PROJECT MUSE®

JONATHAN GOLDMAN

The Buttons on Pandora's Box: David Tudor and the Bandoneon

In the summer of 1966 the pianist David Tudor (1926–96) was preparing for the first concert in which he would appear as both instrumentalist and composer. The concert took place on October 15–16, 1966, at the 69th Regiment Armory in New York as part of the "9 Evenings: Theatre & Engineering" undertaken by Billy Klüver, an engineer working at Bell Telephone Laboratories. The events involved collaborations between artists (including many notable personalities associated with the Merce Cunningham Dance Company, such as John Cage and Robert Rauschenberg) and engineers from Bell Telephone Company, in order to encourage artists to make use of Bell Telephone's battery of experimental electronic audiovisual devices. Tudor's project was a collaboration with the composer and video artist Lowell Cross, the sound artist and engineer Anthony Gnazzo, and a Bell Telephone Laboratories engineer named Fred Waldhauer. At the center of the project was the instrument Tudor had been playing for just over five years and that would continue to be a major focus of his interest throughout the 1960s: the bandoneon, the large concertina invented in mid-nineteenth-century Germany that, after migrating to the Rio de la Plata region of South America, became profoundly embedded in the Argentinean and Uruguayan tango tradition. Tudor had been introduced to the instrument through the composer

Specializing in twentieth-century music history, Jonathan Goldman is assistant professor of musicology at the School of Music of the University of Victoria. He is editor-in-chief of the journal *Circuit: Musiques contemporaines*. His book, *The Musical Language of Pierre Boulez: Compositions and Writings*, was published in February 2011 by Cambridge University Press. Goldman also performs on the bandoneon, focusing on tango repertoire; an arrangement he made of an orchestral piece by Astor Piazzolla was published in 2002 by Éditions Henry Lemoine.

American Music Spring 2012

Mauricio Kagel (1931–2008), who had dedicated his 1960 composition *Pandorasbox, bandoneonpiece* to Tudor. Six years later, and despite more than a few technical difficulties, as was not uncommon over the course of nine evenings, the "happening"-style work, entitled *Bandoneon! (a combine)*, was performed.[1]

The "combine" in the title was a conscious appropriation of the term coined by Robert Rauschenberg for his assemblages of heterogeneous objects, and Tudor's piece was certainly an assemblage in the manner of what would today be called multimedia. The work's genesis harks back to a concert given in Toronto on May 13, 1966, at which Tudor used his bandoneon to perform Lowell Cross's *Musica universalis*, a work for an unspecified instrument that featured projections of visual images created from the *x*-*y* scan lines of a television set. In Tudor's Armory production, performed five months later, the symmetrical aspect of the bandoneon—which essentially consists of two distinct instruments that share a single air supply—suggested a visual isomorphism with the two-dimensional space described by television scan lines designed by Cross. Tudor's *magnum opus bandoneorum* included other inspired gadgetry, including remote-controlled robot-like carts bearing speakers that wandered about onstage, and a vochrome—a set of harmonium reeds fitted with contact microphones that was used to filter the bandoneon's signal, thereby triggering various other sonic and visual events.[2] The use of this vochrome, whose reeds are excited by other reeds, is a typical example of the ways in which Tudor and other experimental composers projected the interior space of the bandoneon onto its environment. Moreover, the remarkable outburst of compositional activity in the U.S. avant-garde that resulted from Tudor's initial association with Mauricio Kagel and his subsequent engagement with the bandoneon reveals the extraordinary sensibilities of a virtuosic musician who was in the process of changing his primary mode of making music. The period in which Tudor engaged with the bandoneon coincided with his transition from being mainly a performer (albeit a co-composer of indeterminate works) to mainly a composer (albeit of performance-based live-electronic works). The stereophonic character of the bandoneon contributed to Tudor's later approach to electronic music, as well as to that of certain musical projects by other U.S. composers such as Gordon Mumma (b. 1935) and Pauline Oliveros (b. 1932). The two independent signals of the bandoneon and its long, continuous sound, with irregular envelopes and prominent combination tones, may well have inspired not only Tudor, but also these other composers, to approach electronic music as processes in which sounds mutually modulate each other. From *Bandoneon! (a combine)* onward, Tudor's compositional *modus operandi* paradoxically "obviated the need for any compositional means."[3] Consequently, Tudor's engagement with the instrument constitutes a decisive but little-known stage in his creative development.

The Bandoneon

The bandoneon is a free-reed instrument, a large concertina with a hand-operated bellows that was invented either in Chemnitz or Carlsfeld, Germany (with a mechanism introduced to that country from China) in the 1830s.[4] Like the accordion, it evokes premodern folk traditions, despite its modern mechanical construction. The most common models of the instrument are bi-sonic, like its free-reed cousin the harmonica: each button triggers one of two different notes depending on whether the bellows are opened or closed. Although practical for small concertinas and accordions equipped with just a few buttons on either side and designed for playing alternating dominant-to-tonic progressions by changing directions on the bellows, this arrangement becomes more complicated in an instrument as large as the bandoneon, which can have as many as seventy buttons. Moreover, the bandoneon has a notoriously counterintuitive keyboard layout, and no fewer than four separate key arrangements need to be mastered: left hand/right hand, opening bellows/closing bellows (see fig. 1 for the keyboard layout).[5] Since the late nineteenth century, the bandoneon has been considered the iconic

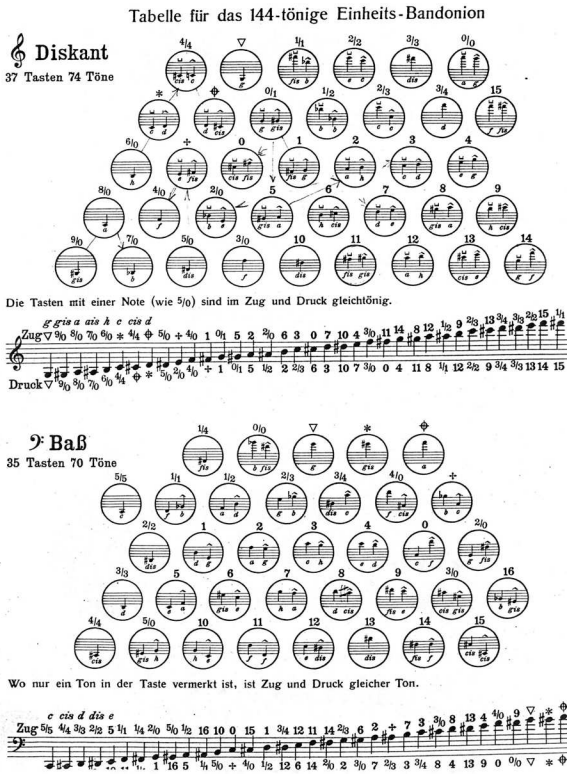


Figure 1. Keyboard layout of 144-note (bisonic) Einheits-bandoneon, with opening and closing bellows, left and right hands, similar to layout used by Tudor. From Peter Fries, *Bandonionschule* (Leipzig: Oskar Seifert Musikverlag, 1935), p. 3; bandoneon tutor in possession of Gordon Mumma.

instrument of the tango, and thereby become a symbol of the national identity of Argentina.[6] The guitar is associated with the rural expression of this identity via the figure of the gaucho, and the bandoneon is its urban equivalent.[7]

Kagel's Instrumental Theatre and Its Application to Pandorasbox

The Argentinean-born Kagel was sensitive to the webs of connotation an instrument or a genre could engender, and he delighted in subverting them, notably but not exclusively through parody. His works often play on his audience's expectations and even prejudices, most notoriously in his *Exotica for Extra-European Instruments* (1972), in which Western musicians are asked to perform on a vast array of non-Western instruments while singing with affected "foreign-sounding" accents, in an effort, as Kagel himself explained, to "expose the rather relative term 'exoticism.'"[8] These Western musicians inevitably fail in their task, and as a result they seem "primitive," thereby calling into question the preconceived notions about primitiveness presumably held by the bourgeois concertgoing audience.

The bandoneon can play the role of the strange or exotic, owing in part to its illogical keyboard layout, but also to Argentina's geographic remoteness from Europe. Its low social status—squeezeboxes are associated with street music, vaudeville, gypsies, peasants, and the like—makes it a stranger to the concert hall. These characteristics might well have attracted Kagel, who could play the bandoneon, to compose *Pandorasbox*.[9] For him, the irony here is double or triple: the bandoneon is actually a German instrument, but when performed in the halls of so-called serious concert music, it appears exotic and strangely primitive, even if its mechanism testifies to its origins in the modern era. In *Pandorasbox*, the indigenous instrument is estranged, in the same way as Kagel was also made strange when he performed the work, as he often did throughout the 1960s: Argentinean by birth but bearing a German-Jewish name, he behaved oddly on stage, smiling at the audience at odd moments, spinning on his stool, and wiggling his knees to create vibrato. One suspects that, in avant-garde music circles in West Germany, the bandoneon, despite its German roots, would have been the very embodiment of the Other: the poor man's instrument among the rich, the folk instrument in a learned context. The composer Frederic Rzewski, in a 1965 commentary on Kagel's piece, summed this up when he began by stating that the bandoneon was the "typical instrument of blind-beggar musicians in the streets and subway stations."[10]

Kagel was able to exploit the very strangeness of the bandoneon as a way to create the Brechtian alienation effects that were his stock-in-

trade. The instrument not only looked curious, with its long, telescoping bellows, but also sounded odd: when its reeds are out of tune—common given the difficulty of tuning the instrument precisely—it produces prominent beating effects that can at times sound as if they were modified electronically. Although the piano needs to be electronically transformed if it is to be used as an abstract sound source, the bandoneon seems to produce denatured sonorities in its natural state.[11] As a result of its illogical key arrangement, this strangeness is also felt by the composer who writes for it: the instrument is never amenable to formulaic melodic arrangements, whether of a chromatic or a diatonic variety. The bandoneon lends itself well to pointillistic passages with broad leaps of register, since spatial trajectories through the keyboard that correspond to musical cells with leaping, jagged intervals are easily executed on the instrument (although it is also well suited to smooth, continuous musical sonorities).

A characteristic passage in *Pandorasbox* illustrates how Kagel exploited the unusual keyboard arrangement of the instrument (fig. 2). It features fairly disjunct motion in both hands, and its execution on a piano (or for that matter a chromatic, i.e., unisonic, bandoneon) would require perilous leaps. A look at the key map of the diatonic bandoneon (fig. 1) reveals that Kagel chose these notes as a function of the key layout of this instrument, which is also borne out by the practice notes made by Tudor, who performed the work several times beginning in 1965 (fig. 3). Playing this figure on the bandoneon merely involves pressing down four adjacent keys on three adjacent rows with the fingers of the right hand, and a similar arrangement for the fingers of the left hand. The bisonic character of the instrument is further exploited in passages that feature rapid changes of direction of the bellows ("bellows shakes"). When employed on the bandoneon, this effect produces two chords in rapid succession, a gesture produced without releasing the buttons (fig. 4). In sum, *Pandorasbox* constitutes an exposition of the intrinsic properties of the bandoneon: its jagged phrases make its illogical keyboard layout audible, and it thereby sounds out the instrument's eccentricities.

David Tudor's Introduction to the Bandoneon via Pandorasbox

A number of circumstances placed the bandoneon in Tudor's path. In 1957 Kagel had moved to Cologne, a city Tudor often visited for concert performances and for work with Karlheinz Stockhausen at the studios of Westdeutscher Rundfunk (WDR) radio. It was there that Stockhausen's *Kontakte* (1958–60) received its first performance in November 1960, with Tudor at the piano. Kagel's and Tudor's paths crossed often in those years. Kagel's *Sexteto de cuerdas* (1953; revised 1957), a serial string sex-

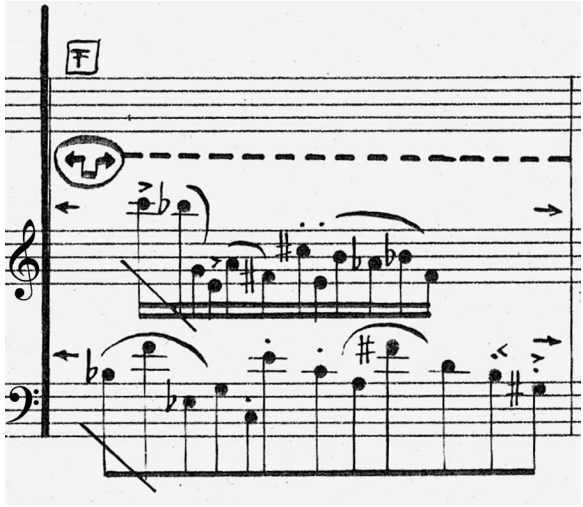


Figure 2. Excerpt from page 4 of the score of *Pandorasbox. Bandoneonpiece* (clefs added). Copyright © 1960 by Henry Litolff's Verlag. Used by permission of C. F. Peters Corporation.

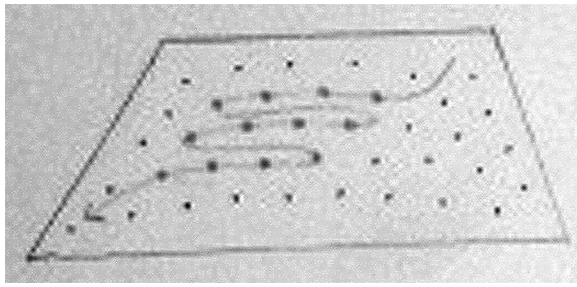
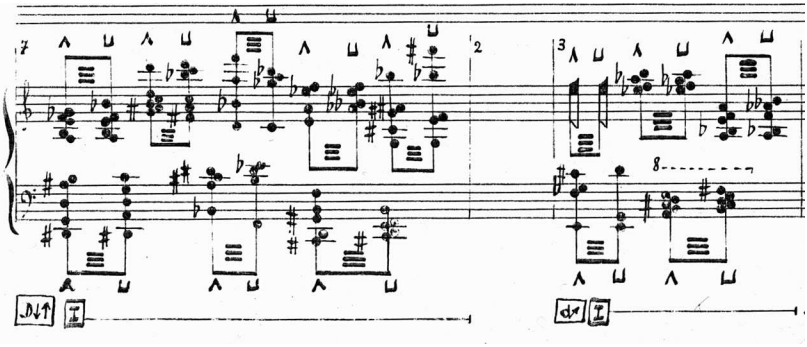


Figure 3. David Tudor's practice notes for the upper voice of the passage shown in figure 2 (keyboard layout shown in figure 1). David Tudor Papers, The Getty Research Institute, Los Angeles (980039).

Figure 4. Excerpt from page 2 of the score of *Pandorasbox. Bandoneonpiece*. Copyright © 1960 by Henry Litolff's Verlag. Used by permission of C. F. Peters Corporation.



tet, was performed during the 1958 Darmstadt International Summer Courses for New Music in a concert in which Tudor played works by Cage and Boulez, among others. Tudor and Kagel began collaborating as early as 1959, the year in which Tudor performed Kagel's *Transición II* (1958–59), scored, like *Kontakte*, for piano, percussion, and tape at Darmstadt.[12] Later, Tudor would go on to play Kagel's piano work *Mimetics* (*Metapiece*) (1961) and to perform on the organ in *Improvisation ajoutée* (1961–68).[13] But sometime in the late 1950s, the two must have decided on a plan in which Kagel would compose a bandoneon piece for Tudor—a strange proposition considering that Tudor had never played the instrument. This plan might have emerged not only from Tudor's enthusiasm for the instrument, but also as a result of his prestigious reputation in avant-garde circles in Germany, which imparted to the pieces he premiered the aura of a consecration.

Although Kagel introduced Tudor to the bandoneon, *Pandorasbox*, dedicated to Tudor, owes its existence partly to Kagel's encounter with Cage and Tudor. Kagel had first been exposed to Cage's music at the latter's now-notorious visit to Darmstadt (in the company of his performer of choice, Tudor) in 1958.[14] Like many pieces from Kagel's first decade of compositional output (as well as many subsequent ones)—including *Sur scène*, *Sonant*, *Metapièce (Mimetics)*, *Improvisation ajoutée*, and *Antithèse*—*Pandorasbox* bears the hallmarks of Cage's whimsical theatricality. This period marked a decisive point in Kagel's career during which many of his works problematized the theatrical dimension of musical performance.[15] The instructions that precede the score of *Pandorasbox* reveal this humorous, theatrical attitude:

> It is recommended that there be laughing and smiling during the performances. [T]he performer should make a clear distinction between little, moderate, and much, as degrees of acoustic (laughing) and optic (smiling) articulation. [S]uch action should be incorporated as far as possible into the instrumental sound (acoustic) and the playing action (optic) of the performance. [T]his does not exclude the possibility of remaining serious.[16]

In another theatrical flourish, Kagel requires the performer to present *Pandorasbox* on a rotating stool, allowing the performer to play with his back to the audience, thereby sending the sound from the left side of the instrument to the right side, and vice versa (fig. 5).

Pandorasbox's adherence to the Darmstadt/Cologne/Donaueschingen zeitgeist around 1960 is overt, and not only in the graphic nature of many of the score's annotations and its use of the theatrical dimension of music making. It is also apparent in its unfinished character, which explains why the year of composition of this work is always printed with indeterminate ellipses (1960, . . .) even though the score is marked with

Figure 5. Kagel performing *Pandorasbox*, c. 1965, with stool rotated 180 degrees. Photo: Karsten de Riese. Used by permission.

a definite date: "Köln, July–August 1960." Kagel indicates in the instructions that "the composer reserves the right to add new measures to the piece. [S]uch additions may be accepted or rejected by the interpreter. [I]f accepted, . . . new measures must be substituted, anywhere in the piece, for the old one it replaces." These additions contain some of the most idiosyncratic graphic notations of the score (fig. 6).

Pandorasbox bears witness to an aspect of the instrument that seems to have fascinated Kagel: its stereophonic character. Indeed, several passages in *Pandorasbox* explicitly thematize the opposition between the two sides of the instrument by each side's sounding in turn in an apparent effort by the composer to exploit the bandoneon's stereophonic properties. The dual nature of the bandoneon's sound sources is particularly underscored in supplementary measure C, in which four-note chords are played in alternation between the hands, creating a panning effect, along with a tremolo produced by knee shakes (fig. 7). Kagel stipulates with respect to this measure that "the sounds must move (stereolike) from right to left and viceversa." Kagel's use of acoustic stereophony, which would have

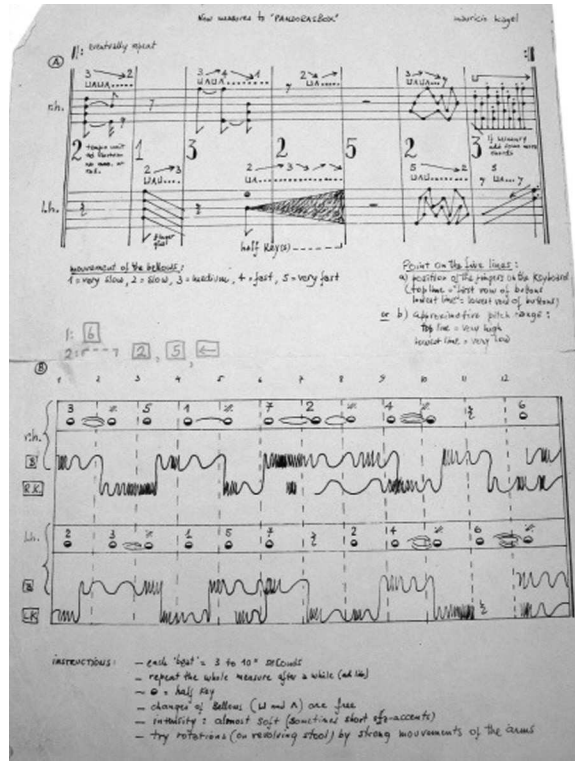
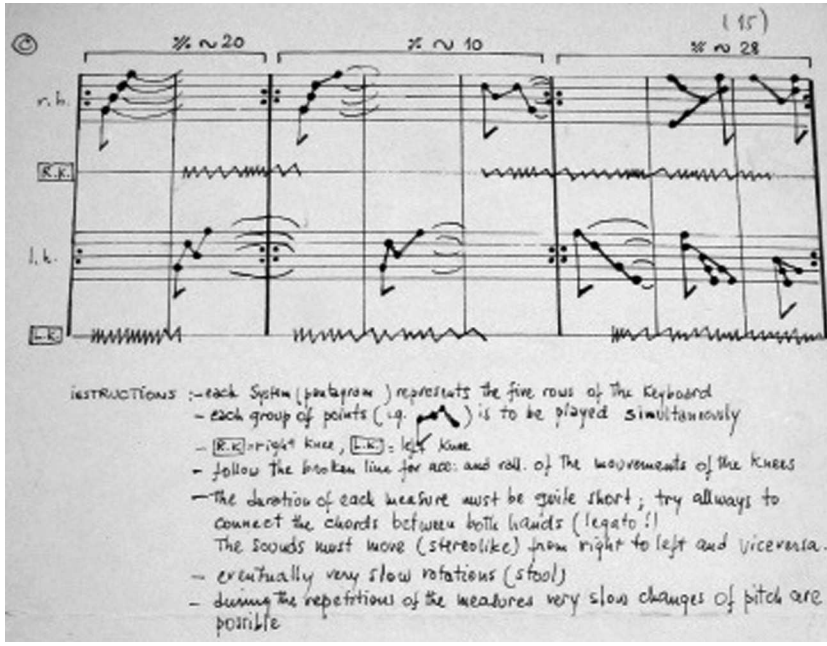


Figure 6. Supplementary measures A and B from *Pandorasbox*, David Tudor Papers, The Getty Research Institute, Los Angeles (980039). Copyright © 1960 by Henry Litolff's Verlag. Used by permission of C. F. Peters Corporation.

struck many listeners as innovative, was also a critical engagement with an electronic recording technique that was still in its infancy. Although the history of stereo sound dates at least as far back as experiments at the Bell Telephone Labs in the early 1930s, and stereophonics had been showcased in Walt Disney's 1940 film *Fantasia*, stereo and binaural recordings only started to become commercially available in the late 1950s.[17] In the early 1960s, stereophony was still a decidedly avant-garde effect and a source of considerable excitement among sound engineers and composers as well as the general public.[18] As Tim Anderson has commented, referring to the musical thought of John Cage:

> by 1957, the promise of in-home stereo technology had become widely anticipated by musicians and serious listeners alike and was viewed as a model audio technique that had . . . a significant relationship with musical recording and reproduction. In an avant-garde context, mentioning the term "stereophonic" places these artists in an interesting, perhaps unexpected . . . relationship to another context of fashionable consumer technologies, industrial demands, and popular listening practices of the period.[19]

Figure 7. Supplementary measure C from *Pandorasbox*. David Tudor Papers, The Getty Research Institute, Los Angeles (980039). Copyright © 1960 by Henry Litolff's Verlag. Used by permission of C. F. Peters Corporation.



Avant-garde composers frequently employ a musical strategy in which they extract a technology, such as stereophony, from its context (in this case the recording studio, where it was conceived as a component of "high fidelity") and use it as a compositional parameter in and of itself—as a method of presentation rather than representation. A familiar feature of the evolution of sound technology in the twentieth century is that it undergoes category changes: a new technology crosses the aisle from a production tool to a presentation tool or vice versa, just as the loudspeaker, invented as a tool of representation of preexisting music, later came to be exploited by composers of *musique concrète* and electronic music as a component in the very production of musical works. Stereophony underwent a similar transformation in the history of avant-garde music.[20] The properties of the bandoneon fit in with this composerly interest in stereo sound: the instrument is already spatialized along its horizontal axis and because the bellows are long enough (much longer than those of the accordion) to ensure that these two sides are sufficiently separated in space to be heard as distinct sound sources (and in some cases, captured by different microphones and sent off into different loudspeakers).[21]

Moreover, another feature of *Pandorasbox* consistent with tendencies of other avant-garde composers during this period lies in the nonfixed nature of the score: Kagel prepared two separate scores for the same work, indicating in the preface that

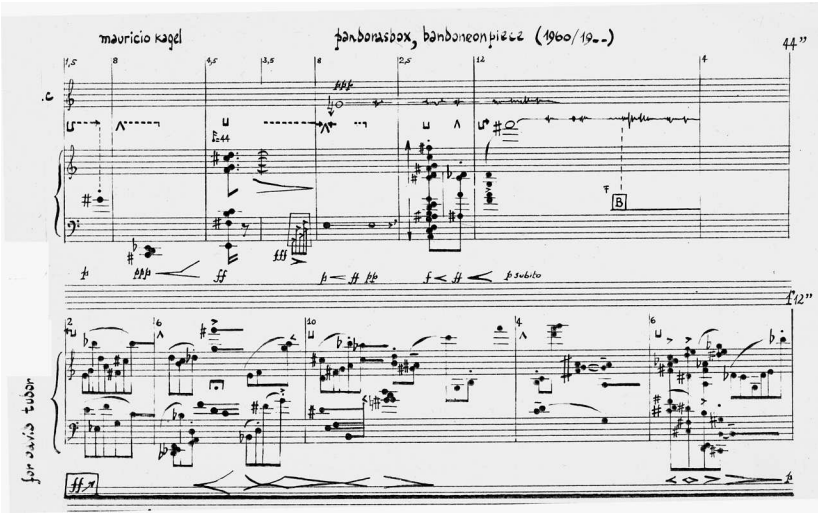
> the piece exists in two composed versions; one with pitches determined and the other with pitches free within given register. [T]he performer may either 1) choose one of the two versions and play it from beginning to end, or 2) alternate at will between them, provided only that the changeovers do not occur within bars. [T]he degree of interpolation may be decided in performance.

Both versions of the score were bound together, with the notated version placed before the indeterminate one. The presence of the two scores suggests that Kagel may have been hedging his bets: the young South American composer striving for acceptance in the Western European avant-garde milieu was eager to display both his conventional métier (via the notated score) and his comfort in the heady world of indeterminacy in the manner of Cage or Bussotti (via the graphic score). Some of the figures in the indeterminate version of *Pandorasbox* recall Kagel's theories of manipulation of graphic symbols via geometric operations such as translations and rotations, which he included in an article published in *Die Reihe* in 1960.[22]

It might reasonably be assumed that Kagel prepared two versions of *Pandorasbox* with the two possible performers in mind: David Tudor, the work's dedicatee, and himself, its composer. As an Argentinean who knew how to play the bandoneon, it might be thought that Kagel wrote the notated score for his own performance needs, while the graphic score was intended for use by Tudor, since the tablature would presumably have facilitated a realization of the work by a pianist who was at the time unfamiliar with the bandoneon.[23] Such an assumption underestimates the fastidiousness with which Tudor approached all of his performances. Whatever Kagel's intentions, it was the reverse that took place: Kagel seems to have used the graphic version of the score in his own performances of the work.[24] At any rate, he certainly does not adhere to the pitch or rhythm specifications of the score in the few extant recordings of his performances of *Pandorasbox*, all very different from one another.[25] Recordings of Tudor performing the work attest, on the other hand, to the fact that Tudor read from the notated version of *Pandorasbox*, or at least sections of it, including the opening measures, with a modicum of note accuracy (see beginning of notated score, fig. 8).[26]

Tudor's practice notes for *Pandorasbox* demonstrate that far from approaching the instrument as a mere sound source, relying on Kagel's graphic annotations, Tudor meticulously studied and mastered the key layout of the instrument. Figure 3, one of countless such examples found

Figure 8. *Pandorasbox*, notated version, beginning. Copyright © 1960 by Henry Litolff's Verlag. Used by permission of C. F. Peters Corporation.



among his practice notes, illustrated how Tudor first notated musical phrases and then traced out the sequence of buttons on the bandoneon to which they correspond. Tudor's thoroughness is not surprising, to judge by the accounts of his friends. He was known for the extreme care with which he approached not just the preparation of musical works, but all aspects of his life.[27] Clearly, Tudor was not going to perform *Pandorasbox* without having full mastery of the instrument, and the extant recordings of Tudor performing *Pandorasbox* bear out his attitude.

Tudor's evident passion for cracking the bandoneon code in *Pandorasbox* was a corollary of his fascination with puzzles of all kinds, which was in turn an important impetus for composers—Cage first and foremost—to produce ever more complex scores for him, since they knew that Tudor would be more likely to embrace a work that presented technical conundrums for performance. The most notorious example of such works was *Music of Changes* (1951), featuring a complex notation for which Tudor produced "more than eighty pages of charts, lists, computations and timings" in preparation for the performance, as well as an alternate score in collaboration with the mathematician Hans Rademacher; these calculations were undertaken even though the work's notation was not open-ended.[28] Similarly, Tudor's preparatory notes for *Pandorasbox* fairly bristle with his mental exhilaration before the challenge of the bandoneon's illogical keyboard layout. Since this layout was initially unfamiliar to Tudor, he needed to transcribe the piece into a kind of tablature before playing it, so, as his practice notes testify, he essentially compiled a road

map for his fingers. John Holzaepfel observes that Tudor's meticulous realizations are "not very different, in one sense at least, from written realizations of figured bass or of the diminutions of Baroque preludes; that is, they are practical solutions in the root sense, written with the aim of making a composer's notation practicable in performance."[29]

Performance History

Predictably for a work that required the musician to perform on an unfamiliar instrument, *Pandorasbox*'s performance history was fraught with false starts, delays, personnel changes, and tensions between composer and performer. Tudor intended to premiere *Pandorasbox* in Montreal in August 1961 and to perform it the following month at the Darmstadt Summer Courses.[30] In the weeks leading up to these two performances, Kagel expressed some misgivings about having conferred the responsibility of the first performance on a musician who had never played the instrument in public. In a letter dated September 5, 1960, Kagel wrote in serviceable English to Tudor:

> We must speak a lot about "pandorasbox. bandoneonpiece." I am sure that the bandoneon is one of the most difficult instruments; and my piece is not the Hanon . . . , perhaps the "Études transcendantales"? I worked very hard in pandorasbox, the material, all the new possibilities were very exciting; I understand your courage to hit the nail on the head, or better, to find the right way to play the right key. Please write to me as soon as you know something new.[31]

Kagel's unease proved justified, for Tudor canceled both performances. In a letter to Wolfgang Steinecke, director of the Darmstadt Summer Courses, dated August 16, 1961, Tudor wrote: "Unfortunately I've had to abandon the Bandoneon-piece of Kagel for the moment; there are so many demands on my time that I haven't been able to study either the instrument or the piece sufficiently to present it as yet; so it must wait for another year."[32] In a comment that one supposes to be sincere, since it does not serve to excuse the cancellation, the pianist adds that "this makes me quite sad, because there is nothing which interests me more." One already senses in this remark Tudor's growing disillusionment with his role as avant-garde pianist. Starting in 1960, Tudor had become something of an avant-garde pianist *malgré lui*: reluctantly accepting contracts, the pianist who had famously premiered the works of Cage, Stockhausen, Bussotti, and Earle Brown was starting to feel like "an actor playing the same role." Holzaepfel has observed that "as early as 1960 there were signs that Tudor's interest in the piano was waning." With plans to perform works by the younger generation of avant-garde composers, Tudor wrote to his longtime partner, the writer M. C. Rich-

ards: "I'm not terribly pleased with any of my activities of recent months or of those I see in the very near future."[33] Part of this disillusionment came as a result of the tumult caused by Cage's presence at Darmstadt in 1958. What Earle Brown, an eyewitness, described as "a high time of collision between a kind of American iconoclastic attitude and the European elitist intellectual organization thing" was experienced not exclusively as a triumph for Tudor, but also as a tribulation.[34] He eventually transformed himself into a composer in his own right, principally of live electronic works, the most impressive and celebrated example being *Rainforest*, commissioned for the 1966 Merce Cunningham Dance piece of the same name.[35]

As a result of Tudor's inability to master *Pandorasbox* in time for either the Montreal or the Darmstadt concert, as well as another aborted plan to give the first performance on a Japanese tour with Cage in the fall of 1962, it was Kagel, not Tudor, who ended up giving the premiere of *Pandorasbox*—but two years later, in a concert in Munich in July 1963.[36] Tudor went on to perform the U.S. premiere of the work at the insistence of Kagel, who may have been trying to make up for having stolen the premiere from the work's dedicatee. "I have a great bitte," Kagel wrote. "[C]ould you play 'pandorasbox' in Buffalo (American Premiere) the 5th of March[?]. I think the only right performance of the piece (and not only the musical one) would be realised by *YOU*."[37] This performance took place at the State University of New York at Buffalo on April 3, 1965, where Kagel was the Slee Visiting Professor, and Tudor performed *Pandorasbox* in several concerts over the next year. Predictably, the music critic of the *Buffalo Evening News* was more struck by Tudor's theatrical gesticulations than by any of the work's stereophonic acoustical effects:

> There seemed to be a sober-faced punster at work on the squeeze-box, as well. Mr. Tudor, slightly graying, trim sack suit, looks like the junior member of an old seed-catalog firm, in repose. In action, he comes closer to a reaper of bedlam. Spreading the music on the floor, Mr. Tudor sat on a revolving stool, revolving now and then. He jiggled the Bandoneon with his knees, hummed out of tune as he played out of tune (that makes two out-of-tunes, not one in-tune) and paired up guttural bass groans with treble squeaks.[38]

The Bandoneon in the American Avant-Garde

Tudor went on to commission a number of works for the instrument that would allow him to perform whole concerts on the bandoneon, coupling the ten-odd minutes of *Pandorasbox* with other works. There was, for example, Pauline Oliveros's *Duo for Accordion and Bandoneon* (1964), conceived to be performed by the composer, whose principle instrument

is the accordion, and Tudor, then a frequent visitor to San Francisco, where Oliveros was living. Initially planned as a fully composed work, the Duo exists in complete score written out by Oliveros and preserved in the David Tudor Papers in the Getty Research Institute in Los Angeles. This work was first performed on March 30, 1964, as part of the Tudorfest concert series curated by Oliveros in honor of its namesake's visit, which took place at the San Francisco Tape Music Center's fabled 321 Divisadero Street headquarters.[39]

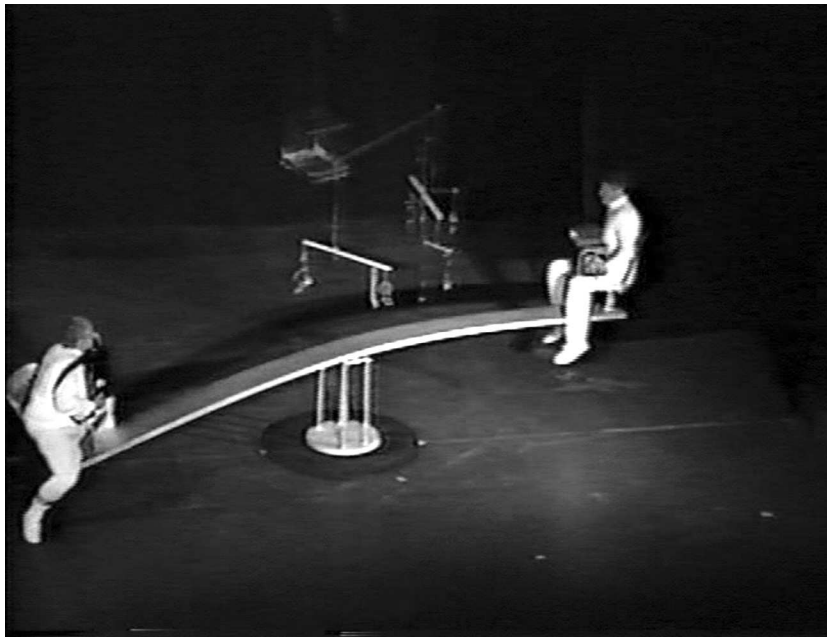
Significantly, the concert was staged by the dancer and choreographer Elizabeth Harris, who decided to have Tudor and Oliveros perform the piece while seated on either side of a rotating seesaw mounted on a lazy Susan, clearly emphasizing the stereophonic properties of both instruments. This arrangement gave rise to the so-called seesaw version of the work. It is unclear whether Harris's staging was itself inspired by Kagel's rotating stool in *Pandorasbox*, which Tudor would likely have discussed with her in the weeks leading up to the performance. Alternatively, it is possible that Harris would have seen a performance of *Pandorasbox* performed by Kagel himself, since Kagel had been invited to Mills College in Oakland, California, in 1963.[40] In either case, the staging can be considered an extension of Kagel's stereophonic experiments. Describing the duo in a program note from the time of its first performance, Oliveros emphasized the fact that the seesaw setup accentuated the "native" stereophony of the instrument:

> A few days later, Elizabeth [Harris] had constructed a handsome seesaw which not only went up and down, revolved around the center and had revolving seats, but it was absolutely silent. [Oliveros's pet mynah bird] Ahmed's cage was suspended over the center as part of a mobile made from wooden dowels and large, odd-shaped lead fishing weights. David and I clambered onto this glorious instrument, which was not only dramatic, but would surely create stereophony with the sound sources in motion.[41]

The stereophony of the instrument is in the Duo transposed to a higher level of structure—another instance of mirroring that might be likened to the rhetorical figure of synecdoche—since two stereophonic ("bi-instrumental") instruments are themselves separated in space.[42] Not only does the rotating seesaw create a three-dimensional spatialization that goes beyond even what is attainable through stereophony, but according to Oliveros the rotation was fast enough to provoke a Doppler effect, the downward glissandi familiar from the sound of sirens on a moving ambulance.[43]

More than two decades later, on October 16, 1986, this performance was reprised at the Victoria Theatre in San Francisco, with composer Gordon Mumma (b. 1935) performing the part composed for Tudor and his bandoneon (fig. 9).[44] Oliveros later acknowledged that this experi-

Figure 9. Pauline Oliveros and Gordon Mumma performing the Duo for Accordion and Bandoneon in 1986. Still from videotape of performance; videographer unknown.



ment in spatialized sound has led her to incorporate similar effects in her music up to the present day. The seesaw staging sensitized Oliveros to the spatial layout of both the accordion and the bandoneon and the way it could lead to different spatial arrangements in musical performances. In a 2008 performance with the free-jazz pianist Cecil Taylor, Oliveros asked to be seated on a swiveling secretarial chair, and during the concert she spun around, much like Kagel in *Pandorasbox*, creating a simple but effective panning effect on her stereophonic instrument.[45]

Other Tudor commissions for the bandoneon followed, most to be performed at the First Live Electronic Music Festival (FLEM) in Davis and Oakland, California, in December 1967—a collaboration between Mills College, Oakland University, and the University of California, Davis. There was, for example, Stanley Lunetta's *Piece for Bandoneon and Strings*. Lunetta (b. 1937), a composer and percussionist who specialized at the time in the construction of sound sculptures, uses Tudor as a kind of sculptural element in the highly conceptual performance piece. The strings in the title refer not to violins or cellos, but rather to electric wires connected to microphones attached to Tudor's person, including his throat. Three assistants pull on the strings as if Tudor were a puppet to trigger vari-

ous amplified sound events (fig. 10). Clearly, the emphasis on clownish gesticulations sets the Lunetta piece squarely in the lineage of Kagel and his *Pandorasbox*.[46]

Predictably, most of these commissioned pieces did not have much of a life after their first performance; in some cases, so ephemeral are they that no recordings even exist (as is unfortunately the case for Lunetta's *Piece for Bandoneon and Strings*).[47] Some of them are little more than elaborate jokes, such as *. . . But Don't Step on My Blue Suede Bandoneon* (1966), for two amplified performers, by Anthony Gnazzo. Other pieces for bandoneon were likely inspired by Tudor's advocacy, even if they were composed for different musicians, such as Toru Takemitsu's *Crosstalk for Sam Francis* for two bandoneons and tape, composed for the Crosstalk Multimedia Festival, which took place at the Olympic Stadium in Tokyo in 1969, a festival organized by Roger Reynolds and peopled by adepts of Cage.[48] Whether quirky, whimsical, or serious, the works written for Tudor share a number of characteristics: an interest in the bandoneon's bi-instrumentality, a tendency to exploit electronic sound manipulation, and an interest in long sustained notes (and the combination tones produced when two or more of these notes sound). All of these traits are exploited in Mumma's powerful musical essay for bandoneon and electronics, *Mesa* (1966), perhaps the most significant work to come out of Tudor's bandoneon period.

Tudor had had the idea of commissioning a piece that coupled the sound of the bandoneon with a live electronic interface several years before the FLEM concert and called on Mumma to write such a work for him. Having met Mumma in 1960, the year of Tudor's first appearance at the ONCE Festival of New Music in Ann Arbor, Michigan (his subsequent appearances were in 1963 and 1965), Tudor knew Mumma to be at the forefront of the burgeoning genre of music with live electronics (in Mumma's parlance, "cybersonics").[49] In 1964 Mumma had published a pioneering article on the construction of home studios for electronic music, a topic of great interest to Tudor, who eventually built one for himself.[50] As Mumma recalled in a 2008 conversation, they discussed the project on the roof of a parking garage in Ann Arbor in September 1965 during a concert given as part of a follow-up event to the regularly programmed February ONCE event.[51] Tudor was enthralled by the instrument's long sustained tones:

> [Tudor] knew that I was doing a lot of work with electronics, made my own circuitry and so on; but also because we'd performed together, in works by [Toshi] Ichiyanagi and Cage and so on, he knew that I was more than just a technician. In fact the technician part is secondary in my life. So, there was a wonderful afternoon on that roof, and we had a break from rehearsals, and it was lovely, September in Ann Arbor, and he brought out the bandoneon. And I remember I asked

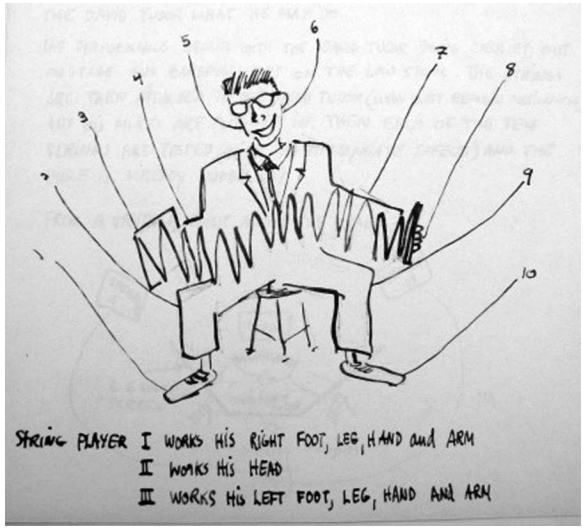


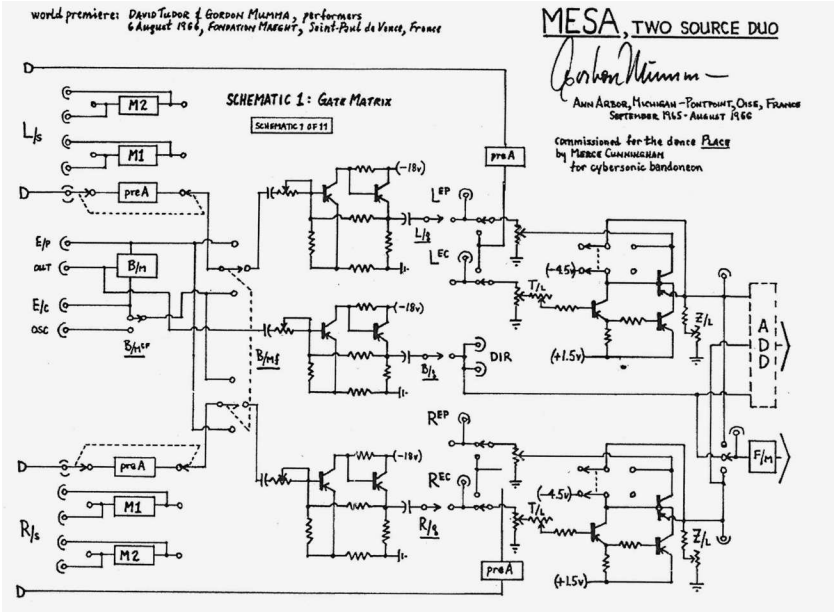
Figure 10. Instructions for Stanley Lunetta's *Piece for Bandoneon and Strings* and photo of Tudor performing the piece at the First Live Electronic Music (FLEM) festival at Mills College in December 1967. Score extract use by permission of Stanley Lunetta. Photo: Gordon Mumma.

him, "What do you like best about it?" and he said, "See if you can breathe this long . . . ahhhhhhh [imitates the sound of a long sustained tone on the bandoneon]." I knew then after hearing him play until the bellows were completely extended, and completely controlled, I knew just what I was going to do. I knew what the principle was for the piece I was going to make for him. So I asked him to show me more stuff.[52]

It was not only the capacity to sustain notes at length that fascinated Tudor, as Mumma's comments suggest, but also the irregular envelopes that such sounds produce: it is relatively difficult to sustain a bandoneon note with a constant intensity because of fluctuations in the air pressure caused by the movement of the bellows. Consequently, the sounds produced are bewilderingly irregular and full of unpredictable nuances. The electronic circuitry used in *Mesa* was elaborate, as the schematic diagram of the piece's electronic circuitry prepared by the composer at the time displays (fig. 11).

Mumma also described how he was also fascinated by what he called the "subharmonics," or difference tones. These tones of the instrument are especially audible when two notes in the high register of the bandoneon sound together and generate a third tone whose frequency is equal to the difference of the two source tones.[53] These tones then lent them-

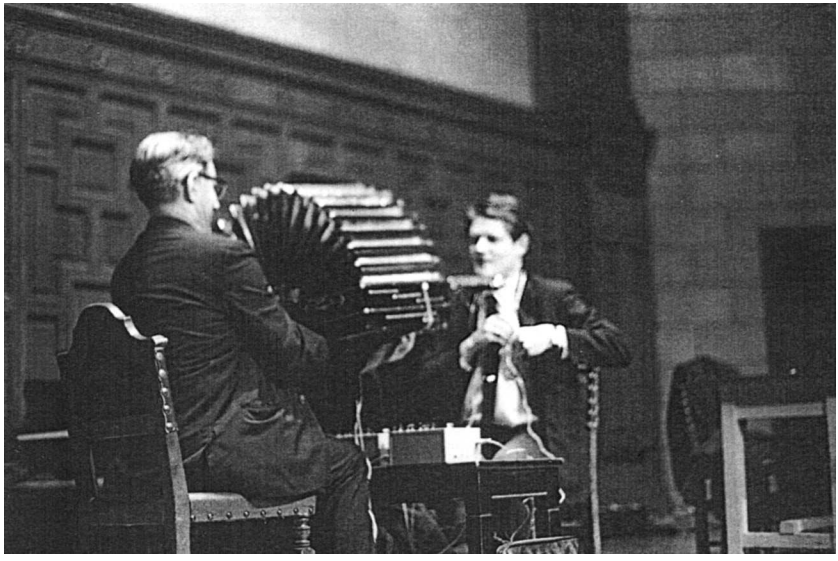
Figure 11. Gordon Mumma's electronic schema for *Mesa*. Used by permission of Gordon Mumma.



selves well to amplification and enrichment through the process of ring modulation in the electronic part of *Mesa*. As figure 11 attests, Mumma's principal electronic process in *Mesa* was to have sound from one side of the bandoneon serve as carrier frequency for the ring modulation applied to the sound of the other side. The electronics of *Mesa* effectively exploit the bilateral nature of the bandoneon in a particularly ingenious way: Mumma harnessed the vibrations of the metal reeds of the instrument, and the two sides were amplified using contact microphones and sent out into pairs of speakers, creating a quadraphonic effect. In effect, in *Mesa* two signals act on each other, creating a kind of exponential stereophony.

The title of *Mesa* refers somewhat enigmatically to what the composer describes as "aspects of its binary musical architecture, the structural geometry of monolithic semiconductors used in its electronic circuits, the contours of its cybersonic thresholds, and the expansive, eroded, mesa landscapes of the south-western United States."[54] Its use of state-of-the-art electronic circuitry is certainly one of its aspects that inspired Merce Cunningham to use it in his 1966 dance piece *Place*, since much of the music the dancer-choreographer was using in the mid-1960s exploited electronic sounds of a fairly strident variety.[55] Containing no prerecorded sounds, *Mesa* created the electrified sonorities of an industrial soundscape with only one bandoneon (Tudor) and one technician (Mumma) manning

Figure 12. Tudor and Mumma perform *Mesa* at the First Live Electronic Music Festival (FLEM), Mills College, Oakland, California, December 1967. Photographer unknown.



the "cybersonic" controls (fig. 12). *Mesa* was later performed not only by Mumma, but also by Kagel, who played it with Tudor in early 1968 during a Cunningham Dance Company European tour that featured *Place*. In these performances, it is unclear which performer, Kagel or Tudor, performed on the bandoneon and which one controlled the electronics. It is possible that they took turns.

Interpretations

One of the sources of Tudor's attraction to the instrument certainly lay in the instrument's expressive potential. He had an abiding interest in the popular idioms associated with the instrument, and was sensitive to its extremely strong topical associations with the urban culture of Argentinean tango. Kagel introduced Tudor to the jazzified *tango nuevo* of Astor Piazzolla, writing to him in 1962, "I will make a copy of the Piazzolla record and send it to you."[56] Tudor loved Piazzolla's music, and several of his dinner guests recall helping Tudor prepare one of his elaborate meals of Far Eastern cuisine while listening to recordings of tango music. For Oliveros, her access to the expressivity of tango was mediated through her acquaintance with Kagel, and it was doubtless the same for Tudor. As she recalled in a 2008 conversation: "David and I used to spend a lot of time listening to records. He had a ton of Astor Piazzolla. I used to visit him in Stony Point [New York] where he lived. In the '60s, but it spilled into the '70s . . . He had these Astor Piazzolla records and we would be cooking Indian food, and listening to Astor Piazzolla. It was wild."[57] Oliveros recounts the chain of transmission this way:

> On the one hand there's the composer, Mauricio Kagel, who transmits his interest in the bandoneon to David Tudor. Tudor and I met in 1963, just about the time this was happening. So I got infected with the bandoneon too, because I didn't know about it. But then the other composer who was really important was Astor Piazzolla. When I got introduced to Astor Piazzolla and heard all his amazing music and playing, the expressive power of the Bandoneon blew me away.[58]

Besides the expressive possibilities of the instrument to which Oliveros alludes, Tudor's fascination with the peculiar sonic properties of the bandoneon, some of which it shares with Tudor's first instrument, the organ, doubtless had much to do with his attraction to the instrument.[59] First and foremost of these sonic properties is its stereophonic character. As Tudor noted, "*Bandoneon!* dealt with the bandoneon itself, which is one of the very few instruments which are two-sided."[60] Tudor, like Kagel before him, was struck by the other bilateral aspects of the instrument: besides

having two semi-autonomous sides, the instrument has a bellows that can be operated in two directions, creating another parameter of musical variation. Tudor attended to what he expressed as the "concept of the difference between pulling and pushing the bellows, so that the length of the phrases was determined by the amount of air in the bellows at a given time."[61] The spatialized nature of the instrument means that it was well suited to works such as Kagel's *Pandorasbox*, Oliveros's *Duo*, Mumma's *Mesa*, and Tudor's own *Bandoneon! (a combine)*, all of which took advantage of the spatial dimensions of the concert hall, as did so many avant-garde pieces in the late 1950s and 1960s.[62] Kagel consciously exploits this property by the simple (and theatrically effective) technique of the rotating stool: as stereo left and stereo right continuously invert, natural panning effects are generated that send the music spinning around in circles. It is clear that in *Pandorasbox* and the bandoneon pieces that followed in its wake, the internal space enclosed by the bandoneon is mirrored in that of the concert hall in a kind of sonic synecdoche. The boxy instrument mirrors the shape of the typical halls in which it is played, creating an intraspatialization that induces an extraspatialization into the hall. The spatial distinctness of the two sides can then be cleverly mapped onto the two-dimensional plane of a television projector, as Lowell Cross did not only for his *Musica Instrumentalis* but also for Tudor's *Bandoneon! (a combine)* project. As Cross wrote in a 1971 article,

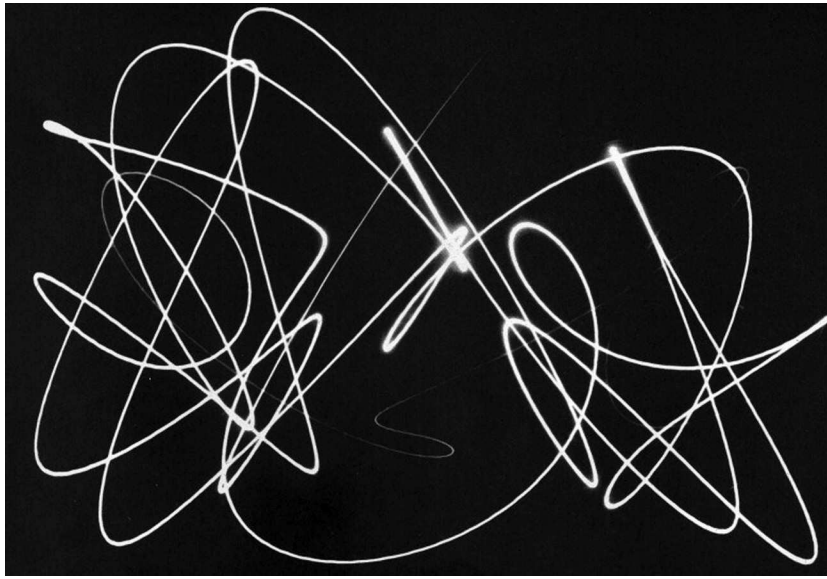
> I explained to [Tudor] that he had already experienced himself as a feedback "component" in *Musica Instrumentalis*, during which his physical movement of the bandoneon between the microphones produced audible stereophonic phase-shift effects over the loudspeakers and visible kinetic phase-shift effects on the TV screens. We talked about feedback in general, which can bring audio, video, or servo systems to conditions of sustained oscillation.[63]

The bandoneon, with its two sound sources sometimes separated by as much as four feet (when the bellows are fully extended), is consequently ideal for the two-dimensional mapping onto the x and y scanlines of a television tube, creating a significant contribution to the development of "laser light shows," and a visual counterpart to sonic stereophony (fig. 13).

Obviously thinking of the bandoneon, Cross went on to note in his 1971 article that even if the choice of instrument is left to the performer,

> The audio-video generating source is a single "stereophonic" musical instrument capable of producing sustained sounds. Such a stereo instrument will have two or more sound-producing elements separated in space, as in pipe organ installations. Spatial distribution of sound is necessary for the production of phase differences between the x and y signals.[64]

Figure 13. Example of Lowell Cross's video output. This image, from *Video II (B)*, *x-y* scanning on the screen of a modified TV set (1965), similar to the output of the projector at Tudor's *Bandoneon! (a combine).* Photo © 1966 Lowell Cross.



Beyond this homology between the spatialized sounds of the bandoneon and the dancing lines of Cross's visual projections, however, the bandoneon can be understood as a metaphor for the spatial parameter itself, a characteristic Frederic Rzewski extolled in his 1965 essay on *Pandorasbox*:

> Inhalation is the fundamental experience of space. *Pandorasbox* is space music: not however in the sense of many of the newer attempts to add the dimension of space as a further parameter along with the others, so that the locations of the acoustic sources are dissociated from each other and serialized; rather, with Kagel, space becomes the transcendental unity of all possible parameters.[65]

Later, Mumma emphasized the way in which the stereophonic nature of the bandoneon was multiplied in *Mesa*, saying that "the indigenous 'stereo' characteristics of the bandoneon were expanded by cybersonic circuits to produce a quadraphonic sound. In live performances, *Mesa* was projected from four separate loudspeakers around the audience."[66]

The two-sidedness of the instrument also sparked Tudor's imagination in a way that goes to the heart of the nature of live-electronic music in the predigital age. As Tudor said in a 1993 interview, "The bandoneon opens in two directions, but the reed assembly is available on two sides. So I modulated one side against the other side. And that was the beginning of

the piece *Bandoneon!*"[67] The technological basis of analog live electronic music is modulation, whether of frequency, amplitude, or indeed any other kind. The principle of modulating one sound against another is fundamental to the techniques available for the modification of sound spectra in real time, a principle that relies on the separation in space of these two sounds (the "baseband data signal" and the "carrier"), a separation to which the bilaterality of the bandoneon is particularly suited. In the bandoneon, Tudor had found an instrument that both produced sustained notes of very long duration and had two distinct sound sources that could then be captured by two different contact microphones.[68] These two distinct sounds, produced by a single musician, could be used to act on each other in a relationship of mutual modulation.

These long sustained notes were also particularly well suited to the fundamentally continuous nature of the music favored by Tudor and the composers of live-electronic music working around him.[69] Tudor was at the center of a U.S. avant-garde musical movement in conscious opposition to a certain Continental modernism. In the 1950s Tudor had been a purveyor of pointillism, whether performing serially determined works by Boulez or Stockhausen (the three sonatas of the former and the *Klavierstücke* of the latter), as well as the chance-generated but equally pointillistic works of John Cage or Earle Brown (for example, the former's *Music of Changes*, or the latter's *December 1952*). Over and above aesthetic differences, these pieces all share a texture of what Pierre Boulez termed "striated time."[70] Musical discourse is conceived by and large in these works as islands of isolated note-dots or conglomerates of cluster-like surfaces that resist temporal continuity. In contrast, in the electronic music that Tudor would go on to compose and perform, overlapping continuity and "smooth time" prevail over fragmentation and pointillism.

Crucially, electronic music is not in this period produced with the aid of sequencers or a MIDI interface, either of which defines sounds as time-specific events along a temporal axis. Rather, sound passes through a transducer such as a microphone and then through resonators, modulators, filters and the like, before being disseminated through loudspeakers. Performing such live electronic music is not dissimilar to the effect of creating a feedback loop by pointing a microphone at an amplifier: once the process is set in motion, it keeps building; the system keeps vibrating through electric stimulation, or is reinjected with new sonic inputs. In such music, there are no time-specific events, no "points" of sound, just smoothly progressing sonic textures, whether violent or calm in nature. This might explain why the smooth sonorities of held notes on the bandoneon so captured Tudor's imagination, as was seen in Tudor's remark to Mumma ("See if you can breathe this long . . ."). The long sustained notes of *Pandorasbox* already heralded the possibility of creating long swathes of smooth time. Mumma, very much in tune with Tudor's

preoccupations, explored in *Mesa* the smooth sonorities produced by the ring-modulated bandoneon sounds.

In essence, Tudor's basic compositional approach in *Bandoneon! (a combine)*, one he shared with contemporaries such as Pauline Oliveros, Gordon Mumma, and especially John Cage, was to set up a series of material conditions—staging, electronic wiring, instrumental combinations, and so on—and then to conceive of a composition as a nearly automatic playing out of these conditions. This compositional stance was particularly well suited to the (in principle) endless streams of sound that can flow from musical instruments plugged into electric current. Another context for this changing approach is suggested by the fact that these streams of sound find a significant parallel in the drone-based aesthetic of pioneering U.S. minimalist composers like La Monte Young, Phill Niblock, or Tony Conrad. With Tudor's electronically augmented bandoneon, it is as if the instrument's bellows were stoking a fire: sound is kindled through feedback loops deliberately set up between the resonating bodies and the instruments that capture and diffuse these vibrations. Once they are set in motion, they escalate like a forest fire. As Tudor commented, "I had discovered this principle of what's called a saturated amplifier, where you arrange feedback around an amplifier to the point where the circuit oscillates of itself. All you have to do is activate it by putting a signal in, and it can keep oscillating forever and ever. Which is one of the features of the piece."[71]

This approach to the creation of sonic environments then became the basis of Tudor's own compositional methods, in which the interface becomes the essence of the composition: the composer sets up the material conditions of the work and the composition is the sum total of the (unpredictable) sounds that issue from this apparatus. As Tudor wrote in his program note to the event, "*Bandoneon! (a combine)* uses no composing means since when activated it composes itself out of its own composite instrumental nature."[72] Inspired, like the pitches in *Pandorasbox*, by adjacent buttons on the keyboard rather than some precompositional system, Tudor's multimedia extravaganza was conceived to be an exercise in the self-realization of the sonic apparatus. It is somewhat ironic that the bandoneon became a precursor and ally of Tudor's analog electronic music, rather than the digital electronic music that followed: ironic, since the bandoneon is a box with seventy-five-odd buttons, that is, triggers controlled by human digits, which one might have thought ideal for controlling digital musical outputs. The buttons of the bandoneon were, however, not specifically used to trigger distinct events the way a current MIDI controller is used; live electronic music was just not conceived or produced in this way in this period because it was less concerned with discrete sonic events than with continuous processes.[73]

It remains that Tudor spawned this electronic bandoneon repertoire at a critical juncture in his life. Tudor in 1959 was already seeking ways to move beyond the role of avant-garde pianist. Tudor the pianist had always been a co-creator, but he was moving toward a desire to conceive of his own sound worlds.[74] He found the bandoneon, the cipher of this disillusionment, along the path that led him from a compositional-based performance practice to a performance-based compositional practice. In its way, the large concertina from Carlsfeld ushered in Tudor's three decades of exploration in the electronic realm and a particular brand of live electronic music composed by a host of American avant-garde composers emerged that was directly informed by Tudor's engagement with it.

NOTES

An earlier version of this paper was presented on November 4, 2010, at the annual meeting of the American Musicological Society in Indianapolis. I wish to express my profound gratitude to Gordon Mumma for his generous help in the preparation of this article, including countless insights and suggestions, as well as loans of photos, scores, and recordings. I also wish to thank Barbara Norton for her excellent editorial work, the editor of *American Music,* Neil Lerner, and my anonymous readers for their many useful comments and suggestions.

1. Like all of the 9 Evenings commissions, *Bandoneon! (a combine)* was performed twice. The first performance was, according to Tudor, a technical disaster, but "the second time the piece was done, it worked perfectly"; Bruce Duffie, "Presenting David Tudor. A Conversation with Bruce Duffie," interview, April 7, 1986, transcribed by Matt Rogalsky, http://www.bruceduffie.com/tudor3.html. The exclamation point in the title is to be read as a factorial, the mathematical sign for a number multiplied by all the whole numbers less than it (e.g., $5! = 5 \times 4 \times 3 \times 2 \times 1 = 120$).

2. The remote-controlled robot-like carts were operated by the composer David Behrman and Anthony Gnazzo, as well as the Bell Labs engineers Per Biorn and Larry Heilos. The vochrome was designed by Robert Kieronski. See Joel Chadabe, "A Conversation with David Tudor" (1993), http://emfinstitute.emf.org/articles/chadabe.tudor_93.html (accessed 2009).

3. Tudor, quoted in Lowell Cross, "Remembering David Tudor," *Musicworks* 79 (2001): 12.

4. The bandoneon's oldest relative is the Chinese *sheng*, a mouth organ consisting of vertical pipes arranged in a circle. On the use of the bandoneon in twentieth-century concert music, see Henry Doktorski, "The Classical Bandoneon" (1998), http://free-reed.net/history/bandoneon.html (accessed May 1, 2010).

5. "Bandoneon" states that "in 1921 a chromatic model was introduced that produced the same note on the push and the pull: this instrument has almost totally eclipsed the diatonic variety" (*Grove Music Online: Oxford Music Online,* accessed September 16, 2010, http://www.oxfordmusiconline.com/subscriber/article/grove/music/47694). This purported twilight of the diatonic instrument rests on nothing more than wishful thinking in a Weberian process of rationalization. Only in France do musicians still use the chromatic model, the reason being that the French have a vibrant button-accordion culture, which uses nearly the same fingering as the chromatic bandoneon. This allows button accordionists to transfer their skills directly to the chromatic bandoneon. In the region in which the vast majority of the world's bandoneon players reside, that is, the Río de la Plata region

of Argentina and Uruguay, the diatonic (bi-sonic) instrument—or more precisely, the 142-note "Rheinische" model—is the only version in use. Other bi-sonic key layouts also exist, in particular the 144-note Einheitsbandoneon; see Doktorski, "Classical Bandoneon." The model that Tudor played was an Einheitsbandoneon (see n. 23 below). For a good summary of the confusing world of bandoneon keyboard layouts, see Christian Mensing, "The Keyboard Systems," The Bandoneon Page Website, http://www.inorg.chem.ethz.ch/tango/band/band_node13.html#bd:sys (accessed May 10, 2010).

6. See Ramon Pelinski, ed., *El tango nomade: Ensayos sobre la diaspora del tango* (Buenos Aires: Corregidor, 2000).

7. See Melanie Plesch's cogent discussion of this subject, "The Topos of the Guitar in Late Nineteenth- and Early Twentieth-Century Argentina," *Musical Quarterly* 92, nos. 3–4 (2009): 242–78.

8. Björn Heile, "*Weltmusik* and the Globalisation of New Music," in *The Modernist Legacy: Essays on New Music*, ed. Heile (Aldershot: Ashgate, 2009), 111.

9. Kagel has an early opus for that instrument in his catalog entitled Prélude no. 1 (1956), but the existence of this work as well as others by Kagel have yet to be substantiated.

10. Frédéric Rzewski, "Inspiration und Sterblichkeit der Musik: Einige Reflexionen über Mauricio Kagels 'Pandorasbox,' Bandoneonpiece (1965)," *MusikTexte* 120 (2009): 65 (my translation). Rzewski also claimed that the bandoneon, "like the Jew's harp, the bumbass and the vibraslap, is an anachronism" (ibid.).

11. Mumma uses this beating effect in both his live-electronic bandoneon piece, *Mesa* (to be discussed later in this article), as well as in his tape piece *Pontpoint* (1980), which uses the bandoneon as one of its principal sound sources. See *Gordon Mumma: Mesa/Pontpoint/FWYYN, with Pauline Oliveros and David Tudor (all 1986,* 33⅓ rpm): Lovely Music, VR 1092; CBS Odyssey, 2316–0158; and CBS France, S-346 1065. Significantly, after buying his bandoneon in a shop in East Berlin in the early 1970s, Mumma never tuned it (Gordon Mumma, interview with the author, Victoria, British Columbia, October 25, 2008 [hereafter Mumma interview]).

12. Tudor performed the piece a second time on September 23, 1960, at the Venice Contemporary Music Festival. He attended the Darmstadt courses four times altogether: 1956, 1958, 1959, and 1961. See Amy C. Beal, "Negotiating Cultural Allies: American Music in Darmstadt, 1946–1956," *Journal of the American Musicological Society* 53, no. 1 (2000): 125.

13. For organist, two assistants, and three-voice choir ad lib.

14. Kagel was sufficiently struck by his encounter with Cage's music that he wrote an article about Cage's presence in Darmstadt for an Argentinean newspaper ("John Cage en Darmstadt 1958," *Buenos Aires Musical*, October 16, 1958). He wrote, "The appearance of Cage in Darmstadt, accompanied by the pianist David Tudor—his communicating vessel—produced an anti-Dali reaction. The first concert, devoted to works for two pianos by North American composers, caused an immediate stir [*La aparición de Cage en Darmstadt, acompanado del pianista David Tudor—su vaso comunicante—producjo una reacción anti-Dali. El primer concierto, dedicado a obras para dos pianos de compositores norteamericanos, causo immediatamente un fuerte escozor*]." On Cage and Tudor's visit to Darmstadt 1958, see Amy C. Beal, "David Tudor in Darmstadt," *Contemporary Music Review* 26, no. 1 (2007): 77–88.

15. I wish to thank Matthias Kassel, curator of the Collection Mauricio Kagel at the Paul Sacher Stiftung, Basel, Switzerland, for this observation. See also Jean-François Trubert, "Kagel, Mauricio," http://brahms.ircam.fr/composers/composer/1786/ (accessed June 4, 2010).

16. From indications on the score preserved in the David Tudor Papers, Getty Research Institute, Los Angeles, CA (hereafter Tudor Papers).

17. See Glenn D. White and Gary J. Louie, *The Audio Dictionary* (Seattle: University of Washington Press, 2005), 374–75; Tim J. Anderson, *Making Easy Listening: Material Culture and Postwar American Recording* (Minneapolis: University of Minnesota Press, 2006), 117, 167.

18. A sense of the technological excitement among composers, engineers, and physicists that greeted the introduction of stereophonic recording techniques can be felt—albeit on the other side of the Atlantic—in Michel Philippot, "Aspects psycho-sociologiques de la haute-fidélité," in "Problèmes actuels de la fidélité sonore," special issue, *Cahiers de la revue du son* 5 (1965): 3–13; H. Mertens, "L'écoute stéréophonique," in "Stéréophonie et reproduction musicale," special issue, *Cahiers de la revue du son* 6 (1966): 102–16; R. Condamine, "Les microphones et la construction de la stéréophonie," *Conférences des journées d'études, Festival international du son haute fidélité—Stéréophonie facture instrumentale* (Paris: Chiron, 1969), 35–49; and J. P. Legouix and R. Condamine, "La stéréophonie et les mécanismes de l'audition binaurale (conférence dialoguée)," *Conférences des journées d'études, Festival international du son haute fidélité—Stéréophonie facture instrumentale* (Paris: Chiron, 1970), 33–46.

19. Anderson, *Making Easy Listening*, 111.

20. Simon Emmerson, *Living Electronic Music* (Aldershot: Ashgate, 2007), xiv. In fact, according to Jonathan Sterne, *The Audible Past*: *Cultural Origins of Sound Reproduction* (Durham, NC: Duke University Press, 2003), most of the technology used for recording emerged from yet another sphere: that of devices conceived to assist the integration of the deaf into society.

21. It is a feature of tango recordings since at least the 1960s that the bandoneon is often recorded with radically panned stereophony: the right side of the instrument is placed on stereo right, and the left on stereo left, as if the homology between the bilateral bandoneon and sterephony were too salient to be ignored by sound engineers. For an example, see Leopoldo Federico's *Recital de solos de bandoneón*, Polygram Argentina, 5426, 1983, compact disc.

22. See Mauricio Kagel, "Translation—Rotation," trans. Cornelius Cardew, *Die Reihe* 7 (1965): 32–60.

23. According to Mumma, Kagel was proficient enough on the bandoneon to be able to play tangos on the instrument; Mumma interview. Maria Dunkel discusses how the bandoneon was conceived as an instrument for amateur performers ("Buttons and Codes: Ideographies for Bandoneon and Concertina as Examples of Alternative Notational Systems in Nineteenth-Century Germany," *Free Reed Journal* 2 [2001]: 5–18). Beside every button on a bandoneon is a sequence of symbols (e.g., "1/2," "3/*"). German music publishers would print anthologies of simple pieces in which notes are replaced by numbers, allowing amateurs (who had to be already familiar with the songs, since there was no system for notating rhythms) to perform them. Thus, Kagel's tablature notations are actually closer to the original notation for the instrument than is standard musical notation.

24. He performed it many times, including in Munich, Amsterdam, Zagreb, and then later in several cities in the United States.

25. On *The Mauricio Kagel Edition*, Winter and Winter, 910 128-2, 2006, CD 1, as well as in archival recordings held by the Getty Research Institute and the Paul Sacher Stiftung, Basel, of a performance in Nuremburg in May 1967.

26. Live concert recordings, Tudor Papers.

27. This rigor is well illustrated by a well-known anecdote related by Cage in which Tudor's precious box of spices, invaluable to the curries he was famous for preparing, arrived from India with the contents all jumbled together. Tudor proceeded to use a pair of tweezers and a number of dishes of various sizes in order to separate out the spices, a process that, as Cage told the tale, took three days. See John Cage, *Silence: Lectures and Writings* (Middletown, CT: Wesleyan University Press, 1961), 193. I wish to thank Roger Reynolds for pointing out the parallel in a 2010 conversation.

28. John Holzaepfel, "Cage and Tudor," in *The Cambridge Companion to John Cage*, ed. David Nicholls (Cambridge: Cambridge University Press, 2002), 173. Similarly, Tudor took great pains to construct a fully determinate realization score for Cage's *Variations II* in 1961 for amplified piano. See James Pritchett, "David Tudor as Composer/Performer in

Cage's *Variations II*," *Leonardo Music Journal* 14 (2004): 11–16; and Pritchett, "David Tudor's Realization of John Cage's *Variations II*" (2000), http://www.rosewhitemusic.com/cage/texts/Var2.html (accessed November 15, 2009).

29. Holzaepfel, "Cage and Tudor," 183–84.

30. Tudor expresses his intentions in a letter from Kagel to Wolfgang Steinecke, July 17, 1961 (archives of the Internationales Musikinstitut Darmstadt [IMD], Darmstadt). The Montreal performance was meant to coincide with the Semaine internationale de musique actuelle (August 3–8, 1961), a major avant-garde music festival organized by French-Canadian composer Pierre Mercure that featured works by the likes of Cage, Feldman, Kagel, Nono and Stockhausen. See "Musique automatiste? Pierre Mercure et le *Refus global*," in Jonathan Goldman, ed., *Circuit, musiques contemporaines* 21, no. 3 (2011).

31. Mauricio Kagel to David Tudor, September 5, 1960, Tudor Papers.

32. David Tudor toWolfgang Steinecke, August 16, 1961, IMD archives.

33. Quoted in John Holzaepfel, liner notes to *David Tudor & Gordon Mumma*, recorded 1962–69, New World Records, 80651, 2006, compact disc.

34. See Beal, "David Tudor in Darmstadt," 81. On Cage's (and Tudor's) presence in Darmstadt in 1958 and the scandal caused, notably, by Cage's lectures, see David Shultis, "Cage and Europe," in *The Cambridge Companion to John Cage*, ed. David Nicholls (Cambridge: Cambridge University Press, 2002), 33–38.

35. Pritchett sees 1970 as the year in which Tudor came to see himself as a composer in his own right ("David Tudor as Composer/Performer," 11). Four years earlier, in *Bandoneon!*, Tudor downplayed his role in its creation, describing it as a work that "composes itself" and that needed "no compositional means." Pritchett, however, thinks Tudor's compositional realizations begin much earlier than that: he considers Tudor as having had almost more authorial claim to *Variations II* (1961) than its putative author, John Cage.

36. Tudor was on tour with Cage in Japan in the fall of 1962. See Paul van Emmerik, "A John Cage Compendium," http://www.xs4all.nl/~cagecomp/1912–1971.htm (accessed February 10, 2009); in a letter to Tudor dated January 12, 1963, Kagel asks, "How was the Japan tour? Did you play Pandorasbox?"; Tudor Papers.

37. Mauricio Kagel to David Tudor, September 19, 1962, Tudor Papers.

38. J. D., "Rare Bandoneon Featured in Kagel's 'Pandora's Box," *Buffalo Evening News*, April 5, 1965.

39. Recording found on "Pauline Oliveros: The Wanderer," Lovely Music, VR 1902 (1984), 33⅓ rpm; reissued, Important Records, IMPREC 141, 2007, compact disc. The recorded version of the work bears the title *Duo for Accordion and Bandoneon with Possible Mynah Bird Obbligato, See-Saw Version*, in reference to the sound of Oliveros's pet, which found its way onto the recording. Pauline Oliveros describes the preparation of Tudorfest in "Memoir of a Community Enterprise," in *The San Francisco Tape Music Center: 1960s Counterculture and The Avant-Garde*, ed. David W. Bernstein (Berkeley: University of California Press, 2008), 86–88.

40. Although it is not clear whether Kagel ever performed *Pandorasbox* during any of his visits. I wish to thank David Bernstein for suggesting this possibility in November 2010.

41. Undated program note, Tudor Papers.

42. The spatial conception underpinning the seesaw contraption is also reminiscent of the spinning sounds that Stockhausen created for *Kontakte* through the use of four microphones that capture the sounds emitted from a speaker mounted on a rotating platform.

43. Oliveros discusses the Doppler effects produced in the seesaw version of the Duo; Pauline Oliveros, interview with the author, Victoria, British Columbia, November 23, 2008 (hereafter Oliveros interview).

44. Tudor was in poor health at this time, so Oliveros invited Mumma to play the bandoneon part in this reprise performance; Mumma interview.

45. Performance at the inaugural concert of the Curtis R. Priem Experimental Media and Performing Arts Center (EMPAC), Troy, NY, October 5, 2008.

46. The wry performance instructions explain the concept: "This piece is for David Tudor, his bandoneon, and three string players. If you are already David Tudor, you will have no problem performing this piece; but if you are *not* David Tudor, you must study hard, for you must be him during this performance. Notice his smile, and the manner in which he seats himself on a low stool with his bandoneon. Learn to hold your head as he does. Practice thinking. Learn to play lowly [*sic*] without moving. Appreciate what you hear. The David Tudor is controlled by ten strings."

47. As the composer confirmed in a telephone conversation with the author in July 2010.

48. Recorded on the *Orchestral Space '68*, Victor Entertainment Japan, Tower Records Japan, NCS-546, 1968, 33⅓ rpm.

49. Founded by Mumma, Robert Ashley, and George Cacioppo, who were later joined by Roger Reynolds, Bruce Wise, and Donald Scavarda; see Richard S. James, "ONCE: Microcosm of the 1960s Musical and Multimedia Avant-Garde," *American Music* 5, no. 4 (1987): 369.

50. Gordon Mumma, "An Electronic Music Studio for the Independent Composer," *Journal of the Audio Engineering Society* 12, no. 3 (1964): 240–44; reprinted in *Circuit: Musiques contemporaines* 19, no. 3 (2009): 85–90.

51. After the 1965 ONCE Festival, a follow-up event took place on September 17–19, 1965, known as ONCE AGAIN; see Leta E. Miller, "ONCE and Again: The Evolution of a Legendary Festival," liner notes, p. 20, to *Music from the ONCE Festival, 1961–1966*, New World Records, 80567, 2003, five CDs. "For lack of other sufficiently large space, atop the old Maynard Street parking structure"; James, "ONCE: Microcosm of the 1960s Musical and Multimedia Avant-Garde," 381. At ONCE AGAIN Tudor and Mumma participated in the performance of Cage's *Talk I*.

52. Mumma interview.

53. Significantly, Oliveros employed difference tones as the basic material of her early electronic music (*I of IV* [1966]) composed at the San Francisco Tape Music Center. She describes having been shown by her teacher Willard Palmer how to produce difference tones on an accordion. Pauline Oliveros, "The Accordion (& the Outsider)" (2004), *The Squid's Ear*, http://www.squidsear.com/cgi-bin/news/newsView.cgi?newsID=429 (accessed January 13, 2011).

54. Gordon Mumma, liner notes to *Gordon Mumma: Live Electronic Music*, with Robert Ashley, Gordon Mumma, and George Cacciopo, recorded 1963–85, Tzadik Records, TZ 7074, 2002, CD.

55. Recorded at CBS Studios in 1967; live recording from the 1966 Paris concert released on *Music for Merce: 1952–2009*, New World Records, 80712, 2010, 10 CDs. Beverly Emmons designed the sets for *Place*. In *Chance and Circumstance: Twenty Years with Cage and Cunningham* (New York: Knopf, 2007), 475–76, Carolyn Brown, principal dancer of the Merce Cunningham Dance Company, describes the production.

56. Mauricio Kagel to David Tudor, September 19, 1962, Tudor Papers.

57. Oliveros interview; revised by Oliveros in September 2011.

58. Ibid.

59. In fact, Tudor's initial interest in the organ, beginning when he was a young boy, was inspired by the "sound and mechanics of [a] small reed organ his father played at the family church"; Holzaepfel, liner notes to *David Tudor & Gordon Mumma*. See also John Holzaepfel, "Tudor, David," in *Grove Music Online*, http://www.oxfordmusiconline.com.ezproxy.library.uvic.ca/subscriber/article/grove/music/28561 (accessed May 11, 2011). The reed organ, a free-reed instrument, is a close cousin of the bandoneon.

60. Quoted in *David Tudor, "Bandoneon! (a combine)."*

61. Chadabe, "Conversation with David Tudor."

62. Other works that exploited the spatial dimension of the concert hall include Karlheinz Stockhausen's *Gruppen* (1955–57) for three orchestras, Iannis Xenakis's *Terretektorh*

(1965–66) for orchestra dispersed among the audience members, and most of Henry Brant's oeuvre.

63. Lowell Cross, "*Musica Instrumentalis* and *Video II (B)*," *Source*: *Music of the Avant Garde* 9 (1971), http://www.lowellcross.com/articles/musica/ (accessed May 2, 2010).

64. Ibid.

65. Rzewski, "Inspiration und Sterblichkeit," 67 (my translation).

66. Mumma, liner notes for *Mesa*, on *Gordon Mumma: Live Electronic Music*.

67. Chadabe, "Conversation with David Tudor." Also heard on DVD *David Tudor, "Bandoneon! (a combine)."*

68. Contact microphones are similar to the needle assembly of a turntable, which John Cage had already used in *Cartridge Music* (1960), and which Tudor used in the *Bandoneon! (a combine)* project.

69. Essentially all of whom composed such works for the Merce Cunningham Dance Company, including David Behrman, John Cage, Toshi Ichiyanagi, Alvin Lucier, Gordon Mumma, Pauline Oliveros, Christian Wolff, La Monte Young, and many others.

70. Pierre Boulez defines the "smooth time/striated time" (*temps lisse/temps strié*) distinction in *Boulez on Music Today*, trans. Susan Bradshaw and Richard Rodney Bennett (Cambridge, MA: Harvard University Press, 1971), 98–99.

71. From a taped interview included in the DVD *David Tudor, "Bandoneon! (a combine)."* In fact, to avoid a serious sonic conflagration, Tudor needed to put a "stop" button on his bandoneon when he performed *Bandoneon! (a combine)*, but the sense of dangerous sonic escalation certainly remains an essential part of the aesthetic experience of the work.

72. From the Tudor Papers.

73. The emphasis on continuous sonic processes can also be seen in the way analog synthesizers are equipped with knobs (for making incremental changes) rather than buttons (for switching between binary states). D'Arcy Gray has noted that even though Tudor was composing electronic music well into the age of digital music making and the MIDI interface, he "continued to work with his own brand of electronics, seemingly unaware of the changes that were taking place around him." Gray, "David Tudor in the Late 1980s: Understanding a Secret Voice," *Leonardo Music Journal* 14, no. 1 (2004): 41.

74. See Pritchett, "David Tudor as Composer/Performer," on this question.