

Title:	Salvage (2008) and The Royal Touch (2014)
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Salvage (2008) and The Royal Touch (2014)

Salvage (2008) sprang from my immersion in the many hacking workshops I presented in the wake of the publication of the first edition of *Handmade Electronic Music: The Art of Hardware Hacking* in 2003¹. The piece was inspired in equal part by:

- The sounds that arose from the workshop tables, which evoked the rich, glitchy texture of my earliest electronic work, and that of my peers and mentors in the pre-computer 1970s. They contrasted refreshingly with the sampling, looping, granulation and other DSP-based effects so prevalent at the time.
- The peculiar form that these sounds took in the hands of a room full of hackers: the semi-controlled chaos of parallel but unsynchronized experimentation with similar, not-easily controlled circuits. As You Nakai observes regarding the apparent conflict between John Cage's dislike of improvisation and his acceptance of certain forms of un-scored, "personal" decisions:²

By superimposing the inputs of an increasingly large number of imaginative personalities [in *Variations V*], Cage and his colleagues created a work with so many collaborators and such intricate linkages that each participant could *influence the sound, but none could control it*. The greater the number of participants, the more unpredictable the result. Thus Cage increasingly buried his own intentions under the weight of those of his artistic partners.³

Art historian Susan Tallman elaborates:

¹ Nicolas Collins *Handmade Electronic Music – The Art of Hardware Hacking*. Routledge, New York, 2006.

² For background on Cage's attitude toward improvisation see George Lewis, "Improvised Music after 1950," *Black Music Research Journal*, Vol. 16, #1 (Spring 1996), pp. 99-122.

³ Quoted in: Leta E. Miller, "Cage, Cunningham, and Collaborators: The Odyssey of *Variations V*," *Music Quarterly* 85-3 (2001), 553.

Risk is distributed in a tranche-like fashion. In an orchestra, like the housing bubble, tranches are used to cover up *mistakes* – the tuning of an individual violin. But in works like *Variations V* they cover up *intentionality*⁴.

- The desire to shrink my silicon footprint. I had recently read about the environmental impact of electronic recycling in the town of Guiyu in the Guangdong province of China, and I decided to make a pointed, if token, gesture of reducing that toll by one circuit board.

I constructed an instrument that would extract sound from any dead, garbage-bound circuit board – computer, cell phone, printer, television, etc. I built a bank of six simple oscillators from a single CMOS 74C14 IC. The frequency range of each voice in this design — from sub-sonic through audible pitch to ultrasonic whistling — is determined by a choice of a fixed capacitor; the precise pitch would typically be set by a resistor in the feedback path from its output to its input, but in my implementation each output and input is connected to test probe (like that on a multimeter) instead. When a pair of probes is pressed against the traces on the dead, unpowered circuit board, the frequency is determined by whatever components lie in the path between them – typically a complex (and unknowable/unknown) array of diodes, transistors, integrated circuits and other components, rather than a simple resistor. As a result, moving the probes across the board elicits an unpredictable and unstable sequence of pitches. When multiple probes touch the board short-circuits and feedback between them further complicate the sounds.

This an ensemble piece. Each of six performers manipulates a pair of probes; a seventh cues the others. The performance begins with one player moving probes across the traces aside of the dead circuit board, hunting for different sounds. Every minute or so the conductor cues an additional player to join the group; the complexity of sound increases, and the effect of probe movement becomes more obscure to player and audience alike. After all six players are active the conductor occasionally signals them to freeze probe movement, which shifts the sound from energetic chaos to a wobbly suspension of semi-stable pitches. After three such freezes the conductor shuts off the audio from the circuit, leaving only the acoustic sound of the probes being scratched across the board, which reaches the audience's ears like the sound of distant cutlery in a quiet restaurant. Throughout the process a camera above the circuit projects the action onto a screen, so that the audience can see the hand movements often obscured by the clustered performers – a modern update on *The Anatomy Lesson of Dr. Nicolaes Tulp*.

Salvage starts by turning a circuit board upside down, and that action serves as a useful metaphor for the work as a whole. Right-side up (or as an engineer would say, component-side up), a circuit board is a knowable thing. The components themselves are labeled in codes an engineer understands; this information, aided by a schematic, reveals the function of the circuit, and gives the engineer enough information to anticipate the outcome of

⁴ Personal conversation, July 9, 2016.

a new connection, or to diagnose and repair a failure. But disconnect the board from power, turn it over, and the cleverest of engineers would be no better at predicting or analyzing the effect of a probe movement than a novice hacker – the logic that rules the component side has been so fully obscured that what was once highly rational becomes a source of uncertainty.

Likewise, any one of the six musicians is a rational actor, and after a few minutes exposure to the circuit board and probes the performer acquires a sense of cause (movement) and effect (sound), even if the exact sound is unpredictable, and this causality is apparent to a listener as well. But put six players on one board and this logical mechanism similarly devolves into uncertainty.

This is what I love about certain workshop moments, the thing that is distilled into a good performance of *Salvage*: flipping logic over to reveal irrational richness.

I cannot perform *Salvage* as a solo: I can't tape 12 probes to my fingers, wiggle them across the board, and get the same effect. The piece requires six brains connected to twelve hands, even if -- to use Tallman's analogy -- personal expression is buried in the tranches. As much as I appreciate the chaotic totalism of *Salvage*, after a few years in repertoire I tired of the brinksmanship of rounding up performers and scheduling enough rehearsal time in my sound checks. I searched for a way of adapting the essence of the work into a solo format.

In the past, as a practical expediency, I have occasionally extracted the core techniques of ensemble compositions for incorporation in solo variations: *It Was A Dark And Stormy Night* (1990)⁵, for two vocalists and a dozen musicians, spun off the more practical and portable solo/duo *Sound For Picture* (1993)⁶; I adapted the skipping CD techniques of *Broken Light* (1991)⁷, for string quartet, into *Still Lives* (1993)⁸, which could be presented as a solo or duo. Carrying over the sound palette and disjunctive transitions of circuit recycling was not difficult, but for months I puzzled over a performance interface that could imbue my two hands with the instability of the dozen employed in *Salvage*. My first attempts at contacts between my circuitry and a piece of e-waste – metal fingerpicks, wire brushes, rivets through beer coasters – were failures. Fishing weights eventually proved the perfect solution: a dozen small lead shots could be rolled and nudged under ten fingers, and their precarious resting state mimicked the instability of *Salvage*'s probes held in nervous hands. *Salvage* always degenerates into frenetic kineticism. The fishing weights of *The Royal Touch* impose on hand movement the tranquility of a trout stream instead, zooming in on and freezing the widescreen chaos of its predecessor.

With the hand gestures even subtler than in *Salvage*, a projected a view of the circuit board seemed appropriate for this piece as well. A laptop is usually available, being used for

⁵ Nicolas Collins *It Was A Dark And Stormy Night*, Trace Elements Records, 1992.

⁶ Nicolas Collins *Sound Without Picture*, Periplum Records, 1999.

⁷ Collins *It Was A Dark And Stormy Night*

⁸ Collins *Sound Without Picture*

other pieces on a typical program, so folding the lid down to aim the built-in camera onto the table seemed the way to go. The sounds of *The Royal Touch* all originate in circuitry, but since the laptop is already being used for its camera, I wrote a small program, based on routines I had developed for the software recreation of *Devil's Music* (1985/2003/2015)⁹, that performs gentle processing on the sounds from the hardware. The sonic role of the computer is supportive but so subtle that often I can't distinguish between the analog source and its digital extensions.

In both *Salvage* and *The Royal Touch* one might consider the circuit boards rescued from the rubbish as archives of sorts: arrays of material organized around specific functions — documenting the work of Antoni Gaudí in the case of one of my father's archives; routing phone calls in France with one of the circuit boards for *Salvage*. My father's archive now resides in the Burnham Library, and each researcher there navigates a different path according to the research goal — possibly leading to Gaudí himself, but just a likely connecting to a subject unanticipated by my father. The performers in my pieces trace new pathways across the boards. Unlike proper researchers, however, my players have no idea what they are doing: they cannot read the Catalan of circuitry, they can only navigate by touch and ear. Given the sheer mass of contact points, it's unlikely they can ever follow the same path twice. Not so good as a research methodology, but potentially rich terrain for musical performance.

⁹ Nicolas Collins *Devil's Music*, Trace Elements Records, 1986; software available via <http://www.nicolas-collins.com/software.htm>.