

INTRODUCTION

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Network Sound and Data Workshop

Center for Computer Research in Music and Acoustics (CCRMA)

Stanford University

Workshop Overview

<https://ccrma.stanford.edu/workshops/nsd2012/>

The Vision

“I dream of instruments obedient to my thought and which with their contribution of a whole new world of unsuspected sounds, will lend themselves to the exigencies of my inner rhythm.”

Edgard Varèse (1917)



Before the Computer

Ada Lovelace during her work with Babbage's difference engine:

"Supposing, for instance, that the fundamental relations of pitched sounds in the science of harmony and of musical composition were susceptible of such expression and adaptations, the engine might compose elaborate and scientific pieces of music of any degree of complexity or extent."

Ada Lovelace (1843)



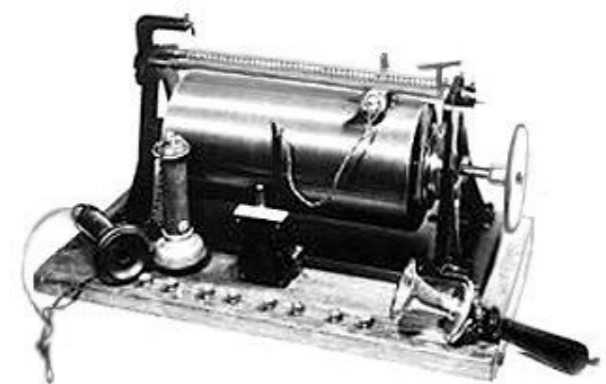
Beginnings of Electronic Music



Elisha Gray: "Musical Telegraph" (1876)

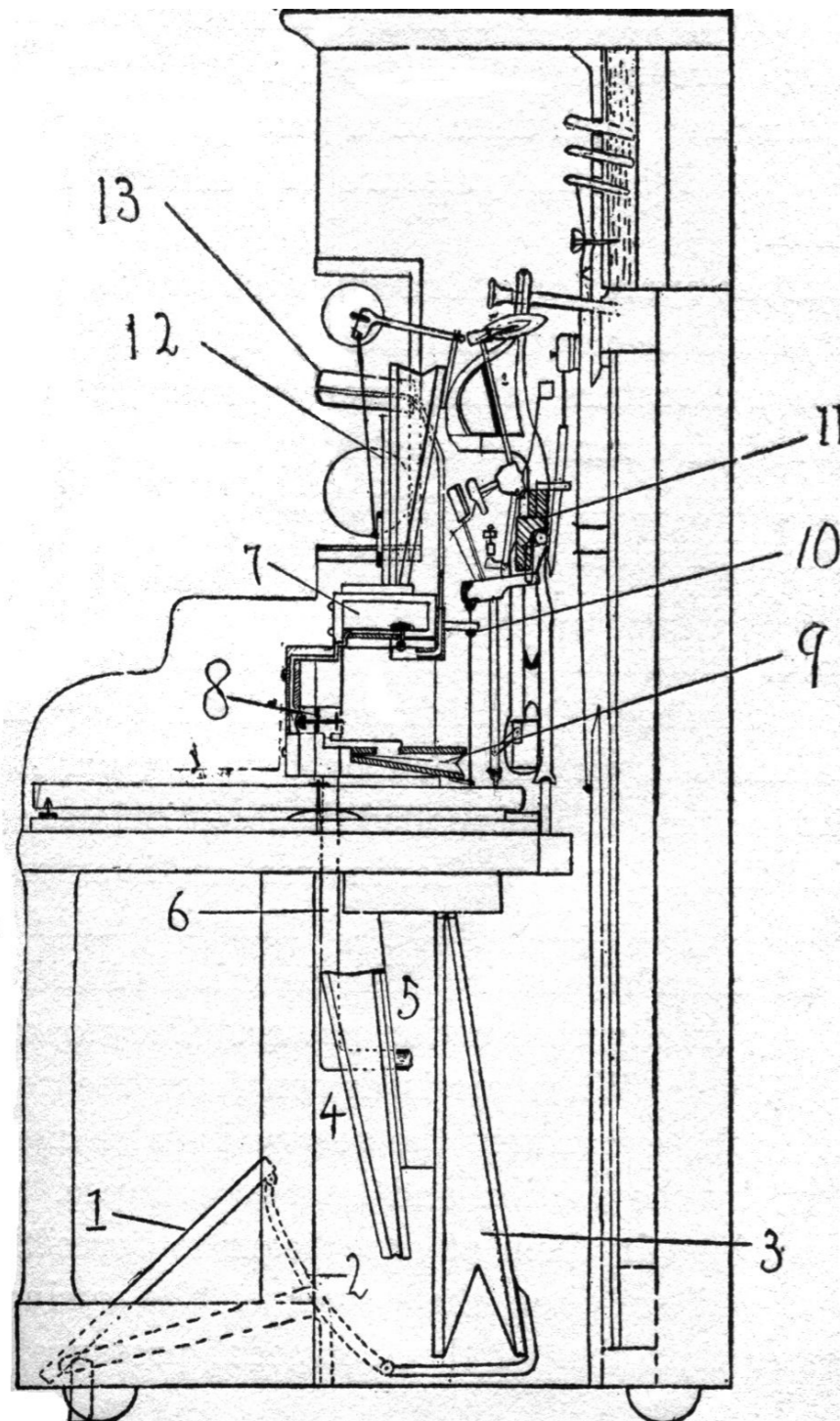


Thomas Edison: "Phonogram" (1877)



Valdemar Poulsen: "Telegraphophone" (1898)

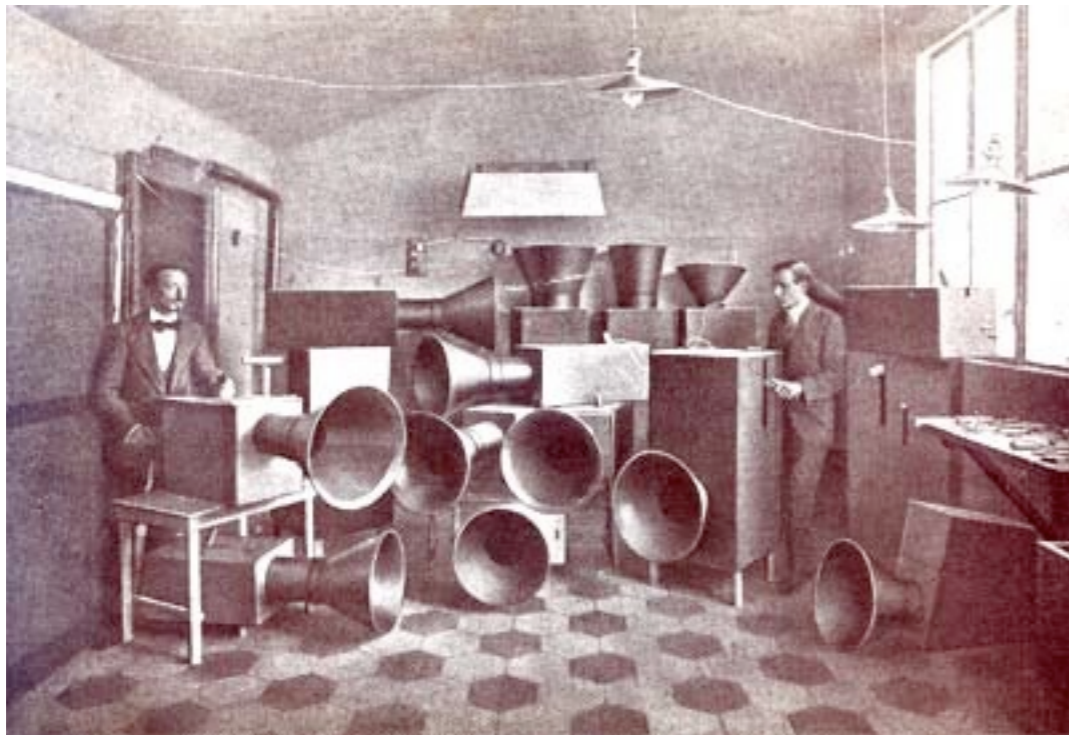
Player pianos (early 20th century)



Ideas of Change



Ferruccio Busoni "Manifesto" (1907)



Luigi Russolo and the Futuristas (1913)

First Instruments



Leon Theremin (1920)



Ondes Martenot (1928)

Aleatoric and Concrete Music



John Cage "Imaginary Landscape 1" (1939)

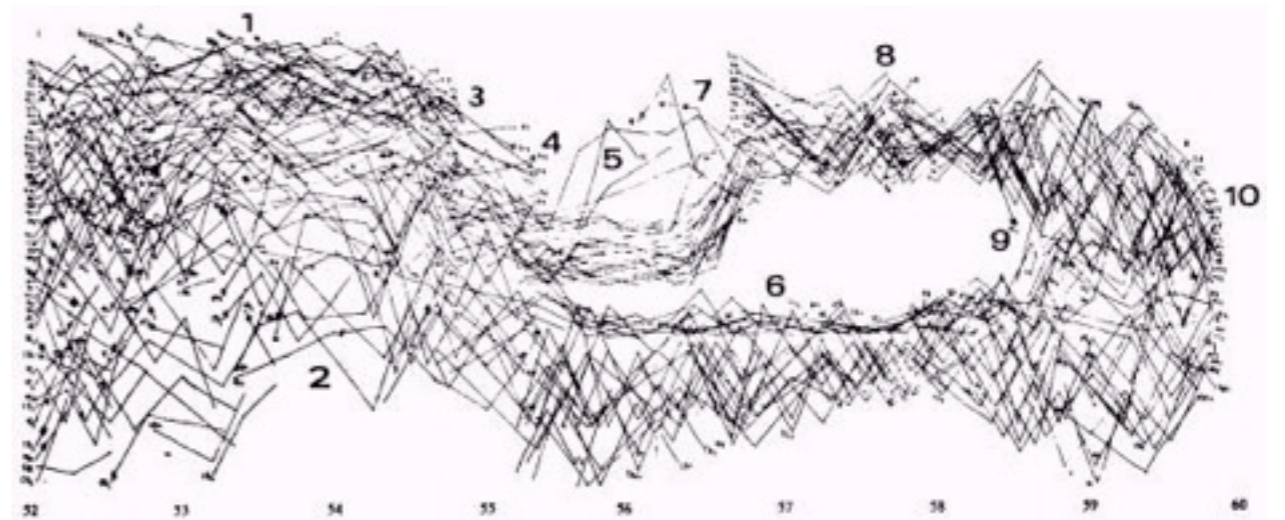


Pierre Schaeffer "Musique Concrète" (1949)

Stochastic Music, Multimedia

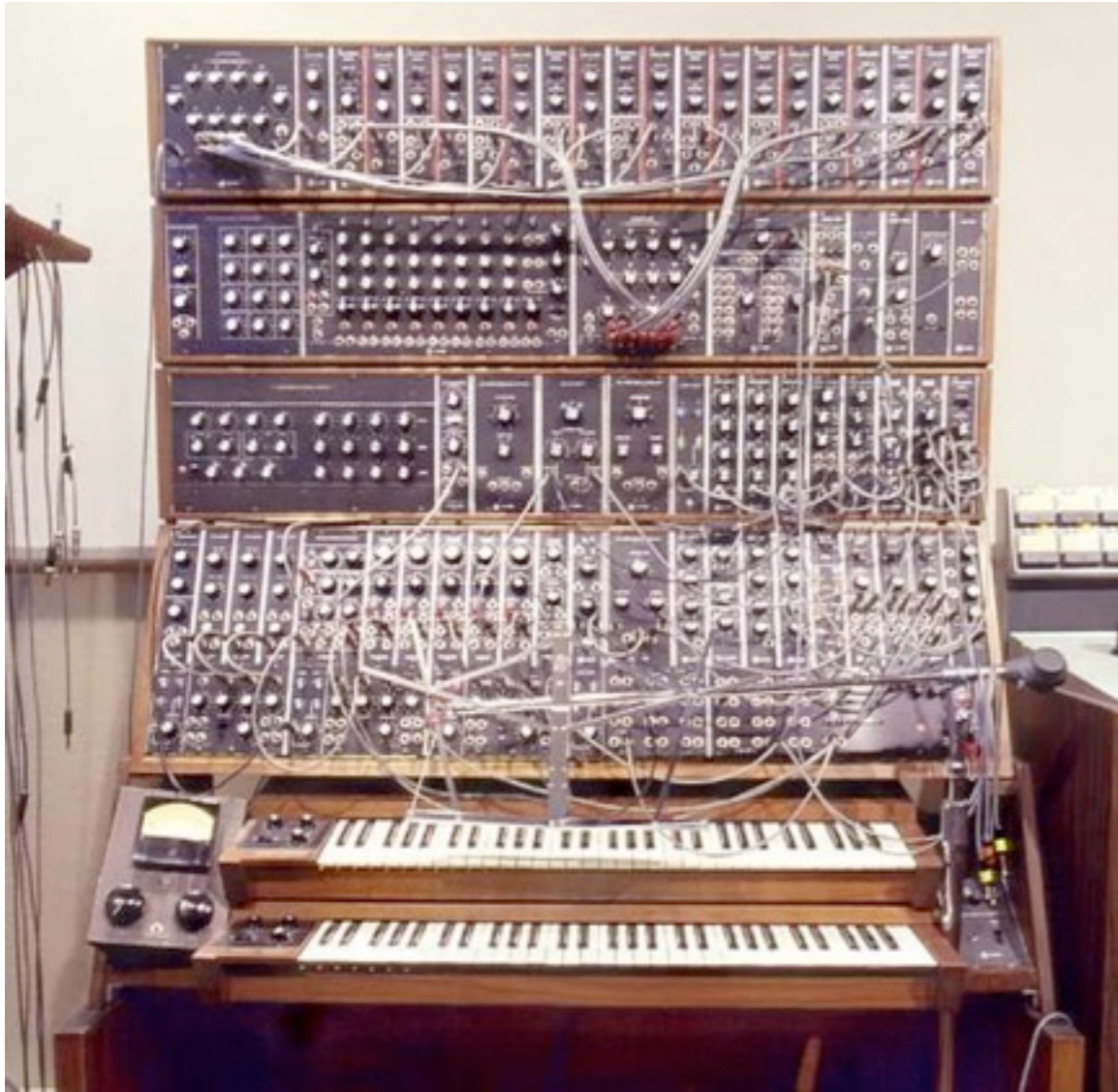


**“Poeme Electronique” 425
speakers and video, Edgard
Varese (1958)**

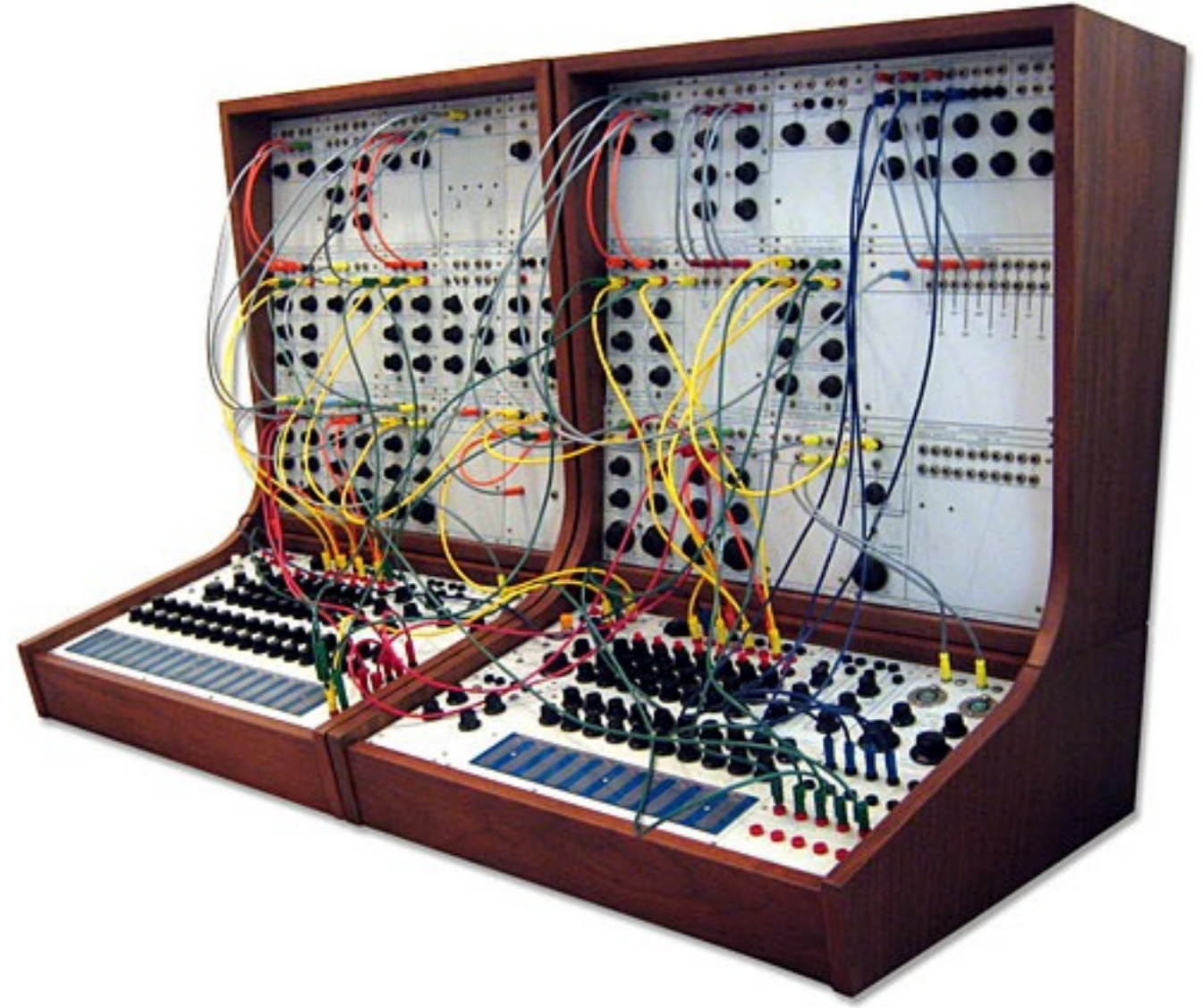


**Measures 52-60, “Pithoprakta”,
Iannis Xenakis (1956)**

1964: VCO Synthesizers

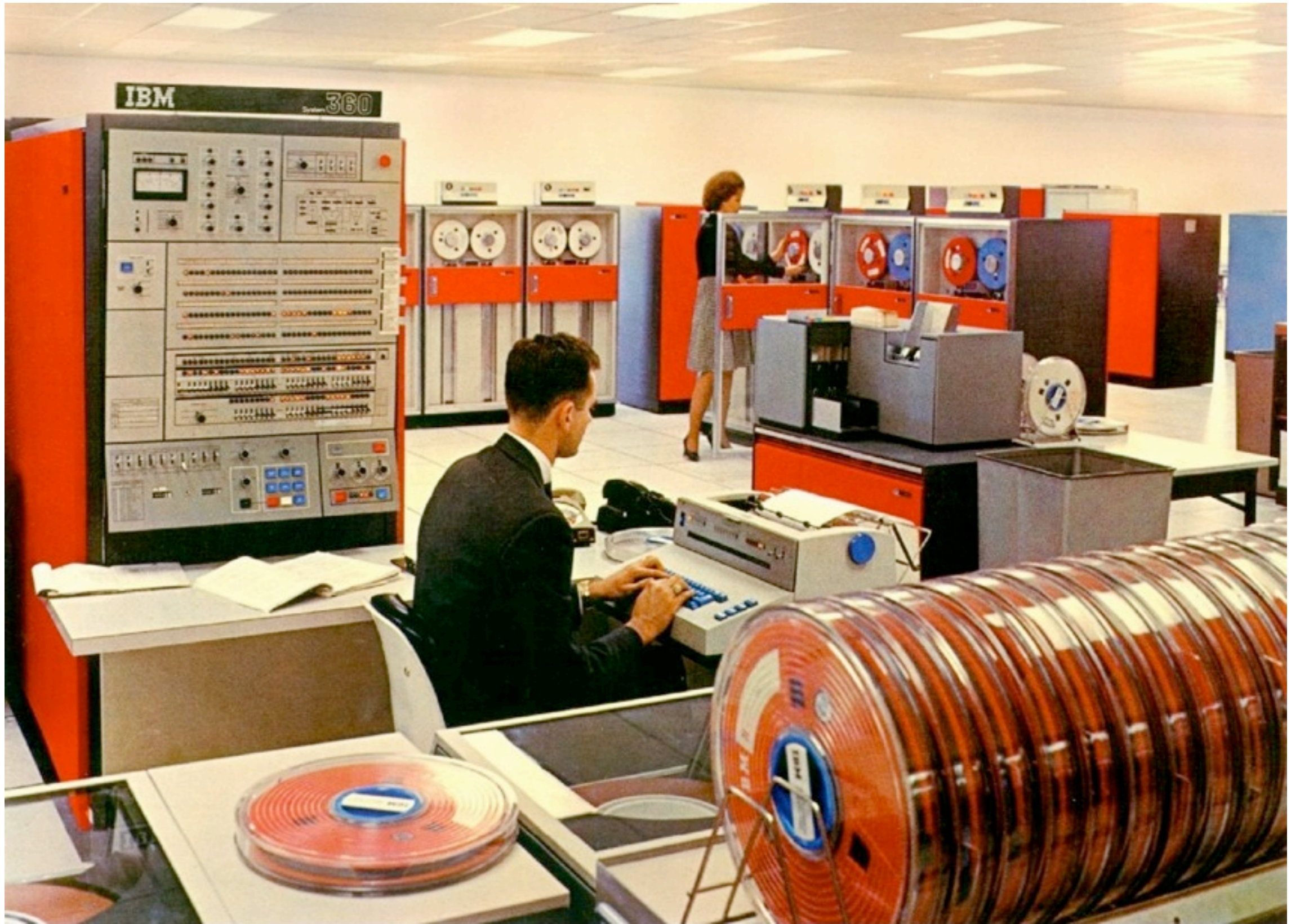


Robert Moog VCO Modular Synthesizer



Donald Buchla VCO Modular Synthesizer

Computer Music Languages | Milestones



MUSIC I - MUSIC N in Bell Labs



Max Mathews
The Father of Computer Music

*Bicycle Built for Two" by Kelly,
Lochbaum, and Mathews, 1961*

1957: MUSIC I/MUSIC-N family:

Unit Generators (UGens) (atomic and predefined processing blocks)

UGens: Audio Input, Output, and Control Inputs

Examples: Oscillators, Filters, Amps, Envelope Generators

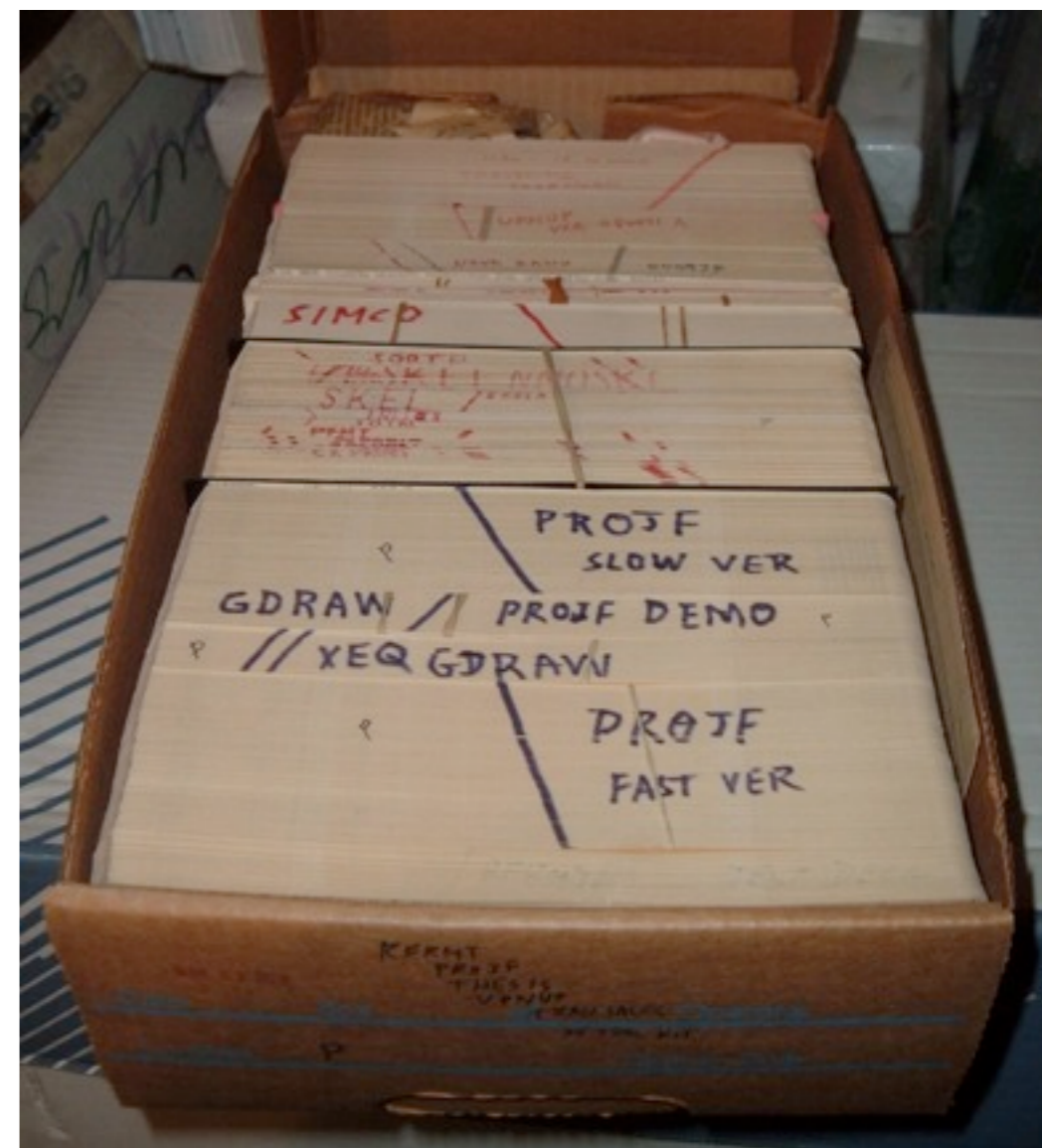
A Patch (instrument) is formed by connecting several UGens

An Orchestra is created through the connections of several Patches

A Score controls an Orchestra

MUSIC I - MUSIC N at Princeton and Stanford

Max Mathews handles a copy of MUSIC IV to John Chowning

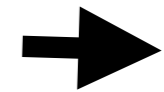
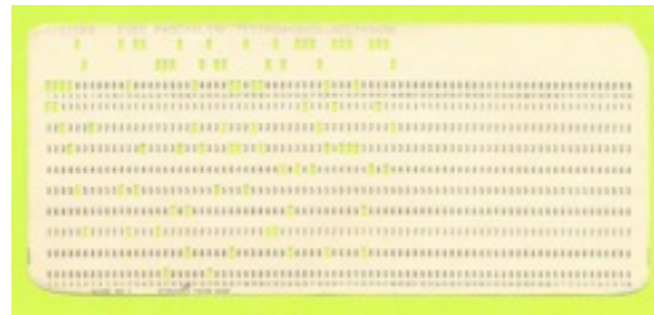


MUSIC 10 y SCORE, Stanford AI Lab

Chowning y Andrew Moorer create MUSIC 10 and SCORE



→
Design



Audio

Very Slow Process

1968: MUSIC V in FORTRAN

Real-Time Systems

The screenshot shows a Pure Data patch named 'Click's-Session.rtf'. It features two code windows: 'Click's-Session.rtf' and 'Plucky.rtf'. The 'Click's-Session.rtf' window contains the following code:

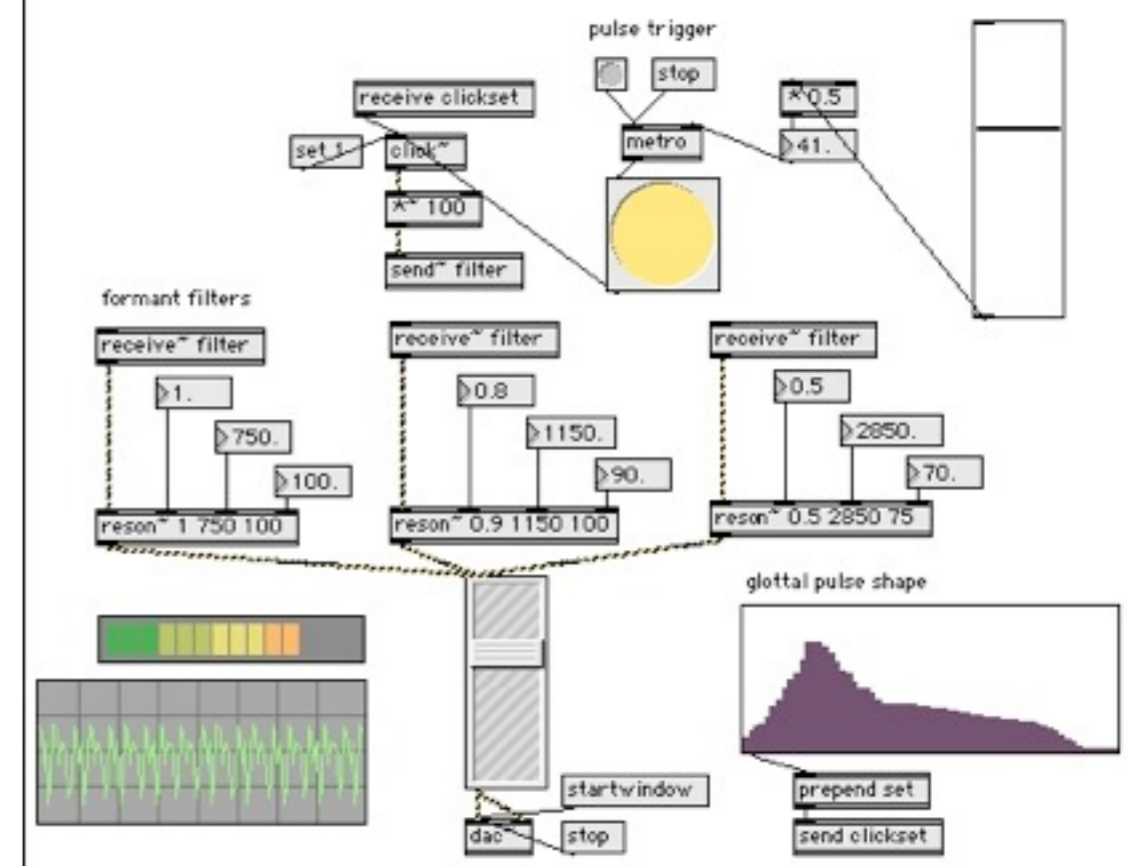
```
// - 0:7:27.61 -  
SynthDef(\lcsynth1, {arg out=0, amp=0.1, pan=0.0, freq=440,  
sustain=0.1;  
var sound, env;  
env=EnvGen.ar(Env([1  
sound=RLPF.ar(Saw.ar
```

The 'Plucky.rtf' window contains the following code:

```
{  
var n;  
n = 8; // number of 'voices'  
Mix.ar( // mix all stereo pairs down.  
Pan2.ar( // pan the voice to a stereo position  
Combl.ar( // a comb filter used as a string resonator  
Dust.ar( // random impulses as an excitation function  
// an array to cause expansion of Dust to n channels  
// 1 means one impulse per second on average  
1.dup(n),  
1.5 // amplitude  
0.01, // max delay time in seconds  
// array of different random lengths for each 'string'  
{0.008.rand+0.0003}.dup(n),  
4 // decay time in seconds  
1.rand2}.dup(n) // give each voice a different pan position  
n:10);
```

Below the code windows are several control panels: 'SimpleSynth' with buttons 'Go 0', 'Go 1', 'Go 2', 'Stop 4', 'Go 5', and 'Stop 6'; 'stethoscope' showing a waveform; and an 'internal server' window displaying system statistics:

internal server	
Quit	K Internal -> default prepare rec
Avg CPU : 3.9 %	Peak CPU : 5.1 %
UGens : 141	Synths : 4
Groups : 2	SynthDefs : 68



...Network Music

Network Music Performance

Def:

“A network music performance (nmp) is a *bi-directional, dis-located* and *multi-modal* set of interactions regardless of its synchronicity or asynchrony between participants.”

Alain Renaud

Where does it come from?

1876



Elisha Gray: "Musical Telegraph"

1929

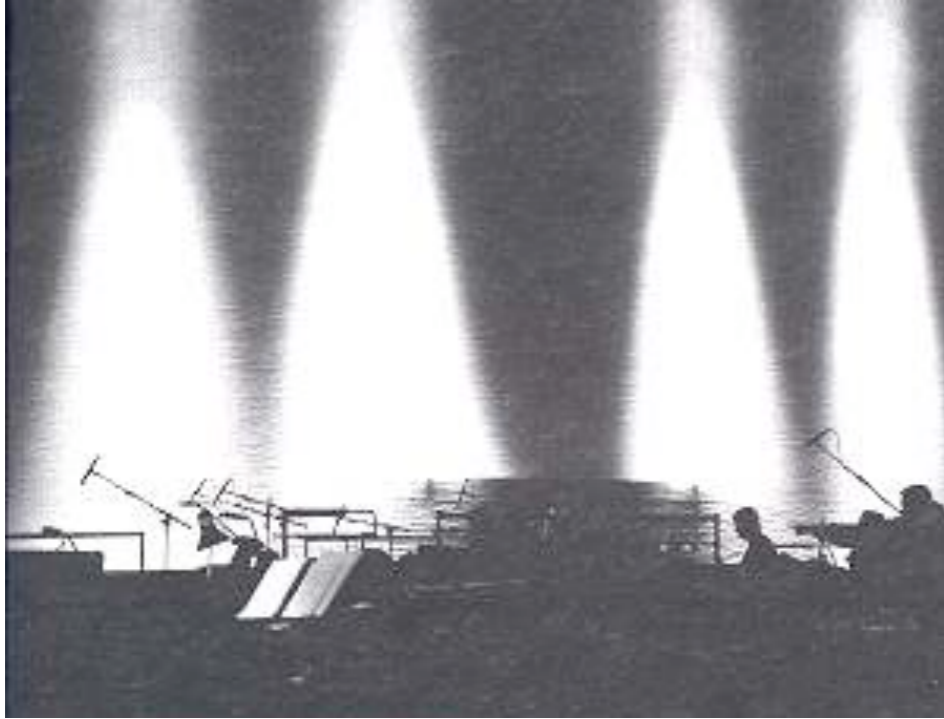
Der Lindberghflug

Paul Hindemith / Kurt Weill / Bertolt Brecht



Radio Broadcast +
Listener at Home

1950's



John Cage's "Transistor Radio" Pieces

1966 - Public Supply - Neuhaus

<http://www.medienkunstnetz.de/works/public-supply-i/audio/2/>

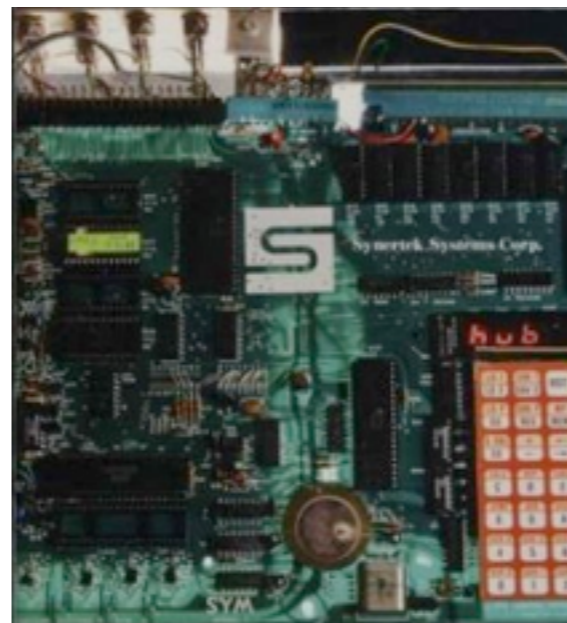


© Max Neuhaus

Late 1970's

The Hub

A computer music network band



The League of Automatic Music Composers 1978- 1983



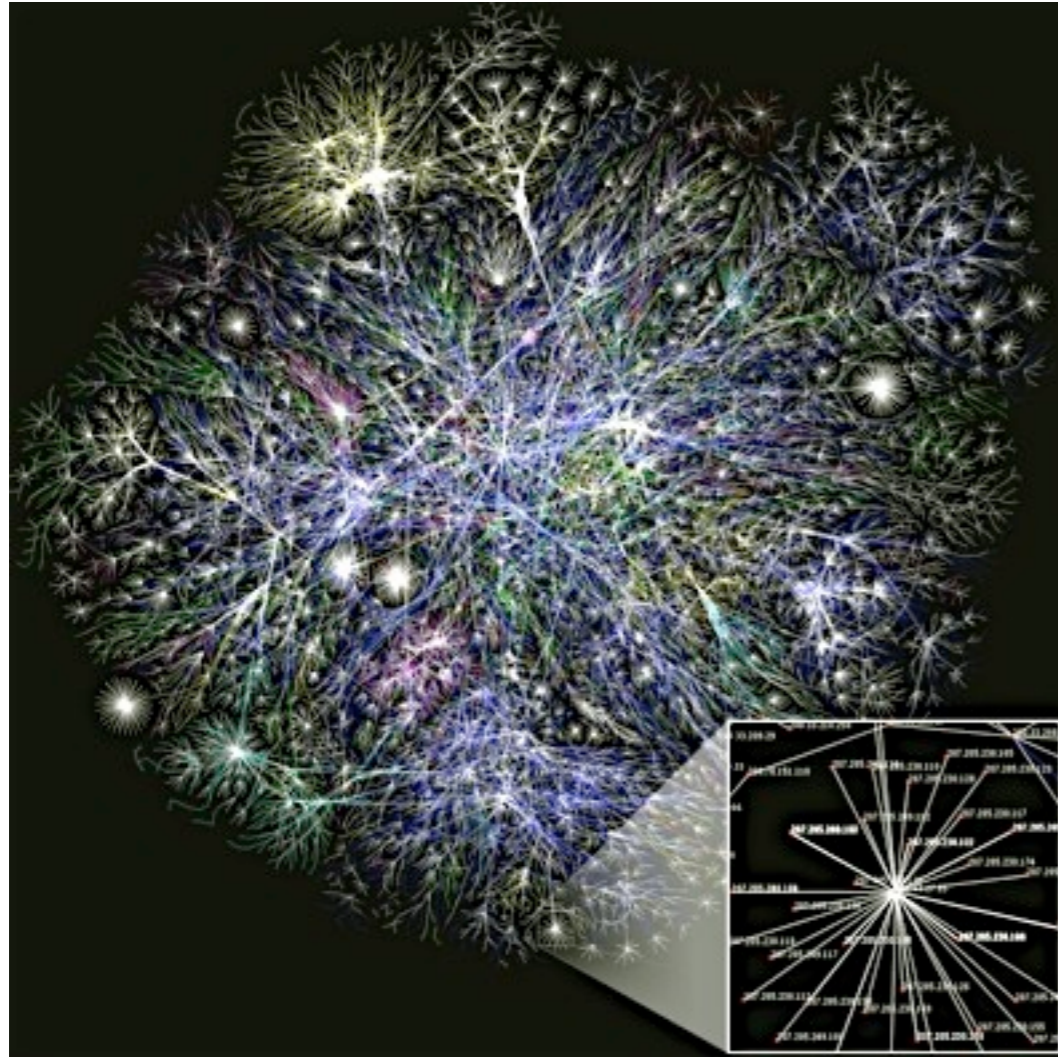


1988 - Françoise LeGrand - Satellite Symphony: Beethoven and One Woman's Dream

http://www.world-orchestral.com/mov/Montreal_final.mov



Digital Networks



1990's

Speedup of the Internet

Firsts bidirectional, "real-time"
music exchanges

Real-time



30 to 0.5 seconds

Year 2000

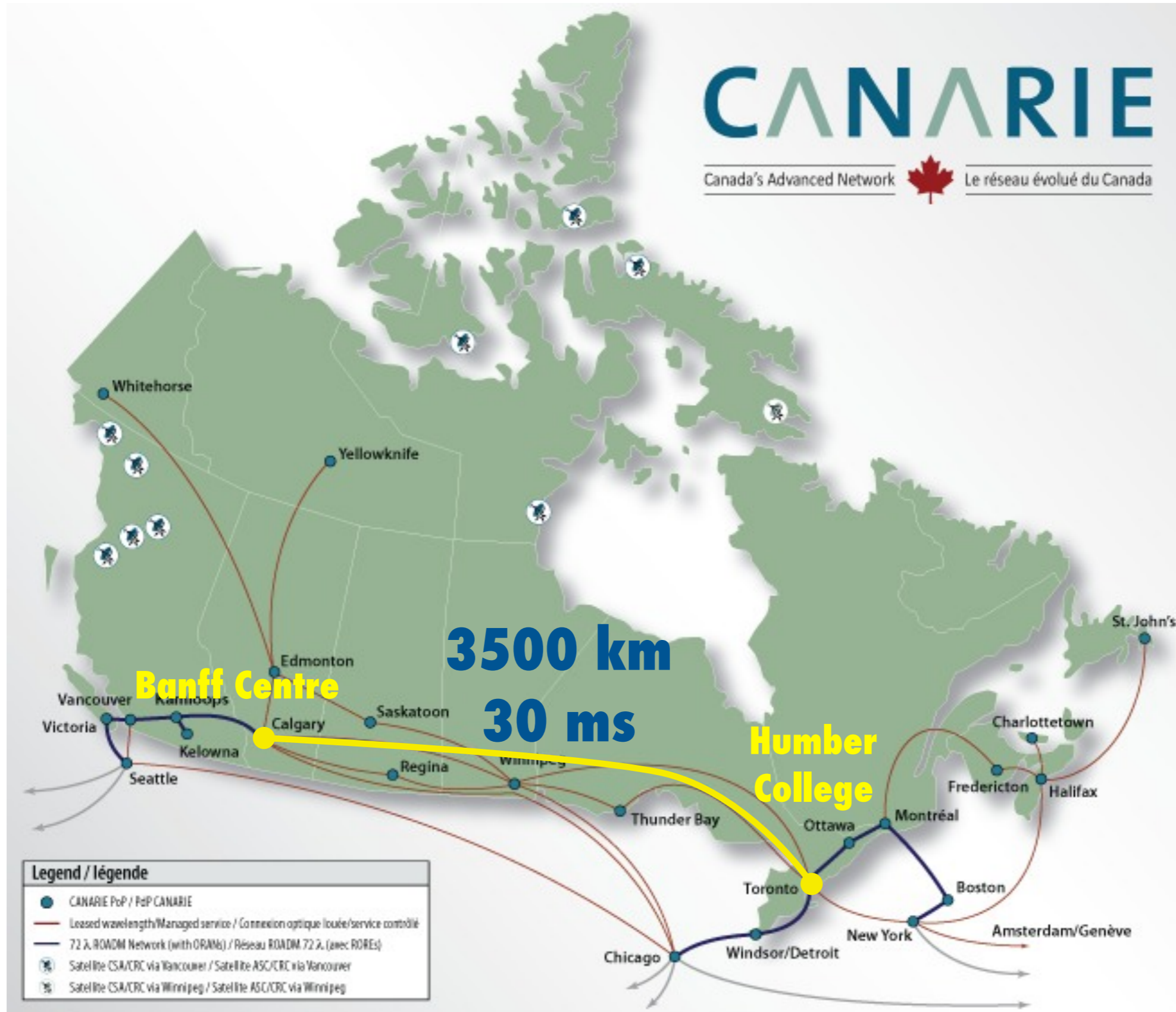


<http://ccrma.stanford.edu/groups/soundwire/>



Some Examples

TeleJazz



TeleJazz - 16 channels | 48kHz | 16 bits

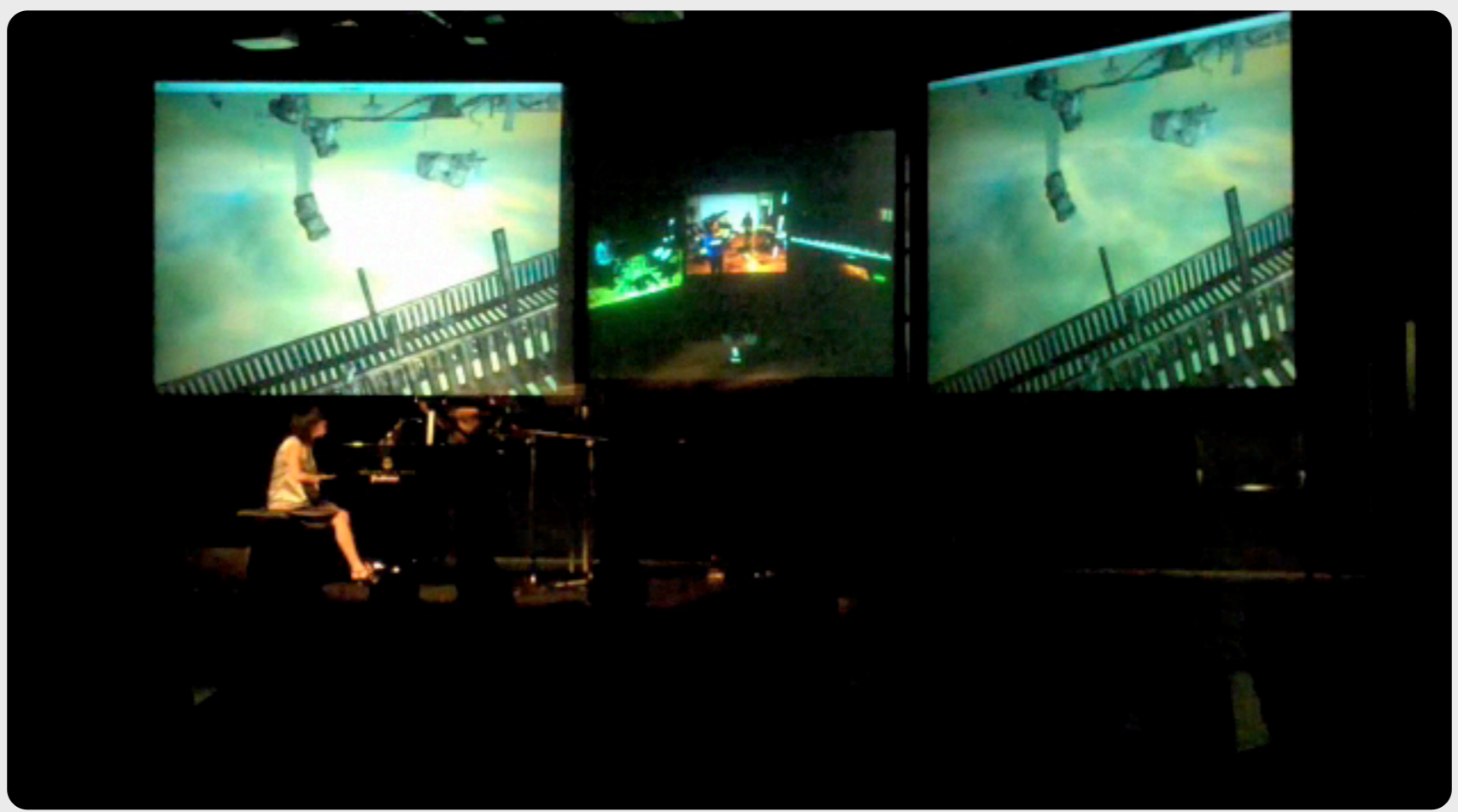


Banff



Terry Riley's *In C* - Stanford/Beijing April 2008





Credits

History of Computer Music

- Joel Chadabe, *“Electric Sound: The Past and Promise of Electronic Music”*