

Circuit Bending, Hardware Hacking, Performance Technology

History and curation



Richard Hoadley
2014
v0.02

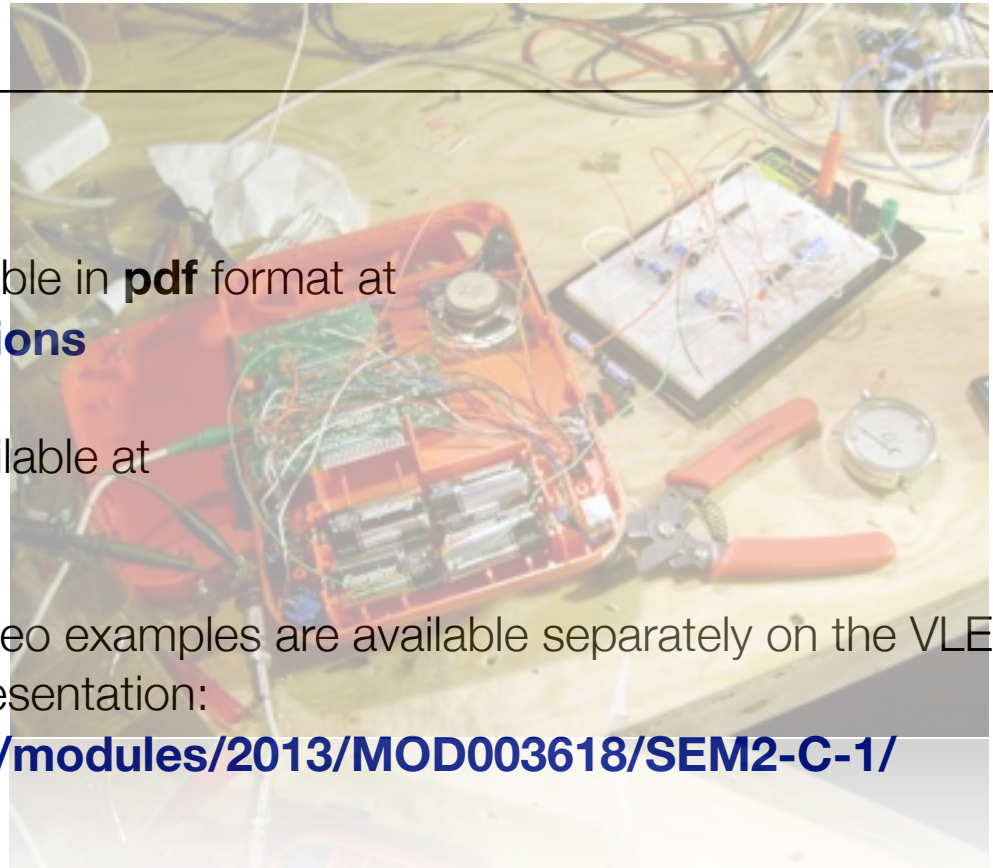
Note

This presentation is available in **pdf** format at
rheadley.net/presentations

Further information is available at
rheadley.net/cbhh

Most of the audio and video examples are available separately on the VLE implementation of this presentation:

<https://vle.anglia.ac.uk/modules/2013/MOD003618/SEM2-C-1/Pages/Home3.aspx/>



Technology has always been an integral part of music: unlike many other art forms, music is entirely formed by our interaction with other, physical entities, even if those entities are our own bodies.

Feature about Daft Punk Get Lucky on
BBC Radio 4, Broadcasting House, 21st
July 2013 (7:24)

Most current pop music is created not with live instruments, but from pre-formed, off the shelf chunks of music known as loops. Musician Matthew Herbert explores the art of the loop and the million-dollar industry that has grown up around it, and asks whether it is setting music makers free from the constraints of traditional instruments or killing creativity.

Loops are pre-recorded performances, typically of a solo instrument, and typically 1 or 2 bars long. Looping isn't new - it started soon after the advent of tape recorders. But recent advances in computer technology and software mean that effects which once needed a full-scale studio costing thousands of pounds can be created for little or no cost on a laptop or even a mobile phone. A CD of loops costing £10 can be used to make a million-selling international hit, but who is the real composer?

Matthew once made an entire album from the sounds of a single pig's life, so he's no stranger to the benefits of loops and sampling. He talks to producers, musicians and loop-creators and experiments with technology ancient and modern; he hears from looping's defenders and detractors and looks into a musical future which he finds fascinating but many find terrifying.

And, along the way, he builds a dance track out of a Radio 4 Continuity announcer.

http://www.bbc.co.uk/iplayer/episode/b03wgpyg/The_Art_of_the_Loop/

Musician and songwriter Midge Ure looks at the many ways scientific and technological innovation have stimulated creativity in pop music.

From the invention of the steel guitar string, through the tape recorder and the synthesiser, to the drum machine and Autotune, musicians have always embraced the latest ideas and adapted or distorted them to produce new sounds.

Musicians Anne Dudley (Art of Noise) and Thomas Dolby join music journalist David Hepworth and blues researcher Tom Attah, exploring how the laboratory has informed and inspired the studio.

Midge demonstrates what you can achieve with just a laptop these days - but laments the passing of an age of invention in popular music.

[http://www.bbc.co.uk/iplayer/episode/
b01pgnbm/
The_Forum_The_Real_and_the_Virtual/](http://www.bbc.co.uk/iplayer/episode/b01pgnbm/The_Forum_The_Real_and_the_Virtual/)

Digital technology has given us a new realm to operate in, but is the border between the real and the virtual becoming increasingly blurred? And what's the role of maths in helping us to make sense of things, both real and virtual?

In this episode of the ideas discussion programme, Bridget Kendall brings together three people whose work takes them close to the dividing line of the tangible and intangible worlds. From Jerusalem, the Israeli digital innovator Eyal Gever uses 3D imaging software to create stunning models of simulated catastrophes, from Boston the American professor Robert Kaplan explores the way that maths gives expression to virtual ideas, and in the studio the British ceramicist Edmund de Waal describes his love of hand-crafted, physical objects and how they connect people through time.

[http://www.bbc.co.uk/iplayer/episode/b0229pbp/
Mechanical_Marvels_Clockwork_Dreams/](http://www.bbc.co.uk/iplayer/episode/b0229pbp/Mechanical_Marvels_Clockwork_Dreams/)

(swan at 44:00)



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Early musical examples

Scriabin - colour organ, included in
Prometheus: Poem of Fire (1910)

Attempted realisation:

[http://www.youtube.com/watch?
v=V3B7uQ5K0IU](http://www.youtube.com/watch?v=V3B7uQ5K0IU)

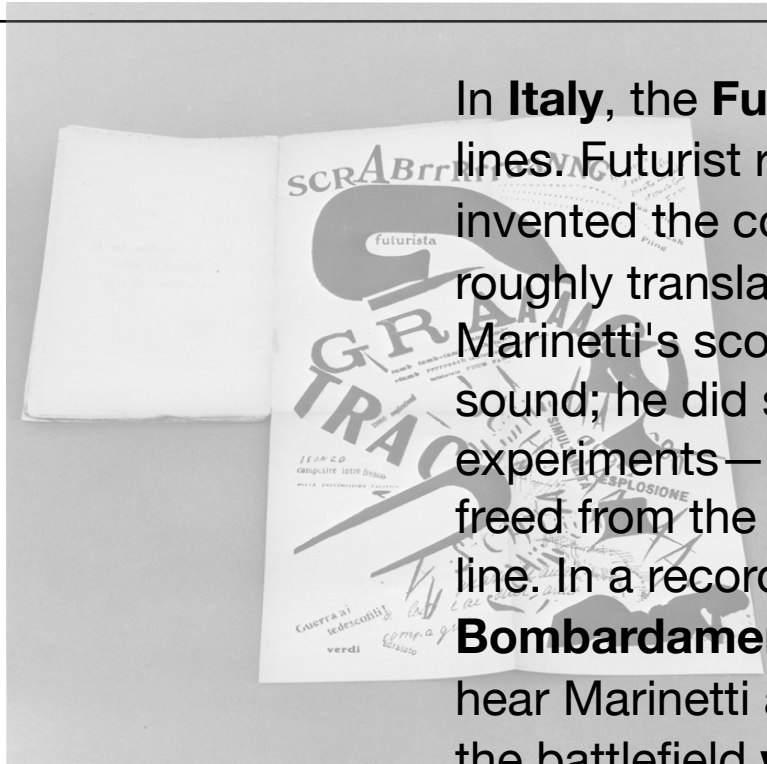
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Subtitle

Pamela Kurstin - theremin

**[http://www.ted.com/talks/
pamela_kurstin_plays_the_theremin.ht
ml](http://www.ted.com/talks/pamela_kurstin_plays_the_theremin.html)**

F.T. Marinetti **The Battle of Adrianopole** (1926)



In **Italy**, the **Futurists** were working along similar lines. Futurist ringleader **F.T. Marinetti** (1876-1944) invented the concept of **Parole in Liberta**, which roughly translates into **words in freedom**.

Marinetti's scope included the page as well as the sound; he did some of the first typographical experiments—words floating around on the page, freed from the ‘tyranny’ of the paragraph, stanza, or line. In a recording of his most famous poem,

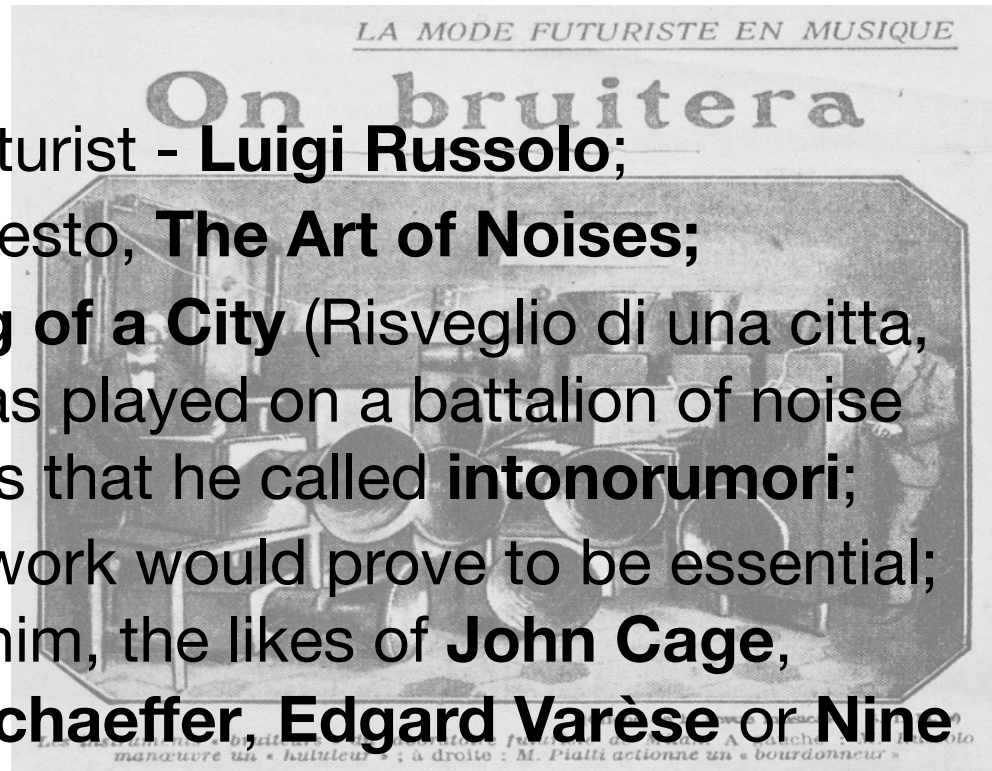
Bombardamento di Adrianapoli, (1926) we can hear Marinetti actually **performing the sounds** of the battlefield **with his mouth**: machine guns rattle and canons boom. The **score** for the piece, from which Marinetti reads, is a **stunning graphic work**, with letters of different sizes flying around the page. *Click to play and stop sound example*

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Luigi Russolo **The Art of Noises - Awakening of A City** (1913-14)

Another Futurist - **Luigi Russolo**;
1913 manifesto, **The Art of Noises**;
Awakening of a City (Risveglio di una città,
1914) was played on a battalion of noise
machines that he called **intonorumori**;
Russolo's work would prove to be essential;
without him, the likes of **John Cage**,
Pierre Schaeffer, **Edgard Varèse** or **Nine
Inch Nails** wouldn't be possible.

Click to play and stop sound example



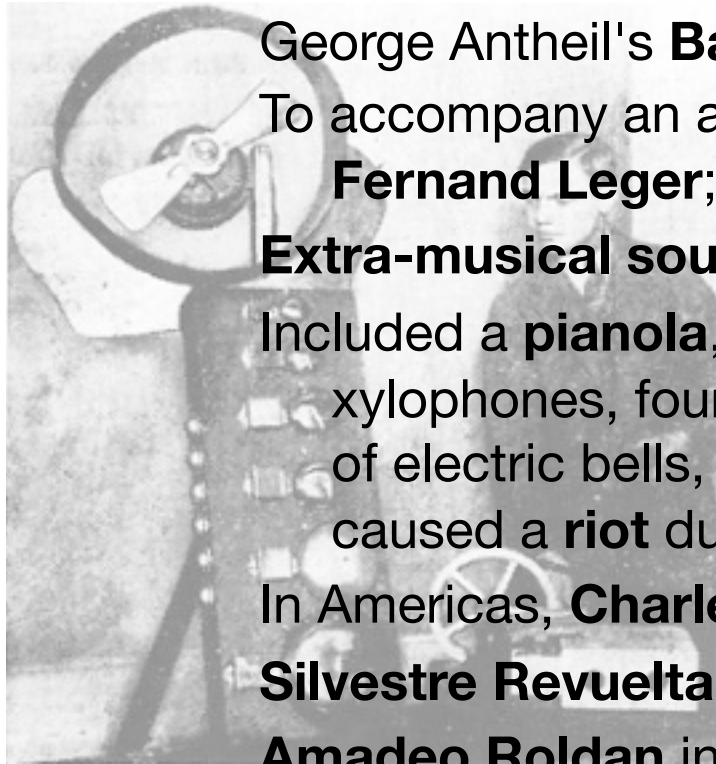
Music For 16 Futurist Noise Intoners

<http://www.youtube.com/watch?v=Lqej96ZVoo8>

Performa is delighted to present "Music For 16 Futurist Noise Intoners," an evening-length concert of original scores and newly commissioned compositions for the intonarumori, or "noise-intoners." As part of its celebration of the 100th anniversary of Italian Futurism, the Performa 09 biennial, in collaboration with the Experimental Media and Performing Arts Center (EMPAC) and SFMOMA, has invited Luciano Chessa to direct a reconstruction project to produce accurate replicas the legendary instruments (8 noise families of 1-3 instruments each, in various registers) that Russolo built in Milan in the summer of 1913. As the first instruments capable of creating and manipulating noises through entirely mechanical processes, the intonarumori can be considered to be the original analog synthesizer, and the ancestors to the latest electronic synthesizers used today.

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George Antheil **Ballet Mécanique** (1925)



George Antheil's **Ballet Mécanique**;

To accompany an abstract silent film by the artist

Fernand Leger;

Extra-musical sounds;

Included a **pianola**, two or more pianos, three xylophones, four bass drums, tamtam, **siren**, a battery of electric bells, and three airplane propellers - it caused a **riot** during its Paris premiere;

In Americas, **Charles Ives** and **Edgard Varèse**;

Silvestre Revueltas in Mexico;

Amadeo Roldan in Cuba;

Carlos Chavez in Mexico.

Click to play and stop sound example

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Pierre Schaeffer **Etude aux Chemins de Fer** (1948)

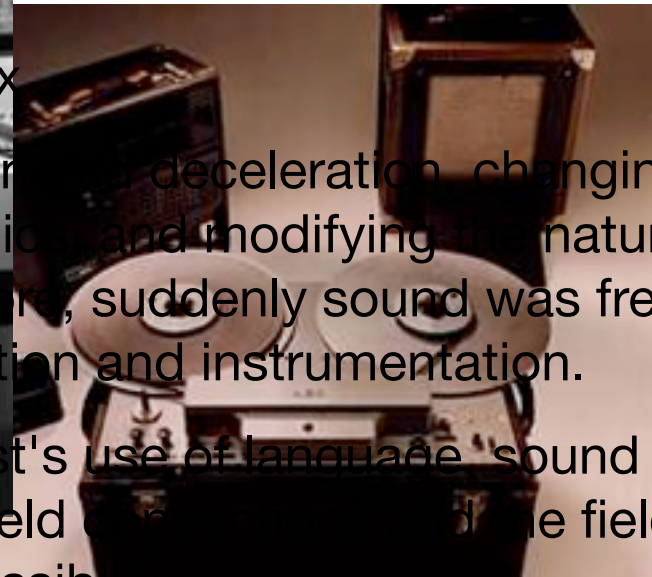


Buckminster Fuller “wars drastically speed up the pace of technological innovation”, so it was with the tape recorder.

Bing Crosby and Ampex

By rhythmic acceleration and deceleration, changing the pitch and dynamics, and modifying the nature of the instrumental timbre, suddenly sound was freed from traditional notation and instrumentation.

Like the Russian Futurist's use of language, sound was freed from its long-held constraints and the field was rife with new possibilities.



Click to play and stop sound example

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John Cage and David Tudor **Indeterminacy** (1959)

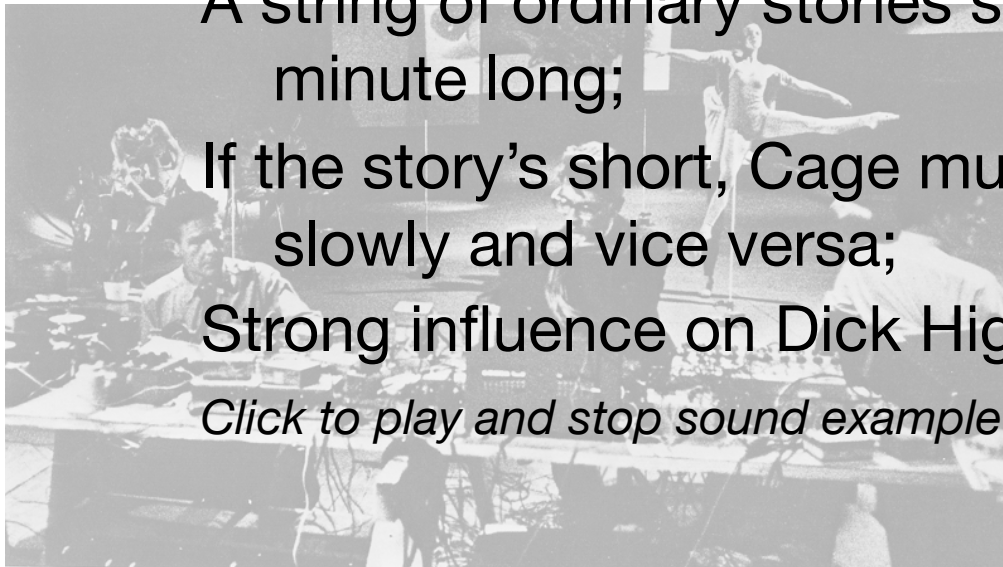
Cage is also important to sound art;

A string of ordinary stories spoken, each one minute long;

If the story's short, Cage must speak more slowly and vice versa;

Strong influence on Dick Higgins and **Fluxus**

Click to play and stop sound example



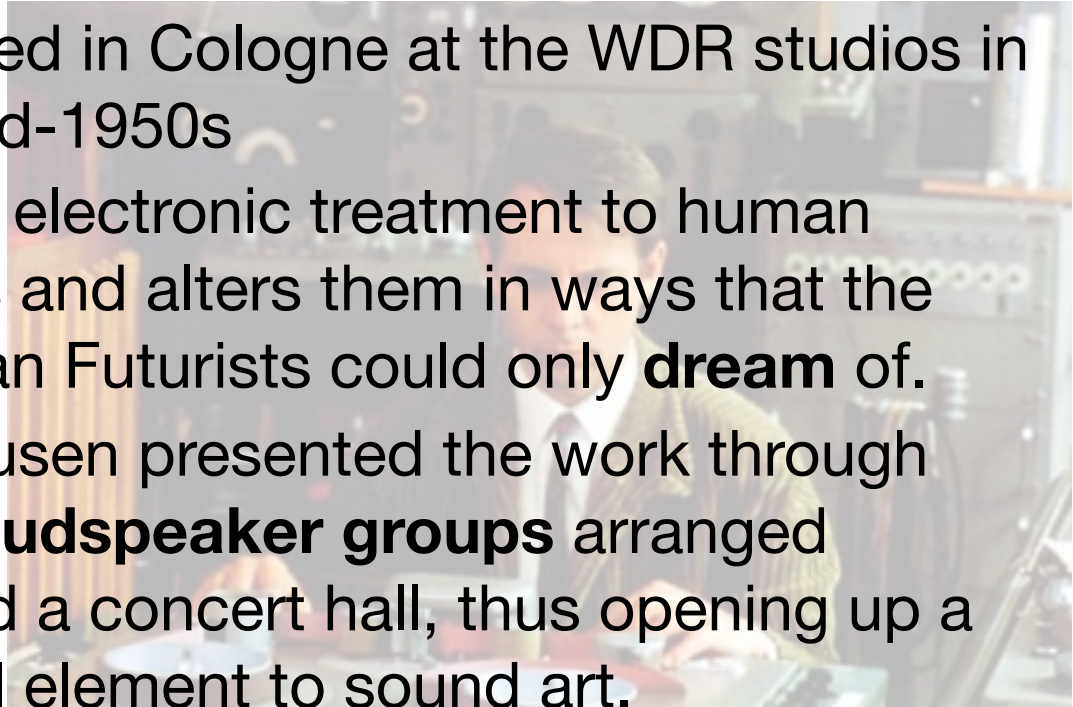
Gesang der Junglinge (1955-56)

Composed in Cologne at the WDR studios in the mid-1950s

Gives an electronic treatment to human voices and alters them in ways that the Russian Futurists could only **dream** of.

Stockhausen presented the work through **five loudspeaker groups** arranged around a concert hall, thus opening up a spatial element to sound art.

Click to play and stop sound example





John Cage on *Game Show*

Henri **Chopin**

<http://www.ubu.com/sound/chopin.html>

Technology was crucial to the explorations of the French sound poet **Henri Chopin**.

By manipulating tape recordings of his **throat** made using **contact mics**, Chopin was able to manipulate his voice so radically that it sounded more like the abstractions of **musique concrète** than it did like a voice.

Chopin explored the potential of **the body itself as sound source**, paving the way for a generation of artists exploring the body such as **Chris Burden** and **Karen Finley** in the 1970s.

Click to play and stop sound example

David Tudor “Rainforest”
realisations here and **here**

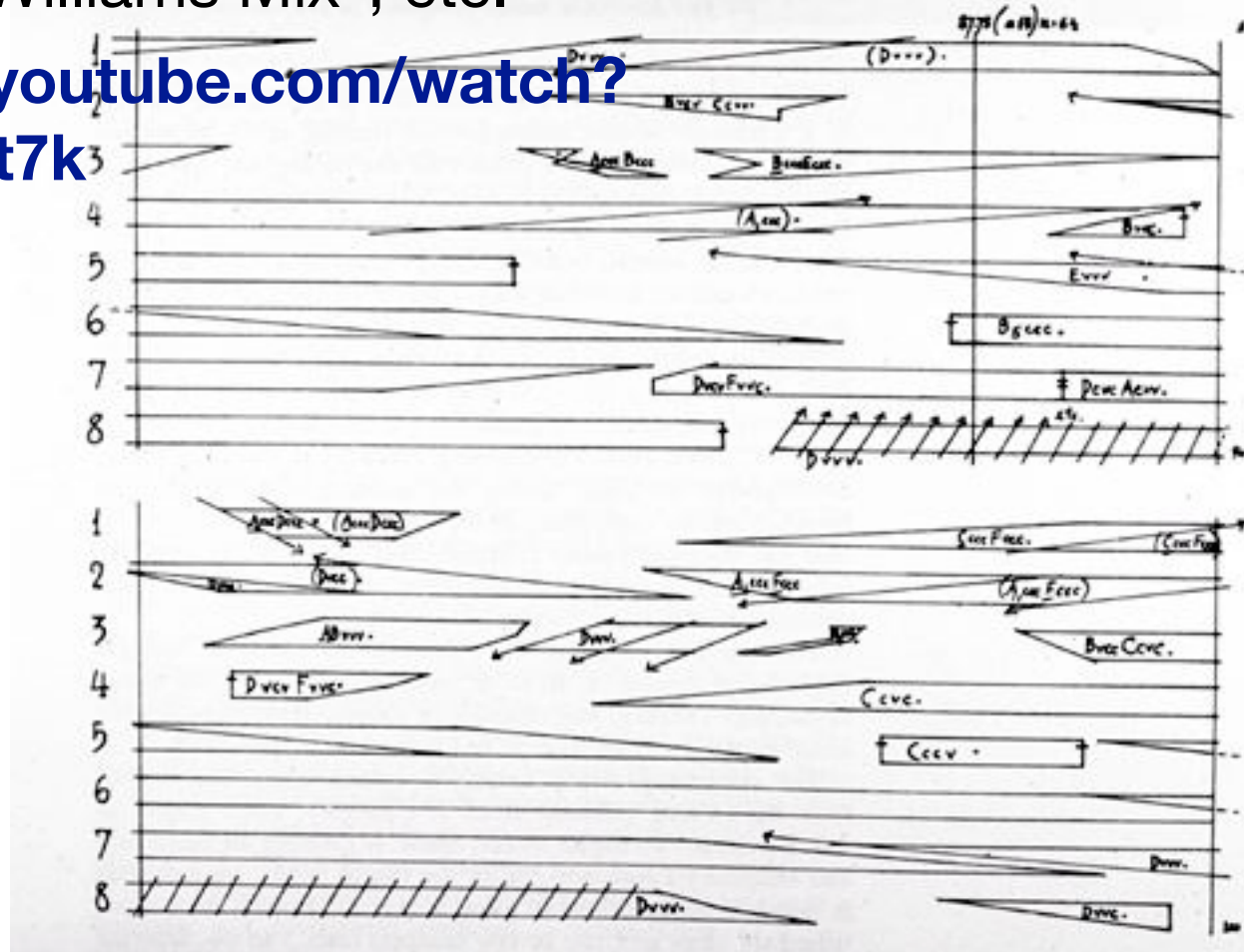
More information:

**[http://www.getty.edu/research/tools/
guides_bibliographies/david_tudor/av/
rainforest.html](http://www.getty.edu/research/tools/guides_bibliographies/david_tudor/av/rainforest.html)**

Alvin Lucier: Music For Solo Performer

John Cage “Williams Mix”, etc.

<http://www.youtube.com/watch?v=9ql4Ophbt7k>



Steve Reich “Pendulum Music”

Nam June Paik, Cage...

In 1963 Nam June Paik, on the threshold of his transformation from composer to video artist, attached dozens of strips of prerecorded tape to the wall of a gallery in Wuppertal, Germany, and invited the visitors to play it back via handheld tape heads. According to legend, John Cage once did a similar thing in reverse. He fully covered a tabletop with blank tape, invited the public to scribble across it with tape heads attached to pencils through which electronic sound was playing; at the end of the evening the tape was wound onto a reel and played back for all to hear.

Tony Luisi and his Putney VCS 3 - Demo
1973

[http://www.youtube.com/watch?
v=q67zcFBHGYQ](http://www.youtube.com/watch?v=q67zcFBHGYQ)

Zinovieff and the VCS3

[http://www.youtube.com/watch?
v=F_9oSQaYbNQ](http://www.youtube.com/watch?v=F_9oSQaYbNQ)

EMS Synthi Technical overview...

[http://www.youtube.com/watch?
v=MN3J74ghRP0](http://www.youtube.com/watch?v=MN3J74ghRP0)

EMS VCS3:

http://www.youtube.com/watch?v=Cp3Og2uR_a8

VCS3 Users Manual:

<http://www.thesynthi.de/index.php?archives/51-VCS-3-Users-Manual.html>

What the Future Sounded Like (2006):

<http://www.youtube.com/watch?v=8KkW8UI7Q1I>

Korg intro movie:

<http://www.youtube.com/watch?v=dbZ6rOivfnA>

Also available in software version (PC and iPad)

Investigate either VCS3 or MS-20. Create either a short composition or demonstration. Indicate how you might notate/preserve either one.

Boulez Repons

Georgina Born: “Rationalising Culture”

Tod Machover + Dan Ellsey: Inventing instruments that unlock new music

[http://www.ted.com/talks/
tod_machover_and_dan_ellsey_play_ne
w_music.html](http://www.ted.com/talks/tod_machover_and_dan_ellsey_play_new_music.html)

Hypercello: 5:30

Mark **Applebaum**

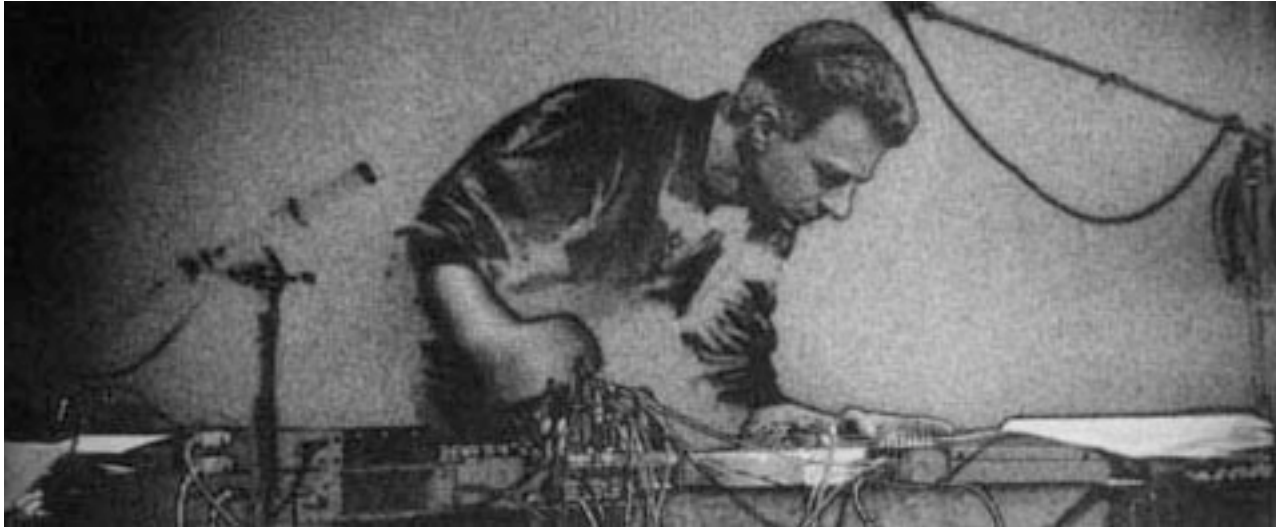
[http://www.ted.com/talks/
mark_applebaum_the_mad_scientist_of_
music.html](http://www.ted.com/talks/mark_applebaum_the_mad_scientist_of_music.html)

Note in particular some of the extremely
critical comments...

Reed Ghazala

Nicolas Collins

<http://www.nicolascollins.com>



Phil Archer

<http://philarcher.net/main/works.html>

Ryan Jordan: Derelict Electronics

Furt: Richard Barrett

Peter Vogel

Leafcutter John

Reactable

<http://www.reactable.com>

The Reactable was conceived and developed since 2003 by a research team at the Pompeu Fabra University in Barcelona. Sergi Jordà, Martin Kaltenbrunner, Günter Geiger and Marcos Alonso presented their creation for the first time in a public concert at the International Computer Music Conference 2005 in Barcelona.

Bad Timing

<http://www.bad-timing.co.uk>

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Other **Presentations**

<http://rheadley.net/presentations>

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