



SIGGRAPH2015
Xroads of Discovery

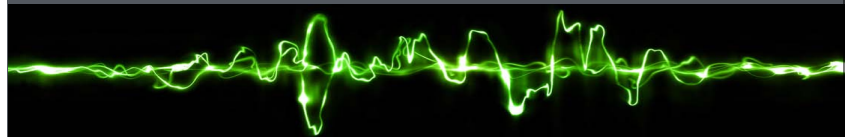
The 42nd International Conference and Exhibition
on Computer Graphics and Interactive Techniques



THE
UNIVERSITY
OF UTAH

A Noise-Based Curriculum for Technological Fluency

Erik Brunvand
University of Utah



General Education

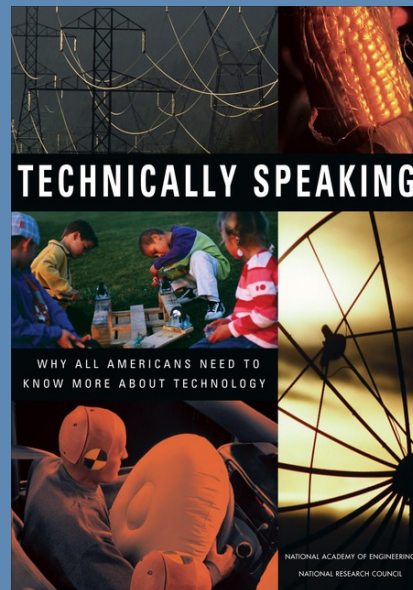
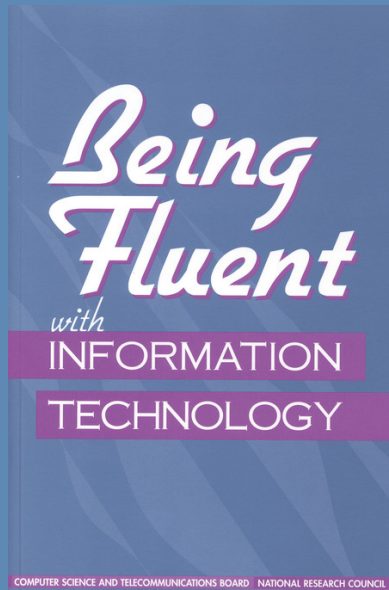


- At the University of Utah: Three of four “intellectual exploration” areas
 - Humanities
 - Fine Arts
 - Social & Behavioral Science
 - Applied Science

What about technology?
Engineering problem solving?
Technological fluency?
Computational thinking?



Technological Fluency



Technological Fluency

- Technological *literacy*
 - Implies only basic knowledge of the subject
 - A skills-based idea
- Technological *fluency*
 - Enables manipulation of the medium
 - The ability to handle unintended and unexpected problems



Technology Focus

“Electronic technology is pervasive in our modern world but how it actually works can be a mystery to many people. In this class students will explore the fundamentals of electronic technology with a goal of increasing their technological fluency.”



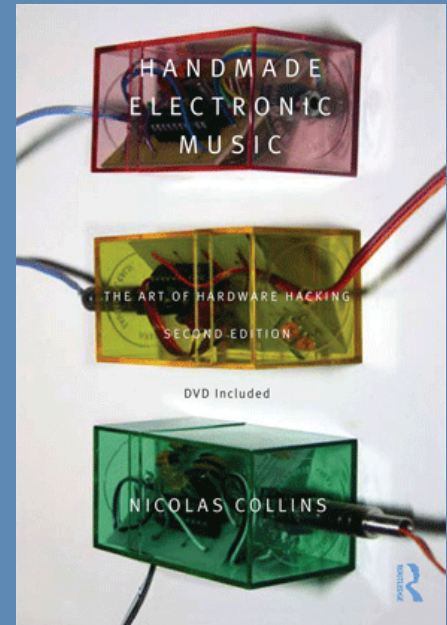
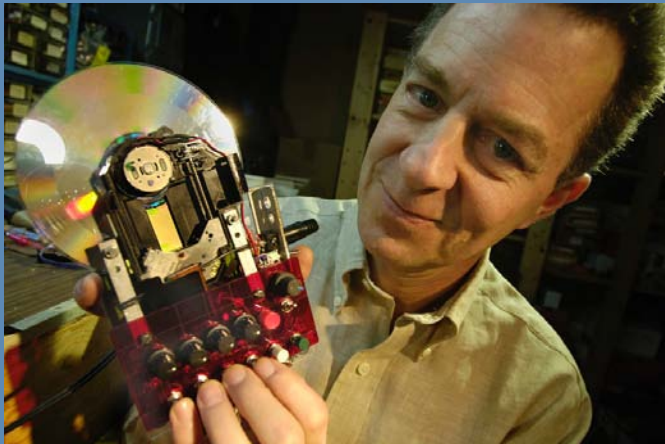
But Not an “Engineering” Course

“Through hands-on labs and projects students will gain a fundamental understanding of how electronic things work and what are their capabilities and limitations. This will be explored in the context of making art and noise with electronic components, some of which will be built from scratch, and some of which will be discovered from existing cast-off or broken devices.”



Textbook

- Handmade Electronic Music
- Nicolas Collins



- Reading assignments
- Listening assignments
- Projects
 - Induction coil recordings
 - Arduino sound
 - Toy hacking
 - Oscillators
- Final project

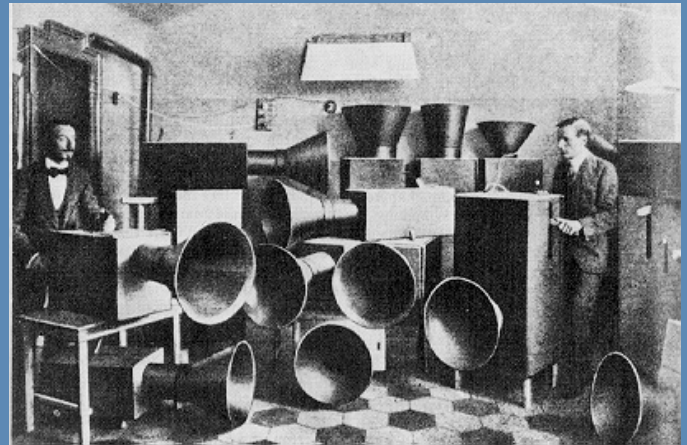
Curriculum



Readings / Context

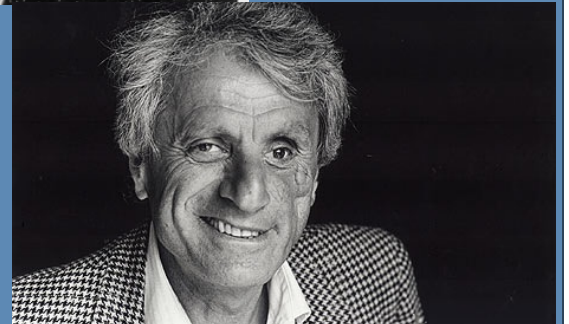
- Experimental and electronic music
- Precursor to contemporary Sound-Art

Russolo - The Art of Noises
Varèse - The Liberation of Sound
Cage - The Future of Music - Credo
Ussachevsky - Music in a Tape Medium
Stockhausen - Advice to Clever Children
Harley - The Electroacoustic Music of
Iannis Xanakis



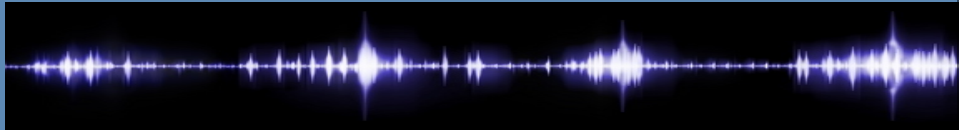
Intonarumori

Readings / Context



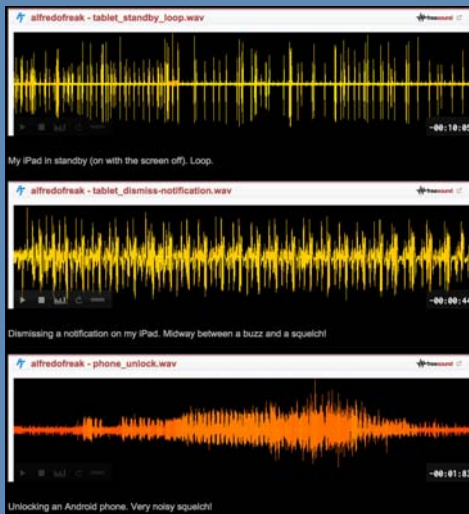
Listening (Ear Training)

- From 100 Exercises in Listening and Sound-Making by R. Murray Shafer, Arcana Editions, 1992
 - Listen to sound/noise around you
 - Practice listening/hearing from a critical perspective
- Examples:
 - Take 10 min and write down all the sounds you hear
 - Find a pitched sound in your environment, hum that pitch, walk around the block, what happens?
 - Bring an interesting sound to class
 - Make lists of old sounds and new sounds



Project: Inductive Coil Recordings

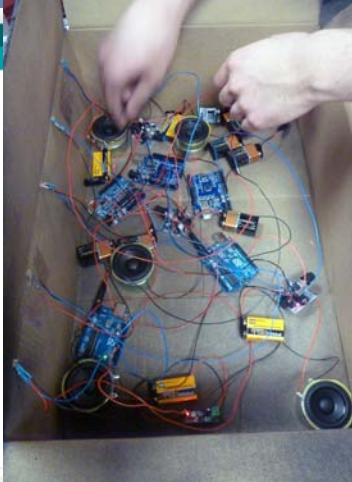
Use inductive coil to record EM noise in your environment



Project: Arduino Sound

Simple programmed sound using Arduino "tone" library

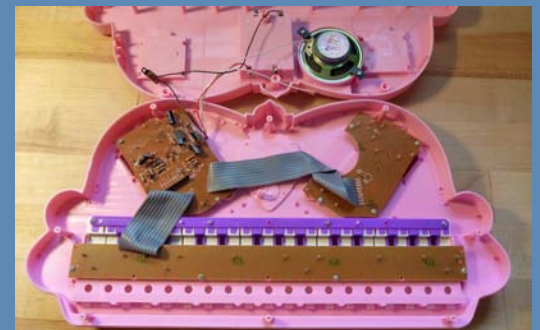
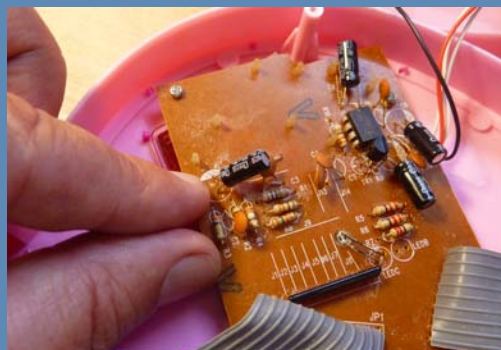
```
SimpleTone1 | Arduino 1.6.3  
SimpleTone1 | pitches.h  
/* VERY simple tone program */  
#include "pitches.h"  
int speakerPin = 9; // attach the speaker to pin 9  
  
void setup(){  
  pinMode(speakerPin, OUTPUT); // Make speakerPin an output  
}  
  
void loop(){  
  tone(speakerPin, NOTE_A4); // tone fires up an A4  
  delay(1000); // play it for 1 sec  
  noTone(speakerPin); // stop the tone  
  delay(300); // "play" some silence  
  tone(speakerPin, NOTE_B4); // play another tone  
  delay(1000);  
  tone(speakerPin, NOTE_C3);  
  delay(500);  
  tone(speakerPin, NOTE_C5);  
  delay(2000);  
  tone(speakerPin, NOTE_D3);  
  delay(1000);  
}
```



Project: Circuit Bending

Creatively hacking and re-purposing (upcycling) electronics in the service of making sound

Hardware Hacking
vs.
Circuit Bending



Project: Circuit Bending

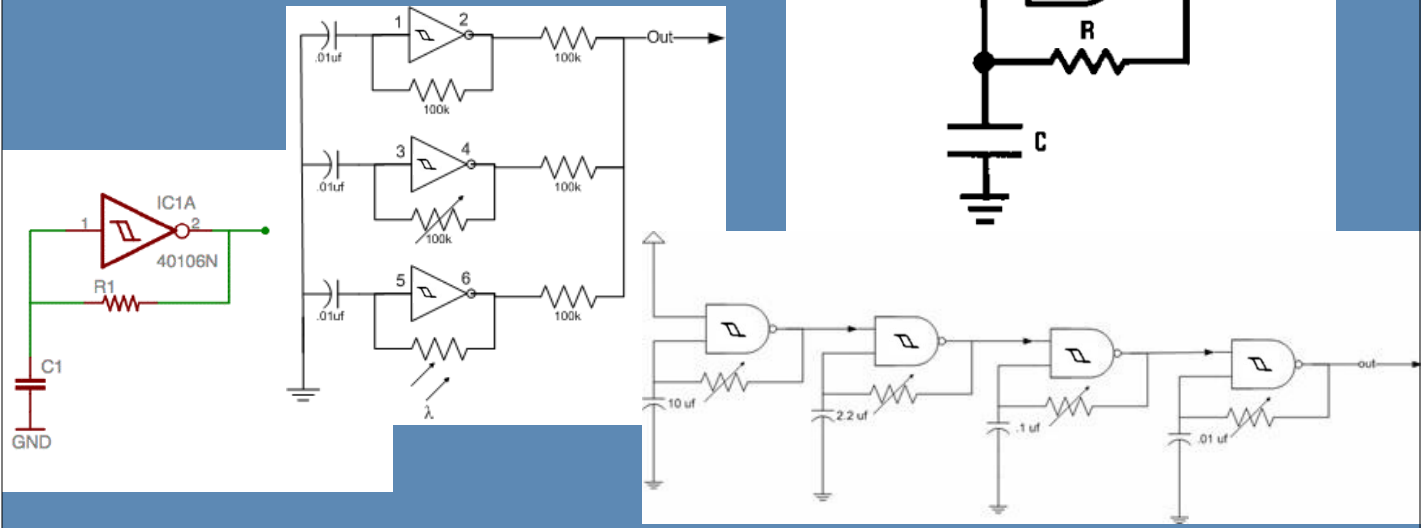


Project: Circuit Bending



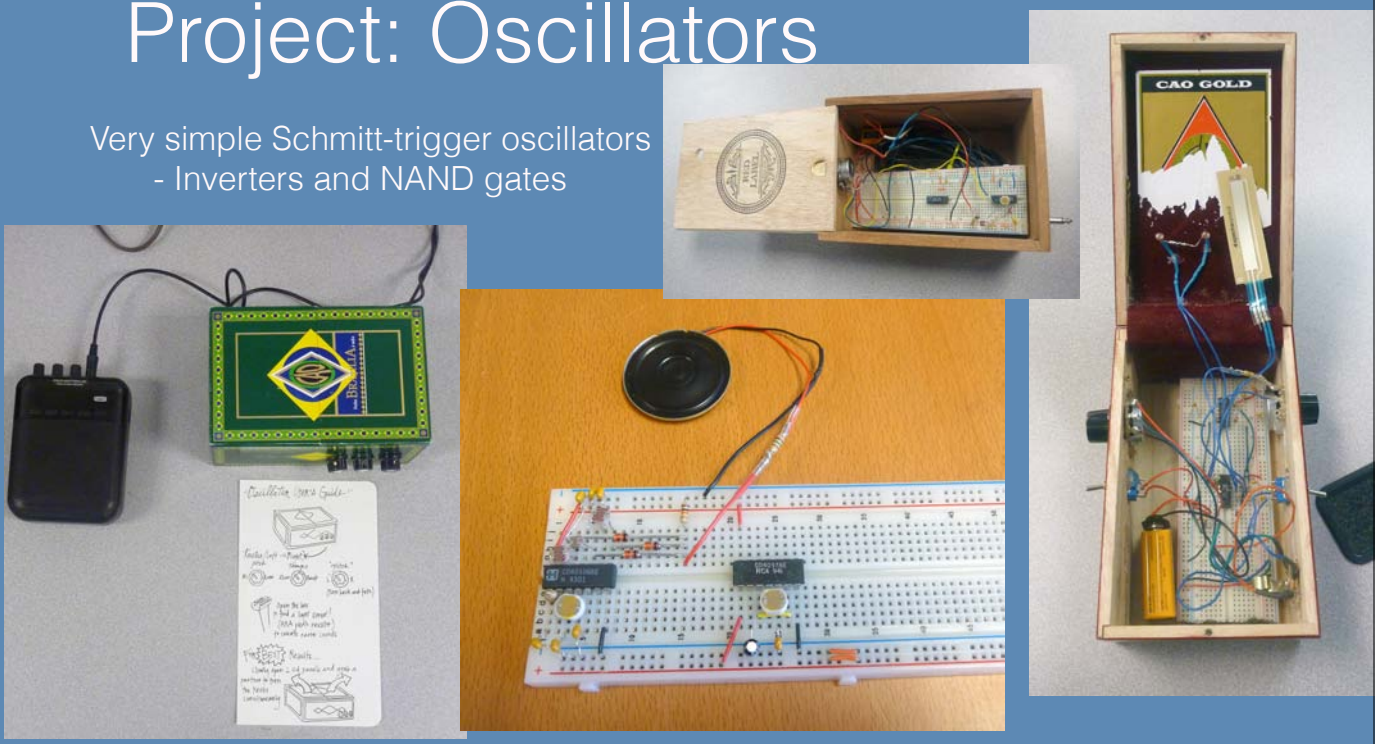
Project: Oscillators

Very simple Schmitt-trigger oscillators
- Inverters and NAND gates



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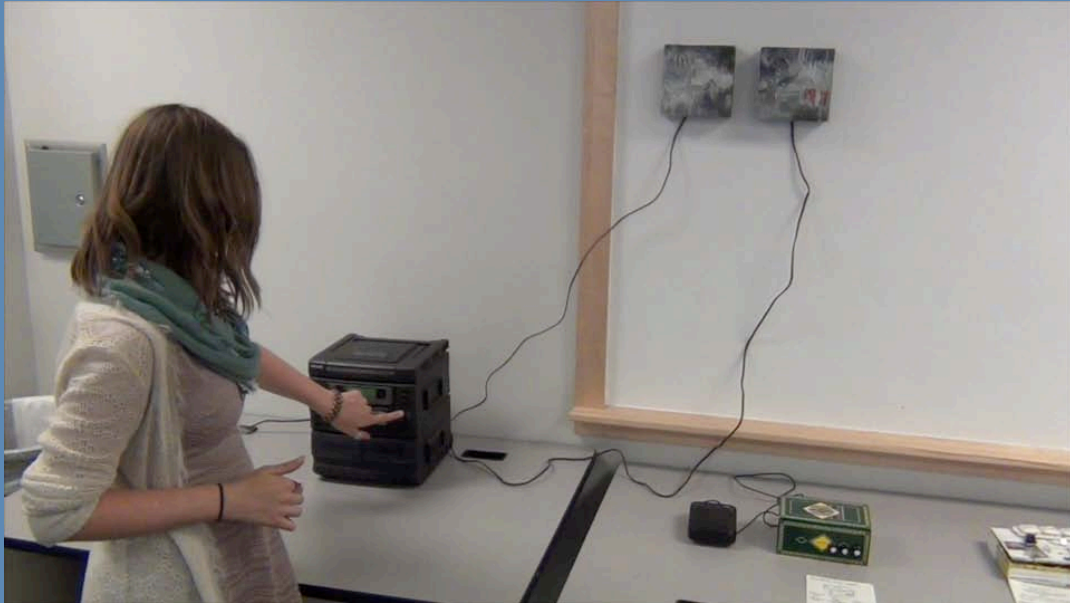


Final Project: Sound Art

Chosen/proposed by each student — Use “raw material” from previous projects



Final Project: Sound Art



Final Project: Sound Art



Final Project: Sound Art



Conclusions

An attempt to design a new **general education** course that promotes **technological fluency**

Through the lens of Sound-Art and Digital Media

Readings and listening for context, projects for raw materials (and learning opportunities), final project for synthesis

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