

Input of musical notation

Music 253/CS 275A
Stanford University

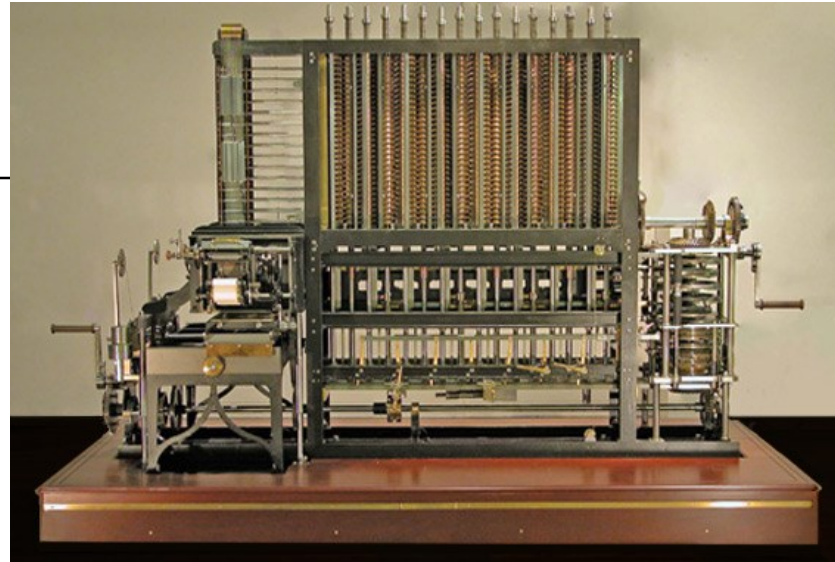


Possible sources of musical input

- **Symbolic data entry**
- **Sound**
- **Graphics construction**
- **Optical recognition**
- **Hybrid systems**

Calculation methods

1. Symbolic data entry
2. Graphics assembly
3. Sound capture
4. Optical recognition



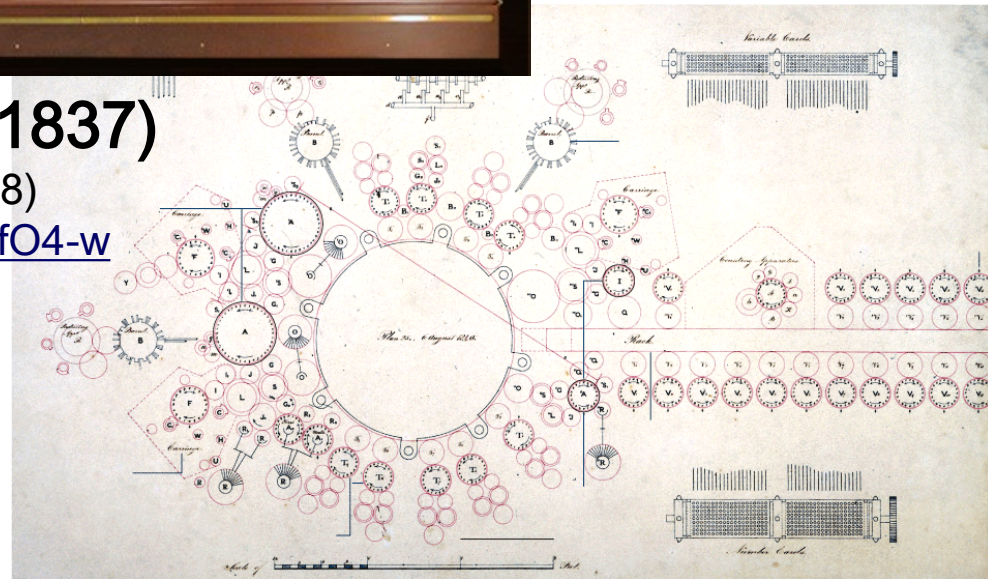
CHM first Sat 2p

Babbage Difference Engine (1837)

Analytical Engine--CHM reconstruction (2008)

<https://www.youtube.com/watch?v=KBuJqUfO4-w>

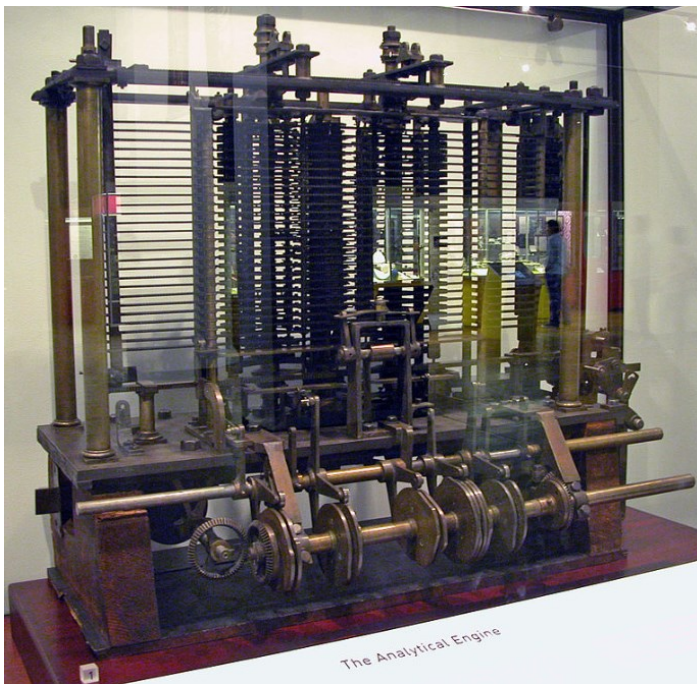
What can these machines process?



Babbage analytical engine (1849)

Babbage Analytical Engine (1837)

- **Aim:** to process data
- **Needs:**



Data



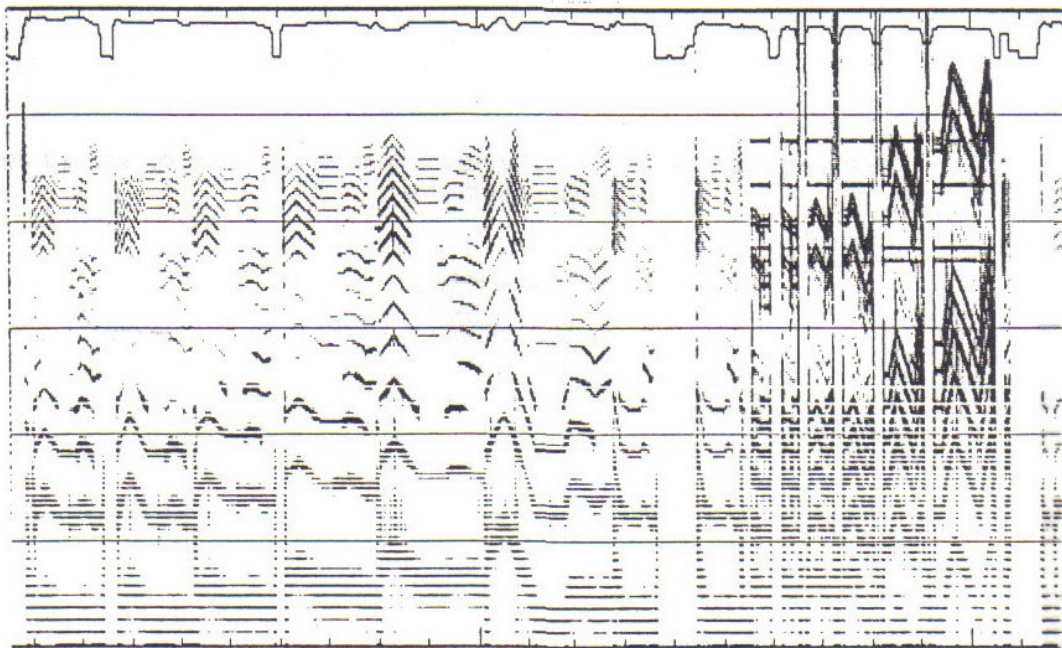
Instructions

Two types of **punched cards** used to program the machine. Foreground: 'operational cards', for inputting **instructions**; background: 'variable cards', for inputting **data**

Sound transcriptions methods (1930)

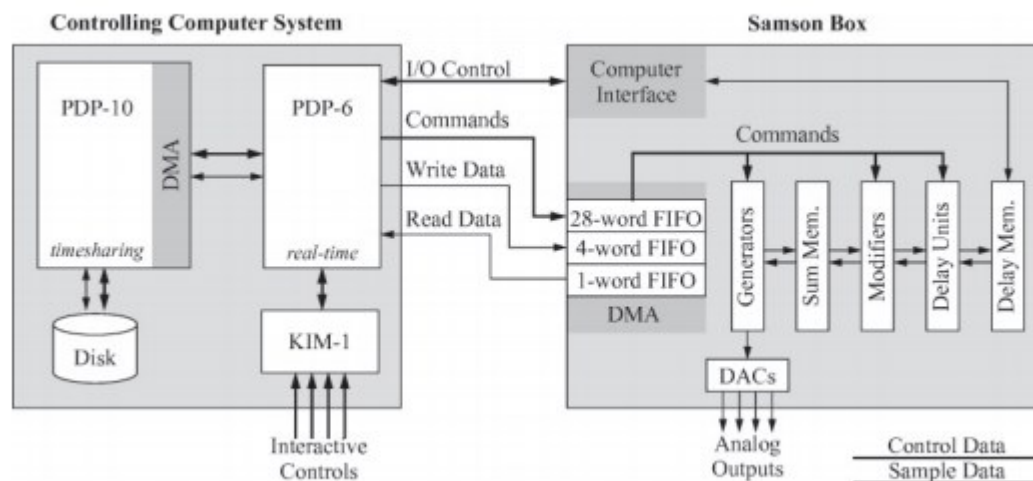
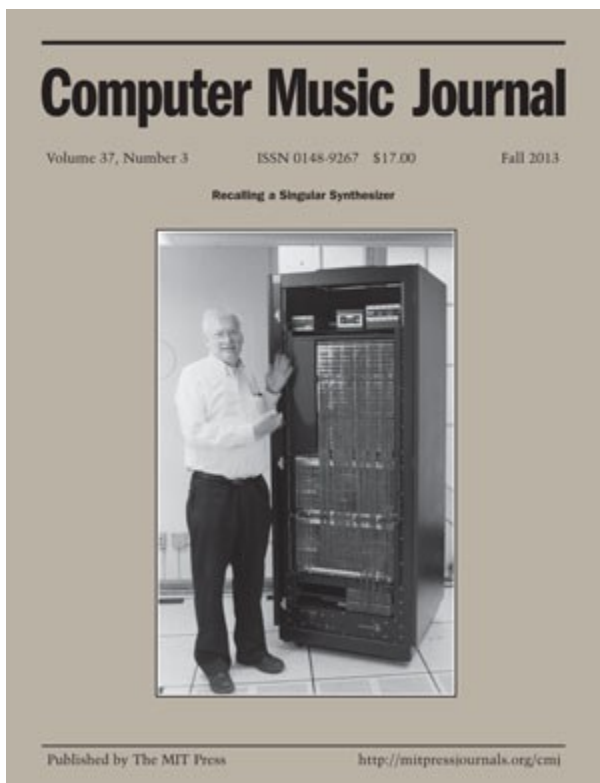
1. Symbolic data entry
2. **Sound capture**
3. Graphics assembly
4. Optical recognition
5. Combination systems

How can we make sound tangible?



Sonogram (Carl Seashore et al., since c. 1930)

Samson box (for “audio computation” c. 1975-80)



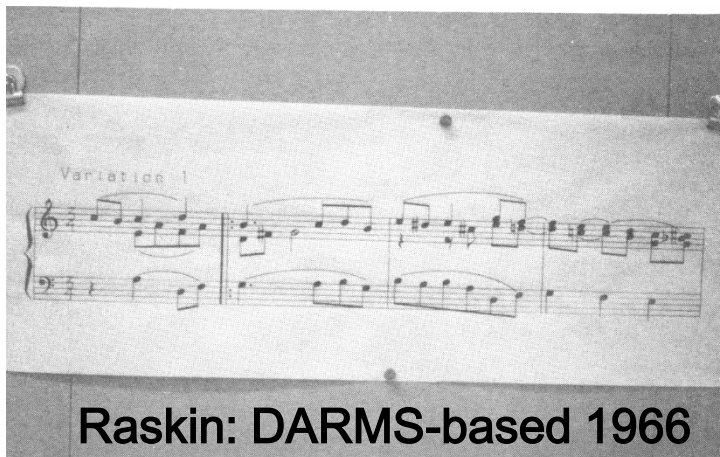
Gareth Loy's full article (2013) at:
http://www.mitpressjournals.org/doi/pdf/10.1162/COMJ_a_00193

Alex Di Nunzio, "Samson Box,"
<http://www.musicainformatica.org/topics/samson-box.php>

DARMS Pioneers (1966--)

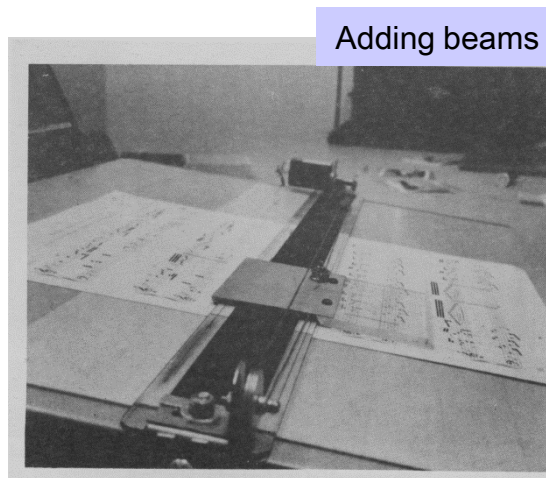
Stefan Bauer-Mengelberg (1927-1996)

- IBM mathematician; **developer**
- Assistant **conductor** (to Leonard Bernstein)
- Implemented system for making a computer transcribe a composition (by Stefan Volpe)
- Edited papers of **Gödel** (Escher, Bach)
- IP **lawyer**



Jef Raskin (1942-2005)

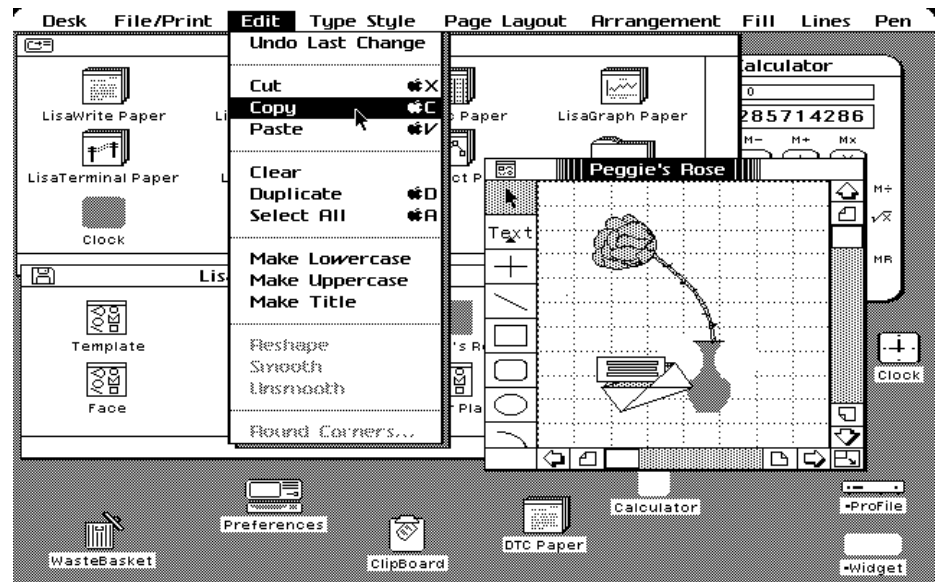
- **Apple #4**
- co-dev (with Brian Howard, Apple #32) of Apple G&S (forerunner of *QuickTime*)
- Developed original **Mac interface**
- Composer
- First person to **implement** DARMS (1966)



Raskin system, 1967

Input methods (1984)

1. Symbolic data entry
2. **Graphics assembly**
3. Sound capture
4. Optical recognition



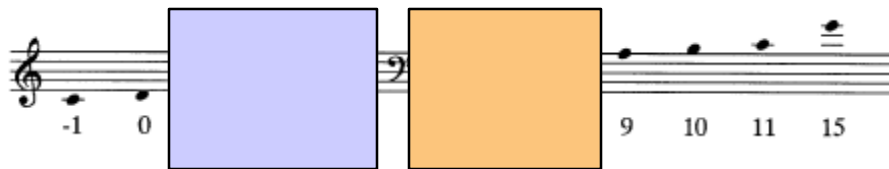
Lisa 1 (1984)

Apple Graphics & Sound: Brian Howard, Jef Raskin

How can this be processed?

Symbolic codes for music

- **1965-1985**: hand encoding (type keyboard)
 - **DARMS** (Digital Alternate Rep. of Music Scores)
 - **MUSTRAN**, IML-MIR et al.



(“Great Society” encoding scheme)

- Designed for **mainframes**, **card-readers**
- **Few printing possibilities**
- Important for
 - the **thinking** that went into the task
 - **documentation**
 - **Implementation** (school music, esoteric repertoires)

Ancestors of computer typesetting of music (1955-75)

Leuning, Ussachefsky et al.

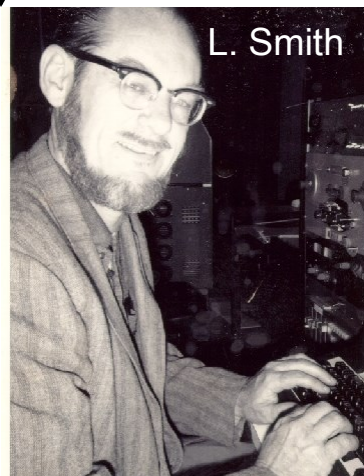
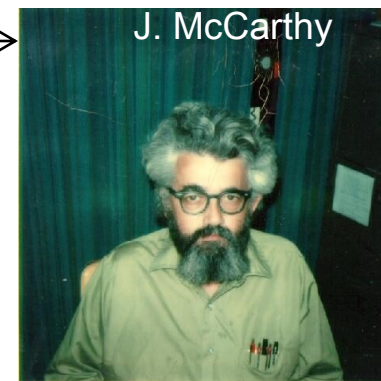
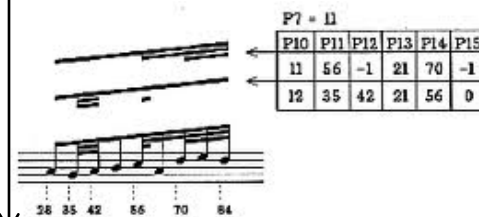
Columbia-Princeton tape-music collaboration (from 1954)



Leland Smith (SCORE, 1974-2013)

Prof. of composition

Stanford AI lab



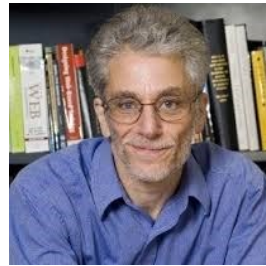
Cheerleaders for hand encoding (1970s, 1980s)

Raymond Erickson (DARMS)

Queens Univ., NY (open)

Tom Hall (DARMS)

A-R Editions, WI (proprietary)



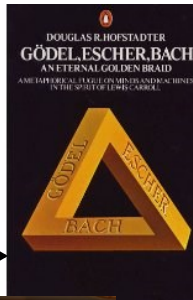
Michael Kassler (IML/MIR)

Princeton, 1970s

Don Byrd (2000s-*Nightingale*)

Princeton, 1980s

Indiana U., 1990s-present

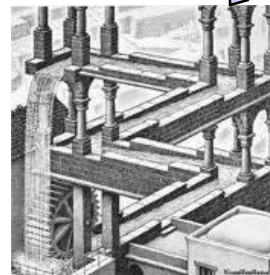


Don Byrd' music typesett

Doug Hofstadter's text
(1979)



Ray Erickson



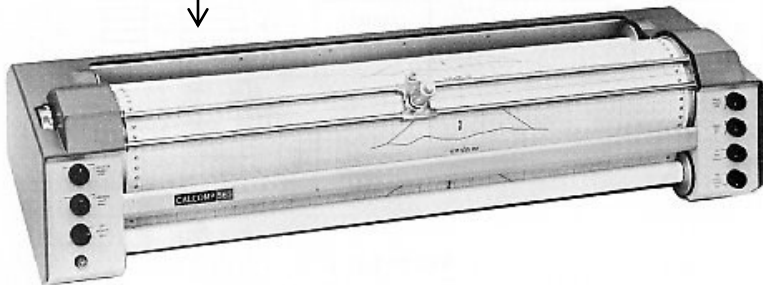
2. MIDI-assisted era (1985-2005)

Machine and hand input

- point and click palettes (graphic assembly with mouse)
- Many problems with MIDI timing resolution
- Cross-hatched systems (part MIDI, part hand)

Printing options kept changing

- 1970s: **plotters** (SCORE)
- 1980s: **dot-matrix** printers (MuseData) →
- 1990s: **laser** printers, PostScript
- 1985-2005: high-end **phototypesetting** shops



Conceptions from the phonograph

- Edison (from 1889, but not initially musical)
- Transcription tools (graphics)
- Recording horns (sound)
- Video capture
-



Edison's recording violin



Amberol (1877)



Synchronization (?)



Edison's Black Maria (1892-1910)

See <https://en.wikipedia.org/wiki/Kinetoscope#/media/File:Hapci-fr.gif>

Turntable for altering
light/shadow

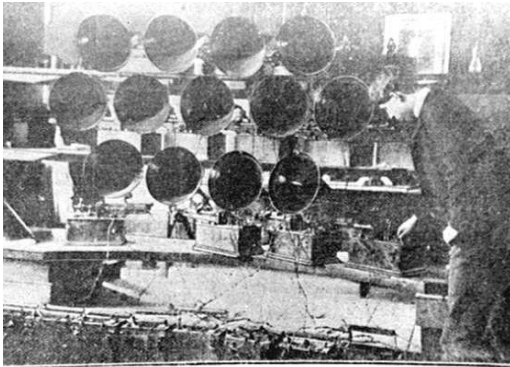
Films were “narrated” by
live music (piano, organ)
until 1930s

Film and audio were not
synchronized until *c.* 1946.

Edison recording studio (1905)

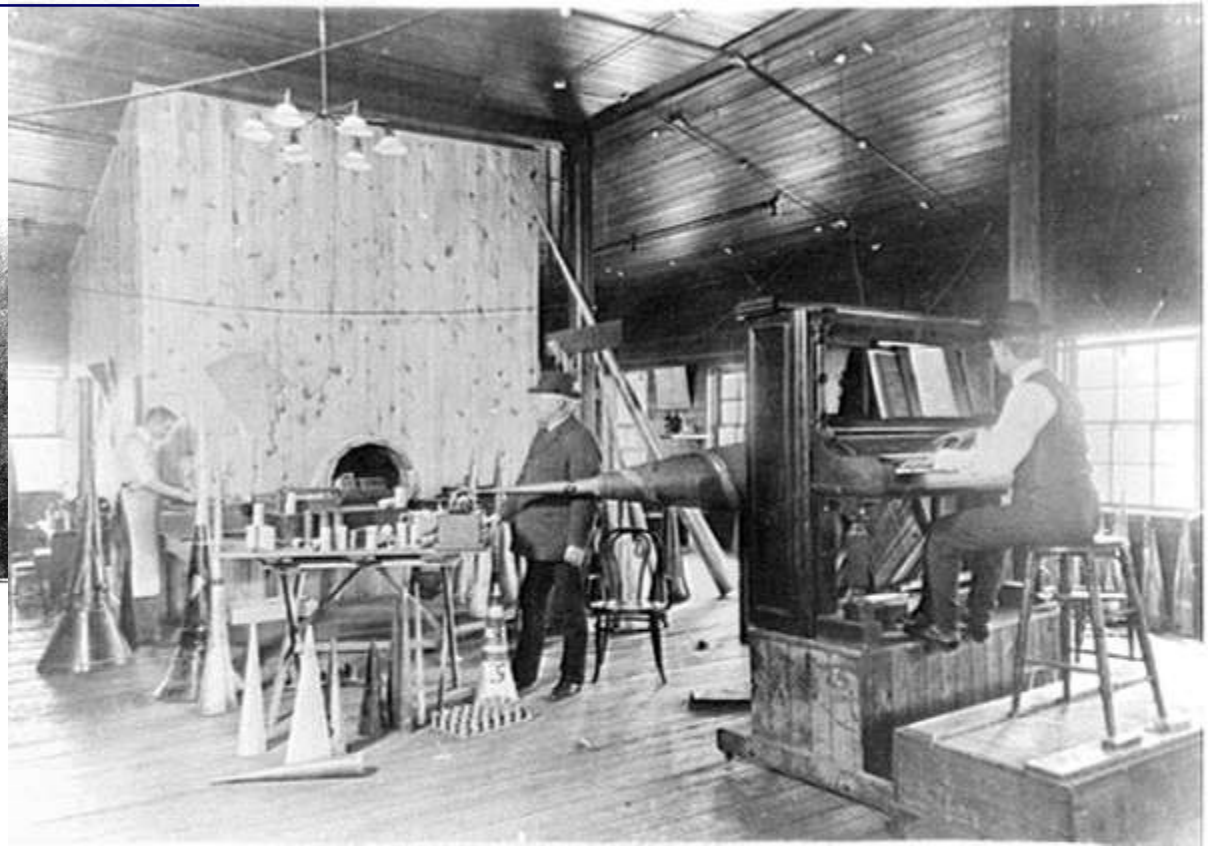
<http://www.tinfoil.com/record.htm>

West Orange, NJ

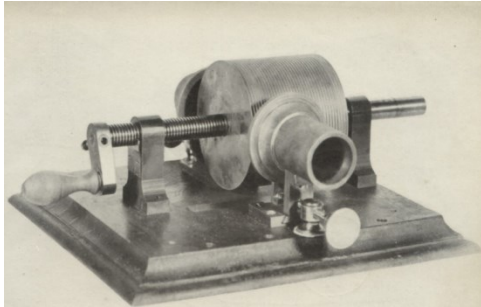


MAKING A BAND RECORD, WITH THIRTEEN RECORDING HORN.

Setup for band recording



Reproducing music: Early recording technology



Edison Amberol c. 1908

