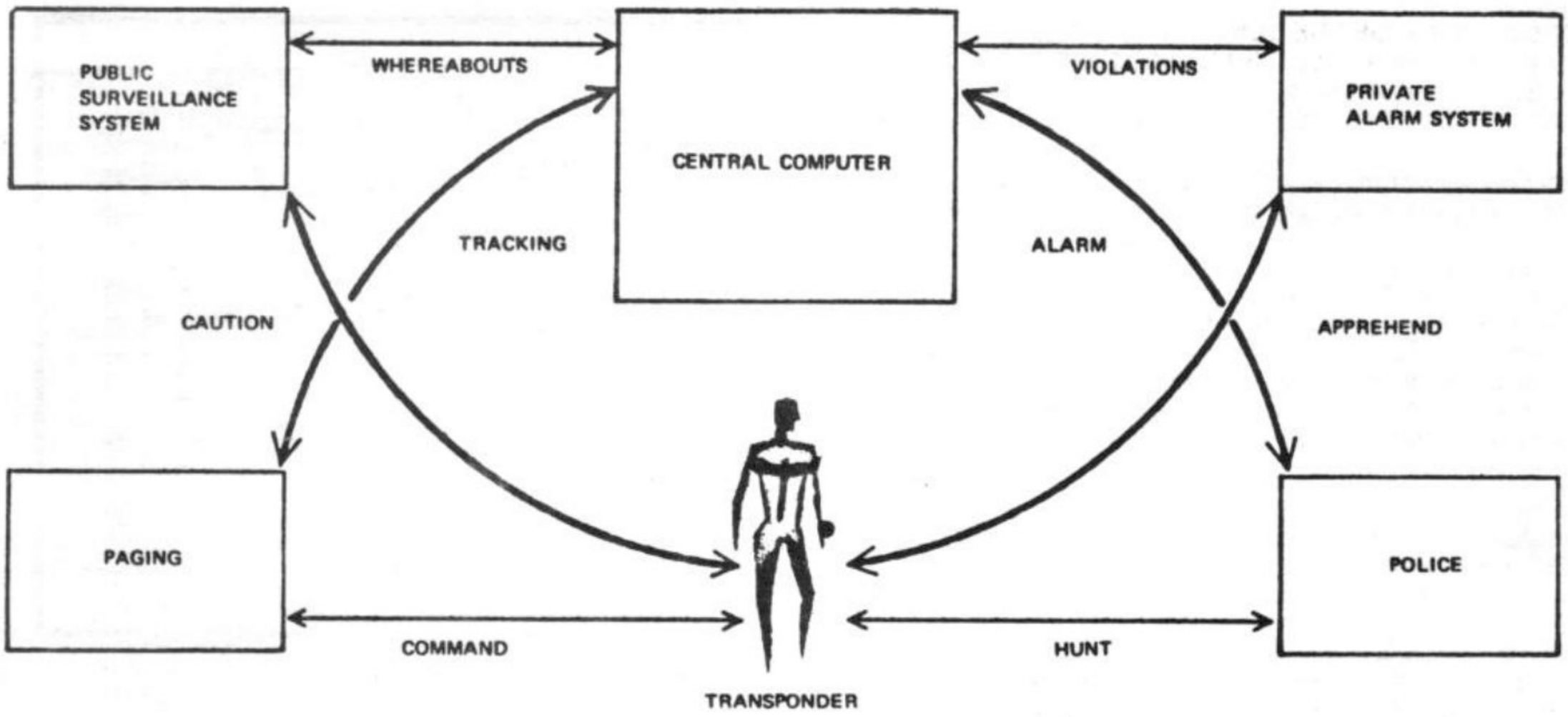


The Chinese were first to synthesise a protein (bovine insulin, six years ago) and they may score a first with their ARTorg; they seem to have a natural flair for binary and perhapsternary combinatorial synthesis, possibly on account of their inter-writing with very divergent speech patterns. I adduce this in order to equate unpunctuated (un-organised) binary, with each number having equi-probability, with the 214 Chinese radicals (encoded in eight bits with 41 gaps in scale-256 and inter-radical space for the zero); having portrayed this equivalence I can then contrast it with fixed-string and variable-string (k-count being less than m-maximal+1).

It is not clear to me from reading the Gordon Hyde article, where, he wishes his strings had the length of our DNA-protein molecules, whether the organising power of his ARTorg comes from the distribution of commas in a binary-sequence with equi-probability and no impossible sequences (such as those of binary-coded denary or binary-coded radicals in Chinese) or whether it comes from the gaps when binary numbers are parked out on the real world's experience of musical combinations, chemical responses, DNA input for the 20 outputs of amino-acid, arithmetical odd-integer-squares, stellar bodies and other concepts or sensible entities like quasars and quarks. Nor does he say whether in any language or meta-language (transfinite) the length of string must be uniform.

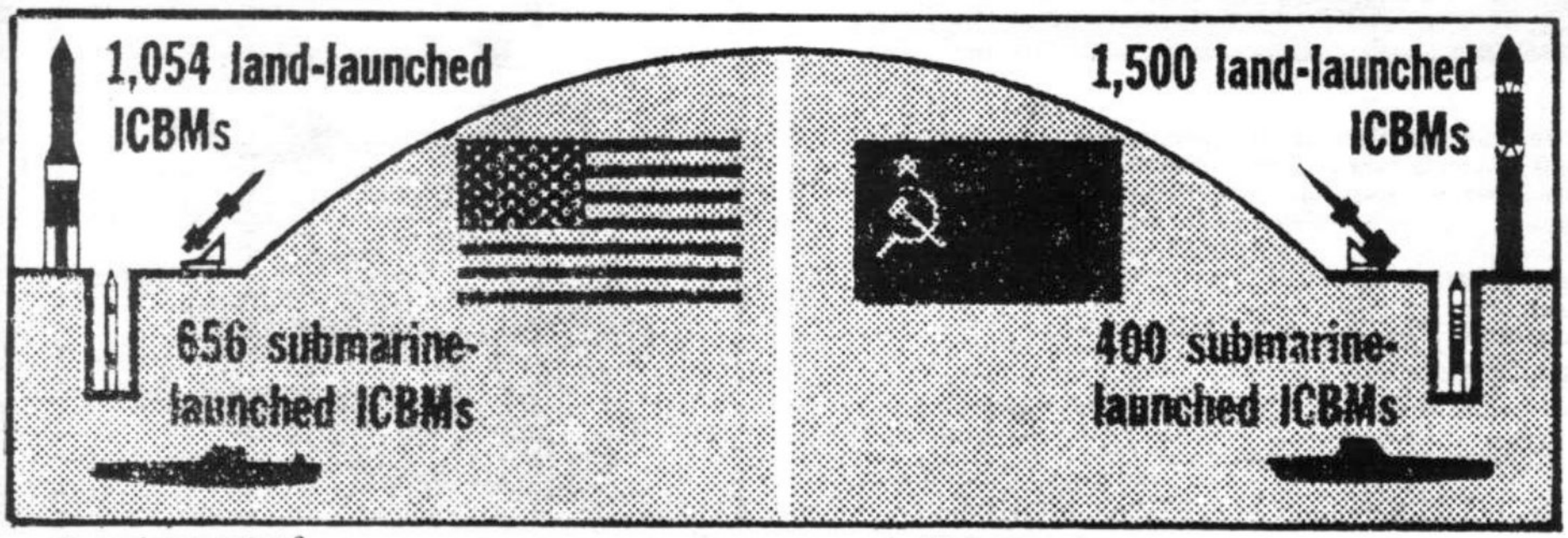
Binary numbers can have equiprobability, but if symbols for music notes are grouped by concordant chords, or symbols for chemical elements are grouped by compounds, the pattern will be very divergent, and informative. We can build up any symbol if the yexence (two-dimensional matrix) is big enough, and 7 x 5 is often chosen for the ABC; optimally we can design a set of symbols that will save five sixths of the space in terms of cells or bits. But some of the saving comes from expanding the count of symbols from 26 to 5 x 16 = 9 x 9 - 1 with 4 or 3 orthogonal dimensions; and some of the saving comes from adapting English speech to the improved set of symbols; this may not be cricket, but it would certainly baffle our M15 and 6 experts and it would help the blind who need all the contextual confirmation they can obtain.

*Perception is the distinctive feature of the artist; let us learn to speak as we can type most economically with musical feed back from printed circuitry; a set of 80 grooves ****** each ¼" long will feed a short-wave data ****** 20x4=80 collection centre for laseray infrared CO_2 communication, with satellite shortcuts for long-distance facsimile. Filtering off the items from A to C while transmitting A's items to B can best be performed by my electronic logister, Patent 731, 797, which closes the gaps between selected items. B's load for C and A is then accepted before the laseray rangefinder fires A's residue at C, and so on in rotation; so each of countably many line-of-sight points communicates with three others and a central computer can take account of local congestion to route every new message. The final lap can be covered by short-wave radio, recipients being alerted by hospital-bleepers; when he reaches his facsimile receiver his message will be waiting for him. The cost of handling messages can be assessed by local-centre secretaries or accountants who can themselves form clusters before connecting to lasergrid. The Post Office can be compensated generously for its archaic hardware. We need no longer travel to our documentation in City Offices – for it will come to us by TUNGLASeray in The Universal Numer-Gram Language Adaptive-System RAY.*

New Hydrofin & Plasticol Ltd.
Little Knoll, West Chiltington,
Pulborough, Sussex.

Douglas S. Blacklock
9th October 1970.

(This letter refers to Gordon Hyde's article in PAGE 11)



Q. And computers?

A. And computers.

A DESCRIPTION OF THE COMPUTER '70 THEME EXHIBIT, OLYMPIA, LONDON 5–9 OCTOBER 1970. DESIGNED BY FGS Ltd. IN CONJUNCTION WITH COMPUTER ARTS SOCIETY.

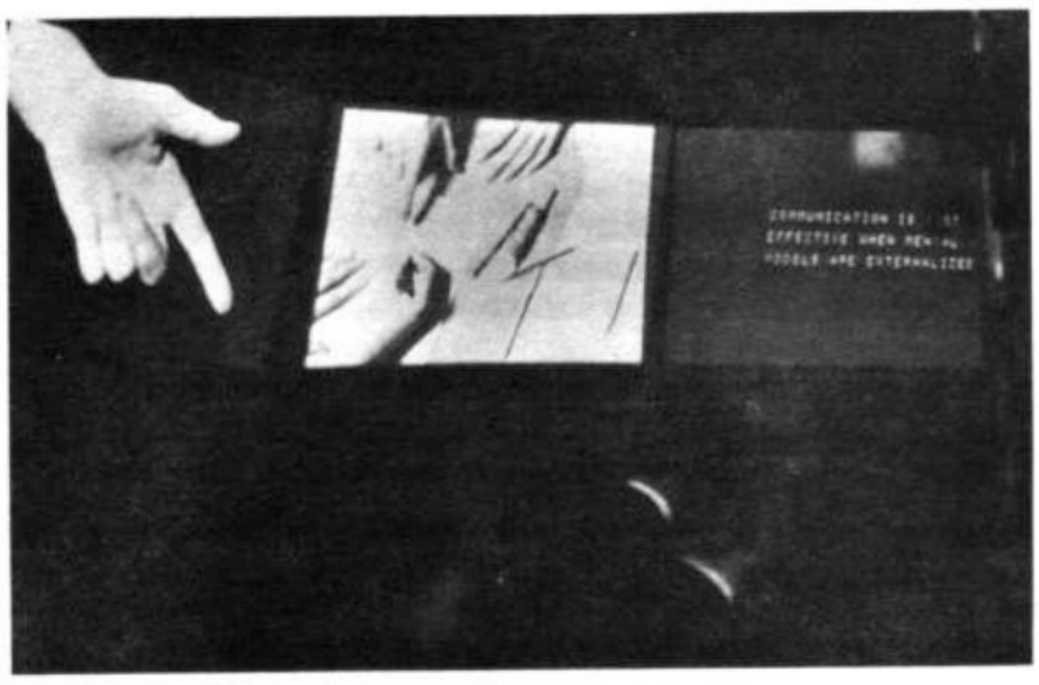
We always seemed to have a small queue outside the entrance to the dome, a one-way light-fast revolving door. The first impression on entering was of a deep-blue light, and a drop in temperature not unlike passing from a hot summer street into a cool cathedral. Clusters of people grouped around the central tower, playing with a light-pen, seated players staring intently into green screens, their hands hovering over joysticks. Rhythmic clicking sounds as colour-slide projections changed in a rapid sequence travelling round the nine screens, which were high up around the inside surface of the dome.

Players would sit at one of the nine storage display terminals and opt to play through one of four possible programmes. They were then presented with a series of problems, each carrying a set of programmed alternative solutions. Each solution had a social score and a score to the individual. Throughout the game (programmed by George Mallen), as each choice was made the scores were updated and at the conclusion, each player would be in a position somewhere between these two extremes: the millionaire, who in the process of acquiring his wealth, had ruined the globe, or the rather ragged-trousered philanthropist.

The game was run from a remote PDP 10 computer in Great Portland Street, with the Idiom acting as Umpire. The Idiom would interrogate the computer, to discover the overall balance of personal gain and social benefit, which it displayed on its own screen; at the same time it selected a slide scenario appropriate to the overall level of play, from the random-access slide projectors.

There were eight possible levels, each a complete scenario lasting three minutes. They ranged from a sequence of utter devastation with didactic comments (the lowest level), to the more philosophical high levels, on dreaming, and the dynamics of mental model-building. Anthony McCall.

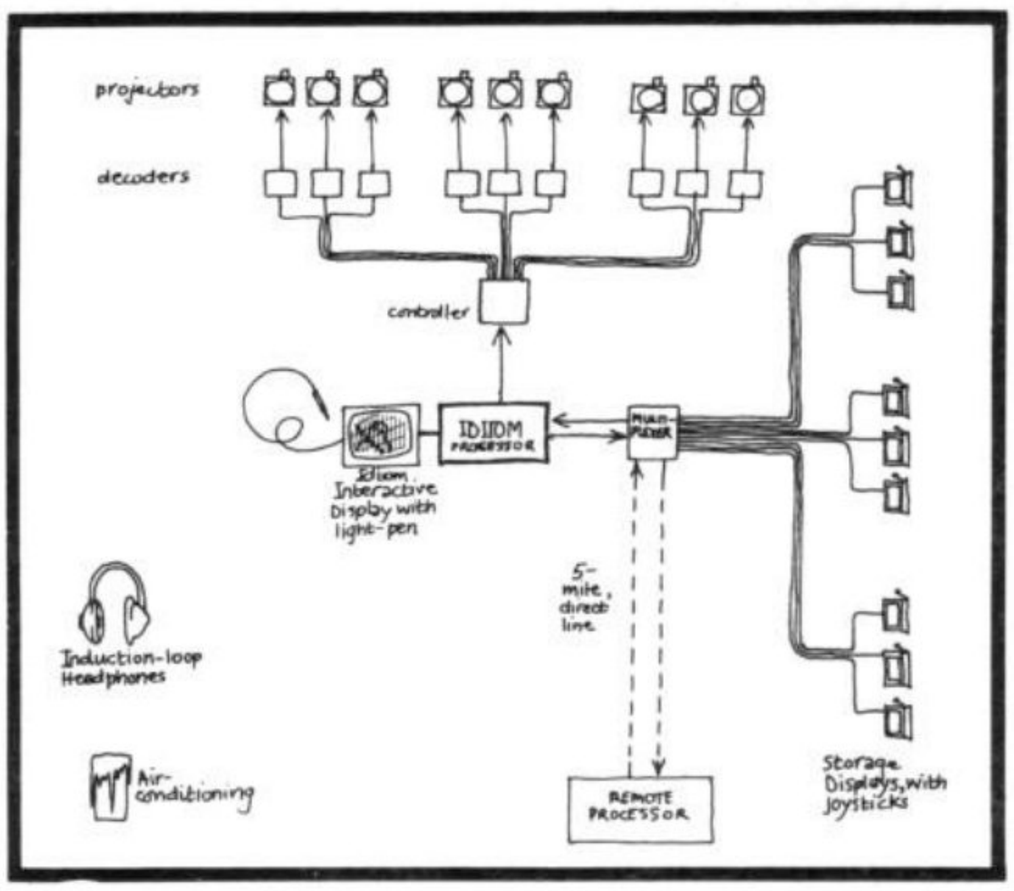
John McNulty, Christine McNulty: 4 East Heath Road, London N.W.3. 01-435 9580.
Anthony McCall: 43 Egerton Gardens, London S.W.3. 01-589 9119
(Foundation General Systems Ltd.)



"The staff engage in a continual mechanised game. The scene is not unlike an air-traffic control room and people make their moves and gain their information through display and control boards. They are indulging in one of the business games commonly used nowadays in training executives, and their play is a continual exercise in the running of the industry. The display and control boards are identical, for the intention is that any player may in some conditions assume any role."

Gordon Pask, "My prediction for 1984", 1962.

The Automatic, unmanned factory of 1984.



The Computer'70 theme exhibit, System.

In the Central Theme Exhibit at Computer '70 we have tried to present three concepts.

We have aimed to make an integrated system using some of the latest equipment available in order to demonstrate that systems which are interlinked can combine to create more than just the sum of their parts.

We have attempted to show the direction in which work patterns are evolving in terms of better communications, decentralisation, grouping by interest and the dawn of the computer utility.

We have tried to show how man's next and most immediate task is to learn about systems and their inter-relations so that he can manage his resources and make more effective decisions.

We are interested in the systems approach and most of all we are concerned with systems integration. We want to develop the concepts of man/machine/man communication to the situation where man can 'drive' his terminal with a hitherto unparalleled degree of control. There is now a device on the market which you can plug direct into your telephone handset to access a computer — with the other plug you can connect a standard television set to give you an instant visual display unit for computer output. The next step will take us to a multi-modal (music, pictures, words, numbers or whatever) communications device which can plug in anywhere. With developments like this we are confident that artists will return to their neglected role as leading explorers of inner space.

Foundation General Systems Ltd. September 1970

The Automatic, unmanned factory of 1984.

pair from (PA, PB, & PC) as basis for another system, but (Problem 3) how do we construct the fourth line so as to satisfy the requirement of the rotation ϒ ?

ARCHITECTURE. The Bulletin of Computer-Aided Architectural Design is now available on a subscription basis. Individuals: £0.50 or $2.00; organizations; £1.00 or $4.00. Send to Dr. T.W. Maver, Bulletin of CAAD, ABACUS, School of Architecture, University of Strathclyde, Glasgow, C.1. U.K. This continues to be a very useful publication. The editors request brief reports on work in progress; lists of papers; news of conferences, grants, hardware acquisitions, requests for help, and any other relevant contributions. Send to Nigel Cross, Design Systems, Faculty of Technology, Open University, Bletchley, Bucks, England. The following information is taken from the March 1971 number of the bulletin. The Department of Building Science at the University of Liverpool is to have a Computer Aided Design Centre which will be the first of its kind in the United Kingdom. The Centre, which is being supported by an award of £85,796 from the Science Research Council, will provide facilities for building designers on Merseyside and the North-West. It will open in June 1971. The centre will be unique in the U.K. in having a computer for use solely on architectural design work. The Centre will have close links with Liverpool Polytechnic and Leeds Polytechnic, and the computer will be linked to the Atlas computer at the Cambridge Computer Aided Design Centre. It is envisaged that the Centre will eventually have more than 50 students.

Two papers: The Impact of Computers on the Architectural Design Process, and Experiments in Predicting the Effects of Computer-Aided Design Systems, being a summary of research projects previously undertaken at UMIST, are available free from Nigel Cross (address above).

A post, initially for one year, is offered jointly by ABACUS and the Department of Computing Science at Strathclyde University. The appointee, who will have a wide computing background and special experience in graphics, will spend half his time in lectureship duties with the Computing Science Department and half on research on the use of graphics in architecture. Details and forms from the Registrar, University of Strathclyde, Glasgow, C.1.

A computer graphics laboratory is being formed at the Department of Design, Southern Illinois University. For information write to Robert Ashworth, Department of Design, Southern Illinois University, Carbondale, Illinois, 62901, U.S.A.

The University of Strathclyde has also received a grant of £11,500 from the Leverhulme Trust to finance the three year appointment of a System Analyst in the school of architecture.

The IEEE Computer Society has formed a new technical committee on computer architecture. The goal is to promote interest and research. For information write to: Prof. C.S. Flynn, Computer Science Department, The John Hopkins University, Baltimore, Maryland, 21218 U.S.A.

COMPUTER GRAPHICS. The Kunst Kontor Franzius is acting as agent for the Werkstatt-Edition Kroll for the sale of a series of five silk screen posters by George Nees. These were programmed on a Siemens-Anlage System 4004, and drawn on a Zuse-Graphomat. The format is 70x100, three of the prints are in single colour, one is in two colours, and one is in three colours. The price inclusive of postage is DM 39.80 per print. An attractive brochure showing all five prints is available free from: Kunst Kontor Franzius, 8 Munich 13, Adalbertstrasse 23-25 ruckgebaude. Germany. You might at the same time request the leaflet on analog and digital graphics by Herbert W. Franke. This has some detailed notes on the construction of these works, which include some of the first electronic graphics made with an oscilloscope in 1956. The prints are priced from MD 16.00 to DM 100,00. They are available in one or more colours, and in a signed edition. Price is inclusive of packing and postage. Order from address above. You might like to have the address of the printers of these works-maybe they would print your graphics. It is Josef Kroll, Siebdruckerei, 8 Munich 2, Nymphenburger Str.86, telefon 529525.

Below is a list of other suppliers of computer graphic prints and originals. They will send you publicity material on request.

MODERN-ART GALERIE, 1010 Vienna 1, Wipplingerstrasse 18. Austria. This gallery exhibited works by Otto Beckmann in the spring. Ask for their highly interesting illustrated brochure on the experimental group 'ars intermedia' of Vienna (in German).

Motif Editions, 58 Frith Street, London W.C.1. England.

K. Schroder Verlag KG, 3 Hannover, Plathnerstrasse 27, Germany.

Lloyd Sumner Computer Creations, Box 1842A, Charlottesville, Virginia 22903, U.S.A. Lloyd Sumner has produced a calendar for 1971. Size 14" x 21" white on a spectrum of colours, price including postage: $3.50.

Pentagon for Peace is the title of a **summer project in Denmark.** Taking place now till the autumn it consists of building, teaching and studying the arts of peace. People with experience of computers particularly welcome. You can either pay, or in a graded manner, work for your residence and keep. P.f.P. Hesbjerg 5573, Hoemstrup, Fyn, Denmark. (Near Odensee). Phone: 09-967505.

An urgent message to our American members. Hide your car on Saturday, 31 July. That's the day the Los Angeles Free Press has designated as a national day for sabotaging automobiles.

ROUNDUP

Katherine Nash known for her work on ART 1 is taking a sabbatical year starting September 1971. She plans to travel in Europe. You may like to meet her. Her address is: Professor Katherine Nash, University of Minnesota, Dept. of Studio Arts, 208 Art Building, Minneapolis, Minnesota 55455. USA.

Frau Dr.Marlies Gruterich, **documenta** Gm.b.H.35 Kassel, Kolnische Strasse, 5, Germany, asks all those working with computer art to send documentation. Dr. Gruterich is assistant to Dr. Harald Szeemann, the director of the next documenta which takes place at Kassel next year from 28 June-8 October.

Circus of computer-and related **films** will tour Europe in October/November 1971 is being organised on a generous budget by Society member Malcolm Le Grice. Potential contributors write to him at 48 Salisbury Road, Harrow, Middlesex, England.

A colourless ink turns black only when applied to specially treated surfaces. This is free-flowing ink which does not clog the pen. **Plotter maniacs** may want address: Frederick Post Company, Box 803, Chicago, Ill, USA. Specify 'Qantar'.

A second 'Almanach of Science and Technology' is being produced by Adrian Rogoz, who with twenty other is forming a club of quote **Rumanian cyberart** investigators. If this doesn't scare you, the address is A.R. Intrarea Antrenorilor 1, Bucaresti-Sectorul 1. Rumania.

Still behind the Iron Curtain-the **IFIP Congress** 23-28 August 1971 in Ljubljana, will be graced by the now customary (and possibly redundant? Ed.) display of computer churned out art, performances of computer music, showing of computer films.

CATALYST, often mentioned in the pages of PAGE, has fallen victim to the G.R.O.W.T.H. mania. The latest number to reach us consists of fifty-seven pages measuring 18x13½inches. Packed out with info on the art scene. Cheap at 50p for individuals, and £1 for organisations. Please add 25p for year's postage. This covers subscription for one year i.e. five issues. Subscribe now or else price goes spiralling up soon. Even if you live outside the United Kingdom, you can put your ideas, your plans and hopes and pictures on a sheet of paper measuring 8x6 inches, send them, and they will be printed pronto at no cost to the starving genius. Another address! Jos Tilson, Art Information Registry, 71 Stepney Green, London, East 1. England. 01-790 2406.

Really! You can't get away from the subject anywhere...Quote from Melody Maker, London, 22 May, 1971,p.12: 'It was revealed that the Pentagon, more or less as an exercise, had compiled information in **"data banks"** on radicals and possible "trouble makers". These included respected politicians, and *even more chilling* (our italics), rock stars like Arlo Guthrie and Joan Baez. Big Brother, 1984 and the Brave New World, march ever nearer. What can YOU do to beat the computer spies? (We take exception to this.Ed.) Don't fill in forms, don't volunteer information, boycott credit cards.'

Rabid revolutionaries recommend report of the **Finnish seminar on product and environmental design.** Full of bumpy illustrations. CHEAP at 12 pence incl.post from David Wild, 20 Chalcot Road, London N.W.1. Or try to get it *free* from ORNAMO, Teollisuustaiteen Litto, Unioninkatu 30, Helsinki 10. Finland.

Our spies tell us that **fibre optic wavelengths communication research** is hotting up all over, they are now saying (pardon-some more of these vulgar figures coming up) that one system could handle 100 million simultaneous 2-way telephone calls, plus 80% of bandwidth available for guard space, Picturephone and TV signals. Also coming along nicely are gas plasma displays called Digivu (Did she view?). Kollsmann Instrument Corp. Syosset, N.Y. is producing numerical display that relies on the light-absorbing effect of ceramic. Best place to follow these developments is Electronics, the American weekly. Also very stimulating is the Technical Page in the Financial Times.

Friends of the Earth, 8 King Street, London, W.C.2. 01-836 0718, are the people who have been assembling art lovers at the I.C.A. and got them to dump non-returnable bottles outside Schweppes'offices. Meanwhile action on a grander scale is being contemplated in the USA. An action filed in a court in New York seeks compensation for motor car pollution on behalf of all USA citizens. The sum claimed is a mere $675,000,000,000,000, or £280 billion. The Times, 25 May, 1971,p.19.

THE TRANSFORMATION PROGRAM

COLIN EMMETT

I first used a graph plotter at Time Sharing Ltd., London, to draw the images generated by this program. Once the program was working properly I was able to output the images onto a Tectronix storage tube display; from which the illustrations printed here were photographed. I am still working on the Fortran version which will output the images onto magnetic tapes to be run on a Stromberg-Carlson 4020 microfilm plotter at the Atlas Company Laboratory at Chilton, from which an animated film of these transformations will be easily produced.

This program is a model of a world where everything is equivalent to everything else; it will transform any line drawing into any other. Time here is a series of discrete steps, each section of time having its own image, which is drawn onto a frame of 16mm film, so that it can be projected as a normal film. All objects in this world are collections of straight lines, or vectors, which are drawn sequentially by the graph-plotter, using two types of line, visible ones with the pen down, and invisible ones with the pen up. (In the case of the microfilm plotter, the invisible lines are just ignored, and it goes onto the beginning of the next line.)

Having defined this rather limited world, we see that each drawing is very similar, being a sequence of two types of vector. The only difference is that one drawing may have more or less of each type than the other. The program I have been involved in developing has three different strategies for equalising the number of points in the two drawings to be transformed. The idea is that the different solutions arrived at can be compared and judged according to whether they look right or not.

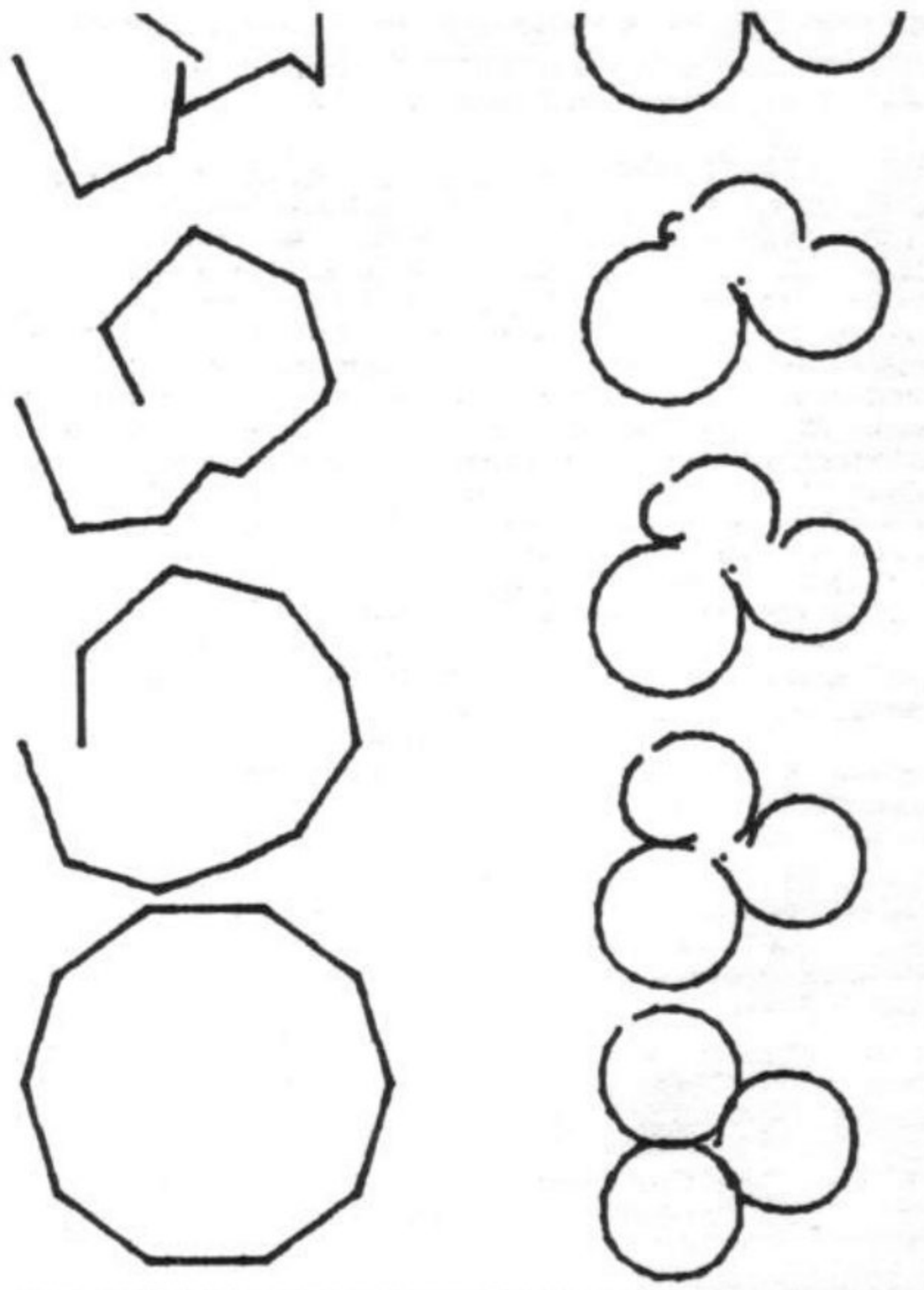
The first method implemented was called MAPPER. This method sees two strings of vectors, which are shape 1, the start, and shape 2, the goal. It takes the larger string and calls it BIG, and the other is SMALL. Now supposing BIG has 300 drawn vectors, and SMALL 230, in order to relate BIG to SMALL we need another 70 vectors in SMALL. So we divide the first 70 vectors in SMALL by 2. If BIG was 500 we would divide the first 30 vectors in SMALL by 3, and the remaining 200 by 2. But what about the undrawn vectors which we have ignored so far? These can be anywhere in the sequence, so each time one turns up, the point counters in the other shape are advanced so as to provide a line of zero length to correspond to it. We now have two new arrays which look exactly like the old objects when drawn, but which have an equal number of points.

The second method implemented is called GANGER. This differs from MAPPER in that instead of dividing up the vectors, it adds drawn vectors of zero length between the vectors of the smaller shape, in the same proportions as in MAPPER.

As can be appreciated, these two methods impose their own characteristics on the intermediate stages by dividing up the vectors in such an arbitrary and insensitive way, but it does provide some interesting solutions, when unexpected things happen. All the word transformations were done with MAPPER, hence the rather illogical correspondences introduced in some of the examples. There has not yet been time to do any good comparisons of these methods though. To avoid the tendency these methods have to dominate the transformation with their own character, the third method called SHADOW was implemented.

SHADOW works from a quite different point of view. Rather than taking the inequality in number of points into account, it takes the inequality of the drawings themselves. The physical length of the vector strings in the start and goal drawings are computed, and they are then projected onto each other to give two new collections of vectors with a total of shape 1 + shape 2 vectors in each. Each vector has an effect in proportion to its length relative to the overall size of the drawing. Undrawn vectors are ignored when computing the lengths, but are corresponded with zero length vectors in the opposite shape, as in the other methods. This method is much more sensitive to the qualities of the drawings themselves, but takes twice the amount of computer time.

Once the correspondence has been established, the difference between each point on one shape and on the other is calculated for the two co-ordinates (or three co-ordinates). The generation of the intermediary stages in the transformation is a trivial



matter of taking the number of stages required and adding this fraction of the difference to the co-ordinates of each point on the start shape until the goal is reached.

Two things decided on in advance have a strong effect on the intermediary drawings; the first is the sequence of the vectors, and the second is the overall orientation of the start to the goal. If, for instance, the points in one are numbered from the bottom and going systematically anti-clockwise, and the other starting at the top and going clockwise, then the intermediary drawings will turn inside out as they progress from start to goal.

In the TELCOMP version of this program the operator sits at a teletype and is presented with simple sets of alternatives to help describe shapes and choose options, so it is usable by people unfamiliar with the program or programing . It can be used as a way of building up linear figures by starting with simple drawings and then using intermediary stages as original drawings, and so on. The drawings can be rotated relative to each other and the numbering of the points altered to provide the inside-out effect, or to avoid it. Subroutines for generating circles and polygons are also included.

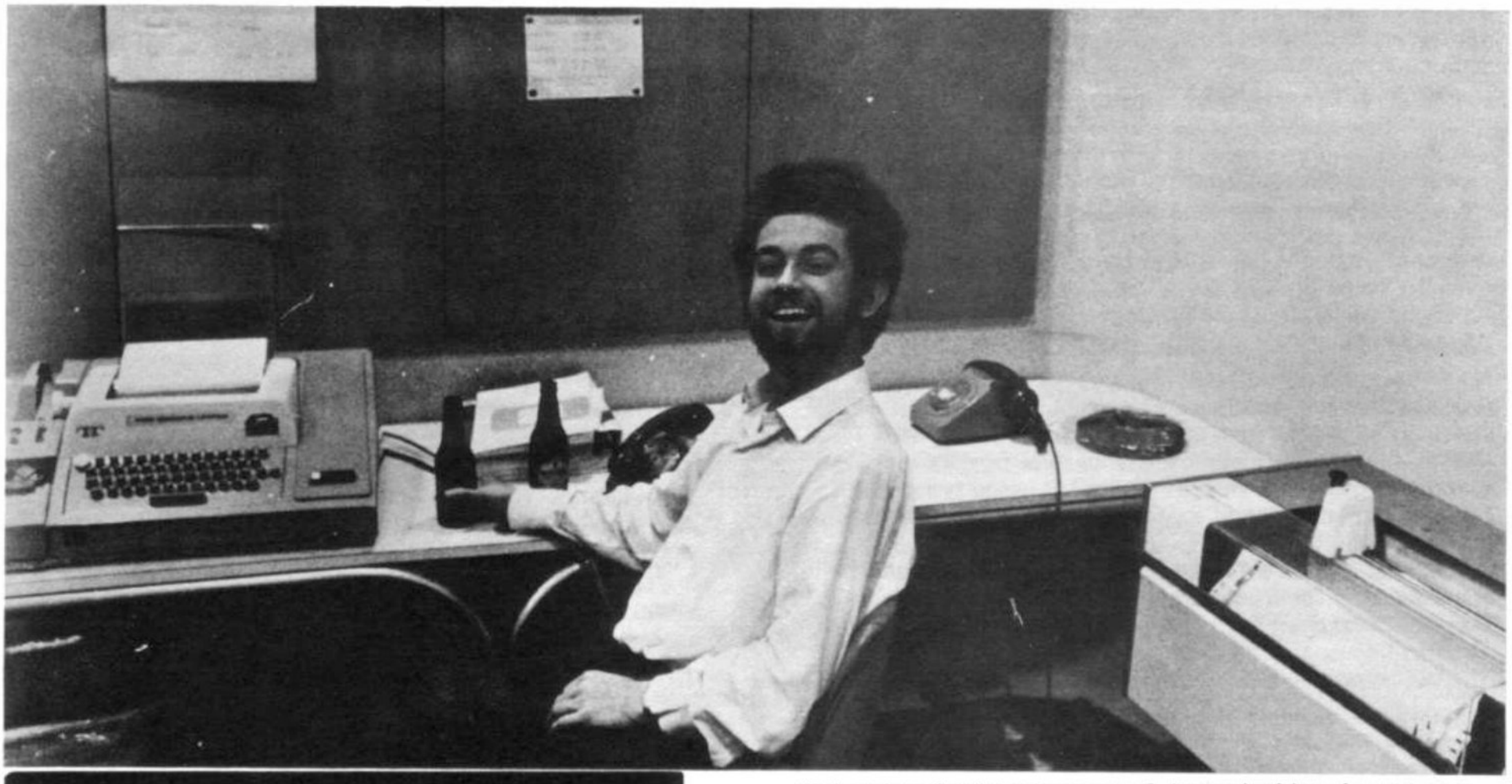
The FORTRAN version is being re-designed to suit the more remote contact of punched-card input and S.C.4020 output, but will be able to operate on a larger scale due to the increased speed. The SCRIPT routine, which provided the letters, is being extended to provide a fairly naturalistic handwriting as well.

This program continues to expand very rapidly as new routines are thought of and old ones improved, so it is still very much alive. Only a few of the possibilities have been tried yet, due to lack of time up to present. This program has a lot to reveal.

AUTOBIOGRAPHY RE COMPUTERS

I was born in 1950, while my parents were stationed in Austria, my father being in the British Army. I spent the next seven years, until he retired, in four countries, moving from Austria to Hong Kong then to Norway and finally Germany, each move being interspersed with a short stay in England. I then went to boarding school, firstly in Otford, Kent, then in Woodbridge, Suffolk, and finally took my A levels at Kettering technical college,Northamptonshire.I went to Loughborough college of Art to do my Foundation Course, and was then accepted by St. Martin's College of Art to do a Diploma course in Fine Art, where I am now in my final year.

My interest in programming computers developed directly from the scripts I made, to notate the complex simultaneous movements occuring in the animated films, I was making, at the end of the first year at St. Martin's These films were



designed to simulate the types of change I wish to incorporate into Kinetic structures. Although three four-minute, 8mm, films were made, the scores themselves turned out to be far more valuable, because of the detailed frame by frame break-down of movement, which was then easy to think of in terms of increments in 'DO' loops and subroutines. My first 'contact' with the computer was during a weekend programming course, organised by the C.A.S. at Time Sharing Ltd. in November '69. Since then various programs have been developed, some for animated film, a couple of text generators, and one for audience participation which I am still developing, as well as using the calculating power of the computer to help with three-dimensional geometry and the detailed dimensions of geodesic structures. The merge program is the most recent effort and is described here. Then there is the 'Learning Maze' which was dreamed up during the C.A.S.'s brainstorming sessions for the Computer '70 theme exhibit; this was a labyrinth of cylindrical rooms, each about nine foot in diameter, entered via three, three-sided, doors pivoted about their centre points. Decisions on which of the two or three doors to enter or leave would be made from information displayed on the doors. The circular structure of the rooms give no direction clues, so it would be very easy to find ones self going in circles. I had hoped to be able to incorporate the computer into the structure so that it controlled the locking and unlocking of the doors, using response made by the participants in their rooms to guide it. A reel of thread wouldn't help you get out of this little maze.

The future looks favourable in that I have a place at the Royal College of Art, to do a two year course leading to a Master's Degree by Project, in the school of Graphic Design. Two or three students are taken, over and above the normal course intake each year, to do a project related to the work of one of the existing research groups within the school of Graphics, though the choice of subject need not be restricted to the areas covered by these groups. I intend to look into the potential for computer graphics as an aid to the imagination and creativity. I am interested in how our perceptions arrange things into classes of same and different, because we often do it in a rather illogical way, and it occurs to me that the computer could be used to make use of the way that two experts disagree in their interpretations of the same thing. To be able to reliably generate images which would cause a different reaction from each 'expert' would provide a direct way of relating those experts to each other. Something like this would not require prior classification of individuals; as each person developed their ideas, so their reactions would tend to change, and this would be easily recognised.

I am going to the U.S.A. for three months this summer, during which time I hope to meet as many of the members of the C.A.S. over there as possible, with a view to exchanging ideas and getting a feeling as to where things might be going, before returning to start on the project at the Royal College of Art.

QUESTIONS FOR A 'PROPER MATHEMATICIAN'

MICHAEL THOMPSON

Introduction

In PAGE 14, Timothy Drever presented [1] an interesting mathematical study of the superimposition of three plane waves all travelling in the same plane with directions 120° apart. This note is concerned with his stated reasons for publishing which are, firstly, that he 'became interested in the mathematics of the situation; this is another approach to comprehending it as a structure'. Secondly, he wants to know what 'a proper mathematician' could find out about 'the strange properties of this function.' Lastly, he would like to see the system visualized using a wave tank or a computer graphic display.

His article contains a considerable analysis of the ***physical structure,*** that is it describes a series of objects we might make. Although Timothy Drever is extremely interested in how individuals or groups might experience these objects, it is clear that the mathematical analysis cannot tell us much about this. Certainly, a description of such an experience would be very different from the description of the structure itself. Now a 'proper mathematician' might well be able to tell us more about the physical structure, but if asked to describe the experiences resulting from it he would probably regard Timothy Drever as a more competent person than himself. The mathematician has not been set the right problem.

A well known example of another wrong problem occurs in the work of A. Michael Noll, who hoped [2] that 'computer generated hyperobjects might result in some 'feeling' or insight for the visualization of a fourth spatial dimension? Unfortunately, he had to report that 'this did not happen, and we are still puzzled as the inhabitants of Flatland in attempting to visualize higher spatial dimension'. The problem here was that Noll hoped that a physically exact description (in fact a plane projection) could help us with a visual problem.

Physical problems and visual problems are quite distinct, and today, solutions using computers are normally only available for the physical. Most computer art programs do not solve visual problems, but merely visualize physical structures. Any success is based on the fact that most material that is 'expressive' visually must also have a physical description, and if by chance or intention we have once generated it by computer, then we can record the parameters that produced this success and use them later. This can be done in a very sophisticated manner, for example, the Sound-Light Program of Peter Struycken [3]. This has a set of purely physical structures containing no reference to our visual experience, which nevertheless when superimposed in various ways become a source of visual material of suprising richness. Struykens has learnt by experience which parameters can produce an expressive output.

I now wish to present an approach quite different from most computer art work. Stated very briefly, it is to have the computer deal directly with the visual problem, which is represented by a model of a Visual Process [4]. The input parameters will then be in visual, rather than in physical terms, and when the artist studies the output to decide on the next run, he will not have to reformulate his visual problems in terms of physical structure to choose parameters for input.

I know of no examples [5] of programs written with this intent, and can here only present a proposal for one. This proposal is intended to be the kind of problem statement that an artist with some mathematics could well present to Timothy Drever's 'proper mathematician'

A visual process: Looking at four lines.

As only four lines have to be drawn we are not likely to waste much time over output problems. The ***physical stucture*** is easily formulated:

1. Select four angles at random between 0° and 360° (assume that 0° is the vertical).
2. Select four lengths at random with given mean and standard deviation (which could be in the input).
3. Print this out as a Table, and/or graph it with all the lines emerging from a single point.

The result of such a program is a physical object of great simplicity (Fig 1 and 2 with one line of zero length in Figure 1), but this object is only physically simple, and visually it is extremely complex.

The Visual Process described here is not a scientific fact, but must be regarded solely as a basis for program specification. Someone with a knowledge of perception may well be able to suggest other Visual Processes. This process is a model for perception of right angle systems such as those in Figures 3a and 3b which describe ways of seeing Figure 1, and a part of Figure 2.

In Figure 4, the three heavy lines AP, BP, and CP form the picture itself, and 0 is the observers eye. A Visual Process will now be suggested:

> The observer's perceives the point P to remain at P
> but the point A to be at A' on AO
> " " " B " " " B' " BO
> " " " C " " " C' " CO.
> The three lines A'P, B'P, and C'P are all at right angles to each other and if this is not possible then the illusion is absent.

The role of the computer depends on this model, for one could specify some property of the right angle system (PA', PB', PC') and have the computer generate one or more pictures possessing this property, or alternatively inform us that such a course of action was not possible with our chosen Visual Process.

Say the property in question was 'orientation', which might be defined as the direction in space of the interior diagonal of cube with three edges laying on A'P, B'P, and C'P. The program would then have to generate pictures all having the 'orientation' requested in the input.

Such material is not very expressive, but the fourth line can add a great deal (Figure 2). We now have two more perceived right angle systems which present some visual conflict, for the eye cannot easily fit the new line into the systems perceived without it (Figure 1). The result is that the observer's mind switches back and forth. The computer might deal with this if we could propose some way of adding the phenomena to our Visual Process.

Propose that the angle between systems is relevant, and this angle be the rotation necessary to make the first system parallel to the second. The program now has two inputs, the orientation of the first system, and the rotation between it and the second system. More detail is given in note [6].

The question: 'do these angles exist in our minds when we look at the picture?' may best be left to science; for the artist it is sufficient to produce visual experiences to order, We will not know if this can be done for the Four Line Problem, until somebody proves the relevent theorems, and on this basis writes the program.

1. DREVER, Timothy 'Field Work 3: A Structured Arena' in PAGE 14 Bulletin of the Computer Arts Society. Feb.1971.
2. NOLL, A. Michael, 'A Computer Technique for Displaying n-Dimensional Hyperobjects'. C.A.C.M. Vol.10 No.8 August 1967.
3. STRUYCKEN, Peter. "Geluid-kijken" (three audio-visual projects) Stedelijk Museum Amsterdam. Catalogue No. 498. March 1971.
4. I acknowledge that 'Visual Process' is not defined in this article, however it is central to my work, and the subject of an article under preparation.
5. Generators of visual material based on information theory might be suggested, but I reject this on the grounds that the theory has a purely physical and statistical basis, and the human element must appear in my approach. I doubt that artists feel awareness of information theory processes in their vision, but if they do then clearly they are justified in calling it a Visual Process, and using such a generator.
6. Let ***orientation*** be specified as (α, β) where α is an angle in the plane of the picture measured clockwise with 0°, the vertical, and β is in a plane vertical and at right angles to the picture. Given (α, β) generate two lines PA, & PB on the picture surface using purely 'physical structure' techniques (see texts). ***Problem 1;*** How do we select PA' & PB'? After this, construct a line at right angles to the plane PA'B', and project this line PC' onto the picture surface as PC.

   Let ***rotation*** (γ) be in any direction from the orientation (α, β) ***Problem 2.*** Which directions are feasible? Try each

COMPUTER ARTS SOCIETY NEWS

The Society now has its own premises at last. There will be an office and computing equipment. The accomodation consists of two rooms on the second floor of this very large complex of artists studios run by S.P.A.C.E. The address is: The Dairy, 13a Prince of Wales Crescent, London N.W.1. Nearest tubes, Chalk Farm and Kentish Town. (Note: do not send correspondence to this address.)

Stonehenge and other Machines. A day trip into the past. Sunday 20 June 1971. Coach leaves 50/51 Russell Square, London, W.C.1. at 10.30am; Odeon, Hammersmith Broadway, 11am; The Station, Bagshot, Surrey at 11.45 am. Return to London about 10pm. Members 70p, guests £1, students half price, children under ten free.

An Italian Computer Arts Society is being formed-ICAS. Interested person should contact Alessandro Martini, 12 Raimondo da Capua, 00153. Roma. Italy.

The final session of a programming course takes place 18-19 June at Honeywell-Bull, Brouwerstraat 4, Amersfoort, Holland. Contact CASH-address below.

Dr. Richard I.Land of Harvard University attended the Society meeting in London on 5 May, and gave an instructive illustrated summary of some work taking place at Harvard on full-colour 3-D interactive graphics.

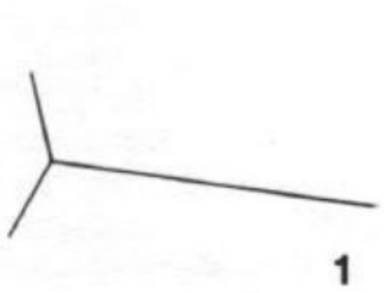
AIMS AND MEMBERSHIP

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 £1 or $3 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 £1 or $3 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.

COMPUTER ARTS SOCIETY ADDRESSES

Chairman: Alan Sutcliffe, ICL, Brandon House, Broadway, Bracknell, Berkshire.
Secretary: John Lansdown, 50/51 Russell Square, London WC1.
Editor of PAGE: Gustav Metzger, BM/Box 151, London WC1.
Dutch Branch (CASH): Leo Geurts and Lambert Meertens. Mathematisch Centrum, Tweede Boerhaavestraat 49, Amsterdam, Holland.



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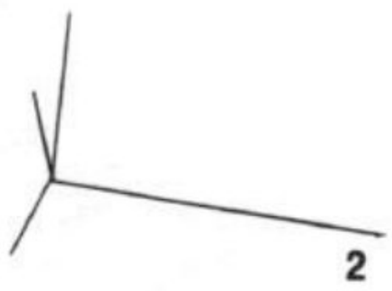
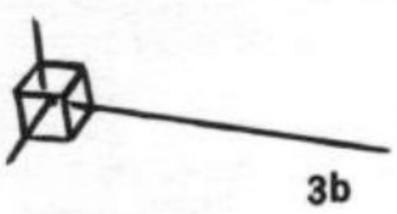
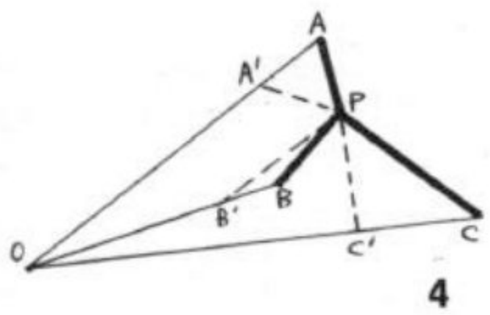


2

3a



3b



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Thompson article ends top of p.3.

CONFERENCES EXHIBITIONS

Manfred Mohr Computer Graphics. 11 May-11 June.A-R-C Musee d'Art Moderne de la Ville de Paris **France.**

Kunstler-Theorie-Werk. Stadtische Kunsthalle, Nurnberg, **Germany. Till 1.August, 1971. This exhibition includes a section on computer art.**

Rutherford Centennial Symposium: The Structure of Matter. 7-9 July, 1971. Christchurch. Contact: B.C.Wybourne, Dept. of Physics, University of Canterbury, Christchurch, **New Zealand.**

SPNM Composers Week-end. 10-13 July 1971. Goldsmiths College, London, **S.W.7. Contact: SPNM 29, Exhibition Road, London S.W.7.**

1971 National Conference of the ACM. Chicago **3-5 August. ACM 1133 Avenue of the Americas, New York, 10036. U.S.A.**

Counter-Conference, Boulder, **Colorado, 3-5 August, 1971. Contact: David Burmaster 545 Technology Square, Cambridge, Mass, 023139. U.S.A. These two meetings will mark a climax in the campaign for social responsibility in the computer profession. Their repercussions will be felt for years to come.**

International Joint Conference on Artificial Intelligence.1-3 September, Imperial College, London. **Contact: British Computer Society, 29 Portland Place, London W.1.**

Design Participation Conference, 5-8 September 1971, UMIST. Manchester. **Anyone may attend this conference. There will be some high-powered speakers including the American champion Ralph Nader. Organised by Design Research Society. Contact: Design Research Laboratory, UMIST, PO Box 88, Manchester M60 1QD.U.K.**

Systemotechnika 6-17 September, 1971. Leningrad, **Russia. International exhibition with attached symposia.**

Conference on Displays (IEE). University of Loughborough, **England. September 7-10, September, 1971. Contact: IEE, Savoy Place, London, W.C.2. England.**

Vacation School on Lasers, their Control and Applications. London. **13-24, September, 1971. Contact: Secretary, Dept. of Electrical and Electronic Engineering, The City University, St. John Street, London, E.C.1.**

Computer Peripheral Exhibition and Conference, COMPEC, Seymour Hall, London, **28-30 September, 1971. Trident Conferences and Exhibitions Ltd. 14 Queen Anne Terrace, Plymouth.**

20-22 October, 1971.
Computer Graphics Symposium, West Berlin. **Sponsored by Gesellschaft fur Informatik. Contact: Prof. Dr.-Ing.W.Giloi, Lehrstuhl und Institut fur Informationsverarbeitung, W.Berlin, Germany.**

Conference on Computer-Aided Design. 25-28 April, 1972. University of Southampton. **Contact: IEE, Savoy Place, London, W.C.2.**

A sequel to the highly attended Computer Graphics 70 Symposium is being prepared with the title ONLINE 72. ONLINE 72, Brunel University, Uxbridge, **Middlesex. England.**

FORMULATION OF PLAD 1: A PROGRAMMING LANGUAGE FOR ART AND DESIGN

I am in the process of designing PLAD 1. I would greatly appreciate help with ideas for the facilities, philosophy and structure to be built into this High Level, problem-oriented language for artists. The compiler is to be written this year, and a first version will be completed by the summer of 1972. Thus there is a need to define the basic structure very soon. The desirable properties proposed so far are: machine independence; independence of architecture as well as configuration; easily and consistently extensible; context-free syntax and self documentating-but not as verbose as COBOL. It is proposed to write the compiler in standard FORTRAN IV and to use a revised ART 1 as the target code. The first version will contain at least all the features now found in ART 1, with additional flexibility gained from a free format source coding. I would like to receive comments and suggestions from readers, especially from artists, concerning the facilities that should be available from such a language. An early response would be appreciated.

Roger P.Saunders, 29 Hazeldene Drive, Pinner, HA5 3NJ, Middlesex, England.

'ars intermedia'

This is one of the most interesting groups working in the field of computer art. It is an experimental group concerned with theoretical and phenomenological investigations. Their first work in this direction began in 1965 with abstract films in polarised light. Following contacts with the Technischen Hochschule, Vienna, Institut fur Niederfrequenztechnik and the Deutschen Rechenzentrum, Darmstadt, they produced computer graphics and programmed text montages.

In 1968 Oskar Beckmann started work on a computer that is specifically meant for artistsic tasks; the computer was completed in the beginning of 1970. The current work programme of the group includes: computer graphics, computer film and music, the design of computer sculpture, investigations into imaginary architecture, and programmed laser graphics and laser films. At the same time system theoretical research and actual production of artistic objects is taking place in all these fields.

There are at present five regular collaborators in the group: Professor Otto Beckmann, born 1908 in Wladiwostok, now living in Vienna, works as artist, is the director and founder of 'ars intermedia'. Dipl.-Ing.Alfred Grassl, born 1941 in Vienna. Has worked as assistant in the Institut fur Niederfrequenz-technik, TH Vienna,,and now works in the computer centre of the Austrian railways.

Dipl.-Ing.Gerd Koepf, born 1942 in Innsbruck. Assistant in the Institut fur Hochfrequenztechnik, TH Vienna (laser group).

Dipl.-Ing. Oskar Beckmann, born 1942 in Vienna, lives in the Vienna suburb of St. Polten. Leader of a development group in the firm Siemens (NTW). Gerhard Schedl, born 1941 in Vienna. Photographer.

This is the present state of the group's work; some of their studies have not as yet been published. A 'picture-sound-identical' (Bild-Ton-identischer) computer film made in 1970 and shown for the first time on Austrian TV in August 1970. The title 'Bild-Ton-identischer Computerfilm' (BTC) describes a film, where picture and sound is controlled by a computer program, where both picture and sound is determined through a logical transformation. Further investigations deal with the systematic treatment of the 'picture-sound' transformations, and a study with the working title 'sound-figures'.

In the course of the study 'Imaginary Architecture' a film is now being made dealing wth variation problems of fictitious architectural systems of a lower order, and pointing to the possibilities opened up by the new theory. About 200 single pictures and graphics are being produced in connection with this work. A film 'Configurations in Laser Light' has been completed, which uses coded cards in a new manner. The time-dependent program information is output by the computer in transparent cards according to a special procedure.

The group has worked on problems of computer sculpture for some time. Several methods have been developed, and from these, life size coloured sculptures have been realized. The most recent works have led to the method of the 'correlated program' which leads to the simultaneous output of ground-plan, section and side view of a three-dimensional object.

Owing to the specific structure of 'ars intermedia' it has been possible to achieve a particularly close and fruitful contact and dialogue between artists, architects, musicians, film experts and technical scientists. A central point of the work is the synthesis between theory and possibilities of communication techniques and information theory on the one hand, and artistic aspects on the other.

'ars intermedia' has its own computer since 1970. The analogue-digital installation 'a.1.70' (shown on Austrian TV in August 1970) has been specially developed by the group, who have constructed it in a two-year period. The installation incorporates a series of special peripherals for film, music and optical coding. By means of the partially analogue peripherals it is possible to enter directly into the running program, and thus to approximate to a cybernetic model of the creative process.

The group's determination to have its own computer installation relates to an understanding that the typical computer installation is not ideal for artistic work, as well as for a need for independence. Work on an enlarged installation started in the autumn of 1970.

'ars intermedia' finds that having its own computer makes the group's aims and working manner largely independent regards material influence and intellectual tutelage of established firms or institutions.

An illustrated brochure (in German) on 'ars intermedia' can be obtained from: MODERN-ART GALERIE, 1010 Vienna, 1, Wipplingerstrasse, 18. Austria.

Professor David Bohm and the artist Margaret Benyon discuss holography and lasers at ICA, London, 1st July 1971, at 8 p.m.

COMPUTER ANIMATION: a one-day Symposium, 30th July, 1971 at Didcot. Send fee of £8 (incl. meals) before 30th June to: Sec. Atlas Computer Laboratory, Chilton, Didcot, Berks. England.

Deadline for 9th Annual Computer Art Contest sponsored by Computers and Automation is 2 July. The entries will be published in the August issue of the magazine. Address to Editor, Computers and Automation. 815, Washington Street, Newtonville, Mass, 02160, USA.

ALGORITHMS PROCEDURES AND TECHNIQUES

In future issues of PAGE John Lansdown will present details of algorithms, procedures and techniques useful for computer artists. A great amount of ingenuity and creative work goes into algorithms and procedures for computer art programs, and it would be most helpful if more of this work could be made available to members. Readers are therefore asked to send contributions for this feature of PAGE direct to John Lansdown. There will be no restriction on languages or method of presentation. Readers are requested to keep to the more widely used languages, or to use flow charts wherever possible. Of particular interest would be algorithms which use methods other than randomness for producing patterns.

UNITED STATES. During the summer Mr. Jeffrey Raskin, Assistant Professor of Visual Arts, and Director of the Visual Arts Computing Center at the University of California at San Diego, is offering to give, at a number of locations, a series of one week seminars in computer programming in the Arts and Humanities. Participants at these seminars will engage in an intensive study of computer programming as it applies to their own work. This seminar will be valuable both to people who wish to learn to use the computer in humanistic applications, and to those interested in methods of teaching computer programming to any non-technically oriented group.

Mr. Raskin has been teaching programming to artists and humanists since 1968 and has developed a teaching language called Flow. This language will be implemented prior to each seminar on whatever system is available. Time sharing service leasing can be arranged if there is no computer facility at the site. The participants will learn how to program in Flow and then in a major programming language. Flow and its documentation may be retained at the host institution after the seminar without cost.

Interested institutions should write to: Jeffrey Raskin, Visual Arts Computing Center, UCSD, La Jolla, CA. 92037 for full details.

ABOUT THIS ISSUE. Michael Thompson is one of the early members of the Computer Art Society. Last autumn he moved to Israel from London with his Israeli wife and child. In sending his article to PAGE in April he writes: 'I'm still unemployed (largely because I want to live in Jerusalem, which hasn't much to offer in the way of industry) and so have spent quite a lot of time on Computer Art Theory. I have an article, almost 6,000 words at present, which seeks to put visual problems directly into the computer program by clearly defining the difference between the visual problem and the physical problem (we don't 'see' what is drawn, we see what we 'think we see' i.e. what we perceive). Computers must work on *perceived* problems; at present they don't.' If you have any comments on M.Thompson's article you might like to write to him: his address is; c/o Masny, 15 Rechov Beitar, Talpiot, Jerusalem. Israel.

We have great pleasure in introducing the ideas of Colin Emmett. You may want to communicate with him. His address is: 56 Claverton Street, London S.W.1. 01-828 4476.

The cover illustrations. The top illustration is from one of the most fascinating and important articles on the relations of computer and society ever published; we strongly urge readers to look this up. It is 'Crime Deterrent Transponder System' by J.A. Meyer, in IEEE Transactions on Aerospace and Electronic Systems, Vol.AES-7, No.1.January 1971, pp.2-22. The lower illustration is from The Sunday Times, London, 22 May, 1971. The adaptation stems from a poster issued in an edition of 50,000 by radical American artists last year showing babies killed in the Song-My massacre and captioned 'Q.And babies? A.And babies'.

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