

## David Tudor as Composer/Performer in Cage's *Variations II*

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### ABSTRACT

David Tudor was a musician with two careers: the first as a performer and the second as a composer. For the most part, these two careers occurred in sequence: Tudor began performing his own compositions for live electronics at about the same time that he stopped performing works composed by others. Understanding this transition from performer to composer is critical in understanding Tudor's life and work.

This task is made more complex, however, by the nature of Tudor's work as a performer. Because he specialized in the realization of indeterminate scores, and because he entered into such close collaboration with avant-garde composers (most notably John Cage), the distinction between performer and composer is often unclear in Tudor's performances. Disentangling these roles, particularly in the period when Tudor himself was moving from performer to composer, becomes a challenging task. Can we see Tudor-the-composer in the work of Tudor-the-performer?

In my presentation for the symposium, I will use an examination of Tudor's realization of John Cage's *Variations II* as a case study in identifying the overlapping of performer and composer roles, both within this specific realization and within the context of Tudor's history. To do this, I will present first an analysis of Cage's score on its own terms — that is, in the context of Cage's work and thought. With that background, I will then explain Tudor's approach to the work in his realization for amplified piano. This analysis, based almost entirely on the rich manuscript materials in the Getty Institute's Tudor collection, will show just where Cage's thought ends and Tudor's begins; how Tudor went beyond Cage's score and moved in a direction that diverges sharply from Cage's intent. Finally, I will present my case that, because this realization has much more in common with Tudor's own compositions (such as *Bandoneon!*) than with Cage's musical ideas, the realization of *Variations II* can be considered as more a composition by David Tudor than a composition by John Cage.

### FULL PAPER

#### Introduction

We know David Tudor in two different guises. The first was as a performer of avant-garde music in the 1950s and 60s; the second as a composer of music using live electronics. It is possible to see a short period of overlap between these two careers. In the early 1960s, Tudor's performances of piano music involved more and more amplification and electronics. His first compositions appear during the same time frame, although Tudor appears to have been hesitant at first to call himself a composer. Indeed, the work he considered his first composition — *Fluorescent sound* of 1964 — was not even identified as a composition at its performance, much less as a composition by David Tudor. *Bandoneon!* (1966) was the first piece for which Tudor was billed as the composer, but even then, Tudor seemed to downplay his role as creator: he described the work as a work that "composes itself" and which "needed no compositional means." But by 1970 the transition was complete, and Tudor was working entirely as a performer/composer of works for live electronics of his own construction.

The questions that Tudor's life and work pose for me are about the emergence of his compositional voice. Where did the composer David Tudor come from? What, if anything, does his composing owe to his work as a pianist? What caused him to move from one role to the other? And finally, what role did electronics play in this transition? Because so many of the performances he created in the later 1950s and onward involved electronics and amplification, that it would seem likely that this common ground is key to understanding the path of Tudor's creative life.

The scope of these questions is wide, and I hardly expect anyone to answer them definitively in the near term. In this paper, I will identify and document one case that can serve as a starting point for this research. Here I will explain how Tudor created his performance of John Cage's composition *Variations II*, a realization that Tudor created for the amplified piano. Drawing upon original manuscript documents in the David Tudor collection at the Getty Research Institute, I will show how this specific realization represents an emergence of Tudor's compositional voice, even as it continues his tradition as a performer of Cage's music. In particular, I will describe how Tudor's voice differs from Cage's (and from Tudor's own performances of Cage's music), and suggest how his work with electronics may have made Tudor's discovery of that voice possible.

## 1. Cage's *Variations II*

*Variations II* (1961) represents the greatest degree of abstraction of a compositional and notational model that Cage developed over the period from 1958 to 1961. The basic mechanism is very simple: interpreting the distance from a point to a line as a measurement of a musical parameter. The premise of such a notation is thus that each line represents an axis of measurement for a given parameter (or more properly, a perpendicular to an axis of measurement). Using measurements of graphic space as a way of determining the values of sonic parameters in this fashion was an integral part of many Cage notations in the 1950s. The openness of graphic space was a way of exploring the total space of sound, which was a fundamental — perhaps *the* fundamental — motivating force for Cage's work at the time

In *Variations II* these ideas distilled to a strikingly pure rendition. In the notation, there are six lines and five points; each of these eleven tokens are on individual pieces of transparent plastic. They are arranged haphazardly by the performer. Each point represents a single sound event and the six lines represent reference lines for measuring six different variables: frequency, duration, timbre, amplitude, point of occurrence within the whole time span of the performance, and overall structure of event (number of tones, etc.). For each point, the performer measures the distance to each line, thus locating that event in the total space of possibilities. The piece consists of as many arrangements and readings of these materials as the performer cares to make.

The notation of *Variations II*, because it allows any configuration of dots and lines, can describe any sound. Beyond this, since the performer makes as many arrangements of dots and lines as they wish, a performance of *Variations II* can consist of any number of sounds taken from the entire range of sounds that can be described. And if this was not expansive enough, Cage adds the following instruction that opens the score further: "If questions arise regarding other matters or details ... put the question in such a way that it can be answered by measurement of a dropped perpendicular." Another way of stating this is that additional parameters of sound may be added to the interpretation; not only the number of dots, but the number of lines in this score can be increased as needed by simply rearranging the materials and making more measurements. Given this enormous flexibility, it is not an exaggeration to say that *Variations II* encompasses any piece of music that could possibly be created. All that is required is that the parameters of the music be identified and measured in the proper way.

Cage wrote *Variations II* as a birthday present for David Tudor; what kind of realization would he have expected Tudor to make using this gift? Quite probably, Cage would have expected Tudor to approach the work in a manner similar to the way he had approached all such compositions in the 1950s: to produce a very detailed performance score using the technique of precise measurement. From the very beginning of their association, Tudor had been a master of the fastidious, careful working out of Cage's scores. To insure that he accurately rendered the constantly shifting tempi of *Music of changes*, for example, Tudor calculated to several decimal places the elapsed duration in seconds of each of the nearly 900 measures of the score. Tudor's careful methods in turn influenced Cage's approach to composition. Tudor's use of a stopwatch to make an accurate measurement of time in *Music of Changes* ultimately led Cage to notate his works in clock time, for example. And the entire point-and-line measurement notation probably owes a good deal to Cage's experience of watching Tudor work out his scores using various rulers and calipers.

Beyond this history, there are reasons to believe that Cage would have expected the same approach from Tudor with *Variations II*. In 1958, Tudor created a realization of Cage's *Variations I* — a notation very similar to that of *Variations II* — that relied on just this sort of careful definition of measurement scales and a precise performance score. And Cage's performance instructions for *Variations II* are steeped in the language of his work of the 1950s.

The identification of frequency, amplitude, timbre, and duration as the fundamental characteristics of sound was a refrain that appears throughout much of Cage's writing on music in the 1950s. And in describing the structures of events he uses terms such as "constellation" and "aggregate," terms that refer to musical elements he had identified in the charts of his *Music of changes* in 1951 and in the process for the "Ten thousand things" pieces of 1953—1956. The instructions to *Variations II* thus suggest that Cage saw this piece as another way to build music using the same structural elements that he had been using throughout the 1950s. No doubt he would have expected Tudor to do the same.

## 2. Tudor's realization of the score

Tudor knew from the outset that he would be realizing *Variations II* for performance on an amplified piano. I will focus first on the mechanics of the realization, and then describe this instrument and how the realization actually worked in performance. Tudor's first notes towards a realization (transcribed in Figure 1) closely follow Cage's measurement model. He listed the six parameters and ideas about how they could be measured: frequency could be low to high ("LMH" here means "Low-Medium-High"); point of occurrence was within a twenty-minute duration; duration was short to long ("SML" here means "Short-Medium-Long"); amplitude was soft to loud ("SML" here means "Soft-Medium-Loud"); overtone structure (here abbreviated as "o.s.") was an arbitrary scale that ran from "natural" to "chaotic;" and structure of event was interpreted as "degree of aggregation" (presumably meaning the number of tones), running from single to "manifold." These notes are accompanied by a list of different types of actions that could be made with an amplified piano, along with what appears to be an attempt to categorize the actions by complexity of overtone structure.

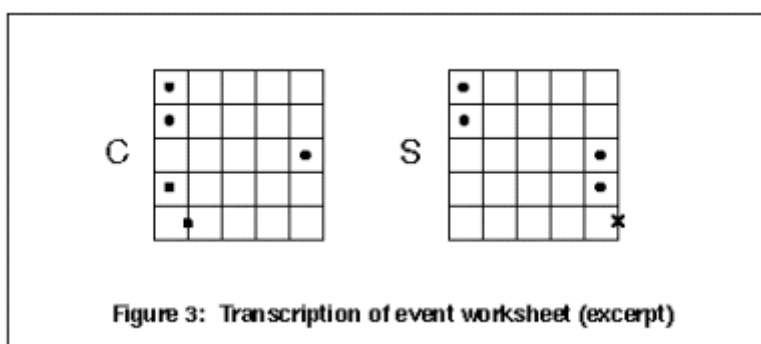
freq	L M H	(place)
occ.	20'	
dur.	S M L	(if statis., qualitative)
amp.	S M L	(actions)
o.s.	nat. – low amp – med amp – hi amp – access	
	1	3
	simple – compound	
	2	4
	complex – chaotic	
deg. of agg.	single – dual – manifold	

**Figure 1: Transcription of Tudor's first notes for Variations II**

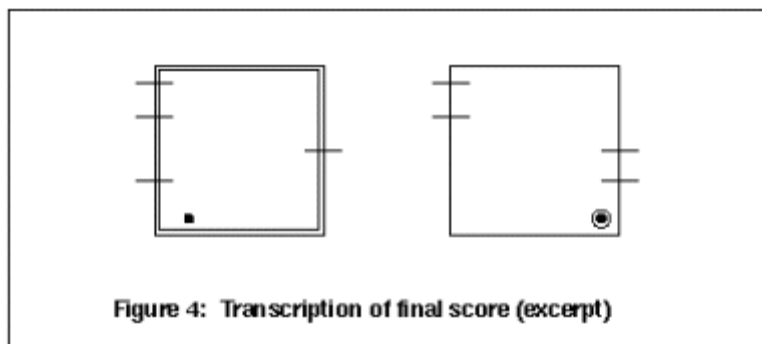
This approach could have formed the basis for a realization of the *Variations II* that stayed close to the model of the *Variations I*. This model was abandoned early on, however, and the realization took a sharply different direction. A later version of the same outline of the six parameters (transcribed in Figure 2) lists only two possible values for each parameter: simple or complex. This in effect removes the concept of measurement from the piece altogether. Tudor was no longer considering the six parameters as continuous variables subject to linear measurements. Instead they became binary variables capable only of switching between two discrete values. Exactly what he meant by "simple" and "complex" is open to discussion, and Tudor's own comments are not consistent in this regard. I will address this in the third section of this article when I describe Tudor's performance of the realization. What is most important to note at this point is that Tudor's simplification of the measurement system to a binary choice takes the notation of *Variations II* away from Cage's conception and into a wholly unexpected realm. For Cage, the sonic parameters were analogous to the dials of an imaginary sound synthesizer; Tudor's "simple/complex" switches are a different interface between the musician and sound.

T	simple, complex
A	simple complex (with A) [prep or altered]
F	simple complex (condition)
D	simple (long or short) takes own time complex (overlapping or prep.)
O	simple complex (R)
C	simple complex

**Figure 2: Transcription of Tudor's later notes for Variations II**



The realization proceeded from this simplified model. Tudor made fifty sets of measurements and notated the results on graph paper. Figure 3 is a transcription of two such sets of measurements. Each reading was represented as a five-by-five grid with an additional modifier. The first four rows of the grid describe (from top to bottom) the parameters of timbre, frequency, duration, and amplitude. A dot appears either in the rightmost or leftmost column for each of these, indicating a value of “simple” or “complex,” respectively. The bottom row of the grid describes the point of occurrence. This is represented by either a dot or an × located on one of the six vertical lines of the grid. In this case, the use of a dot or an × represented the values of “simple” and “complex.” The horizontal placement of the mark, described by Tudor in his notes as “stopwatch initiation,” was used in determining exactly when the event would begin, with a range of 60 seconds from left to right. I interpret “stopwatch initiation” to mean a practice following that of Cage’s *Cartridge music*, where the values 0 to 60 are used to determine the seconds within the next minute when the event is to begin. For example, if an event ends at 5:35, and the next point of occurrence is marked as 10, the next event would begin at 6:10. Finally, each of the grids is accompanied by a letter “S” or “C.” These notations represent the value of the “structure of event” parameter (simple or complex). According to Tudor, “structure of event is interpreted by the fact that two or more of these complexes (events) can be used at once.” A simple event was one that occurred by itself, while a complex one occurred simultaneously with another event.



Tudor made no further determinations, measurements, or refinements to these readings. Given the reduction of the measurement model to a choice between two broadly-defined values, there was not really anything else that he could add. His final notation for the realization was just a simpler version of the grids: Figure 4 is a transcription of the final rendition of the two grids of Figure 3. Each event is notated as a square; the dots for the parameters of timbre, frequency, duration, and amplitude have been changed into short horizontal lines intersecting the left or right side of the square. The point of occurrence is still notated horizontally as a point along the bottom of the square, although “simple” and “complex” values are now shown as a single dot or a circled dot, respectively. Finally, the value for structure of event is notated here as a single border (simple) or double border (complex) around the entire square.

The fifty events were notated in this manner on three narrow pieces of heavy paper. Each piece has a single row of events on either side. Tudor referred to these notations as “nomographs.” Their most important characteristic is that they expressed all the information needed in a compact, easily-scanned format. He describes them as “a series of graphic figures ... [made] in such a way as to make all conditions for each event readable at a single glance.”

### 3. Tudor’s performance

Tudor’s realization of *Variations II* certainly bears little resemblance to the hypothetical “typical Tudor realization” I suggested earlier. Precision of measurement and the detailed definition of a wide range of specific sounds is nowhere to be found. In their place is a reduction of parameters to the very vague descriptions of “simple” and “complex,” thus allowing for considerable leeway in their concrete interpretation. I believe that the source of this unusual (for Tudor) approach was his choice of instrument: the amplified piano.

As Tudor indicates in his notes regarding the realization, the amplified piano is not just a piano that happens to be amplified:

My realization of *Variations II* evolved from a decision to employ the amplified piano, conceived as an electronic instrument, whose characteristics orient the interpretation of the six parameters to be read from the materials provided by the composer.

Tudor was clearly thinking of the amplified piano as something greater than the sum of its parts (piano and electronics). Here it is a unified electronic instrument with its own characteristics that must be addressed in the realization.

The amplification setup used is described in some detail in an interview Tudor gave with Frank Hilberg in 1990. The piano was amplified via three different devices. First, there were microphones placed above and below the piano. Secondly, there were contact microphones attached to the piano, or to automobile “curb-scrapers” (essentially stiff wire springs) that could be used to play the strings of the piano, or which could be woven between them to conduct their vibrations. Finally, Tudor used phonograph cartridges with various objects inserted into them. These cartridges could be used both as amplification devices and as ways to activate the instrument: Tudor moved them among and along the strings of the piano, sometimes letting them just sit on top of the strings, vibrating freely with them. The signals from these various microphones were mixed together, amplified, and played through speakers in the same space as the piano. The damper pedal of the piano was held down throughout so that the strings could vibrate freely.

This setup produces a number of feedback loops. Playing on the strings of the piano excites the various microphones in different ways depending on their placement and nature. When these signals are amplified and played back into the space, feedback is communicated directly through the microphones, but also through the sympathetic vibration of the strings of the piano. The whole system presents a very complex interaction of its various parts. Adjusting the levels of the various microphone signals, the ways in which the cartridges are deployed in the piano, and the ways in which the piano is played will alter the behavior of the whole system.

However, the system is so complex that its behavior can never be totally predicted: the amplification of the piano made it, to some degree, an uncontrollable instrument. Tudor's own characterization of it was that he "could only hope to influence" the instrument — he could not predict the nature of the sounds that would result from a particular action. Clearly, given a performing resource of this nature, a precise approach to realization-through-measurement would be completely inappropriate and futile here. Indeed, it was the unpredictability of the amplified piano that shaped not only Tudor's rather stylized approach to the *Variations II* notation, but which was the controlling factor in his manner of interpreting the score he had so produced.

How did David Tudor interpret his "nomograph" notations? What did he mean by "simple" and "complex"? There is some uncertainty about this, caused in part by Tudor's own conflicting accounts. In a 1990 interview with Frank Hilberg about this realization, Tudor indicated that the terms referred to the nature of the sounds produced. He says, for example, that "if the overtone structure of the sound should be complex, then you had to make something that had a complex overtone structure." This approach would be largely in keeping with Cage's conception of the parameters defining an acoustic space.

However, a different approach is suggested in a 1973 article by Ray Wilding-White on ten selected realizations of Tudor's. Wilding-White's account of the piece is also based on an interview with Tudor conducted on 27 November 1973 — much closer to the actual origin of the realization than Hilberg's interview. This account, I believe, gives the key to understanding Tudor's approach to the piece. Regarding the values of "simple" and "complex," Wilding-White quotes Tudor as saying that "these two terms apply to the process (involved in creating the sound) and not the product (I.e., the sound produced)." In other words, Tudor did not interpret the measured parameters as describing the *sounds* to be produced, but instead as describing the *actions* to be made.

Ampl:	S fixed (0 to infinity)	C variations, feedback processes, etc.
Freq:	S } (as conditions) unchanging	C } changing
Dur:	S Takes own time	C Overlapping, mixed, etc.
Occur:	S Once only	C Repeated
Timb:	S Fixed spectrum	C Varied spectrum

**Figure 5: Transcription of later version of notes in Fig. 2**

That this action-based approach was the one used is confirmed by Tudor's notes for the realization. Figure 5 shows a transcription of a later version of the notes given in Figure 2 above. These later notes clarify the abbreviations and

shorthand used in the earlier version. The notes about the interpretation of duration, for example, show very clearly the difference between describing a sound and describing a process. Sounds with simple durations “take their own time” — the duration is determined by the sound itself without need for any intervention on the performer’s part. Complex durations are those that require the performer to conceive, manage, or invent them: ones that overlap, etc.

In performance, then, Tudor would read a graphic notation from his score and begin to act on the amplified piano within the range of values given to him. Hence, in reading Figure 4, the first event is of complex structure, indicating that it should be simultaneous with the second one. The first event would have a simple timbre, frequency, and amplitude (i.e., static in all three parameters), but a complex duration, suggesting that Tudor’s performance action would cause a variety of rhythms to emerge. The second event (simultaneously with the first), would require a simple (single) timbre and frequency, but complex duration and amplitude — Tudor’s performance actions would need to cause a change in amplitude and some kind of rhythmic activity. Finally, the second event has a complex point-of-occurrence, meaning that the event is repeated.

Given these rather broad instructions, Tudor had a number of performance means at his disposal. A number of pages of notes for the realization are little more than lists of actions that he might make. There are five documents listing sounds; each has slightly different contents. A composite of these is shown in Figure 6. A great deal about these lists is unknown. The performance actions are given in a shorthand that leaves their interpretation somewhat ambiguous. There is no way to know how Tudor arrived at these possibilities, although it seems likely that these were worked out through experimentation and practice. It is not possible to associate particular actions with particular nomographs. And finally, it is not clear how many, if any, of these actions were actually used in a given performance. However, these lists do give a sense of the kinds of ways that Tudor interacted with the amplified piano.

<p><b>Single sounds:</b></p> <p>Beater on plastic (flat) on sb          Bongs under (ped)          Metal beater on horizontal rod on bdg          Vertical ruler mute (keyboard) short          Plastic rod scrape on bdg          Single tones (amplified, natural, entering feedback, cartridge)          Thimble slaps          Clusters (amplified)          Cartridges          Feedback          Rubber scrubbing bs          Beater on rubber: sb          Bass string preparation (cork) pizzicato          Cartridge pressure          Ruler mute with wedged cartridge</p> <p><b>Complex sounds:</b></p> <p>Plastic rod or ruler: scrapes and sweeps          Horizontal ruler and large rubber beater: resonated and muted bongs</p> <p>Horizontal or vertical ruler friction          Ruler muted pizzicato, knife-edge hand strokes and muted pizzicato</p> <p>Nail scrapes (slow, fast, mixed)          Fists (open, closed, muted)</p> <p>Plastic edge sweeps          Thimble slaps and sweeps          Fist on plastic on bdg</p> <p>Cartridge and cluster</p> <p>Cartridge and thimble</p> <p>Bass string preparation (cork and plastic) sb = pizz          Cluster (falling arm)</p> <p>Horizontal ruler mutes (pizz) and sweeps</p> <p><b>Figure 6: Lists of sounds (compiled from multiple sources)</b></p>
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### Conclusion: authorship and origins

The description of David Tudor's realization and performance of *Variations II* raises the question of authorship: is this really a performance of John Cage's composition? Or is it a performance of a piece by David Tudor presented under Cage's name? In many ways, both the approach to the realization and the performance itself are quite un-Cagean. Tudor's manner of creating the performance score from the transparencies does not follow Cage's model of taking measurements within a sound space of interpenetrating continuous variables. Instead, he reduces all variables to a simple two-state model. The performance from this score allows — indeed, it actually invites — performer flexibility and improvisation within a broadly-defined context, something that Cage did not embrace at this time. Even the sound of Tudor's performance seems unlike other Cage pieces of the period. Cage's sound world was one of distinct, perfectly separated sound events (think of *Atlas eclipticalis*, for example, another work composed in 1961). In Tudor's *Variations II*, the sounds merge, overlap, and run into one another in waves of feedback and reverb. But perhaps most importantly, Cage's music of the 1950s, of which *Variations II* is the culmination, was about sound and its independence from thought. Tudor's realization and performance isn't really about that at all, but instead is about the performer's action, his personal discovery and exploration of the amplified piano.

Therefore, I would answer that Tudor's performance does not, in fact, primarily derive from Cage's composition. Instead, in his realization of *Variations II*, Tudor has created a performance situation that derives from his creation of an uncontrollable, unpredictable instrument: the amplified piano. The use of multiple microphones of multiple types, combined with the use of loudspeakers in the same space as the instrument makes for an extremely complex set of interactions among the various sound channels. Given such an instrument, the performer must be flexible,



ready to drop paths that are not proving fruitful, pursuing unexpected paths that arise during the course of the performance. Tudor's open-ended and ambiguous realignment of the *Variations II* notation provided a series of formulas for exploring the possibilities and sound of the instrument. As a result, his performance is really more about actions than their results.

The compositional strategy of Tudor's *Variations II* — the design of a complex, uncontrollable electronic instrumental system that must then be explored through performance — is one that clearly defines Tudor's early work as a composer. Looking, for example, at *Bandoneon!*, we find that Tudor created a very complex electronic system, activated by his own bandoneon playing. The sounds of the bandoneon were routed through a bank of nonlinear processing circuits, the outputs of which served both as audio signal and as input to a number of complex switching and routing devices. The multiple layers of processing and switching prevented Tudor from being able to completely control it, so that his performance took the character of an exploration of the possibilities presented. While the specific systems and performance situations of *Bandoneon!* and *Variations II* are quite different, the underlying compositional approach is the same.

The emphasis on action rather than sound, on exploration of the unknown rather than precise measurement of acoustic space — these characterize not only the differences between Tudor's compositional vision and Cage's, but the differences between Tudor-the-composer and Tudor-the-performer. Where did this new direction come from? I believe that we can look to the introduction of electronics into Tudor's performance toolkit for the answer. The kinds of electronic technology available to Tudor at the time — simple microphones, amplifiers, and processing boxes — not only encouraged this sort of improvised adventure of electronic music, but demanded it. Simply put, there was no way to quantify and control the outputs of these sorts of devices, at least not to the fine level of precision that would have been required by Tudor's working methods of the 1950s. Facing the problems of instruments "you could only hope to influence," Tudor responded as one might expect of a consummate performer: he made the working out of the problems the basis of his art.

Given the common set of devices at their disposal, and given the collaborative, communal performance environment of the time, one would expect Tudor's performance approach to electronics to appear in Cage's work as well. Cage's *Cartridge music* of 1960 is a clear case of this. Despite the superficial similarities of this score to works such as *Fontana mix* or the *Variations* series, the use of graphics and transparencies here takes quite a different direction. Unlike just about every Cage work prior to this (*Theatre piece* is a notable exception), *Cartridge music* defines a way of making a score that is about actions, not the sounds they produce. The same forces are no doubt at work here — the manipulation of unidentified objects inserted into phonograph cartridges is not something that lends itself to quantitative measurement and control.

But for Cage, this action-oriented approach to composition was a limited and short-term interest. By the 1970s, he was firmly back in the arena of sound. This is not surprising, I think. Cage's interest in technology had always been directed towards an environment that would allow him to map sonic space by allowing access to the full range of all the specific parameters of sound. Tudor's interests, on the other hand, are more oriented towards performance: the makeshift world of microphones, amplifiers, and the unexpected interactions of simple components. Cage was never comfortable in this uncontrollable environment; for Tudor it opened the door to his new career as a composer.

Clearly, the analysis of a single composition — and I consider Tudor's realization of *Variations II* to be a composition in its own right — cannot serve as the sole foundation for such sweeping statements. I only offer these as a glimpse into the kinds of issues that still need exploration and research. It will only be after further study of Tudor's compositions and his evolution as a composer that we will be able to see the kinds of influences and cross-influences that happened in the Cage-Tudor circle of the 1960s and beyond. The example we have been reviewing here is of David Tudor playing what is ostensibly a Cage piece, but which is really a Tudor piece. Is *Cartridge music* a case of John Cage playing a Tudor piece? Answering such questions will be interesting, indeed.