Chroma

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In This Issue

ACMA AGM

The 1991 ACMA Annual General Meeting was held on 10 May in the Heinze Room at the Faculty of Music, University of Melbourne. Elections were held for all office bearing positions and the 1991 commitee sees some new new blood mixed with some more familiar faces. Graeme Gerrard was re-elected President for the second year running and Anne Shirley-Peel stayed on as Treasurer. Warren Burt took over the Vice-Presidency from Jim Sosnin and Michael Hewes was elected Secretary in place of David Hirst. David and Jim regrettably declined to accept nomination for re-election due to other commitments, and all present thanked them for their contribution in 1990.

Concerts

ACMA held two concert this year, on 10 October and 21 November at the Elm St Hall in North Melbourne. There were twelve pieces presented at the first concert, six were tape pieces, with the other six involving some live performance. The program was as follows:

Greg Schiemer - *Spectral Variations*
UFO - electronic oscillator swung on a string, triggering (via PZM mike) Greg's HC-11 based processor to generate MIDI data for a Yamaha FB-01 sound module.
Linda Ceff - *Persephone*
A tape piece that made extensive use of piano sounds processed with Sound Designer on a Macintosh.
Warren Burt - *Excerpts from Twenty Four Chorales for Chris Mann*
Live computer control of S900 sampler and E-mu Proteus presets.
Michael Hewes - *Merge with Panic*
A short, punchy tape piece using environmental noises processed with Sound Designer on a Macintosh.
David Hirst and Thomas Stainsby - *Spray*
Computer controlled synths. Two Macs running a program written in HMSL by David. An improvised duet.
Anne Shirley-Peel - *For the Innovent Victims of Chernobyl*
Tape piece of synthesized sounds. See Anne's article in this issue of Chroma.
Stephen Adam - *Morphogenesis - non sequitur*
Lavish tape piece using synthetic and real sounds. Made exciting use of 4 channel spatial manipulation.
OHM (Fiona Allen, Jim Franklin, Anthony Hood, Julian Knowles, Caroline Szeto) - *Raising Dust*
Live keyboard and MIDI wind controlled samplers.
Cindy John - *Let's Go-Go On*
Tape piece using an elaborate sound palette including vocal samples and recorded percussion.
Graeme Gerrard - *Think Out Loud*
Tape and computer controlled sampler. Processed environmental sounds using 4 small speakers swung on ropes around the audience.
David Chesworth - *Composition #5 for Silicon Valley Installation*
Tape piece employing sophisticated samples exploring a pop-art genre.
Chris Knowles - *Improvisation*
Chris on keyboards and pedals with samplers and Mac running MAX.

It was an important concert that exposed the richness of work being done, both in the studio and live electronic music performance. The audience was very relaxed, mostly seated or lying on cushions, and there was much enthusiastic

discussion of the various pieces afterwards (and on into the wee hours, for some).

The second concert saw more tape pieces:

Csaba Szamosy - ***Four Pieces***
Included graphics on the Amiga.

Newton Armstrong - ***Yoa Yua-Din***
Tape piece using Proteus 2 percussion samples and effects.

Kimmo Vennonen - ***Reality Intrudes***
Textural tape piece using aberrant EPS samples.

Adam Wolter - ***Untitled***
Refreshingly low tech tape piece.

Rodney Berry - ***Plastic Men Are Coming***
Used Middle Eastern folk music samples over a relentless beat.

Amelia Barden, Graeme Gerrard, Michael Hewes, David Hirst, Neil McLachlan, Jim Sosnin. - ***Sextet for Oboe, Gongs, Computers and Mixer***
Amelia - Oboe, Graeme & Neil - Javanese gongs, David & Jim - computers, Michael - mixing and controls.
Oboe and gongs were processed live by two Macintosh computers, with Sound Accelerator DSP boards, running software which is the result of a joint project of Graeme, David, Jim and Michael. An interesting variety of processes including FM, ring modulation and pitch shifting.

Edite Vidins - ***a, b, c, d***
Four tape miniatures.

Stephen Adam - ***e.E.e.(Bundoora mix '91)***
Tape piece of edited and processed sound files made with Sound Designer.

Warren Burt - ***A Postmodern Object-Oriented Chaotic Cellular Microtonal Teledildonic Virtual Simulacra (Buzzwords for sampled orchestra)***
Computer controlled E-mu Proteus. Warren's weird jazz.

In 1992 we plan to do three ACMA concerts. Tentative dates are:

26 March - Elm St Hall, North Melbourne
2 - 7 July - Melba Hall (as part of the Australian Composers Conference)
8 October - Elm St Hall, North Melbourne

We need tape pieces and proposals for live performances. We can supply a 4 channel sound system, including mixing desk, and various tape playback machines. We're particularly interested in pieces/performances from people outside of Victoria. It would be great if we could also do some ACMA concerts in other States in '92.

Papers are also invited from members so we can put forward proposals for the Australian Composers Conference in July, and also for the Third International Symposium on Electronic Art, to be held in Sydney in November.

Contact Graeme Gerrard on (03) 344 4127 BH, or Michael Hewes (03) 344 7457 BH, (03) 457 6551 AH.

York from the inside...

- Anthony Hood

The Department of Music at the University of York has had a reputation for originality and excellence since its founding by the amazing Wilfrid Mellers in the mid-1960's. Particularly in it's early days it attracted the best young musicians from Britain and beyond, including notable Australians Martin Wesley-Smith and Anne Boyd.

The innovative spirit has been maintained by the university's Music Technology group, responsible for the development of the Composers Desktop Project (CDP) system, and the establishment of one of the first post-graduate programs in music technology. The reputation of those at the music department at York for doing things a little differently aroused my interest when I was looking for an institution in which to pursue post-graduate study overseas, but ultimately it was the friendliness and enthusiasm of Richard Orton, David Malham, Trevor Wishart and others that drew me to the north of England back in 1989...

IRCAM on your desk

In the August '89 edition of *Chroma*, Warren Burt said that "the most impressive development I saw anywhere on my travels...was the work of the *Composers Desktop Project*". Early in 1987, a group of composers, software and hardware designers came together with the idea of developing a low-cost desktop system offering the same music synthesis, editing and composition utilities that had previously been the domain of those with access to large institutions such as IRCAM or Stanford. The AtariST was chosen over other machines due to its affordability and its built-in MIDI capability (although there is talk of moving to Macs and then perhaps to NeXT machines). After four years, the range of CDP software running on the Atari is impressive, and the project can boast a membership numbering in the hundreds throughout 15 countries.

The hardware configuration of the CDP workstation comprises an AtariST with at least 1 Mbyte RAM, a SCSI hard disk drive and interface, a PCM digital converter or DAT machine, and the York-designed *SoundSTreamer* interface, which is responsible for sending out a chunk of data to the DAC while reading in the next chunk from the hard disk (and vice versa). An 80 Mbyte hard disk will store about 9 minutes of stereo sound at 44.1kHz and is probably the minimum size for most compositional work. With the plummeting cost of drives, getting something much larger is quite feasible for most - one can find 200Mbyte SCSI drives now for only $1300 or so.

Using a DAT machine's DAC has the obvious advantage of allowing long-term direct digital storage on tape. The DAT recorder must have an AES/EBU interface, which rules out some of the cheaper machines.

CDP software

The package most central to the CDP system is the *Groucho* editing suite (its name derived in a roundabout way from CARL "Marx"). *Groucho* offers soundfile manipulation utilities for splicing, mixing, looping, filtering and so on, operated from within the CDP desktop (see figure 1), or from a commandline environment. The latter form of interaction allows the batching of large processes to leave running overnight.

At one level, the CDP can be used as a huge non-realtime digital sampler, manipulating sounds just through the Groucho package. But the CDP's real strength lies in its direct synthesis capabilities. Several of the most powerful synthesis programs developed over the past years have been implemented on the system, offering the composer a diverse range of approaches and techniques.

The music composition languages *CMusic* and *CSound* were implemented early in the CDP's development, the two programs similar in concept but with CSound perhaps a little more sophisticated and user-friendly. Within both languages, various unit generators, filters and resonators are linked together, the output of one functioning as the input or the control signal for another. Very complex waveforms can be generated by only a few lines of code, through additive or subtractive synthesis, through distortion techniques such as waveshaping or FM, or through a combination of these. Inputs can be taken directly from a soundfile, so it becomes easy to use a sampled human voice as an FM carrier, for example. Granular synthesis is one technique which certainly warrants further exploration. Specialised routines have been added to CSound so that a large number of very short sonic "grains" (length in the order of milliseconds) can be copied many times with the composer controlling density, amplitude and frequency spread. There have been a number of successful pieces produced at York over the past year which exploit this very powerful form of synthesis.

A FOF unit generator ("fonction d'onde formantique", or in English "Formant Wave Function"), the synthesis method employed in the *CHANT* program (CMJ, vol.8 no.3), has been written by Michael Clarke of Huddersfield Polytechnic. Designed primarily for imitating the human singing voice (which it does extremely convincingly), the program is also powerful in producing other real and non-real timbres - sounds that seem organic and quite removed from the medium used to generate them.

The *Phase Vocoder* was ported from the CARL software written at San Diego, with additional routines implemented by Trevor Wishart based on his work at IRCAM. The Phase Vocoder analyses an input soundfile using a Fast Fourier transform, describing a sound as a series of amplitude values for discrete frequency bands. These are updated over a series of overlapping time-windows of length in the order of milliseconds. The "analysis file" created can be manipulated in a number of ways, and the transformed sound then reconstituted. For example, a sound can be time-stretched while maintaining its pitch and timbral characteristics, or can be transposed, keeping the same formant structure. An harmonic spectrum can be stretched or compressed, turning a singing voice into a bell, or the timbral characteristics of a speaking voice can be imposed on a piano tone. One sound can be interpolated gradually into another - in Wishart's *Vox 5*, the laughing of a woman evolves into

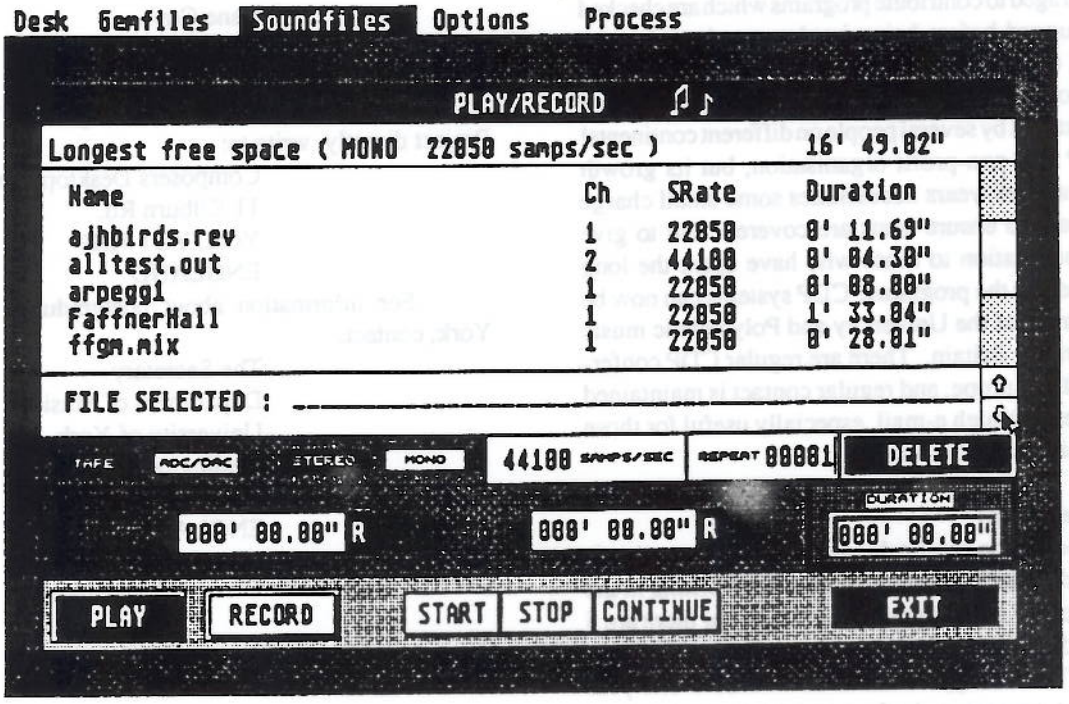

Fig. 1

the neighing of a horse! Obviously any type of filter algorithm will be very slow, and when using the current CDP implementation of the Phase Vocoder one can wait several hours for a particular transformation, but the results can be very impressive and well worth the wait.

MidiGrid

One other CDP program worth mentioning is Andy Hunt's *MidiGrid*, an innovative piece of software that has now been released commercially. The user creates MIDI "events", perhaps a series of notes, chords or controller information, and positions them in a grid on the screen. Each event can then be triggered by the mouse or by an external MIDI instrument. *MidiGrid* moves away from the idea of the MIDI sequencer as some type of "tape recorder", acting more as an interactive compositional and performance instrument. *MidiGrid*'s applications have proved to be wider than when originally conceived - for example, as the size of the grid and mouse is user-definable, it has proved a useful tool for those with limited movement due to physical disability. One interesting experiment is Richard Orton's *CrossOver*, a work for two Ataris both running *MidiGrid*. The piece is partly self-generating, with each system triggered by the other, and with global control imposed by the composer and two performers. Fractal-like musical structures are induced, with simple motivic germs generating unpredictably a whole range of self-similar patterns, growing into an increasingly chaotic system before eventually petering out (although in some performances a stray note or two might unexpectedly sound a minute or so after the apparent end of the piece!).

Software development for the CDP is an ongoing process. It is a co-operative project, and members are encouraged to contribute programs which are checked and de-bugged before being implemented on the systems and distributed to other members. It is also not unusual for a piece of software to be developed through different stages by several people on different continents! The CDP is a non-profit organisation, but its growth over the last few years necessitates some small charge for software to ensure costs are covered, and to give some remuneration to those who have spent the long nights creating the programs. CDP systems can now be found in most of the University and Polytechnic music departments in Britain. There are regular CDP conferences held in Europe, and regular contact is maintained by members through e-mail, especially useful for those of us at this end of the world!

Mustechies et al.

One reason for the dynamism of music technology at York is the sheer number of those working in the area, especially as post-graduates. This year there are 5 DPhil candidates, and 34 others enroled in the MA/MSc in Music Technology. This is an intensive one-year degree that comprises both course work and a final project in either engineering or music. Included in the "taught" component are topics as diverse as psychoacoustics, signal processing, educational applications of technology and Artificial Intelligence, with students becoming fluent in C, Prolog and Assembler during the year. The makeup of the "mustechies" (as they affectionately are known) reflect the ethos of the music technology group at York - to bring musicians and engineers together. It is also notable that several of the group are from outside Britain and a large proportion are women - electroacoustic music is not just a male pursuit.

In a limited space it is not possible to give more than an outline of some of the areas of interest at York. There are many other research projects in progress, including the development of object-oriented music composition languages, the musical applications of Artificial Intelligence and Alternate Realities, and the MIDAS DSP project (which will have everything running in real time within two years). I have a particular interest in the Ambisonic surround sound system, and a separate discussion of this will feature in a later edition of *Chroma*.

It is almost incongruous that York, a smallish city so full of history and tradition, be home to a group which is playing such an important role in the development of an art form with as brief a history as electroacoustic music. Those who visit York are immediately struck by the sense of excitement about the place and the enthusiasm and dynamism of those in the music technology group. I have certainly found my time spent there inspirational.

I now have my own CDP system up and running, and am happy to show it to anyone interested. I can be contacted through:

Department of Music
Saint Ignatius' College
Riverview,
Lane Cove,
NSW 2066
ph (02) 882 8289

To contact the Composers Desktop Project directly, write to:

Composers Desktop Project
11 Kilburn Rd.
York, YO1 4DF
ENGLAND

For information about postgraduate study at York, contact:

The Secretary
Department of Music
University of York
Heslington,
York, YO1 5DD
ENGLAND

Hidden Message Encoded in Musical Ground Bass

- Anne Shirley-Peel

At the inaugural ACMA Concert, held on 10th October, 1991 my piece *For the Innocent Victims of Chernobyl* was played. In this article I want to expose the background thinking which is built into the piece.

I was moved to create a work about the nuclear explosion that occurred in the No. 4 reactor in Chernobyl on 26 April 1986, because we are still hearing of the repercussions on the people, particularly the children and the environment today. When it exploded the reactor released 90 times more radiation into the sky than the bomb that was dropped on Hiroshima and the people were exposed to these high levels of radiation, unaware of the danger, except for those who were working at the reactor. When the Chernobyl reactor was opened there were basic deficiencies in its design and operating procedures. The secrecy and lies upon which the Government system was based allowed such an accident to happen along with its far reaching consequences.

The Piece

The wind blows over the Ukrainian heartland bringing the sound of the distant bells of Kiev. But the heartland is distressed, a message is pulsed out in morse code "CHERNOBYL HAS EXPLODED". The ground bass expresses the theme and the radiation fallout, expressed in the high register, begins to shower down on the *Innocent Victims of Chernobyl.*

All the material, with the exception of the USSR National Anthem, is derived from the ground bass. The rhythm of the morse code message is used in augmentation in the ground bass, creating a 100 beat theme of interchanging duple and triple pulses. The pitch of the theme was derived from the message by using the letter-names which already have corresponding pitches, as well as allocating pitches to the letters which do not. These decisions were made using purely musical criteria, as outlined below.

CHERNOBYL - The theme begins on the note C, followed by the letter H, the pitch for which I drew on the already existing German tradition of Bach, Schumann and also adopted by the Soviet composer, Shostakovich, which gives the pitch of B natural to the letter H; forming a falling semitone C-B or a rising major 7th. I chose the interval in the form of the falling semitone. The following letter E formed the interval of a falling perfect 5th or a rising perfect 4th. I chose to use the falling perfect 5th B-E. The following letter R, was given E-flat in order to keep the pattern of the falling semitones C-B and E-E flat separated by a falling perfect 5th. The letter N was intuitively given G-flat, followed by the letter 0, the two letters being consecutive in the alphabet, O was logically given the note F, forming a further falling semitone G-flat - F. The letter n in German traditionally represents B-flat thus forming another falling perfect 5th B-flat - F. In order to complete the sequence I then gave the letter Y the pitch of A; thus forming the sequence [C-B, E-E-flat] [G-flat - F, B-flat - A]. The second 4-note cell is a transposition up an Augmented 4th of the first 4-note cell. The final letter L was given a further semitone drop to A-flat. Refer to fig. 1.

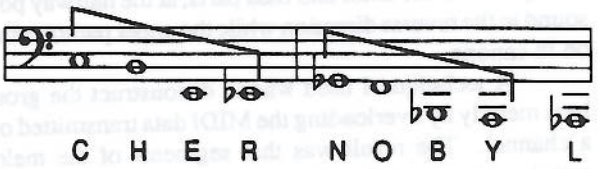

Fig. 1

The pattern of the two falling semitones separated by the falling perfect 5th evoked my feelings of sadness for the people of Chernobyl. The first 4-note cell was then reordered to [E-E flat - C-H] in the tenor region which creates the falling semitones separated by a falling minor 3rd; an allusion to the signature motif of Dimitri Shostakovich [D - E-flat C-B].

HAS - formed the three-note cell [B A E-flat] in keeping with the German tradition of S representing E-flat.

EXPLODED - In order to keep the falling semitone pattern, I gave "X" the pitch E-flat forming E - E-flat; "P" the pitch of E natural in keeping with the sequence established in the word CHERNOBYL. The sequence is derived from the pattern "L" = A-flat; "M" = G; "N" = G-flat; "O" = F, it follows then that "P" = E. I kept "L" consistent with A flat, and "O" consistent with F and "D" "E" "D" as sounded. The 4th, 5th and 6th letters outline a descending diminished chord A-flat, F, D which is made up of two falling minor 3rds. This is shown in fig. 2. The first tetrachord of 16 beats is derived from the CHER of fig. 1.

I was surprised to note that what seemed an intuitive choice for the pitch of letters N and L formed a logical pattern of one semitone per letter as shown in fig. 3.

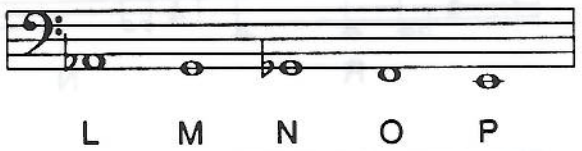

Fig. 3

These recurring patterns are indicative of the underlying repetitiveness of the daily lives of the people, which were shattered by the reality of the explosion and in the piece creates an interesting tension between the expressed idea and the means of expression.

At this point you may be thinking why did three letters R, S & X each share the pitch of E-Flat? Why not give a different pitch to each letter in order to distinguish between the letters? I felt that the uniqueness of the letters would be distinguished by the rhythm of the morse code for those letters. Thus "R" has . - . ; "S" has ... ; and X has -..- ; "E" & "P' share the same pitch of E natural but are distinguished by the rhythms as follows; E has . , P has .-.

I noticed that the morse code rhythm for some letters formed rhythmic palindromes (they sound the same, whether they are heard forwards or backwards e.g. X has -..- and P has .-.). I decided to reflect this palindrome in the overall

form. I created a palindrome in the ground bass which is gradually deconstructed. I have often admired the work of Josquin, for example in his *Missa L'homme Arme*, where in the *Agnus Dei* the tenor and bass parts, at the halfway point, sound in the reverse direction while the upper parts continue on in canons.

A technique I used was to deconstruct the ground bass melody by overloading the MIDI data transmitted over a channel. The result was that segments of the melody remained intact whilst others were obliterated.

The duration of *For the Innocent Victims of Chernobyl* is ten minutes with the deconstruction and the mirror image starting at the five minute mark. The length of the theme is 1'40" which means that six playings create the 10 minute work. We hear the first three playings then the mirror image starts and gradually becomes deconstructed, representing the intervention of the radioactive fallout.

The contrapuntal variations were derived from different rates of rhythmic diminution (compression) of the theme, as well as the inverted, retrograde and inverted retrograde forms, transpositions, and timbral changes of the theme. Tiny canons were formed in the upper parts in inversion and double the speed becoming more and more threatening. At four times the speed, the inversion, retrograde and retrograde inversion were strung together to create transparent counterpoint. The ethereal sounding counterpoint and the extremely high tessitura were created through transposition of the ground bass up 6.5 octaves. The wide polarities between treble and bass create, for me, a sense of space. These were then further treated by increasing the speed to ten times the original, providing the sounds for the radioactive fallout. An interesting sound was found through expansion of a high speed passage to create arpeggiated chords which interrupt the melodic flow. The harmony is a result of the combination of the melodic lines and their variations.

The timbre of the ground bass was chosen for its strong, sombre quality which combined the sound of bells on the attack of each note, somewhat reminiscent of the great bells of Kiev, an allusion to Mussorgsky's *Pictures at an Exhibition*. The bells and the ground pulse out the message of danger and imminent destruction. Tubular bells were used as one of the timbral changes, producing a metallic sound in the high speed passages.

The deployment of the USSR National Anthem was to portray the people, unaware of the high levels of radiation fallout in the air showering down on them, as they proudly marched through the streets of Chernobyl on May Day 1986, five days after the explosion.

In the second half of the piece both the ground bass and the national anthem become mutated by the radiation theme in the high register and gradually become totally

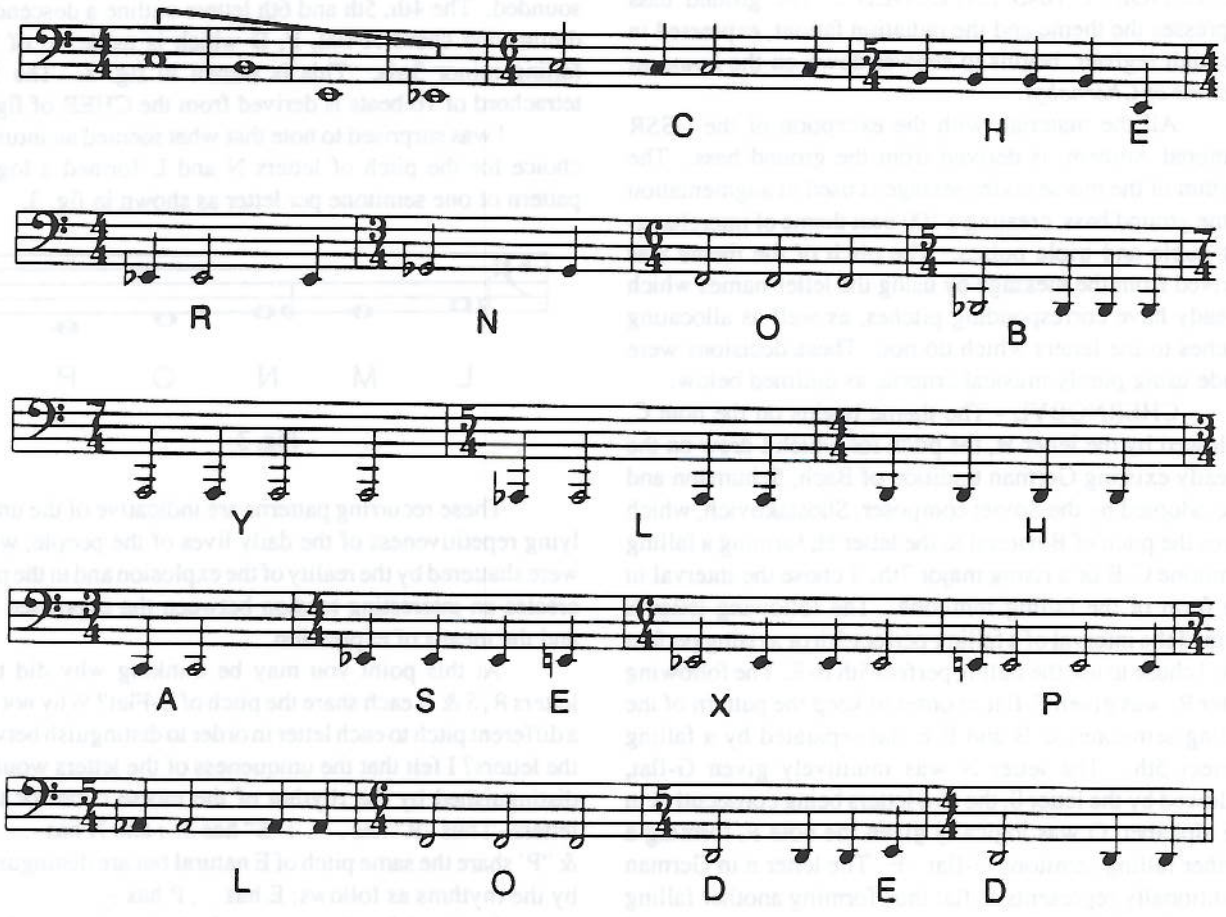

Fig. 2

deconstructed. The radiation prevails and leaves nothing but the insects and the wind sighing across the destroyed land. The opening four notes of the piece are heard in their original form at the end of the work, indicating that the earth, Gaia still continues on.

MIDI technology was used to create and explore the new sounds available in the Roland MT-32 multi-timbral sound module, which was linked to the Yamaha Clavinova CLP-550. Control and manipulation was achieved using Dr T's Keyboard Controlled Sequencer version 3.5 Level II, running on an Amiga platform. This is a large and complex program with separate units for editing and mixing. I am still exploring the ways in which this technology can be used in the service of my compositional style. I have found that by limiting the source material and exploring all the different transformations that the sequencer offers has given me a sense of freedom. The interaction between the treated sounds created new paths from which new sound images emerged.

Chroma is edited by Graeme Gerrard. (Thanks to Michael Hewes and also to Thomas Grubb).

Report and Commentary: The 1991 ICMC Conference

- Jeff Pressing

Set in the altogether charming Canadian city of Montreal and ably hosted by the McGill University Faculty of Music, the 1991 International Computer Music Conference (ICMC) proved a well-organised and stimulating event that successfully combined artistic controversy, cutting edge product demonstrations, and serious discussions of the potentials of the music/machine/human interface. The sheer pace of a typical day, which began at 8.30 am and finished at 12.30am, and alternated between communal offerings (special events and four concerts per day) and concurrent sessions (typically 4 or 5 independent sessions and demonstrations running in parallel) made the risk of burn-out appreciable, however. It did have the advantage of giving all credible (and some not so credible) intellectual and sonic ideas an airing.

In what follows, therefore, my descriptions are inevitably limited to events with which I had direct or dependably vicarious contact, and they reflect the biases of my interests. I hope they may nevertheless prove of some value to those who have different priorities.

The conference's first day was given over to registration and tutorials on various subjects, designed to inform the non-specialist: MIDI, Sound Synthesis, CD/DAT/DSP, History of Computer Music, and Standard Musical Graphic Language. In the evening, Julius O. Smith III gave the keynote address, in which he quickly surveyed the many approaches to computer music synthesis. These were grouped into four main categories: processed recording, spectral mode, physical model, and abstract algorithm. He also made some comments about the relative advantages of DSP boards and RISC processors, a schism facing the microcomputer music industry with important implications. He was of the view that the use of the faster RISC processors is not without some drawbacks and that the utility of DSPs is still very considerable. He also mentioned waveguide synthesis, based on physical modelling, that has a good chance of making a significant commercial impact via a new wave of synthesizer design.

Perry Cook, as I had a chance to see later in visiting Stanford, has some very impressive programs for the NeXT environment that physically model the voice, brass and wind instruments. These are based on the real-time solution of differential wave equations that exactly describe resonators which are close physical analogs of traditional instruments. On-screen real-time graphical control of lip and tongue positions, lip pressure, resonance spaces in the head, etc., make this an exciting option for those with a faith in the power of natural sounds and their extension beyond the possibilities that humans can execute.

On the second day things got seriously under way. Papers were grouped into the following rough headings:

Sound Synthesis Systems
Composition Systems

Analysis of Musical Structure
Audio Analysis
Aesthetics, Philosophy and Criticism
Educational Issues
Perception, Cognition, and Psychophysics
Interactive Performance Systems
Composition Theory
Sound Representation
MIDI Applications
Studio Reports
History and Archiving

Concerts also began, four per day (11.00 am, 5.00 pm, 8.30 pm, 11.30 pm). Most people thought there were too many concerts, and the quality, as usual, was distinctly variable—though there were some high points. A number of people felt that pure tape pieces should not be put on in such concerts—that live performers should always be involved, whether playing alone, with computer interaction, or with computer-generated tape. Certainly attention to the performer and the possibilities which may be found in instrumental virtuosity were critical concerns for many pieces. Macintosh and NeXT computers were used exclusively for live performance, as far as I could tell. But more on concerts later.

One noticeable trend was the continuation of the development of the integrated workstation. This was visible in the incorporation of DSP synthesis functions into MIDI based control languages, and in new environments on the NeXT, Macintosh, DEC workstation and Silicon Graphics (Iris Indigo) machines. MAX was very popular, featuring widely in concerts, and it now has some impressive objects written for it. Carla Scaletti's Kyma/Capybara system also has its advocates. On the Macintosh platform feature detection objects and interactive signal processing for acoustic instruments using pitch-to-MIDI converters was described by Todd Winkler of CCRMA (Stanford).

Jean Piché demonstrated and gave out sample copies of MAXGEN (that bomb after 15 minutes, as commercial application is intended), that allows multi-control point graphic curves to be drawn, scaled, inverted etc. and used to affect any other process in the MAX environment. Bruce Pennycook (the sleepless conference head) showed T-MAX, a parallel processing development system for MAX which allows the spawning of some objects as parallel processes that operate remotely on an arbitrary number of INMOS Transputers. David Wessel of CNMAT (UC Berkeley) described their multimedia and DSP objects which have now largely become standard issue from Opcode. Particularly impressive was the version of MAX written for the NeXT IRCAM workstation marketed by ARIEL. This upgraded version, which comes bundled with the IRCAM hardware, was written by the original author Miller Puckette—a very fine mathematician—and now has a complete range of DSP operations paralleling all the familiar MAX operations, but operating in the audio signal range, distinguished from control type MIDI objects by a ~ at the end of their names. This allows the effortless construction of filters and other standard computer audio processing elements. This version of MAX is rather different from the Macintosh version in other ways.

I also spoke to Keith Hamel, author of *Notewriter*, who is to put out a new notation/MIDI/automatic part production and sizing package for the NeXT. If this package delivers as it seems likely to do, given Keith's excellent programming record, this could make the NeXT a very desirable music platform indeed. The heavy adoption of NeXT machines by Stanford, CNMAT, IRCAM, Princeton (notably Paul Lansky's group), McGill, and other centres, promises a critical role for this machine in computer music research. Just becoming established for music work, but with greater speed and graphic power is the new Silicon Graphics Iris Indigo machine which comes in at about the same price and has large amounts of RAM, direct video and digital outputs, and scads of other handy features for multimedia applications. Real-time signal analysis programs of unparalleled display power come as demos with this machine.

The other notation environment that I found exciting was *Acousmographe*, by Olivier Koechlin and Hugues Vinet of INA/GRM in Paris, for the Macintosh. This program, due to be released imminently, allows the importation of sound files from standard formats and their sonogram and FFT display, with extensive editing features. It also provides full colour paint and drawing tools, so that a colour graphic score can be created from the frequency domain plot very readily, and readily printed out. Those who have had occasion to create graphic scores for tape plus performer pieces will save days of work with this program. It was also enjoyable to see Macintoshes functioning under French language menus.

HMSL continued to have some support, as Phil Burk described the integration of real-time synthesis facilities into this language, and Larry Polansky described his own compositional work with it over the past decade.

I found the work on an Optical Music Recognition System by Ichiro Fujinaga, Bruce Pennycook, Bo Alphonse and Kharim Hogan of McGill University potentially very important. Recognition rates are now pushing 80-90% for the printed page or the neatly executed hand, and the system can learn to recognise new symbols or new calligraphic variants of existing symbols, apparently by using normalized central moment representations and a metric space of graphic symbols using extracted features as independent variables. This could eventually save much time for composers if it could ultimately reliably interface with notation programs that automatically produce parts.

C.P. Tsang of the UWA Department of Computer Science presented interesting work on the use of Constraint Logic Programming to perform computer analysis of chord sequences and autoharmonization of melodies. This seemed a well-designed system that allowed compositional flexibility.

Work at MIT's Media Laboratory had a significant profile. Barry Vercoe and several students (Daniel Ellis, Tom Maglione) presented impressive and fundamental work in progress on Auditory Separation and Scene Analysis (Bregman's 1990 MIT Press book is apparently excellent), and perceptually-based audio data reduction. Todd Machover and his confederates presented his "hyperinstruments show", via talks on the details of capacitance-based monitoring of

cello performance by Yo-Yo Ma, and two pieces at a featured opening concert. Machover's *Bug-Mudra*, a multimetric rock-style piece for KAT controller, electric and acoustic guitars, and hyperinstrument bank, was intense and relentless and well-played, although the EXOS Dexterous Hand Master data glove, designed to provide extra real-time dynamic shaping, worn by Machover in conducting, failed to work on this occasion. *Begin Again Again* was performed by Machover on cello and accessed over 100 MEG of live RAM samples via 4 Mac IIfxs and eight Sample Cell modules. These pieces were well-received but also resulted in some boos. How nice for art to matter! The criticism behind the boos may have been based on the offensiveness of the publicity engine surrounding this enterprise, and the very high technological overhead for limited benefit, bordering on inelegance of application. Despite this, I found these two of Machover's best pieces.

Audification (or Sonification) of data was a provoking issue in a few sessions. The idea here is to see what the auditory representation of (usually multi-dimensional) data may make possible. Visualization of complex data sets, be they celestial, meteorological, or musical is difficult when the dimensions get to four or more. The idea is that some dimensions—or all—might be mapped onto music variables, like tempo, pitch, attack, timbre, changes in a repeating motive, etc. to aid understanding. The usefulness of this is subject to some debate but it behooves computer musicians to consider its potentials carefully.

One panel discussion was based on the question of whether compositional algorithms and computer environments were really very successful, and what future directions they should take. Here these was plenty of heated discussion from the panel and the audience, ranging from those who doubted that computers had contributed very much at all to music, to those who felt that learning to program was more relevant for musicians than ear-training. I didn't take notes for this session and regrettably can't be more specific.

A number of theoretical frameworks guided the pragmatics of computer and music design. Neural networks made only a small contribution to the conference but there was still strong interest in intelligent music and learning systems. An important talk on connectionism and musiconomy by Gareth Loy examined the issues in formal specification of music, reviewing problems such as the encoding of chorale harmonization and species counterpoint and what they have revealed about the more general application of AI techniques to music. Interactivity featured in the concerts and in the work of several centres, such as CNMAT. Several talks took as their domain temporal problems, such as Peter Desain and Henkjan Honing's 'Generalized Time Functions', and my own 'Some Applications of Time Theory to Computer Music Design'. Self-similarity acted again as a popular touchstone for composition, sound synthesis, and theory, often in the explicit form of fractals or cellular automata.

Concert Music

The music of the concerts showed certain clear trends, often geographic. French composers, whether from France or French Canada, used a different more abstract sound world than most others, with fewer MIDI sources, and often utilized 'diffusion' (motion of sound between multiple speakers).

The tape piece *Espace/Escape* by Francis Dhomont, a senior composer working at Université de Montréal (Jean-Jacques Nattiez, the noted semiologist, is also there) was, I felt, an exemplary flagship for this direction, showing concern for detail, maturity, depth of conception, and a progressive spirit. I also liked Gilles Gobeil's piece for tape and Ondes Martenot, *Voix Blanche*, which featured powerful sound complexes and sudden changes of dynamics, and showcased the viability of this early instrument, which has a considerable repertoire, such as Messiaen's *Turangalila-Symphony* and other works little played in Australia.

Andrew Schloss' piece *Wildlife* featured Schloss on percussion and David Jaffe on Zeta violin, in an engaging display of interpersonal and person-machine interactivity. Robert Rowe's *Banff Sketches*, which I heard only the end of, due to an unexpected change of program order, got a strong audience response. He now works at NYU (Greenwich Village) and his definitive book *Interactive Music Systems*, for MIT Press, is set to appear in June 1992, along with a CD-ROM of programs and pieces. NYU is rapidly building a very large music technology program.

David Evan Jones' *Still Life Dancing*, for percussion ensemble and tape, showed skilful percussion writing and an interesting sound world but perhaps lacked some overall direction. Keith Hamel's *Window*, an interactive work for alto saxophone and electronics showed a fine ear for chordal voicing, and achieved delicacy and an engaging sparseness. Sergio Barroso's *La Fiesta*, with the composer at the keyboard, for tape and synthesizer player, was busily impressive, with a complex organic texture. The soloist did not appear to be doing anything specifically virtuosic, however. Horaccio Vaggione's *ASH* for clarinet and tape, played by Kelly Burke, created nice crunchy sounds (surprisingly, purely from acoustic instrument sources—winds, piano, percussion.) that galloped jauntily around the room but went on a bit too long. Richard Boulanger's *Mobile Structures* was a trio between Boulanger, Max Mathews, (both on Radio Drums) and a new version of Mathews' Conductor Program. This composer-ascribed "virtual concerto" did not live up to the promise of its program notes.

Many other pieces succeeded only in part, or in my view, failed outright. But there was much I was unable to attend that seemed promising, such as Jean-Claude Risset's *Attracteurs Etranges* or the premiere of Xenakis' *GENDY301*, which respectively engaged chaos theory and stochastic mathematics. These have become standard reference point tools.

A few final comments

Overall, the conference was an exciting event, and there was an enjoyable scent of rapid development of ideas and collegial interchange. After the conference I went on a short lecture and solo concert tour that was very enjoyable. Two people told me that my research had changed their life, an idea for which I was frankly unprepared.

Economically, harder times have hit North America

as they have here. Despite this, there are new programs springing up at a number of places, varying in design from traditional studio-based computer music facilities to multi-disciplinary Art and Technology programs, such as Neil Rolnick's program at Rensslauer Polytechnic in New York. Readers who are academics may be interested to hear that funding in many institutions was the subject of restriction, including the University of California system and places such as Stanford. Despite this, we in Australia remain at a competitive disadvantage in both funding and time available for research. In the better North American universities, a full teaching load might be one 3-hour course for one semester per year. And although there the time devoted to fund raising is greater than here, perhaps we need to find a way to work together inter-institutionally in teaching programs to maximize our research opportunities.

Chris Mann

On being it:

To the extent that music changes it's mind during it's duration, it is always and necessarily the last word and tough the pragmatics of being the last word means it guarantees itself, it argues for a cosmetic coherence, it acquires definitions.
It is music in the process of becoming definitions that its cease to be music.

Listening (instead (hypocrite)) to what-would-you-have-done/thought/said/(whatever)-if (narrative explains amplification as an action (or account)):
The competence of sceptics is never greedy. It depends.

(Given that entertainment is faster than real time) Dear ACMA,
Is Computer Music hardware based? (A process without a subject?
Too smart by half?)
Time based? (Neurotic?)
Backward compatible? (Is Leibniz a composer of Computer Music?
Lull? (Is it a refuge? A situation? (What do you get?)))
Does it require a future? (Is Turing going to be a composer of Computer Music? Neumann von Neumann? Failure?)

Buy the same token: (Dear ABC,)
1. We all know a bureaucrat to be someone paid to say 'no'. We also know this to be a reasonably efficient way of avoiding mistakes. It is coincidentally a reasonably efficient way of avoiding relevance.
2. When a bureaucrat cries on your shoulder, shoot it.

Vox Moment

- Interview by Graeme Gerrard

Transcription of an interview on 14 December with Diane Palmer and Lawrence Harvey of Vox Moment, electroacoustic ensemble from Canberra.

David Boyle - composing
Lawrence Harvey - composing & computer operator
Tim Kreger - composing
Diane Palmer - keyboards
Tim Philips - percussion

How and when did the ensemble get together?
LH Around the beginning of 1990 when we just started to do live work with the Macs and other instruments as well. There were 3 composers and other performers who were interested in doing this sort of work. Up until now the ensemble has been operating under the umbrella of the Canberra Institute of the Arts and the Australian Centre for the Arts and Technology (ACAT). We did several concerts and broadcasts and we now have funding for the concert series through the Australia Council.
DP We felt it was important to become independent from the Institute for things like rehearsal space and equipment, and also a way of merging the composition and performance areas there. We applied for and received a grant from the Australia Council to present a series of concerts in Sydney, Canberra and Melbourne.

How do you work on the pieces?
LH At this stage it has been a combination of pieces that have been written by individuals and just brought in for rehearsal, and also a situation, like in my piece *Alis*, where I wrote a computer program and it was a matter of us all getting together to experiment and see what the algorithm could do. We also do a piece Pierre Boulez wrote in the '70s *Explosante Fixe* which we arranged for the ensemble. We're interested in doing open score pieces from the '60s and '70s where the instrumentation is flexible. Sometimes it is with or without electronic processing.
DP And we're interested in doing works by other composers too, written specifically for Vox Moment, not just works from composers within the group.

What are the major issues in performing electroacoustic music?
DP I think one of the main ones is an audience one. People just don't know what to expect. So often there is a comment by people that they don't know what to expect.
LH Yes, even for otherwise informed audience members. People know what to expect when they see someone sitting in front of a piano vibrating the string and getting all emotional about the string vibrating. But with new technology, probably what's necessary is to explain what is going on because it is not always obvious. The danger then is whether the whole thing turns into just a demonstration of technology - or are we having an artistic musical experi-

ence? Do you lose the mystery? It's a fine line. The only rule is that there is no rule. Even the performers learn in performance the relationship between what they do and what the algorithm does with that.

DP In a piano or violin recital people generally have a history, an expectation of behaviour, whereas with the new instruments that isn't there yet to fall back onto.

The audiences of techno rock bands don't seem to have the same kind of curiosity about the technology and the way performers interact...

LH But we perform in a concert situation. It is a real act of submission to just sit there and listen and that's something a lot of people just aren't used to.

DP Like they don't know what to do with themselves, especially people with a visual arts background. It's like that's really not enough for them to do, they can't dance or move around...

LH You sit and listen and be quiet. People don't often do that when they listen to music coming from a loudspeaker, even in their own home. If you put the stereo on you can walk around, turn it off if you want, or if the phone rings. Whereas in a concert you give yourself up to someone else's sense of time, whether the performer's or the composer's.

Do you think there is a new kind of audience being attracted to, say, Vox Moment concerts?

LH At this stage it's too early to say. Someone like OHM, who have been around a bit longer than us, might be starting to find a new audience. It's been really diverse so far. We might get computer people or people who have a passing acquaintance with a Macintosh, for example. They might get more out of it than the usual Musica Viva audience.

What about musical or technological issues?

DP I feel like it's still in a state of flux. We're still experimenting a lot to see what works and what doesn't work.

LH There's a general logistic problem. Rehearsal space in studios is very difficult. Most studios are very small; they're not intended for interactive work with instruments. Setting up in general performance spaces is a lengthy process, getting all the technology together. And if there's a software or hardware problem instrumentalists often have the attitude "Well I'm ready, what's the problem?"

In this tour, we've looked at not playing in music institutions - mainly because of economic pressures, they're so expensive nowadays. They are interested in the kinds of things that attract large audiences and ticket sales, and they are relatively expensive to hire.

DP Alternative venues, like the Botanical Gardens in Sydney, the Old Darlington School, the new Museum of Contemporary Art, where Vox Moment are doing concerts in this tour, are much more interested and receptive in this kind of music. They are really keen and enthusiastic.

LH It's part of experimenting with things. We haven't done an outside concert before so we just want to see how it works. We don't want to be confined by conventional thinking in concert presentation.

What about the technology? What kinds of things are you using?

DP You want an equipment list?

LH Well, the ensemble is Macintosh based at present. In the early stages we were using things like *M* and *Jam Factory*, but now we're writing mainly in Forth, doing our own software or using *Streamer*, which was a program developed at A.C.A.T. Tim [Kreger] has written MIDI drivers, MIDI recorders, MIDI analysis programs and so on.

The other main thing I've been working on is System Exclusive control over the Quadreverb. It's fine to use a MIDI controller for some things to give a kind of analog control feel over the parameter settings, like decreasing the size of a room using reverb. But if you want to set something like delay times exactly and instantaneously, you need a digital control.

We use this in *Shimmer* and in *Stratus* where the other performers are playing gongs and other percussion, and there's one person just doing the mixer and working the computer to control the effects processor. So you have much more of network, and more control over the micro-structure of the synthesis.

We're currently using a Yamaha TX816, Akai S900 sampler, TG77, Quadreverb, Tapco, MV 1602 mixer, DX7 and KX76 keyboards.

DP I've mainly used piano timbres so far but one of the pieces we'll be playing in Albury is a prepared piano piece that uses Pythagorean tuning. One of the things about synthesizer keyboards is that they are so noisy and the action is quite different to the piano, which I still play quite a lot. You need less arm weight of course, but there are other techniques you have to learn like playing the controllers and patch selection.

What have you got planned for the future of Vox Moment?

LH Next year we're possibly looking at expanding the ensemble, getting more instrumentalists in. The major artistic interest at the moment is to have an ensemble that's a combination of intsrumentalists and computer and digital technology.

DP We definitely aren't into having a conducted ensemble. We work in a very democratic way, with each person contributing and making musical decisions. We also want to incorporate a brass or wind player. As the equipment becomes more portable we hope that touring will become easier. There are problems with percussion though. It's more cumbersome than the electronics. Everything needs a stand!

LH Next year we'll be touring north to Lismore, Sydney, Newcastle.