



Reimagining Hyperinstruments

A Special Edition of *Musical Aesthetics and Media Technology (MAS.825)*

Prof. Tod Machover

TAs: Manaswi Mishra and Nikhil Singh

Fall term 2021, W 2-4:30 pm (3-3-6)



Study Past & Future of Hyperinstruments



Study Past & Future of Hyperinstruments

Explore many related issues of music+tech++

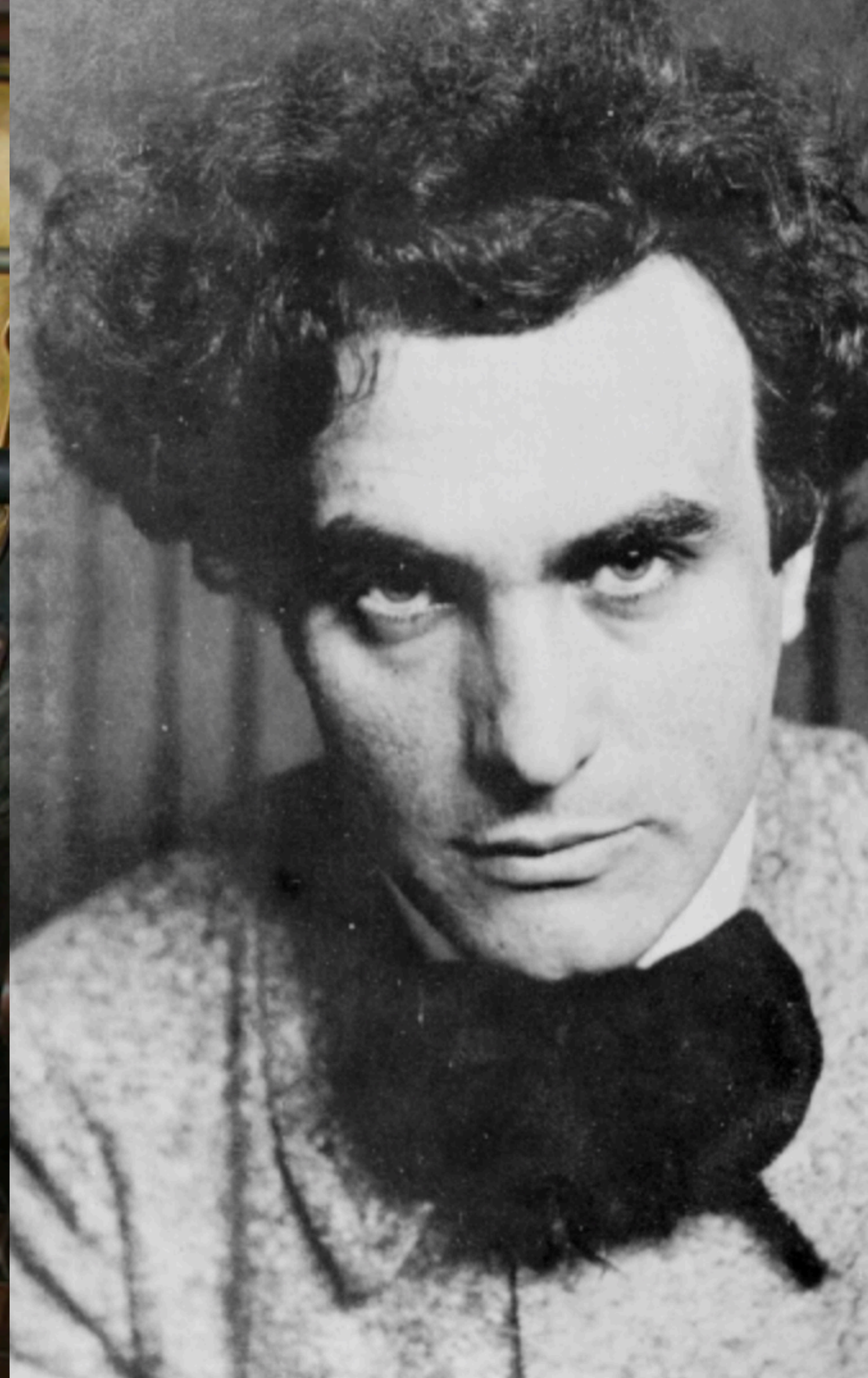


Study Past & Future of Hyperinstruments

Explore many related issues of music+tech++

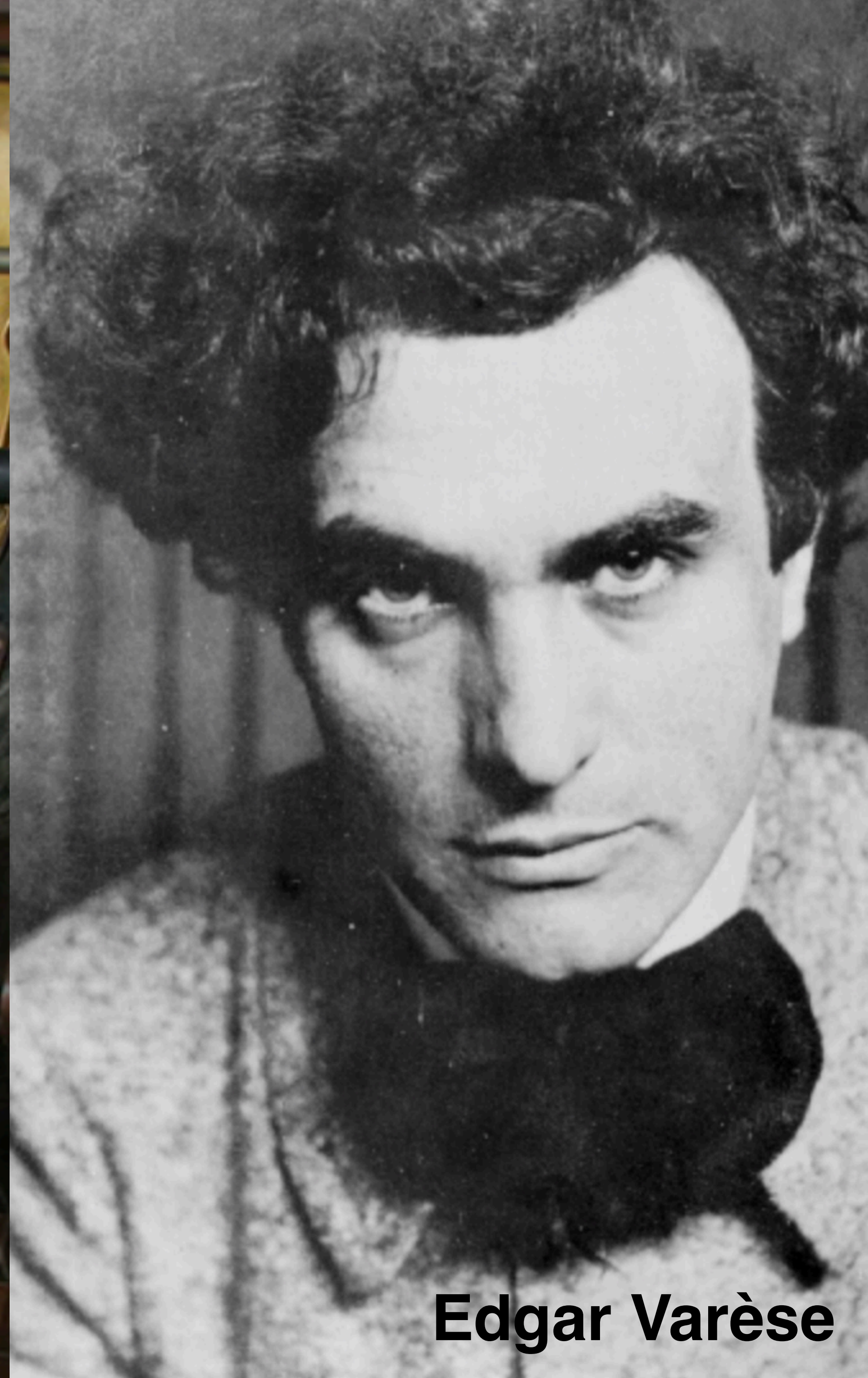
**Combine listening, analysis/discussion,
experimentation, performance, collaboration**

Brief History of Electronic Music

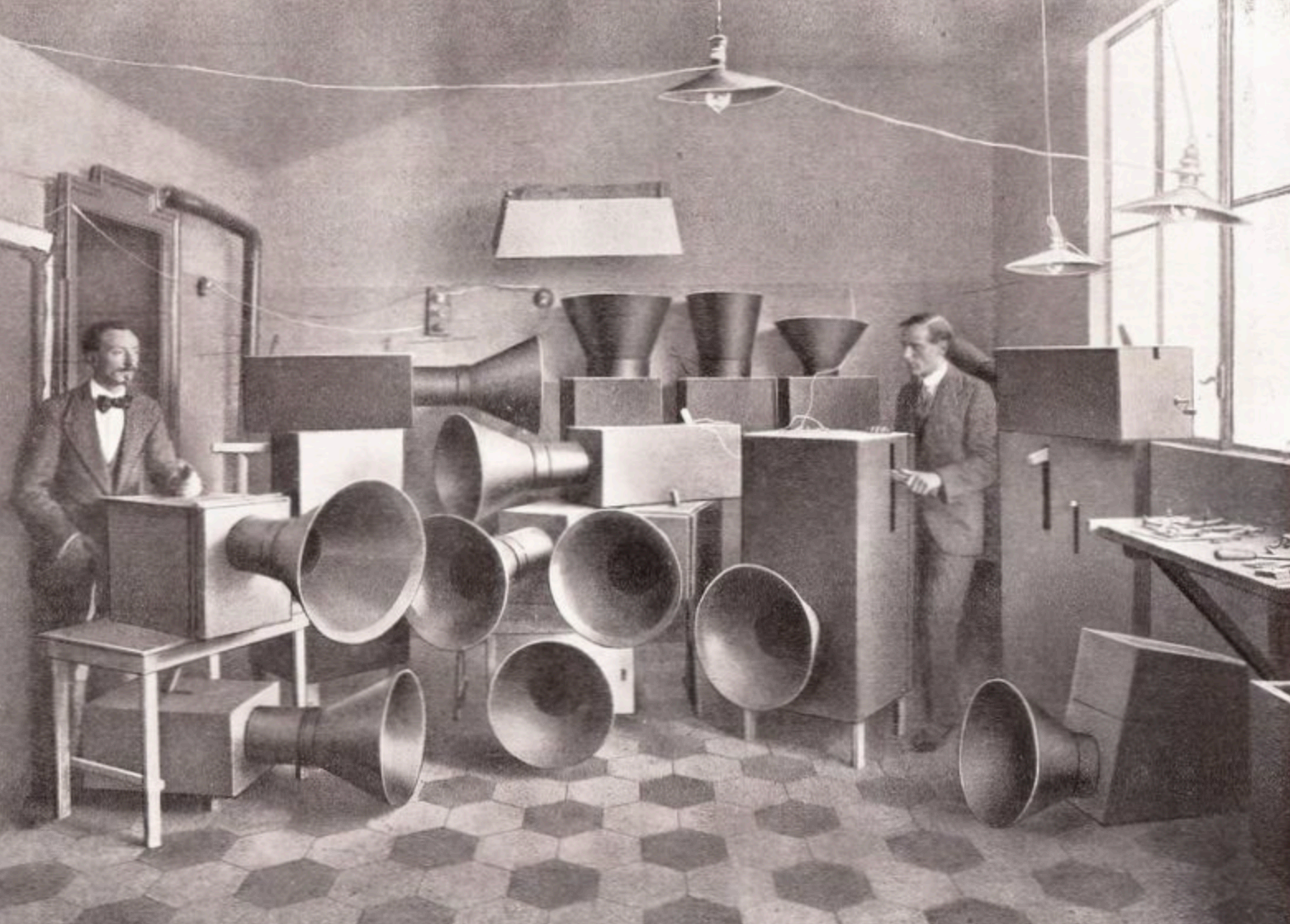




Player Piano

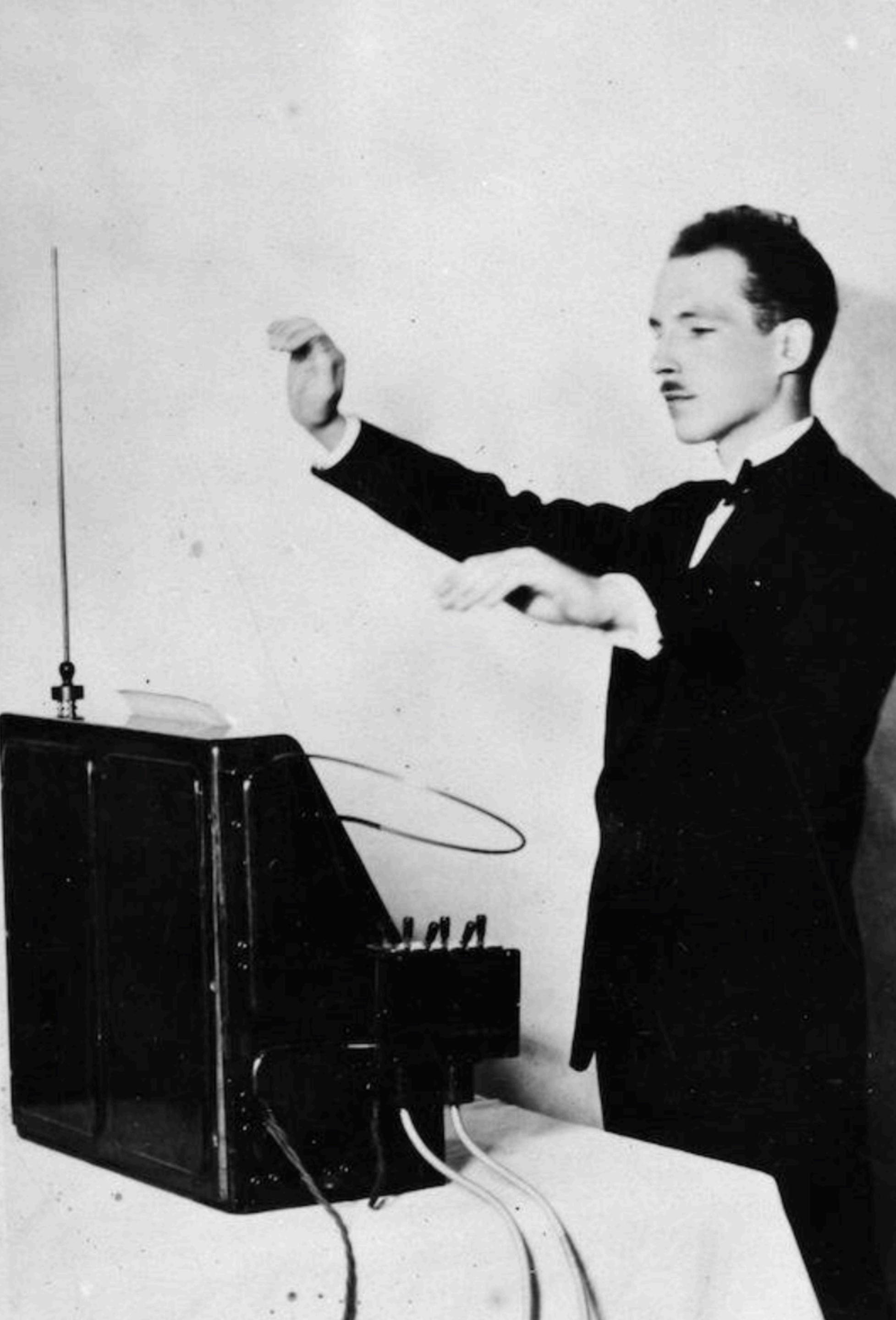


Edgar Varèse



**Luigi
Russolo**

*L'Arte
dei
Rumori*



**Lev
Theremin**

**Clara
Rockmore**



Karlheinz Stockhausen



The image displays a handwritten musical score for the piece "Kontakte" (1958-1960). The score is divided into two main horizontal sections. The upper section features a large graphic notation area with multiple staves. At the top of this section, there are two boxes labeled "XIII B" and "XIII C". Above the staves, there are handwritten numbers: 38,2°, 40,6°, 46,7°, 48,2°, 58,6°, and 62,8°. The graphic notation includes various symbols, arrows, and lines, with some text like "Schleifend." and "II-III". The lower section is a traditional musical score with multiple staves. It includes various musical notations such as notes, rests, and dynamic markings like "f", "p", "sf/f", and "pp". There are also some handwritten annotations like "Filstech auflegen" and "mit einer Hand". The score is written in black ink on a white background.

Kontakte (1958-1960)



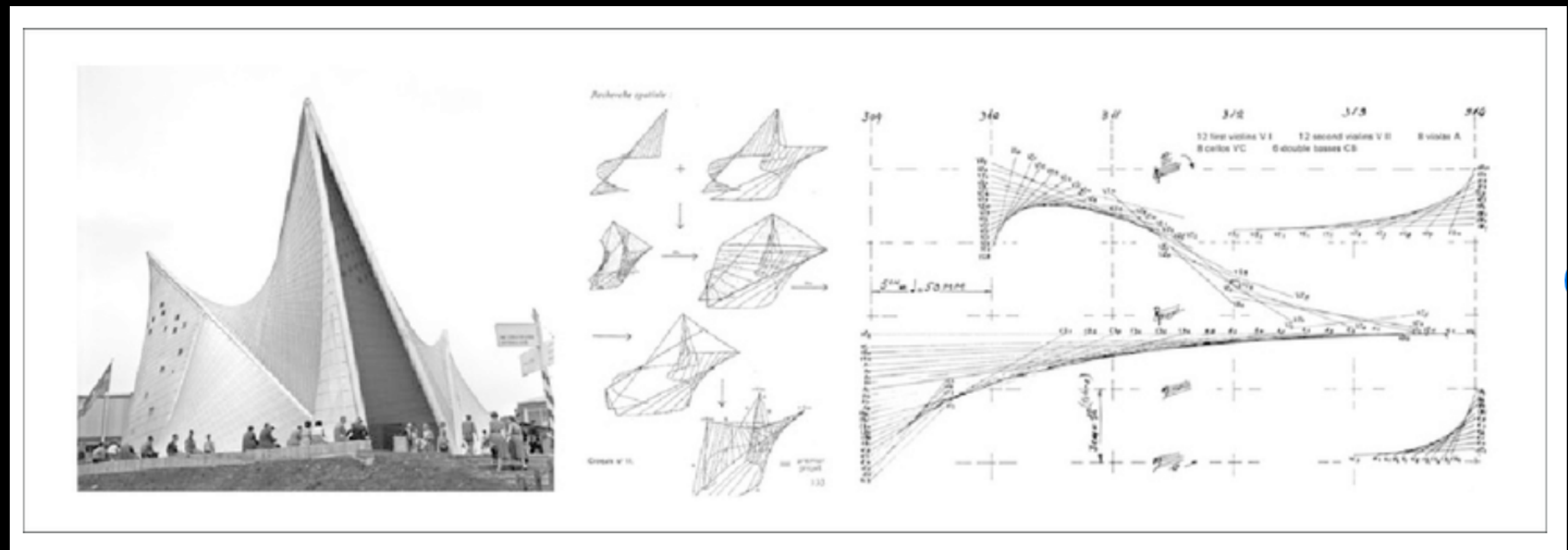
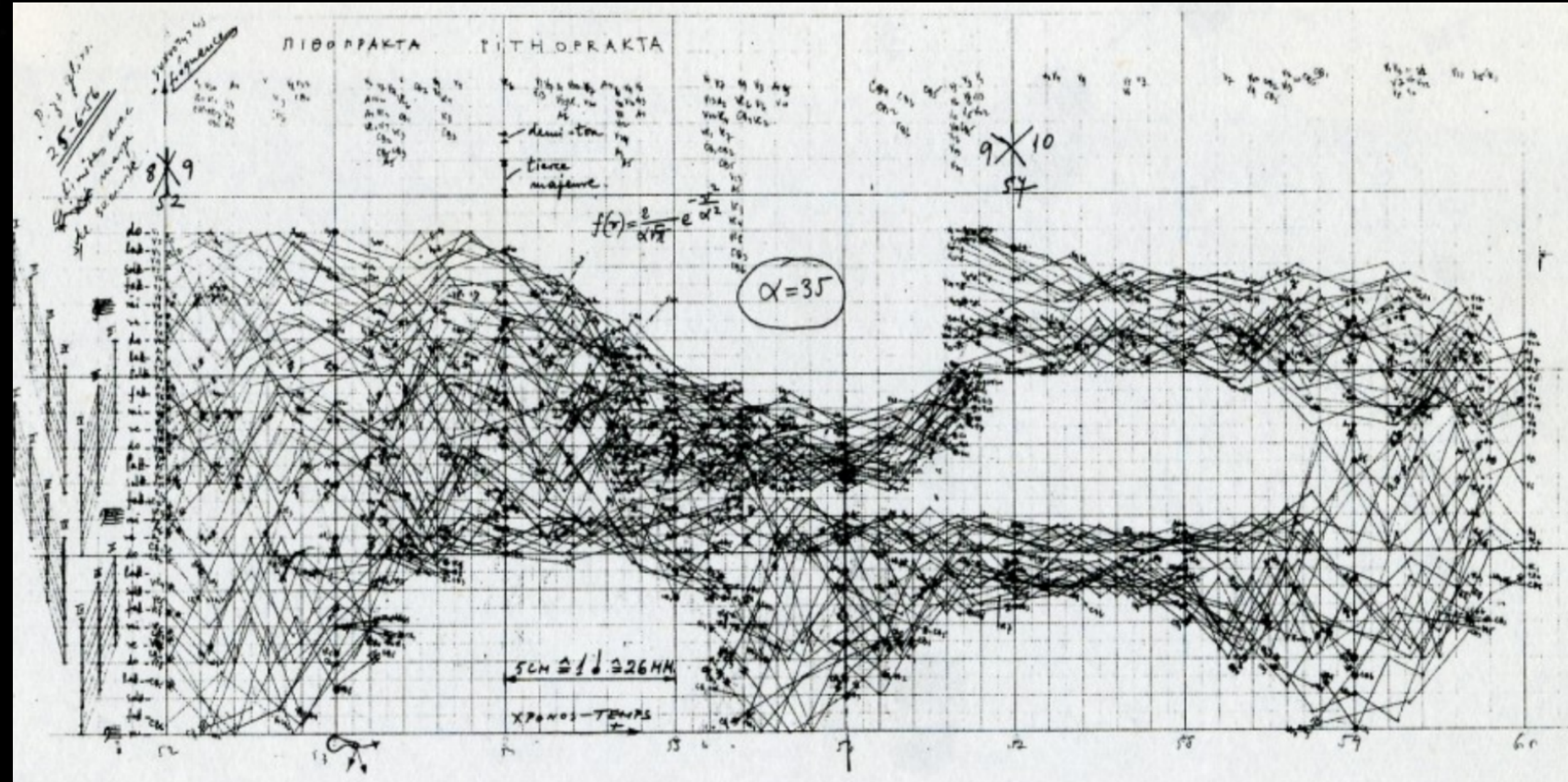
Daphne Oram

Iannis Xenakis





Iannis Xenakis





**Suzanne
Ciani**

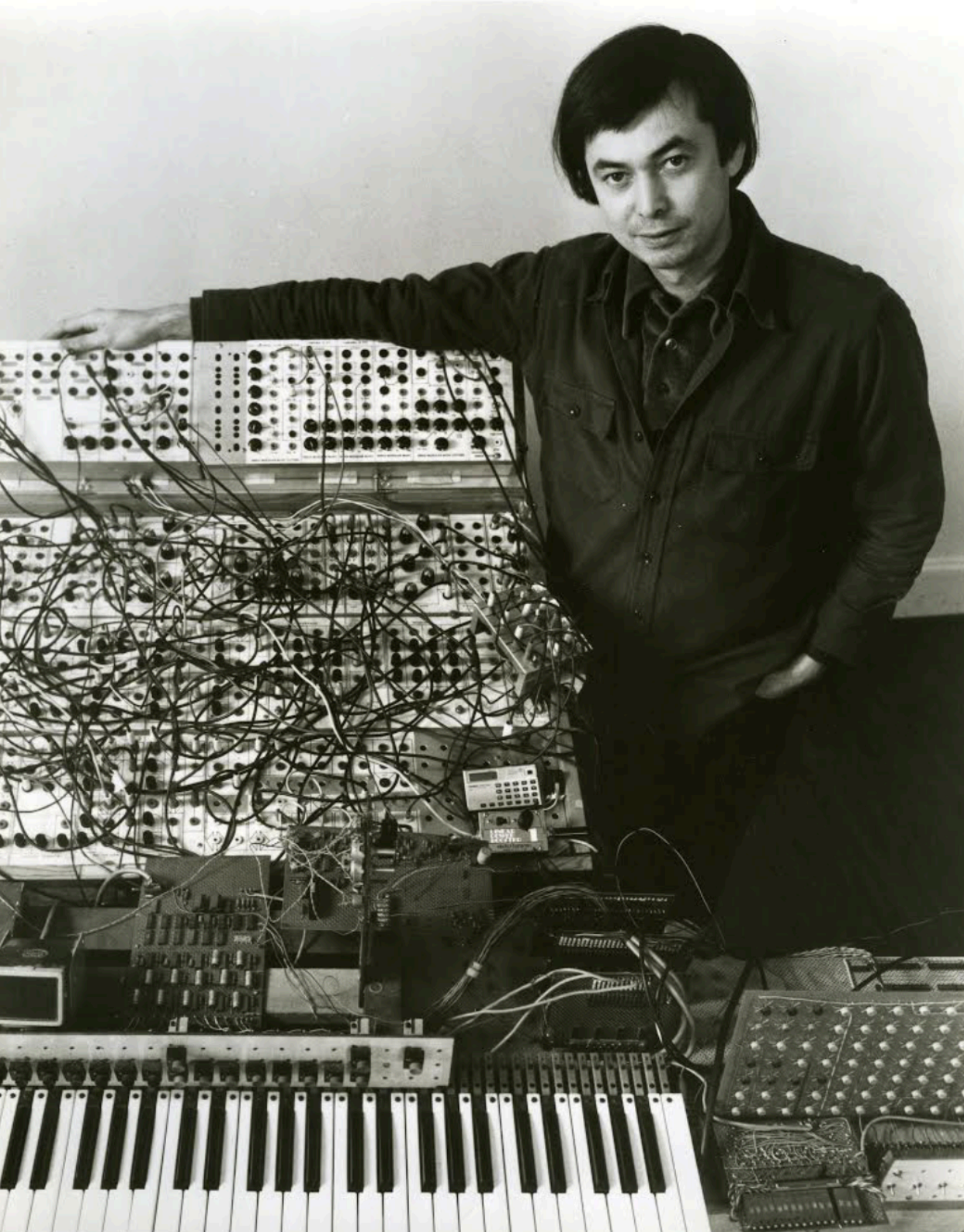
Buchla
Synthesizer



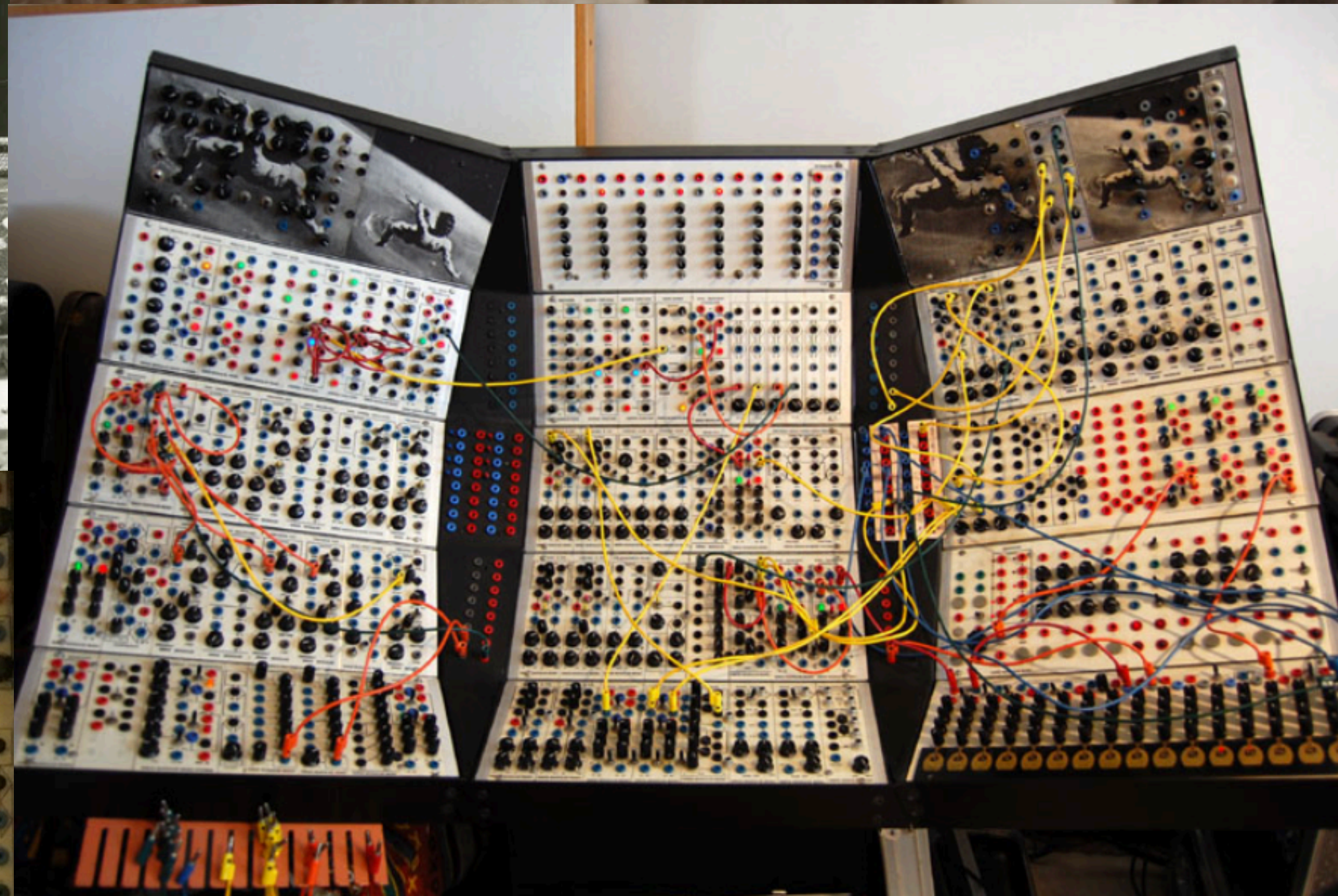
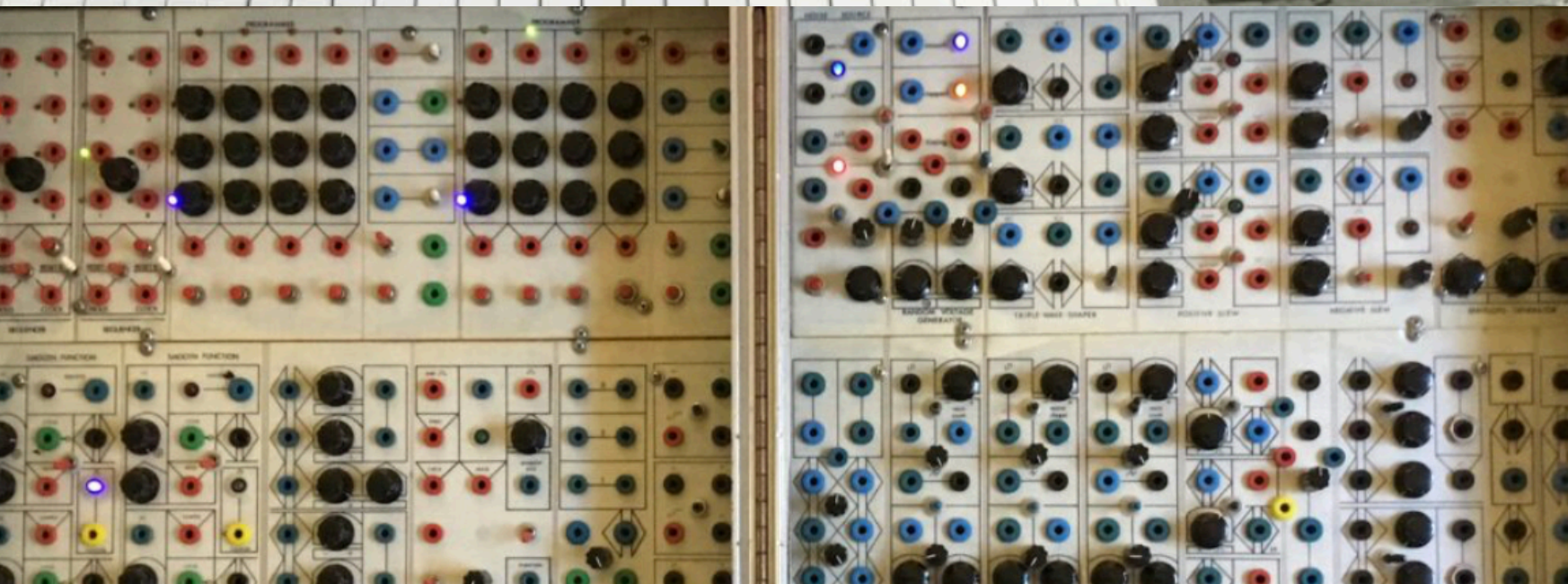
**Wendy
Carlos**

*Switched-on
Bach*

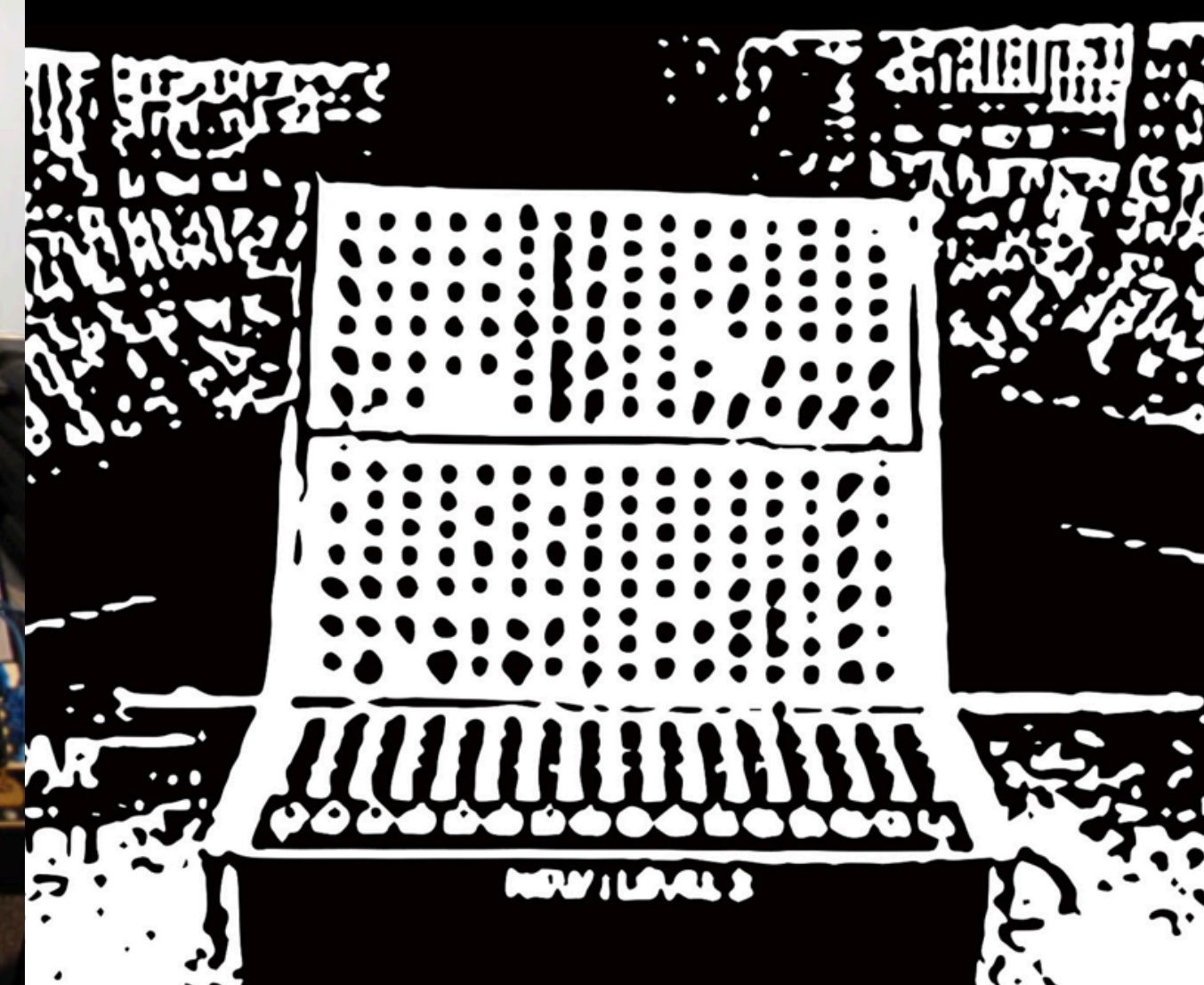
Moog
Synthesizer



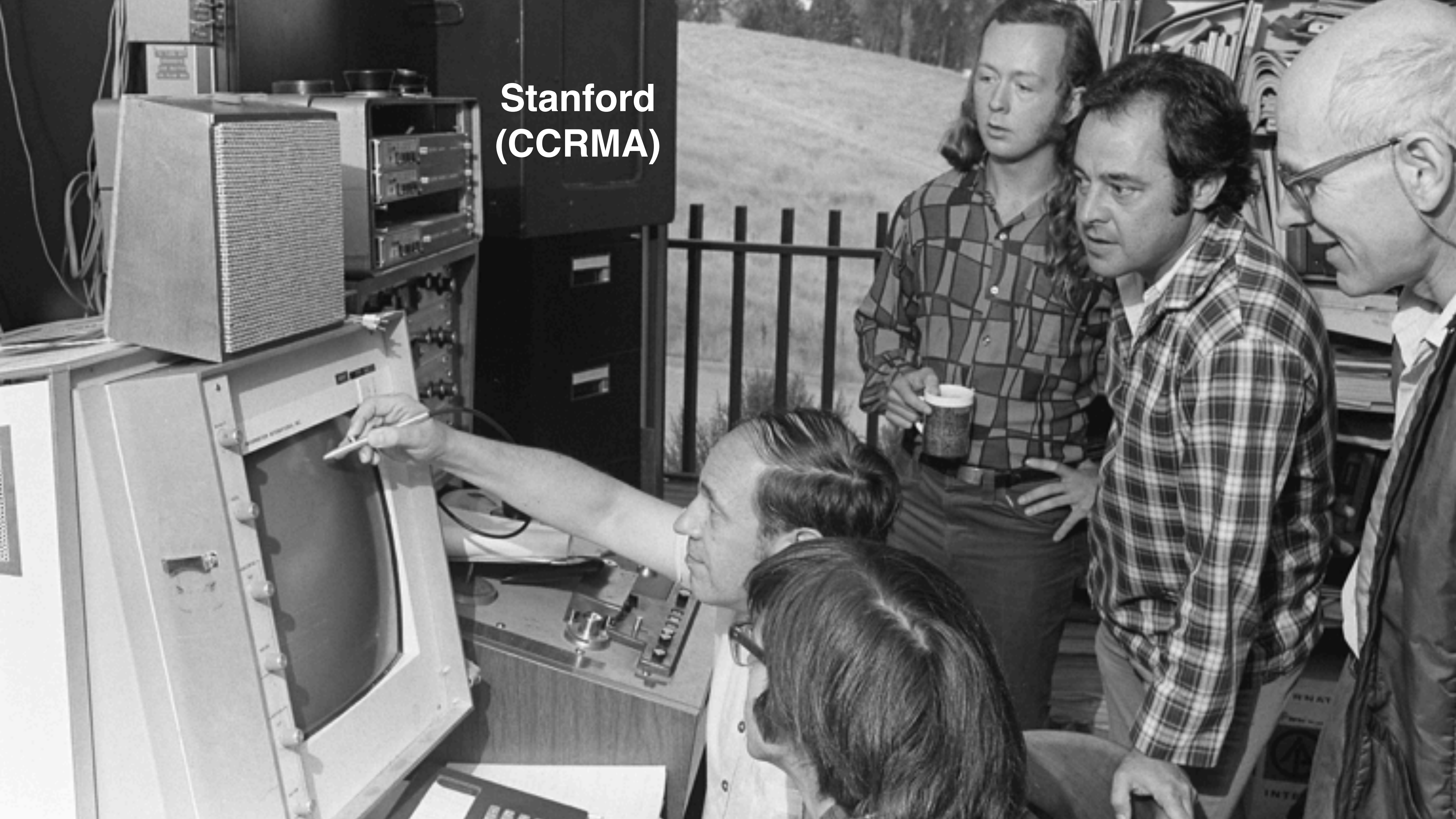
Serge and Ivan Tcherepnin



serge
MODULAR MUSIC SYSTEMS



**Stanford
(CCRMA)**



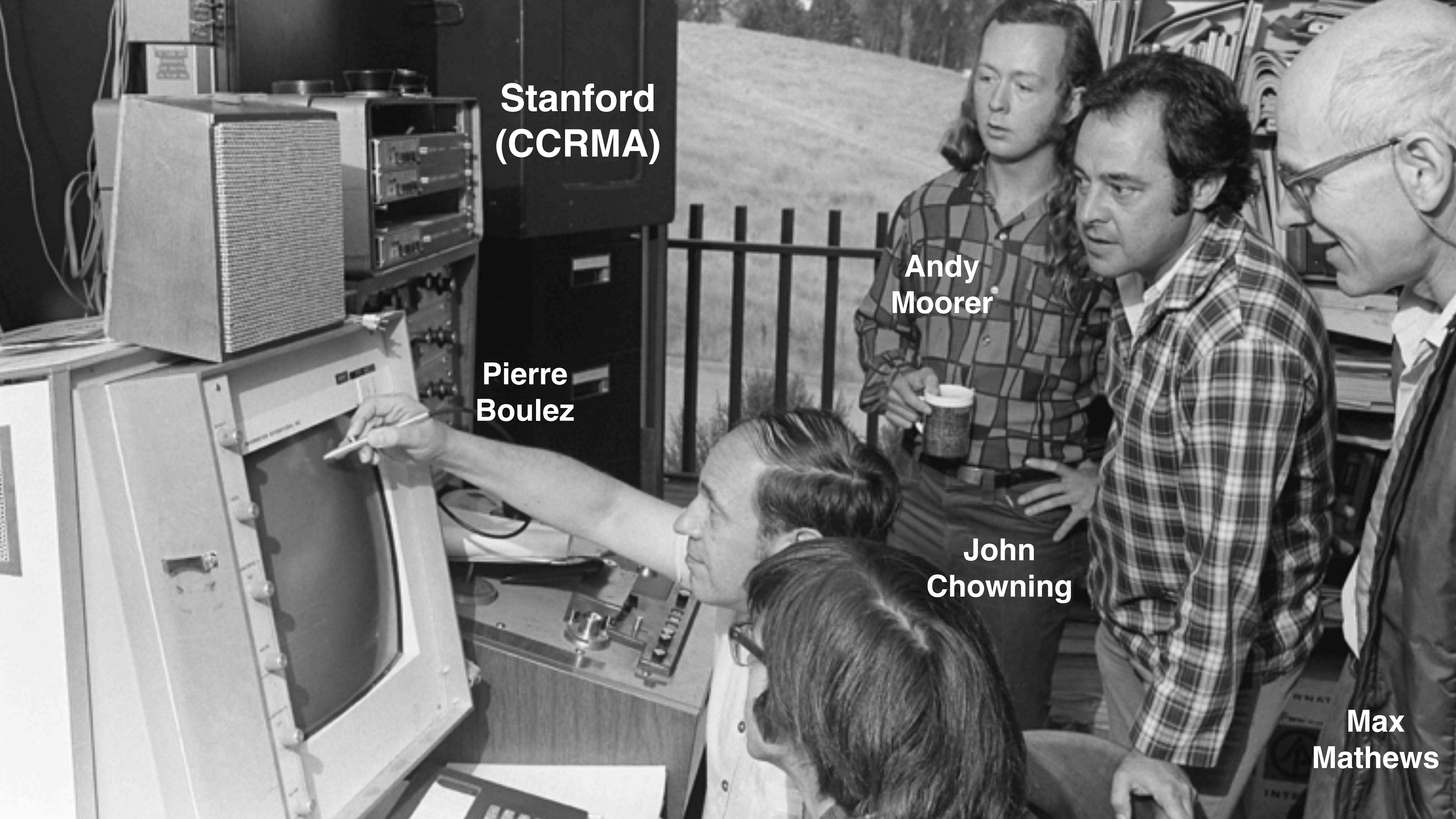
**Stanford
(CCRMA)**

**Pierre
Boulez**

**Andy
Moorer**

**John
Chowning**

**Max
Mathews**





**John
Chowning**

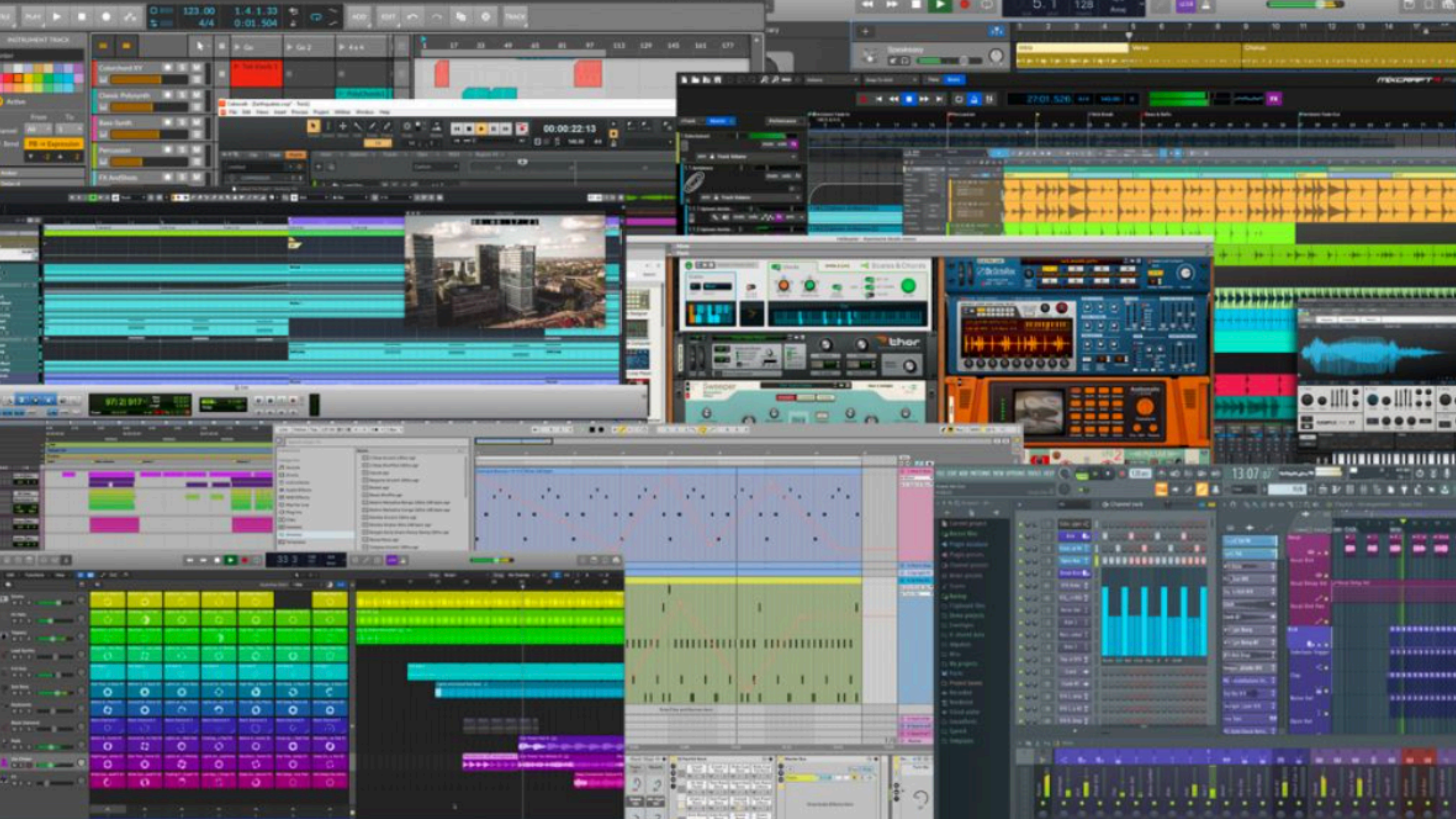
FM synthesis

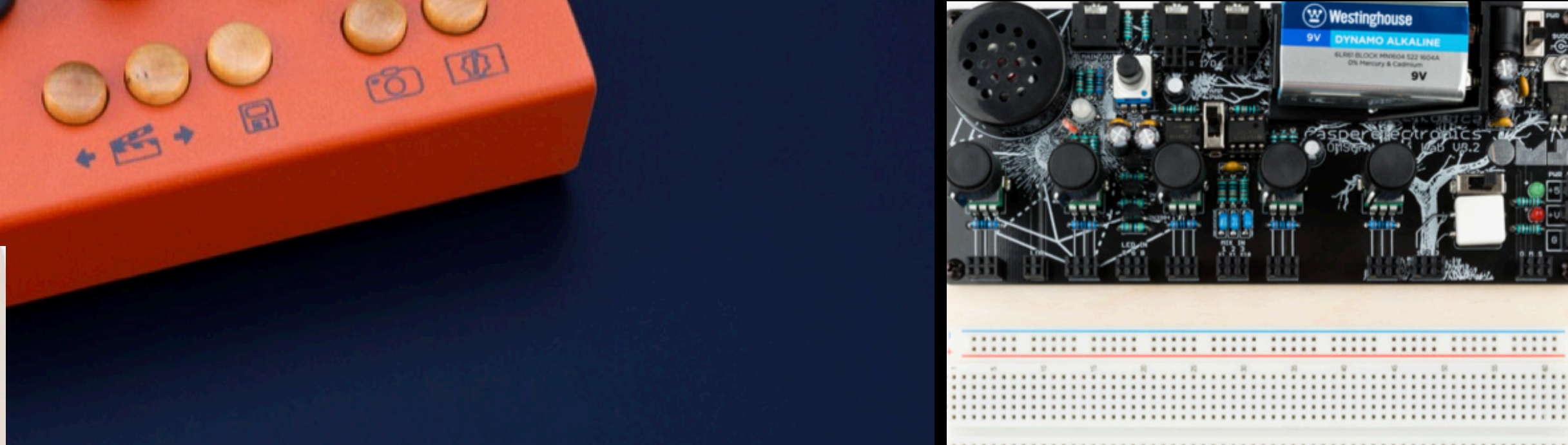
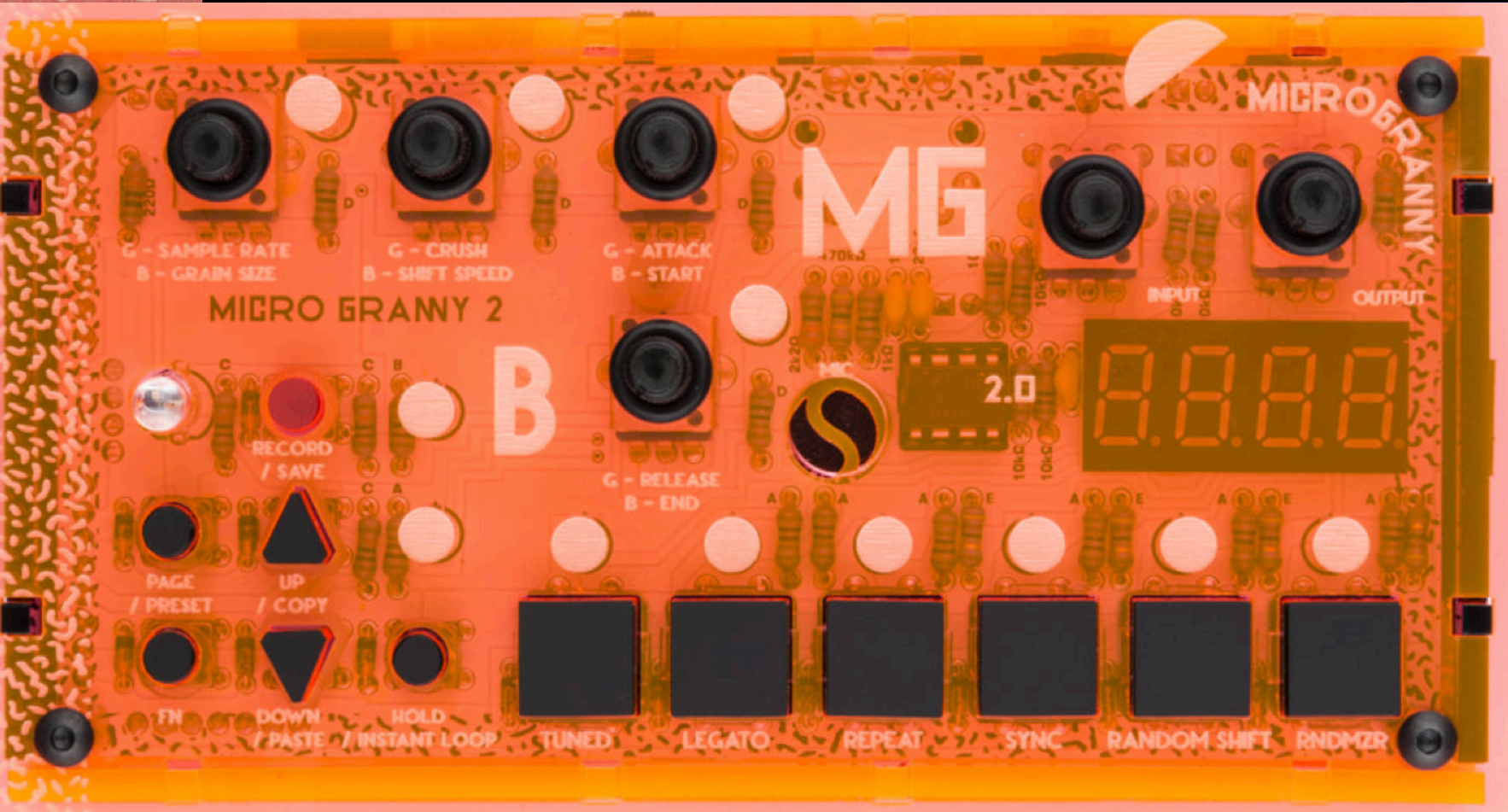
Yamaha DX-7

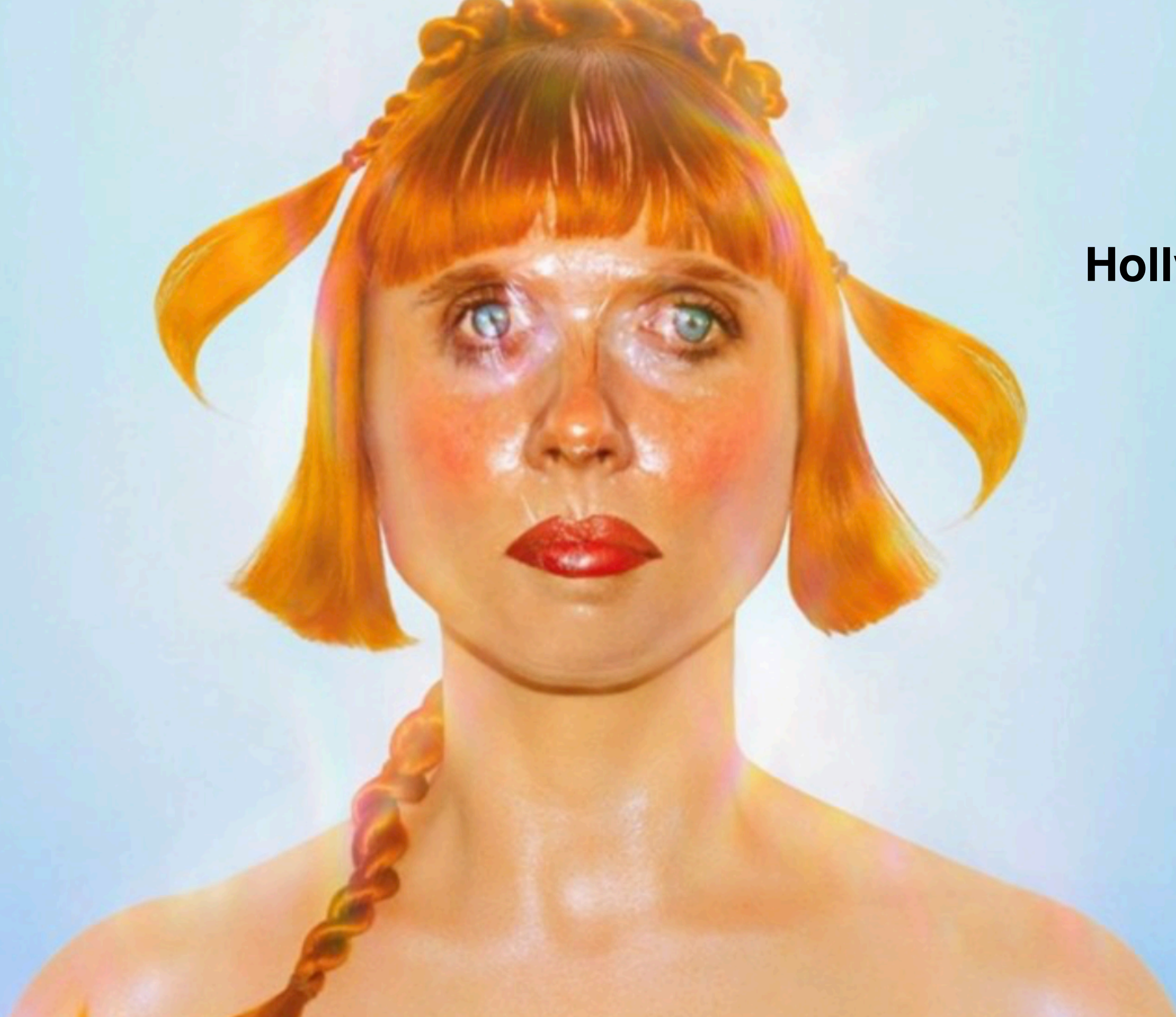
**George
Lewis**











**Holly Herndon
and
Holly+**

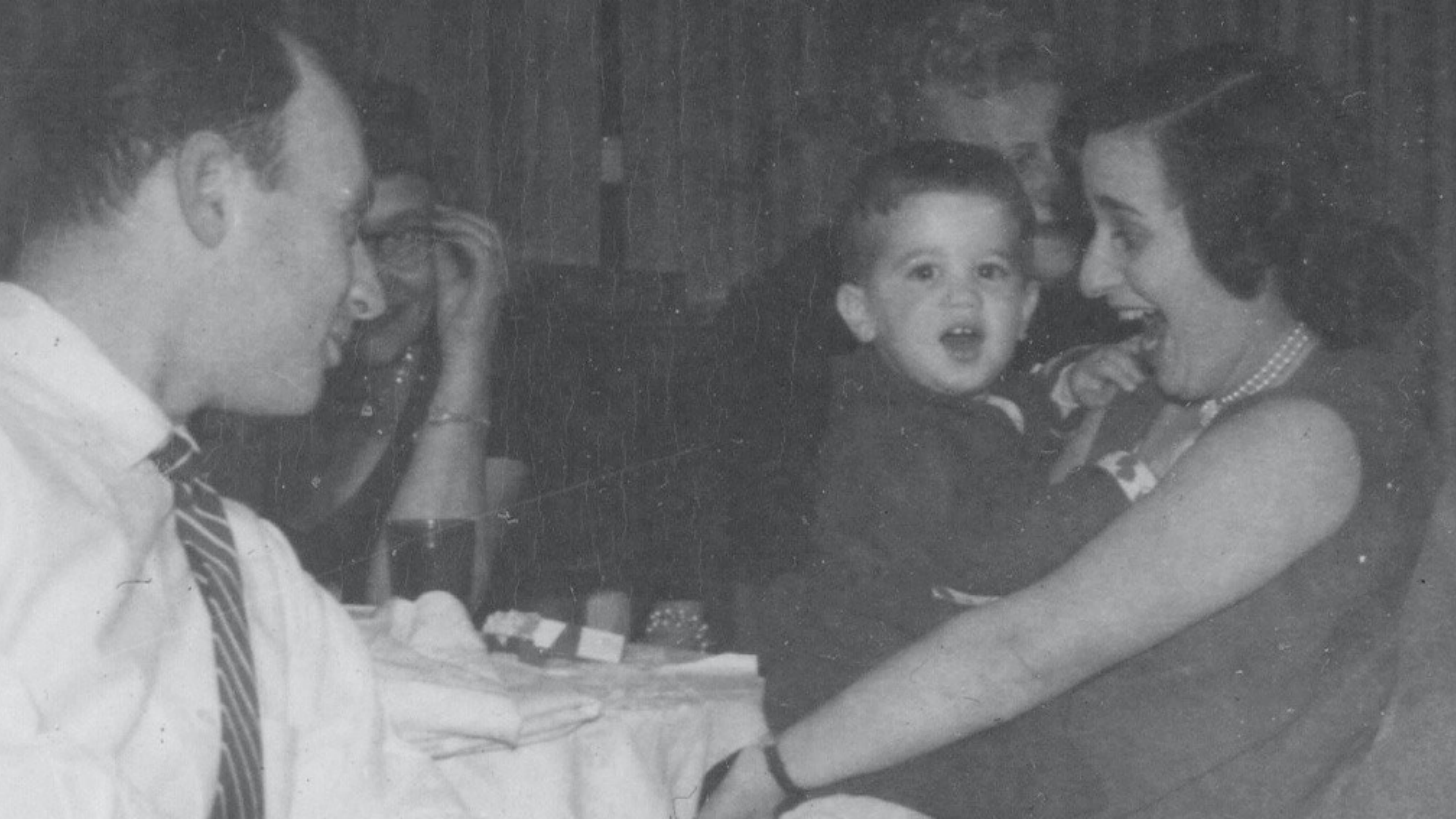


July 6 2021



**Listen To Your Body Choir by
team M.O.G.I.I.7.E.D. wins AI
Song Contest 2021**

My **Brief History**



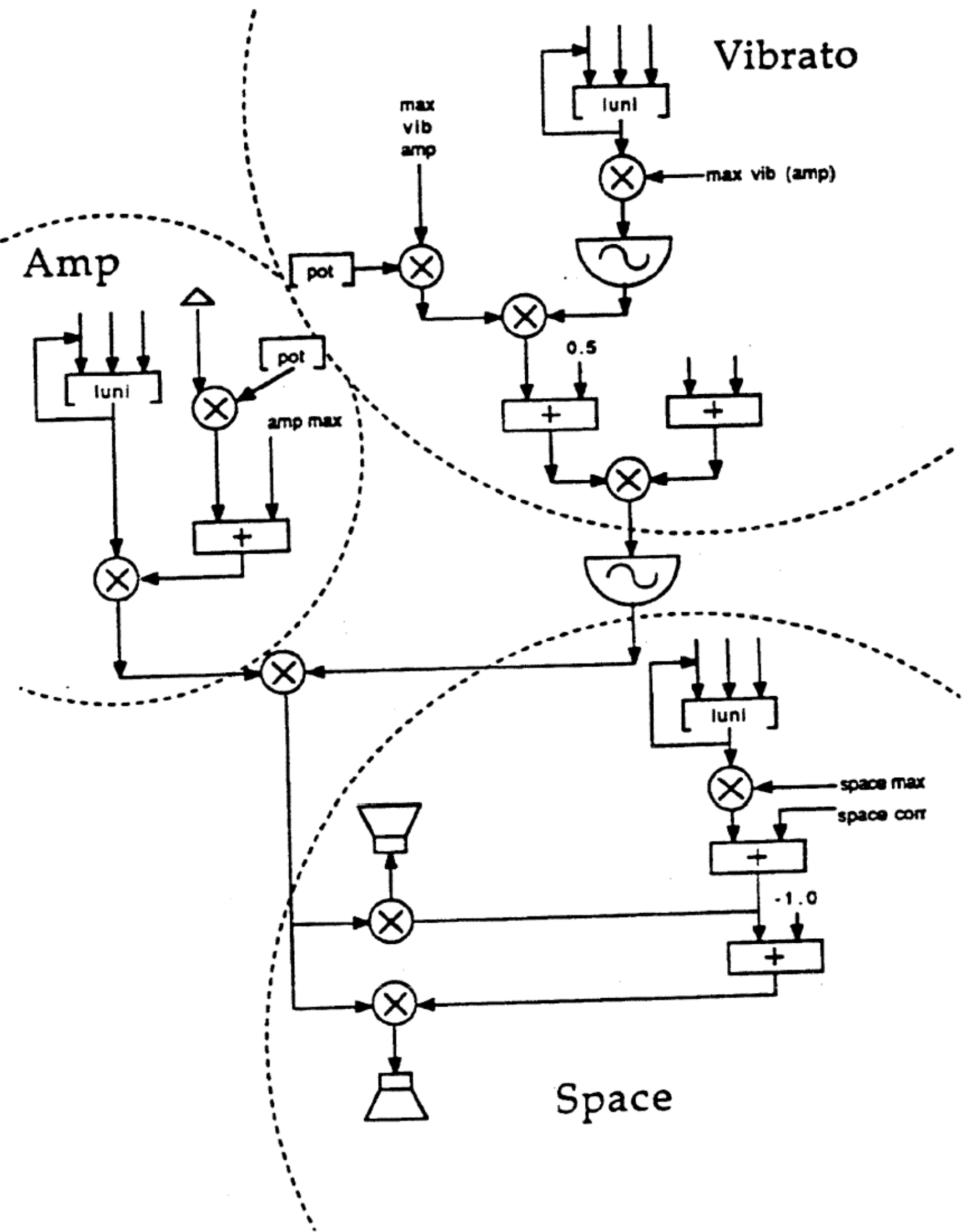






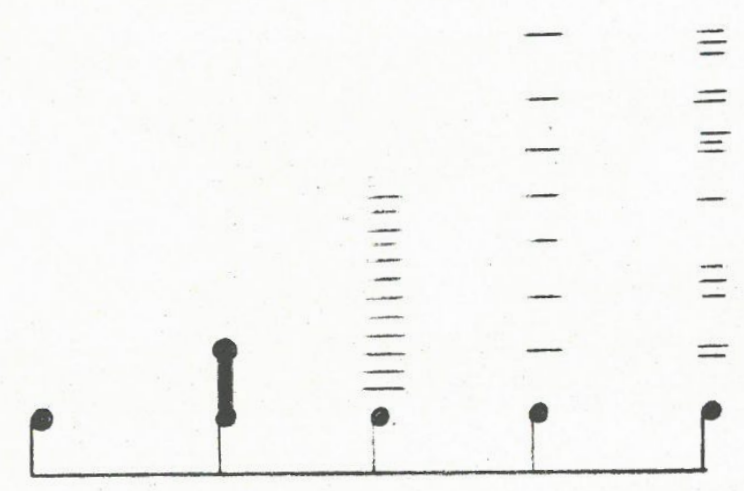




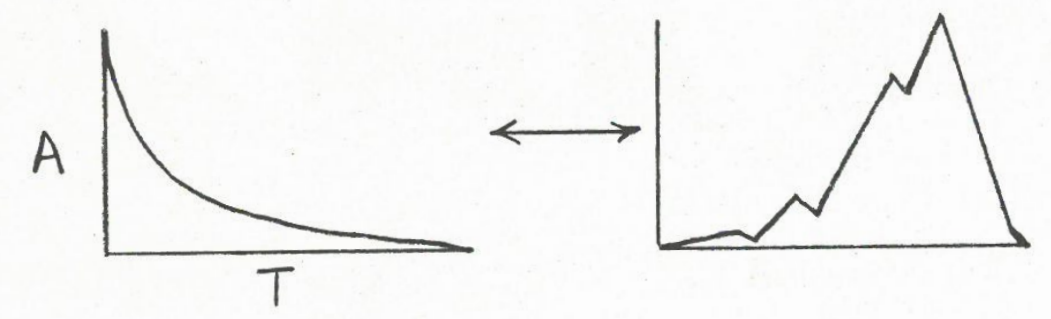


PARAMETERS

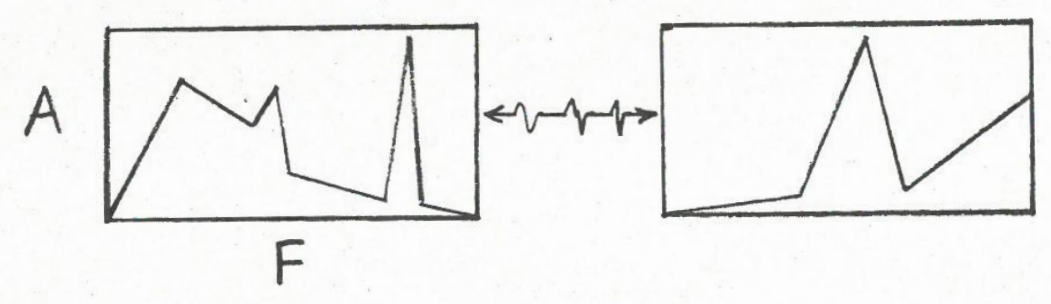
a) FREQUENCY CONTENT



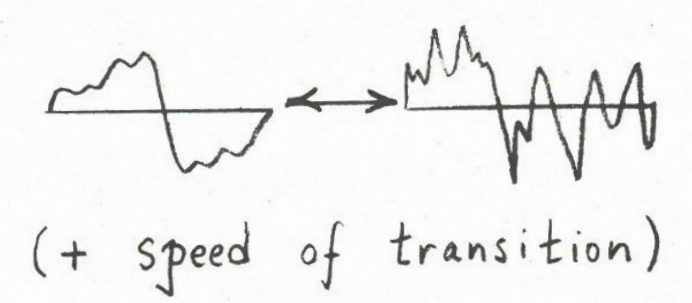
b) AMPLITUDE (envelope)



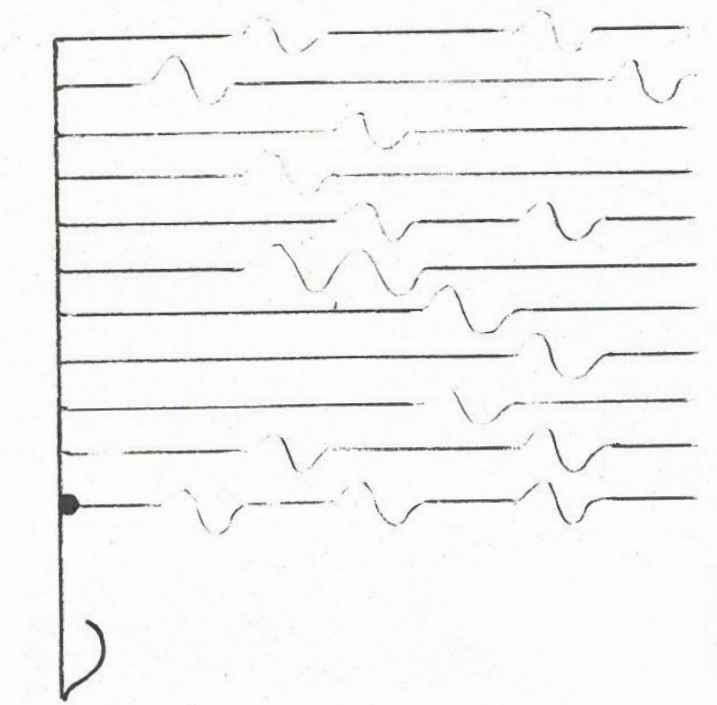
c) SPECTRAL ENVELOPE



d) WAVEFORM

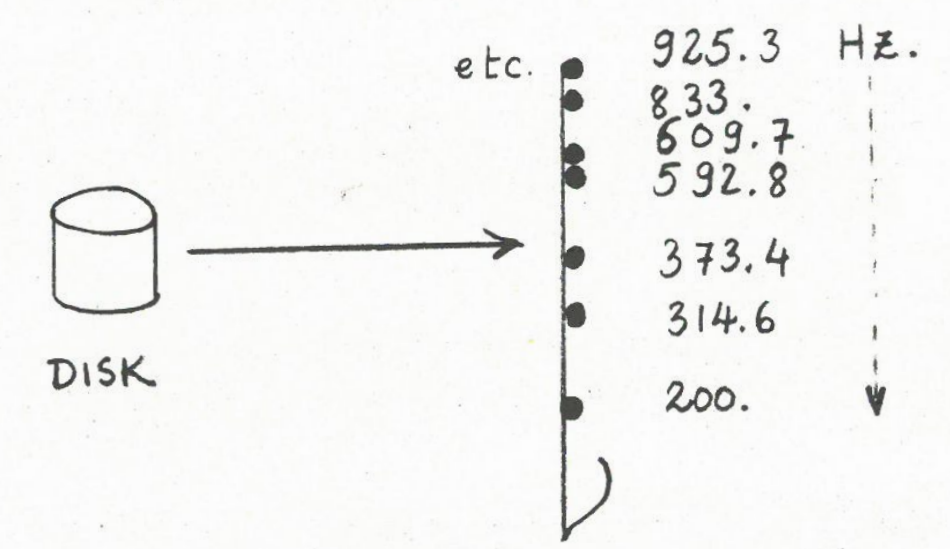


e) PHASE = \emptyset

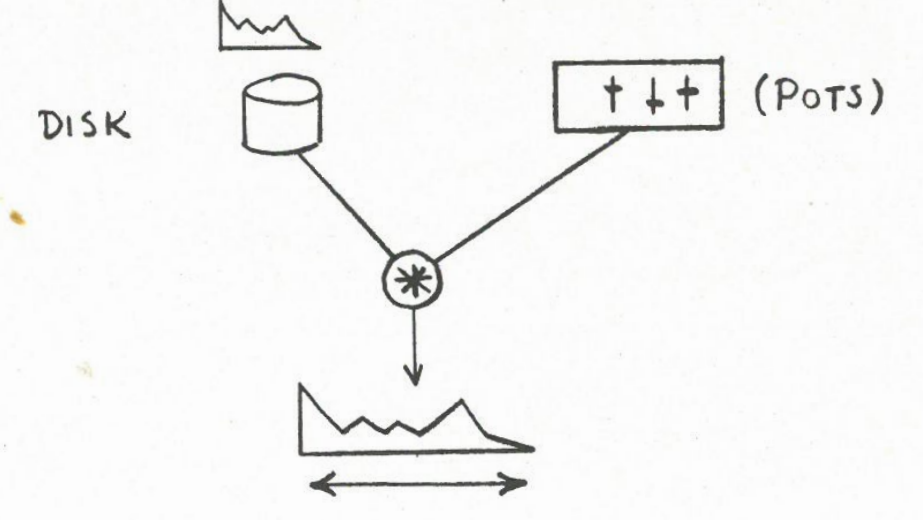


MODES

1) PRE-STORED



2) "SCALED"/MODIFIED



3) REAL-TIME

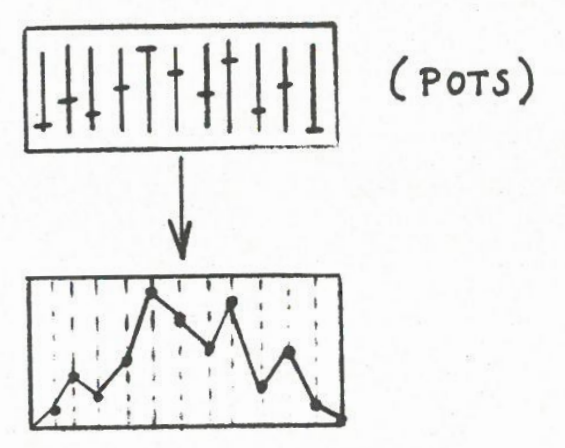


FIGURE 2

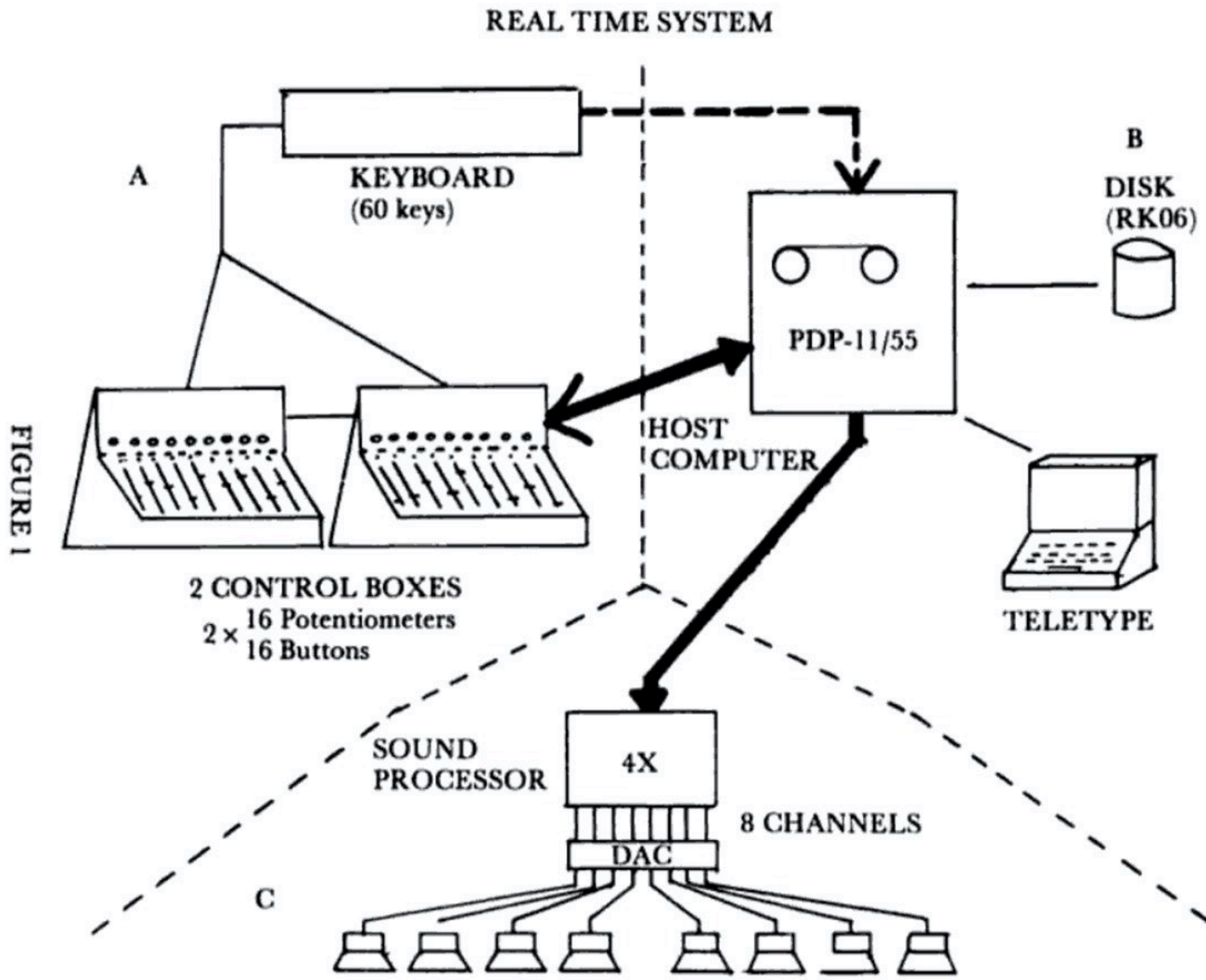
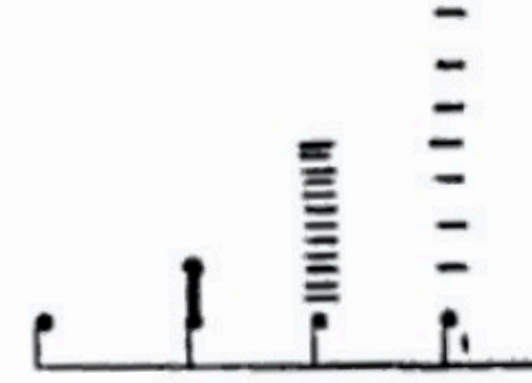


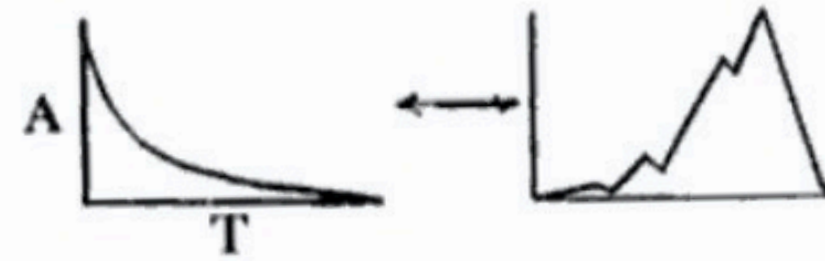
FIGURE 1

PARAMETERS

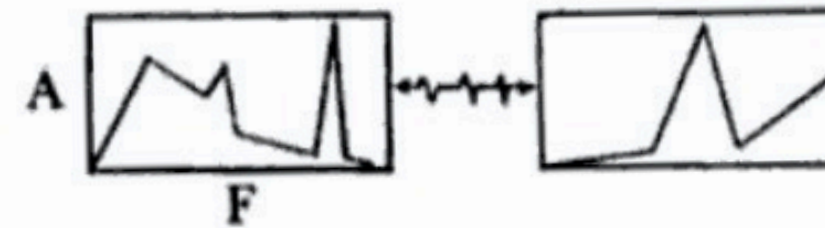
a FREQUENCY CONTENT



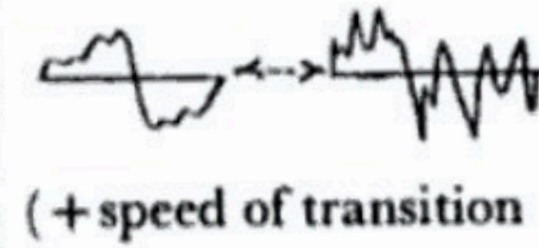
b AMPLITUDE (envelope)



c SPECTRAL ENVELOPE



d WAVEFORM



e PHASE = ϕ

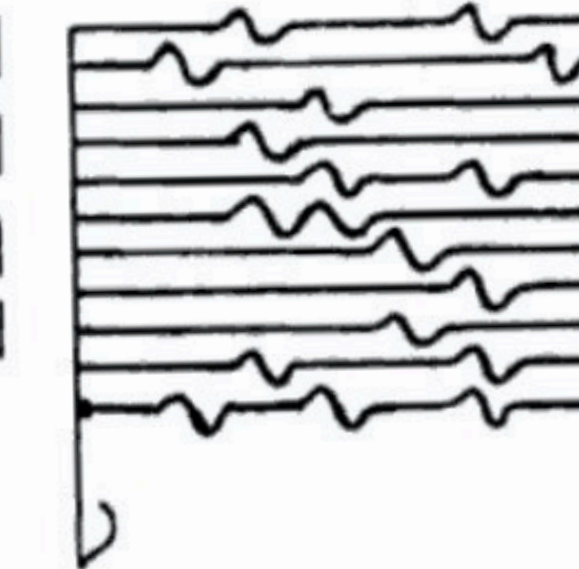
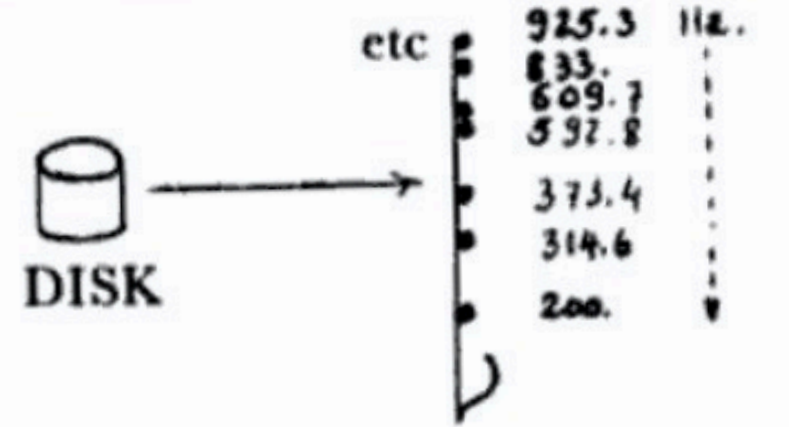


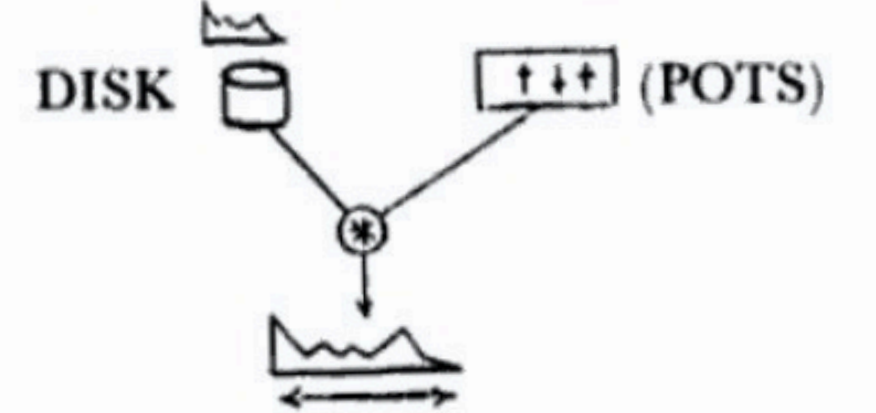
FIGURE 2

MODES

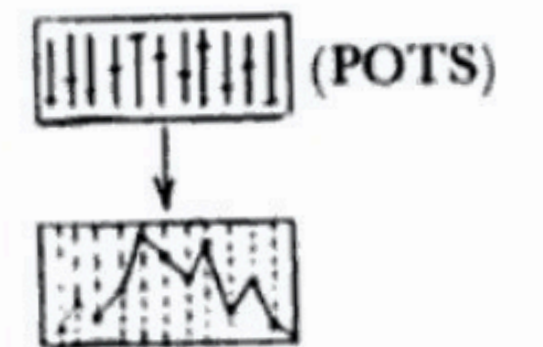
1 PRE-STORED



2 "SCALED"/MODIFIED



3 REAL TIME



FUSIONE FUGACE

Venice Biennale
(1982)



VALIS

(1987)







721

accelerando (change wood accents) — very fast "fuzzy twister" — gibberish

ALL LIGHTS CUT — Total Blackout on stage!

STOP VERY ABRUPTLY

Fat
 ... (how many)...
 ... (combien)...

Perc.
mp → *mf* → *pp* → *ff* L.V.

Pno.
mf → *pp* → *ff* L.V.
glissando
ped. → *ped.*
 (leave open; let sound die naturally)
 2 (repeat faster and faster)

4x
 (more and more)

Nar.
 (how many) (along w. complexity include many ways of saying phrase!!)
 HOW MANY HOW MANY HOW MANY
 shout, inevitable whisper

OTW
 whole kbd. pulsating with clusters

Prd.
 fill in (at least) before cluster little by little

Stage Flooded with Bright Light — MENTAL HOSPITAL

LONELINESS TRANSITION

During this transitional music, Fat's gestures and expressions

Fat
 (standing in center stage wearing white shirt-jacket)

Perc.
pp

Pno.
pp

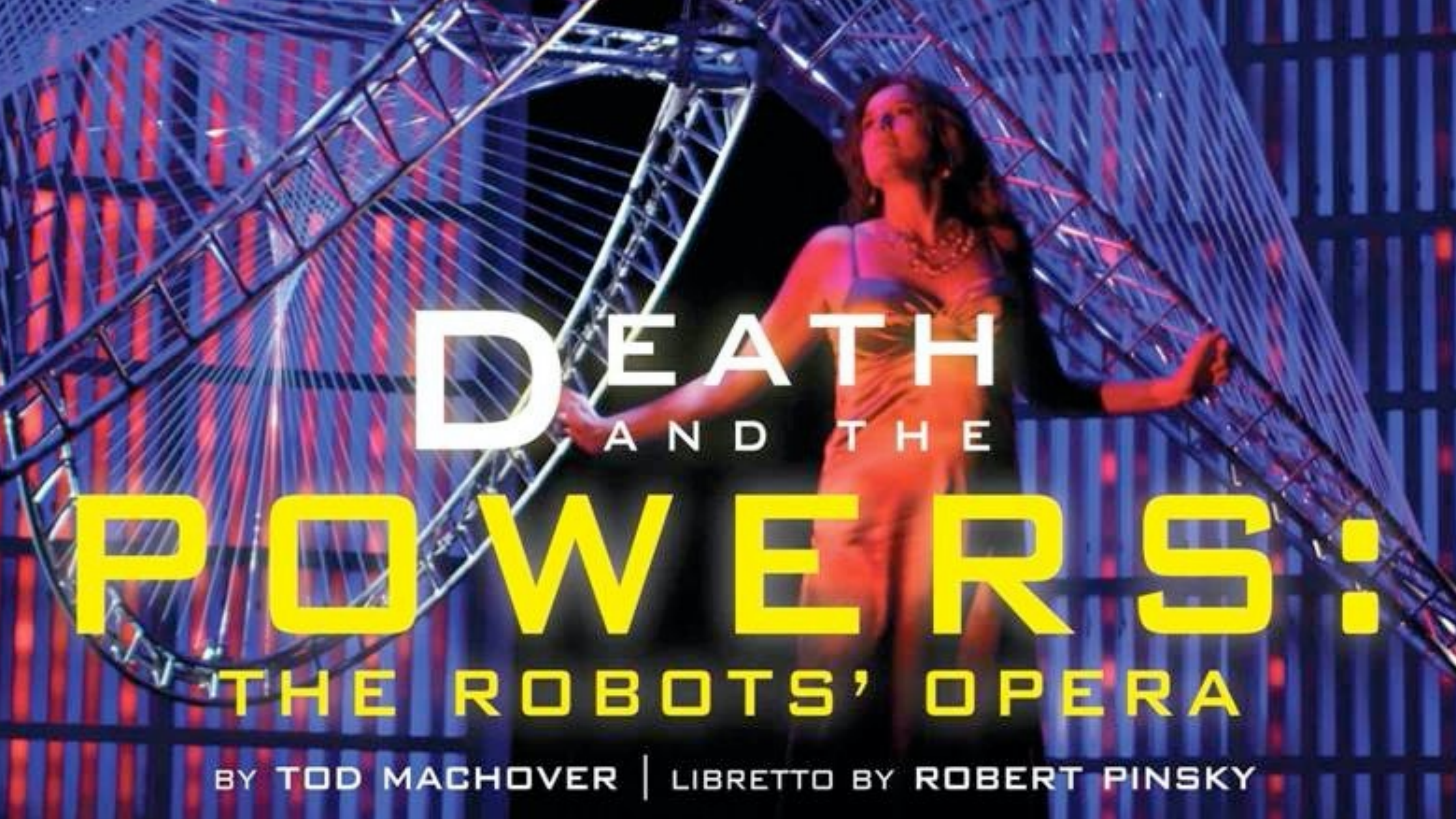
Tape
 Very slow, rhythmically free

The score to Veb's is dedicated to my father, with love and gratitude, for his 60th birthday.

Hyperinstruments







DEATH
AND THE

POWERS:

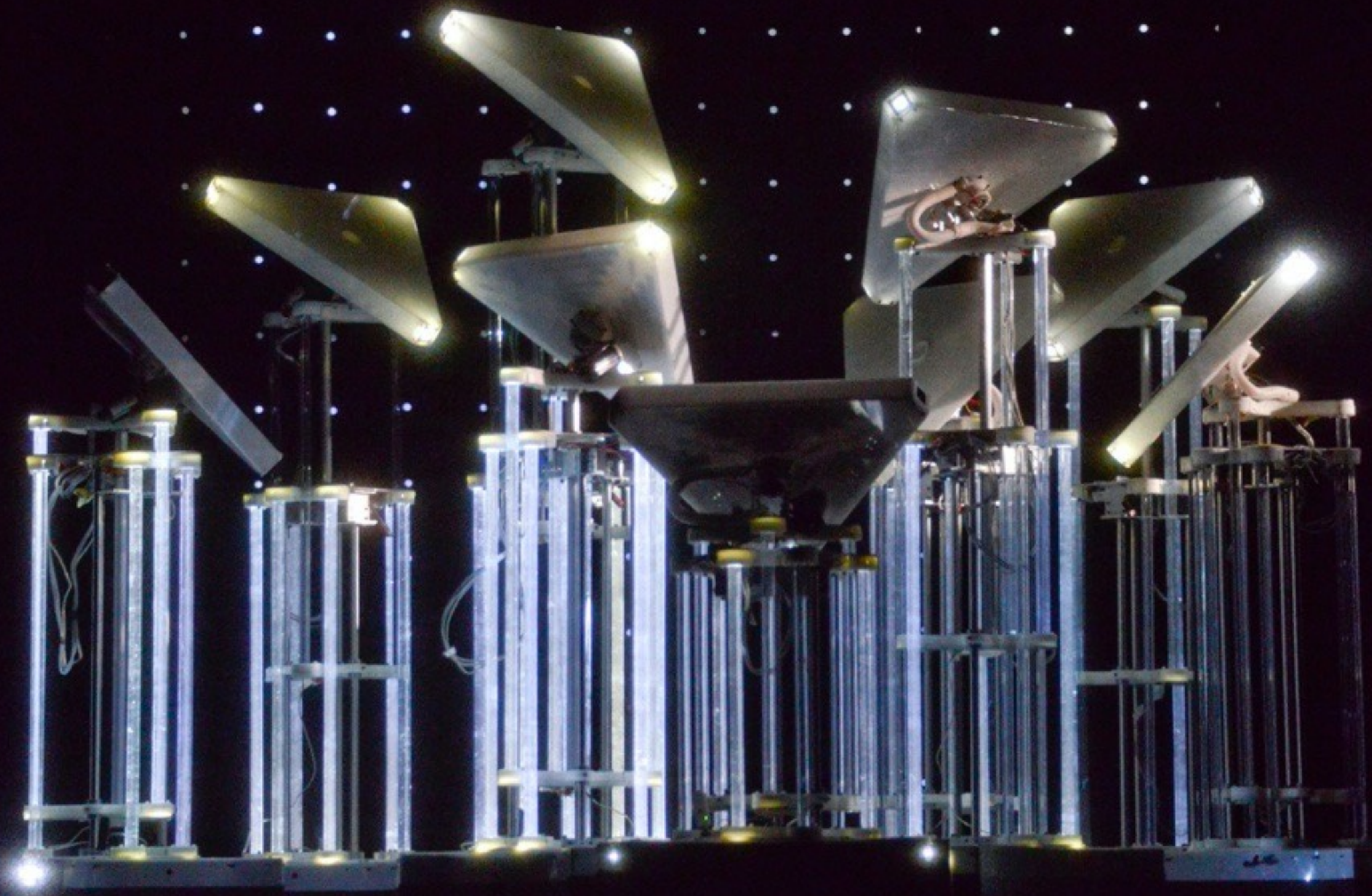
THE ROBOTS' OPERA

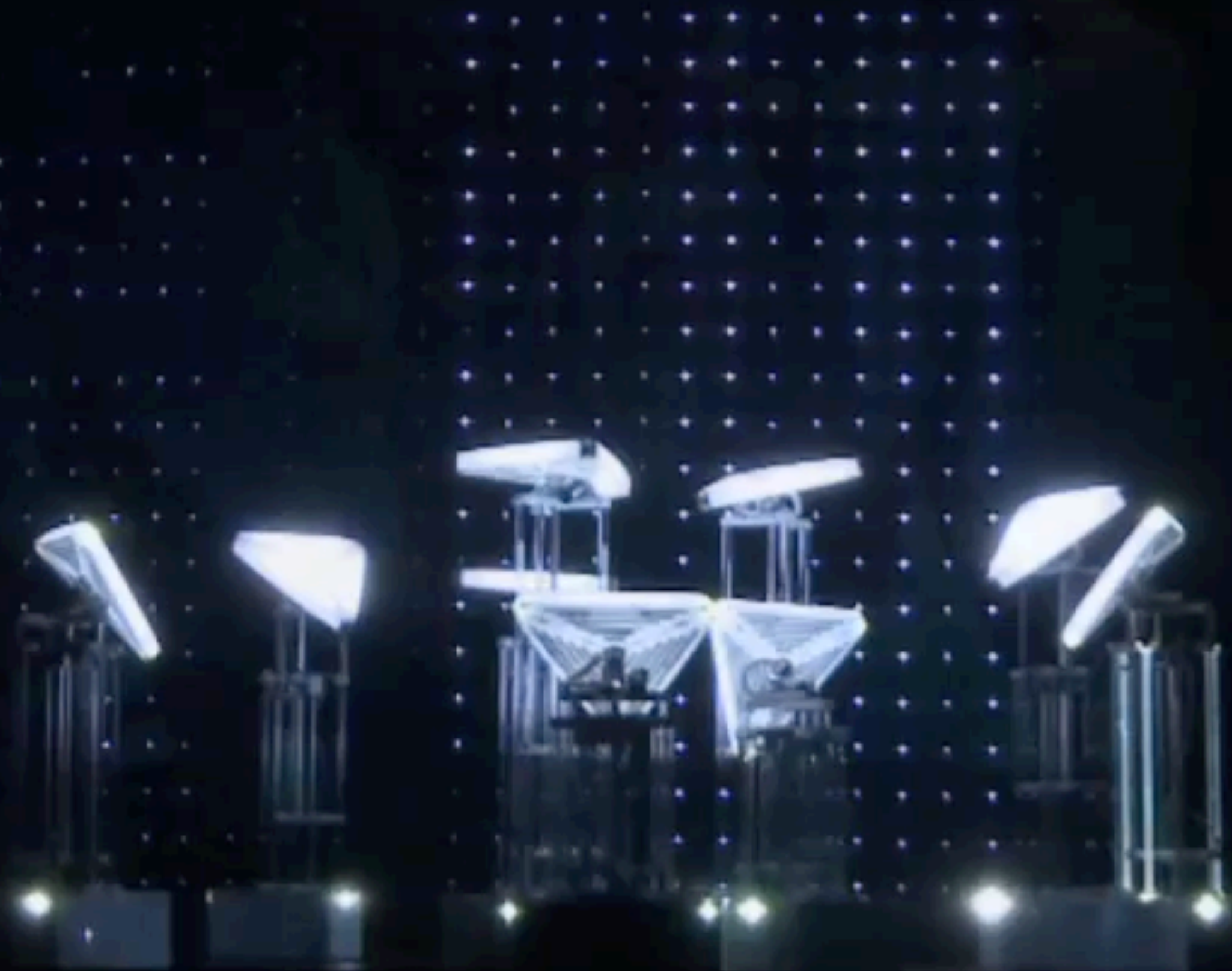
BY TOD MACHOVER | LIBRETTO BY ROBERT PINSKY

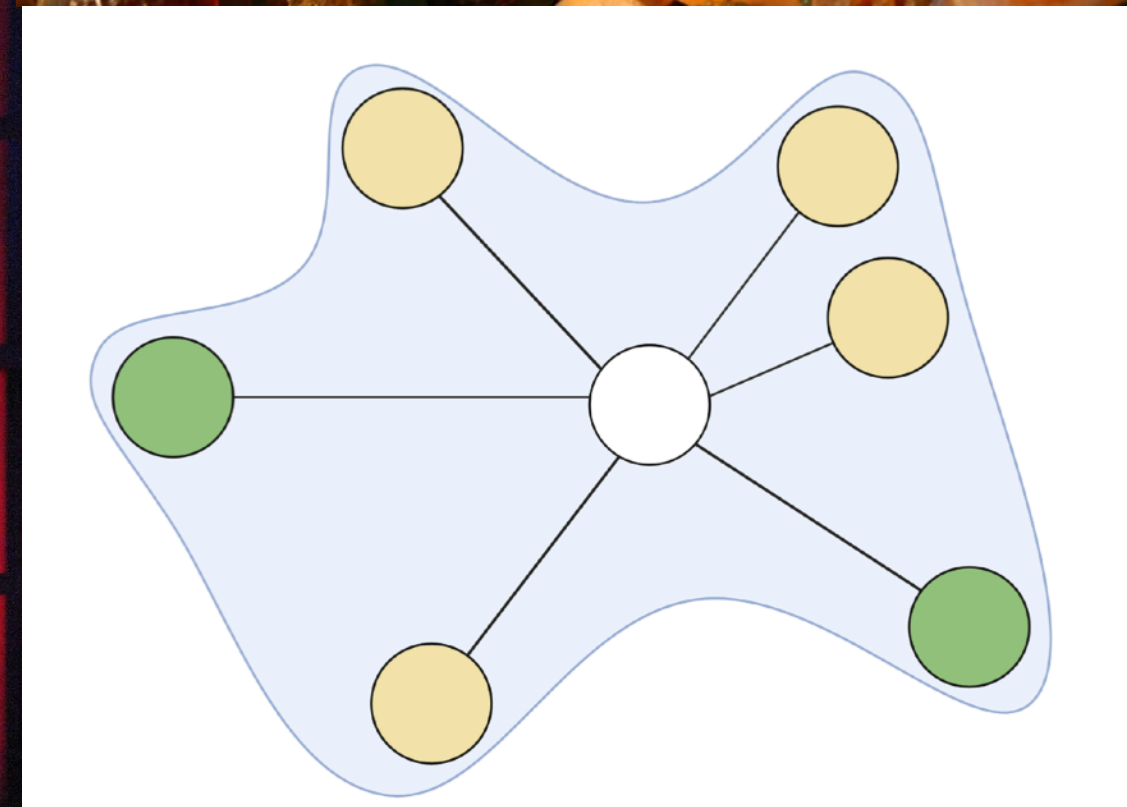












What's Next?

What's Next?

More beautiful

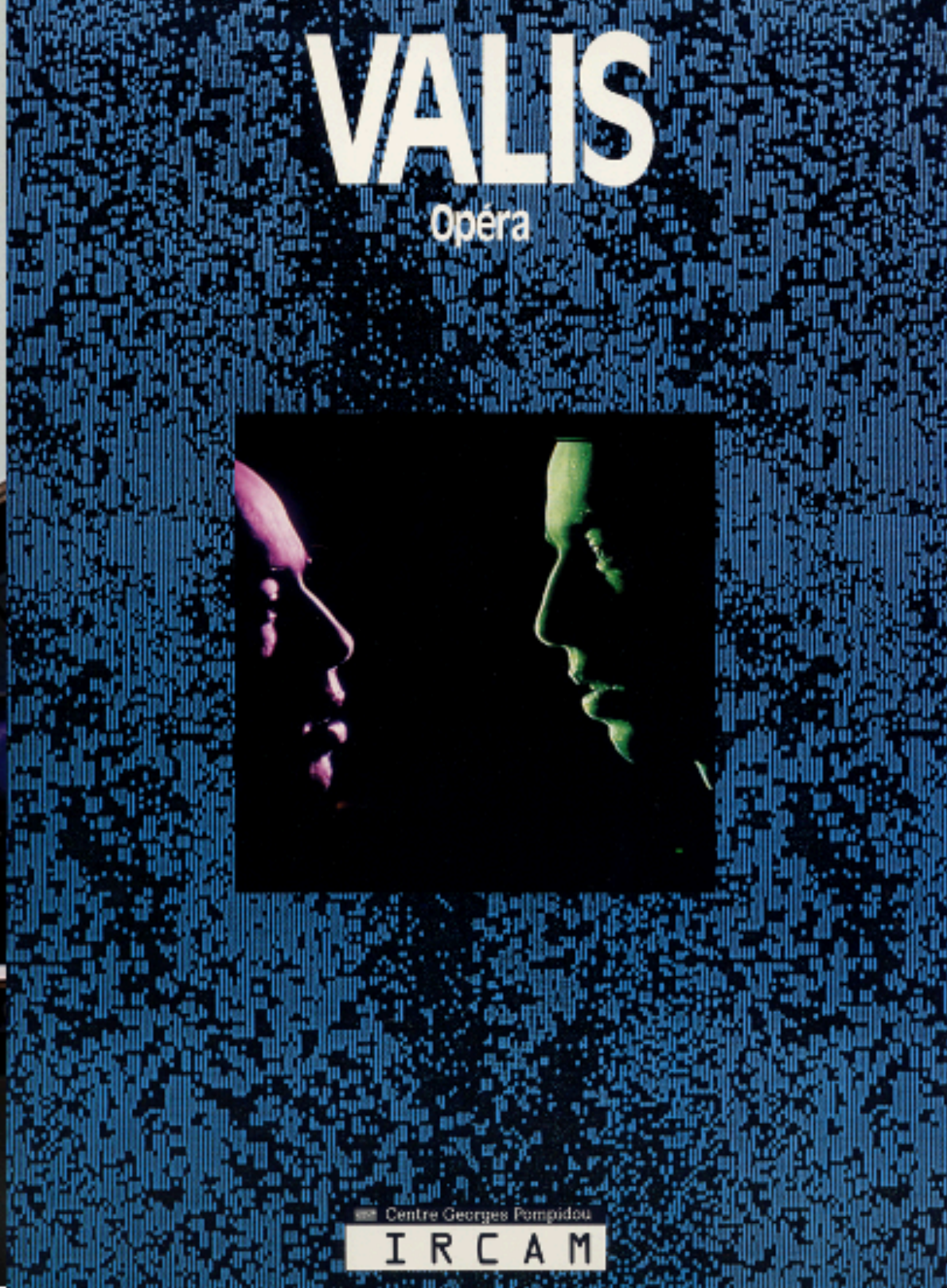
More subtle

More responsive

More independent

More intelligent

More shocking!





Syllabus



September 15

Syllabus

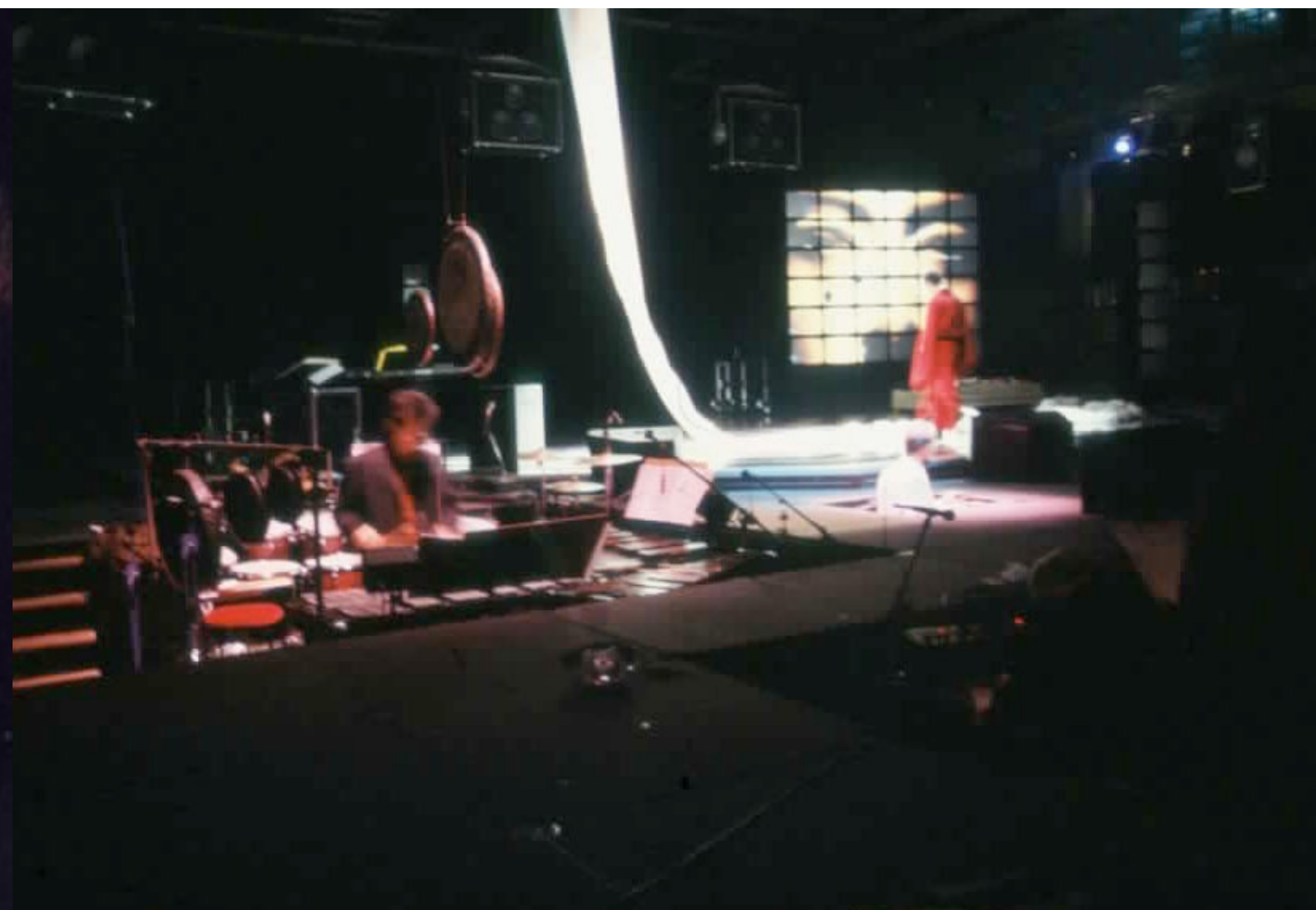
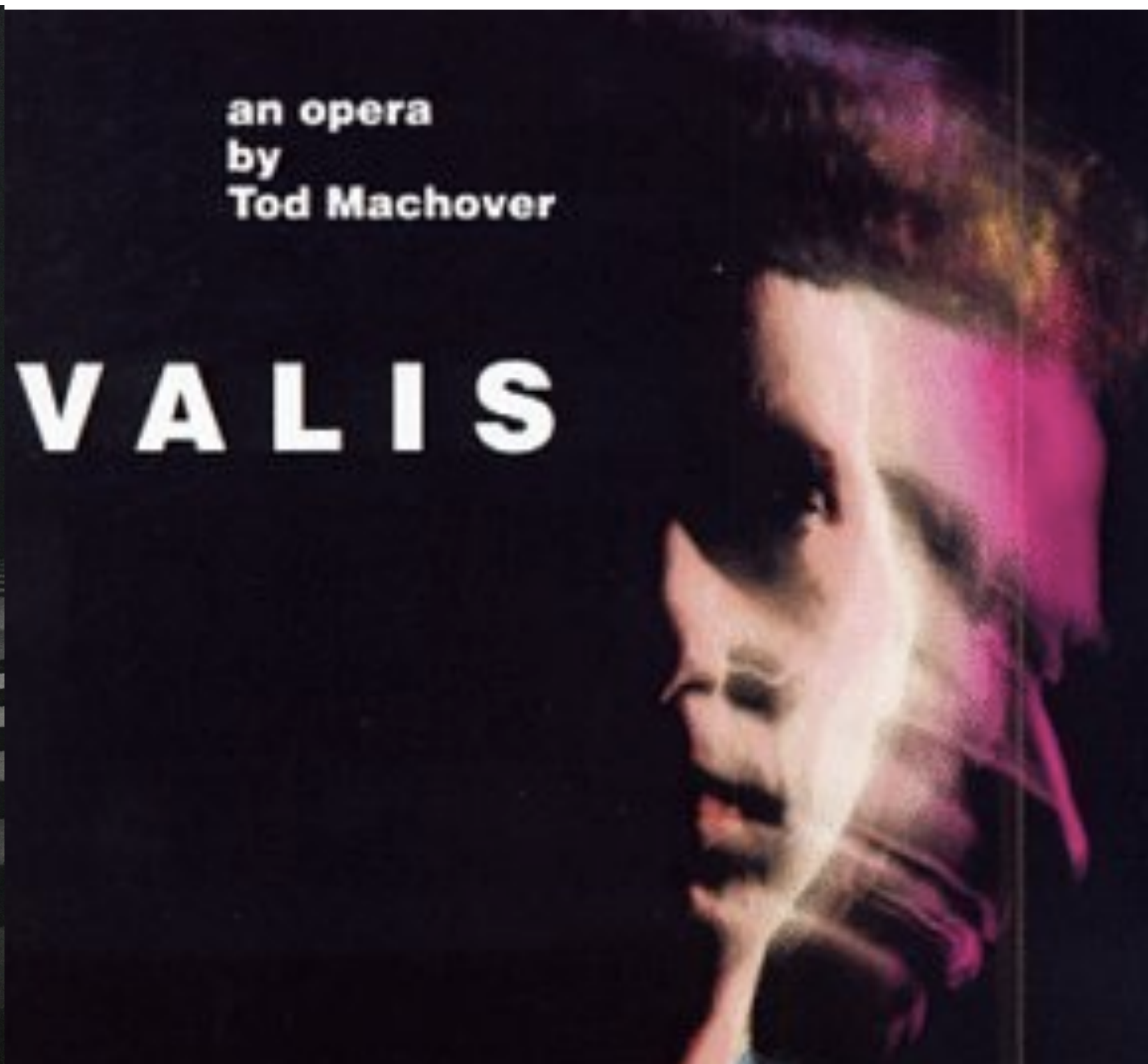
Introduction



September 22

Syllabus

VALIS 1





September 22

Syllabus

VALIS 1



Joe Chung

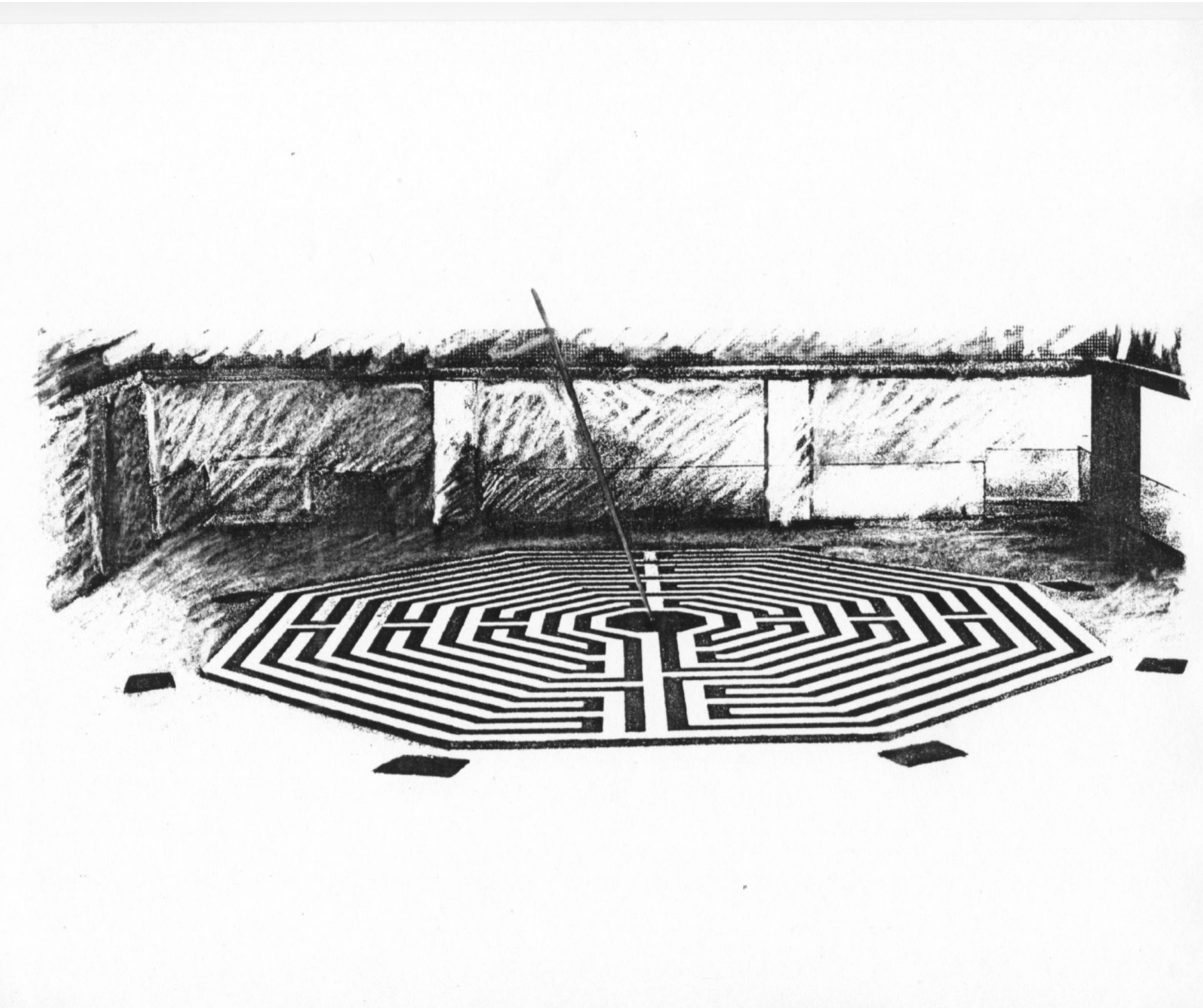


September 29

Syllabus

VALIS 2

Project 1





**Field Trip
to see
Karsten
Schuhl's
*superpose***

***MIT
Student
Gallery***



October 6

Syllabus

Brain Opera



Brain Opera



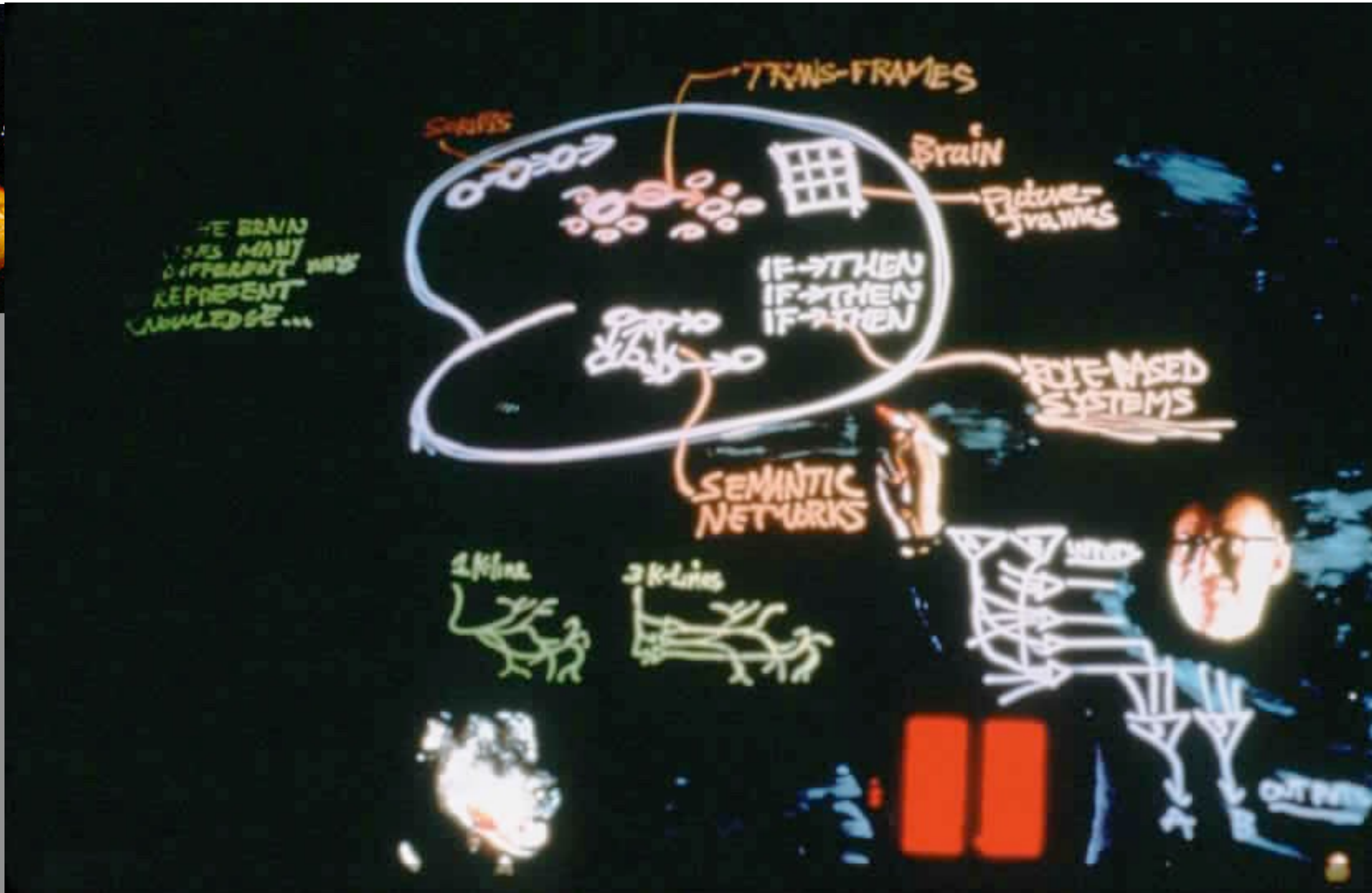
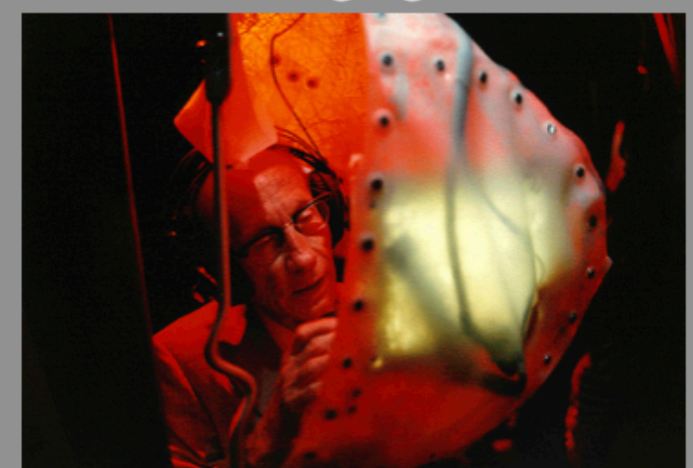
House of Music, Vienna



Harmonic Driving
Singing Tree



Gesture Wall
Melody Easel





October 6

Syllabus

Brain Opera

Joe Paradiso



Will Oliver

The Brain Opera Technology: New Instruments and Gestural Sensors for Musical Interaction and Performance

Joseph A. Paradiso

MIT Media Laboratory E15-325
Cambridge MA 02139 USA

joep@media.mit.edu

Tel: +1-617-253-8988
Fax: +1-617-258-7168

Keywords: Brain Opera, human-computer interface, multimodal input devices, electronic music interfaces, interactive music systems, percussion interfaces, interactive dance, electric field sensing, capacitive sensing



October 13

Syllabus

Virtuosity vs. Everyone



Eran Egozy

Deriving Musical Control Features from a Real-Time
Timbre Analysis of the Clarinet

by

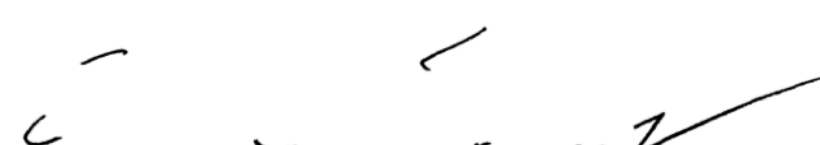
Eran Baruch Egozy

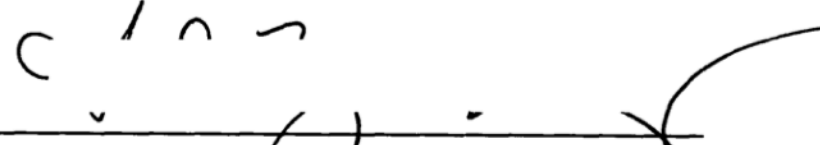
Submitted to the Department of Electrical Engineering and Computer Science
in Partial Fulfillment of the Requirements of the Degrees of

Bachelor of Science in Electrical Science and Engineering
and Master of Engineering in Electrical Engineering and Computer Science

at the Massachusetts Institute of Technology
January 1995

© Massachusetts Institute of Technology, 1995. All rights reserved

Author 
Department of Electrical Engineering and Computer Science
January 20, 1995

Certified by 
Tod Machover, M.M.
Associate Professor of Music and Media, MIT Media Laboratory
Thesis Supervisor





October 20

Syllabus

Hyperconnected Concerts



Nikhil Singh









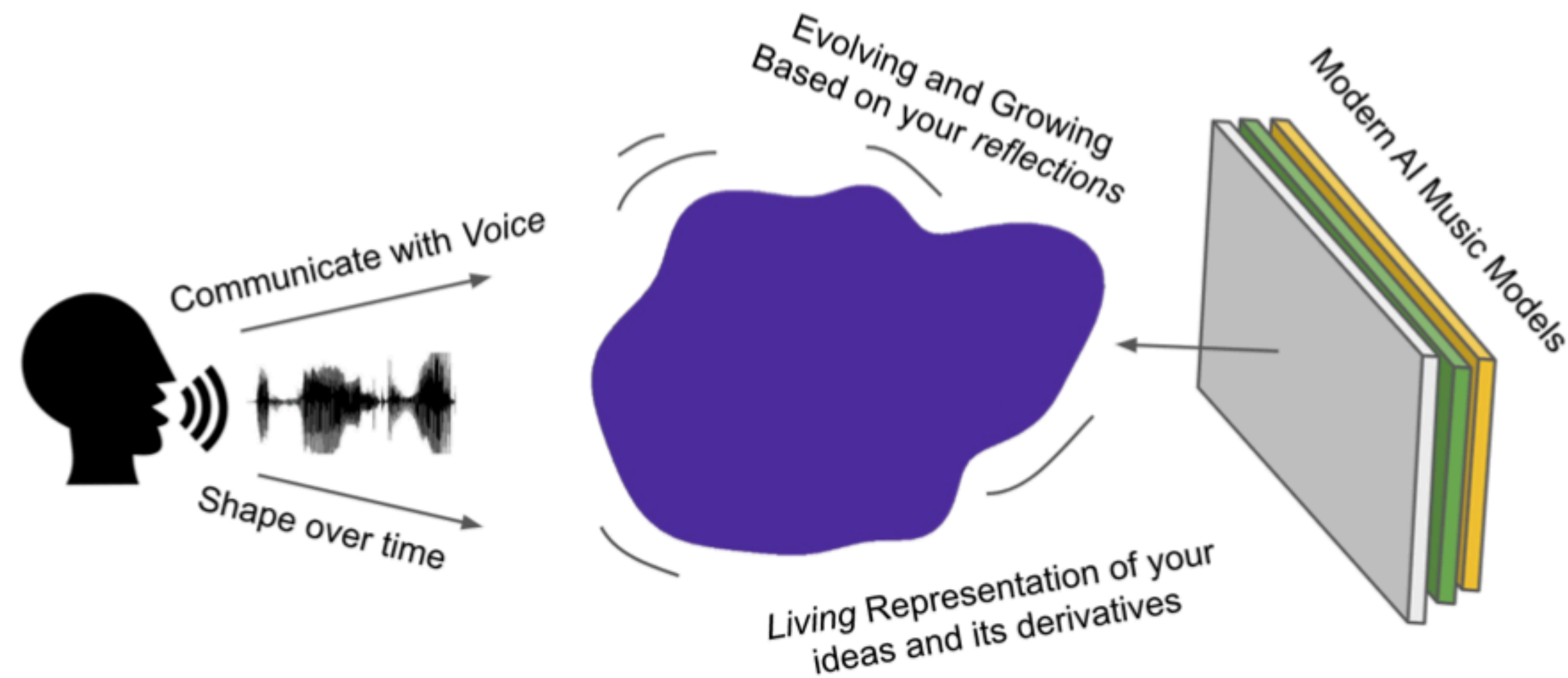
October 27

Syllabus

AI/ML & Hyperinstruments



Manaswi Mishra



Akito van Troyer

JAMES MADDALENA

baritone

JOËLLE HARVEY

soprano

PATRICIA RISLEY

mezzo-soprano

HAL CAZALET

tenor

DOUG DODSON

countertenor

DAVID KRAVITZ

baritone

TOM McNICHOLS

bass

BMOP
sound

TOD MACHOVER
DEATH AND THE POWERS



BOSTON MODERN ORCHESTRA PROJECT GIL ROSE



November 3

Syllabus

Death and the Powers

JAMES MADDALENA

baritone

JOËLLE HARVEY

soprano

PATRICIA RISLEY

mezzo-soprano

HAL CAZALET

tenor

DOUG DODSON

countertenor

DAVID KRAVITZ

baritone

TOM McNICHOLS

bass

BMOP
sound

TOD MACHOVER
DEATH AND THE POWERS



BOSTON MODERN ORCHESTRA PROJECT GIL ROSE





November 3

Syllabus

Death and the Powers

JAMES MADDALENA
baritone

JOËLLE HARVEY
soprano

PATRICIA RISLEY
mezzo-soprano

HAL CAZALET
tenor

DOUG DODSON
countertenor

DAVID KRAVITZ
baritone

TOM McNICHOLS
bass

BMOP
sound

TOD MACHOVER
DEATH AND THE POWERS

BOSTON MODERN ORCHESTRA PROJECT GIL ROSE
SUPER AUDIO CD

Making Musical Magic Live

Inventing modern production technology for human-centric music performance

BENJAMIN ARTHUR PHILIPS BLOOMBERG

Bachelor of Science in Computer Science and Engineering
Massachusetts Institute of Technology, 2012

Master of Sciences in Media Arts and Sciences
Massachusetts Institute of Technology, 2014

Submitted to the Program in Media Arts and Sciences,
School of Architecture and Planning,
in partial fulfillment of the requirements for the degree of
Doctor of Philosophy in Media Arts and Sciences at the
Massachusetts Institute of Technology
February 2020

© 2020 Massachusetts Institute of Technology. All Rights Reserved.

Signature of Author:

BENJAMIN ARTHUR PHILIPS BLOOMBERG
Program in Media Arts and Sciences
17 January 2020

Certified by:

TOD MACHOVER
Muriel R. Cooper Professor of Music and Media
Thesis Supervisor, Program in Media Arts and Sciences

Accepted by:

TOD MACHOVER
Muriel R. Cooper Professor of Music and Media
Academic Head, Program in Media Arts and Sciences



**Ben
Bloomberg**



November 10

Syllabus

Wild Ideas & Project 2





November 17

Syllabus

Final Projects: Proposals



November 24

Syllabus

No Class

Thanksgiving Break



December 1

Syllabus

***Final Projects:
Piece Demos***



December 8-10

Syllabus

***Final Projects:
Setup & Rehearsals***





December 11-12

Syllabus

Final Projects:
Dress Rehearsal
&
Performances



Project Reminder

Sept. 15-29

Project 1



Project Reminder

Project 1 A MINUTE OF MUSIC

For those without any music/audio experience:

Make a 1 minute piece of music by any means, that uses recorded sounds, etc.

For those with some music/audio experience:

Make and perform a 1 minute piece of music with some kind of real-time system (e.g. Max/MSP, Web tech, Hyperproduction+REAPER, openFrameworks, etc.)



Project Reminder

Sept. 15-29

Project 1

Oct. 20 - Nov. 10

Project 2



Project Reminder

Project 2 HYPERCONNECTED CONCERTS

- Form a team (MIT + Harvard + Berklee?)
- Put together a **5-minute** virtual concert experience (e.g. with 1-3 performers from class)
- Create an experience that *augments* the traditional live-stream concert format with whatever technology/resources available (supplemented by workshop on interactive and web technologies)
- Perform the concert live in class, perhaps connected to Berklee students in Boston



Project Reminder

Sept. 15-29

Project 1

Oct. 20 - Nov. 10

Project 2

Nov. 17 - Dec. 11/12

Final Project/Performance



Project Reminder

Final Projects/Pieces/Performances

TBD



Tech Workshops & Office Hours

First TWO are:

Monday, September 20

Monday, September 27



Possible “Field Trips”

- [Victor Wooten @ BSO](#)
- Class screening of “[Sisters with Transistors](#)” documentary
- [Conrad Tao @ Longy](#)
- [Claire Chase Harvard Faculty Recital \(Sep 29\)](#)
- Laurie Anderson’s “virtual” [Harvard Norton Lectures](#) (6 Oct, Nov 10, Dec 8)
- [HYDRA @ Harvard](#) (Dec 4 and 5)
- Visit(s) to Berklee College of Music



Assignment for Next Week

Listen to full *VALIS* recording, on CD or via links

Study CD booklet (physical or PDF)

**Read *Hyperinstrument Progress Report*
(at least pages 1-23)**

Watch “Big Thinker” Video



Reminders

Class website: reimhyp.media.mit.edu

TAs: Nikhil Singh (nsingh1@mit.edu)
Manaswi Mishra (manaswim@mit.edu)

Admin/Producer

Priscilla Capistrano (priscill@media.mit.edu)

Tod (tod@media.mit.edu)



Reminders

You must be fully registered; no listeners.

Must fill out our Google form (on website).

Harvard students need MIT ID/Covid-Pass.



Reminders

Introductions!

