

## **David Tudor**

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David Tudor (1926-1996) was thirty-two years old when he began delving seriously into electronics. He already had an extraordinary career by that time, first as a brilliant young organist in his native Philadelphia, then switching his instrument and establishing himself as the most prominent pianist of the avant-garde in both America and Europe throughout the 1950s. His virtuosity was to such an extent that composers started writing specifically for him rather than for the piano, while his love of puzzles motivated them to explore new forms of graphic notation that required the performer to determine the specific details of the performance. After engaging in such activity for seven or so years, however, Tudor grew weary of the same kind of works composers around the world were sending him. Following a brief instruction that the Swedish composer Bo Nilsson had almost inadvertently included in the score of *Quantitäten*, he began amplifying his piano in 1958.

Incorporating electronics shifted the nature of piano from a percussion instrument to a resonant chamber whose characteristics could be explored especially through the use of feedback. Tudor became fascinated at the new possibilities. He began to peruse popular electronic magazines, collect amplifiers and record cartridges, and taught himself to read schematics and to solder. Soon he was amplifying many other things besides the piano. His friend John Cage followed suit and started writing pieces that involved amplification for Tudor to perform. Tudor on his part became friends with younger musicians who were more well-versed in technology, most importantly with Gordon Mumma, who he later acknowledged as having helped him get over his fear of electricity.<sup>1</sup> By the mid-1960s, Tudor had developed a distinct kind of live-electronic music in which modular devices, homemade and commercial electronic gear as well as acoustic instruments and objects, were tentatively assembled to form a compound instrument of his own design for each performance. The modular nature allowed Tudor to “compose” the degree of control he had over the set-up, and as a consummate virtuoso, he preferred to push things to the edge of control and keep the situation indeterminate. In addition, it was customary for Tudor to switch some components from one performance to the next so that the configuration was always new and challenging.

This approach influenced a whole generation of younger musicians, as Alvin Lucier recalled: “Tudor made all his devices with inexpensive electronic components, everything he used was home-made. That was very inspiring. The development of experimental music in the United States, that phase of it anyway, started with David Tudor’s table of electronics.”<sup>2</sup> At the same time, the specifics of what was happening inside each component on the table remained hidden, for Tudor tended not to discuss how he made his music even to his closest collaborators. Although inspired by his instruments, Lucier also admitted, “nobody knows what they are!”<sup>3</sup>

But Tudor did leave behind an enormous amount of materials which are now archived in different institutions. The bulk of his paper materials and recordings are kept at the Getty Research Institute (Los Angeles, California), while Wesleyan University (Middletown, Connecticut) houses the instruments which number up to approximately 500. About half of these are commercial equipment, mostly guitar effect pedals which he began using in the 1970s, but the collection also includes many transistor mixer-amplifiers from the late 1950s. The rest are

homemade instruments, built either by Tudor himself (around 150 of these) or by acquaintances and friends. His own instruments are shrouded in mystery since almost none of them carry any labels explaining what they are, or what each of the jacks and knobs does. But since he kept notes of everything, it is possible to figure things out by matching the instruments at Wesleyan with the schematics at the Getty as if they were pieces of a giant inter-coastal puzzle (an oddly pertinent research method given Tudor's devotion to puzzles). This procedure has indeed revealed many things about Tudor's instruments and his music that was unknown until now.

For one thing, Tudor never designed circuits from scratch. Similar to how he used other composer's scores as "material" (which is how he called them) in his pianist days, all the electronic instruments he built had a source, according to which they can be largely grouped into three types: (a) articles from popular electronics magazines and books, (b) schematics from friends, most importantly Mumma and Lowell Cross, and (c) rehoused kits. And just as he was known to be meticulous when realizing the graphic scores, it was customary for Tudor to follow precisely the instructions given to him when building an instrument.

The period Tudor made his own instruments was limited roughly to the ten years between 1965 and 1975. The particular things he built was always tied to some specific interest he was pursuing, which in turn was connected to a specific work or a series thereof. It is therefore possible to group his instruments into families that share related purpose, function, or style.

A) Simple circuits and kits housed in plastic cases (many soapboxes). These were the first series of instruments Tudor made, and they include several amplifiers, a clipper, a harmonic generator, a reverb, and a square wave oscillator. Most of them were made for *Bandoneon !* (read as "Bandoneon Factorial"), Tudor's contribution to *9 Evenings: Theatre and Engineering* in October 1966. In this seminal piece, the first one he signed his name as a composer, Tudor aimed to make a giant noise generator using the network of instruments that processed and distributed the sound of his bandoneon (an accordion-like free-reed instrument central to Argentine tango music) across the 20,000 square feet space of the 69th Regiment Armory serving as a massive resonant chamber. His electronic set-up indeed focused on imparting additional harmonics and inharmonics to the sound of the acoustic instrument, multiplying its spectrum density to approximate white noise. The same sound was also used to control the lights and visualized on magnified oscilloscopes made by Lowell Cross. In addition, remote-controlled carts moved around objects which had been converted into "instrumental loudspeakers" with distinct resonant characteristics by attaching transducers to them, a development of his initial interest in the conversion of piano into a resonant chamber through electronics.

B) Oscillating amplifiers. Soon after *Bandoneon !*, Tudor purchased amplifiers (at least three Roundhill AA-100 with a gain of 70 dB), which he housed in black phenolic boxes and brought its inputs and outputs (a selection of two impedances for each) out to the surface of the panel. By wrapping feedback around these ports, and inserting resistor and capacitor substitution boxes and other passive components in the route, Tudor obtained a variable oscillator. These were originally made for *Rainforest*, Tudor second piece premiered in March 1968 which developed the principle of "instrumental loudspeakers" into a separate piece for Merce Cunningham's choreography of the same name. They were subsequently used in many different configurations throughout the 1970s.

C) Phase-shifters and splitters. Tudor started building many of these in 1968, soon after the premiere of *Rainforest*. It appears that this was an effort to reproduce the two out-of-phase signals of the bandoneon with electronics for his collaboration with Cross where he continued to work on the visualization of sound, first with a converted television set and later with a laser system. Towards the end of the decade, the same phase shifters were inserted into the feedback path when Tudor enlarged the mechanism of the oscillating amplifiers to create entire configurations of modular electronics arranged in a loop. This “giant oscillator” became central to the lineage of no-input feedback works in the 1970s including *Untitled* and *Toneburst*. *Tudor’s approach to feedback was inherited as the core technique of the later movement of “no-input mixing” and certain Japanese.*<sup>4</sup>

As the number of components kept increasing it became a burden for constant touring as well as performance. Tudor solved the problem by replacing a part of the set-up with the recording of its output. But this shift of instrumentation yet again shifted his focus. Instead of sculpting the sound that the giant oscillator spews out semi-automatically through feedback, he became more concerned about the parallel processing of a sound source which made one sound appear as many. To pursue this interest, Tudor began purchasing commercial guitar pedals in the mid-1970s, whose market was in bloom around then. He consequently made fewer instruments of his own.

As the term “instrumental loudspeakers” suggests, Tudor’s approach to any instrument was focused on its specificity. Feedback was a good method of exploring these specific principles, as returning the output of a system to its input brings out and intensifies the inherent characteristics of that system.

At the same time, Tudor opted for modularity, creating miscellaneous networks of instruments mixing old and new ones, as well as those made by himself and others. Therefore, the specific nature of any component was also influenced by what it was connected to in the set-up. For Tudor, this compound instrument also included the particular space where music was being performed. Here we can detect the influence of organ, Tudor’s first instrument, which is always coupled with the architecture of the church in which it is placed, and which enwraps the performers and listeners. This influence also led Tudor to enlarge the mechanism of specific electronic device to a large scale, as with the giant white noise generator of *Bandoneon !*, or the giant oscillators of no-input feedback works. The instrumental loudspeakers of *Rainforest* can also be regarded as giant filters, and Tudor likened his later endeavor of making one source appear as many to a “giant reverb.” In 1970, Tudor worked with the Experiments in Art and Technology to turn the entire *Pepsi Pavilion* into an instrument at the Osaka Expo, and he subsequently spent more than a decade trying to transform an entire island into an instrument in order to examine the maximum scale for feedback to occur. This proposed piece, *Island Eye Island Ear*, was never realized, but Tudor appears to have regarded it as his most important work.

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<sup>1</sup> “I am a person who is terrified of electricity. I knew nothing at all about it. And Gordon [Mumma] helped me get over that. Now I have a lot of experience related to that but I’m still terrified, you know. In a way, it’s always going to terrify me. But it doesn’t deter me from

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working at it.” (Charles Amirkhanian, John Cage, Takehisa Kosugi, Gordon Mumma, Michael Pugliese, and David Tudor, “A Kind of Anarchy: Merce Cunningham and Music (September 19, 1989) [videorecording],” MGZIDVD 5-469, Merce Cunningham archives, New York Public Library.)

<sup>2</sup> Lucier, “Thoughts on Installations,” kunstradio.at, accessed December 15, 2018:  
<http://kunstradio.at/ZEITGLEICH/CATALOG/ENGLISH/lucier-e.html>

<sup>3</sup> Alvin Lucier, Private conversation with You Nakai, June 1, 2012, Wesleyan University.

<sup>4</sup> David Novak, *Japanoise: Music at the Edge of Circulation* (Durham, NC: Duke University Press, 2013), 156-8.