80694-2

*Computer Cantata* (1963) 23:04
1. Prolog to Strophe I; Strophe I 6:35
2. Prolog to Strophe II; Strophe II 2:07
3. Prolog to Strophe III; Strophe III; Epilog to Strophe III 5:42
4. Strophe IV; Epilog to Strophe IV 3:16
5. Strophe V; Epilog to Strophe V 5:15
Helen Hamm, soprano; University of Illinois Contemporary Chamber Players; Jack McKenzie, conductor

*Quartet No. 6 for Strings* (1973) 23:56
6. Arrabiato 6:05
7. Tranquillo 8:30
8. Vivace 9:15
Concord String Quartet: Mark Sokol, Andrew Jennings, violins; John Kochanowski, viola; Norman Fischer, cello

9. *A Portfolio for Diverse Performers and Tape* (1974) 21:51
Gregg Smith Singers; Gregg Smith, conductor
Tape parts realized at the Experimental Studio, Polish National Radio, Warsaw

TT: 69:03

## Lejaren Hiller: A Total Matrix of Possibilities

Born on February 23, 1924 in New York City, Lejaren Hiller started his experiments with music and technology at an early age . . .

> My parents owned a Duo-art player piano. I often fooled around at the keyboard and even tried to jot down my own tunes. I found, however, that I could obtain highly satisfying effects by cutting designs and punching holes into the piano rolls.[1]

His pre-college training in music included piano and harmony lessons. While Hiller majored in chemistry at Princeton University, he continued to study music. He took courses in counterpoint, ear training, and composition from Milton Babbitt, and studied composition, analysis, and fugue with Roger Sessions.

After earning his Ph.D. in chemistry from Princeton in 1947, Hiller worked as a research chemist for DuPont for five years, where he developed a method for dying Orlon. Afterward, he joined the faculty of the University of Illinois in the chemistry department, where his research involved the statistical computation of the dimensions of idealized polymer molecules in solutions. This research project involved the use of the University's ILLIAC I computer, the first computer to be owned by an academic institution.

During this time Hiller began to work toward a masters degree in composition. Hiller realized that the probability processes he was using in his chemistry research could also be used to generate music. This work led to the first composition written with the aid of a computer, *The ILLIAC Suite*.

*The ILLIAC Suite* received more press than many composers receive over the course of their entire career. . . .

> I wrote *The ILLIAC Suite,* and that hit the headlines—quite literally. All of a sudden I went from a nobody to somebody who was actually on the front page of many newspapers—usually in the most absurd kind of news article, but nevertheless, it drew attention to me.[2]

However, this attention was tempered due to its predominantly negative flavor.

After the notoriety of *The ILLIAC Suite,* Hiller communicated his frustration pertaining to his professional career to Dean Frederick Wall of the graduate college. When asked what he would like to do, Hiller replied that he would like to start an electronic music studio. Thus, he transferred from the chemistry department to the music department. In the fall of 1958, the second electronic music studio in the United States, the experimental music studio, opened at the University of Illinois. Here, Hiller taught one of the first courses in electronic music at a university in the United States, a two-semester course in the studio called "Seminar in Musical Acoustics."

After teaching in the music department at the University of Illinois for a decade, Hiller was offered a position at the State University of New York at Buffalo. The job promised greater support for experimental music and a substantial increase in salary, as well as a return to the East Coast for a native New Yorker.

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[1] Tracy Caras and Cole Gagne, *Soundpieces: Interviews with American Composers* (Metuchen: The Scarecrow Press, Inc., 1982), 328.
[2] Caras and Gagne, 234.

In 1984 family members began to notice that Hiller was beginning to have memory lapses. He was diagnosed with encephalitis in 1987. After the symptoms of the encephalitis subsided, it was evident that his mental state was in decline. He continued to teach at SUNY Buffalo until 1989, the same year in which he stopped composing. The Alzheimer's disease that plagued the composer's mind led toward his admission to a nursing home in 1992, finally leading to the stroke that took his life on January 26, 1994.

Among the most common features of Lejaren Hiller's music is a love of musical eclecticism and diversity . . .

> I just assume that everything and anything can go into a piece if it is appropriate. So, for example, I'll write tonal music if I want to; I'll even insert key signatures if it is useful, something which some people regard as provocative. . . . But I certainly use tonal methods, serial methods, of course, chance methods, charts, mathematical formulas like Fibonacci series, eye music—you name it. And all of this with or without computers and electronics. But again I say that I try all of them in what you might call a total matrix of possibilities.[3]

Hiller focused not only on variety within individual compositions, but from work to work as well. . . .

> Some composers find they work most effectively by steadily and slowly progressing from one piece to the next in a clearly perceived evolution of style and idea. The consistency seems necessary to their development. With me, I seem to need to address each new compositional project as something that should differ, even radically, from previous efforts, that should have its own identity and gesture. Hence, everything is grist for the mill—from the abstract experimentation of computer pieces to multi-media extravaganzas, to expressions of Americana, to twelve-tone and serial music, to microtone, to popular musical comedy style, to classical romantic mainstream, to folk-music sources.[4]

This emphasis on eclecticism and diversity was particularly out of the ordinary during Hiller's early years of success in the late Fifties and early Sixties, an era that was more oriented toward the uniformity of integral serialism.

The three works contained in this collection are examples in Hiller's catalog that demonstrate his love of musical diversity and eclecticism. These works also exhibit other trends that are common in Hiller's music, including collaboration, an interest in microtonality, symmetrical and arch forms, and indeterminate instrumentation. The works span a little more than a decade, from 1963 to 1974, which were amongst his greatest years as a composer. The works also use a variety of instrumentations, from purely acoustic to electronic, and computer music with live ensemble.

In 1961 Hiller first proposed the *Second ILLIAC Suite*. The title was changed to *Computer Cantata* due to the fact that the ILLIAC I computer on which the work was begun had been recently decommissioned, as well as the fact that the work began to resemble *The ILLIAC Suite* less and less as work progressed. An added benefit of the title change is that it distances the work from preconceptions based upon *The ILLIAC Suite*.

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[3] Caras and Gagne, 243.

[4] David Ewen, *American Composers: A Biographical Dictionary* (New York: G. P. Putnam's Sons, 1982) 331.

The *Computer Cantata* also reflects another trend in Hiller's music, namely, collaboration. Having come from a research background in chemistry, Hiller was accustomed to working collaboratively in a research environment, and he brought this experience to his work in computer-assisted composition. This manner of working can also be seen as favoring his love of musical diversity and eclecticism.

Hiller was aided in the *Computer Cantata* by a graduate student in composition named Robert A. Baker, who was assisting Hiller with a project to create the first computer-based music notation system, the Musicwriter. This program was written for the ILLIAC I computer, and worked in conjunction with a music typewriter made by Cecil Effinger that could input and output paper tape.

Baker also aided Hiller on the creation of MUSICOMP, the first general-purpose computer language for computer-assisted composition. Originally written for the ILLIAC I computer, MUSICOMP was rewritten for the IBM 7090 after the ILLIAC I was decommissioned. The system consisted of more than forty subroutines that could be used in conjunction with each other to generate music for up to 31 parts, with each part having up to 9 parameters, each of which can have 15 levels. Hiller used this language to generate several compositions, including *Computer Cantata*, *An Avalanche for Pitchman, Prima Donna, Player-Piano, Percussionist, and Pre-recorded Playback*, *HPSCHD*, and *Algorithms I* (versions I-IV).

Arrangements had originally been made with Max Mathews to realize the computer-generated sound in the *Computer Cantata* at Bell Labs. Instead, a unique real-time computer sound synthesis system that was developed at the University of Illinois by J. L. Divilbiss was used. This system, the CSX-1 Music Machine, used the output of the left-most bit of the accumulator to produce simple waveforms. The computer used for this project was a one-of-a-kind transistor-based machine called the CSX-1, which was built by the Coordinated Science Laboratory and had six accumulators, allowing it to produce three simultaneous tones.

The instrumentation of the *Computer Cantata* was designed to demonstrate the flexibility of MUSICOMP. Two examples from each standard instrumental family (woodwind, brass, pitched percussion, and bowed strings) were included, as well as voice, unpitched percussion, guitar, theremin, and tape. For the tape part, Hiller used examples from each of the major categories of electronic sound: periodic signals (sawtooth, square, and sine waves), and white and colored noise, as well as computer-generated sounds from the CSX-1 Music Machine.

The *Computer Cantata* consists of eleven sections arranged symmetrically, another tendency in Hiller's music. The core of the work consists of five strophes, each of which is either preceded by a prolog or followed by an epilog. The center strophe utilizes both a prolog and an epilog in order to preserve symmetry.

The text used in the five strophes of the *Computer Cantata* was generated by John B. Carroll of Harvard University, and Lee S. Hultzén, Joseph Allen Jr., and Murray Miron of the University of Illinois. The text was generated using stochastic procedures meant to approximate American English text. The sample for the study consisted of some 20,032 phonemes, randomly selected from the periodical *Plays, The Drama Magazine for Young People*. Zero through fourth-order approximations were done, which were used for the five strophes respectively.

The music for these strophes also utilized stochastic approximations. The sample used for the approximation was a passage of music by Charles Ives. Ives was a favorite composer of Hiller's due to Ives's musical sense of humor and eclecticism, and the excerpt used for this approximation, mm. 14–39 of "Putnam's Camp" from *Three Places in New England,* was selected from a work that uses layering of diverse materials. The brevity of the sample excluded any approximation beyond the second order. The first eighteen measures of the first strophe presents a progression from noise sounds to percussion to harmonic tones by progressively adding groups of such sounds and instruments.

The Prolog to Strophe I and Epilog to Strophe V are rhythmic studies for percussion. In the Prolog to Strophe I, the dynamics decrease as the density of attacks increase, ultimately culminating in rolls at the end of the movement. In the Epilog to Strophe V, the dynamics increase toward the middle of the movement, while there is a slight decrease in the density of attacks over the course of the movement.

The Prolog to Strophe II and Epilog to Strophe IV are studies in integral serialism, based upon *Structure Ia* by Pierre Boulez. Both movements utilize the same tone row, which was randomly generated using the MUSICOMP command SHUFFL. In order to reflect the symmetrical design of the *Computer Cantata,* Hiller used only prime and inversion forms of the row in the Prolog to Strophe II, and retrograde and retrograde-inversions of the row in the Epilog to Strophe IV.

The Prolog and Epilog to Strophe III are both studies in computer-synthesized microtonal music, utilizing nine-to-fifteen-note-per-octave equal temperament. Microtonal music was a lasting interest of Hiller's, having used microtones in *Seven Electronic Studies, HPSCHD,* and *Quartet for Strings No. 5 (In Quarter Tones).* The sound was realized using the CSX-1 Music Machine. The left and right channels simultaneously presented contrasting temperaments, each with a three-voice texture.

*Quartet No. 6 for Strings* was a commission for the Concord String Quartet, who had premiered his *Quartet No. 5 for Strings* in 1971. This piece is a study in environmental sounds; for this work, Hiller compiled notes on the sound patterns that surrounded him. He then separated them into three categories:

> (1) Sounds which originate in the racket and noise one endures in commercial and industrial areas and in heavy traffic, sounds which easily provoke aggrevation [sic] and exasperation; (2) Sounds which originate in placid and peaceful situations, sounds such as those which drift in through an open window on a quiet summer afternoon; (3) Sounds which are relatively cheerful if not always of lofty aesthetic merit, such as the droning of the TV set that drifted upstairs from downstairs when our children tuned in to Saturday morning cartoon shows.[5]

These three categories respectively became the materials for the three movements of the piece. After defining the materials, he began to articulate what the flow of the work would be. . . .

> Here, I employed chance processes (random number tables, I-Ching values, etc.), systematic groupings and constraints such as gradually narrowing down the variety of available pitches in the third movement, deliberate overlayering of sounds from different sound sources to create a complex counterpoint, imposition of speech patterns, and so on.[6]

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[5] Lejaren Hiller, *Quartet No. 6 for Strings*, program notes, manuscript.
[6] Hiller, *Quartet No. 6 for Strings*, program notes.

He then used this narrative form as guide for composing the piece.

The work is constructed in a vaguely tonal sense with the first and last movements emphasizing the key of G, while the center movement nearly exclusively emphasizes the note D. Ultimately the work he composed is not a medley of transcribed sounds from the real world, but is rather a musical narrative, providing a commentary on such sounds.

Lejaren Hiller's fifty-first completed composition, *A Portfolio for Diverse Performers and Tape,* was commissioned by Polskie Radio of Warsaw, Poland. The piece utilizes up to ten performers with up to eight channels of tape. The indeterminate instrumentation of the piece is a feature that also appears in other Hiller compositions, perhaps most notably *HPSCHD*. The tape parts were realized at the Studio Eksperimentalne of Polskie Radio, while the performance materials were compiled in Malta where Hiller resided in the spring of 1974.

The eight channels of tape is accomplished using four stereo tapes, which are started in timed sequence. The first tape, which Hiller referred to as the "Timing Tape," which includes a strike tone every thirty-two seconds, is used to synchronize the performance. Also included in this tape is a bass rumble sound and two children's songs recorded by his children, Amanda and David Hiller. The second tape, or "Harmony Tape," features a seventh-chord progression leading from E-flat to A. The third tape, the "Bell Tape," is comprised of tones made from sum and difference tones of whole-tone scales that are organized through the means of change-ringing, a technique that Hiller previously used in *Algorythms II*. Finally, the fourth, or "Canon Tape," works in conjunction with the performers to present an eighteen-part canon where eight of the parts are presented by the "Canon Tape."

In addition to the introduction and coda, each performer uses five sheets of music for performance materials for the canon. Each sheet is a free transcription from one of the fifty compositions that Hiller had written previous to *A Portfolio for Diverse Performers*. These transcriptions are abstracted, with key signatures, tempi, dynamics, and tessituras removed. These sheets may be played in any order, but performers are instructed to fill out the notation to make it expressive. In addition, the performers are to follow the harmonic scheme, gradually moving from E-flat to A over the course of the piece.

Nearly a decade and a half after Hiller's death, most consider his legacy to be the *ILLIAC Suite*. In an era where diversity and eclecticism are celebrated throughout the arts, his music deserves a second look. Does it provide a link from the music of Ives to today's eclecticism? Listen, discover, and enjoy!

—James Bohn

*James Bohn is a composer and video artist. His book on Lejaren Hiller is published by the Edwin Mellen Press.*

SELECTED DISCOGRAPHY

*An Apotheosis for Archaeopterix for piccolo & berimbau.* Lejaren A. Hiller, Jr. On *For the Birds.* Fleur De Son FDS 57944.

*Computer Music Retrospective (1957–1985).* Contains *An Avalanche for Pitchman, Prima Donna, Player-Piano, Percussionist, and Pre-recorded Playback; Computer Music for Percussion and Tape; Expo '85 for Multiple Synthesizers; Persiflage for Flute, Oboe, and Percussion;* and *Quartet No. 4 for Strings,"ILLIAC" Suite.* Wergo 60128-50.

*HPSCHD.* John Cage and Lejaren Hiller. EMF Media EM 138-2.

*HPSCHD: Solo VII.* Tiensuu, Jukka. On *The Frivolous Harpsichord.* Ondine 891.

*Metaphors for Guitar Quartet.* The Buffalo Guitar Quartet. New World Records 80384.

*Quadrilateral for Piano and Tape.* Sven Thomas Kiebler. On *Piano + live electronics / tape.* Vox Box, CDX 5143 and 2e2m 1014.

*String Quartet No. 5 (in Quarter Tones).* The Concord String Quartet. On *American String Quartets 1950–1970.* Vox Box CDX 5143.

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