resonator
OR_k	Binary value indicating whether the K^{th} POP is an oscillator or a relaxator	How an exciter circuit "rings" the K^{th} resonator. For oscillators, the exciter applies an impulse function, with controllable rising and falling slopes. For relaxators the exciter function injects a noise burst with exponential decay.
S_k	Stability of the K^{th} POP	Variance of a controlled random modulation of the pitch assigned to the K^{th} resonator
W_k	Dispersion (variance) of energy of the K^{th} POP across all brains	Spatial positioning of the K^{th} resonator output in the multi-channel, surround-sound field
ERP	Detrended, single-channel EEG averaged across all brains	Sonification of ERP via pitch modulation of all resonators active in the instrument at that time

Table 1. Mappings from POP parameters and ERP data to parameters for sliding window software-based electronic music instrument



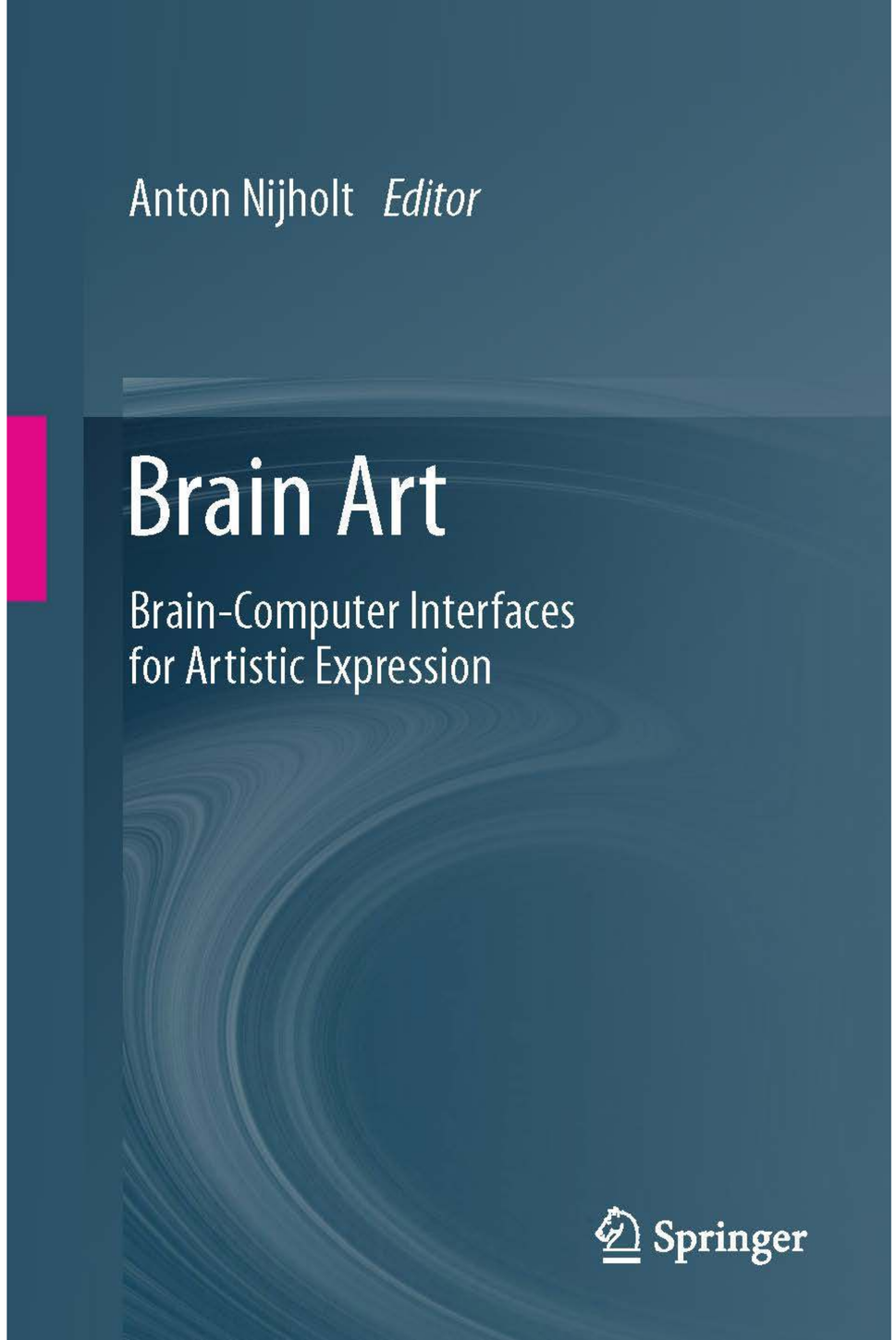
Gaming Media and Social Effects

Anton Nijholt *Editor*

More Playful User Interfaces

Interfaces that Invite Social and Physical Interaction

Springer



Author Proof

Chapter 4
More Than One—Artistic Explorations with Multi-agent BCIs

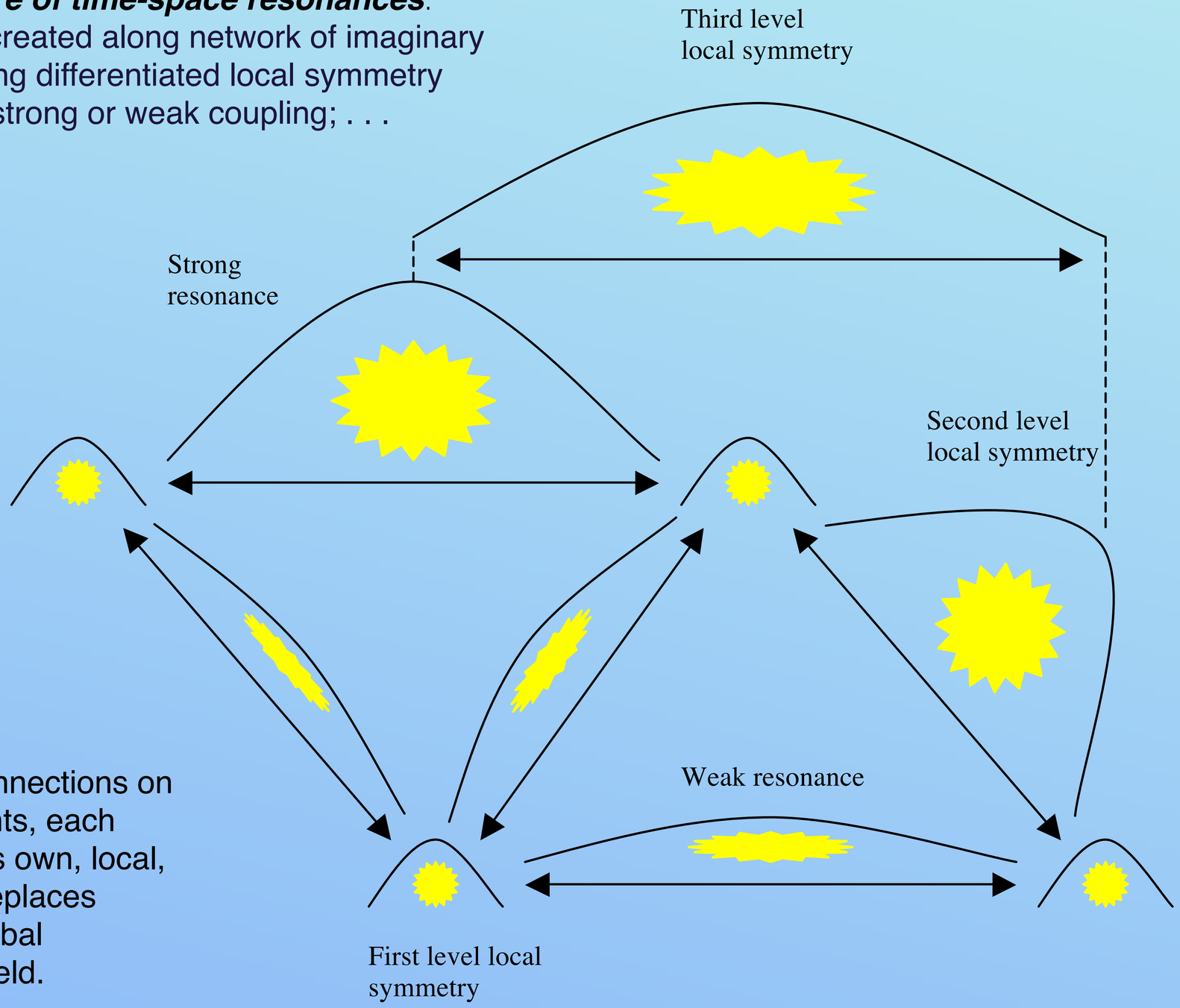
Check for updates

David Rosenboom and Tim Mullen

Abstract In this chapter, the historical context and relevant scientific, artistic, and cultural milieus from which the idea of brain-computer interfaces involving multiple participants emerged is discussed. Additional contextualization includes descriptions of the intellectual climate from which ideas about brain biofeedback led to pioneering applications in music and its allied arts. The chapter then proceeds with more in-depth explanations of what are termed *contingent* and *non-contingent* feedback schemes, along with descriptions of early artistic applications and how those might be differentiated. Effects ensuing from the qualitative nature of the feedback signals in brainwave music are also briefly discussed. Following this, substantial space is devoted to describing selected examples of relatively recent musical and artistic pieces that employ multi-agent BCI. These are described with more extensive technical details that illustrate how the ideas, some of which could only have been imagined in earlier times, are now made possible by advances in available technology and new methods for analyzing brain signals from both individuals and groups. These include: implementing biofeedback schemes in which feedback signals depend upon contingent conditions in electroencephalographic features measured among multiple participants, multivariate principal oscillation pattern detection, "hyper-brain" scanning, employing wearable technology, and other related methods. Complex brain-computer music systems are also described in detail. Key artistic concepts explored include the idea of active imaginative listening as performance and cooperative multi-agent artistic productions with BCIs. Some concluding commentary and ideas for future research are also offered.

Keywords Active imaginative listening · Artscience · BCI · BCMI · Bioart · Biofeedback · Brain-computer interface · Brain-computer music interface · Brainwave music · Contingent feedback · Cooperative brain-computer interface · EEG · Event related potentials · ERP · Hyper-brain · Hyperscanning · Listening as

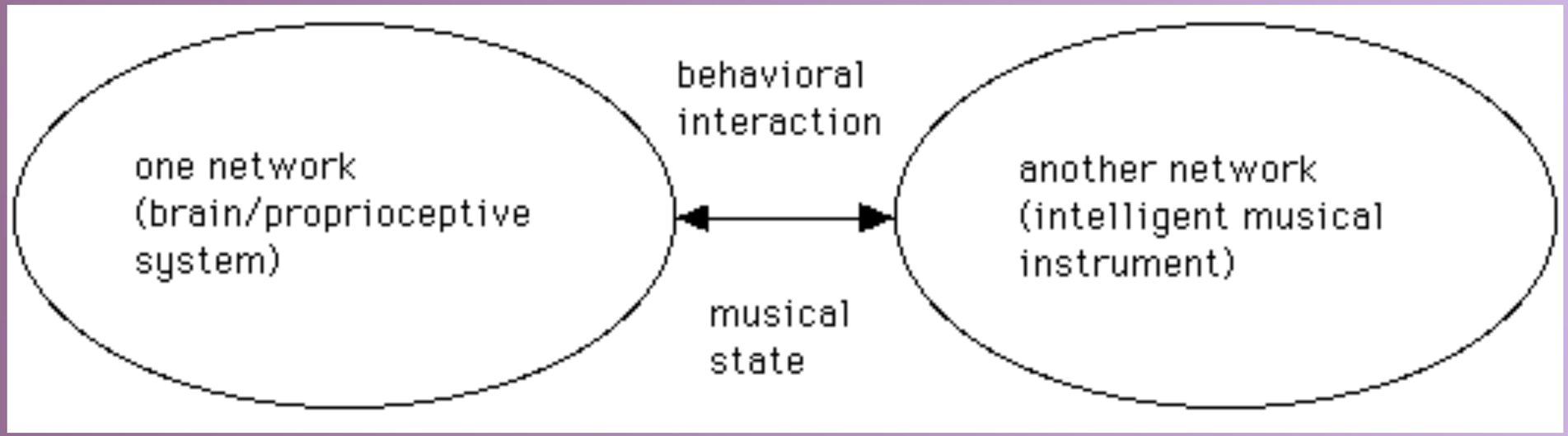
Fibrous nature of time-space resonances:
relationships created along network of imaginary lines connecting differentiated local symmetry systems with strong or weak coupling; . . .



. . . web of connections on different extents, each manifesting its own, local, time-space, replaces concept of global background field.

Concurrent Complexities in . . .

Propositional Music with interacting networks become . . .

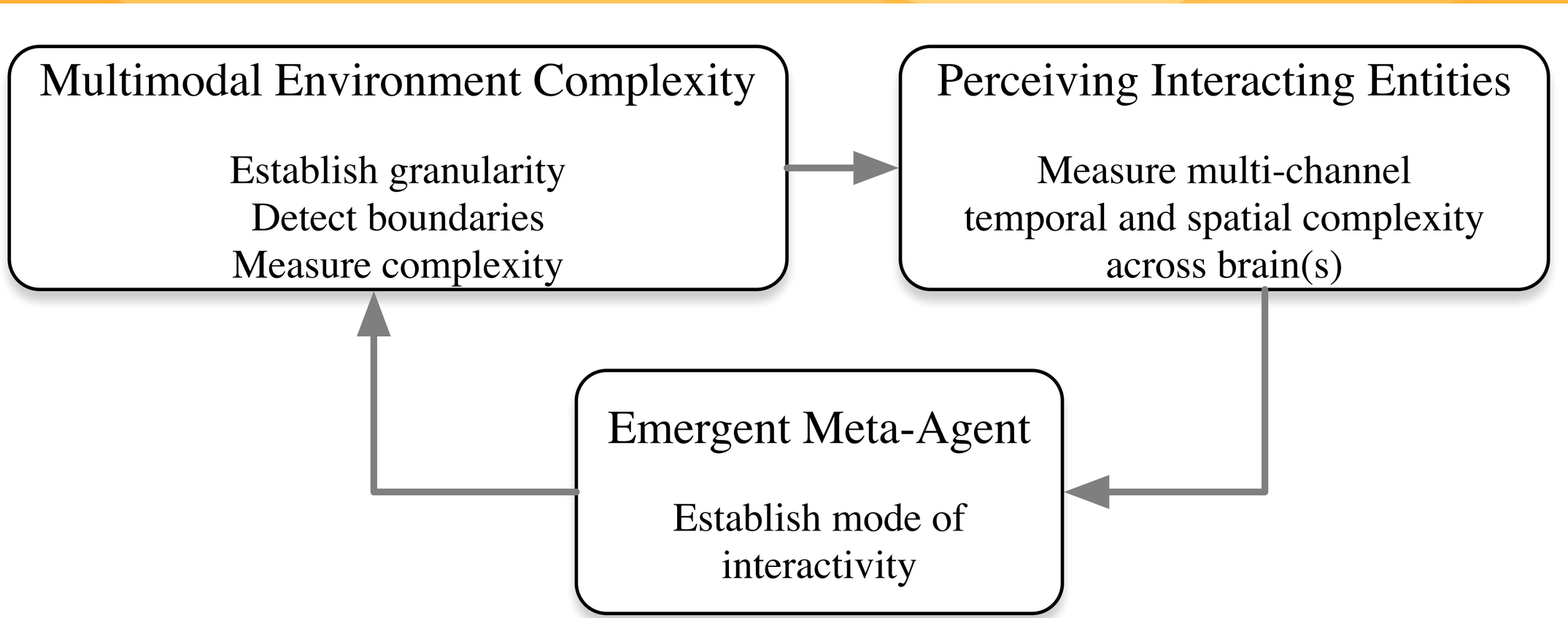


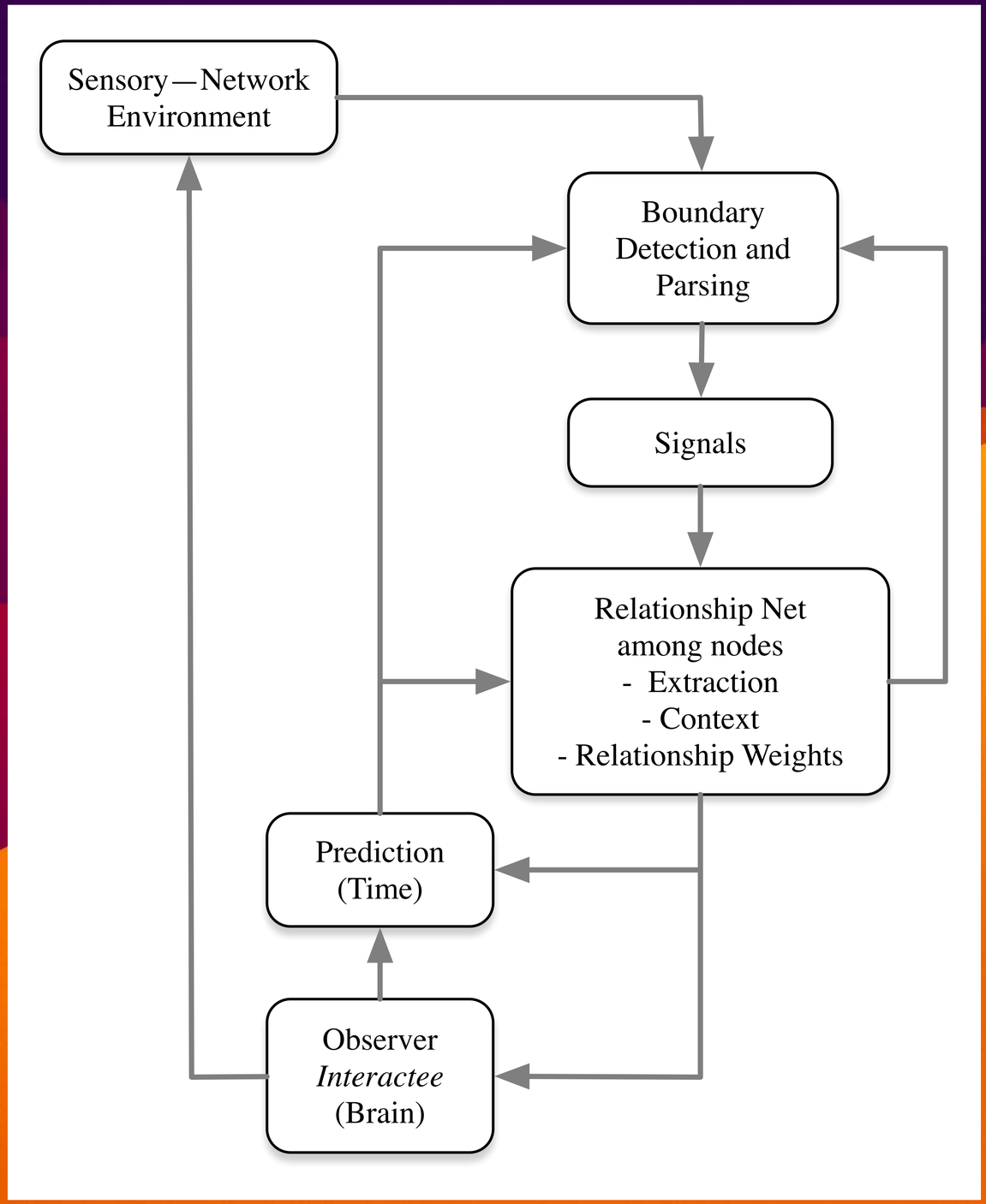
1992

Musical States—differentiable interactions—

located along scales for comparison—

—just like “notes”


Multimodal Environment Complexity
Establish granularity
Detect boundaries
Measure complexity
Perceiving Interacting Entities
Measure multi-channel
temporal and spatial complexity
across brain(s)
Emergent Meta-Agent
Establish mode of
interactivity


Sensory—Network Environment
Boundary Detection and Parsing
Signals
Relationship Net among nodes
- Extraction
- Context
- Relationship Weights
Prediction (Time)
Observer
Interactee
(Brain)

(Heinz von Förster)

COGNITION ➔ computing a reality

COGNITION ➔ computing descriptions of a reality

COGNITION ➔ computing descriptions of descriptions of descriptions . . .

COGNITION ➔ computations of computations of computations . . .

(DR Propositional Music)

MUSICAL COGNITION ➔ computing musical propositions

COMPOSITION-PERFORMANCE ➔ activating musical propositions

Imagining *as* composition

Imagining *as* performance

Listening *as* composition

Listening *as* performance

Composition *as* situating

Composition *as* inviting

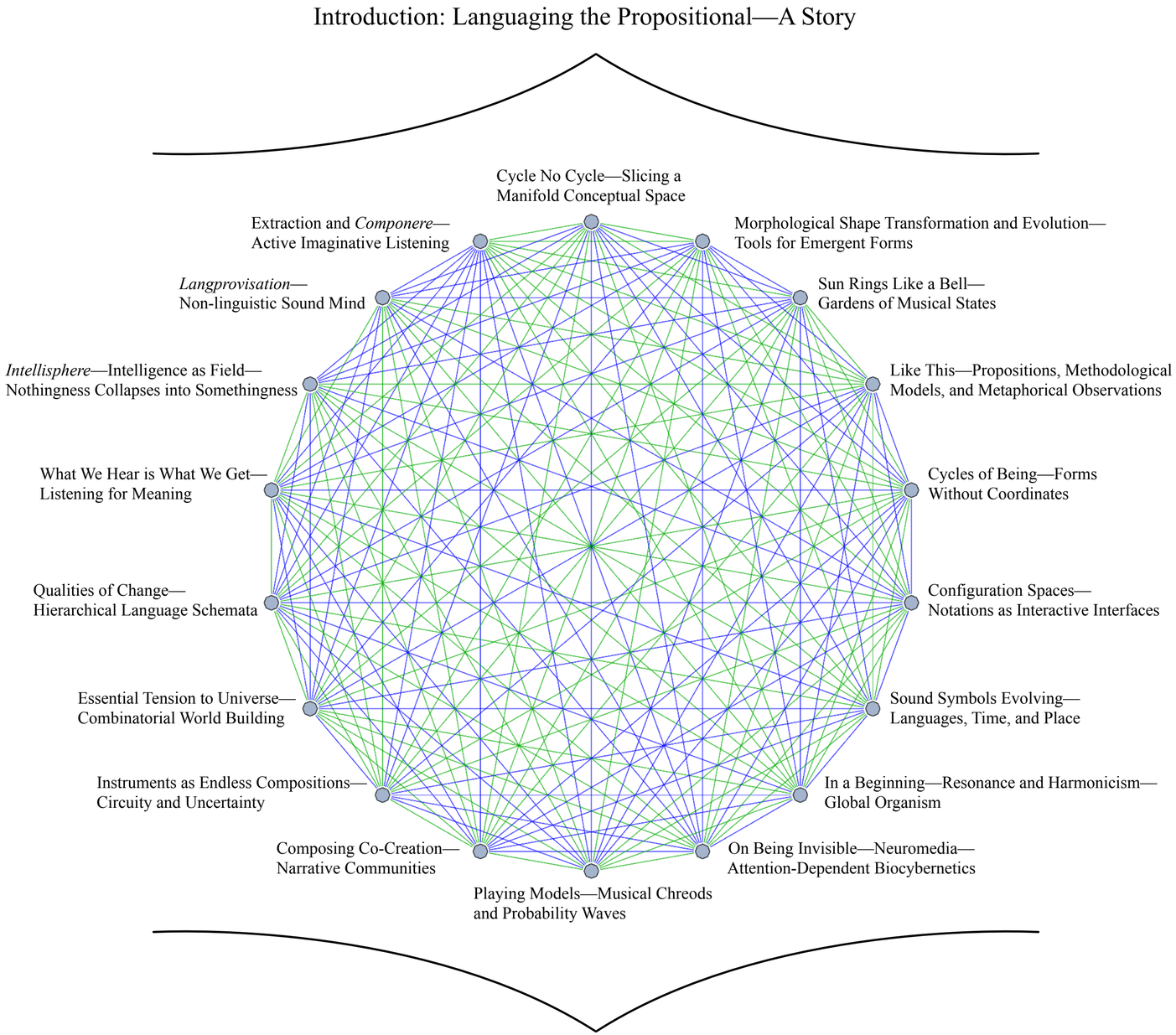
Composition *as* co-creation

Composer-performer practices *as* situating cognitive synthesis

. . . . . *as* . . . . .

Propositional Music

(book forthcoming)



davidrosenboom.com