Hearing Spaces: David Tudor's Collaboration on *Sea Tails*

Nancy Perloff, Collections Curator, Modern and New Media Collections, Getty Research Institute

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ABSTRACT

In 1983, the American composer David Tudor (1926-1996) collaborated with Jackie Matisse Monnier, kite artist, and Molly Davies, filmmaker, on a six-monitor video piece called Sea Tails. The three artists spent eight days on Nassau in the Bahamas, where Davies filmed the underwater kites of Monnier, and Tudor recorded sea sounds (shrimp, coral, splashes, wind) from which he later mixed a score.

Using notes and correspondence in the David Tudor archive of the Getty Research Institute, as well as interviews she conducted with Monnier and Davies, Perloff reconstructs the collaborative process of making Sea Tails. She argues that when we watch the video, we perceive the structure mapped in the artists' notes as a succession of varied returns–memories–of a small repertoire of sound sources and kite images. The artists exploited the mysterious powers of the ocean space to achieve their subtle transformations. Points of contact between the film, sculptural, and sound media of Sea Tails reveal Tudor's post-Cagean form of collaboration, in which he ceded controls over compositional process and performance to outside forces–the collaborating artists, the reverberation of the performance space and of physical objects. The new role of collaboration prompts us to redefine modernist distinctions between composition and performance.

FULL PAPER

"*Full fathom five thy father lies;*
Of his bones are coral made;
Those are pearls that were his eyes;
Nothing of him that doth fade
But doth suffer a sea change
Into something rich and strange. . ."

—Ariel's song, *The Tempest*

I

When David Tudor started composing electronic music in the early 1970s, he was interested in the ways in which space transformed sound. Bill Viola, much influenced by Tudor's music of this period, explains that in the crucial concept of resonance, "all [spatial] objects have a sound component, a second shadow existence as a configuration of frequencies."[1] Musicians activate particular frequencies by applying force with hammer, bow, or breath, which drives sound waves through an object. When the spatial dimensions of the sound waves match those of the object, it vibrates in response at its resonant frequency. David Tudor began, not with the sound, but with the object. The object was sometimes a resonant, "found" material, sometimes a traditional acoustic instrument, and sometimes an environmental site. Through electronic amplification, he extended and altered the physical object, so that it began to lose its sonic identity.[2] He then drove sounds through it, reveling in the unpredictable resonant frequencies produced by the physical modulation of his new instrument.

The mystery heightens in Tudor's pieces in which the resonant object (oil drum), the acoustic instrument (piano, bandoneon), or the site generating the source sounds (an island, an ocean space) are visible and can sometimes be activated and transformed by the listener (touched as sculptures, navigated through as a craggy island terrain), while

[1] Bill Viola, *Reasons for Knocking at an Empty House: Writings 1973-1994* (London: Anthony d'Offay Gallery, 1995), p. 157.
[2] Matt Rogalsky, "Live Electronic Musicians of the Merce Cunningham Dance Company", M.A. Thesis, Wesleyan University, 1995, p. 25.

the output sounds are unexpected and do not seem to emanate from the objects in which they vibrate. The distinctive visual dimension of Tudor's work sharpens the juxtaposition between sites and materials we *see,* and sounds we *hear*. For instance, in Tudor's realization for amplified piano of John Cage's *Variations II*, the solo instrument produces crashing, densely textured, non-pitched sounds more orchestral and electronic than pianistic. The unobtrusive contact microphones attached to the piano or to stiff wire springs, which transmit feedback out into the space, hardly prepare the audience for this violent wash of sound. In his electro-acoustic sound environment, *Rainforest IV*, unexpected gong sounds emanate from the oil drum and chirps from inside the suspended barrel. Tudor effects these sound transformations by physically modifying his instrument, by experimenting with resonance, electronic feedback, amplification, and filters, and by distributing the acoustically and electronically modified sounds through the performance space. The physical space, which can mean the performance site, the physical object (in which sound resonates), the instrument or environment generating the source sounds, and the electronic configuration, becomes the *catalyst* for the composer's exploration and for the listener's perception of sound as malleable, sculptural material.

Tudor's electronic music thus concerns itself less with sounds as sounds, and more with the complex *relation* between sounds and the physical spaces in which they vibrate. This situation raises intriguing questions about our point of view as listeners. Is there a particular vantage from which we hear the sound, or has the vantage become the entire (performance) space?[3] How do we, as listeners, connect the sounds with what might be called their "source space"? Or do we? To what extent does this preoccupation with space, and the dependence of sound on physical spaces, present an important difference between Tudor and his longtime collaborator on indeterminate piano and taped pieces, John Cage?

In Tudor's live electronics of the 1970s and 80s, the performing musicians respond in real time to unpredictable feedback loops amplified by the acoustics of the performance site and fed by the musicians through multiple channels in a custom designed sound system. Sometimes pre-recorded sound provides the input signals. Other times, the chain of electronic components produces the signals. Tudor conceived of *Microphone* (1973), for example, as an "interface between a performer and the feedback of his sound." [4] For his environment installed at the 1970 World's Exposition in Osaka, performers sent feedback of directional microphones into the space of the Pepsi Pavilion, where loudspeakers arranged in spatial patterns controlled the incidence and duration of the resulting signals. Modulators, designed by Gordon Mumma, were placed into the signal paths in order to vary the musical content of the feedback signals. If sound moved quickly enough from speaker to speaker, Tudor mused, there would come a point when listeners could no longer distinguish the source sound from the feedback it generated.

The series of pieces in Tudor's *Untitled* (1972) explores an electronic sound world that, like *Microphone*, does not use pre-recorded materials as a point of departure. Two chains of electronic components with feedback loops send their output as a stereo signal to a third chain. The performer manipulates the various controls in order to separate the different parts of the total output among four channels and to adjust and modify this output. The work is "discovered" in live performance, "through the exploration of all possible points of variation within the electronic hook-up."[5] In a later live electronics piece, *Dialects*, (1984) input signals consist of two pre-recorded sources that are electronically modified: the beating of insects' wings, and alpha waves which produce vowel-like sounds. In performance, groups of these prepared sounds rotate at rapid speed, while the musicians periodically tap bunches of delicate wire flowers, created by the artist Jackie Monnier. The responsive vibration of the sculptures triggers live electronic percussive elements. The concept that physical touch of the sculptures, and their vibrations in space, produce unexpected sounds can be traced to *Rainforest IV*. While the "rules of the game" and the electronic setup differ in each of the electronic pieces I have discussed, physical and spatial modification of sound by the performer is the operative principle.

Tudor's schematic diagrams and program annotations for his live electronic pieces guide the performers' design of sound systems, electronic circuitry, and instruments, as well as the modification of this set-up to enhance amplification in a given performance site. His distinctively late 20th-century aesthetic departs from classical and modernist composition by establishing parameters, not through the notations and instructions of the written score,

[3] Viola, *Reasons for Knocking at an Empty House*, p. 155.
[4] See Experiments in Art and Technology, *Pavilion*, ed. Billy Kluver, Julie Martin, and Barbara Rose (New York: E.P. Dutton, 1972), p. 18.
[5] See Tudor's Program Note in David Tudor Archive, GRI 980039, Box 3.

but through a particular collaborative situation among composer, performer, listener, and electronic configuration. Performers and, by extension, listeners, no longer understand composition as an activity separate from realization or, if they do, then compositional activity designates only the conception of the work and the establishment of source sounds and electronic set-up. Performance/realization signifies "another kind of process," "something other than just a score," a process which plays different media (sounds, filmed images, lighting, sculptures, architecture) without establishing hierarchy.[6] Since Tudor's live electronic pieces occur in real-time, they can incorporate the unpredictable response of feedback and signal to the particular performance venue as well as on-the-spot mixing of pre-recorded sounds. In an installation such as *Rainforest IV*, sculptures selected for the performance transmit source sounds designed for those sculptures and responsive to the movements of the audience/public around and inside the objects, as well as to human touch. The process of virtuosic improvisation begins with a finite choice of compositional inputs specifying parameters (formal structure, sculptural objects, timings, source materials, or amplification), but prompts actions for which the performer cannot anticipate or control the outcome. Each performance is a new realization.

The impression of chaotic textures, sonic density, and arhythmic, pitchless material in *Microphone*, *Untitled*, *Dialects*, and *Rainforest IV* belies the tremendous discipline, and the physical and technical skills demanded of its performers. The audience begins to comprehend these demands by **watching**, that is, observing the effect of the musicians' subtle adjustments of knobs on the waves of sounds emanating from surrounding speakers on floor and ceiling. The **visual** dimension is, thus, crucial to our interpretation. Yet, the audience also comprehends that the distinctive sound world belongs to David Tudor and that performances by other musicians of his live electronic work must be judged in terms of their preservation of Tudor's sound. Virtuosic, technical control was Tudor's hallmark, first as a pianist and then as a composer. Moreover, the mass market devices (amplifiers, filters, modulators) harnessed by Tudor's live electronics paradoxically underwent conversion, in his hands, into personal instruments tailored to the individual sound systems and unexpected resonances that intrigued him. Tudor, like many multimedia artists, was interested in "'miniaturizing', 'personalizing' and 're-singularizing' generic technology.[7] One of his program notes on *Untitled* explains: "The components used, mostly home-brew, were amplifiers (fixed or variable gain, fixed or variable phase-shift, tuned, saturating types), attenuators, filters (several types), switches, & modulators with variable side-band capability." Self-taught in electronics, Tudor saved and pored over "how to" guides and brochures, discovering devices originally designed for one purpose which he crafted into something else. The conception and sound world are thus unmistakably Tudor's. Yet the work hovers on the edge of individuality, venturing into a terrain neither modernist nor postmodernist by "surfing chaos," that is ceding controls over compositional process and performance to outside forces: the structural constraints of collaborators, the reverberation of the performance space, feedback and physical modulation triggered by objects and instruments.[8]

The quintessential modernist collaboration took place among artists and privileged one artistic medium. Jean Cocteau created the scenario for the ballet *Parade* (1917) and made Picasso's sets and costumes the centerpiece for a spectacle with music and dance. Nijinsky designed his choreography for *The Rite of Spring* (1913) to illustrate Stravinsky's music. The Russian Futurist opera, *Victory over the Sun* (1913), made its radical statement through a set design in the form of a black square, by Kazimir Malevich. Postmodern mixed media works often incorporate the audience in an interactive installation, but continue to favor one medium. In Bill Viola's video, *I Do Not Know What it is I Am Like*, sounds are substances which are sometimes mimetic, amplifying the action we see, and sometimes an evocative, electronic hum which coexists with the visual movements on the screen; in Donald Buchla's control device, *Lightning*, light is the stimulus, detecting motion and converting it into signals which control sound. In the collaborations of John Cage, Merce Cunningham, and Jasper Johns, and of Cage, Cunningham and Robert Rauschenberg, a rigorous compositional process of indeterminacy produces sounds, sets and costumes, and choreography which are performed simultaneously and independently, without attempt at integration but with adherence to strict compositional parameters. Tudor's multimedia production, by contrast, synthesizes media into a

[6] Young in John Holzaepfel, "La Monte Young and Marian Zazeela, New York, 25 July 1999" (recorded and transcribed interview), quoted in Liz Kotz, "Disintegrated Circuits: Rethinking the Score in the Postwar 'Aesthetics of Indeterminacy'", paper delivered at the David Tudor Symposium, Getty Research Institute, May 19, 2001.
[7] Nicholas Zurbrugg, "Introduction: Contemplating Electronic Arts", in Zurbrugg, ed., *Electronic Arts in Australia* (Continuum, Volume. 8 no. 1), pp. 13-14.
[8] Ralph Jones, one of the musicians who participated in Tudor's workshop of *Rainforest IV* in Chocorua, New Hampshire in 1983, coined the phrase "surfing chaos" in a discussion at the David Tudor Symposium, Getty Research Institute, May 18-19, 2001.

new genre which is part installation, part sound sculpture, part sound environment, and part theatre. The synthesis leaves much up to the listener – especially speculations about the relation between collaborating artists and media, and the mysterious power of the physical spaces (instruments, environmental source, and performance sites).

This interest in a non-hierarchical, synthetic form of multimedia spectacle may explain why Tudor did not collaborate with major artists and why, as we shall see in the ensuing discussion of his six-monitor video installation, *Sea Tails*, he wittingly tailored his score to the formal and time constraints of the film and correlated sounds with visual imagery. Tudor's collaborative art-making required a special working relationship with his partners and produced results that were not conceivable by one of the artists working alone. Filmed on Nassau in the Bahamas in 1983, *Sea Tails* brings together Tudor's electronic score derived from tapes of underwater sea sounds and video footage by filmmaker Molly Davies of underwater kites created by the artist Jackie Monnier. The sea space in *Sea Tails* makes strange the identity of the sounds and kites, even though the sounds we hear originate in the sea and the kites are designed for water and pulled there. The viewer is continually seeking to define the source of the sounds, the kite materials, and the speed at which sounds and kites travel. In this essay, I will reconstruct the intricate collaborative process that went into the making of *Sea Tails* in order to articulate Tudor's invention of a new form of musical collaboration stimulated more by spaces than by sounds. Space also preoccupies visual artists and filmmakers, hence fueling the sympathies Tudor shared with his collaborators **(see Figure A)**.

II

At first, it seems surprising that Tudor's career as pianist of American experimentalism led to his composition of multi-media electronics. Manuscripts held in Tudor's archive demonstrate that this seemingly new direction flowed from his early interest in the aesthetics and the musical repertoire of the Austro-German tradition, especially theories of sensory and spiritual correspondences. As a young musician studying piano with Irma Wolpe and composition with Stefan Wolpe, Tudor meticulously copied passages from Wassily Kandinsky's treatise on abstraction, *Über das Geistige in der Kunst*, and from writings by Arnold Schoenberg, including "Tonality and Form" of 1925. In these essays, Kandinsky and Schoenberg analyse the common methods of the arts and the underlying relationships between music and painting. Tudor did not date his notes, but he probably drafted them in the early 1940s, concurrently with his compositional studies and performances of piano music by the modernists, including Anton Webern, Arnold Schoenberg, Alban Berg, and Wolpe. Unlike the program notes he later wrote to explicate his compositions, these notes were not intended for publication. They indicate an aesthetic development which, in such a reticent artist, provides valuable clues about the continuity of his thought.

Some thirty years later, we find Tudor pursuing this line of thought in rare jottings he made during the composition of his multi-media works. **Figure B** shows Tudor's development of ideas for his environmental piece, *Island Eye Island Ear*, conceived between 1974 and 1983, but never realized. At top right, he has written "sound, fog, visual, kites"; in the lower right, beneath "characteristics," he has paired words in which the first evokes sound and the second, sight ("amplify magnify," "concert exposition"). "Sound beams" and "sound reflections," paired on the lower right, similarly associate sound with visual phenomena. Notes for his *9 Lines, Reflected*, a sound installation with aluminum kite tails made in collaboration with Jackie Monnier in 1987, read:

1. spectacle (relating to properties of space)
2. visuals]

   music] together.

Tudor's charged annotations suggest that he was thinking about both compositions in terms of correspondences between the aural and visual senses and between ways of viewing and listening. His parallels are abstract, evocative, and mystical. Interpreted with the writings from Kandinsky and Schoenberg, they trace an interest in sensory spectacle and in associations between the media. As John Cage exclaimed in a conversation with Daniel Charles (1970-71): "Look at David Tudor. By producing feedback between audio and video circuits, isn't he in the process of bringing some of Scriabin's spiritualist tendencies to fruition?"[9]

[9] John Cage, *For the Birds* (Boston: Marion Boyars, 1976), p. 219.

Collaborative intermedia work pose a challenge for historians and critics, because of the importance of documenting individual contributions to the collective realization of the work of art. The collaborative process in Tudor's live electronic works is particularly elusive, due to his scant notations. In contrast with the piano realizations, for which he made charts, timings, preparatory scores, and a final performance score, few records of the electronic work exist (often only notes such as those discussed above, and formal program notes). Tudor did not use the electronic score, which took the form of a circuit diagram or "schematic," as a conclusive notation. And recordings and videos recreate the live performance or installation, but not the steps towards that end. Tudor's sketches for *Sea Tails* consist of a brief program note, a schematic, and lists of sound sources and time plans for the structure of the sound tapes. Interviews I conducted with Monnier and Davies help interpret these preparatory sketches by clarifying Tudor's collaborative role, for instance, his decision to be on location during the filming and to record the underwater sounds while on the boat, where he witnessed the kites and the divers below; his mixing of the sound tapes after seeing the completed film; his derivation of formal structure and timings from the requirements of the film and the kite types.[10]

Since *Sea Tails* is a video piece, however, it is intriguing to reconstruct its installation history, in order to establish how Tudor, with his preference for live electronics, presented a medium which did not typically involve performers. The premiere of *Sea Tails* took place at the Centre Georges Pompidou in Paris, June 3 – 27, 1983. Visitors to the installation saw six monitors stacked in pairs which were placed in a row. The three different films playing on each recorder were twenty-one minutes long and repeated in a continuous loop, so that the piece had no apparent beginning or end. Three different sound scores accompanied the films.[11] The piece was, therefore, fixed in its performance. Yet, at the second installation, presented as part of a Molly Davies Retrospective Live at the Theatre Am Turm in Frankfurt (October 27-31, 1983), Tudor sat at an electronic tabletop and remixed his recorded sea sounds (source materials) on the spot, rather than playing prerecorded sound tapes.[12] A program note written by Tudor for a "Sound Totem Version of *Sea Tails*" at the Whitney Museum in New York on September 17, 1986, moreover, states that this "concert performance of *Sea Tails* presents an enhanced version of the sound tracks." According to Jackie Monnier's notes and recollections, Tudor "performed" *Sea Tails* in a 1986 installation at the Whitney Museum by remixing audiotapes to the accompaniment of the kite film.[13] A photograph of Tudor at his electronic tabletop confirms this account **(see Figure C)**. The photograph shows Tudor's concurrent performance with Monnier's mylar sculpture, *9 Lines,* in which sound was produced by the movements of mylar attached to wires and stimulated by air currents in the gallery.

We must conclude that if the films of *Sea Tails* were fixed, the sounds could vary with each performance. This suggests that in future installations of *Sea Tails*, according to our new knowledge gleaned from Tudor's archive and from his collaborators, musicians should feel free to create new realizations of *Sea Tails*, as they do for *Untitled*, *Dialects*, and *Rainforest*. Indeed, realization through live performance was Tudor's preference and the site of his experimentation; he liked the strategy that performers had to show flexibility with their instruments and that circuit diagrams, rather than scores, provided guidelines for on the spot responses to amplified sound.[6]

Recalling a European performance of his *Untitled* (1972), Tudor told Joel Chadabe:[7]

> *Untitled* was an electronic hookup designed in such a way that it had no beginning, no point in my thinking where the sound originated. The manner of making the hookup was to connect the end of every chain to the beginning in a complete feedback loop. But highly involved. There were . . . I counted them at one time, there were sixty feedback loops in the electronic hookup. . . So it really came out wild. It was so unpredictable, it was just wonderful. It's the kind of thing that couldn't be done again.

[10] All references and quotations are culled from interviews with Jacke Monnier, February 14, 2001 and with Molly Davies, February 26, 2001.
[11] Molly Davies found the VHS films for the Pompidou performance in her studio in November, 2001.
[12] This information gleaned from conversation between Molly Davies and the author, November 6, 2001. Performance history of *Sea Tails* provided by Anna Craycroft. The reference to the "Molly Davies Retrospective Live" appears in notes in the David Tudor Archive, Getty Research Institute 980039, Box 26, folder 2.
[13] See program note dated 1986 by David Tudor in Box 3 ("Electronic Work"), program notes from 1986 by Jackie Monnier in Box 26 ("Projects 1986-1989"), David Tudor Archive, Getty Research Institute 980039. Monnier discussed the sound totem version in interview with author, February 14, 2001.

That said, *Sea Tails* differs from *Untitled* and more closely resembles *Rainforest IV*, the project *Island Eye Island Ear* (which immediately preceded it), and *Dialects* because, like them, it utilizes collaborating visual imagery to reinforce the idea of spatial exploration. Indeed, it is Tudor's vision of space–as something connected both to a physical site and to a mystical, spiritual realm–that Bill Viola and the musicians coming out of Composers Inside Electronics found so compelling.

III

Sea Tails was conceived in 1983 by Molly Davies, a filmmaker, and Jackie Monnier, a kite artist.[14] Monnier's ten-year period of work with Tudor on *Island Eye Island Ear* (1973-1983) prompted her suggestion of the *Sea Tails* project, which likewise transformed sounds that had been recorded on an island site. For *Island Eye*, Monnier designed kites which were to move through the air, while the anticipated visitors walked through water-vapor clouds and fog created by Fujiko Nakaya and listened to sounds that Tudor generated from parabolic antennas fed by tape recordings he had made of island sources. To guide visitors' paths, Margaretha Asberg choreographed hanging, standing, and floating mirrors, as well as hand-carried mirrors, telescopes, magnifying glasses and natural sculptures. Under Billy Kluver's direction, the artists hoped to reveal the special physical properties of Knavelskar Island in the Swedish archipelago. Kluver attributes the kite, fog, and dancers, and the title of the piece, to David Tudor.[15] **Figure D** shows a map of the island's geographical features, with Tudor's indications of the paths of sound beams through the terrain. He expressed to Kluver his interest in highlighting natural features by electronically transforming the recorded sources, so that visitors strolling through the island's rocky cliffs and soft pine forests would hear sounds reflected back and forth between antennas and bounced off rocks and other natural obstacles.[16] Since the mixture of sounds originated from different terrains of the island recorded at different times of year, visitors experienced the sounds as constructed, rather than live, and thus as memories of their natural source terrain. This process, in which sounds assumed new identities through their shifting environmental spaces, served as a precedent for *Sea Tails*. The filming of kites in *Sea Tails* can be traced to contemporary discussions about *Island Eye*. In an interview from 1979, during her collaboration on *Island Eye Island Ear*, Monnier explained that since kites "have to do with movement," she planned to document this movement through the medium of film.[17]

Tudor accepted the invitation of Davies and Monnier to compose the sound score for their underwater kite film. A grant which the two visual artists received from the Groupe de Recherches et d'Essais Cinematographique (subsidized by the French Ministry of Culture) enabled them to pay Tudor's travel and equipment expenses.[18] He joined them in February, 1983 on the trip to Nassau to record the sounds on location and be present during the filming process.[19] The three collaborators, a French photographer, and a few divers spent eight days on a boat filming in the Atlantic Ocean. Monnier and the divers pulled the kites, while Davies filmed, and the photographer made sure Davies moved her camera with the kites. Tudor was, in Monnier's words, "a witness. . ., though he never put his head underwater. He was a witness to the different things we were trying to do. And he knew that we were working in the depths of ten meters…that we were using the surface at one point and then the middle space and the lower space." **(see Figure E)**

Tudor collected the underwater sounds by placing little microphones in baby food jars he had filled with mineral oil, sealing them, and dropping the jars over the side of the boat. Wearing earphones, he sometimes responded "beatifically," as Davies recalls, to noises which the divers helped him identify: the shrimp eating off the coral, a fish called a "grunt" eating down below. A manuscript in Tudor's archive **(Figure F)** lists his source materials and

[14] Monnier inherits and carries on the tradition of two of the twentieth-century's greatest visual artists. She is Henri Matisse's grand-daughter and the step-daughter of Marcel Duchamp.
[15] See Billy Kluver's talk on David Tudor at the symposium, "The Art of David Tudor: Indeterminacy and Performance in Postwar Culture", Getty Research Institute, May 17, 2001. For the roles of the collaborating artists on the project of *Island Eye Island Ear*, see the David Tudor Archive 980039, Box 21.
[16] Interview with Billy Kluver, February 6, 1979, in Experiments in Art and Technology Papers, GRI 940003, Box 111, folder 25.
[17] See interview with Billy Kluver, February 6, 1979, in Experiments in Art and Technology Papers, GRI 940003, Box 111, folder 25. We do not have a record that the film was ever made.
[18] See letter from Jackie Monnier to David Tudor, January 7, 1983, David Tudor Archive, Box 25, folder 14.
[19] See letter from Jackie Monnier to David Tudor, January 7, 1983, David Tudor Archive, Box 25, folder 14. In the same letter, Monnier tells Tudor that the piece has to be finished by July 15, 1983. It will be on three video screens and "could be used as a gallery installation piece for me and by Molly [Davies] for her film showings."

successive timings, annotated with comments that identify the source ("wind," "splashes," "shrimp"), evaluate the quality of the taped sounds ("too noisy, "very good"), and indicate devices of electronic modulation ("different channels," "high frequency"). Tape 4A, for example, opened with 24:05 minutes of wind sounds followed by shrimp and probe (an underwater microphone). These recordings contained the source materials from which Tudor would select twelve sound types for his tapes that accompanied the underwater kite films. In the early phase of collaboration, his freedom to explore and collect was limited, not by a search for particular kinds of sounds, but by the need to envision his final score in conjunction with Monnier's kite imagery. Tudor watched Monnier fold and unfold the kites on the boat, she recalls. "He knew about them… he was there when we were filming them." Thus he had visual images in mind while he collected sounds, but could only imagine the sea changes that would take place when the kites came alive on film.

From the outset, the collaborators shared a primary goal to make the clearest, best-lit images they could. For Davies, this required a close understanding of Monnier's kites, their materials, and their underwater movement. Monnier fabricated her kites based on experiments she had made with underwater kites in Cadaques, Spain. She tested different materials (filter paper, sail cloth) to see how each moved underwater. She experimented with the effects of light on a range of vibrant colors and varied the shapes, lengths, and widths of her sculptures. Based on these close observations, she created four kite types for the *Sea Tails* project, sketched in a drawing which she sent to Tudor from France after the filming in the Bahamas had been completed. Her sketch, shown in **Figure G**, identifies the four kite types as: 1) little bright colorful kites; 2) big filter paper painted kites; 3) big brightly lit kites made of sail cloth; 4) dark kites made of sail cloth. During the filming, Davies and Monnier highlighted their colorful kite sculptures by capturing frames of the kites alone. If fish were swimming into view, they excluded the fish from the frame. They avoided coral. They steered the boat to the least windy spots or to the spots where the bottom was clearest and deep enough. The changing locations made it difficult for Tudor to anticipate which sounds he would collect. Yet he yielded to the requirement of visual clarity and brightness imposed by his collaborators, treating it as a parameter which circumscribed his ability to select, while revealing the effect of new ocean spaces and depths on the recurring sounds of shrimp, wind, coral, and splashes. Moreover, when it came time to select sound types from his source recordings, Tudor similarly whittled down his collected materials to arrive at a minimal repertoire of twelve sources. He omitted the sounds of humans (voices and coughs) and the noise of machines (the overhead rumble of airplanes, the clanging of boat chains and boarding clanks). He discarded strong, punctuated sounds such as "violent splashes" in favor, simply, of "splashes."

Once footage and sounds had been collected, the collaborators packed their tapes and equipment and left the Bahamas, Davies for Stuttgart, Monnier for the town of Villiers, outside Paris, and Tudor for New York. Their collaboration, coordinated between different cities and continents, now focused on the film structure of the videotapes. The three artists planned to reunite in Paris after Davies had completed the master film, so that Tudor could mix the sound score. Since Davies had conceived from the beginning a setup with three pairs of video monitors running simultaneously, she developed a visual structure based on units of three. She assigned a different tape to each video pair and distributed the kite footage among the three tapes. For each tape, she planned three edited groups of materials (edit A, edit B, edit C) that were repeated, but in a different sequence. The schematic chart of this structure drafted by Jackie Monnier **(Figure H)** analyses the contents of the three videotapes ("Film 1," "Film 2," "Film 3") in the tripartite structure I have described. Below the chart, Monnier explains that the sequence of A, B, and C edits is repeated as a loop, and she identifies the four kite types contained within each edit. Her kite descriptions correspond closely to her annotations on the drawings shown in **Figure G**, but in addition she has indicated timings ("little kites which are bright take 1 min 55 sec," etc.). A sketch by Tudor transfers the information on Monnier's chart almost verbatim, but emphasizes the timings by listing them above and the sequences of A, B, and C edits below. Tudor's changes to the kite descriptions by Monnier, subtle as they are, are revealing, for he inserts an indication of movement. The opening kites are "bright and colorful," while the filter paper kites which follow them are "sensual, slower." The big silk kites have a "long slow movement." The "tapering down" of the dark kites implies a decreasing speed, which signals cadence.

Assuming, from these sketches, that Davies and Monnier determined the kite timings and passed on the information to Tudor, how did they arrive at such precise durations, and how did the durations define the structure of *Sea Tails*? Davies recalls that when she began the film editing, she grouped her footage according to kite type, keeping the big bright kites together, then cutting to the little filter paper kites, to the big bright sail cloth kites, and finally to the kites fabricated from dark sail cloth. Next she selected the finest footage from each group, timed it, and divided the generic duration into three so that she could distribute it equally among her three videotapes (total 5.75 minutes for

bright kites divides into three equal durations of 1:55, 1:26 for filter paper kites, 3:10 for big sail cloth, 1:00 for dark sail cloth). Each of the A, B, and C edits contained the four generic timings, in the specified order of bright, filter, big sail cloth, dark sail cloth, producing three seven-minute edits. When the generic timings returned, for instance 1:55 in the B edit, Davies could introduce new kite footage, so long as it belonged to the appropriate kite type (in this case, bright kites) and stayed within the requisite duration. Structural repetition meant repetition of timings and of edits, not literal recall of visual imagery, which returned as part of the pool of edited footage for the corresponding kite type. A succession of three edits (A, B, C or B, C, B, or C, A, A) produced a 21-minute film which looped continuously.

Davies assigned a different order to the edits in each of the three *Sea Tails* films. The first film followed A B C, the second B C B, and the third C A A. The challenge now lay in configuring her films. She had three video recorders, which she could simply have connected to each of the three stacked pairs of monitors. Had she done this, screens in a stacked pair would have shown the same film, in a continuous 21-minute loop. Davies chose instead to connect each video recorder to two screens positioned *diagonally*, so that film 1 ran simultaneously on top left screen and on bottom center, film 2 on top center and on bottom right, and film 3 on top right and on bottom left **(see Figure I)**. Viewed diagonally, two screens showed identical footage. But the more customary way of viewing, looking down or across, revealed subtly different edits of the same kite types. Davies' goal was precisely to create a film experience in which we are never looking at exactly the same image on adjacent screens. Viewers experience the films as a tantalizing play between difference and sameness. The diagonal cross-play catches one's attention, connecting two identical images, but our eyes veer back to looking up and down, and left to right, where we are confronted by similar kites on vertical and horizontal screens, but always different edits.

Within each screen, bright kites initiate and dark kites close each 7-minute edit, effecting a process on all six screens from light to dark, from clarity and immediacy to muted colors and distance. Davies and -Monnier worked together to highlight individual characters for the different kite types: the swift bright kites flaunt star, letter, and cross shapes, in contrast to the alligator patterns covering the filter paper kites and to the abstract, colored shapes on the sail cloth kites that come into view gradually as the sculptures curve and billow **(see Figure J)**. The eye is challenged both to observe kite sculptures on an individual screen and to roam from screen to screen, sometimes catching identical kites on diagonal screens, but more often sensing the perpetual variation of the four kite types and their renewal process from lightness to darkness.

Tudor's approach to the recordings he had collected of underwater shrimp, splashes, and wind resembled Davies' and Monnier's in its exploration of perpetual variations of a minimal repertoire. The first thing that becomes apparent from his chart of the musical structure of *Sea Tails* is that he conceived his score as three successive 7-minute units, each containing the four kite types and together adding up to 22 minutes, the length of the complete film **(see Figure K)**. We know from studying the film chart drafted by Davies and Monnier, that the first 7-minute unit on Tudor's chart represents edit A, the second unit edit B, and the third unit edit C. Tudor did not assign his units letter names, but numbered them 1, 2, 3. In unit one, the timing of 1'55" matches the bright kites; 1'26" (the duration from 1'55" to 3'21") matches the filter paper kites; 3'10" (the duration from 3'21" to 6'31") matches the big silk kites; and 57" (the duration from 6'31" to 7'28") matches the dark kites. Computation of successive timings in Tudor's next two units reveals a precise repetition of these durations. Tudor's chart did not map the structure of all three sound tapes, because the successive timings on each tape were identical.

When it came to inserting sound materials into the durations, however, Tudor saw the need to outline all three sound tapes. This was important because, while successive *timings* on each film were identical, the sound contents, like the visual materials, changed ever so slightly. In the films, the A, B, and C edits contain variant pools of images representing each of the four kite types. Judging from Tudor's construction plan for the sounds **(see Figure L)**, which lists contents of tapes A1, B1, and C1, each containing three units, there are many more than four corresponding sound types. Twelve numbers signify twelve sounds, as well as transformations identified as 5a, 9b, 11a, etc.[20] How minimal a repertoire is Tudor actually working with? A pendant chart in Tudor's preparatory materials on *Sea Tails* provides the answer **(Figure M)**. He lists numbers 1- 12, identifies the sound he has assigned to that number, and indicates the source tape from which he selected the sound. Although there are indeed 12 sounds, they can be generalized as a succession of three types: shrimp, probe and flag, shrimp and water. Why three sound types, when Monnier had fabricated four different types of kites (bright, filter paper, silk, and dark), and

[20] "Transformation", Tudor's term, most likely refers to electronic amplification and mixing.

Davies had spliced her film footage to produce four corresponding timings? Here, we can only speculate. Supporting charts in Tudor's archive indicate that he organized his sound materials for each edit in three parts, with a fourth sub-part (the 1-minute timing of the dark kites) providing a fade-out.[21]

On May 22, 1983, Monnier wrote to Tudor from Paris to clarify his role in the ongoing collaboration on *Sea Tails*. She explained that he would "add the sound" after she and Davies had completed the master film and it had been transferred to master tapes. She mentioned that she had found a studio in Paris where they could do the sound mix. Later in May, Tudor flew to Paris where he saw the underwater kite films for the first time. Since they did not have the studio equipment to run the three films simultaneously, he edited the sound tapes one at a time. Following the June 3 – 27, 1983 installation at the Centre Pompidou, Monnier wrote to Tudor in early July to celebrate the completion of the piece and report that she was shipping a "one-screen version" to Tudor. A letter dated February 25, 1984 eagerly anticipates a new "performance" of *Sea Tails* as part of a summer "Son and Transparence" festival near Avignon and inquires about equipment Tudor will need in addition to a table and electrical outlets, and about his height requirements for the performance space. These letters confirm that *Sea Tails* had a flexibility in the presentation of its sound score, which could be played back as a video piece or played with Tudor's live remixing of his source tapes.

IV

My discussion of a structure for *Sea Tails* consisting of three film edits, each based upon precise timings for four different types of underwater kites, and of Tudor's insertion of mixed recorded sounds into the timing slots, prompts the question: Did Tudor correlate types of kites (represented by their timings) with sound types? If we observe *Sea Tails*, with the knowledge of the permutations of A B C edits and the series of kite types within each, we hear an articulation of distinct sounds at the following points: A high ringing sound of shrimp signals the bright kites which open each 7-minute edit; a pounding, tunneled sound, which I speculate is an underwater microphone Tudor called "probe," sometimes signals the filter paper kites, sometimes the sail cloth (2:18); the pitched, vibrating sound of shrimp coincides roughly with the dark kites. These sounds map shifts of kite type but, like the kite imagery, their returns in new edits are never identical. Just as Davies selects the best bright kite footage, the best silk kites, etc. for each of her three edits, so Tudor selects high shrimp and probe sounds from his source tapes, mixes the recorded sounds, and distributes the results among three edits.

Of course, the association of bright kites with shrimp has no basis in nature. Moreover, the kites are constructed and pulled by invisible divers, and the sounds are recorded and mixed in a studio. Both are thus highly mediated, challenging the viewer/listener to identify their common inspiration in the sea. Yet, even as we listeners puzzle over what the sounds are and whether the sunlight has played such tricks on our eyes that the kites have been momentarily transformed into exotic black or purple whales or dolphins, the blue ocean surges before us on the six monitors, a visual reminder of the constancy of the sea space. The *varied returns* of image and sound reinforce this memory. An enigmatic comment Tudor made to Billy Kluver when they were working on spatial transformations of sound in the Swedish archipelago, for the *Island Eye Island Ear* project, now assumes special relevance: ". . .my intention is to take a sound which lives there naturally in a very definite environmental situation and to put it into another environmental situation so that the way you experience the same sound is slightly transformed by a different environment. In that way, you don't forget the sound." In *Sea Tails*, shrimp, splashes, waves that resonated at particular moments in the ocean depths detected by Tudor's underwater microphones have been recorded, amplified, filtered and mixed, then played back in a performance space in conjunction with films showing underwater kites continually transformed by light and swirling waters. Distinct sounds and images return in varied forms as memories. We encountered them at the beginning of the piece, and we encounter them again and again, knowing we've seen and heard them before, but not being able to pinpoint where or when. This substitution of memory for repetition is vital to the collaborative working together of the different media in *Sea Tails*.

The hearing and seeing through memories represents a deeper level of structure than can be mapped on a diagram. I would argue that viewers who have no knowledge of the series of A B C edits and kite timings will nonetheless be cognizant of this deep internal structure, especially if they take the time to listen continuously to the 21-minute loops of film and sound. The collaborators did not intend *Sea Tails* to have a beginning or end, but a perpetual resonance, as with human memories. Tudor's derivation of structure from space and from the visual parameters of his

[21] All timings are made from measurements based on a stopwatch.

collaborators suggests a provocative turn from Cagian indeterminacy and control, to his own form of Minimalism. The composer Steve Reich has likened the chance processes of Cage to those of serialism, because in both systems, the compositional processes "could not be heard when the piece was performed." Reich, on the other hand, seeks a "compositional process and a sounding music that are one and the same thing. . . I don't know any secrets of structure you can't hear," he wrote in 1974.[22]

It would have been uncharacteristic of Tudor to voice such views, but he worked nonetheless with Davies and Monnier to make a piece that viewers could follow, if not consciously, then subconsciously through the varied returns of a minimal pool of sound and visual repertoire. Perception becomes integrated with the process of composition, as in music by Reich and by La Monte Young, whose early piano pieces Tudor championed and premiered in Darmstadt in 1961 and in New York. Tudor steers an independent course, however, by veiling the minimal repertoire of *Sea Tails* (shrimp, probe, shrimp and water) in complex, even chaotic textures. It would be important to consider how the context of Minimalism enriches interpretations of Tudor's other live electronic works with visual imagery and sculpture, especially *Bandoneon!*, *Rainforest IV*, and *Dialects*. In these pieces, as in *Sea Tails*, the principle that *physical space* itself has a sound component is fundamental to our perception of Tudor's mixed media.

Tudor's exploration in the 1970s, 80s, and early 90s of a new role for sounds in space and his shift from Cagean indeterminacy to active collaboration with listeners and viewers has no doubt inspired some of the recent sound art. The demands his music places on performers, however, has meant that, with the exception of *Rainforest IV,* it is performed primarily by composers who worked directly with him. The complexity and the idiosyncracy of Tudor's electronic tabletop setups, and the fact that he performed live and without scores raises interesting questions about his legacy for the 21st century. I anticipate his influence will be most widely felt through the collaborative gestures of live electronics and visual forms such as dance and sculptures.

[22] See Steve Reich, *Writings about Music* (Halifax and New York, 1974), p. 10.

FIGURES

Figure A. Jackie Monnier, David Tudor, Molly Davies at the Sound Totem Installation of *Sea Tails,* Whitney Museum of American Art at Phillip Morris, September 17, 1986. © photo: Paula Court.

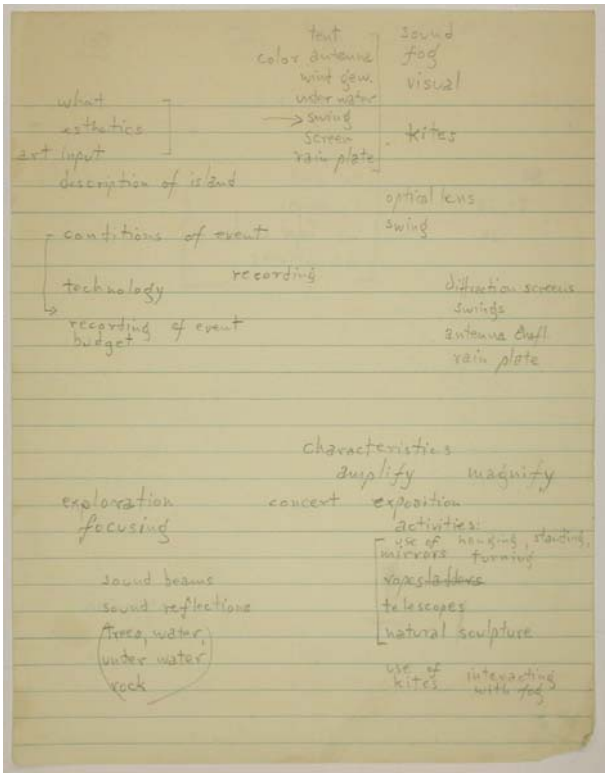

Figure B. David Tudor, Notes for *Island Eye Island Ear* (1974-1983), pencil on paper, David Tudor Archive, Getty Research Institute 980039, Box 21, f. 1. By permission of the Estate of David Tudor. Copyright © Estate of David Tudor.

Figure C. David Tudor at his electronic tabletop with the installation of *Nine Lines Reflected*, Whitney Museum of American Art at Phillip Morris, September 17, 1986. © photo: Paula Court.

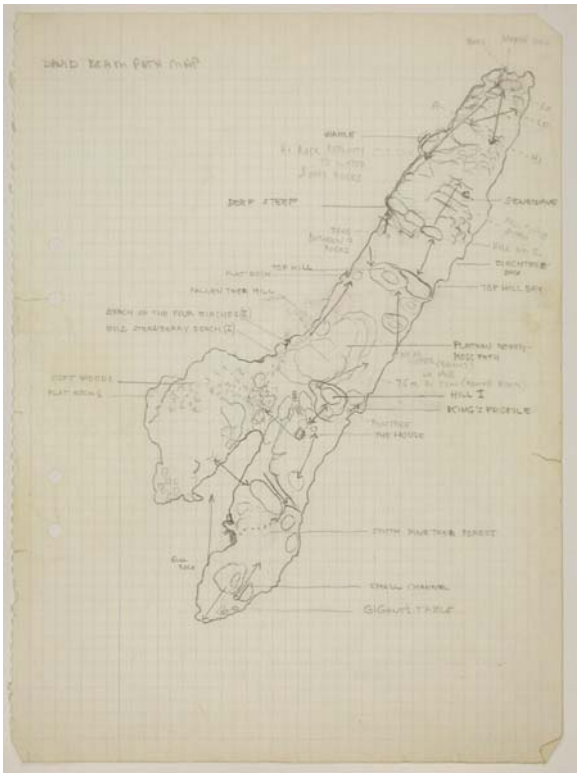

Figure D. David Tudor, Map of Knavelskaar Island, Swedish archipelago (based on original map by Fujiko Nakaya), pencil on paper. David Tudor archive, Getty Research Institute 980039, Box 21, f. 1. By permission of the Estate of David Tudor. Copyright © Estate of David Tudor.

Figure E. David Tudor on the boat on Nassau collecting sounds. © Molly Davies.

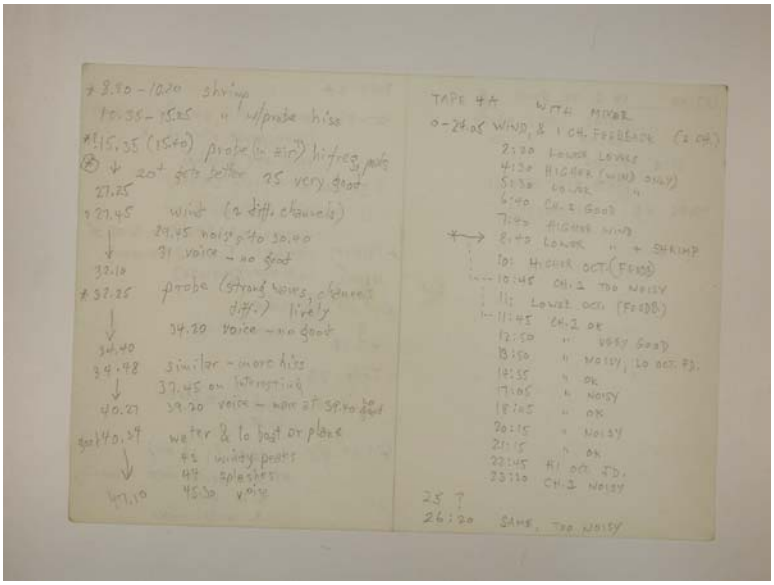

Figure F. David Tudor, List of Contents of Source Recordings (Tape 4A), pen on paper, David Tudor Archive, Getty Research Institute 980039, Box 3, f. 31. © 2002 The J. Paul Getty Trust.

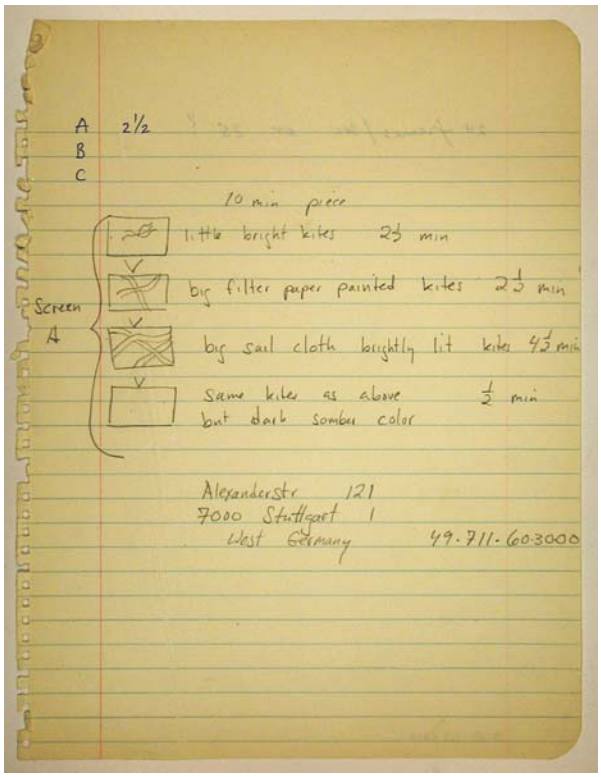

Figure G. Jackie Monnier, Plan for 10-Minute Demonstration Video-Tape, pencil on paper, David Tudor Archive, Getty Research Institute 980039, Box 3, f. 31. © 2002 The J. Paul Getty Trust.

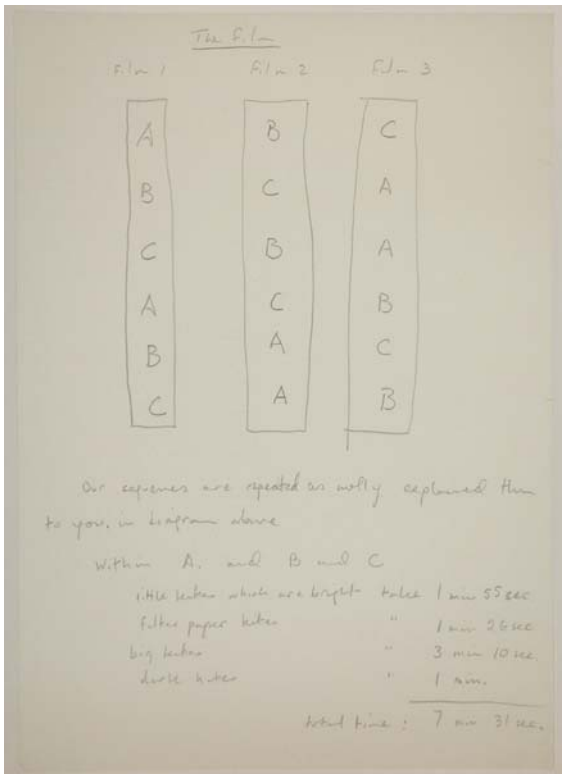

Figure H. Jackie Monnier, Analysis of Contents of Films 1-3, pencil on paper, David Tudor Archive, Getty Research Institute 980039, Box 3, f. 31. © 2002 The J. Paul Getty Trust.

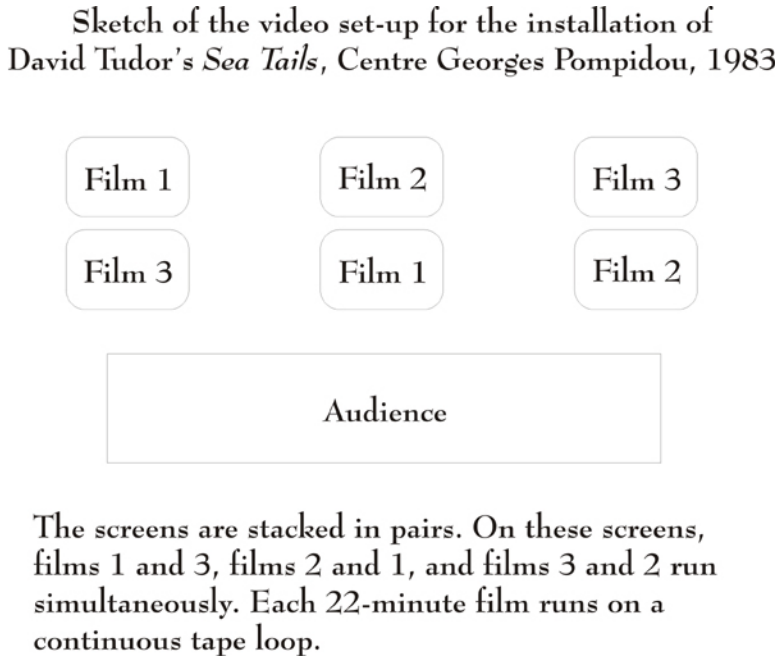

Figure I. Author's sketch of video set-up for installation of *Sea Tails*, Centre George Pompidou, 1983. © 2002 Nancy Perloff.

Figure J. Photograph of Underwater Kites by Jackie Monnier. © photo: Robert Cassoly.

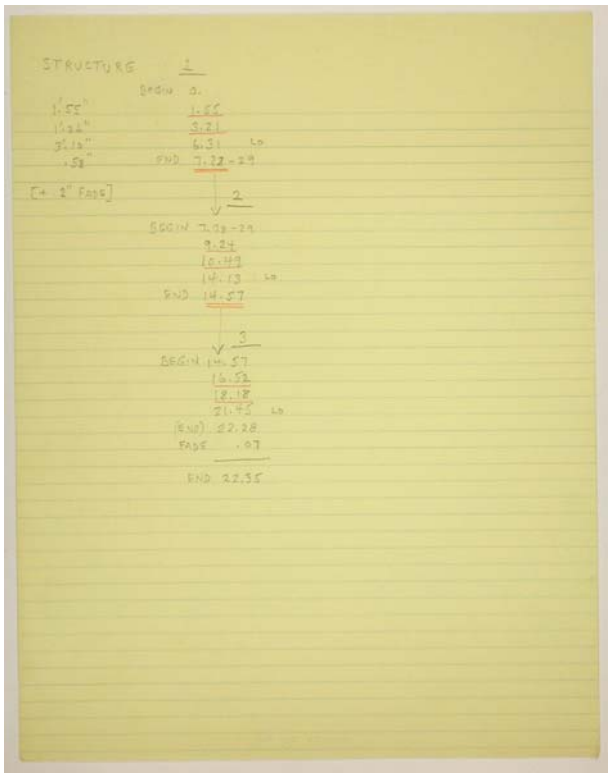

Figure K. David Tudor, Time Plan For Making of Sound Tapes, pencil on paper, David Tudor Archive, Getty Research Institute 980039, Box 3, f. 31. © 2002 The J. Paul Getty Trust.

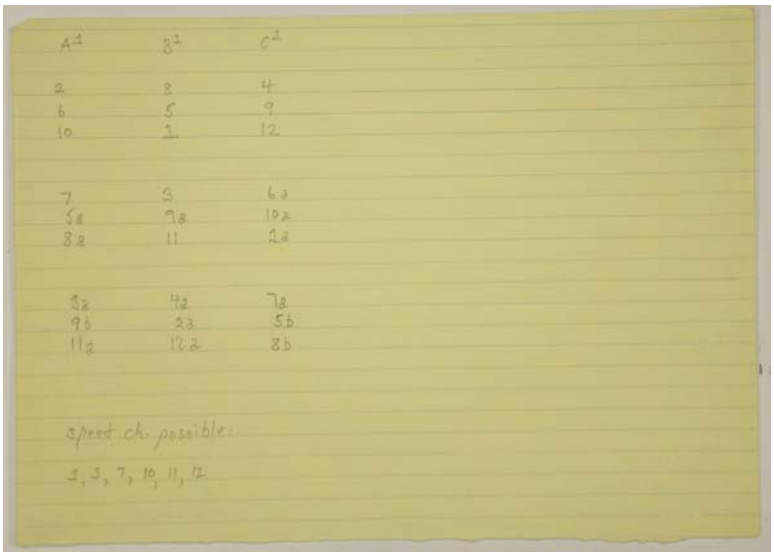

Figure L. David Tudor, Plan for Construction of Sound Tapes (Sounds 1 – 12) for Videos (A, B, C), pencil on paper, David Tudor Archive, Getty Research Institute 980039, Box 3, f. 31. © 2002 The J. Paul Getty Trust.

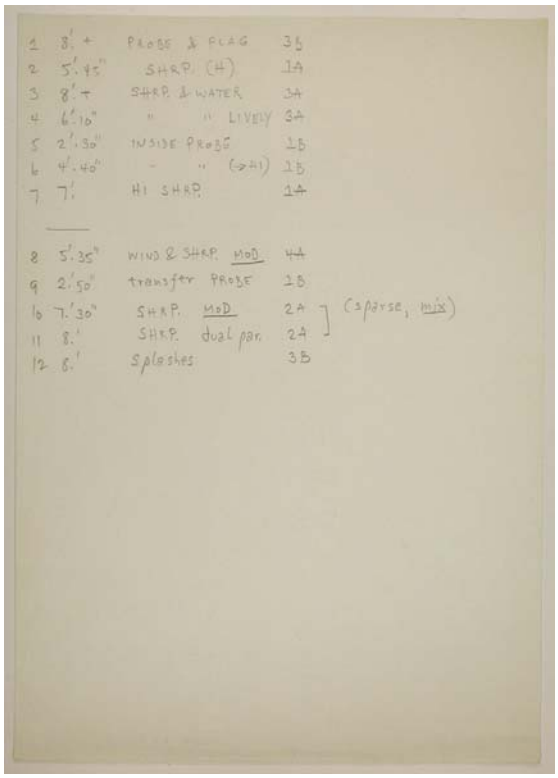

Figure M. David Tudor, List of 12 Sounds, pencil on paper, David Tudor Archive, Getty Research Institute 980039, Box 3, f. 31. © 2002 The Getty Research Institute.