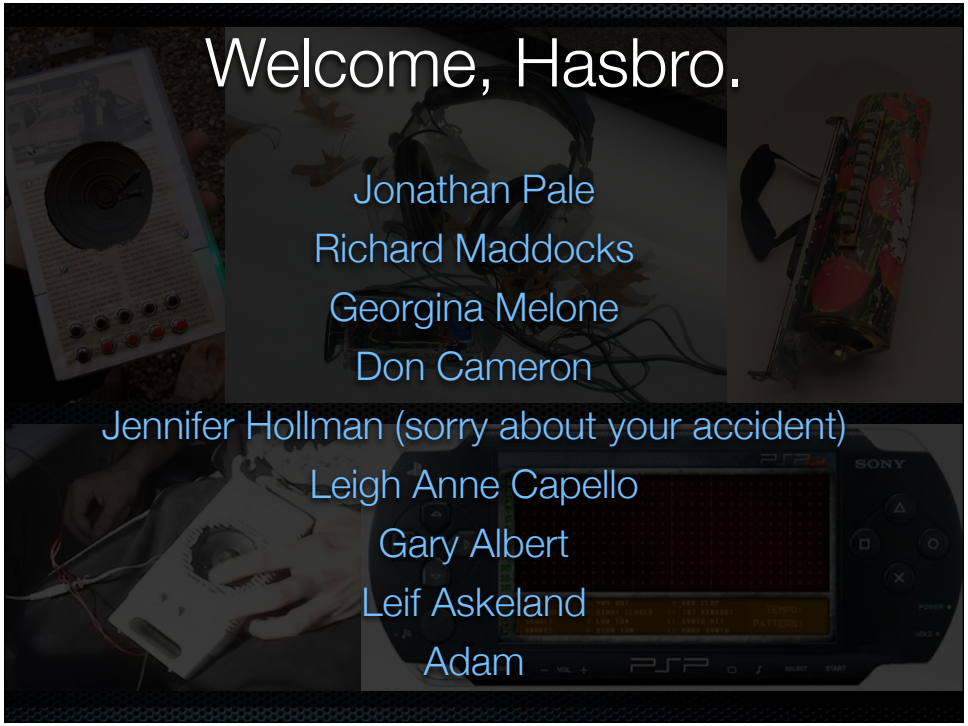
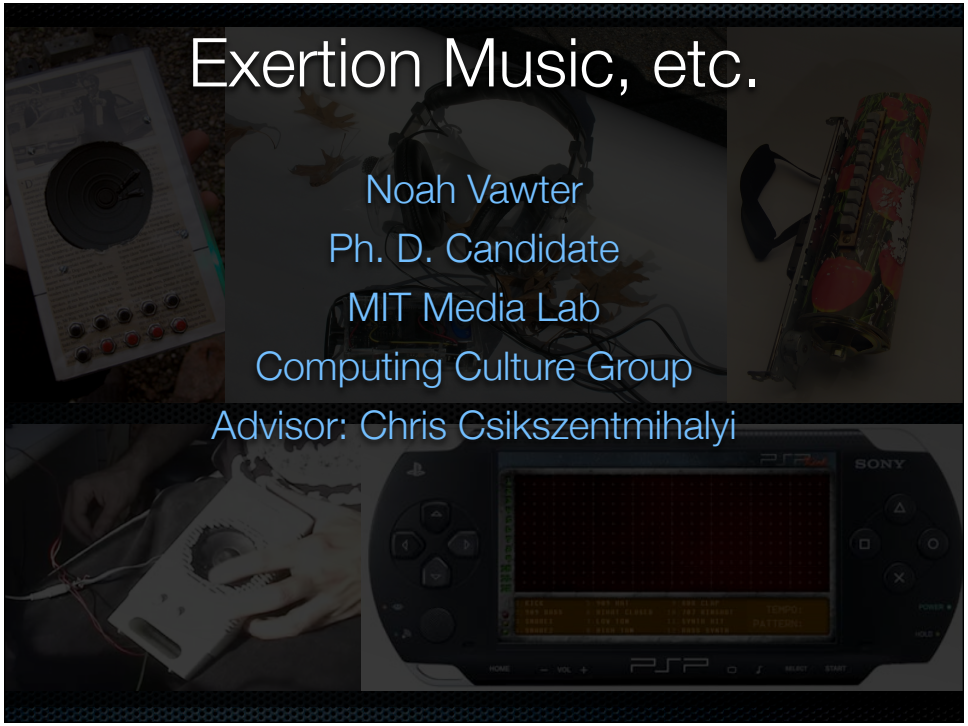

Welcome, Hasbro.
Jonathan Pale
Richard Maddocks
Georgina Melone
Don Cameron
Jennifer Hollman (sorry about your accident)
Leigh Anne Capello
Gary Albert
Leif Askeland
Adam


Exertion Music, etc.
Noah Vawter
Ph. D. Candidate
MIT Media Lab
Computing Culture Group
Advisor: Chris Csikszentmihalyi
SONY
PSP


SONY
TEMPO:
PATTERN:
HOME
VOL
SELECT
START
POWER
HOLD

Themes

- Immediate environment
- Electronic music instrument design
- Prototyping and group collaboration

Ambient Addition

Ambient Addition

Ambient Addition

Membrane

- Touch-sensitive loudspeakers
- Controlled Feedback (Beatles' I Feel Fine)

Membrane

- Touch-sensitive loudspeakers
- Controlled Feedback (Beatles' I Feel Fine)

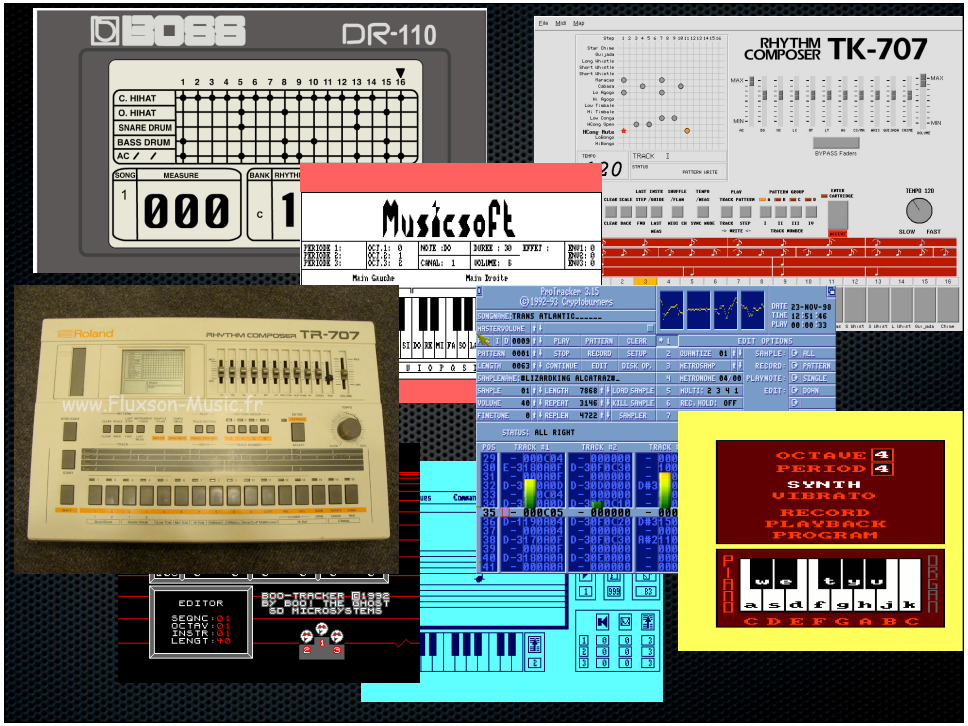
PSPKick :

A portable, unauthorized drum machine

Goals:

Make Portable Music

Create New, Collaborative Medium/Community


DR-110
C. HIHAT
O. HIHAT
SNARE DRUM
BASS DRUM
SONG
MEASURE
BANK
RHYTHM COMPOSER TK-707
Musicsoft
Main Gauche
Main Droite
Roland
RHYTHM COMPOSER TR-707
www.Fluxson-Music.fr
ProTracker 3.15
©1992-93 Cryptoburners
EDITOR
SEQNC:01
OCTAV:01
INSTR:01
LENGT:40
OCTAVE 4
PERIOD 4
SYNTH
VIBRATO
RECORD
PLAYBACK
PROGRAM
PIANO
a s d f g h j k
C D E F G A B C

About Hiking Viking

Originally started making music on a PSP in mid 2005 using a program called PSP Kick. Made about 7 albums worth of songs. Now in late 2008, I have decided to recreate the best of those songs using Logic Studio for Mac. Enjoy! I edited my profile with **Thomas' Myspace Editor V4.4**

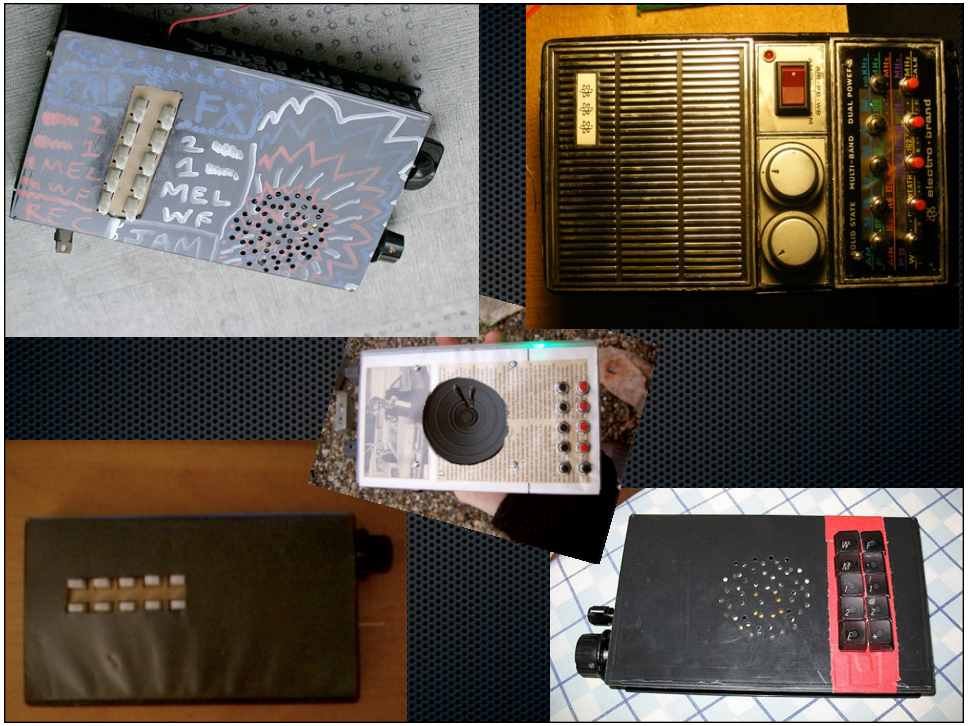
"Creative software like this amazing drum machine not only keep folks interested in your gear, but also help sell more units. So how about it Sony, wanna lay off the firmware updates designed to shut down homebrew apps?" -Roger Altizer

"BitBox"

a.k.a.

One-Bit Groovebox


THE


FX
2
1
MEL
WF
SOLID STATE
MULTI-BAND
DUAL POWER
electro-brand

"BitBox"

a.k.a.

One-Bit
Groovebox

Exertion Instruments

Motivation


LAPTOP PRODUCER
THE LAPTOP IS NO LONGER THE POOR RELATION TO THE DESKTOP MUSIC COMPUTER.

Motivation

Motivation

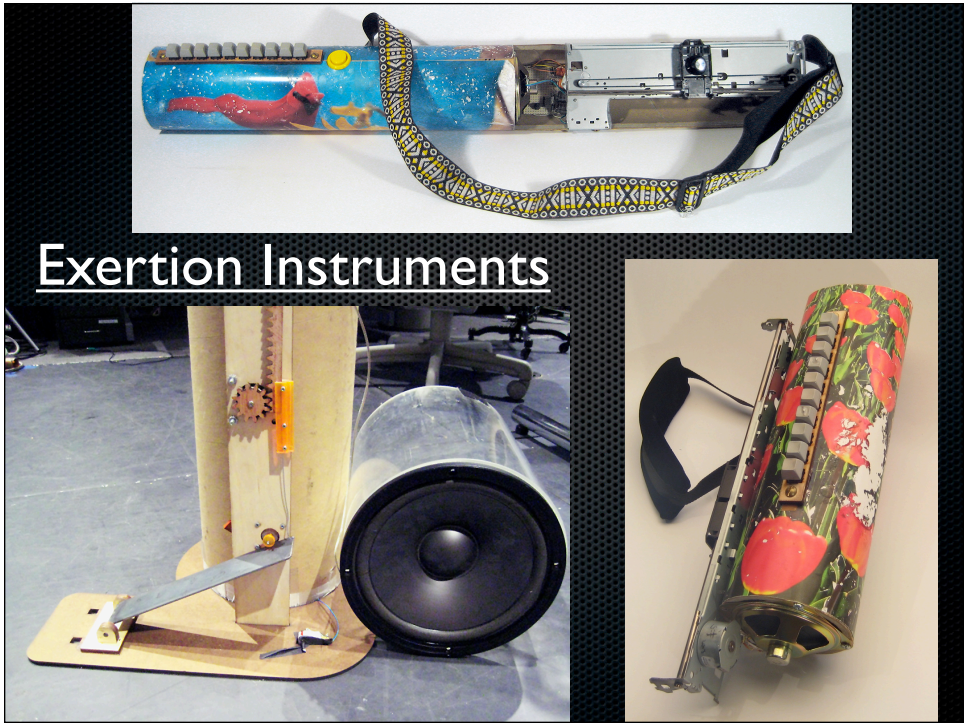
Motivation

Motivation

Motivation

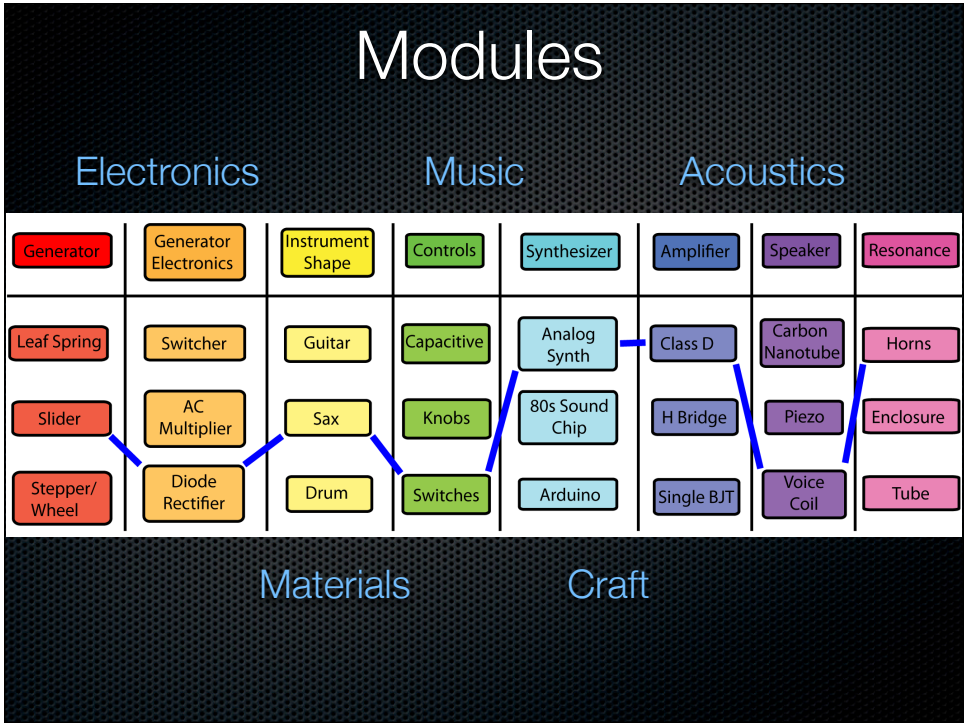
Motivation

Early Prototypes


Exertion Instruments

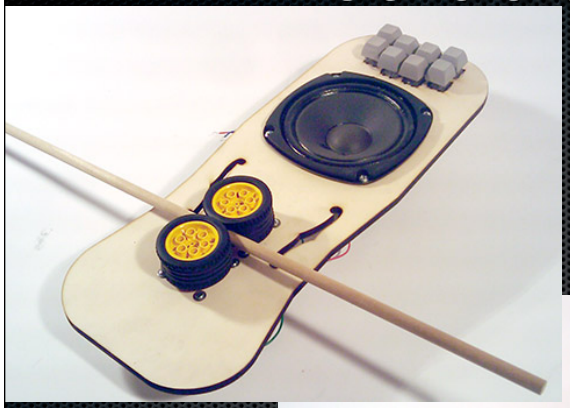
Exertion Instruments

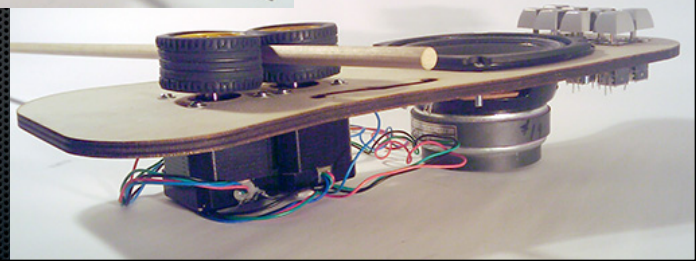
Modules


Electronics
Music
Acoustics
Generator
Generator Electronics
Instrument Shape
Controls
Synthesizer
Amplifier
Speaker
Resonance
Leaf Spring
Switcher
Guitar
Capacitive
Analog Synth
Class D
Carbon Nanotube
Horns
Slider
AC Multiplier
Sax
Knobs
80s Sound Chip
H Bridge
Piezo
Enclosure
Stepper/ Wheel
Diode Rectifier
Drum
Switches
Arduino
Single BJT
Voice Coil
Tube
Materials
Craft

Generators

Stick-Bowed

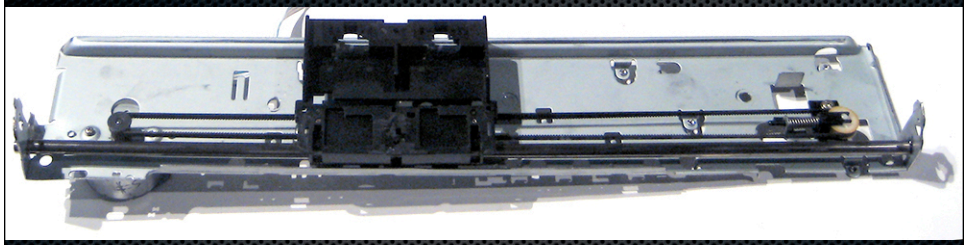




Generators

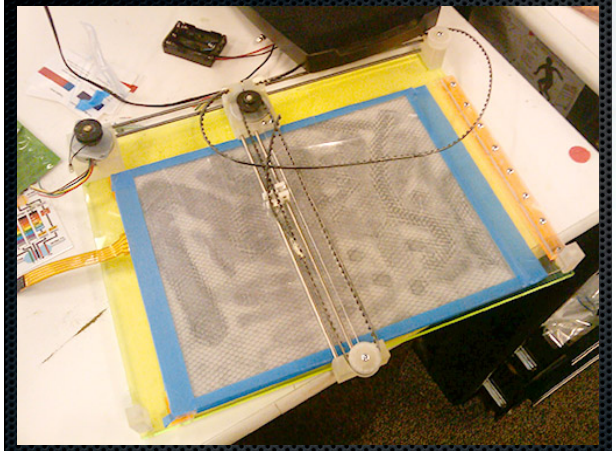
String-Bowed

Generators

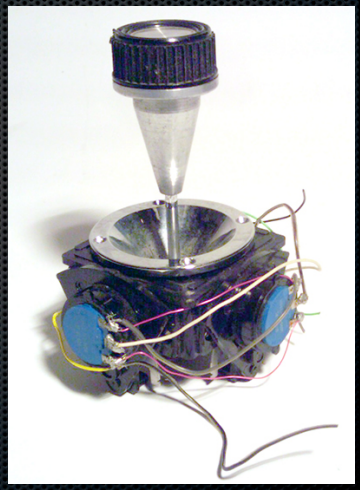


Slider

Generators: Future

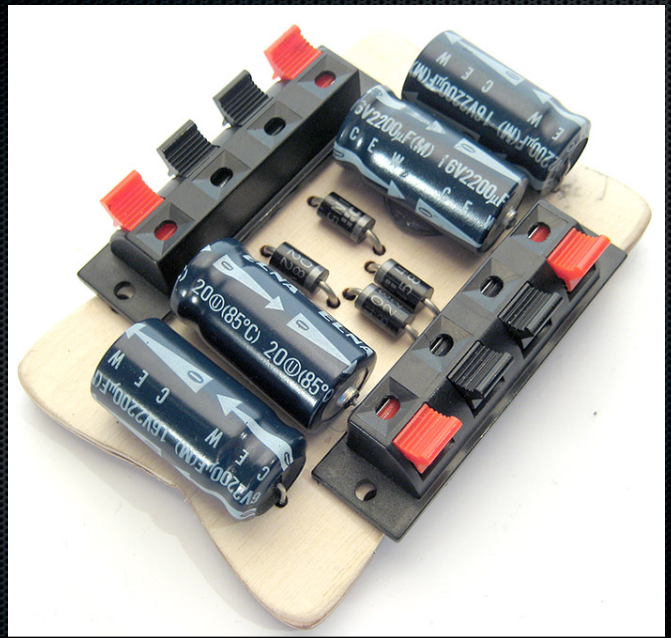


2D Gantry

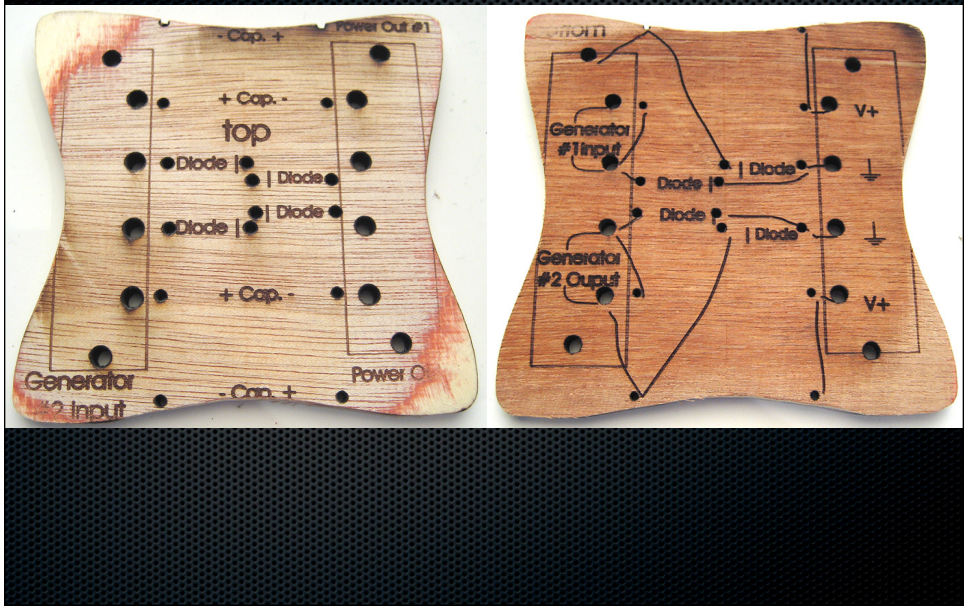


Joystick

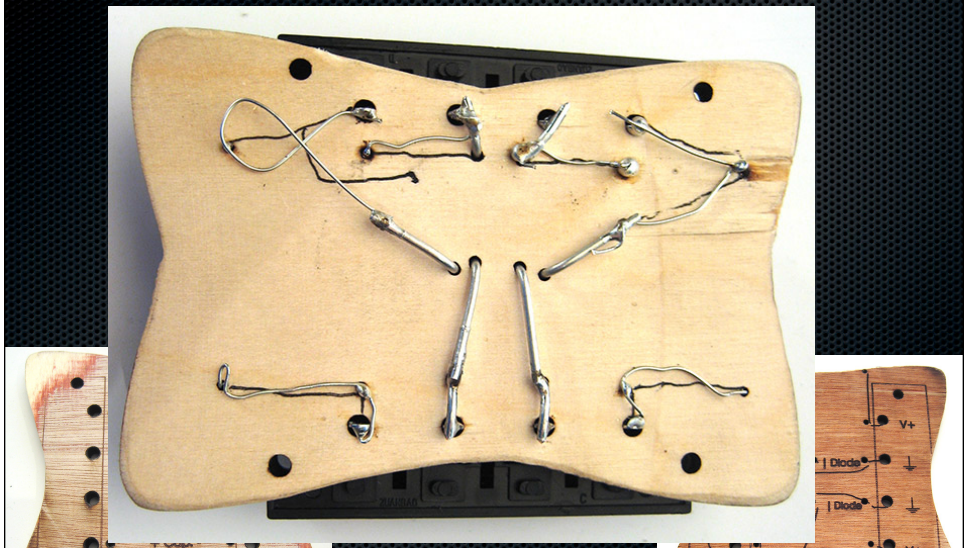
Rectifier



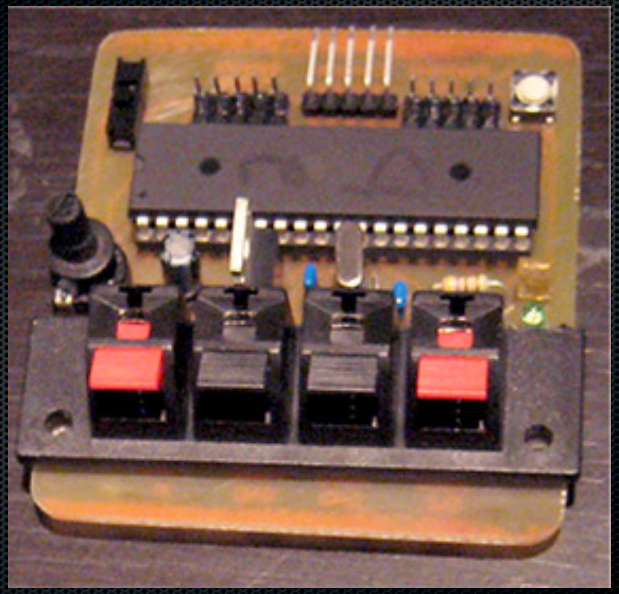
Rectifier


- Cap. +
Power Out #1
+ Cap. -
top
Diode
Diode
Diode
Diode
+ Cap. -
Generator
- Cap. +
Power O
V+
Generator
#Tinput
Diode
Diode
Diode
Diode
Generator
#2 Ouput
V+

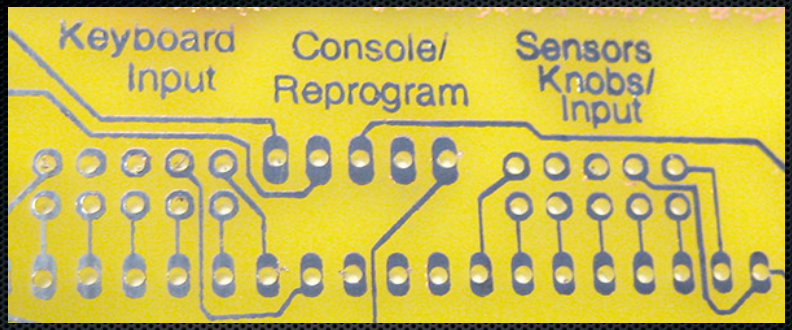
Rectifier

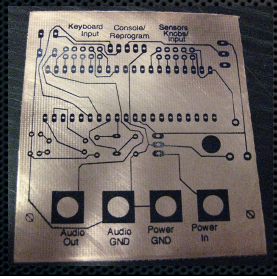


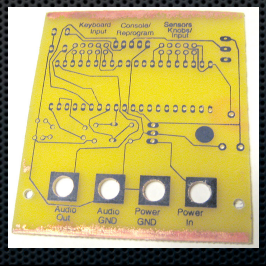
Synthesizers

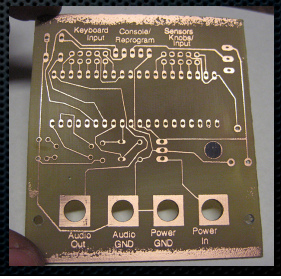


Synthesizers

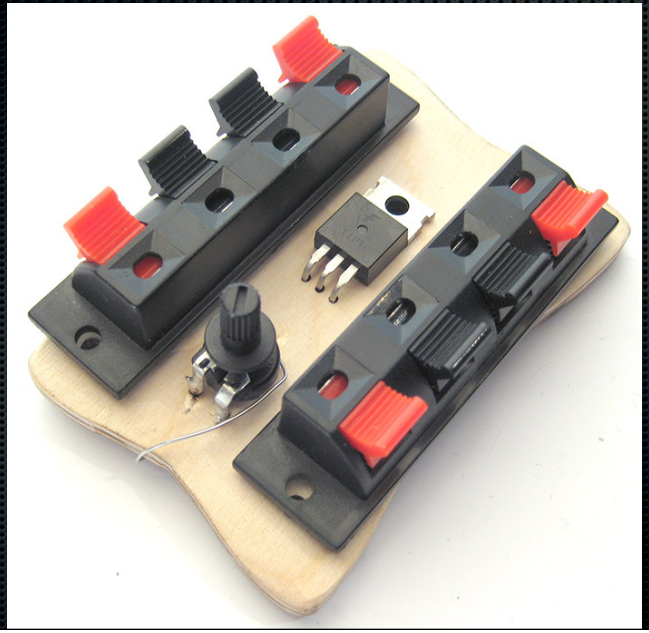




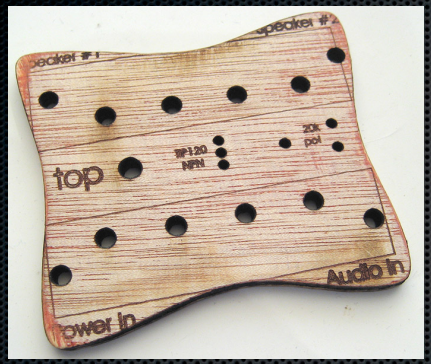


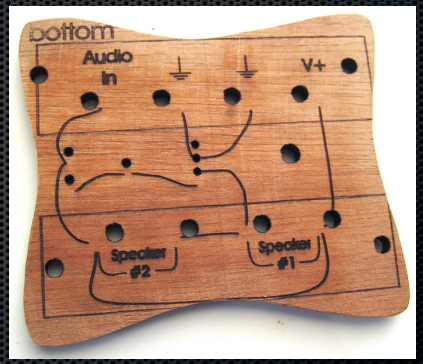


Amplifier

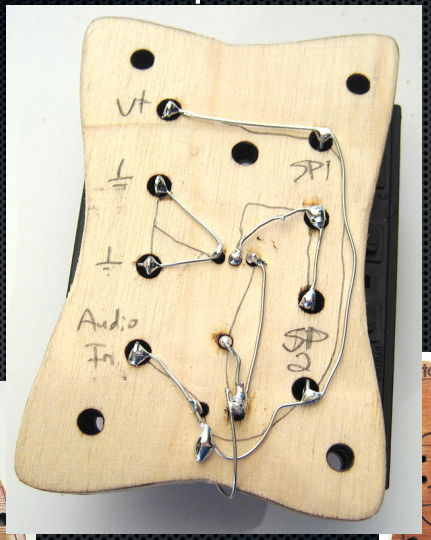


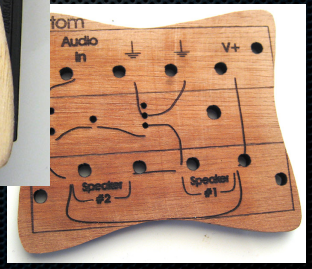
Modules


top
TIP120
NPN
20k
pot
Audio In

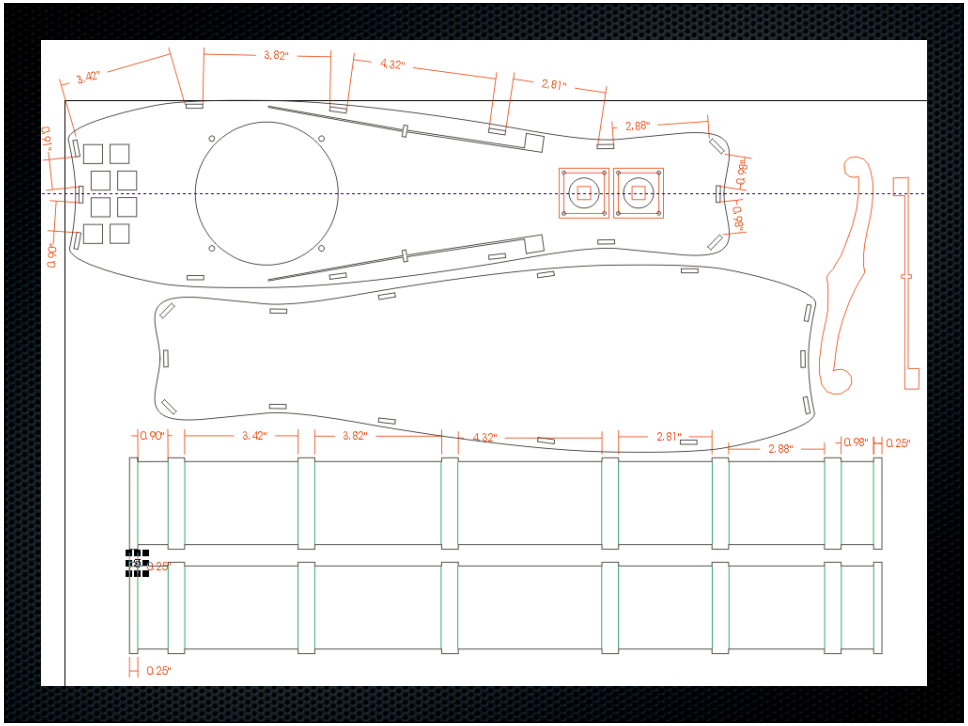

bottom
Audio
In
V+
Speaker
#2
Speaker
#1

Amplifier

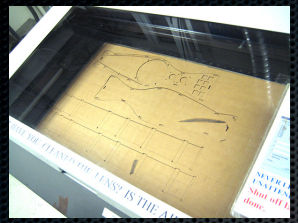


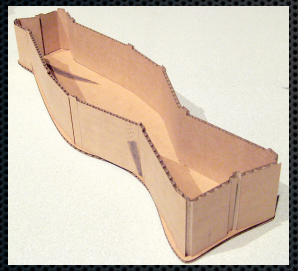


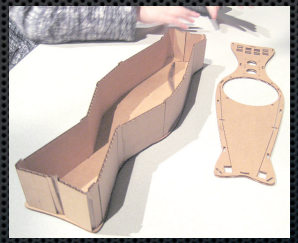
Resonators/Bodies

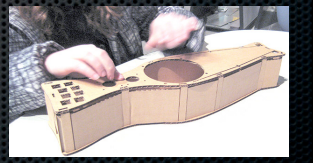

3.42"
3.82"
4.32"
2.81"
2.88"
0.90"
0.98"
0.25"

Resonators

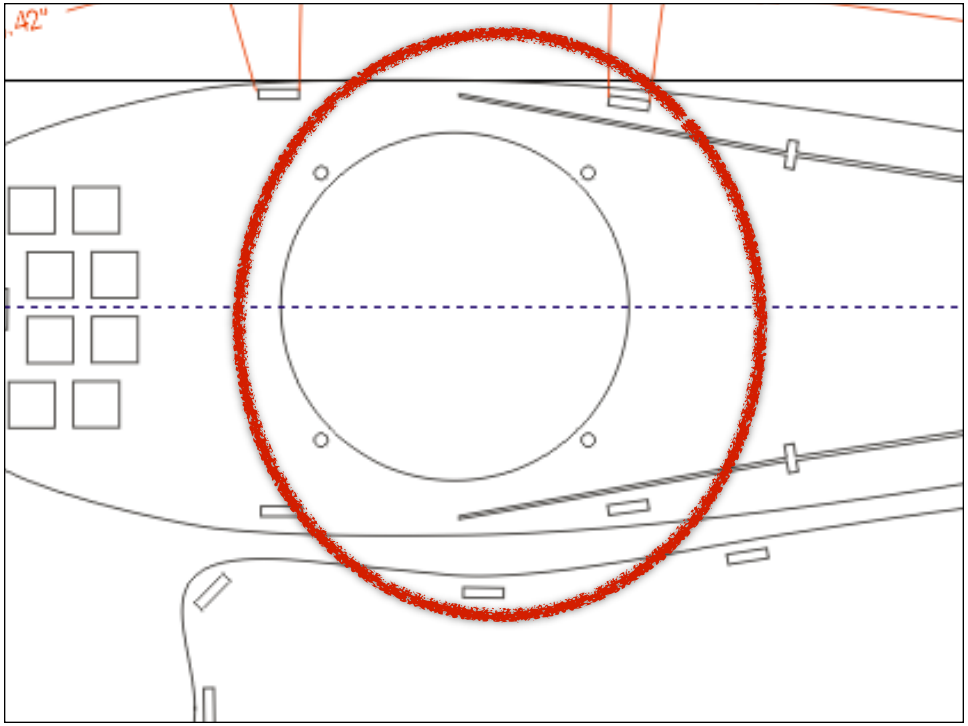








Resonators/Bodies


.42"

Fs=44100Hz
speed of sound= 346.75 m/s
Tube len: 1m
Tube diameter: 10cm

Oscillator fundamental frequency:
44100/608 = 72.5329

Frequency of low D: 73.4Hz

Predicted samples (error < 1%)
44100/73.4 = 600.8174

Calculated resonance frequency of tube:
346.75/(4*(1+.06)) = 81.78066 Hz

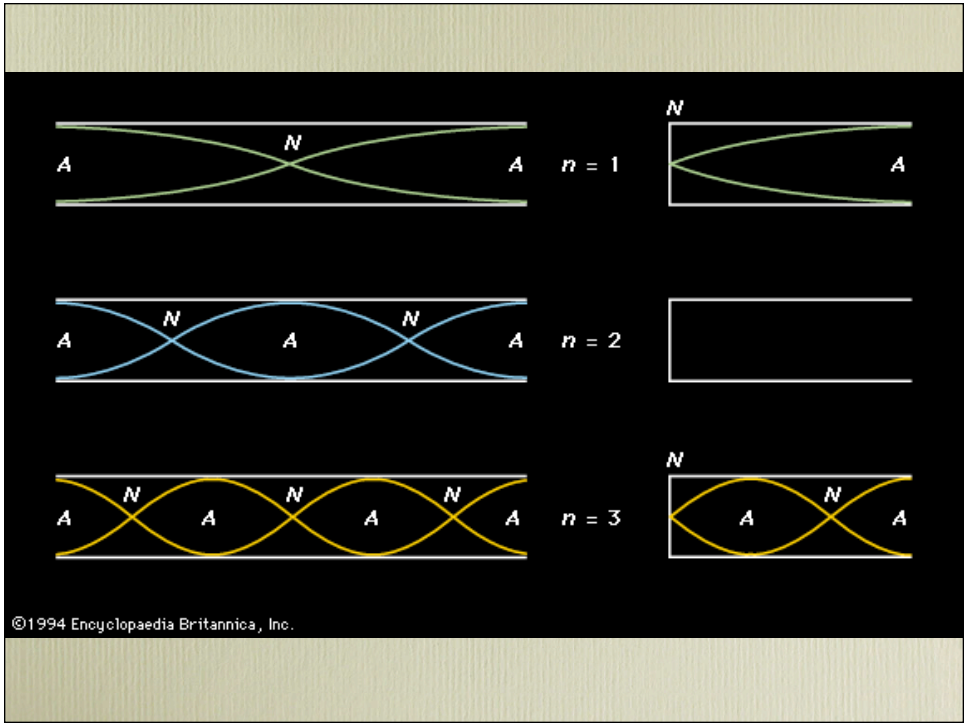
Near match for Osc. Fundamental (11% Higher)
100*(81.78-73.4)/73.4

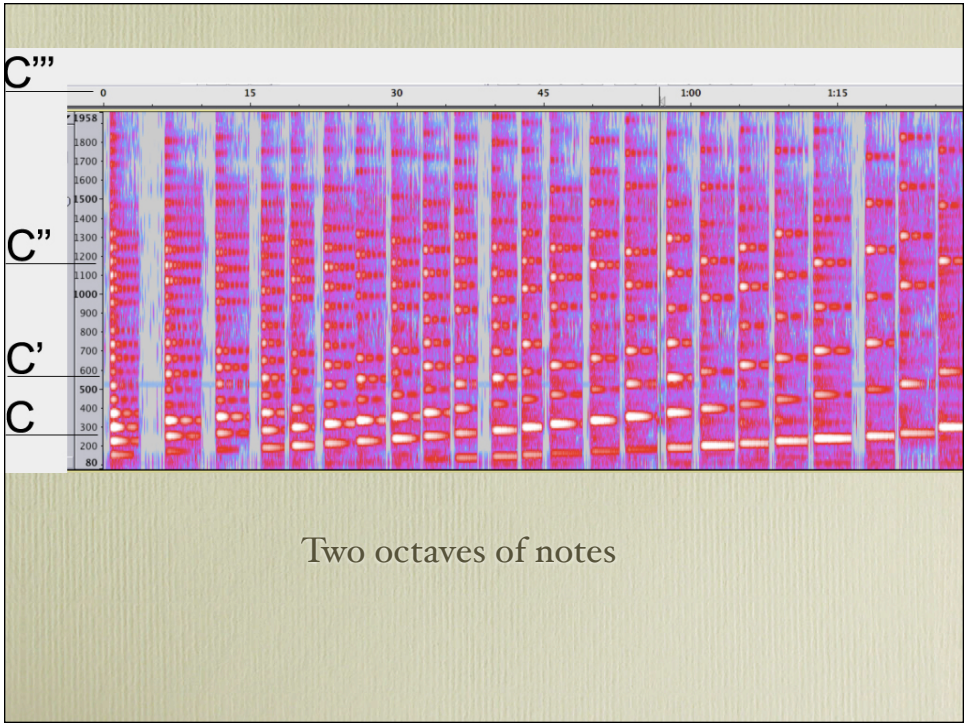
Predicted resonance note (E)
12*log(81.78/73.4)/log(2) = 1.87 = D+ 187 cents

Synthesizer Fs=11.111kHz

Frequency of updating Duty Cycle
11111/400 = 27.7775Hz

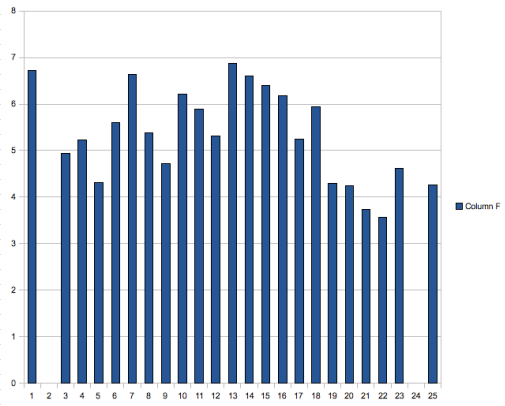
Number of steps in Full Duty cycle traversal:
65536/200 = 327.68 steps


A
N
A
n = 1
N
A
A
N
N
A
n = 2
N
A
N
N
A
n = 3
N
A
N
A
©1994 Encyclopaedia Britannica, Inc.



Two octaves of notes

	A	B	C	D	E	F
1	D-2	17488	0.4	4406.1	0.07	6.72
2			0	0	0	
3	E-2	12873	0.29	3243.35	0.05	4.95
4	F-2	13612	0.31	3429.54	0.05	5.23
5	F#2	11205	0.25	2823.1	0.04	4.31
6	G-2	14579	0.33	3673.18	0.06	5.6
7	G#2	17281	0.39	4353.95	0.07	6.64
8	A-2	13976	0.32	3521.25	0.05	5.37
9	A#2	12270	0.28	3091.43	0.05	4.72
10	B-2	16177	0.37	4075.8	0.06	6.22
11	C-3	15309	0.35	3857.1	0.06	5.89
12	C#3	13826	0.31	3483.46	0.05	5.32
13	D-3	17877	0.41	4504.11	0.07	6.87
14	D#3	17192	0.39	4331.53	0.07	6.61
15	E-3	16660	0.38	4197.49	0.06	6.4
16	F-3	16051	0.36	4044.05	0.06	6.17
17	F#3	13655	0.31	3440.38	0.05	5.25
18	G-3	15454	0.35	3893.64	0.06	5.94
19	G#3	11182	0.25	2817.31	0.04	4.3
20	A-3	11030	0.25	2779.01	0.04	4.24
21	A#3	9737	0.22	2453.24	0.04	3.74
22	B-3	9281	0.21	2338.35	0.04	3.57
23	C-4	12000	0.27	3023.4	0.05	4.61
24						0
25	D-4	11068	0.25	2788.58	0.04	4.26
26						
27	Fs	44100	seconds	phase	phase	% duty cycle
28					65536	
29			Fs2	11111		



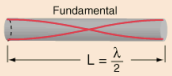
Open Air Column Frequency

At temperature 25 C = 77 F,

the speed of sound is 346.75 m/s = 1137.631 ft/s = 775.6576 mi/hr.

An open cylindrical air column 0f length L = 1 m = ft

will produce a fundamental frequency:



$f_1 = \frac{v_{sound}}{2L} = 173.375$ Hz

In actual practice, the position of the antinode is slightly outside the open end, and an end correction of about 0.6 times the radius of the pipe should be added to each end to get the effective acoustic length.

Discussion of open column | Calculation for closed column

Closed Cylinder Frequency

At temperature T = 25 C

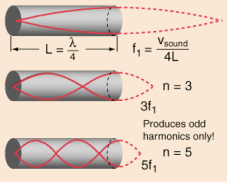
T = 77 F,

the speed of sound is v= 346.75 m/s

v = 1137.631 ft/s = 775.6576 mi/hr.

A closed cylindrical air column 0f length L = 1 m = ft

will produce a fundamental frequency:

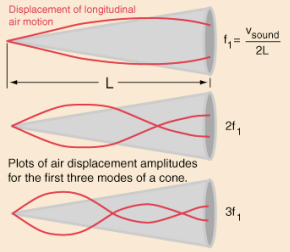


$f_1 = \frac{v_{sound}}{4L} = 86.6875$ Hz

Conical Air Column

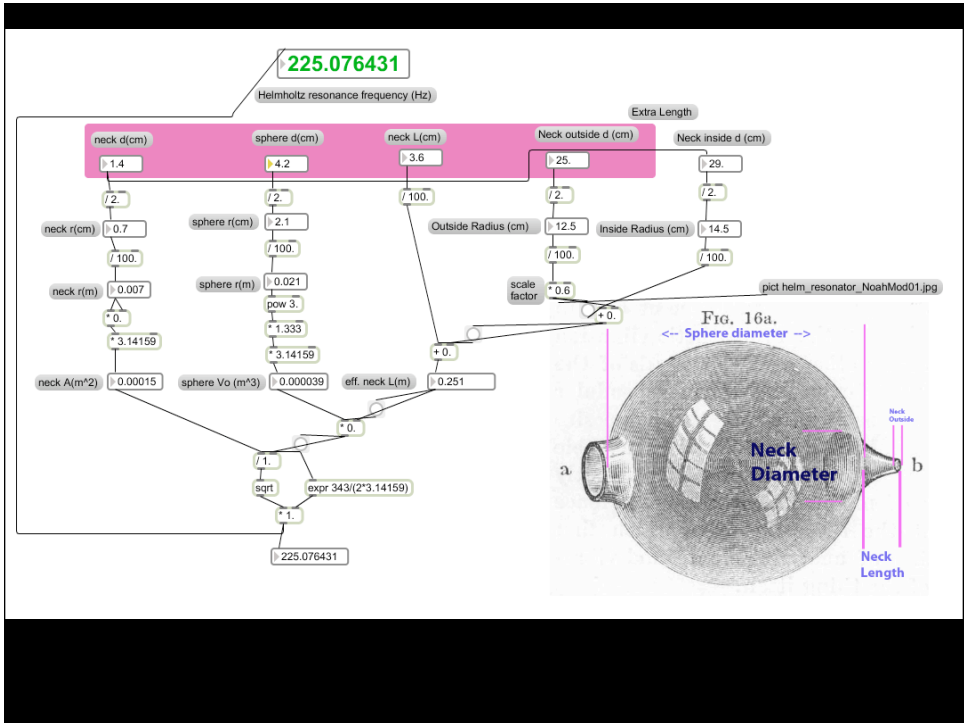
A conical air column will produce the same fundamental frequency as an open cylinder of the same length and will also produce all harmonics.

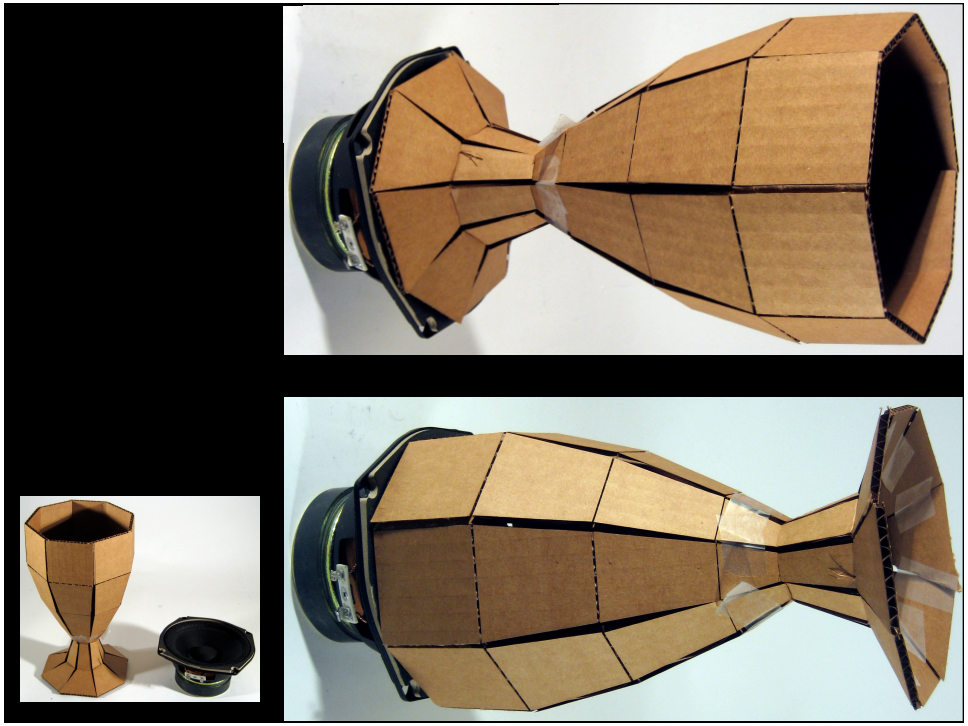
Conical air columns are employed in several of the woodwind musical instruments: oboe, bassoon, saxophone, and others.

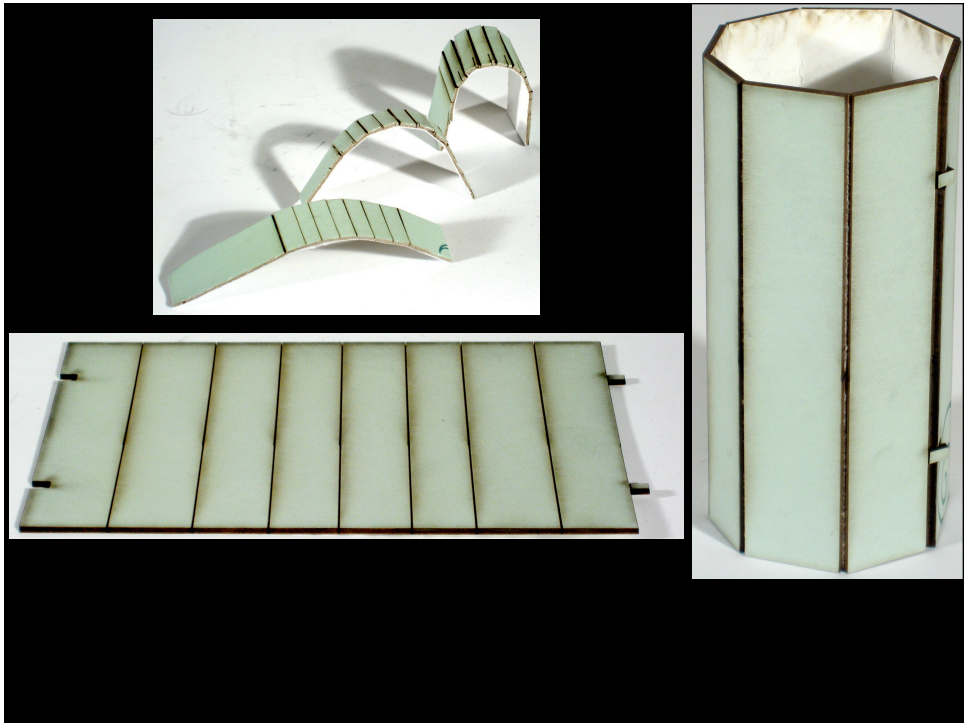


Plots of air displacement amplitudes for the first three modes of a cone.

Comparison of air columns


225.076431
Helmholtz resonance frequency (Hz)
Extra Length
neck d(cm)
1.4
sphere d(cm)
4.2
neck L(cm)
3.6
Neck outside d (cm)
25.
Neck inside d (cm)
29.
/ 2.
/ 100.
neck r(cm)
0.7
sphere r(cm)
2.1
Outside Radius (cm)
12.5
Inside Radius (cm)
14.5
neck r(m)
0.007
sphere r(m)
0.021
scale factor
* 0.6
pict helm_resonator_NoahMod01.jpg
* 0.
pow 3.
* 1.333
* 3.14159
+ 0.
neck A(m^2)
0.00015
sphere Vo (m^3)
0.000039
eff. neck L(m)
0.251
/ 1.
sqrt
expr 343/(2*3.14159)
FIG. 16a.
<-- Sphere diameter -->
Neck Diameter
Neck Outside
Neck Length
a
b



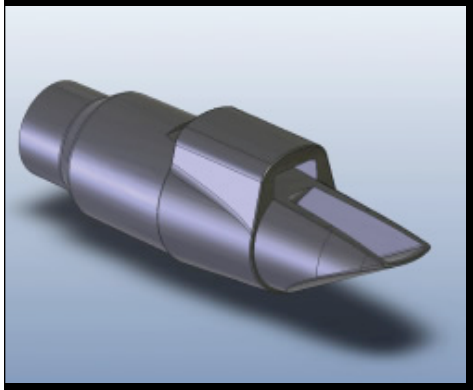


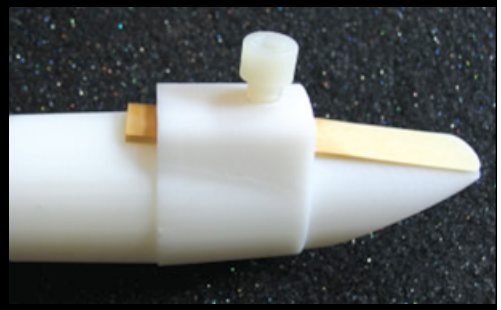
Cajon, Daxophone, Electrophones

What Instruments are evolving now?

Clarflupet

Clarflupet



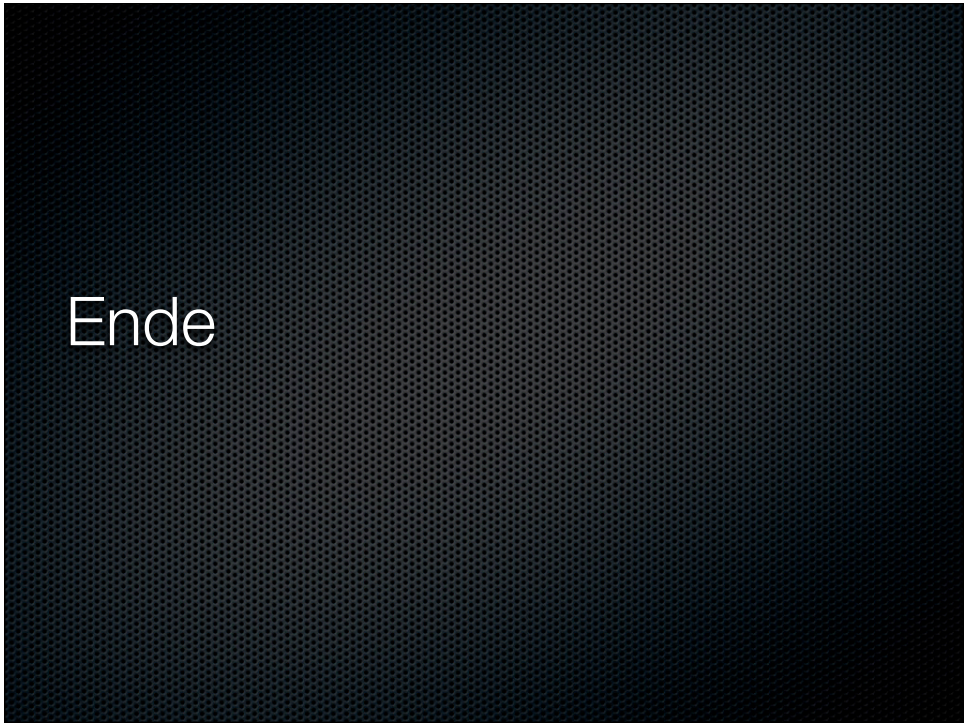


Conclusions

✤ Electronic music instrument design and practice can be rich and participatory.

✤ Rapid prototyping and group collaboration have huge potential.

✤ Surrounding environment/context is of utmost importance in music.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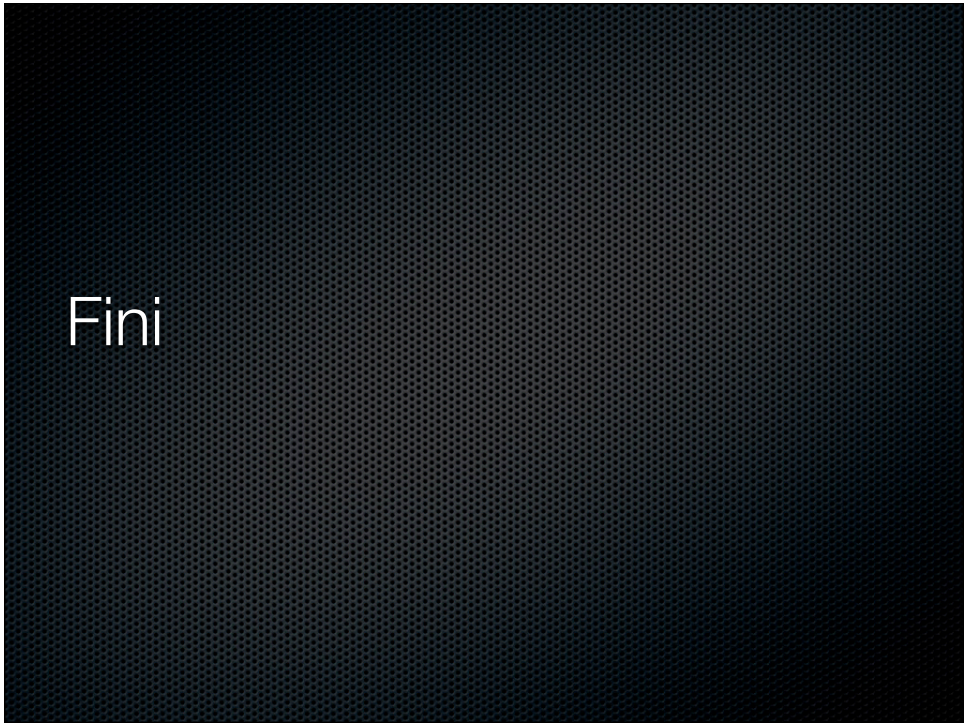
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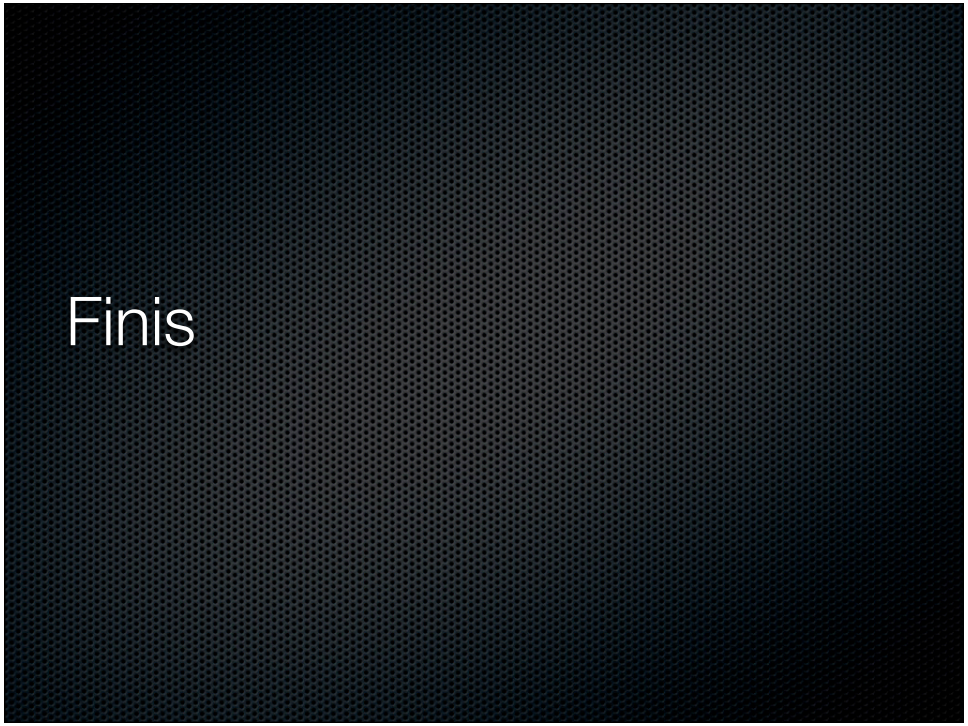
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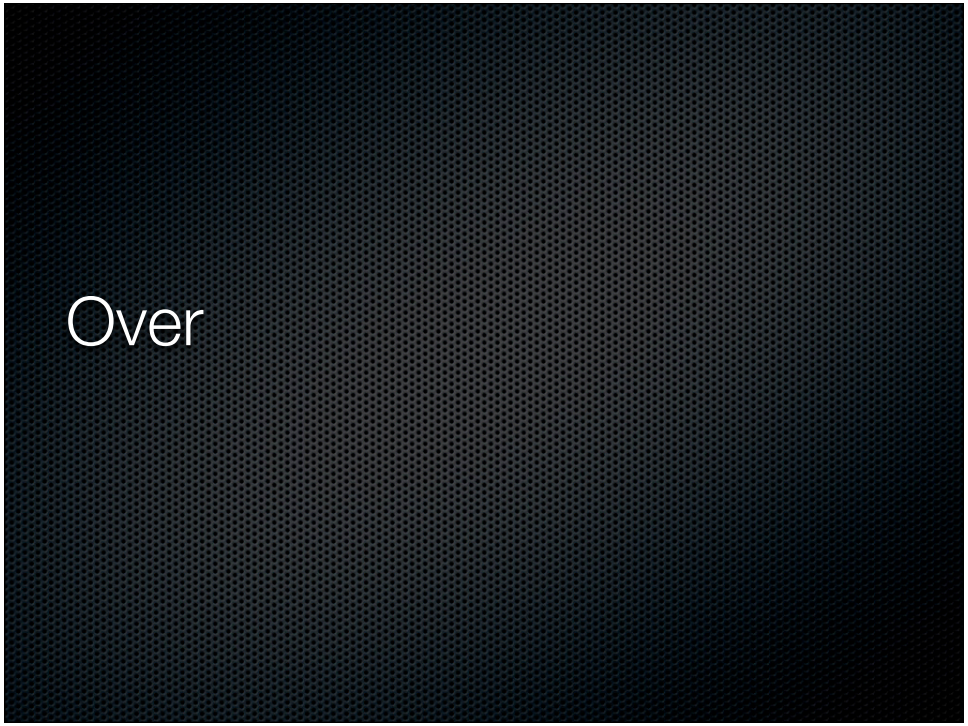
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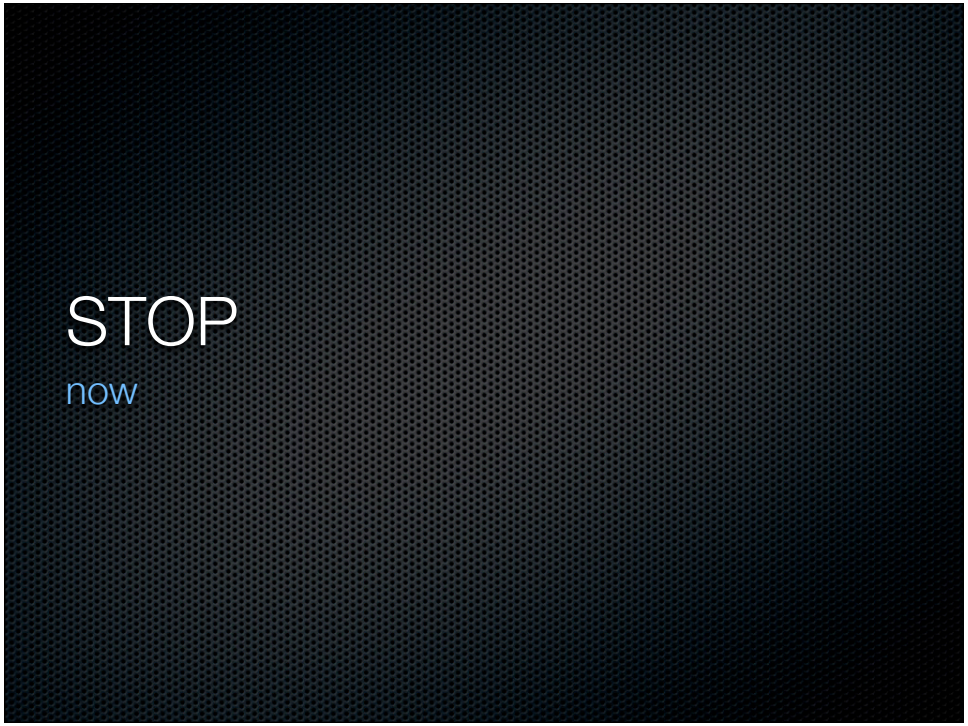
STOP
now

Engineering

Birdcalls

The Persistence of Musical Instruments

- Musical Instrument Design
- Parks
- Performances
- Plays
- Game Shows
- Hollywood Squares
- Tiawanese Game Shows

Wandering Music

Troubadours, Hobos