FOLKWAYS RECORDS FTS 33452

VISIONS

MUSIC FOR ORCHESTRA, 2 PIANOS AND COMPUTER-GENERATED TAPE BY

David Cope

THRESHOLD AND VISIONS for large chamber orchestra

Santa Crus Chamber Symphony, the composer conducting

GLASSWORKS for 2 pianos and computer-generated tape

David Cope, piano / Ken Durling, piano / Assistants: Gretchen Talbot, Mary Jane Cope, Adam Polson

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13 Jul 1978    9:05          HELL.SCR[222,DHC]               Page 1-21

;PRINT P1;< TIC2    34
 TIC5      0.926     0.034    1294.8    0.120 F1        2.000   0.010   3.000   0.031  86.698
           3.650   0.069    0.700 F2        0.000    4.009   0.000   0.000   0.000   0.000
           0.000   0.000    1.051
;PRINT P1;< TIC5    33
 TIC4      0.927     0.033    1278.3    0.120 F1        2.000   0.010   3.000   0.031  86.758
           3.649   0.069    0.700 F2        0.000    4.012   0.000   0.000   0.000   0.000
           0.000   0.000    1.008
;PRINT P1;< TIC4    33
 TIC7      0.933     0.036    1262.1    0.120 F1        2.000   0.010   3.000   0.031  87.182
           3.647   0.069    0.700 F2        0.000    4.035   0.000   0.000   0.000   0.000
           0.000   0.000    1.008
;PRINT P1;< TIC7    34
 TIC3      0.937     0.033    1292.4    0.120 F1        2.000   0.010   3.000   0.031  87.402
           3.645   0.069    0.700 F2        0.000    4.046   0.000   0.000   0.000   0.000
           0.000   0.000    1.045
;PRINT P1;< TIC3    35
 TIC1      0.947     0.035    1265.5    0.120 F1        2.000   0.010   3.000   0.031  88.036
           3.642   0.068    0.700 F2        0.000    4.079   0.000   0.000   0.000   0.000
           0.000   0.000    1.130
;PRINT P1;< TIC1    34
 TIC6      0.948     0.042    1302.3    0.120 F1        2.000   0.010   3.000   0.031  88.060
           3.642   0.068    0.700 F2        0.000    4.080   0.000   0.000   0.000   0.000
           0.000   0.000    1.148
;PRINT P1;< TIC6    34
 TIC2      0.957     0.035    1268.0    0.120 F1        2.000   0.010   3.000   0.032  88.679
           3.638   0.068    0.700 F2        0.000    4.113   0.000   0.000   0.000   0.000
           0.000   0.000    1.013
;PRINT P1;< TIC2    35
 TIC5      0.958     0.038    1246.2    0.120 F1        2.000   0.010   3.000   0.032  88.713
           3.638   0.068    0.700 F2        0.000    4.114   0.000   0.000   0.000   0.000
           0.000   0.000    1.123
;PRINT P1;< TIC5    34
 TIC8      0.959     0.037    1255.1    0.120 F1        2.000   0.010   3.000   0.032  88.760
           3.638   0.068    0.700 F2        0.000    4.117   0.000   0.000   0.000   0.000
           0.000   0.000    1.126
;PRINT P1;< TIC8    34
 TIC4      0.960     0.036    1275.5    0.120 F1        2.000   0.010   3.000   0.032  88.782
           3.638   0.068    0.700 F2        0.000    4.118   0.000   0.000   0.000   0.000
           0.000   0.000    1.033
;PRINT P1;< TIC4    34
 TIC3      0.969     0.042    1281.8    0.120 F1        2.000   0.010   3.000   0.032  89.436
           3.634   0.068    0.700 F2        0.000    4.152   0.000   0.000   0.000   0.000
           0.000   0.000    1.105
;PRINT P1;< TIC3    36
 TIC7      0.969     0.043    1242.2    0.120 F1        2.000   0.010   3.000   0.032  89.396
           3.634   0.068    0.700 F2        0.000    4.150   0.000   0.000   0.000   0.000
           0.000   0.000    1.153
;PRINT P1;< TIC7    35
 TIC1      0.978     0.038    1277.3    0.120 F1        2.000   0.010   3.000   0.032  90.017
           3.630   0.067    0.700 F2        0.000    4.181   0.000   0.000   0.000   0.000
           0.000   0.000    1.055
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AN EXAMPLE OF PRINTED OUTPUT (DIGITAL INFORMATION JUST BEFORE IT IS OUTPUT TO THE DAC AND/OR DIGITAL SYNTHESIZER)

COVER DESIGN BY RONALD CLYNE

FOLKWAYS RECORDS FTS 33452

Side One:

THRESHOLD AND VISIONS
for large chamber orchestra movements I-IV

Santa Cruz Chamber Symphony,
the composer conducting

Side Two:

THRESHOLD AND VISIONS
for large chamber orchestra movement V

GLASSWORKS
for two pianos and computer-generated tape

David Cope, piano
Ken Durling, piano
assistants: Gretchen Talbot
Mary Jane Cope
Adam Polson

recording engineer: Marian Lewis (both works)

VISIONS

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David Cope

DESCRIPTIVE NOTES ARE INSIDE POCKET

FOLKWAYS RECORDS FTS 33452

FOLKWAYS RECORDS Album No. FTS 33452

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THRESHOLD AND VISIONS

THRESHOLD AND VISIONS was completed in the Fall of 1978 and presented for the first time on December 1, 1978 by the Santa Cruz Chamber Symphony in Santa Cruz, California. The work is scored for large chamber orchestra (1 each of woodwinds, and trumpet, 2 horns and trombones, harp, piano, organ, large percussion battery and strings - scored as 4 sections of 1st violins, 2 sections of second violins, 2 sections of violas, 2 sections of celli and one section of contrabassi).

The work is presented in five distinct movements (I: moderate; II: fast; III: very slow; IV: moderate; V: very fast). Materials concentrate on the ever flowing expansion and contraction of motivic modules gravitating toward a variety of central pitches. Form is organic (that is, it is not arrived at in sectional or extramusical formats but rather germinates continually as the material unfolds and is a direct result of the music itself).

SPACE is an integral aspect of the composition with each performer placed exactly in an overview of the stage presented in the score. The following is extracted from an article by the composer about the spatial aspects of this score:

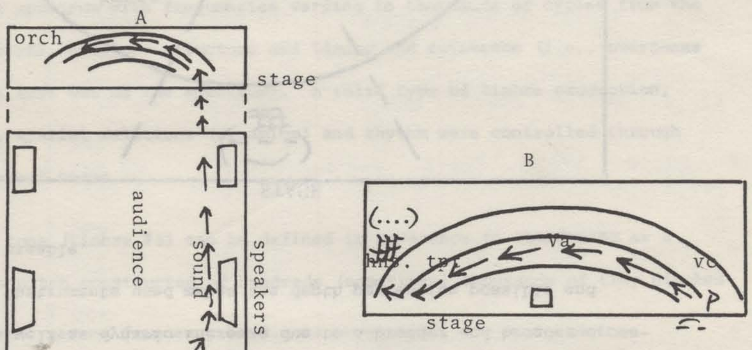

figure 1:
A shows a typical spatial motion through speakers surrounding an audience. B shows how the same gesture can be translated to live performers on a stage.

The first 'solution' lay in transposing a spatial element into a purely musical one. Instead of making sound fly around as simply a modern sonic 'cinematic' gesture, it can be translated into a set of modulations as meaningful (if not more so) as space but not nearly as cumbersome. Spatial 'distance' and direction can be reduced as articulative, dynamic and timbre modulations are increased. This provides very tangible and functional results as long as space is still a vital consideration. Fig. 1 shows how space can be reduced to stage limitations but a spatial figuration remains basically intact.

Note that in A (the original conception) the sound moves from the rear of the hall to the stage in a dramatic and formal gesture. In B, this activity is set for orchestra alone with the sound moving but a fraction of the distance of A. However, the condensation does not affect the event since the ACT of moving is greatly enhanced by 'musical' considerations. Here the same note as in A begins to move, but as it does its dynamics increase and its timbre changes. Especially note the articulations evolving from very legato to very staccato type bowings. The sound accomplishes something substantially more evolved in B than in A.

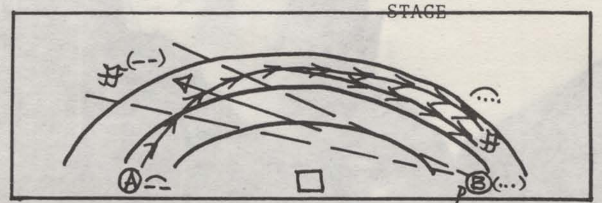

figure 2:
contrapuntal spatial movement

Figure 2 shows how various mobile regions can be established such that two or more moving sounds or spatial activities can go on at the same time. Here the figure B moves from stage right to stage left while A does the opposite. Each is very different in makeup (B is a cluster of artificial harmonics in the strings while A is a bending cluster of pitches around Bb).

With the use of articulations, especially, the possibility of depth perception in spatial activity on stage is real. Figure 3 shows how a sound moves from the front of the stage to the rear. While the visual knowledge of string in front and brass in the rear do help the aural recognition of the sound moving toward backstage, the articulation changes (modulation from short to long) as well as dynamic increase due to a broader and broader cross-section of instruments used makes the depth perception possible and distinctly useable.

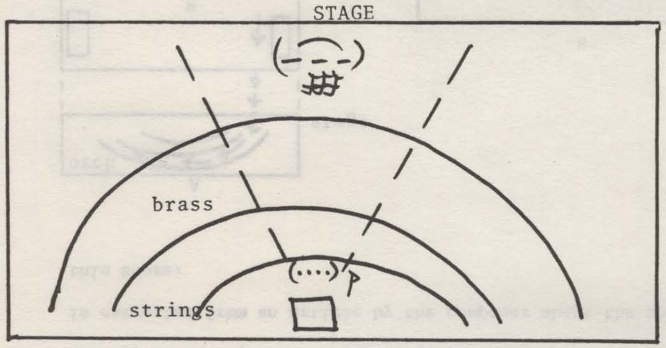

figure 3:
Three dimensional spatial movement (moving away from an audience) in live performance.

When these techniques are applied to musical materials it is very possible to maintain spatial concepts without their becoming the work. In fact, it is very possible to create a piece on multi-levels such that the spatial aspect of the work is not even noticeable on first hearing (unless one is prepared for it) and available only on subsequent more analytical audience levels. Whether this is desirable or not is not the point; the importance lies in its availability to those bent on avoiding the obvious melodramatics and gamesmanship of full scale 360° spatial effects.

As a side benefit from this approach of translation, a work evolves which is also available for recording without loss of inherent potentials as well as avoiding the complications of complicated logistic setups for live performance (speaker locations, multitrack setups, etc.); thus, one solution for a multitude of problems.

From: "Modulations" by David Cope, COMPOSER Magazine. Vol. 8, No. 17, 1976, p. 25 reprinted by permission.

It should be pointed out again that this recording does not permit a wide variety of these spatial permutations to evolve as they would in live performance.

As with many other of this composer's recent works, Navajo influences are included in this piece. The Fourth movement for example contains a number of whisperings from the orchestra on Navajo texts:

trah:	three
kos:	cloud
ya-hahokah:	hole in the sky
adlil:	magic rite
niltche:	wind
nah dekonse:	constellation of the big dipper

These words were chosen both for their sound and inflection as well as their implied meanings to the piece.

As with the composer's other works in this genre, the use of Navajo texts, ideas and music is meant only in the greatest respect and admiration for the Navajo Nation and its ceremony and ritual. The subtle and often involved manner in which these materials are interwoven with the piece at hand is so intricate as to present an impossible task to review or explain here.

The Santa Cruz Chamber Symphony, performing here and conducted by the composer is made up of the following personnel:

Flute: Robin Tinkler
Oboe: Carol Panofsky
Clarinet: Arlen Johnson
Bassoon: Fred Cohen

Horn: Jim Schliestett
Horn: Mike Morgan
Trumpet: Glenn Smith
Trombone: Bill Duran
Trombone: Pat Dennehy

Harp: Henry Spiller
Percussion: Charles Levin
Percussion: Ken Burton

Piano: Ken Durling
Organ: Luke Anderson

Violin

Lisa Suits
Sterling Branton
Willy Juncosa
John Fairweather
Patti Boggs
Philip Kashap
Karen Nigh

Viola

Judy Hobbs
Sarah Mullen
Michael Stamp

Bass

Roger Poirier
David Suggs

Cello

Carol Rice
Gretchen Talbot

Acknowledgements:

David Kilpatrick, Udang Sumarna and the UCSC gamelan for the use of instruments.

Most of the orchestra personnel are students or faculty at the University of California at Santa Cruz.

GLASSWORKS

GLASSWORKS is scored for two pianos, 3 assistants, and computer-generated quadriphonic tape (reduced to stereo in this recorded version). Both live and tape portions involve a wide range of experimental procedures best discussed separately.

The tape portion was composed from June to August 1978 at the Artificial Intelligence Laboratory at Stanford University, Palo Alto, California using a PDP 10 computer and the Samson Digital Synthesizer. The tape has been produced entirely by digital procedures and a digital-to-analog converter (DAC) and no analog synthesizer-produced sounds were used. All splicing was accomplished by computer program changes and not by more traditional means of actually cutting the tape directly. The software design used is that developed primarily by John Chowning and Leland Smith at Stanford. Timbres employed were developed around two substantially different techniques available in the SCORE program at Stanford: FM techniques (CHOWNING MODULATION) wherein timbres are created by frequency modulation varying either or both program and carrier waveforms; or Fourier Synthesis techniques wherein each timbre is constructed from scratch by adding each overtone separately, controlling frequency (often chosen from the inharmonic spectrum with frequencies varying in thousands of cycles from the harmonic norm), envelope structure and timing and existence (i.e., overtones were often left out of the spectrum). A third type of timbre production, frequency, spatial relations (dynamics) and rhythm were controlled through very different means.

A complex tone (timbre #3) can be defined in reference to GLASSWORKS as a continuous pitch constructed of hundreds (sometimes) thousands of tiny pitches produced in a narrow frequency band. As an example, one must imagine 200 to 500 separate sound events per second being produced within the frequency range of 439 HZ and 442 HZ (or 3 cycles difference) with each sound event having say .001 to .009 seconds duration, its own timbre and overtone structure, its own envelope and its own pitch identity (pitch being selected to the thousands of a cycle; i.e., pitch 1 with a frequency of 441.036, pitch 2, a frequency of 439.879, etc.). The result of playing these small sounds over a continuous period of time is the illusion of a single identifiable pitch with a very unique timbre. See Figures 4 and 5.

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21 Jul 1978     7:31           TINK[222,DHC]              Page 2-1

PRECEDE;
FUNC GLAZ;
NPTIX←256;
INST VIBFM HIP1 HIP2 HIP3 HIP4 HIP5 HIP6 HIP7 HIP8,
    TIN1 TIN2 TIN3 TIN4 TIN5 TIN6 TIN7 TIN8;
PLAY;
REVERB 122,377;
*
HIP1 122,186;
P2 MOVE/5 .3,.06/5 .06,.3/5 .3,.06/5 .06,.3/5 .3,.06/
5 .06,.3/5 .3,.06/5 .06,.3/7 .3,.06/8 .06,.3/9 .3,.06;
P3 SUBR NUM/30,5;
P4 MOVE/27 .5,.5/10 .5,.3/20 .3,.3/7 .3,.01;
P5 F1;
P6 3;
P7 .01;
P8 4;
P9 .01;
P10 MOVE/64 90,2394;
P11 1;
P12 .03;
P13 2.1;
P14 F1;
P15 Ø;
P16 2;
P17 Ø;
P18 Ø;
P19 "1";
END;

HIP2 139,237;
P2 1 .04,.06;
P3 SUBR NUM/26,6;
P4 MOVE/21 .5,.5/16 .5,.3/20 .3,.5/33 .5,.22/8 .22,.01;
P5 F2;
P6 3;
P7 .03;
P8 4;
P9 .02;
P10 MOVE/98 1152Ø,Ø;
P11 1;
P12 .03;
P13 .76;
P14 F2;
P15 Ø;
P16 3;
P17 Ø;
P18 Ø;
P19 "1";
END;

HIP3 146,189;
```

figure 4:

An example of input data for two instruments involved in the section of the tape using the release of 'complex sounds' into the performance area. Note the number of controllable parameters (19) and the necessary reference to subroutines (pitch vocabulary of 33 note just intonation).

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13 Jul 1978   9:Ø5          HELL.SCR[222,DHC]            Page 1-21

;PRINT P1;< TIC2   34
 TIC5      Ø.926  Ø.Ø34  1294.8  Ø.12Ø F1     2.ØØØ  Ø.Ø1Ø  3.ØØØ  Ø.Ø31  86.698
           3.65Ø  Ø.Ø69  Ø.7ØØ F2     Ø.ØØØ  4.ØØ9  Ø.ØØØ  Ø.ØØØ  Ø.ØØØ  Ø.ØØØ
           Ø.ØØØ  Ø.ØØØ  1.Ø51
;PRINT P1;< TIC5   33
 TIC4      Ø.927  Ø.Ø33  1278.3  Ø.12Ø F1     2.ØØØ  Ø.Ø1Ø  3.ØØØ  Ø.Ø31  86.758
           3.649  Ø.Ø69  Ø.7ØØ F2     Ø.ØØØ  4.Ø12  Ø.ØØØ  Ø.ØØØ  Ø.ØØØ  Ø.ØØØ
           Ø.ØØØ  Ø.ØØØ  1.ØØ8
;PRINT P1;< TIC4   33
 TIC7      Ø.933  Ø.Ø36  1262.1  Ø.12Ø F1     2.ØØØ  Ø.Ø1Ø  3.ØØØ  Ø.Ø31  87.182
           3.647  Ø.Ø69  Ø.7ØØ F2     Ø.ØØØ  4.Ø35  Ø.ØØØ  Ø.ØØØ  Ø.ØØØ  Ø.ØØØ
           Ø.ØØØ  Ø.ØØØ  1.ØØ8
;PRINT P1;< TIC7   34
 TIC3      Ø.937  Ø.Ø33  1292.4  Ø.12Ø F1     2.ØØØ  Ø.Ø1Ø  3.ØØØ  Ø.Ø31  87.4Ø2
           3.645  Ø.Ø69  Ø.7ØØ F2     Ø.ØØØ  4.Ø46  Ø.ØØØ  Ø.ØØØ  Ø.ØØØ  Ø.ØØØ
           Ø.ØØØ  Ø.ØØØ  1.Ø45
;PRINT P1;< TIC3   35
 TIC1      Ø.947  Ø.Ø35  1265.5  Ø.12Ø F1     2.ØØØ  Ø.Ø1Ø  3.ØØØ  Ø.Ø31  88.Ø36
           3.642  Ø.Ø68  Ø.7ØØ F2     Ø.ØØØ  4.Ø79  Ø.ØØØ  Ø.ØØØ  Ø.ØØØ  Ø.ØØØ
           Ø.ØØØ  Ø.ØØØ  1.13Ø
;PRINT P1;< TIC1   34
 TIC6      Ø.948  Ø.Ø42  13Ø2.3  Ø.12Ø F1     2.ØØØ  Ø.Ø1Ø  3.ØØØ  Ø.Ø31  88.Ø6Ø
           3.642  Ø.Ø68  Ø.7ØØ F2     Ø.ØØØ  4.Ø8Ø  Ø.ØØØ  Ø.ØØØ  Ø.ØØØ  Ø.ØØØ
           Ø.ØØØ  Ø.ØØØ  1.148
;PRINT P1;< TIC6   34
 TIC2      Ø.957  Ø.Ø35  1268.Ø  Ø.12Ø F1     2.ØØØ  Ø.Ø1Ø  3.ØØØ  Ø.Ø32  88.679
           3.638  Ø.Ø68  Ø.7ØØ F2     Ø.ØØØ  4.113  Ø.ØØØ  Ø.ØØØ  Ø.ØØØ  Ø.ØØØ
           Ø.ØØØ  Ø.ØØØ  1.Ø13
;PRINT P1;< TIC2   35
 TIC5      Ø.958  Ø.Ø38  1246.2  Ø.12Ø F1     2.ØØØ  Ø.Ø1Ø  3.ØØØ  Ø.Ø32  88.713
           3.638  Ø.Ø68  Ø.7ØØ F2     Ø.ØØØ  4.114  Ø.ØØØ  Ø.ØØØ  Ø.ØØØ  Ø.ØØØ
           Ø.ØØØ  Ø.ØØØ  1.123
;PRINT P1;< TIC5   34
 TIC8      Ø.959  Ø.Ø37  1255.1  Ø.12Ø F1     2.ØØØ  Ø.Ø1Ø  3.ØØØ  Ø.Ø32  88.76Ø
           3.638  Ø.Ø68  Ø.7ØØ F2     Ø.ØØØ  4.117  Ø.ØØØ  Ø.ØØØ  Ø.ØØØ  Ø.ØØØ
           Ø.ØØØ  Ø.ØØØ  1.126
;PRINT P1;< TIC8   34
 TIC4      Ø.96Ø  Ø.Ø36  1275.5  Ø.12Ø F1     2.ØØØ  Ø.Ø1Ø  3.ØØØ  Ø.Ø32  88.782
           3.638  Ø.Ø68  Ø.7ØØ F2     Ø.ØØØ  4.118  Ø.ØØØ  Ø.ØØØ  Ø.ØØØ  Ø.ØØØ
           Ø.ØØØ  Ø.ØØØ  1.Ø33
;PRINT P1;< TIC4   34
 TIC3      Ø.969  Ø.Ø42  1281.8  Ø.12Ø F1     2.ØØØ  Ø.Ø1Ø  3.ØØØ  Ø.Ø32  89.436
           3.634  Ø.Ø68  Ø.7ØØ F2     Ø.ØØØ  4.152  Ø.ØØØ  Ø.ØØØ  Ø.ØØØ  Ø.ØØØ
           Ø.ØØØ  Ø.ØØØ  1.1Ø5
;PRINT P1;< TIC3   36
 TIC7      Ø.969  Ø.Ø43  1242.2  Ø.12Ø F1     2.ØØØ  Ø.Ø1Ø  3.ØØØ  Ø.Ø32  89.396
           3.634  Ø.Ø68  Ø.7ØØ F2     Ø.ØØØ  4.15Ø  Ø.ØØØ  Ø.ØØØ  Ø.ØØØ  Ø.ØØØ
           Ø.ØØØ  Ø.ØØØ  1.153
;PRINT P1;< TIC7   35
 TIC1      Ø.978  Ø.Ø38  1277.3  Ø.12Ø F1     2.ØØØ  Ø.Ø1Ø  3.ØØØ  Ø.Ø32  9Ø.Ø17
           3.63Ø  Ø.Ø67  Ø.7ØØ F2     Ø.ØØØ  4.181  Ø.ØØØ  Ø.ØØØ  Ø.ØØØ  Ø.ØØØ
           Ø.ØØØ  Ø.ØØØ  1.Ø55
```

figure 5:

An example of printed output (digital information just before it is output to the DAC and/or digital synthesizer). Note the begin time of each note (first number after TIC reference; i.e., .926 followed by .927 etc.) and durations (the very next number shown: .034 - 34 thousands of a second) in this section of a complex tone.

Obviously the structure of each single tiny pitch cannot be separately described without suggesting months of labor per second of sound. Therefore, a type of stochastic procedure was employed allowing the computer to select randomly within a very defined parametric control the variables of each pitch. Gross percentages were then varied to control the resulting timbres (i.e. 60% sine waves, 30% sawtooth waves, 10% triangle waves, etc. though it should be pointed out that standard waveforms such as these were not employed often). The opening pitch of the tape part is in fact a 'complex tone,' made up of thousands of pinpoint pitches giving the illusion of a continuous pitch. Timbre controls were exerted by means of these gross controls of various elements through percentages of carefully selected random events within parameters exerted by the composer. At the end of the sustained pitch these points of sound were allowed to slow down and cascade downward through the performance space, losing the illusion of continuity and gaining independence and identity.

Frequency in GLASSWORKS tape portion was defined through a 33 note just system of intonation evolved by the composer. The system is constructed by using ratios presented by the first 16 notes of the natural overtone

series. The composer has involved himself with activities in intonation experimentation for some 5 years prior to implementation of the 33 note just system. The approach bears at least a brief observation before continuing discussion on GLASSWORKS proper:

If the ratios presented by the first 16 overtones are rigidly imposed an 8 note scale will appear (here arbitrarily given with C as fundamental for purposes of demonstration only). See example 6. It is interesting to note that no perfect 4th appears above the fundamental as it does in most synthetic scales and approaches to intonation.
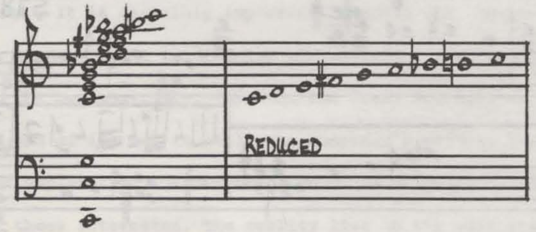
figure 6:
The first 16 notes of the overtone series with C fundamental followed by a reduction of the different notes present into one octave.

For purposes of modulation and interest, an 8 note scale with exactly the same proportions, is constructed on each of the notes of this primary scale. Thusly 8 x 8 or 64 notes can be produced in 'just' format above each of these 8 fundamentals. After converting these to frequencies, many of the 64 pitches can be eliminated as they double exactly some other note presented in the construction. The result is a 33 note scale in just intonation (rather 8, 8 note scales in just intonation with 33 resultant different pitches).

The intonation can (and has) been used in a variety of ways, each producing an unusual fabric of frequency relationships: 1) the 8 note scale can be used with notes from the other 8-note scales being considered chromatic alterations in terms of modulations and borrowed tones - this preserves the 'just' character of the original system and avoids 'beats'; 2) the entire 33 note scale can be used creating a wide variety of microtonal structures and inharmonic variations; 3) the assortment of given frequencies often come extremely close to other intonations (particularly Pythagorean and equal - the tuning of the pianos here) and these can be utilized for variety or unity depending on circumstance.

Beginning with the spill of notes at the end of the first complex tone on the tape until the end, all notes are woven from the 33 note just vocabulary. In all sections where long tones (more than 2 seconds) are employed, a basic 8 note approach is used with other pitches used as chromatic alterations (only after the initial 8 note syntax is fully established). In the 'contrapuntal'section in which tape and pianos perform simultaneously, the tape is constructed of pitches of equal temperament approximation. All other sections employ full 33 note just chromatic materials.

It is important to note a few of the reasons that this piece employs this intonational approach: 1) the computer may be the only instrument capable of producing the exact frequencies to adequately evolve the pitches of the system - certainly the computer makes easy what could otherwise be a nightmare; 2) the flexibility of electronic and computer musics makes any reasonable composer re-evaluate his/her relationship with pitch - the 33 note just system is but one more potential that seemed worthy of exploration; 3) after continuous listening and careful personal evaluation the composer here simply liked the sounds that the system presented.

Space and sound (spatial modulation) have been of great interest to this composer for over 20 years. The computer provides a viable and very useful tool to explore this very real parameter of composition. By varying pitch (doppler effect), direction (speaker control), dynamics (to some degree equaling distance from the listener) and particularly reverberation (local and global) the composer using SCORE at Stanford (particularly using the spatial techniques developed by John Chowning) can move sound from one location to another in a 360° circle around the listener as well as distance from the listener (not controlled by the performance space but by illusory pitches at great distances from any given performance space).

Two types of spatial exploration are created in the tape portion of GLASSWORKS. Monophonic motion is created when a single pitch is moved from one location to another through an illusory space. The opening of the tape portion of GLASSWORKS demonstrates this effect as a single pitch (in this case a complex tone), spins around the listener at various speeds before exploding. Contrapuntal motion is created by a number of pitches moving in various directions at once. When the pianos enter over the tape about 2/3s into the piece, an 8 deep contrapuntal spatiality is created by slowly layering each pitch separately over the other. The effect of contrapuntal layering in space is heightened by the use of repeated pitches whose speed varies from location to location aiding the spatial illusion in relation to the listener. Every pitch in the tape portion in GLASSWORKS is given an exact location in reference to a mid-point in an imagined performance space (even the thousands of single pitches in the complex tones). The locations are controlled by musical and formal considerations much as are the other parameters of the work.

It is important to note, that when reducing GLASSWORKS to a stereo format much of the real spatial illusion is lost. Some of it, however, can be retained in this recording if one approaches the listening experience from a <u>binaural</u> position. If one sits in the middle of the performance space

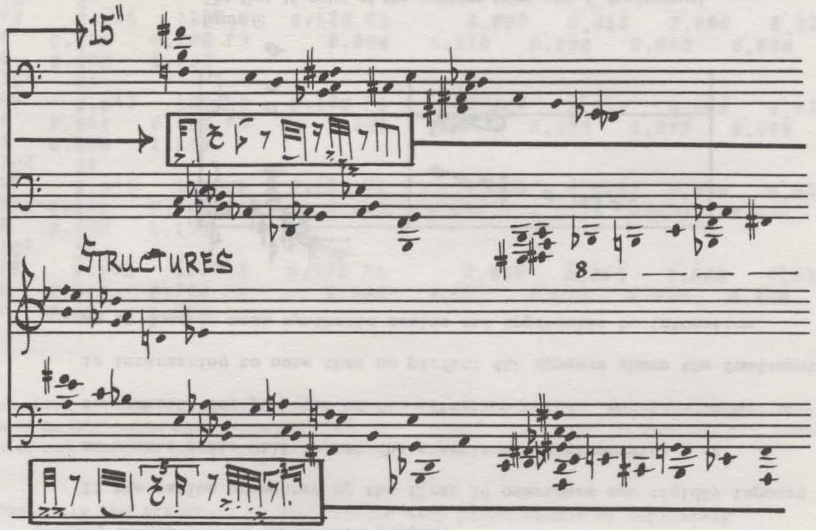

figure 7:

An example of STRUCTURES notation in the 2 piano score to GLASSWORKS. Note how exact pitches are shown as is duration of section but that rhythms (shown in the box) are freely chosen by the performer and attached to notes as possible—no rhythm is made up, all must be chosen from those given here, but which are used with which notes is left up to the performer.

(living room, whatever) and places the speakers to his/her left or right directly opposite one another facing IN toward the listener, a binaural situation (rather than stereo) will occur and much of the otherwise lost spatial effect can be returned to the piece.

The performing score to GLASSWORKS contains as well a number of experimental approaches both to composition (mainly notation) and performance. In a live performance the three assistants perform only in the middle section on the insides (guts) of the two pianos where 10 hands are needed for adequate realization of all the notes. The effects used in this section cover a wide gamut of contemporary performance techniques for the complete piano: 1) preparation; 2) plucking, stroking and glissing the open strings; 3) harmonics; 4) muting; 5) knocking the crossbars; 6) bowing (fishline resined bows strung between the strings and pulled for continuous sound; 7) direct resining (resin applied directly to the strings producing a continuous timbre 3 octaves and a major sixth higher); as well as a host of complimentary instruments such as duck calls, police whistles, vocal sounds, etc. Rather than using each independently for its own unique timbre, the composer here has formed large soundmasses from the effects for a type of 'complex' live sound.

The scores for the live performers involve three modes of interaction and combinations. These are: "games," in which rhythmic patterns, chordal structures and range are treated conversationally and antiphonally by the two pianos; "structures," in which a textural fabric is woven of specific pitches, structurally important notes being brought out by dynamic alteration; and "models," in which sequences of pitches and effects are treated by each performer with temporal flexibility. In this way, all parameters are predetermined while at the same time allowing for the spontaneous vitality usually associated only with improvisational music. It should be made clear that all pitches are fully notated and the piece will sound very much the same from performance to performance. However, the notation allows for conditions to exist wherein the materials interact in a very real way so that exact timings and relationships can vary slightly creating a performance tension, piano to piano and pianos to tape.

Live performance involves some lighting control in that the stage, on the very first chord, is immediately reduced to dim but bright red lighting. When the tape enters (about 1/2 way through the piece) the light dims to darkness to heighten the spatial illusions. When the pianos re-enter, lights which have been attached to the underside of the keyboards of each piano are turned on in red bathing each performer's face (from the underside) in bright red light. These dim to darkness at the end of the performance.

Very few of this composer's pieces involve such immense amount of experimentation and techniques. Clearly this piece (one which involves at least 10 areas of new--at least for this composer--techniques) is unabashed in its drive for innovation. It is certainly important to point out, however, that none of this is in any way meant to diminish the singular importance of the piece's working on its own musically. Whether the drama and form of the piece is viable in and of its own is still the composer's primary goal. The large amount of explanation (only some of which is actually presented here) is given for those interested, the reality lies in the work itself--certainly these notes are to be considered optional and not a prerequisite to the listening experience.

FINAL NOTES

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Recording Engineer: Marian Lewis

ANOTHER RECORD BY David Cope

FOLKWAYS RECORDS FTS 33869
NAVAJO DEDICATIONS
modern music,
based on navajo ceremonies by
DAVID COPE

SIDE 1
- Vortex
- Rituals

SIDE 2
- Parallax
- Teec Nos Pos

OTHER FOLKWAYS ELECTRONIC MUSIC

FOLKWAYS RECORDS FTS 33435 STEREO
J.D. ROBB
RHYTHMANIA

SIDE 1
1. Triptyque
   First Fugue
   Second Fugue
   Third Fugue
2. Rhythmania
3. Cosmic Dance of Shiva
4. Soliloquy
5. Factory Sounds
6. The Beautiful Blue Danube

SIDE 2
7. Her the Clock, Tick
8. Chaconne
9. Toccata
10. Poem of Summer
11. Capricho
12. Little Suite,
    Lonely Wanderer
    Imaginary Birds
    Little Bells
13. Synthi Waltz

FOLKWAYS FTS 33436
ELECTRONIC MUSIC

SIDE 1
- Dripsody, Hugh Le Caine (1955)
- Dance R4-#, Myron Schaeffer (1961)
- Summer Idyl, Arnold Walter, Harvey Olnick, Myron Schaeffer (1959)
- Noesis, Robert Aitkin (1962)

SIDE 2
- Fireworks, 1-55, Val Stephen
- The Orgasmic Opus, Val Stephen
- Collage, J. D. Robb
- Pinball, Jean Eichelberger Ivey
- Inferno, Victor Grauer

FOLKWAYS RECORDS FTS 33437
THE WORLD MUSIC THEATRE OF JON APPLETON

SIDE 1
1. Chef d'Oeuvre
2. Apolliana
3. Sones de San Blas
4. Nevsehir

SIDE 2
5. C.C.C.P.
6. Hommage ot Orpheus
7. 'Ofa atu Tonga
8. Times Square Times Ten

FOLKWAYS FTS 33438 STEREO
ELECTRONIC MUSIC
FROM RAZOR BLADES TO MOOG
PRODUCED & COMPOSED BY J.D. ROBB

SIDE 1
- Retrograde Sequence From A Tragedy
- Excerpt From Spatial Serenade
- Collage No. 2,
- Tarantella
- Canon In Percussive Sound
- Rondino
- Pleasant Obsession

SIDE 2
- Green Mansions
- Les Ondes Martenot
- Transmutations For Orchestra and Electronic Instruments
  Movements 2 and 3
- Analogies - Analog Computer Music

FOLKWAYS RECORDS STEREO
FTS 33439
MUSIC BY JEAN EICHELBERGER IVEY for voices, instruments, and tape

SIDE 1
- Terminus
- Aldebaran

SIDE 2
- Three Songs of Night
  The Astronomer
  I Dreamed of Sappho
  Heraclitus
- Cortege-For Charles Kent

FOLKWAYS RECORDS FTS 33440 STEREO
OUTER SPACE MUSIC
VACLAV NELHYBEL

SIDE 1
1. Strange Eruptions
2. Nebulae
3. Cosmic Cycle
4. Space Meteors
5. Star Clusters
6. Song of the Spheres
7. Cosmic Twilight
8. Mars Craters
9. Cosmic Fright
10. Space Ship
11. Pulse of the Universe

SIDE 2
1. Sun Lava
2. Ionosphere
3. Dark Cosmic Clouds
4. Cosmic Dawn
5. Interplanetary Journey
   (a) Slow Misterioso
   (b) Mysterious agitato
   (c) Strange space spasms
6. Voices From Outer Space
7. Vibrations in Outer Space
8. Cosmic Breath
9. Space Spirals
10. Atmospheric Reactions (Three Sections)
    (a) Slow, rising cosmic excitement
    (b) Woodwinds in lyrical interlude
    (c) Electronic finish with woodwinds

FOLKWAYS RECORDS FTS 33441 STEREO
TRACT
BY ILHAN MIMAROGLU
Singing and Speaking Voice of TULY SAND
A Portrait of the Artist
The Circumstances
Program Music—with a Difference
In Other Words

FOLKWAYS RECORDS FTS 33442 STEREO
THE DARTMOUTH DIGITAL SYNTHESIZER

SIDE 1
- Georganna's Farewell
- Bilder (Images)

SIDE 2
- Emergence
- Tapestry

FOLKWAYS RECORDS FTS 33443
LARS-GUNNAR BODIN
FOR JON
(FRAGMENTS OF A TIME TO COME) 1977

SIDE 1
1. Introduction
2. Something.....
3. Interlude I
4. Soon she would.....
5. Interlude II
6. The room was described
7. Nothing but....
8. The feeling

SIDE 2
1. On he rushed
2. Antifonia, soprano solo I
3. Testimonies
4. Interlude III
5. Soprano solo 2
6. Manual for interdimensional travel
7. Finale

FOLKWAYS RECORDS FTS 33445 STEREO
JON APPLETON
MUSIC FOR SYNCLAVIER AND OTHER DIGITAL SYSTEMS

SIDE 1
- In Deserto
- Syntrophia

SIDE 2
- The Sydsing Camklang
- Zoetrope
- Mussems Sang

FOLKWAYS RECORDS FTS 33450 STEREO
McLEAN:
ELECTRO-SYMPHONIC LANDSCAPES

SIDE 1
PRISCILLA McLEAN

Invisible Chariots
- I Voices of the Invisible
- II Archangels
- III Chariots

SIDE 2
BARTON McLEAN
Song of the Nahuati

OTHER ELECTRONIC CLASSICAL RECORDS BY FOLKWAYS

FOLKWAYS RECORDS FTQ 33951
TO KILL A SUNRISE
BY ILHAN MIMAROGLU

SIDE 1
- To Kill A Sunrise

SIDE 2
- La Ruche

FOLKWAYS RECORDS FTS 33451
GATEWAY
SUMMER SOUND
Abstracted
Animal & Other Sounds
Composed by Ann McMillan

Side 1
- Amber '75
- Syrinx
- Episode

SIDE 2
- Gateway Summer Sound
- Gong Song

DAVID COPE

He has been editor of The Composer magazine for eight years, and his writings on new music have been prolific. His four major books on new music are now considered by many to be required reading for courses on the subject. His New Directions in Music had eight printings before appearing in a second edition in 1976. His most recent book, New Music Composition (commissioned and published by MacMillan), contains over three hundred musical examples, all composed for the book by its author. His eleven articles have been published (some more than once) by leading music periodicals including Music Journal and Instrumentalist as well as electronic journals such as db: The Sound Engineering Magazine. His noted interviews with Pierre Boulez and I. A. MacKenzie have become standard reading in new music. As well, he has contributed to other books such as his article in Elliott Schwartz's Electronic Music: A Listener's Guide.

Professor Cope is currently Resident Composer at Miami University of Ohio in Oxford, where he also organized and performs with the Ensemble for New Music (which has performed in Kennedy Center and Carnegie Hall), and directs the electronic music studio. He also founded and directs the university's annual New Music Festival, which has included as guest composers Karel Husa, Aaron Copland, Donald Erb, and John Cage.

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