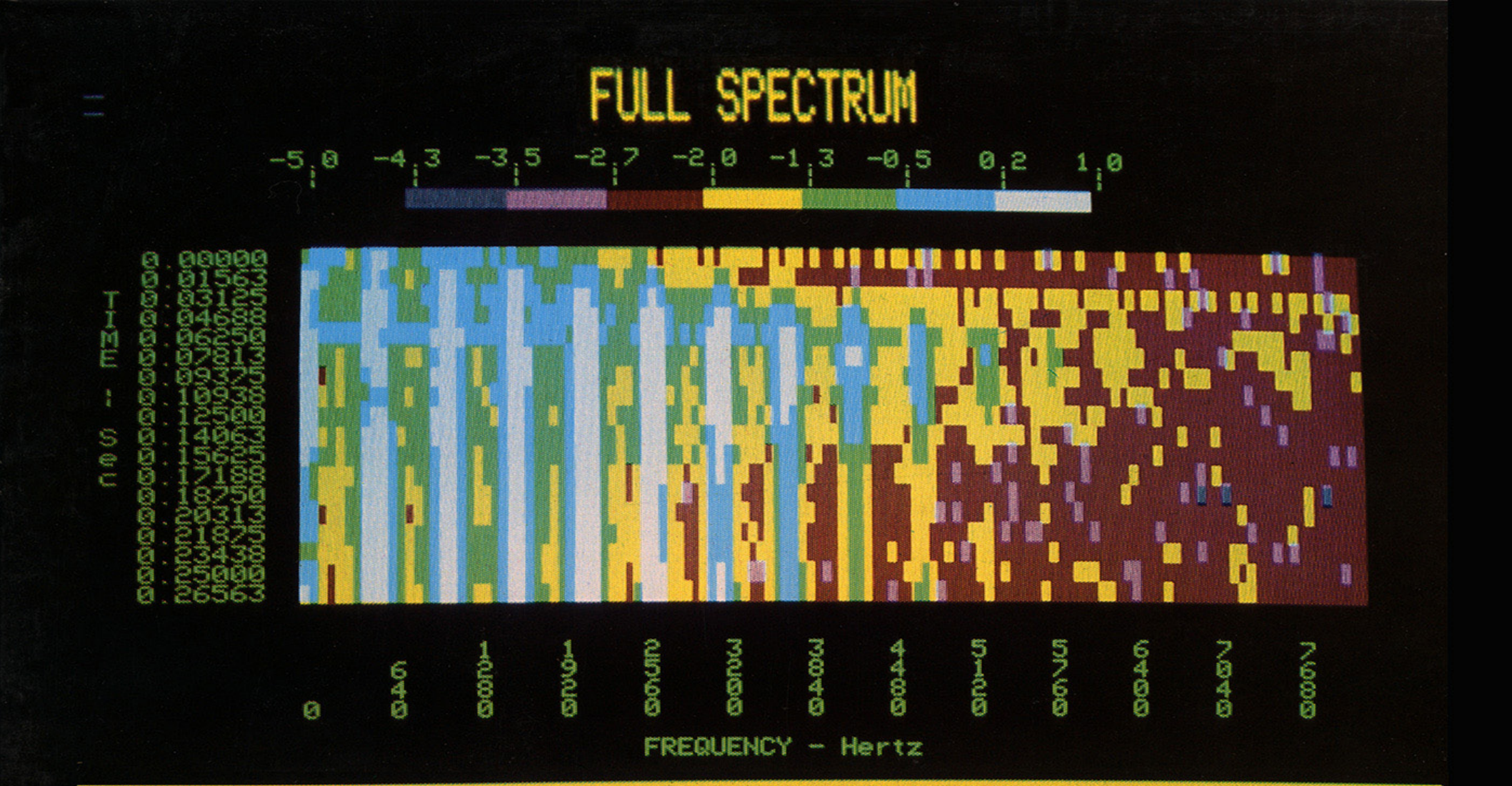

...Australian Digital Music...

Works by

Grainger Cary Burt Clynes Conyngham

All the works on this recording are produced by digital devices. The oldest piece, the link with the past, was created 33 years ago, but only realised in 1978, the other pieces were composed in the last five years. Three of the composers were born in Australia: Percy Grainger, Darius Clynes, and Barry Conyngham, but the first two spent most of their formative years in the USA, and Conyngham owes his interest in computer based music to the same country. The other two were born overseas: Tristram Cary in Britain, Warren Burt in the USA. The Grainger and the Burt compositions were realised on machines in Australia, the Clynes and Conyngham on Direct Synthesis systems in the USA, the Cary on a system in London. Such is the international character of digital music.

Percy Grainger/Barry Conyngham
FREE MUSIC I and II (1′53″)
(Sketches for an electronic piece)
Realised: 1978

Tristram Cary
TRACKS FROM DIVERTIMENTO (4′07″)
Realised: 1973

Warren Burt
STUDY FOR SYMPHONY:
AUGUST 9TH (16′00″)
Realised: 1978

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Barry Conyngham
THROUGH CLOUDS (10′45″)
Realised: 1974

Darius Clynes
I AM NOT A COMPUTER (7′48″)
Realised: 1976

The cover photograph shows a sound spectrogram of a note 'played' by a computer-synthesised trumpet. The display was generated on an *Intecolor 8001* graphics terminal by an Interdata 8/32 computer at Melbourne University, Department of Computer Science, by a programme written by Peter Lamb. Images such as this are useful in comparing the characteristics of a synthesised sound with those of a real one in a quantitative manner. The sound energy at a particular frequency and time is represented by a small colored block, the color bar across the top providing a key to convert color into a sound level in decibels. Frequency is indicated across the diagram and time is shown in seconds down the image.

Original masters of the pieces on this record were produced at the Computer Music Project, University of Melbourne, the recording studios of La Trobe and Adelaide Universities and the final master was produced at the Electronic Music Studios of the University of Melbourne in May 1978.

The following have been indispensible in the preparation of this recording: University of Melbourne — Department of Computer Science, Faculty of Music, Department of Educational Technology, and the Grainger Museum Board.

The production of this record has been assisted by the Australian Computer Society Incorporated.

Produced by Barry Conyngham
Cover photograph: Gerard Lier
Percy Grainger photographs by courtesy of the Grainger Museum Board.
Tristram Cary photograph by Dalman & Smith.
Warren Burt photograph by Roberto Laneri.

Percy Grainger, 1934

FREE MUSIC I and II
Percy Grainger (1882-1961) — Barry Conyngham

At about the age of 25, the famous Australian-born pianist and composer Percy Grainger became convinced his visionary music of the future, Free Music, was beyond the ability of human performers. Much of his work until his death in 1961 was devoted to the invention of a machine capable of playing his Free Music. Sadly for Grainger his ideas were years ahead of the technological means of realizing them. When technology did at last seem to offer hope for a solution with the development of electronically synthesized music in the 1950's, Grainger, by then an aged and disillusioned man, chose to remain in isolation, continuing to work on rather clumsy, outdated apparatuses.

What Grainger was looking for was an instrument which could play precisely notated gliding pitches, at variable amplitudes, with absolute rhythmic precision, for any number of simultaneous, independent voices. *Free Music Nos. I and II,* the only surviving sketches in Free Music style, were written about the time of his Australian tour of 1934-35. They are made on graph paper with the top half of the vertical axis marked out with pitch levels C,C sharp,D etc., and the bottom half with loudness levels p,mp,mf etc. The horizontal axis represents time measured in metronome beats. Each voice is then represented as a line on the pitch graph with a corresponding line on the amplitude graph. The illustration shows the climax of *Free Music II.*

Whether or not Percy Grainger's Free Music is worthy of a place in the history of twentieth-century music is yet to be decided. Whatever the outcome, Grainger's ideas deserved a better fate than to have had to wait so many years after their conception to be realized.

Peter Anderson

(The Free Music materials are on display at the Grainger Museum, University of Melbourne.)

REALISATION OF FREE MUSIC I AND II —

Some forty-three years after he conceived them it is now possible to realise Grainger's concept of freely gliding tones taken direct from a graphic score. The realisation of this recording was made on the Music V system running at the *Computer Music Project* at the University of Melbourne. The graph shown above, taken from reproductions of the score in the composer's own hand, were put into the machine as functions. Certain translation had to be done in the machine as the original data is not in hertz or decibels, but in Grainger's own adaption of traditional musical terms. For instance, the octave is divided into 24 divisions per octave, the amplitude into 70 divisions. Also, to attain the accuracy of the data in each voice (four in *Free Music I,* six in *Free Music II*) each one was synthesised separately, then mixed digitally before outputting the final result through a digital to analogue converter.

No attempt has been made to add colour to the sound, it is pure sine wave, as Grainger would have wished. There seems no other way to obtain the desired accuracy other than by a computer synthesis technique, however *Free Music I* has been very successfully realised by a quasi-digital method by Les Craythorn using a *Synthi 100.*

Barry Conyngham

TRACKS FROM DIVERTIMENTO
Tristram Cary

The origin of this piece was a commission from Olivetti for music to be featured at a grand party they were giving for the opening of a new training centre in Sussex, England.

After some thought I decided that the most elegant ensemble would be all kinds of machine sounds and voices (opposite ends of two scales: periodicity vs. noise, human beings vs. manufactured metalware). I also included a very free drum part to weld these two poles very lightly together (human with noise-making instruments, many of them metal). Two additional 'crossover' devices, formally speaking, were (a) to use voices as noise sources (hissing, whispering etc), (b) to transform the machine sounds into tone sources by using a frequency domain analyser/synthesiser recently developed by EMS of Putney. The Composition on this recording is the machine section of the larger piece.

I spent some days at the Olivetti factory and store with a stereo Nagra and a variety of contact and air microphones. Each take gave me two tracks in sync but with quite different ambiences, and often from very different parts of the machine. I divided my sounds into: (1) single non-repetitive events, (2) repeating sounds, identical or changing (e.g. a mechanism filling something up, or retreating from the microphone), (3) start-up sounds (switches, motors running up), (4) Switch off sounds with associated decelerations to silence.

After editing, selection and premixing of the two tracks in analog form, I treated them at EMS (Putney) on the DAOB (Digital Analyser and Oscillator Bank). This machine ran (1973) in association with a PDP8/S and PDP8/L, with Dectape and 32K disk backing stores. This was a development stage of the then new frequency domain synthesiser which at this point was a five-octave semitone filter/oscillator bank under computer control (in later versions the 64 oscillators were tunable, giving variable density possibilities). On noise sources the semitonal spacing of the comb made it of necessity a rather crude analysis, but I aimed to use this very character in this piece. Amplitude resolution was 6 bits, the analysing filters becoming, in playback, generators at the amplitudes perceived during analysis. Compared with time domain analysis by sampling, very economical bit rates were achieved.

Typically, in Divertimento, one hears the original sound followed by DAOB transformations, usually at slower speeds and longer slew rates than the original, and often shifted in pitch by several octaves — foldover resulting in interesting inversion effects. The analog tapes produced by this process were then further mixed and dubbed (for example near the middle of the piece two whole-tone scales in contrary motion are produced by mixing a DAOB version of a "run-up" track with that of a "switch-off" track, using alternate filter/oscillators and thus making whole-tone scales). Some use is also made of a digital sequencer with a standard analog VC synthesiser.

Warren Burt and Aardvarks IV, 1975

STUDY FOR SYMPHONY: AUGUST 9TH
Warren Burt

Unlike the other pieces on this record, this one was not produced by typing a series of numbers into a computer. In 1974, I realized that the computers' demand for exact specification was completely alien to my musical make up. However, I was still incredibly excited by the possibilities of digital circuitry, so I decided to build my own machine. ***Aardvarks IV*** (its name) would not need numerical input and would be controlled with potentiometers.

The main portion of this machine was a bank of 16 control voltage generators. These would provide a random circulation of certain pre-selected voltage levels. In addition, the speed of selection of these voltages, their range, dispersion and slew rate were all either manually or externally controllable.

This resulted in a logic system where the range and limits of output was determined, but not the moment to moment details. Further, by using the units to control one another, whole systems could be made that I could change the limits of according to the intuitive and empirical needs of the moment.

In this piece, the system outputs three canonically related control voltages, each with both fixed and varying elements. These control three analog oscillators, each in a different way. One produces the arpeggios that form the main bulk of the work, while the wheezing duck-like growls are provided by a second. A third provides the drone which eventually blossoms out into the arpeggios of subharmonics heard at the end.

As for what the piece is about: exhilaration. Explanation follows: In July 1977, having completed the equipment used on this piece, I sat down in my flat on a rare unbusy Saturday to play. No ideas. So two and a half hours of walk on the beach (St. Kilda to Port Melbourne) fixed things up. Felt so good I sat down and produced the piece you hear here. Just as a document I recorded it on a Sony Stereo Cassette Deck. I liked it so much it's on this record.

THROUGH CLOUDS
Barry Conyngham

This is my first digital piece, produced in 1973-4 while a Visiting Fellow at Princeton University. The main programme is Music 360 by Barry Vercoe, running on an IBM 360, the large machine in the Princeton Computer Centre. This piece is an example of direct digital synthesis: the wave shape is made from a string of numbers created in the machine, stored on disc or tape, and played out through a digital to analogue device to loud-speakers. The procedures involved in the piece were as follows:

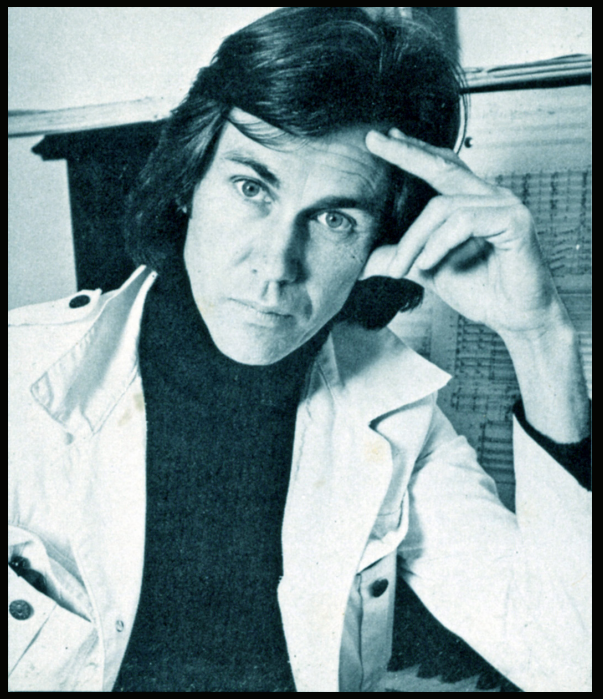
(1) To create two classes of sound, one analogous to a group of human voices, the other to the sounds made by gongs or large bells.

(2) The choral-like sounds are in fact a large number of complex tones presented very close together to form a number of beating relationships. These are presented in the first section as a kind of broken up theme.

(3) The gong-like sounds use the same set of fundamental pitches presented with percussion attacks, exponential in shape, on a set of enharmonic components.

(4) These two sound groups are projected on to each other to mutate, collide and transform the two classes via each other. Thus the choral-like sounds at the beginning, broadened in band width (pitch area) and extended in duration, help form the complex bands of sound heard at the end. The other gong-like sounds, first heard in the second section are also transformed by changing the attack shape and extending the duration form the rest of the sound in the last section.

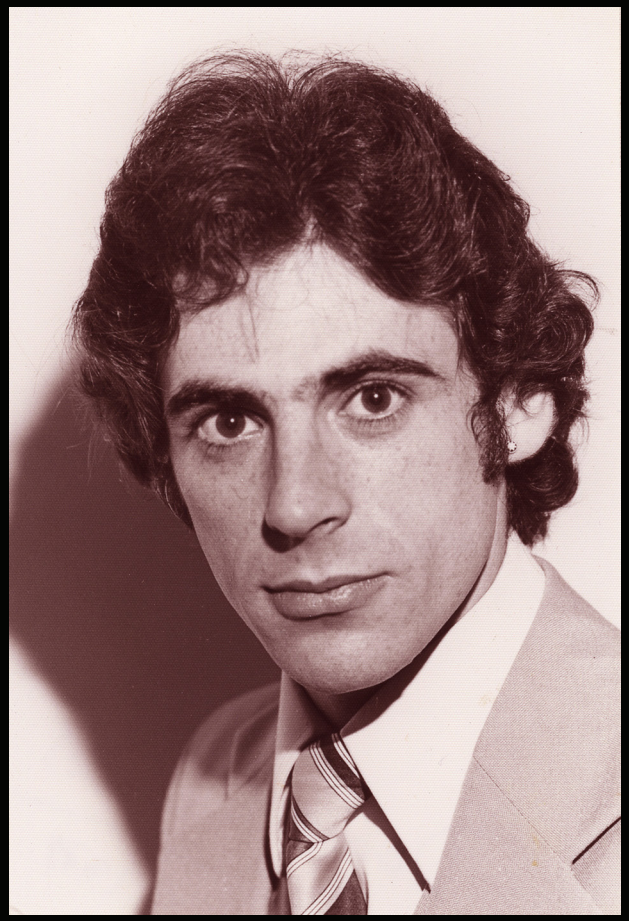
(5) The 'encounter' section of the work which forms the central part of the piece was created via a sub-programme, written for that specific purpose. Here the two groups of sound at first alternate then collide, the gong-like sounds finally appearing to dominate. This is done in three rhythmic planes, a kind of counterpoint, over a large pitch area. As the gongs start to predominate over the choral-like sounds they begin to be heard not as percussive, short sounds, but long enharmonic 'chords', these are in fact the recorded components that made up the choral-like sounds. Thus the end of this section exposes the common ground, the stasis between the groups, the choral-like sound without the beating, the gong-like sound without the attack characteristics. All is the same!



(6) The last section is in fact beyond the stasis point, the transformation being carried on to a new state.

(7) All the above is either clarified or obscured by playing and moving them in a stereophonic plane across the speakers and an echo plane away from the speakers.

The title of the piece is an attempt to describe the overall feelings I hoped to explore in the composition; it also may serve to establish a mode of listening for those not concerned with the more technical paraphernalia given above.



I AM NOT A COMPUTER
Darius Clynes

I am not a computer **was created at the Columbia-Princeton Electronic Music Centre. It was realized on the combined facilities of the Columbia University Center for Computing Activities and the Nevis Research Center. Three computed waveform sources of sound are used.**

(1) Speech analysis and synthesis program specially adapted for *Speech songs* by the American composer Charles Dodge, pioneer in computer music.

(2) *Wave melody* instrument consisting of a summation of wave functions rounded to the nearest integer '12' tone.

(3) *Endless glissando* instrument modelled after a version described by Jean-Claude Risset in the 'catalogue'.

The computational digital synthesis program used was supplied to Columbia University by Barry Vercoe, head of computer music research at MIT, called music 360, and was designed for a computer of similar name.

I wrote this piece, joyfully. There is the cry of my daughter Tara Maria who was only a few months old.