PAGE 34 BULLETIN OF THE COMPUTER ARTS SOCIETY FEBRUARY 1975

## COMMENTS ON TRPL

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TRPL is a plotter-graphics program that interpolate a sequence of precisely spaced lines between selected pairs of pre-designed master lines. Assuming certain conditions, interesting and varied Moiré patterns result from these computer-calculated interpolations. But these patterns are more than computer-made Op Art. Three factors – (1) the opposing masters, (2) the gradually shifting regularity of the spacing scheme, and (3) the absolute regularity of the plotter grid – interact to graph a process that has as much to do with, say, the graphical encodings of wood grain as with the ephemera of visual perception. Because these Moiré patterns could not be generated at all but for the pecularities of an incremental plotter, TRPL is also an example of how a constraint within an art-making medium can be used to advantage. In fact, it is an up-dated demonstration of the dialectical unity of constraint (limit) and opportunity (freedom) in all art.

One of these plotter constrains is that the pen moves from point-to-point in discernable increments. In other words, it must follow the normal procedure of moving stepwise either up, down, across, or at some increment of 45 degrees, even when the point towards which it is headed does not fall precisely on one of these trajectories. Since these are the only directions available (though some plotters offer additional ones), all of the curves and most of the diagonals have the characteristic wavy tremor of plotter-drawn lines. It is this stepwise motion and tremor that account for the Moiré patterns in TRPL-made drawings.

Another constraint is that a plotter, like the one at Amherst College where these drawings were made, must contradict the norm of image technology in drawing a low-resolution rather than a high-resolution image. In other words, it must move in increments of 100 rather than 200 steps per inch. Although the program has also been implemented for the UMASS batch system with its 200 steps plotter, the few drawings made on this machine have been mostly disappointing, with the Moiré patterns either weak or absent altogether.

But just as some computers can be programmed to simulate the behaviour of other computers, the UMASS plotter (or preferably one with an even higher resolution) could be made to simulate the Amherst machine with its larger increments. To illustrate this possibility I have "simulated" this kind of simulation. In other words, by retouching one of the Amherst College plots I have straightened the master outside lines to suggest how both sharp and wavy lines might be combined in the same drawing. It should be noted, however, that while it would be possible for the high resolution UMASS plotter to simulate the low-resolution Amherst College machine, the reverse would not be true. (I suspect there is a general principle operative here that could be presented in a more abstract – even mathematical – form.)

TRPL consists of a mainline program and several support routines. The mainline program and one of the subroutines was written by me. The others, which require some fancy mathematics, was generously written for me by Dr Roger Ehrich of our UMASS Department of Computer and Electrical Engineering. Based on a least squares polynomial, this subroutine (called XFIT) creates an elegant curve from a set of designated coordinate points. Or it can be used to join curves to straight lines if this is the kind of master that is wanted. The masters can either be designed at the drawing board on graph paper or at the UMASS PDP-15 interactive graphics display using a light pen and function buttons. Either way, the master ends up encoded on punch cards or tape as input for the computer.

The masters also double as graphs for diverse spacing schemes. This is done by calling DGRAF, which also calls XFIT. In effect, DGRAF establishes a reference line alongside the master, then calculates the varying distances between the two as spacing values for the interpolated lines. For example, a point on the master which is close to the reference lines specifies a small increment (or decrement), while one that is further away specifies a larger value.

The main parameters are: (1) the height of the drawing (specified as units of YMOD), (2) the width (WIDE) and (3) the number of interpolations between the pair of masters (XMOD). WIDE divided by XMOD provides a standard minimum separation between the interpolations; added to this is the value provided by DGRAF's reading of the "graph". The X/Y scaling factors can also be used to fine-tune the spacings and optimise the patterns. In fact, all of these parameters and values must be considered together and coordinated.

More than a single pair of masters can be used in the same drawing. For example, a set AB might comprise the first pair, BC the second, and CD the third. Still needed is a good algorithm for melding a seamless transition from one pair of masters to the next when this is wanted. Although I have deliberately exploited this discontinuity to articulate colour changes in several of the colour plots I have made, it is still a limitation. The programming geniuses I have approached have not been helpful. Perhaps a reader of PAGE will come up with a suggestion.

Although I continue to be unmoved by most kinds of Op Art, TRPL's relevance to Op is obvious. By a quirk of fate computer graphics arrived too late to influence Op Art during its heyday ten years ago. But the over-hasty obsolescence of these come-and-go movements leaves untouched lodes for renewed exploration. Hence my surprise that Op artists have not flocked to the computer, given this machine's incredible ability to plan and execute precise and intricate images according to implacably rigorous protocols.

## XENAKIS ON COMPUTERS IN MUSIC

*Iannis Xenakis gave a seminar on Computers in Musical Composition and Sound Synthesis at the Society for the Promotion of New Music in London on the afternoon of 15 January 1975. He started from our ability and tendency to see the world as objects, to categorise and name objects and groups. "Composition is inventing things and putting things together". This putting together can be either arbitrary (according to intuition, instinct, inspiration) or organised (according to some causal chain, set of rules, procedure). Xenakis discussed pieces where he approached the problem of making decisions about which sounds and in what order without causality, without symmetry, by using a hierarchy of stochastic processes. First ACHORRIPSIS in which all the probabilities were computed by hand, then ST/48 in which a program was used – one which has been in other works and in architectural design. Xenakis showed slides of the La Tourette monastery near Lyon which he worked on with Le Corbusier, including a wall of stochastically designed windows.*

*"Unpredictable = without causality" (No Xenakis, uncertainty is a function of knowledge not of causes)*
*"Symmetry = repetition"*
*"Recognition = re-cognition: sometimes etymology is useful. We can only recognise what we already know, re-cognition".*
*"Perfect = aesthetically interesting"*

*Xenakis then outlined the digital synthesis of waveforms. There seemed a lot missing between the description of waveforms by the composer, and their transmission through a D/A converter. Namely composition. In the short piece he played Xenakis worked with clusters of sine tones in the amplitude-frequency domain – the piece had been realised at the Centre for Mathematical Music in Paris.*

*The seminar was strangely elementary, but not too elementary for the audience of SPNM composers. Xenakis did not speak of the procedures he uses other than stochastic, he did not speak of the development of languages for composers, he did not get to the second part of his subject on Group Structures.*

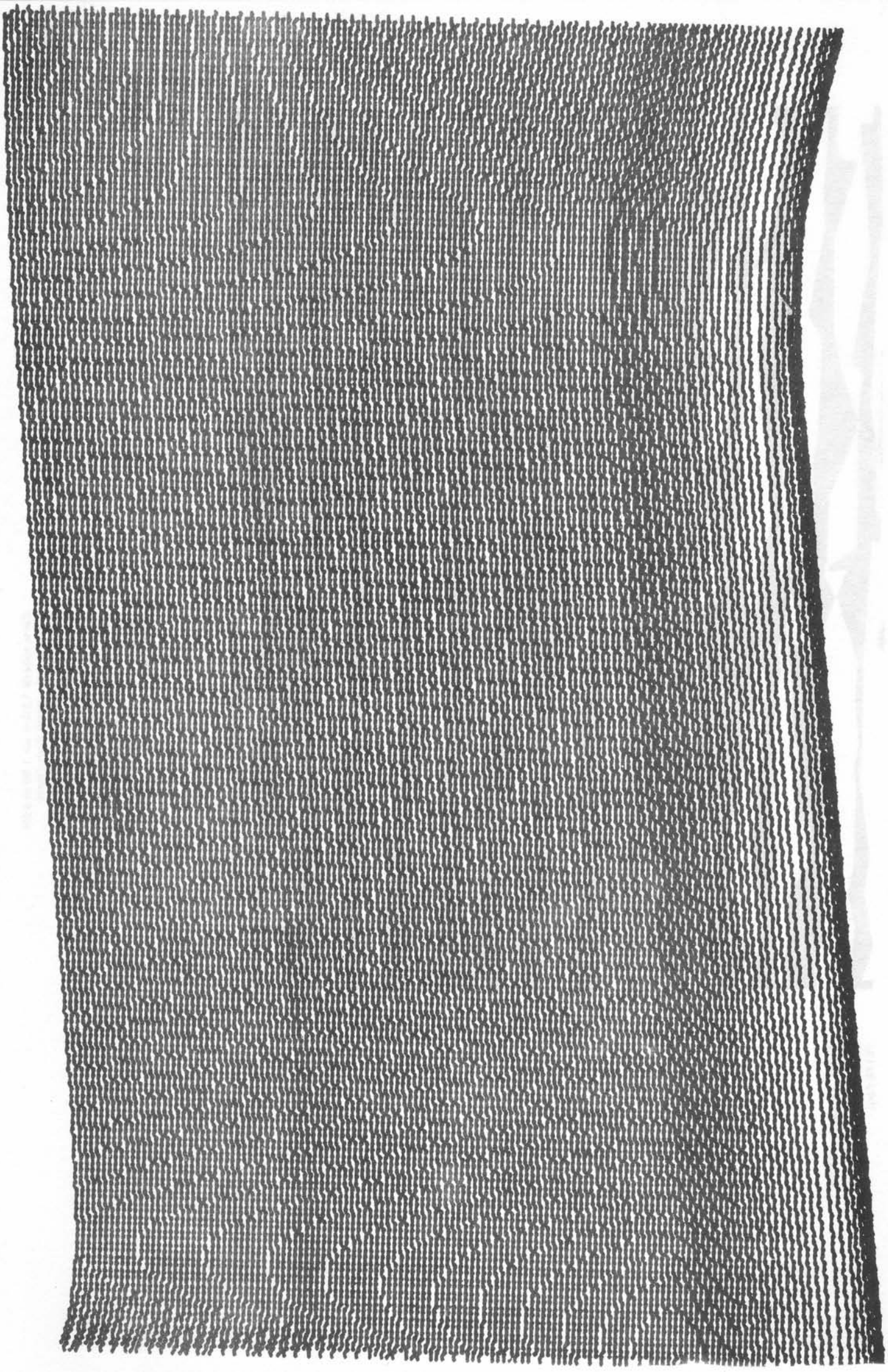
*A recording of the seminar, but not the discussion, was made by the British Society for Recorded Sound, 29 Exhibition Road, London SW7 2AS and may be heard there by arrangement.*

*Question from the audience "Is it a basic part of your aesthetic approach to avoid repetition?"*

*Xenakis "That is a good question. In many cases that is so".*

*And there were the questions about how he names his pieces and whether he puts emotion into his compositions.*

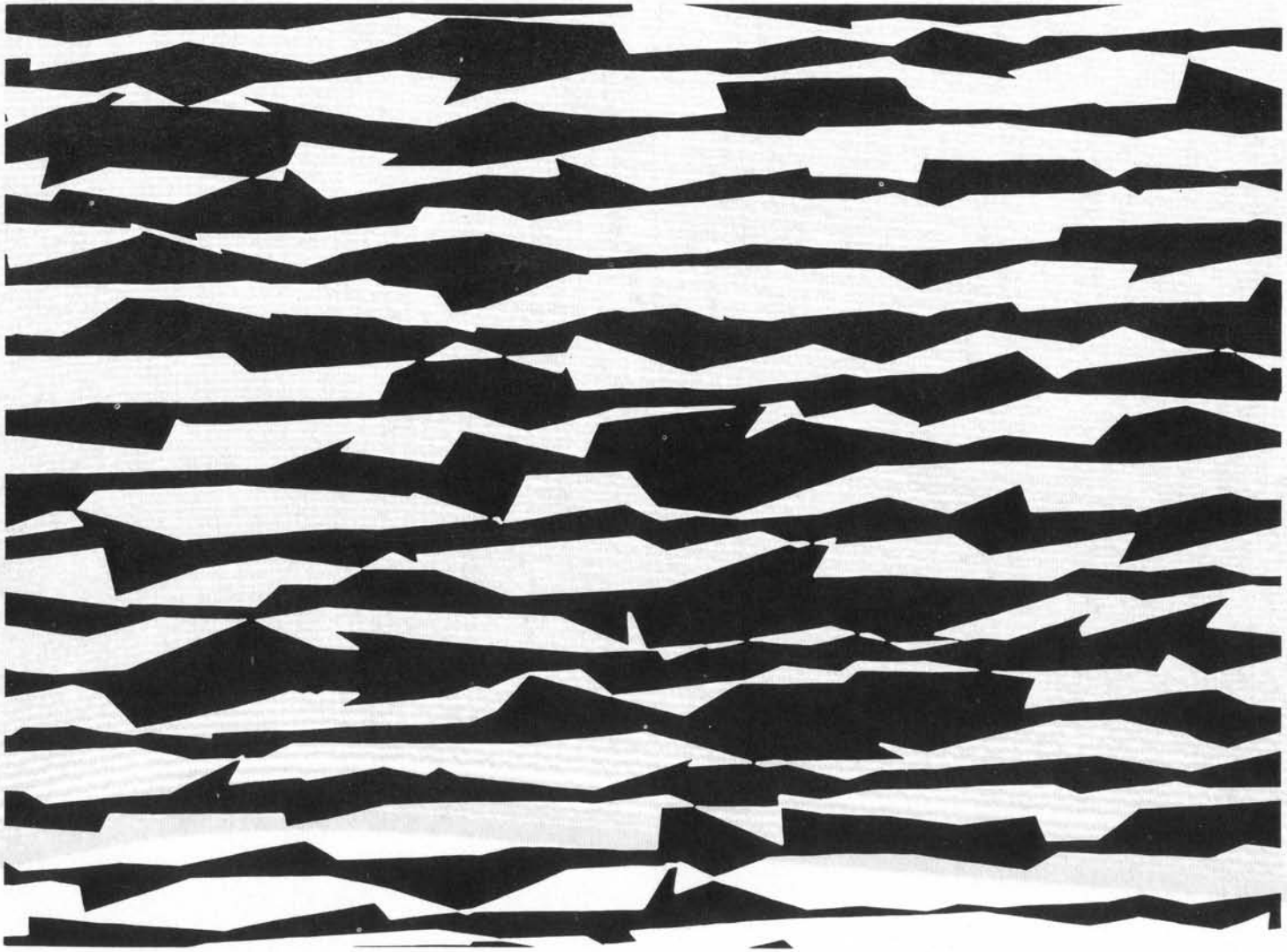
*Alan Sutcliffe*



## VERA MOLNAR

Horizontales 5 (détail)

Cette toile de 1.50 m sur 1.50 m a été faite à la main `partir d'un dessin exécuté par traceur, photographié et agrandi. Cette image fait partie d'une série de partitions d'une surface en *n* domaines, horizontales, coloriées alternativement. Les frontières des domaines sont constituées par des segments dérivés de l'horizontale à un degré $\alpha$ choisi au hasard.



Born in Budapest, Hungary and has lived in Paris since 1947. Studied Fine Art at Budapest.

Vera Molnar believes strongly in geometric painting. From 1959 to 1968 worked with 'conceptual' machines but since 1968 has realised works with the aid of a computer and plotters.

From "Les Cahiers SESA"
No 5, October 1973
23 Avenue de Neuilly
75116 Paris

## UP ALONG DOWN UNDER

*Australia '75 is Australia's first national festival of the creative arts and sciences. As such it acts as a showpiece for Australian creativity exhibited in a large number of different fields. This year there will be exhibitions of Australian inventions, scientific discoveries, crafts, visual arts, plastic arts, and performances of dances, poetry reading, many forms of music and much much more.*

*I am co-ordinating the section dealing with computers and electronics in the arts.*

*Probably the hardest part of this is finding the right people. Australia is quite large, the people are scattered and there is nothing equivalent to the Computer Arts Society. So the search for the right people had to be done personally and this took several precious months of visiting distant cities and making long enquiries.*

*The resulting group of people is something like the Cybernetic Serendipity of the performing arts.*

*It centres around live performance because that's my pet bug. I believe that the computer technology will revolutionise art because it allows machines that are* responsive. *The new machines will create new categories of plastic and performing arts and I have tried to select people who exemplify the new creative directions which are emerging.*

*In sculpture the technology now permits sculptures to be responsive in a highly sophisticated way. (Edward Ihnatowicz's SENSTER is a paradigm in this field.) As time goes by I expect more and more 'sculptures' to 'respond' to their environment.*

*One Australian example of this is a solar powered sculpture which opens its 'petals' while the sun is out and closes them when the sun is hidden. Another is the 'laser chromasons' of Stan Ostaya-Kotkowski. These luminous spheres respond to the sounds around them by changing the coloured patterns on their surfaces. Stan is modifying these to respond to people's brainwaves.*

*The impact of electronics in music is well known and the show will contain a number of music synthesisers with different technological innovations. One has a pressure sensitive playing surface similar to the neck of a cello, whose sensitive playing characteristics it aims to emulate. Another is computer controlled to allow for complex interactive performance situations, and others which are individually crafted musical instruments moulded to the personality of their creators.*

*One music event will involve a string quartet seated at visual display units. They will play from a score which is being produced by a computer under the control of the composer and his program. This composer hopes to do away entirely with the tedium of writing out scores and foresees the day when whole orchestras will read from display units.*

*A small group of ballet dancers will perform works which use the responsiveness of modern technology. Phillipa Cullen specialises in works in which the dancer controls the music and/or lights via various electronic sensors. This gives the dancers the added freedom (and awesome responsibility) of also being the musicians and lighting technicians. I am sure that developments of some of these techniques will one day be common-place on the ballet stage.*

*But the most important area of the show is, in my opinion, the live performance vision systems.*

*I feel that our thinking is confined by our spoken language and that computer controlled graphics may lead to breakthroughs in our thought processes. But this is far in the future. For the present I have been working on/towards a visual piano. That is, a machine which allows one to manipulate visual images with much the same facility as a piano affords a musician working with audio images.*

*So I have put some effort into getting the use of the sort of machines that can do this.*

*Digital Equipment have been very helpful. They are especially installing a GT44 with analog controls and also a PDP11/40 which will drive (i) a colour TV system developed at the Australian National University (ii) a plasma display (iii) digitisers, disc operating system and sundry other things.*

*IBM have also been very good. They were the first to offer help and will install an IBM 1130 with 2250 display disc operating system, line printer, graph plotter and card reader.*

*The big bottleneck is software. All my work to date has been on a Sydney University ageing PDP-8/338 system, and it cannot be transferred to any of these machines in time for the show. So we've got a top-notch programmer working with a few friends to gather the existing software, stir it around and come up with enough to give an effective demonstration of live performance graphics.*

*It is intended that the computer screen be photographed by a TV camera and that the image be artificially colorised in a 'cox box' before being shown on the show's colour video system. I fear that the technology of all this may be too much – something's sure to fail – but on the other hand it* should *work. If so, it will be impressive.*

*Besides the three computer controlled visual systems we will also have a locally built video synthesiser. John Hansen, the builder, is wisely preparing video tapes to back up his live performances.*

*John has also made some very fine looking jewellery by imbedding monitorised electronic circuits in clear plastic. The circuits are driven by thumbnail sized camera batteries and flash attractive patterns of light from the tiny embedied l.e.d.'s.*

*There is more of course. I haven't mentioned the artists' workshops that will run every morning or the exhibition of computer graphics or the section of computer films or the society which will probably be formed to amalgamate these artist-technicians.*

*Doug Richardson, 43 The Scrap, Castlecrag, Sydney, New South Wales, 2068 Australia.*

## GRAPHICS IN ARCHITECTURE

Gollins Melvin Ward Partnership, the large international architectural practice of Manchester Square, London have installed a GT44 Graphics Display System, based on the 16-bit PDP-11/40 computer. This makes them the first solely architectural practice in the UK to acquire in-house, stand-alone interactive graphics facilities.

The interactive graphics capabilities of the GT44 are to be used in the "hands on" mode by the technical staff both to streamline the production of design information, and to allow the designers to explore in greater depth the detailed consequences of alternative design proposals.

The project is in the hands of Dr John Davison, who presented a paper on the development of the GT44 system for architectural design to the Imperial College Symposium in CAD in September 1974.

Said Dr Davison, "By locating the computer section and the computer itself within the office, we are aiming to clear away the mystique surrounding computers, and to encourage staff to regard the computer simply as a tool to aid their design work. We believe this approach is essential to the success of computer aided building design".

## INTERNATIONAL SOCIETY FOR CONTEMPORARY MUSIC

The next annual festival of the ICSM will be held in Paris from 22–29 October 1975 within the framework of artistic events of the Paris Autumn Festival. A large number of concerts will be organised to mark this occasion. These will run parallel to the sessions of the General Assembly of the ISCM and will be devoted to orchestral and chamber music, solo performances, electronic music and so on.

The International Selection Committee is headed by Iannis Xenakis.

Details from:
SIMC/Festival d'Automne
Direction Artistique Musique
3 Cité Bergère
75009 Paris

The closing date for entries will be 15 March 1975.

Parallel to the performance of works selected by the international commission, there will be an extensive series of concerts of live or taped electronic music, with a view to offering as broad a panorama as possible of electronic music in the world today.

## CENTRE FOR MUSIC EXPERIMENT AND RELATED RESEARCH (CME)

This organisation maintains an archive of printed and recorded documents which you are invited to contribute to.

Some of their recent additions:

PRELIMINARY REMARKS ON EXTERNAL VOCAL CAPABILITIES WITH THE ARTIFICIAL LARYNX
Robert Gross, Linda Vickerman
CME
UCSD
La Jolla, California

LOOPS, AN INFORMAL TIMBRE EXPERIMENT

Robert Crickson

THE HYBRID II: A REAL-TIME COMPOSING/PERFORMING COMPUTER SYNTHESIS SYSTEM
Edward Kobrin
CME
UCSD
La Jolla, California

Jeffrey Mack
National Accelerator Labs
Batavia, Illinois

## 47th CONVENTION OF THE AUDIO ENGINEERING SOCIETY

*Copenhagen 25–29 March 1974*

*Session L Digital Technique*

*L-3 Jean-Claude Nicolas: The Automated Mixer*

*Development and application of a computer assisted automatic program audio mixer in a central TV control room.*

*L-5 P J Storey: Total Motion Picture Theatre Automation Utilising Digital Control Techniques and a Mini computer.*
*Developed in last 18 months in Sydney – covers audio levels and switching, lighting, projector control, light and shutter control, curtains and masking.*

## HON. MEMS.

Each year we — the Committee of the Computer Arts Society — should elect someone who has made an outstanding contribution to the creative use of computers in the arts as an honorary member of the society. This was agreed sometime ago. But in 1974 we did not elect anyone.

This year we are glad to announce two new honorary members: both directors of Electronic Music Studios

**Knut Wiggen in Stockholm**
**Peter Zinovieff in London**

## PERPETUAL EMOTION

Peter Zinovieff comes from an aristocratic Russian family (he says).

He went to Gordonstoun and studied geology at Oxford (he has cases of rocks to prove it).

Then he married the beautiful young heiress Victoria.

In the early sixties he got into electronic music. With his money and energy and David Cockerill's brilliance in electronic design EMS was formed. Before the first PDP-8 was bought to control the equipment in 1967, there were already two computer-tending elements in the studio: for storage and pattern generation. A sequencer allowed the storing of the studio settings, including time, for up to 32 events. A radioactive source and counter allowed the generation of sequences of random values.

After installation of the PDP-8, and a bit later a second one, and then a third, there was a lot of work on software, with the language/system MUSYS and the interactive language VOCAB.

In parallel with this the commercial arm of EMS was launched with the VCS3 synthesiser, originally only £150. This opened up the whole amateur and low budget field of electronic music and related education. Other products have been added and most recently a video synthesiser which may have the same impact as the original VCS3.

In the studio, hardware developments continued too. After being one of the very first computer controlled studios, with the digital control of analogue devices, the studio is now one of the first purely digital systems, with banks of digital filters and oscillators under computer control, interaction being possible through a keyboard, a set of 32 sliders and switches, as well as conventional peripherals.

As in other studios, technical advances have inhibited musical work, but many composers have worked there, including Birtwistle and Henze. Peter said recently that he had no more hardware ambitions for 2 years.

Concerts have been organised at the Festival and Queen Elizabeth Halls. He is busy now with the libretto for an opera Orpheus with music by Birtwistle, for Glyndebourne in 1976.

Many people would find one of these roles enough — running a synthesiser business, developing an advanced music studio, writing and composing — but he still finds time to go out with girls as well. There is more than a touch of the aristocrat in him — in the nicest possible sense, of course.

COMPUTER ARTS SOCIETY ADDRESSES
Chairman: Alan Sutcliffe 4 Binfield Road Wokingham Berkshire.
Secretary: John Lansdown 50-51 Russell Square London WC1B 4JX.
Dutch Branch (CASH): Leo Geurts and Lambert Meertens
Mathematisch Centrum Tweede Boerthaavestraat 49 Amsterdam.
US Branch (CASUS): Kurt Lauckner Mathematics Department
Eastern Michigan University Ypsilanti Michigan 48197.

*AIMS AND MEMBERSHIP*

***The Society aims to encourage the creative use of computers in the arts and allow the exchange of information in this area. Membership is open to all at £2 or $6 per year, students half price. Members receive PAGE eight times a year, and reduced prices for the Society's public meetings and events. The Society has the status of a specialist group of the British Computer Society, but membership of the two societies is independent.***

***Libraries and institutions can subscribe to PAGE for £2 or $6 per year. No other membership rights are conferred and there is no form of membership for organisations or groups. Membership and subscriptions run from January to December. On these matters and for other information write to Alan Sutcliffe.***

## COMMITTEE MEETINGS

The Committee meets informally at 7.30 pm on the first Friday of each month in John Lansdown's office, 2nd floor, 50-51 Russell Square, London WC1. We often have one or two guests. All members of the society are very welcome to attend. Bring a friend.

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BULLETIN OF THE COMPUTER ARTS SOCIETY

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PAGE 35 is being edited in USA by Kurt Lauckner

## KNUT WIGGEN, IDEAS MACHINE WHICH NEVER STOPS

— I was expecting you!

Said Karl-Birger Blomdahl on the summery day in 1963 when Knut Wiggen turned up uninvited at the composer's home in Kungsangsskogen. Wiggen had broken off his vacation and hurried back to Stockholm. The reason: Blomdahl had been appointed head of the music department of the Radio Sweden and had declared in the press that one of his conditions was that an electronic music studio should be built.

Blomdahl knew that Wiggen was the one who knew most about such things in this country and thus the collaboration was established.

Knut Wiggen had then for several years been working with this question. At Fylkingen he had together with the technical specialists Tage Westlund and Norman Gleiss worked out a plan for an electronic studio, constructed on the basis of what a composer can wish and in cooperation with ABF he had started a small educational studio.

Swedish music life got a strange contribution when the then poor young Norwegian in 1950 came looking for the sources of knowledge — the 23 year old believed they ran more clear in Stockholm than in his native country which did not even have a college of music. This born, incurable avantgardist soon started to organise the basis of a new music life. He became the most tenacious, future orientator that had ever ravaged the fringe of the Royal Academy of Music. He won the chairmanship of Fylkingen with a radical program and started working teams.

Knut Wiggen thinks radically and he carried through his thoughts to their conclusion. He has been an ideas machine which has never had to stop for oiling.

Fylkingen was during his chairmanship reorganised several times and got ever increasing grants from municipality and state. He moved its concert activities to the Modern Art Museum, introduced the instrumental theatre and happenings. He organised a Scandinavian music collaboration with Nordic tours. He built the world's first electronic music machine.

Knut Wiggen's music machine I was followed by the plans of a music machine II (1962) which resulted in the plans for the computer studio built for Radio Sweden and which later (1969) was organised as an independent foundation with KW as director.

In connection with the publishing of his book The Two Cultures of Music where the theory that the concert-music tradition and the music industry with its use of the electroacoustic distribution system are two parallel music cultures, instead of what is normally considered as one being higher than the other, he met with many set-backs. ***The theory was denied and caused great vexation within one of the cultures.*** Unfortunately, this dominated the board of the studio. The fact that the book also contained a hypothesis about the technical basis for the phenomenon music and one which could be made the basis of advanced research programmes about compositional matters, was less observed.

From this hypothesis he worked out, together with the programmers David Fahrland and Kaj Beskov, the program Music Box (1970-72). The program helps the composer to formulate rules for the music he wants to create. The program has been the basis of a string of sound structures which listeners have acknowledged as music.

A favourite problem is the speculations about our space and time conceptions and how these find their counterpart in the sounds chosen for music creation. Another favourite problem is the technical part in the process taking place when ideas, evaluations and thoughts, acquired in the society, are translated into musical structures. A third is programs for simulating interpersonal processes.

He took the initiative to the Fylkingen proposal of a government gramophone record production. In New York he launched the idea of "art and technique" which resulted in two festivals, one in Stockholm and one in New York, and which has become the objective of Fylkingen and a worldwide movement supported by Unesco. He has published a notable book of the secrecies of piano playing. Since "his" electronic music studio has been completed he is busy organising a union and a special STIM-organisation to guard the special interest of the composers of electronic music.

He has, finally, created a number of computer compositions which after having been processed in the electronic music studio will let us get acquainted with the modern composer Knut Wiggen.

Born in Norway in 1927, studied piano and composition in Stockholm and Darmstadt, piano teacher 1955-62, leader of the Stockholm studio for electronic music 1960-64, leader of the Radio Sweden electronic music studio 1963-69, leader of EMS, 1969-

Chairman of Fylkingen 1959-69

Books: Att spela piano (To play piano) 1966

De tva musikkulturerna (The two music cultures) 1972.

Has written several articles of music in the daily press and magazines.

Has been composing computer music since 1963.

*STOCKHOUSEN SERVES IMPERIALISM*, **a new book by Cornelius Cardew and others (Latimer New Dimensions, 104 Earls Court Road, London W8 6EG) £3.**

**A history of the Scratch Orchestra and other considerations of music for the people.**