

MUSIC ON A LONG THIN WIRE (1977)

for audio oscillator and electronic monochord.

Extend a long metal wire (#1 music wire or equivalent) across or lengthways down a performance space. Affix both ends to the far edges of the tops of tables or other similar platforms and tighten them with clamps, hanging weights over pulleys, or other tension-creating devices. Route the ends of the wire to the outputs of an amplifier, forming a current-carrying loop. Insert wood, metal, or other resonant bridges under the wire at both ends. Set a large magnet down on the table at one end of the wire; adjust the height of the wire so that it passes directly between the poles of the magnet. Attach microphones to the bridges and route them through amplifiers to loudspeakers.

Drive the wire with a sine wave oscillator, causing it to vibrate from the interaction between the current in the wire and the magnetic field across it, in ways determined by the frequencies and amplitudes of the driving signals and the length, size, weight, and tension of the wire. Design musical performances consisting of a series of any number of phrases which explore the acoustic properties of a single vibrating wire. Before each phrase, silently and freely choose a single oscillator frequency which will remain constant for the duration of that phrase. Within each phrase, however, raise and lower the volume controls of either the oscillator or the amplifier or a combination of both, in slow scanning patterns, causing the size of the excursions of the vibrating wire to vary, altering the tension of the wire accordingly, producing nodal shifts, echo trains, noisy overdrivings, rhythmic figures at low frequencies, phase-related time lags, simple and complex harmonic structures, larger self-generative cyclic patterns, stops and starts, and other audible and visible phenomena. At the end of each phrase, the length of which is determined by the nature of the sonic material in that phrase, reduce the volume to zero in order to silently retune the oscillator frequency for the next phrase.

Pick up the sounds of the vibrating wire with the microphones on the resonant bridges and amplify them for stereophonic listening through loudspeakers. Light the wire so that the modes of vibration are visible to viewers.

Commissioned by the Crane School of Music, State University College at Potsdam, New York, for the Live Electronic Music Ensemble, Donald Funes, Director.

In Music on a Long Thin Wire *I've had a better chance than in most of your other pieces of the last several years to watch a composition take shape, to watch the technological and intellectual parts of the piece find a balance. And of course last night was an important performance of the piece, probably the most ambitious one you've tried. Do you feel as though this piece has reached completion? Is it going to change much more, or do you see elements in it that might reach a new balance in further performances?*

No, I don't think it's going to change much more, but I have to settle one last question, which is whether or not there's a critical length for the wire beyond which it doesn't yield musical results. The first experiments we did, as you remember, were on short wires; we used guitar strings that were only three or four feet long. Then we stretched longer wires along the edge of the table in the shop to about, what, eight feet? In subsequent performances, the lengths were determined by spatial or visual considerations.

In Potsdam, New York, where I first performed the piece publicly, I stretched the wire quite long, but we began cutting it, little by little, to try to solve a problem we had, or thought we had, with the resistance of the wire in relation to the amplifier driving it. Later, at a pair of concerts with Bob and David in Alfred, New York, I extended it to twenty feet, and that seemed to work beautifully. Then last night at the Diplomat Hotel we decided to use the entire floor space of the ballroom, and made the wire, as you remember, exactly thirty six feet long. And that led to a problem. A half-hour before the concert we thought we had lost the signal from the pickup at one end of the wire, and began to take it apart; it didn't dawn on me that actually there was no problem there at all. The wire was so long

that the activity at one end wasn't nearly as strong as that at the other — perhaps it had to do with where the magnet was — but when you suggested that I change the pitch slightly, the nodes shifted, and we got sound at that end. Perhaps thirty-six feet is too long. And it's funny because you would think the longer the wire, the lower the sounds would be, but during performances in which I've extended the wire up to eighteen or twenty feet, I've gotten at times the most beautiful, silvery, high, complex sounds. Last night, the very last frequency I selected was around 20 Hz. The wire was vibrating very slowly at that frequency, but then those high harmonics mysteriously began to come in.

I first got the idea for the piece in the acoustics lab at Wesleyan. We were observing the normal modes of vibration of single wires that fit our laboratory tables, but when I began thinking of making a piece of music, I felt I had to change the scale. A short length of wire would look like a laboratory experiment, but if you thought of it as a sound sculpture, your imagination could take that wire down the length of a room. I had to be prepared for not knowing what it was going to sound like, although in my imagination I knew. I had an intuition that it would sound amazing. You don't want a laboratory wire to sound amazing, you just want it to divide into parts so you can prove, for example, that an octave is a natural interval.

You want a clear result. You've mentioned the change of scale that the imagination suggests; I can imagine an impossibly long wire doing impossible things.

Yes, someone suggested that I stretch a wire across the two towers of the World Trade Center, but I replied that Philippe Petit, the

tightrope walker, had already done that. You know, at one point as I was working on the piece, I strung some colored beads along the wire so you could more easily see the nodal patterns as the wire vibrated. I thought of it as a one-dimensional visualization of sound in which it can only go forward and backward, but it isn't really one-dimensional because the wire vibrates up and down and from side to side. It even goes in circular motions. It would have to, wouldn't it, because of the flux field of the magnet?

Yes, which reminds me that Peter Zummo, after he'd seen the piece, said the first thing that came to his mind was the hitch-hiking gesture, the "left-hand rule" for current through a wire and the field around it. But he also said that the image didn't last very long as the piece went on.

I wouldn't have thought of that in a million years!

Well, the technical details suggest some appropriate imagery. The wire is part of a circuit, but it does nothing; there's a current running through it, but nothing interesting happens until you introduce a magnetic field. Then it starts to perform.

Don Funes, the composer at Potsdam who commissioned the piece, said he thinks of the magnet as an electronic bow. I think of the whole system as a disassembled loudspeaker.

That rising melodic gesture at the end of a phrase, as the driving signal is turned down, is intriguing. And it's unexpected that a change in the amplitude of the signal can produce a change in pitch.

Well, that's because as you put less energy into the wire it unstretches slightly and its natural vibrational modes have more effect on the remains of the forced vibration caused by the audio signal. But there's another interesting effect. If you've chosen a frequency close to a resonant frequency of the wire, it vibrates very efficiently, but if you then choose one away from a resonant peak, the wire has trouble responding and the volume decreases. I think of it as a cross-referencing system in which volume can vary pitch and pitch can vary volume, but for two different reasons. The causes and effects are so complex that they defy prediction or analysis, and this gives the piece a personality.

It's a piece that requires a sensitive performer.

Yes. You know, David Rosenboom is amazing in that respect. Recently he invited me to York University in Toronto to give a concert of my works including **Music on a Long Thin Wire**. We decided to ask four or five student musicians to play; when I go to a college to perform, I feel as if I should use the students there. After all, they're there for an education, and the best way to learn about something is to take part in it.

Anyway, I was anxious about getting the wire to vibrate and to make beautiful sounds, so I thought immediately of using a bank of oscillators; I thought I needed the variety. But on the afternoon of the concert we had trouble getting the students together to rehearse, so David and I decided to perform the piece ourselves using only two oscillators, one for him and one for me. We planned to play one at a time but wanted two oscillators so that we could overlap one another as we retuned, hiding each other's silences. While I was set-

ting up **Tyndall Orchestrations** in another part of the performing space, I could hear David playing his oscillator into the wire, and I was struck by the sensitivity with which he tuned the system. It seemed that the more he reduced the power, the more efficiently it vibrated. It was paradoxical. I guess there's a natural plateau above which the wire refuses to handle more power; below that point, it accepts what comes into it and interesting things start to happen. At one point, David achieved a state in which the wire would start and stop vibrating of its own accord; it would go through long cycles of marvelously complex harmonic changes.

*We've talked about providing an opportunity for players to operate in a musical context without the constraints of a musical tradition by substituting instead the constraints of a performing system, as in **The Queen of the South** for example. You perform many of your pieces yourself; to what extent do you consider yourself a composer performer?*

Well, performing my own music, as well as that of my friends and of other composers, is an extremely important part of my life. There is great joy in it. It used to be that a composer would write a piece and then hope that someone would want to play it, but now, particularly since most of our music is not written down, or at least doesn't depend on being written down to be performed, we have the alternative of going out and performing it ourselves. I value that alternative highly, but I still feel the need to write descriptions of the pieces, to make scores; the question is, what kind of scores? I have to decide whether to write them in a practical way, making them easier to distribute and perform, or in a more general or visionary way, empha-

sizing the ideas behind the pieces. I guess I'd rather publish the ideas than the details because my work is not often practical for most performers anyway. It's unreasonable to expect people to set up the configuration for **Music on a Long Thin Wire** every time they want to do the piece, and I also don't want to clutter up the score with too much specific information about clamps, the kind of wire, the power of the magnet, and so forth. If I give them general information about how to do it, some will figure it out for themselves. Others will at least be struck by the idea and will compose similar pieces of their own. I would consider that a compliment.

I guess my work is more concerned with ideas than music. Joan La Barbara calls my music "supermusic." She said that my pieces massage her brain, that when they get started they push her almost to the edge of anger, but the imagery assuages it. She is forced to think so hard when she listens or performs, I don't know whether she was referring to her own part in **Tyndall Orchestrations** or not, that she enters a "supermusical" state.

I can't help but think that there are still other ways to use your ideas. We have interviews, performances and recordings of your music, and the scores themselves. Perhaps your audience is going to be distributed among listeners, readers, and thinkers.

Well, I'm extremely pleased when my musical ideas find social uses. I heard that **Vespers** is being used in England in courses for the blind, and a few years ago I designed a special version of **Still and Moving Lines of Silence** for the Lions Gallery of the Senses at the Wadsworth Atheneum in Hartford. It was going to be a maze through which you would walk, following troughs of sound. They rejected

the proposal on the grounds that it was too difficult for very young visitors, but it might have happened. And of course I have my dream of an architectural space inspired by my and other composers' ideas of what would be necessary and beautiful for the performance of our music. A real building might be the result of that dream, but I can't predict that; it just has to happen.

*If you consider your works from the **Music for Solo Performer** of 1965 to the **Music on a Long thin Wire** of 1977 and the different materials used in those pieces, do you see a connecting thread?*

Yes, it's an interest in the poetry of what we used to think of as science. I don't have any idea what attracted me to that idea; there's nothing in my background that would have predicted it. If anything, I was brought up to believe that my interests in the world were purely "artistic" and that any scientific endeavor was beyond me. I never thought I could fix anything; I could never understand how a radio worked, for example. I was never very successful in physics, or any science class for that matter. I always thought that the world was divided into two kinds of people, poets and practical people, and that while the practical people ran the world, the poets had visions about it. I felt the scientific point of view only skimmed the surface; artists were really the brightest people on earth. Now I realize that there is no difference between science and art.

My first approach to music was that "artistic" one, but I wasn't very successful at it. I could never settle down enough to learn to play the piano very well, though I did compose several successful student pieces for conventional instruments. I didn't get inspired until I started investigating simple natural occurrences. Some composers

find inspiration in words, in setting texts to music, or in politics, or drama, or in more abstract relationships, but I can't seem to get into those. I don't seem to be interested in the ensemble idea either, everybody playing together. I wish I were. I seem to be a phenomenologist in some ways; I would rather discover new sound situations than invent new ways to put materials together. Whenever I think of changing direction, of making something more popular or attractive to a larger audience, I lose interest very quickly, so I follow my instincts and continue making pieces with brain waves, echoes, room resonances, vibrating wires, and other natural phenomena, and try to put people into harmonious relationships with them.

SELECTED BIBLIOGRAPHY

- Griffin, Donald R. *Echoes of Bats and Men*. Anchor Books, Garden City, New York, 1959.
- Griffin, Donald R. *Listening in the Dark: The Acoustic Orientation of Bats and Men*. Yale University Press, New Haven, Connecticut, 1958.
- Jenny, Hans. *Cymatics: The Structure and Dynamics of Waves and Vibrations*. Basilius Presse, Basel, 1967.
- Kock, Winston E. *Sound Waves and Light Waves*. Anchor Books, Garden City, New York, 1965.
- van Bergeijk, Willem A., Pierce, John R., and David, Edward E., Jr. *Waves and the Ear*. Anchor Books, Garden City, New York, 1960.