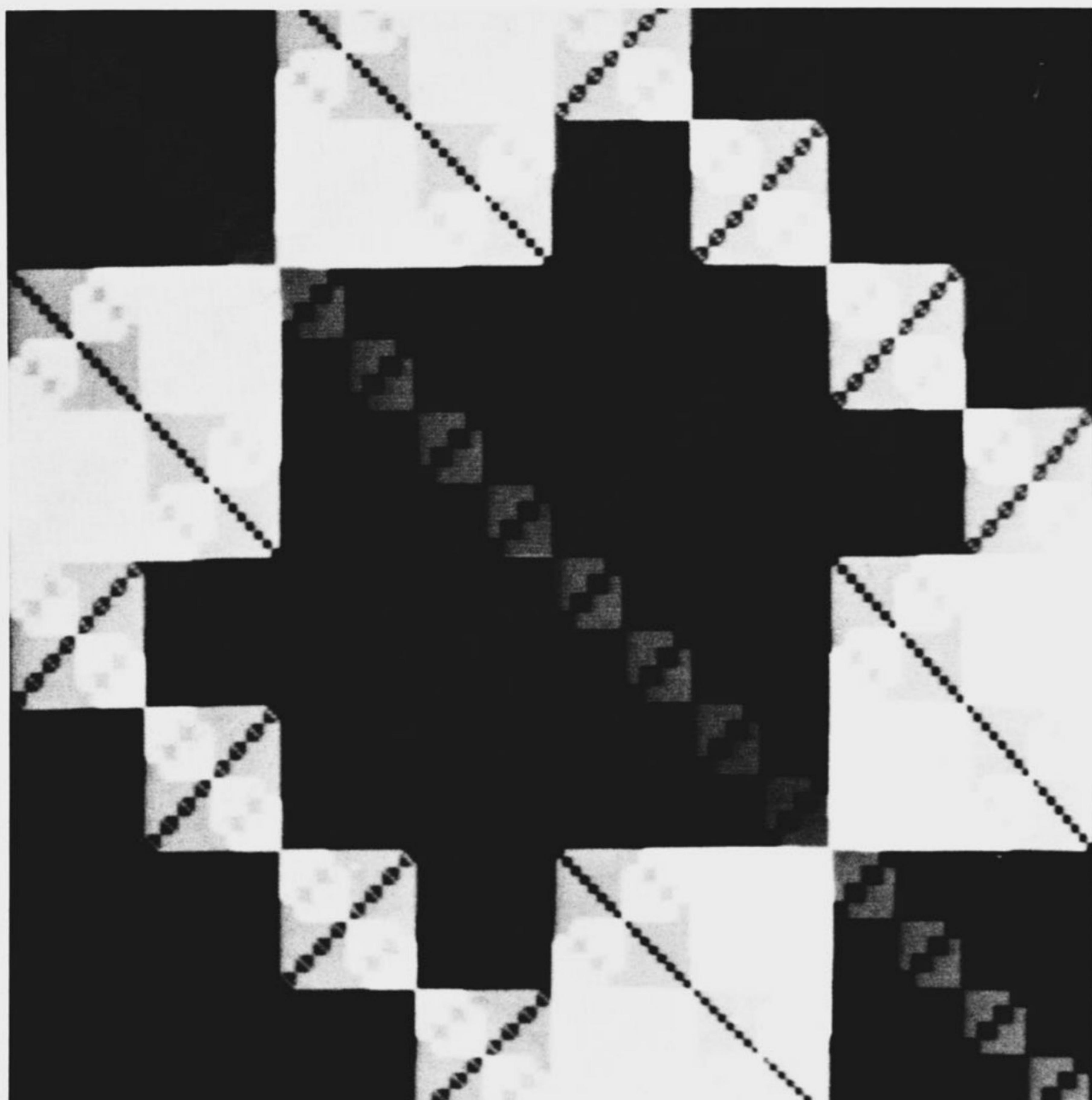


# PAGE48

COMPUTER ARTS SOCIETY QUARTERLY SUMMER 1981



HERBERT FRANKE: COMPUTER ART FROM DIBIAS

COMPUTER ARTS SOCIETY QUARTERLY

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PAGE provides an international forum for the exchange of information, views and theories relating to the creative use of computers in the Arts. Publication of articles does not imply that the views expressed by contributors are necessarily shared by the Editor, nor should they be taken to reflect the general policies of the Computer Arts Society Committee.



PAGE gratefully acknowledges financial assistance from the British Computer Society and the Arts Council of Great Britain.

## EDITORIAL

Readers of small print may have noticed that as from issue No. 47, PAGE now receives financial assistance from the Arts Council of Great Britain. The Arts Council is to be thanked not only for their financial support but also for the interest they have shown in PAGE. The Arts Council comes in for a good deal of criticism; a frequent accusation being a (supposed) tendency to support a small established minority in the art world. Their support of PAGE is evidence to the contrary. Although PAGE is now 13 years old, and has thus proved itself to have remarkable resilience as a small magazine, one is disturbed by the inability of computer-assisted visual art to establish its viability in the art world.

Computer art is still regarded with suspicion, derision or misunderstanding by the majority of artists, dealers, curators, critics and historians, and its public image is still synonymous with lissajous figures, banal pattern generation and insensitive colour. By comparison with the professional standards generally achieved in computer music, computer graphics is taking a painfully long time to transcend the

amateurism which prevailed in the early years. No doubt this situation has been largely generated and exacerbated by the nature of the institutions in which computer art has been fostered. From the pre-existing *milieu* of electronic music, computer music has been developed mainly within music institutions in an informed professional environment. In contrast, computer-assisted visual art was nurtured in institutes of science and technology, where contact with the traditions and values of Fine Art was slight, to say the least. The reluctance of British art schools to introduce computer graphics facilities into their departments of Art and Design both prolongs the agony and reflects a (too justifiable) scepticism of the merits of computer-assisted artistic production.

The situation is changing slowly, and perhaps PAGE has played some part, but it must be said that computer art will continue to be kept 'in its own ghetto' until it raises its artistic values and standards to the same level as that exhibited by the best 'manual' art. The progress that has been made is largely the progress of a small number of artists who are aware of the danger of, and have avoided, being seduced by the technology; maintaining their artistic values in the face of technological innovations which frequently seem to have a trivialising effect on the visual artifact and a stupifying effect on its creator. Unfortunately, even where work of high artistic merit is being produced, too little of it is reaching the Editor's desk. Nor are the issues pertinent to raising artistic standards being discussed in any depth.

If PAGE is to serve any significant purpose it must fulfill at least two functions; it must be an active forum for discussion and exchange of information at the level of professional engagement, and it must monitor the best and most important work being produced internationally. Until the Editor can afford to devote more time to the active solicitation of material, PAGE must continue to rely on the enthusiasm of those who take the initiative and trouble to submit material. If you are concerned with the creative use of computers for any kind of artistic production, you should care that an international forum exists to publish your work and air your views. Use it.

Dominic Boreham

●'Is it necessary from a (a) technological point of view, (b) sociological point of view, (c) political point of view, (d) aesthetical point of view, to make a difference between an artist and a computer artist? Is it necessary to keep computer art in its own ghetto any longer?'

Miljenko Horvat, 1974. Catalogue statement in: *International Computer Graphics*, Polytechnic of Central London/The Lucy Milton Gallery, London.

## THE EVOLUTION OF AN ARTISTIC TOOL: A MICROCOMPUTER GRAPHIC SYSTEM

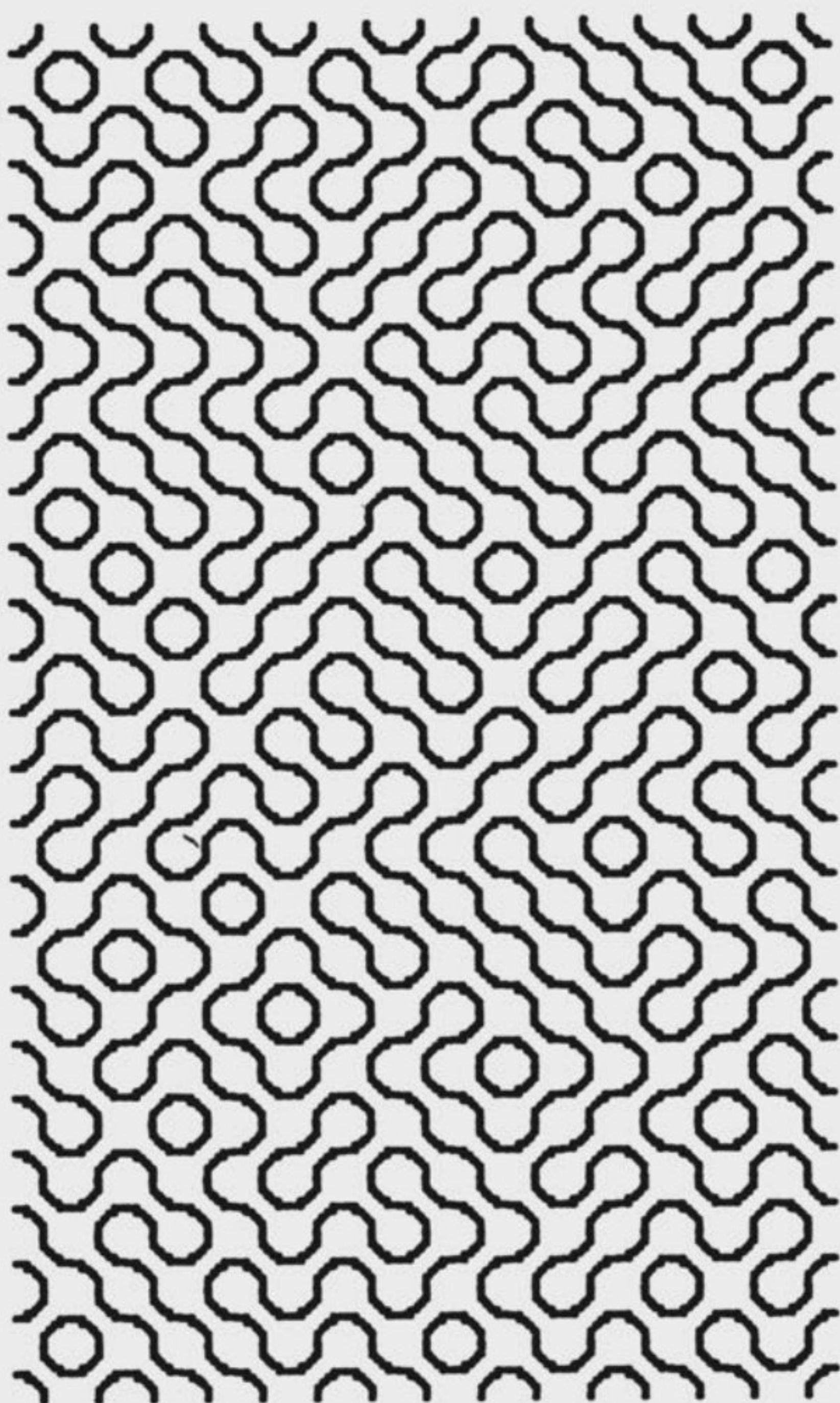
by William J. Kolomyjec\*

For many years computer artists have been using large computers with expensive peripheral devices as a medium for the generation of computer imagery. In the beginning, it was a matter of keypunching and submitting a program 'batch mode', then waiting. The wait took from two to twenty-four hours and it was most frustrating to then find that an error of some sort meant the whole process had to be repeated. John Whitney Sr. made the analogy in his film 'Experiments in Motion Graphics' of playing a piece of music on a piano and then having to wait several hours to hear the resultant sounds. At that time, in addition to tolerating the inconvenience of poor turnaround, the artist had first to solve the problem of how to gain access to a large computer system with the desired graphic peripheral devices.

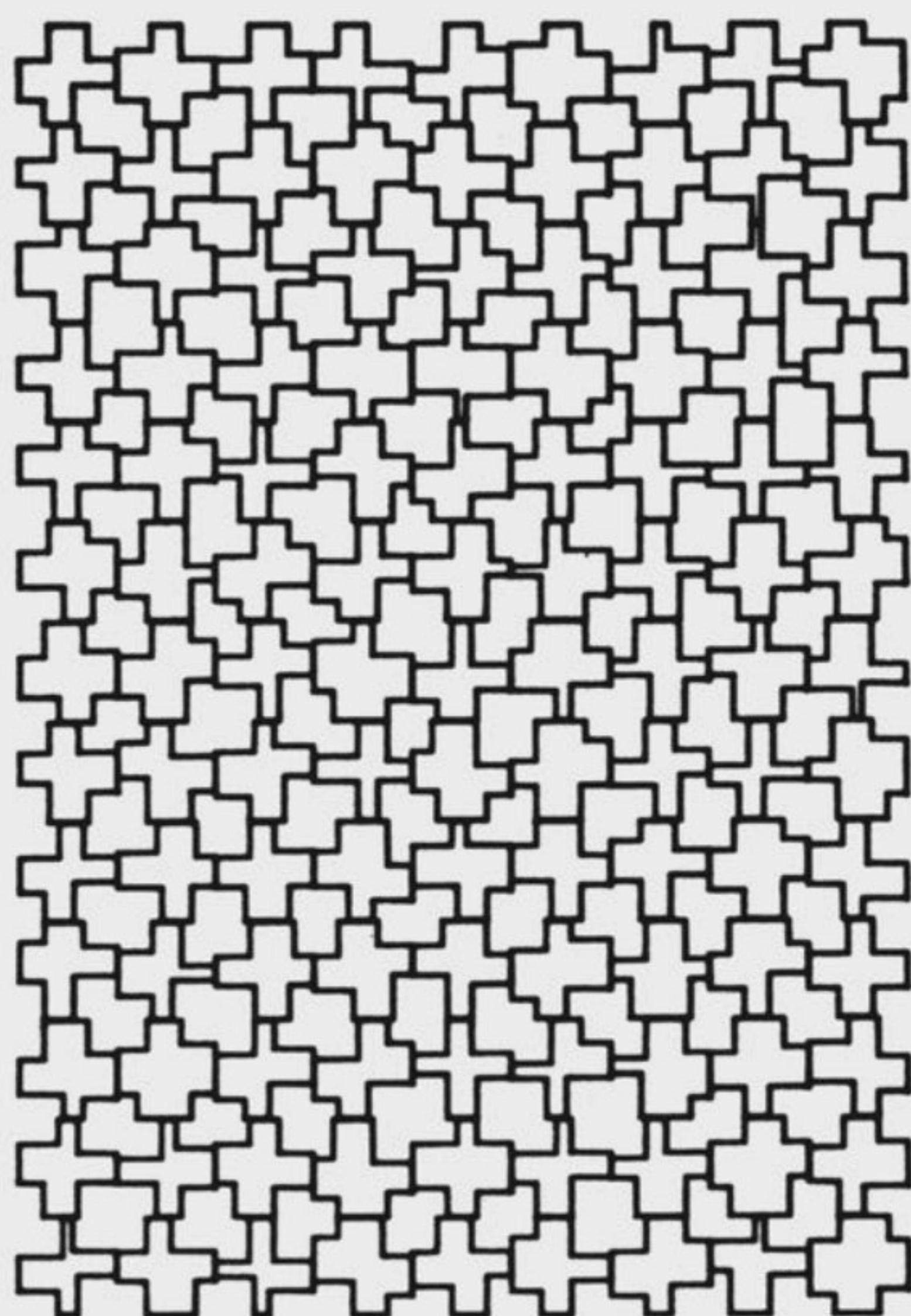
It is somewhat gratifying to know that in the last ten years there have been sufficient advances in technology and consumerism to have brought forth the personal computer. In addition to the advent of affordable microprocessors we are just now beginning to see affordable graphic peripheral devices. With these components, it is now possible to put together computer graphic systems of reasonable quality. What this means to the would-be computer artist is that it is now possible to have a computer system with graphic capabilities in the studio. Not only does this solve the availability and access problem, but it also puts the tool back into the hand of the artist and back into the environment of the studio.

By way of example, I submit the imagery accompanying this article to illustrate that such systems can produce drawings of reasonable quality. These illustrations were produced on the following system: Apple II with 48K RAM, disk drive, TV monitor, serial I/O peripheral card and Houston Instrument, X-Y

\* Artist working in the Department of Metallurgy Mechanics and materials Science, Michigan State University; living at: 560 Pacific Parkway, Lansing, MI 48910, U.S.A.



William Kolomyjec, Amoeba, 1980, 128 × 77 mm



William Kolomyjec, Chopped Square Tessellation, 1980, 133 × 92 mm

digital plotter. This whole system can be purchased for less than \$3,500.00. There are, of course, disadvantages to such a system. To mention a few: the capabilities of the processor are limited, i.e., it is rather slow compared to a large machine; program space is somewhat limited, and the plotter has a small bed size and produces a somewhat coarse line (0.005 step size). However, the advantages abound: it is all hands-on, although it is slow it is convenient, programs can be linked together so that size problems can be overcome, graphic programs can be proofed on the CRT before plotting, programs can be easily edited, and any paper, including fine art papers, can be used with the plotter.

Perhaps the most significant point yet to be made is that thanks to the recent evolution of computers and graphic peripherals, more people will begin to make use of this technology as a form of individual expression. Microprocessor graphic systems are within reach of those who desire to explore the realm of computer image generation. Certainly, the cost barrier has been breached.

It has been argued that the generation of images via a computer is somewhat of a lesser art form than the use of traditional techniques because the hand is removed from the creative process. This is of course absurd. All artists must be competent to handle their chosen medium. Just as one does not attain credible status as a painter without knowledge and proficiency with a paint brush, one cannot be a computer graphic artist without knowledge and proficiency with the graphic system. The rub, as it were, is in the comparison between a paint brush and a graphic system. In the traditional media (painting, printmaking, etc.) the creative process may be formulated in a very simple way as a transition from the concept (the mind), through a technique (the craft or hand), to the final image (the statement). The discipline of the computer artist, if anything, expands this process of mind-hand-statement to include the knowledge and use of technology. Somewhere between the mind and the hand must be an understanding of how to program, or more importantly, how to write a program to produce a desired image.

In most cases, the kind of microprocessor graphic system described above is provided with software which incorporates the rudiments for generating graphic imagery. Hopefully, we can now begin to direct more of our efforts towards the larger concerns of aesthetics and algorithmic techniques of aesthetic image generation.

# COMPUTER ART FROM DIBIAS

by Herbert W. Franke\*

Recently I have had the opportunity to collaborate with some of the people at DFVLR (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt. German Aerospace Research Establishment). The DFVLR is the largest engineering sciences research establishment in the Federal Republic of Germany. Its research centres are located in Braunschweig, Göttingen, Köln-Porz, Stuttgart, and Oberpfaffenhofen near München. The establishment is primarily supported by public funds.

## The DFVLR remote sensing activities

With the concentration of remote sensing activities in the research centre at Oberpfaffenhofen, the DFVLR takes into account the increasing demand for improved information about state and changes of our natural environment. The following fields with relation to remote sensing are covered:

- Data acquisition.
- Ground truth measurements.
- Data preprocessing and data management.
- Research oriented digital image processing.
- Application of these technologies to the problems of different earth sciences and user groups.

The problem of obtaining optimum graphic output from a computer system is connected with the techniques of image processing, which in turn involve aspects of aesthetic visualisation. So it is not surprising that there is a great interest at DFVLR in the creation of computer art.

## The Design of the System

The basic DIBIAS system was developed by Dr. Ernst E. Triendl, the leader of the computer group of the Department of Communication in the DFVLR. The general approach for the design of the system (Fig. 1) was to provide an experimental, research oriented image processing system. A very short period of

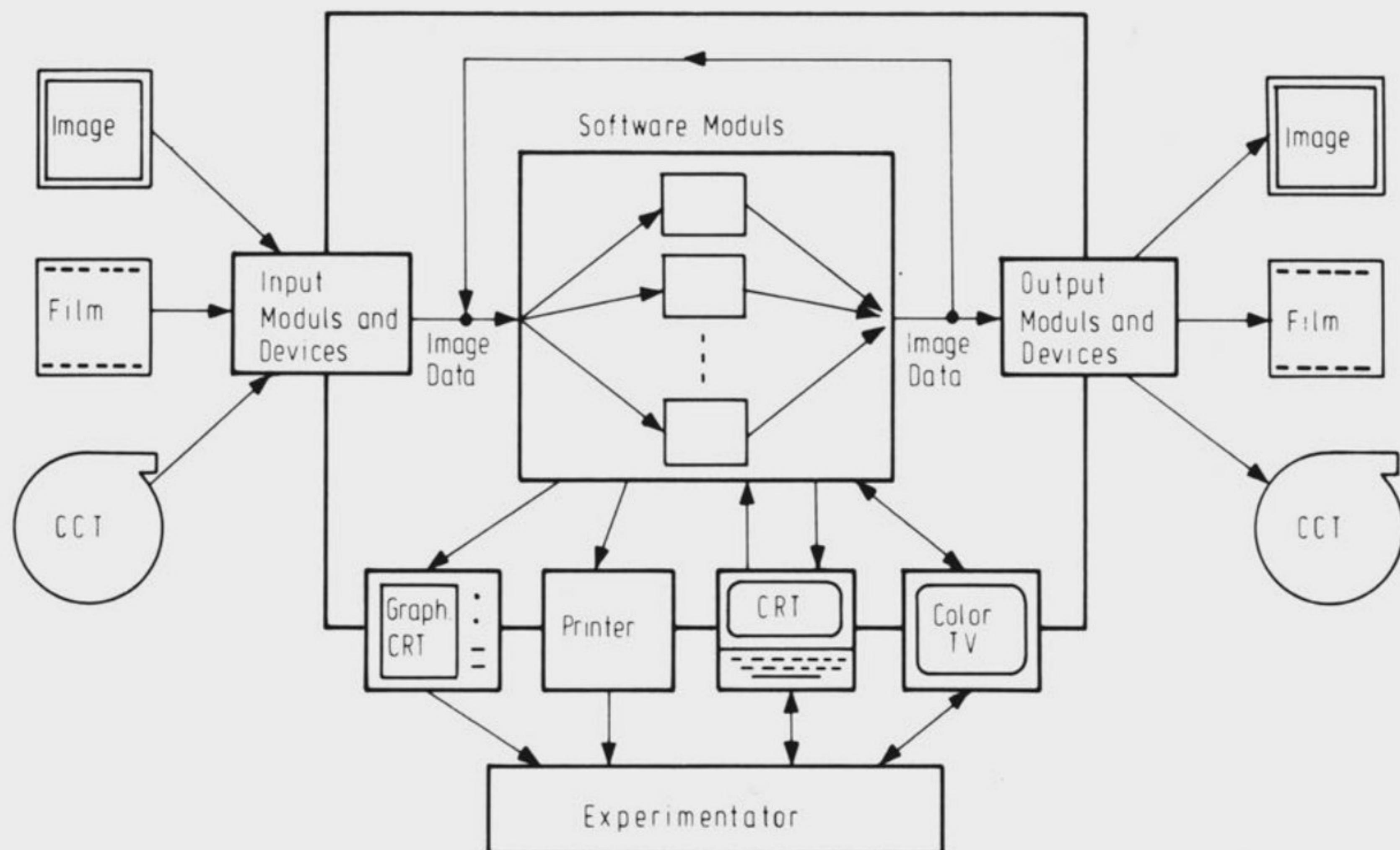
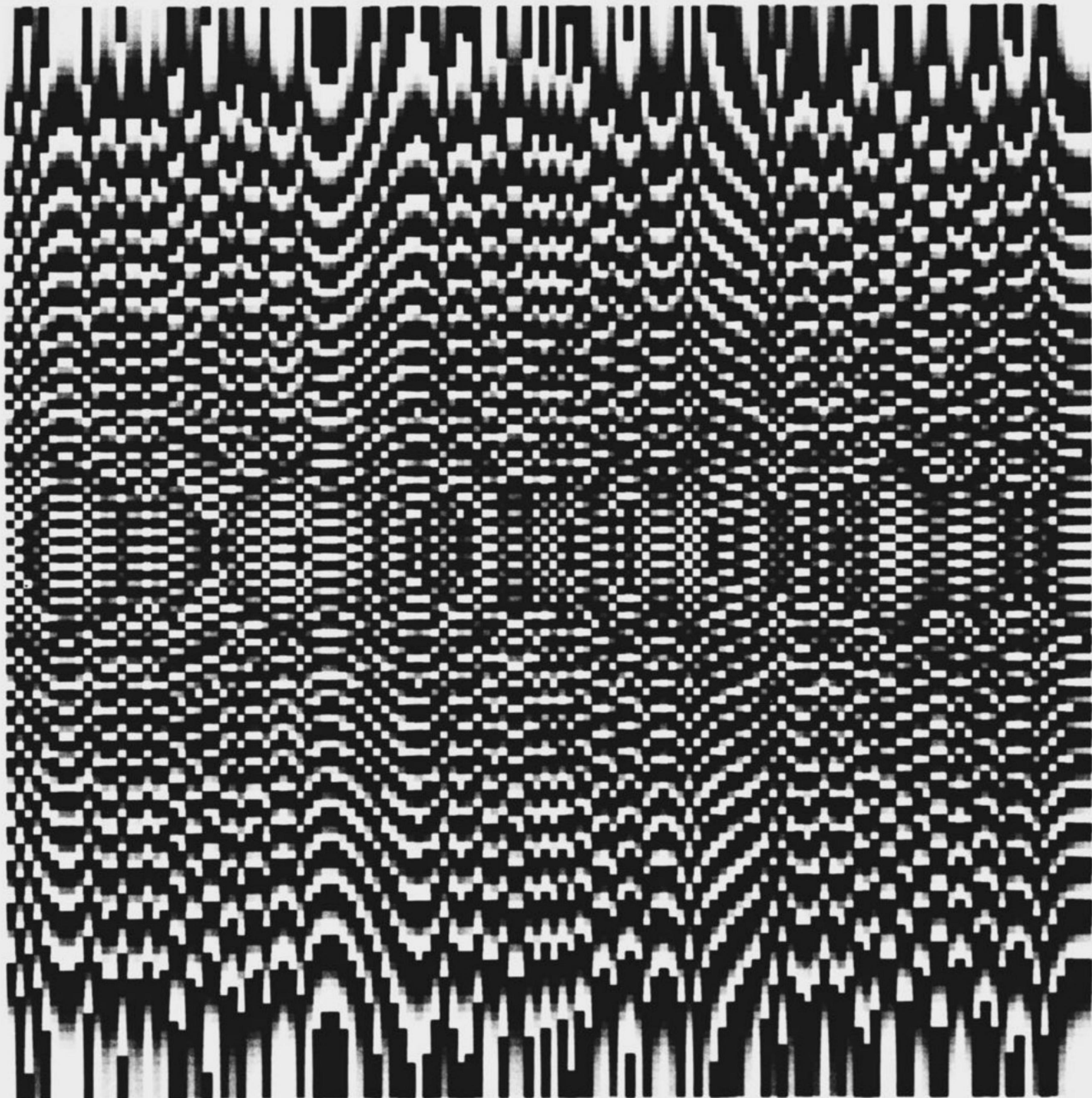


Fig. 1 Diagram of the DIBIAS system

\* Prof. Dr. Herbert W. Franke, physicist and artist living at: D-8195 Egling 2, Thal 23, Fed. Rep. Germany.



Herbert Franke and Ernst Triendl, a.O. 2, 1980

training should be sufficient for a geoscientist without experience of computers to handle the system, and to apply the available algorithms to his imagery. One of the most positive features of the system is the fact that immediately after processing the user can see the results on a colour TV-screen in order to verify that the applied processing yields the desired results. This is considered an essential advantage over image processing on a large scale general purpose computer.

The main design criteria are:

**Interaction:**

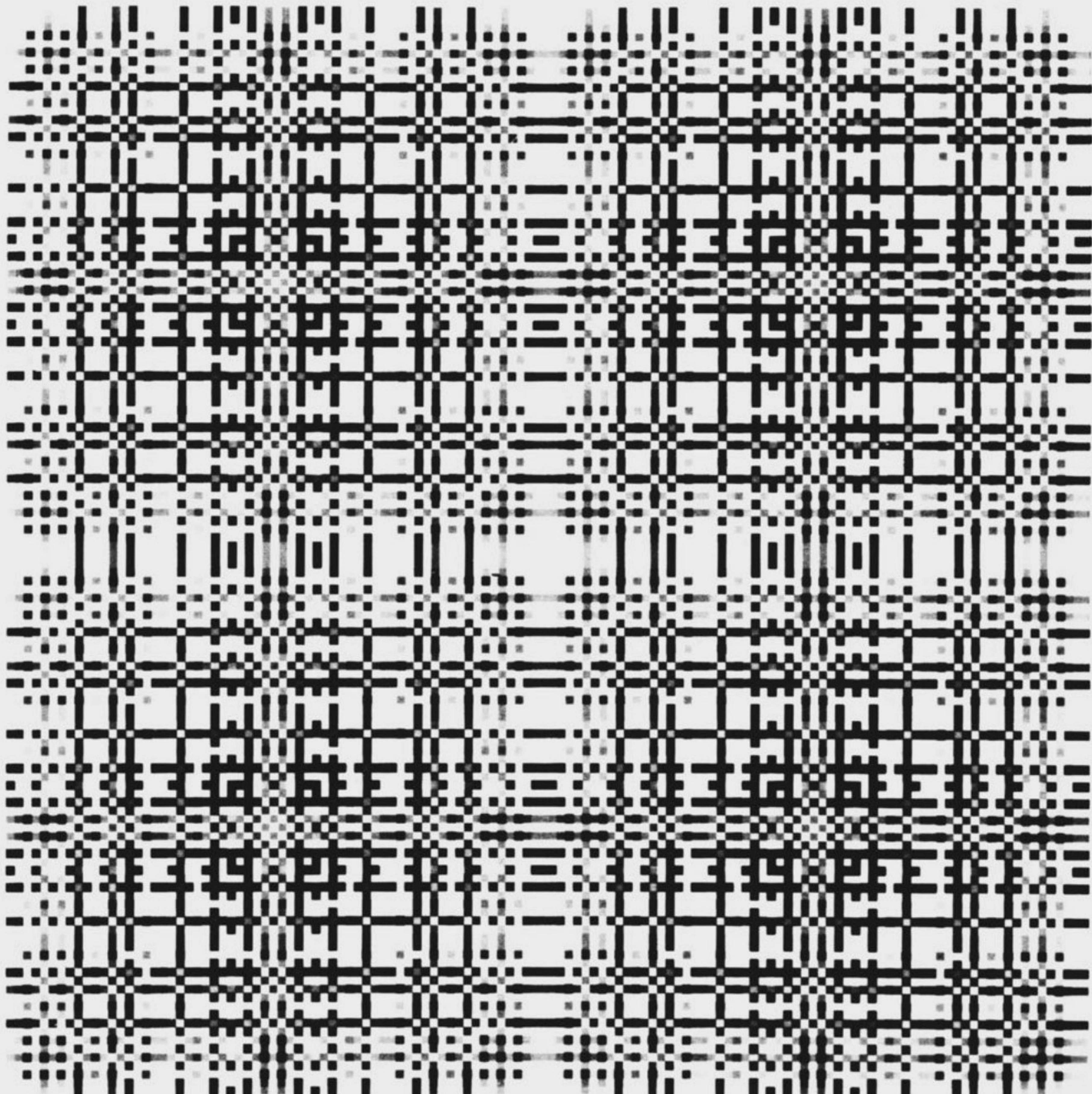
Hardware and software are structured to allow interactive control of processing.

**Access:**

A non-computer specialist is able to learn the use of the system in a short period of time. The system issues many comments to the user and contains tutorial features.

**Modular techniques and expandability:**

The entire DIBIAS software is organised in modules which can be activated by command. New modules



Herbert Franke and Ernst Triendl,  $Z = X^4 + Y^4$ , 1980

may be added at any time.

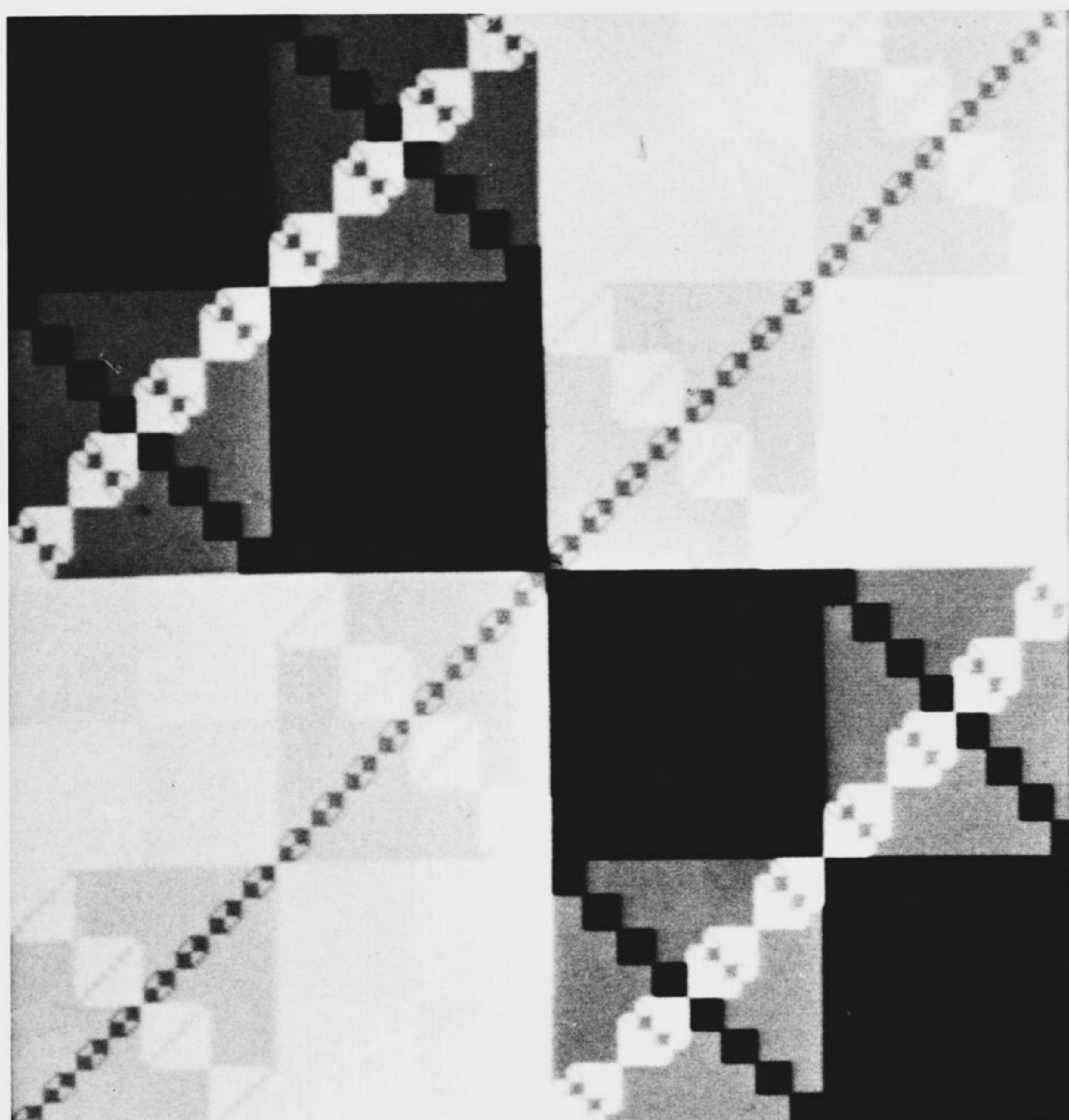
**Multiple processing:**

Several programs may be run simultaneously, thus allowing optimal use of the system.

**Software**

The software concept of the DIBIAS system has been developed with the objective of optimal man-machine-interaction.

The user may read image data by activating the appropriate input program. Further image processing will be accomplished by giving the necessary commands to the system. The system supplies interpretation aids, additional information about the image, system messages and tutorial information. Finally the system enables the user to produce a hard copy on one of the output devices. For time-consuming programs the system is coupled with the DFVLR large scale Amdahl computer in an off-line mode. The DIBIAS software system consists of about 140 programs divided into the following subsets:

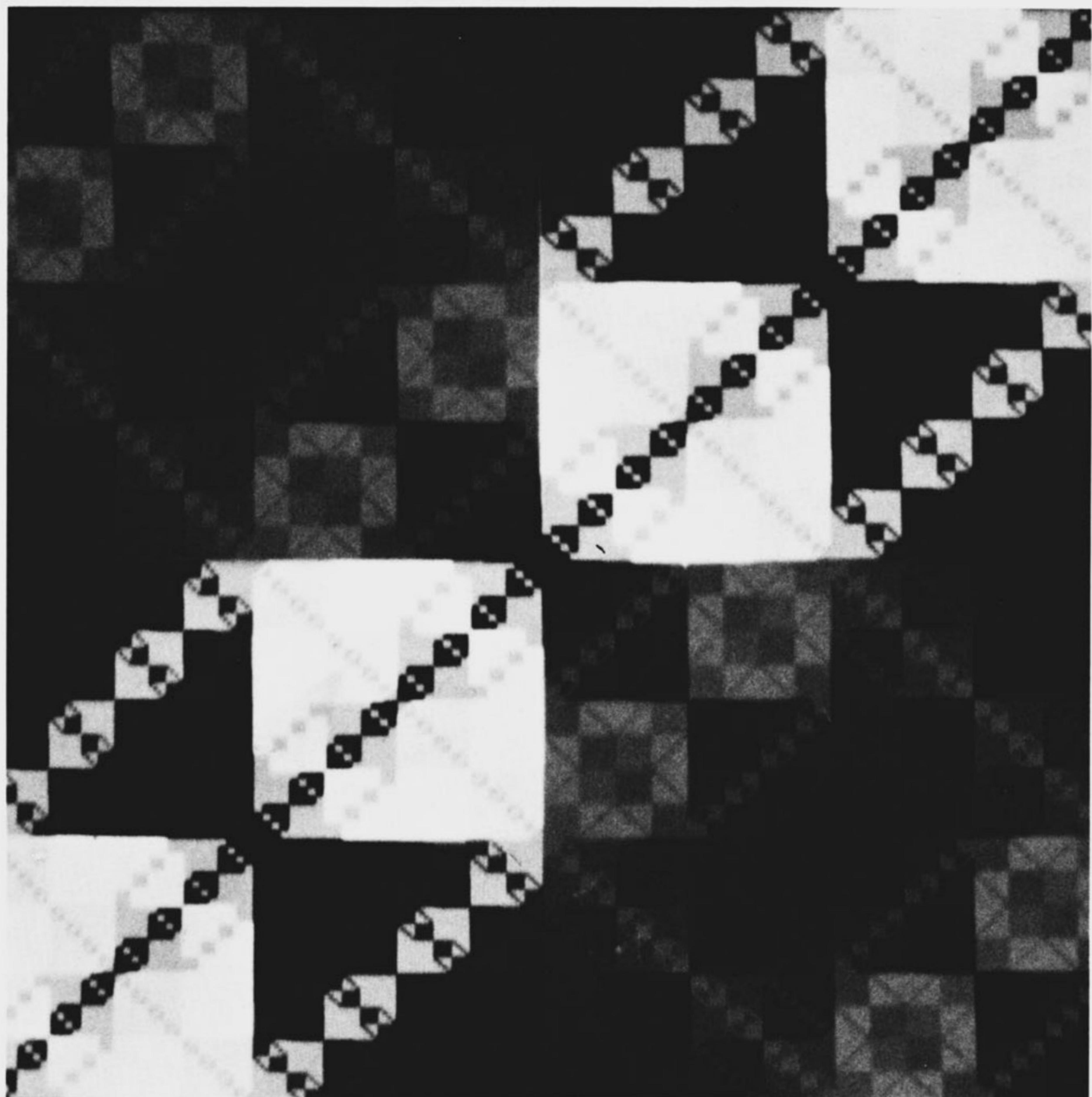


Herbert Franke and Horst Helbig, Logische Struktur, 1980

- Elementary image enhancement.
- Multispectral classification.
- Geometrical rectification.
- Digital filtering.
- Texture analysis.
- Programs to process data on the interactive TV-screen.

As an optimal synthesis of man and computer, using the complementary capacities of each, the system serves both for further research on remote sensing, and for solving image processing problems with quantitative analysis needed in a wide range of earth resources applications in the future.

It is clear that the facilities provided by the DIBIAS system offer many possibilities for the creation of visual art. My first contact with DFVLR resulted in some interesting colour pictures, based on an old photograph of the Austrian composer Anton Bruckner. In co-operation with Peter Novak I used some picture processing methods in combination with structure generation; the result, 'Electronic Anton Bruckner', was published in PAGE 45, July 1980.

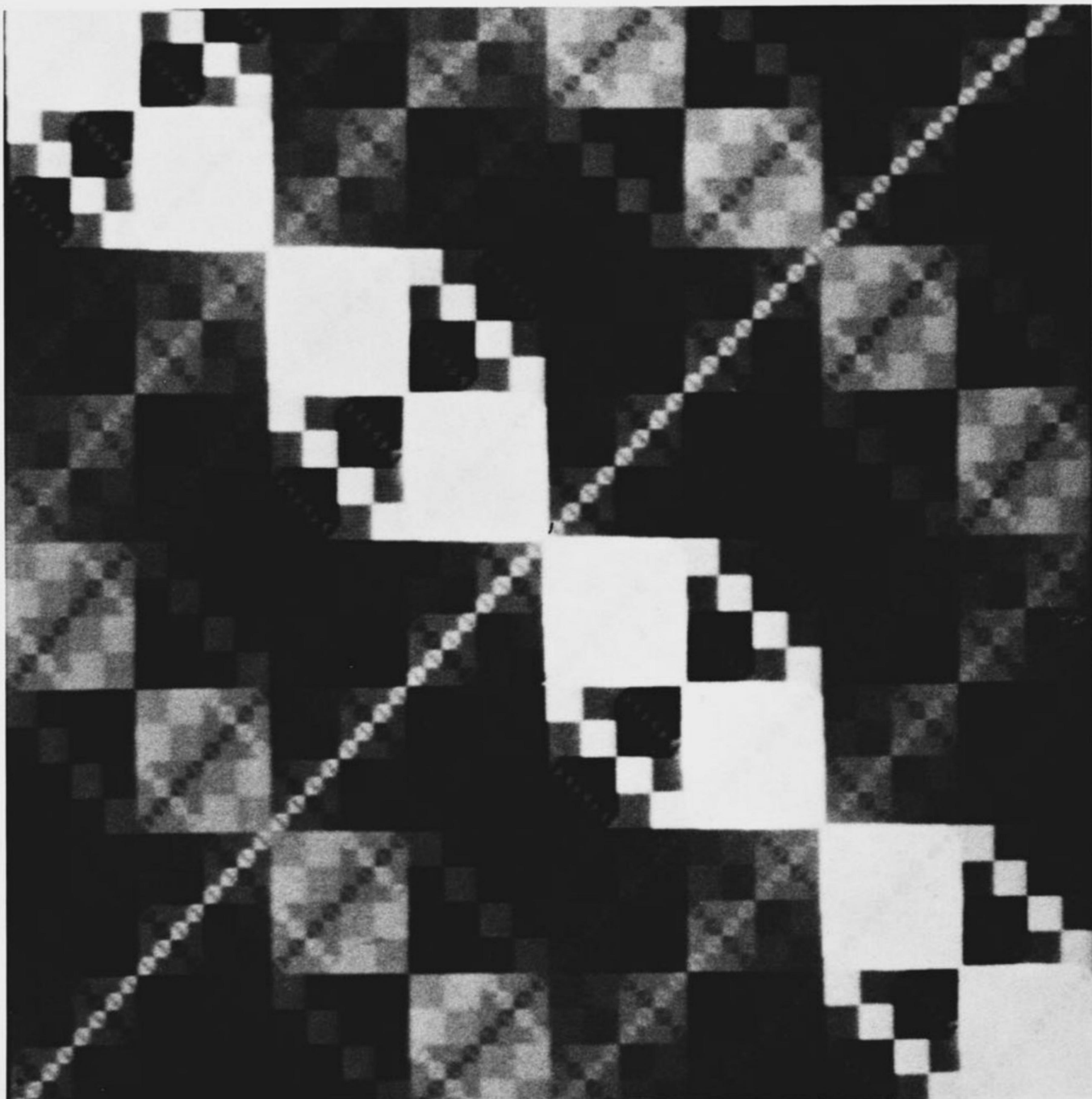


Herbert Franke and Horst Helbig, Logische Struktur, 1980

Subsequently, Dr. Ernst Triendl suggested making a series of experiments in the visualisation of mathematical order. Some of the results we obtained are shown in the accompanying illustrations. It is interesting to speculate on the use of this approach as an aid to education in mathematics. In the last weeks of December 1980 I collaborated with Horst Helbig, following an idea from him for the application of logical connectives to the generation of pictures, and we produced many interesting examples using this approach, some of which are reproduced here. Since it is possible to compose one's colour spectrum and to change it interactively, it is possible to make pictures which change through time.

I wish to express sincere thanks to my colleagues at DFVLR for their fruitful help and collaboration.  
Information about DIBIAS was supplied by:

DFVLR  
Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt  
Forschungszentrum Oberpfaffenhofen  
Institut für Nachrichtentechnik  
D-8031 Weßling



Herbert Franke and Horst Helbig, Logische Struktur, 1980

## ANNOUNCEMENTS

At the time of going to press, there is still no news from Kurt Lauckner regarding his CASUS edition of PAGE 46, which should have appeared in October 1980. Subscribers are assured that this issue will be mailed as soon as possible.

In the winter of this year we celebrate the 50th. issue of PAGE. This special edition will also feature the Brussels International Festival of Electronic Music, Video and Computer Art.

PAGE is now stocked by the Arts Council Bookshop. D.B. or J.L. would welcome enquiries from other bookshops, galleries and arts centres, wishing to stock PAGE for counter sales.



International graphic design exhibition

The FIRST ZAGREB EXHIBITION OF GRAPHIC DESIGN, ZGRAF '75, was held in Zagreb in 1975, with the participation of Yugoslav organizations and artists.

ZGRAF '75 comprised two thematic groups: Socially Involved Poster and Graphica Quotidiana; the former presented the results of a competition organized specifically for the event (Thirty Years of Socialist Yugoslavia; Peace; Non-Alignment; Self-Management), whereas the latter displayed a specific review of current Yugoslav graphic design. The impact of the event, reflected particularly in the great interest of the public and in the response of the critics, made it possible for the organizer — the Association of Applied Artists of Croatia — to organize ZGRAF 2, with the support of the City of Zagreb and the Republic, in the spring of 1978. Thus the initial exhibition has become a cyclic triennial event.

ZGRAF 2 focused on the theme of visual identity. Along with Yugoslav artists, it attracted the successful appearance of a number of foreign institutions and artists (Centre Georges Pompidou, Paris; the cities of Augsburg and Leverkusen; Swissair; Caracas — Venezuela; Cuban Poster). Thanks to the participation of an even greater

number of artists, its topical theme and high selection criteria, this, the second exhibition, accelerated the process of social integration and recognition of graphic design and visual communication.

ZGRAF 3, the International Graphic Design Exhibition, will be held in Zagreb in the autumn of 1981. The central topic is **Graphic Design for an International Understanding**

The topicality of this theme fits into the efforts of the non-aligned world aimed at democratizing information, and stems from the awareness of the visual message being an even more significant link in international exchange of information, thus contributing to mutual awareness and understanding — prerequisites for overcoming all contrasts on the road to world peace.

This thematic message will be presented, at the exhibition, with projects and studies from all fields of graphic design and visual communication.

Information can be obtained from:

ULUPUH  
41000 Zagreb  
Starčevićev trg 6/11  
Yugoslavia

## VDUS AND THEIR EFFECT ON VISION

The Institute of Ophthalmology is to hold a seminar at the London School of Pharmacy on 25 September, under the title of 'Vision and vdus'. Subjects to be discussed will include flicker, eyestrain, colour, screening techniques, and radiation. Speakers from Moorfields Eye Hospital, the National Radiological Protection Board, and the Employment Medical Advisory Service will be among the lecturers. Details: D. Faulkner (01) 387 9621.

## MUSIC ANNOUNCEMENTS

### ISCM WORLD MUSIC DAYS 1982

The 1982 World Music Days of the ISCM will be held in Graz, and other parts of Styria, from 29 October to 7 November as the focus of the Styrian Autumn Festival, Austria. A British reading panel will select works for submission to the International Jury:

Friedrich Cerha (Austria), Roman Haubenstock-Ramati (Austria), Luciano Berio (Italy), Paul-Heinz Dittrich (German Democratic Republic), Dieter Schnebel (West Germany).

#### 1. SUBMISSION PROCEDURES

Each national section of the ISCM may submit up to six works to be considered by the jury for performance at the Music Days. Independent entries may also be submitted by individual composers, music publishers, cultural organizations, etc. Only one work per composer may be submitted. Works should have been composed within the last three years, and if possible not yet performed. The composer's curriculum vitae should accompany any score.

#### 2. CATEGORIES OF WORKS

- A) 1. Works for symphony orchestra (normal-large size, with or without soloists, tape and live-electronics).
- 2. Works for chamber orchestra (as for A1).
- 3. Works for chamber ensemble (2–15 musicians, as for A1).
- 4. Solo works, instrumental or vocal (with or without tape, instruments and live-electronics).
- 5. Works for choir (up to 40 voices, with or without tape, instruments and live-electronics).
- 6. Works for Wind orchestra.
- 7. Works for Jazz-orchestra (big-band) (possibly combined with A1).
- 8. Works for organ (as for A1).

B) 1. Electronic or tape music

Specifications: 19 or 38 cm/sec (7.5 or 15 inches), mono, stereo or quadraphonic  $\frac{1}{2}$  inch; please indicate the direction of the tape: (tail out) or (head out).

2. Music-theatre; audio-visual or multi-media works (video-tapes:  $\frac{3}{4}$  inch).

### BRITISH ENTRIES

All material needed to assess the work, including a tape if available, should be sent to the British Section to arrive by 10 July 1981.

Independent submissions should be sent by 31 August 1981 to:

ISCM World Music Days 1982, c/o ISCM – Austria Section, A – 1010 Vienna, Hanuschgasse 3, AUSTRIA.

Return postage should be provided and the British Section notified of any independent submissions. Enquiries:

The Secretary, British Section, International Society for Contemporary Music, 9 Long Acre, LONDON WC2E 9LH. Telephone: 01-379 7717



The Electro-Acoustic Music Association of Great Britain was formed in 1979 by a group of studio directors and composers, following an Arts Council survey of facilities in the U.K. It encourages the widest possible public membership from anyone with an interest in electro-acoustic music: that is, electronic and tape music, live electronics, computer music – any interface of science, technology and music. The Association publishes a Newsletter which is sent to all members, and which may be obtained on subscription by studios, libraries, music faculties, etc. For further information write to: Hon. Sec. EMAS, 72 Hillside Road, London N15 6NB.

### EMAS PARTICIPATION IN SPNM COMPOSERS' WEEKEND 1981

Last April the first collaboration between SPNM and EMAS took place in a series of concerts and workshops over three days. This year EMAS will be fully integrated into the annual Composers' Weekend. The EMAS Equipment Pool will provide a wide variety of the electronic gear needed for such a national event. The electro-acoustic installations and other concerts will be at St. John's and the majority of the seminars, discussions etc. at Morley College.

### SPNM COMPOSERS' WEEKEND 1981

Morley College and St. John's Smith Square, London, 10–13 September

Principal Guest: VINKO GLOBOKAR

Guest Speakers: DAVID BEDFORD, ROLF GEHLHAAR, TOD MACHOVER, DOMINIC MULDOWNEY, TIM SOUSTER

Artists: Myrha Saxophone Quartet, Michael Nyman Band, West Square Electronic Music Ensemble with Alan Brett, Peter Lawson and Harry Sarnaay

Course Tutors: Barry Anderson, Roger Marsh, Nigel Osborne, Peter Wiegold

#### CONCERTS

Thursday 10 September 7.00pm

Morley College

VINKO GLOBOKAR trombone

works by Berio, Globokar, Kagel & Pousseur

Saturday 12 September 7.30pm

St. John's Smith Square

MYRHA SAXOPHONE QUARTET

works by Bedford, Muldowney

World Premiere: Discours V

by Globokar

Friday 11 September 7.30pm

St. John's Smith Square

MICHAEL NYMAN BAND

works by Michael Nyman

Sunday 13 September 7.30pm

St. John's Smith Square

WEST SQUARE ENSEMBLE with

Alan Brett, Peter Lawson & Harry Sarnaay

*programme to be announced*

## **LECTURES/DISCUSSIONS/DEMONSTRATIONS**

David Bedford, Dominic Muldowney & Vinko Globokar introduce and discuss their works for Saxophone Quartet.

Rolf Gehlhaar, Todd Machover, and Tim Souster on Electro-Acoustic Music and the latest technical developments in this field, including Digital Synthesis.

## **WORKSHOPS/PARTICIPANTS' COMPOSITIONS**

Daily open rehearsals, workshops and forums on participants' compositions.

Peter Wiegold will also lead practical composition workshops.

For further information contact:

10 Stratford Place  
London  
W1N 9AE  
Telephone 01-491 8111

**Society for the  
Promotion of New Music**

**SPNM**

## **MUSICA NOVA 81**

The fifth Musica Nova, presented by the Scottish National Orchestra and the University of Glasgow, will take place from 13 to 19 September 1981 in Glasgow. Originally a triennial event, the success of Musica Nova 79 has prompted its recurrence only two years later, once again combining the best features of a festival and a summer school. As well as providing a rare opportunity to participate in the development of major new orchestral works from preliminary rehearsal stages to performance, Musica Nova encourages considerable informal contact between composers, conductors, performers, critics and all participants during the week.

The concerts of modern music encompass symphonic, electronic and chamber works. With five composers and many distinguished artists in residence, and a wide range of seminars, workshops and open rehearsals, Musica Nova 81 offers a unique opportunity for involvement at many levels with the music of some of today's most important and influential composers.

### **COMPOSERS IN RESIDENCE – PREMIERES**

WITOLD LUTOSLAWSKI	:	NOVELETTE – British Première
MILTON BABBITT	:	ARS COMBINATORIA – British Première
ALEXANDER GOEHR	:	DEUX ETUDES – World Première
JONATHAN HARVEY	:	'WHOM YE ADORE, YE SHALL SEE FACE TO FACE' – World Première
JUDITH WEIR	:	NEW WORK – World Première

### **ARTISTS IN RESIDENCE**

SCOTTISH NATIONAL ORCHESTRA Musical Director: Sir Alexander Gibson

BBC SCOTTISH SYMPHONY ORCHESTRA Conductor: Wilfried Boettcher

NEW MUSIC GROUP OF SCOTLAND Musical Director: Edward Harper

ELECTRONIC MUSIC STUDIO Director: Stephen Arnold

For further details telephone Musica Nova at the Scottish National Orchestra – (041) 332 7244 – or write to: Musica Nova/S.N.O., Freepost, Glasgow G3 7BR

## **GIGO**

The 20th century has finally scotched that great illusion of Modernism, that a machine-based aesthetic is possible. As Ruskin put it, 'Fine Art must always be produced by the subtlest of all machines, which is the human hand. No machine yet contrived, or hereafter contrivable, will ever equal the fine machinery of the human fingers. Thoroughly perfect art is that which proceeds from the heart, which involves all the noble emotions; associates with these the head, yet as inferior to the heart; and the hand, yet as inferior to the heart and head; and thus brings out the whole man.'

As a socialist, Morris used to believe 'the whole man' would come into being with the advent of communism. Like Gabor, he was not opposed to machines, as such, but believed they should carry out only drudgery and toil, leaving men and women free for creative labour.

'Machines,' he said, 'can make anything except a work of art.'

Peter Fuller on William Morris, *Art Monthly*, May 1981.

# COMPUTER MUSIC JOURNAL

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Editor: Curtis Roads Consulting Editor: John Strawn

## ARTIFICIAL INTELLIGENCE AND MUSIC

Part 1, Volume 4, Number 2 Part 2, Volume 4, Number 3

*Computer Music Journal* has produced two special issues about Artificial Intelligence (AI) and music, with the intention of planting 'a seed idea in the hope that others might be inspired to incorporate this dimension into their work'. That is to say, examples of practical applications of AI techniques to music are as yet rather thin on the ground. To a great extent, the importance of this collection of articles therefore consists of presenting the (possible) interconnections between the two disciplines, providing a valuable framework for future research and development.

In his introduction, Curtis Roads distinguishes two main areas for the application of AI concepts: artificial musical intelligence, and applied AI methodology. The majority of the papers concern projects orientated towards musical intelligence (Alphonse, Fry, Laske, Meehan, Minsky, Rahn, Rothgeb). There are only three papers representing applied AI methodology (Greussay, Smolian, Strawn). Both of these approaches are highly relevant to the problems currently besetting the development of computer music, where the introduction of machine intelligence could contribute enormously to man-machine exchange. By way of example, Roads mentions 'the apparent impasse of music-analysis programs that are based on only rendering an account of surface structure of compositions, the one-dimensional user interfaces of many digital sound synthesis systems, the outmoded composition programs, our inadequate understanding of cognitive processes involved in listening and other musical tasks, and the rigid protocols imposed by unintelligent digital performance machines'.

In addition to the authors mentioned above, there are a number of further contributions relevant to the field. I shall give a brief run-down of all the papers in their order of appearance. Part 1 commences with a paper by William Kornfeld introducing the programming language Lisp, the principal language of the AI community. This is followed by Curtis Roads' overview: Artificial Intelligence and Music, which provides a brief introduction to the interconnections between AI and music, including history, development and implementation, current and future research.

Music Analysis by Computer – A Field for Theory Formation, by Bo Alphonse, surveys a number of projects in music analysis by computer, and shows how the incompleteness of music theory severely limits the implementation of computer analysis procedures. He argues that the interaction between theory formation and computerisation is reciprocally stimulating, the computer's demand for theory forcing approximations of human analytical responses, which in turn stimulate advances in musical theory as well as our general understanding of cognitive functions. A good example is provided by John Rothgeb in his paper: Simulating Musical Skills by Digital Computer. Rothgeb recounts his experiences of the attempted realisation of the unfigured bass, and shows how the process indicated the incompleteness of existing theories on the subject.

In: A Computer Aid for Schenkerian Analysis, Stephen Smolian recounts his attempt to incorporate the computer into research in music theory. By examining Schenkerian analysis from the standpoint of the computer programmer, Smolian has employed programming procedures to make more explicit certain key insights which had been only implicit in Schenker's writings. The paper concludes with two substantial Appendices, the first listing all the transformation and application commands used in the course of an analysis. The second Appendix presents a sample dialogue in which an analysis is implemented at a computer terminal.

An Artificial Intelligence Approach to Tonal Music Theory, by James Meehan, applies Roger Schank's AI theory of Conceptual Dependency to music theory tasks. In Meehan's view, E. Narmour's implication/.realisation music theory is conceptually related to Schank's AI model. On Some Computational Models of Music Theory, by John Rahn, takes a look at some of the basic assumptions of music theory and provides a critical appraisal of the papers by Rothgeb, Smolian and Meehan.

In: Toward an Explicit Cognitive Theory of Musical Listening, Otto Laske discusses how musical perception can be formally rendered, so as to describe perception as the basis of conceptual information processing in music. To this end, he sketches a meta-language which employs a methodology of formal pragmatics derived from the work of Jos Kunst.

Part 2 begins with a paper by John Strawn: Approximation and Syntactic Analysis of Amplitude and Frequency Functions for Digital Sound Synthesis. In this substantial paper, Strawn employs methods derived from pattern recognition for the development of a powerful data-reduction technique for additive synthesis. His proposed technique could be equally of interest to hardware and software designers as well as musicians and psychoacousticians. The next article: Interview with Marvin Minsky, reproduces an interview conducted by Curtis Roads. Marvin L. Minsky is Donner Professor of Science at M.I.T., and for

many years headed M.I.T.'s AI Laboratory. He provides some conversational insights into various AI projects past and present, and some new theories of musical cognition.

Musical Software: Descriptions and Abstractions of Sound Generation and Mixing, is by Patrick Greussay and his colleagues at the Groupe Art et Informatique Vincennes (GAI). They describe new kinds of operators and configurations of pipe-line stages that have been implemented at GAI, and which are especially orientated to an interactive environment. The title of C. Fry's article: Computer Improvisation, refers to a program which creates scores. Once the human composer has specified the general form of a tune, the program will improvise the individual details and produce an alphanumeric score arranged in sections, parts, and bars.

Part 2 concludes with some reviews of standard books (Fu 1974, Schnitzler 1976, and Winston 1977) and a new book by Nils Nilsson: *Principles of Artificial Intelligence*, Tioga Publishing Co., California. *Computer Music Journal* can be obtained from: The MIT Press, Journals Department, 28 Carleton Street, Cambridge, Massachusetts 02142, U.S.A.

Dominic Boreham

## MODERN MUSIC The avant garde since 1945 by Paul Griffiths

J. M. Dent & Sons Ltd. 234×153mm 336pp 04365 X £15.00

A comprehensive study of developments in music since 1945, which will be of interest to students, amateurs and readers who want a serious introduction to contemporary music.

The year 1945 provides a convenient starting-point for a study of recent musical history, marking the end of one era and the beginning of another, in both political and artistic spheres. By 1945, Bartók, Berg and Webern were dead, Ives and Varèse had ceased to produce, and Schoenberg had only a few more years to live. Paul Griffiths traces the development of post-war music from the work of those composers such as Babbitt, Berio, Boulez, Ligeti, Nono and Stockhausen, who emerged in the crucial early years of peace, together with those composers of the intermediate generation like Cage, Carter and Messiaen, who faced decisive stages in their work at this time.

The book is divided into two parts, the first part follows a chronological organisation and covers the years up to around 1960. This part deals with the progressive development of total serialism, and its eventual transcendence, the rise of the international avant garde, and the increasing acceptance of chance by Cage and his followers.

By 1960, the diversity of goals that had arisen among the avant garde dissolved co-operative endeavours and gave rise to disparate musical approaches evolving simultaneously. Part II is accordingly organised in a series of traverses concentrating on aesthetic themes rather than chronology. These six chapters scan the music of the last 20 years, considering serialism and computer music in America, indeterminacy and political ideology, the influence of other musical traditions by quotation, collage and integration, the virtuoso performer, live electronics and improvisation, opera and music theatre, and recent developments in serial and melodic organisation.

Highly recommended as a first introduction to those without a formal musical education, who feel the urge to employ their computing skills for the composition of computer music. Paul Griffiths' book not only furnishes a necessary outline of modern music in general, but also places the development of electronic and computer music within historical and cultural contexts. For example, along with Messiaen and Boulez, Chapter 1 includes Pierre Schaeffer, working in the studios of Radiodiffusion-Télévision Française, and his first essays in *musique concrète*, composed on gramophone records. Chapter 5 concentrates on the events in Cologne during 1953–4, and the first experiments in *Elektronische Musik* conducted by Stockhausen and Eimert. Chapter 9, which begins Part II, deals with American serialism and the work of Babbitt, and discusses their influence on the development of computer music, concentrating on the composers working at Bell Telephone, Columbia and Princeton. Chapter 10 concentrates on American 'experimental' work, and includes a section on live electronic music, and the innovations of Cage, Musica Elettronica Viva, Sonic Arts Union, Mumma, etc.

All the chapters conclude with a 'Repertory' listing the works discussed, and giving details of both published scores and gramophone recordings. 80 music examples are conveniently placed in the text, and listed at the beginning of the book, though without reference to the pages on which they appear. Presumably this was considered unnecessary in view of the excellent index which references the text, the music examples and the 'Repertory' sections. Notes to the text are placed at the back of the book, and a (highly) selected bibliography is included. Paul Griffiths worked for several years as editor of twentieth-century music articles for *The New Grove* and is assistant music critic on *The Times*. He is the author of *A Concise History of Modern Music*, *Boulez* and *A Guide to Electronic Music*.

Dominic Boreham

# COMPUTER ARTS SOCIETY

BRITISH COMPUTER SOCIETY SPECIALIST GROUP

## MEMBERSHIP AND SUBSCRIPTIONS

The Society aims to encourage the creative use of computers in the Arts and to further the exchange of information in this area. The Society is a Specialist Group of the British Computer Society, but Membership of the two societies is independent. Membership is open to everyone at £4 or \$10 per year. Members receive PAGE four times a year, and reduced prices for the Society's public meetings and events.

Libraries and institutions can subscribe to PAGE for £4 or \$10 per year. No other membership rights are conferred and there is no form of membership for organisations or groups, though members of other organisations are welcome to join the Society as individuals. Membership and PAGE subscriptions run from January to December. Subscriptions should be sent to John Lansdown or George Mallen at Russell Square Headquarters. Cheques and I.M.O.s should be made payable to: "Computer Arts Society". Enquiries are welcomed from arts centres, bookshops and galleries wishing to stock PAGE for counter sales.

Material for publication in PAGE and enquiries regarding the journal should be sent to Dominic Boreham. Potential contributors are requested to consult the Submission Guide below before preparing their manuscripts.

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## LONDON MEETINGS

The Society holds regular meetings at 7.30pm on the first Monday of each month at John Lansdown's office, 1st floor, 50/51 Russell Square, London WC1. Members and guests are welcome; there is no charge.

## SUBMISSION GUIDE

PAGE publishes articles, notes and information pertaining to any category of the Arts, where the use of computers or electronics plays a significant role. The journal is not rigidly divided into categories, and the form of articles is not restricted by the following headings which are provided to indicate the general scope of acceptable material.

**Extended Articles** on the work of an individual artist, composer, film-maker etc., or the work of a group, studio etc.

**Illustrations** of recent works of art, accompanied by brief documentation of the work and its creator.

**Technical Papers** on hardware and software developments.

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**Advance Information** on exhibitions, concerts, workshops and other events.

**Reviews** of the above, **Book Reviews**.

**News, Criticism, Letters, Advertisements.**

**GIGO – Garbage In, Garbage Out.**

All material should be submitted directly to the Editor at least three months before the desired publication quarter (January, April, July, October). Manuscripts must be typewritten with double spacing. *Dot matrix print-outs are not acceptable.* References should be listed alphabetically (chronologically for a particular author), unnumbered, at the end of the article. They should be cited in the text by author's name and year of publication. Authors are requested to supply the following information for inclusion on the title page of their article: profession, professional location, contact address.

Illustrations must be in the form of glossy photographic prints or transparencies. *Photocopies are not acceptable.* Photographs must be of high quality and either the actual size intended for reproduction, or larger. Please do not trim or mount photographs, but document them on the reverse, with author, title, date, size, location/collection, and credits. Diagrams are preferred in landscape rather than portrait format wherever possible.

It is not necessary to be a Member of the Society in order to submit material for publication.