COMPUTER GENERATIONS

This recording contains three "generations" of computer composers whose music uses three generations of computer music languages. The late GODFREY WINHAM is recognized as a prime force in the development of computer music — he was responsible for the *FORTRAN* version of *Music IV*, the original program developed in 1960 by Max Matthews of Bell Telephone Laboratories. BARRY VERCOE was Winham's student at Princeton and there invented a more streamlined language, Music 360, now in wide use. The newer *Music-11* system was developed by Vercoe at M.I.T. RICHARD HOFFMANN and JOEL GRESSEL did their work at M.I.T. and Princeton respectively, Hoffmann using Vercoe's *Music-11* and Gressel using *Music 360*.

GODFREY WINHAM

N P (TWO PIECES FOR COMPUTER-SYNTHESIZED SOUND)

Realized at the Godfrey Winham Laboratory at Princeton University

GODFREY WINHAM (b. London, 1934 — d. Princeton, 1975) took his early formal education at the Westminster School and the Royal Academy of Music, and he worked privately with Matyas Seiber in composition and on the violin with Hans Keller. In 1954 he emigrated to the United States to study with Roger Sessions as an undergraduate at Princeton University. He continued his studies through the graduate level, and in 1963 was awarded Princeton's first PhD in composition. From 1948 until his death of Hodgkins' Disease, Winham worked extensively in music criticism, theory, and composition. In the 1960's he became interested in electronic music, first with the R.C.A. Synthesizer and later with computer sound synthesis.

Winham's two compositions here are representative of a group of compositional and theoretical enterprises which he apparently referred to collectively as “NP.” As in most of Winham's work, these compositions provided the focal point for investigations the goal of which, in the composer's words, was to provide “better than usual answers” to “awkward questions asked by good students.” This was not a casual activity: there exist close to a dozen notebooks containing sketches and criticisms not only of different versions of the pieces, but also of the compositional system of which they are instances. His starting point for these researches was a critique of 12-tone system as formulated by Schoenberg: “The major disadvantage of the 12-tone method ... seems to me to be the fact that its resources are partitioned into more or less exclusive sets by the different 12-tone rows (as opposed to the tonal system, which in principle is completely available for every work).”

It is clear from the notebooks that a number of alternative and completely independent schemes of realization for these pieces are plausible. It is also clear that the versions here are simply the most recent, not the final ones. As always, the aim was to endow the performances of these pieces with the Bertrand Russell-like directness of the prose found in the composer's notebooks.

It is not known whether the works were originally conceived for acoustic instruments or for the RCA Synthesizer, since the earliest notes are about the system NP rather than the compositions NP. Nevertheless, a number of extant computer listings indicated that as soon as it was available, digital synthesis became the preferred medium, making these pieces perhaps the first composed for computer performance.

As a result of this first contact with the computer, Winham found it necessary to educate himself in the most technical aspects of the process. Among the benefits of his study were numerous modifications to, and enrichments of, the original Bell Telephone Laboratories' Music IV. Winham's version of the program and its descendants have made possible the world-wide dissemination of computer synthesis in music.

NP was realized using the IBM 360 Model 91 and facilities of the Godfrey Winham Laboratory at Princeton University.

BARRY VERCOE

SYNAPSE FOR VIOLA AND COMPUTER

Marcus Thompson, viola; tape realized at the M.I.T. Experimental Electronic Music Studio

BARRY VERCOE (b. New Zealand, 1937) gained degrees in music composition and in mathematics from the University of Auckland. to 1962 he came to the U.S., as a student of Ross Lee Finney at the University of Michigan, where he received a doctorate in music composition. He taught at Oberlin Conservatory, and then served as composer-in-residence for the Seattle-Tacoma school system under a grant from the Ford-sponsored Contemporary Music Project. During that time he also became interested in electronic music, particularly as synthesized by digital computer, and the premiere or his *Digressions*, for large orchestra, double choir and computer was given at the Seattle Opera House in 1968. He subsequently moved to Princeton to work with Godfrey Winham. In 1969 Vercoe devised a new high-speed language for doing sound research and composition on large third-generation IBM computers. Music 360, as it is called, soon became the most popular computer music language, operating in some 40 universities in the U.S. and abroad. It has been used in the composition of more than 150 works to date.

After teaching briefly at Yale, Vercoe was invited in 1971 to establish an electronic music facility at the Massachusetts Institute of Technology in Boston. At this point he switched his allegiance from large computers to small ones.

> "The problem with large computers," he writes, "was that they were always too protected. Composers could not get their hands on the instrument they were writing for. For me, the special moments of private, even personal, reflective experiment are an essential pad of the creative process (as they must have been for Varese, with that battery of percussion in his studio!). The critical economic factor of small computers was that composers now realistically command an entire machine, They would not be forced to compete with the scientific and commercial world, but could define and control their own environment."

M.I.T.'s Experimental Music Studio has two computers — a DEC PDP-11/50 amd an IMLAC PDS-4 — capable of synthesizing a large orchestra-like sound. The composer controls this performance by communicating with the computer in traditional musical terms. Thus, when he "plays" a section of his score at the keyboard, the computer will "listen" and then display those notes in music notation on a screen. The composer can create a large complex score, and can make modifications as he or she goes. Upon request, the computer will synthesize and play back any segment of that score, and can print copies of the score and parts for individual players. The first major works using the system were Vercoe's SYNAPSE and Hoffmann's IN MEMORIAM PATRIS. Vercoe writes:

> "SYNAPSE FOR VIOLA AND COMPUTER was written in February 1976 for Marcus Thompson. I wrote about two-thirds of the piece at home, away from the piano. As each section was completed, I would take it to the studio and 'orchestrate' it for synthesized sound. I would play the notes assigned into each timbre line, listen to the computer performance, add a touch of color here, rescore a note there, and so on, until good ensemble was achieved.
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> The scurrying section just past the halfway mark was composed very differently, however. There I went in with little more than a sketch to tell the computer. I supplied the row I was

using (this is a strict 12-tone work), the combinatorial relationships I wished to maintain, the rotational procedures and registral controls. The computer organized the detail and synthesized the sound. I listened, and then reshaped the structure until I was satisfied.

"Throughout the work the notes of the viola line were also played into the computer. Apart from the satisfaction of seeing it displayed along with the rest of the score, hearing the synthesized viola line enabled me to maintain an aural check on the relationship I was creating between the soloist and the orchestrated accompaniment. In SYNAPSE. as the name suggests, the two are linked as tightly as anything I have seen or heard involving live and synthesized sound. The rhythmic complexity of each part could have meant that the task of synchronizing the two in performance would necessitate a long and arduous learning process. But when I gave Marcus Thompson the score and tape, I also gave him a 'complete performance' with synthesized viola on an extra channel. Using that, he learned his part in two hours — and now surpasses the synthesized version, incidentally, as only a live performer is able to do."

RICHARD HOFFMANN

IN MEMORIAM PATRIS (1976)

Realized at the M.I.T. Experimental Electronic Music Studio

HOFFMANN (b. Vienna, 1925) emigrated to New Zealand in 1935 and settled in the United States in 1947. He began studying the violin at age 5 and had his first public performance (of an orchestral suite) when he was 10. After studies in New Zealand, he sent manuscripts to Arnold Schoenberg, who accepted him as a scholarship pupil. From his arrival until Schoenberg's death in 1951, Hoffmann worked closely with the great composer, becoming his amanuensis and secretary. Simultaneously, he began teaching and studying for the Ph. D. at U.C.L.A. and remained in teaching positions there until he moved to Oberlin in 1954. He is now (1978) Professor of Music at the Oberlin Conservatory of Music.

Hoffmann's music includes four string quartets, numerous orchestral works and works for piano. He is a coeditor of the Schoenberg collected edition and has lectured on Schoenberg's works in Europe, New Zealand and the U.S. His STRING TRIO is recorded on CRI SD 240.

Hoffmann's active interest in computer music dates from 1976. His work in this medium has been concentrated around M.I.T.'s facilities. He writes:

"IN MEMORIAM PATRIS was written in 1976 in Lexington, Mass. and was realized at the MIT Experimental Electronic Music Studio during July and August of that year. Despite the piece's minimal pitch content (a single hexachord and its combinatorial inversion), its limited tessitura (11/2 octaves), and other severe constraints, the computer 'performance' attempts to allow the machine to untold certain aleatoric and inherently unstable characteristics in quasi-random fashion. Rigid control and matrix-like construction is to yield — paradoxically — 'a chaos of delight' (Darwin). The programmatic nature of this piece is expressed in a singularly unsubtle manner; the association of bell, xylophone and organ sounds with death.

"The composition and realization of this work was made possible by grants from the National Endowment for the Arts, Oberlin College, and by the invaluable contibution of my assistant, Don Johnstone."

JOEL GRESSEL

CROSSINGS (1976)

P-VIBES: THREE CANONS (1972)

Realized at the Godfrey Winham Laboratory at Princeton University

JOEL GRESSEL (b. Cleveland, 1943) received a B.A. from Brandeis University and a Ph. D. in music composition from Princeton University. He studied composition with Martin Boykan, J.K. Randall, Earl Kim, Edward T. Cone, and Milton Babbitt, and computer music with Winham and Randall. Gressel is currently on the music faculty of Baruch College of the City University of New York.

CROSSINGS and P-VIBES were realized on the Princeton University IBM 360/91 computer using the Music 360 language. Digital-to-analog conversions were done at the Winham Lab at Princeton. Gressel writes:

> "CROSSINGS is primarily concerned with timbre changes, within individual notes and across the entire piece. 'Instruments' that produce shifting clusters of 'domesticated noise' at the opening of the piece evolve toward a piano-like 'instrument.'Each stage of this evolution presents different idiomatic possibilities and the music changes accordingly.
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> "At the beginning each note unfolds timbrally from a sharply focused attack to a chorus of outward-spreading glissandi. The glissandi are formed by the interaction of a simple sine tone with the upper partials of a complex amplitude-modulating function whose subsonic partials impose a 'spinning coin' internal rhythm on the evolving sound. The exponential acceleration of this internal rhythm is akin to geometric rhythmic structures present throughout the piece. Measures, beats, and subdivisions of beats all form durational series that increase or decrease according to precise ratios.
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> "Subsequent sections employ variants of the opening 'instrument,' each more clearly pitched than its predecessor. With the entrance of the computer 'piano,' harmonic relationships become primary. Polyphony gives way to homophony, and the cocky extroversion of the opening yields to introversion. The original 'instrument' returns for a reprise of the beginning, this time supported by sustained 'piano' sounds. CROSSINGS is dedicated to Godfrey Winham.
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> "In P-VIBES I and III orchestras of computer 'instruments' play canonically related materials at different tempi, chasing each other across time in tortoise-and-hare fashion. P-VIBES I consists of three multivoiced strands. Strand 1 begins the piece; strand 2 enters after 30 seconds and presents an exact inversion of strand 1 at a faster tempo; and strand 3 enters after 60 seconds, restating strand 1 at a still greater tempo. An inversionally symmetrical pitch freeze gradually takes effect toward the middle of the piece as each strand in turn is restricted to 24 pitches. The freeze lifts and the three strands converge, reaching the final chord together at the 21/2-minute point. P-VIBES III consists of two inversionally related strands, rather than three, and uses a different twelve-tone set than P-VIBES I.
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> "P-VIBES II, on the other hand, uses a single 18-note melody. Two clearly pitched 'instruments' state the melody twice as a canon at the unison but with different rhythmic contours. A third semipitched 'instrument' plays the first 12 notes of the melody several times, changes to a lower-sounding waveform, and then presents the entire melody. The music is repeated at a lower dynamic level."

More computer music may be heard on CRI 268 (Ussachevsky), 300 (Dodge, Boretz), 310 (Lejaren Hiller's historic COMPUTER CANTATA from 1963, and music by Melby) 328 (Randall, Ceely), 348 (Dodge), 364 (Melby) and 375 (William Matthews).

MARCUS THOMPSON studied with Walter Trampler and Abraham Skernick, and holds a doctorate in performance from the Juilliard School of Music. He has appeared at the Marlboro and Spoleto festivals, with the Chamber Music Society of Lincoln Center, and as soloist with the St. Louis Symphony, Boston Pops, Symphony of the New World and the National Symphony, and founded the M.I.T. Chamber Players in 1973. He has recorded the Hindemith Viola Concerto for Vox/Turnabout and appears with the Concord String Quartet on CRI SD 381 (music of Tison Street).

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(original liner notes from CRI LP jacket)