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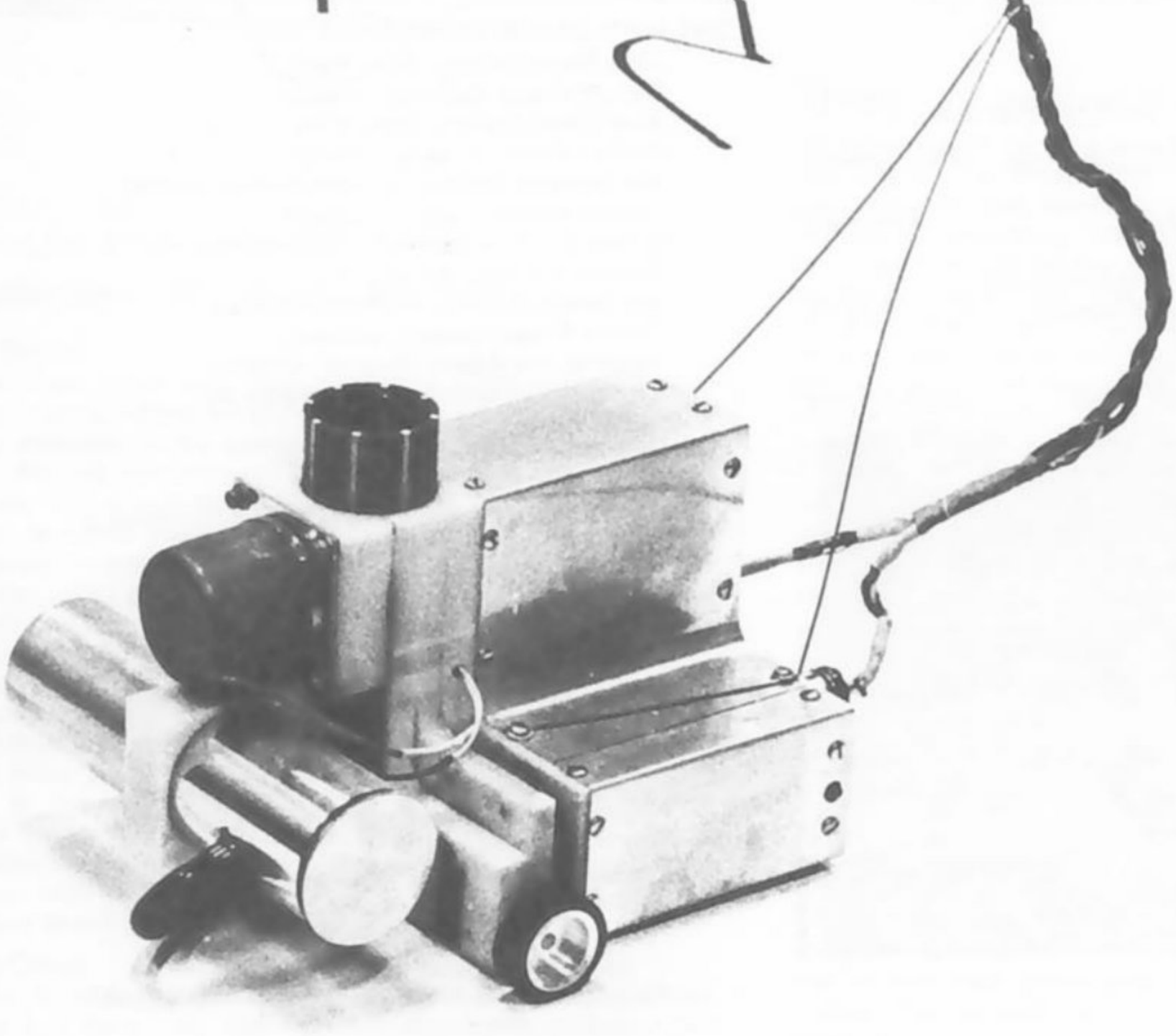
BULLETIN OF THE COMPUTER ARTS SOCIETY

NOVEMBER, 1978



HAROLD COHEN—1978 HONORARY LIFE MEMBER

Harold Cohen of the University of California, San Diego has been selected by the Computer Arts Society as the 1978 Honorary Life Member. This policy of annually awarding life membership in the Computer Arts Society was established in 1971. It is an attempt to recognize outstanding contributions in the creative use of the computer.

The accompanying interview between Harold and Becky Cohen is a reprint from the catalog of his Stedelijk Museum show. The artwork appearing with the text are examples of Harold Cohen's work; they were selected and arranged by Becky Cohen.

HAROLD COHEN. BIOGRAPHICAL RESUME

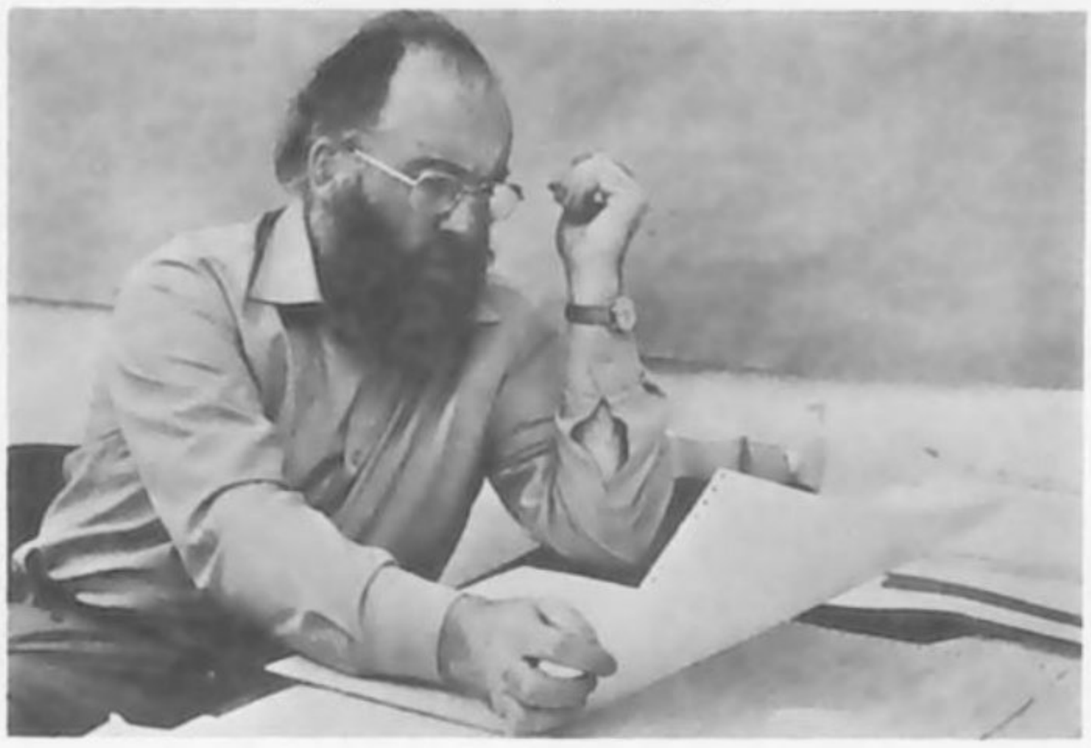
Born 1928.

DEGREES

Diploma in Fine Arts, University of London. 1951.

RECENT POSITIONS

Professor and Chairman, Visual Arts Department, U C, San Diego.	1969-71
Professor, Visual Arts Department, U C, San Diego.	1971-present
Visiting Professor, Art Department, U C, Berkeley.	Fall 1973
Visiting Scholar, Computer Science Department (Artificial Intelligence Lab.) Stanford University	1973-75
Director, Center for Art/Science Studies University of California, San Diego.	1974-present



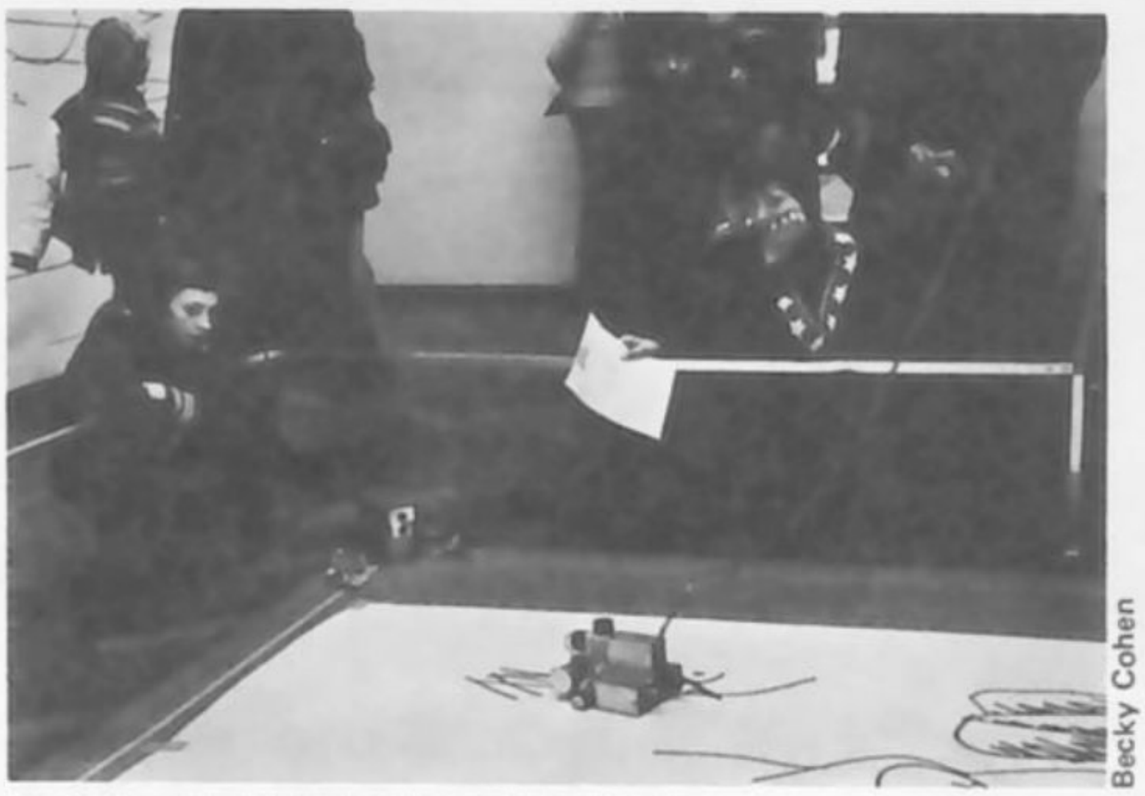
Becky Cohen

PUBLIC COLLECTIONS

Tate Gallery, London
The Victoria and Albert Museum, London
The Arts Council of Great Britain
The British Council
The Gulbenkian Foundation
The Contemporary Art Society, London
Leicestershire Education Committee
University of London
University of Nottingham
University of Warwick
The Art Gallery of Toronto
The Peter Stuyvesant Foundation
The British Petroleum Company
Jews College, London
The National Gallery of Western Australia
The National Gallery of Northern Ireland
The Bristol Art Gallery
The Los Angeles County Museum
The City of Birmingham Art Museum
The Walker Art Center, Minneapolis
The City of Sheffield Art Museum
The Stedelijk Museum, Amsterdan

PUBLIC COMMISSIONS

Wall-Hanging for the Milan Triennale	1963
Tapestry for the British Petroleum Company	1965
Tapestry for the Victoria and Albert Museum	1967

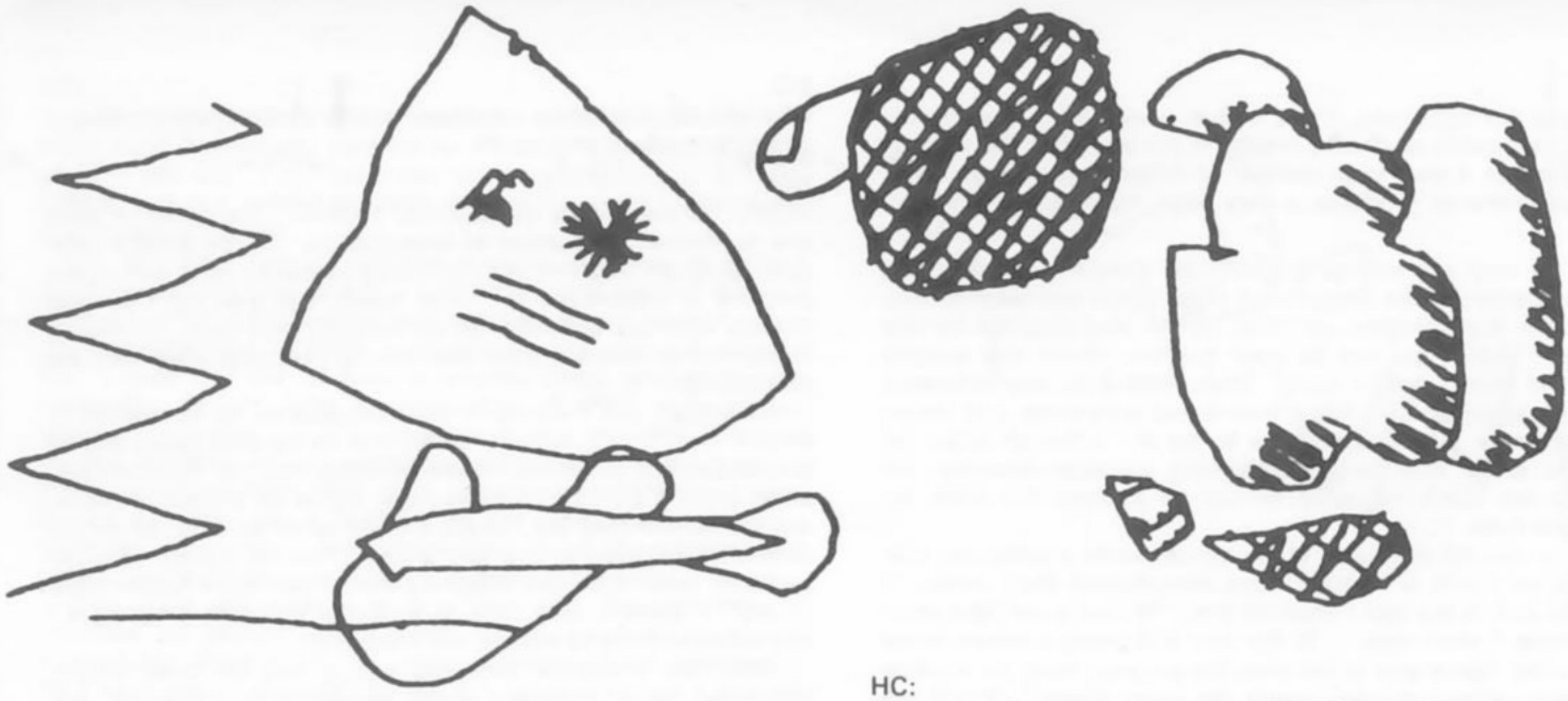


Becky Cohen

ONE MAN EXHIBITIONS SINCE 1961

Alan Stone Gallery, New York	1961
Robert Fraser Gallery, London	1962
Alan Stone Gallery, New York	1963
Robert Fraser Gallery, London	1963
Whitechapel Gallery, London (retrospective)	1965
Jerrold Morris Gallery, Toronto	1967
Musee d'Art Contemporain, Montreal	1967
The Art Gallery, Vancouver	1967
Art Studio Gallery, Aarhus, Denmark	1968
Robert Fraser Gallery, London	1968
Victoria and Albert Museum, London (tapestries and textiles designed by H.C: subsequent tour)	1968
Museum of Modern Art, Oxford	1968
Arnolfini Gallery, Bristol	1968
Curwen Gallery, London ("The Homecoming"—an edition de luxe designed by H.C.)	1968
Everyman Gallery, New York	1970
"A Computer-Controlled Drawing Machine" Fall Joint Computer Conference, under the auspices of Data General Corporation	1971
"Three Behaviors for the Partitioning of Space" Los Angeles County Museum	1972
The Art Gallery, San Diego State College	1972
"Machine Generated Images"—a computer-controlled drawing machine and its output. La Jolla Museum	1973
"Drawings by Hand/Drawings by Machine" The Art Department Gallery, U.C. Berkeley	1974
"New Drawings" The Art Gallery, Sacramento State University.	1974
Retrospective Exhibition, Scottish Arts Council Gallery, Edinburgh	1976
Retrospective Exhibition, Scottish Arts Council Gallery, Aberdeen	1976
The Stedelijk Museum, Amsterdam	1977
"Harold Cohen: An Artist's Use of the Computer" Central London Polytechnic Art Gallery	1978
The San Francisco Museum of Art (coming)	1979

Becky Cohen



HAROLD COHEN
STEDELIJK MUSEUM AMSTERDAM
November 25th 1977 - January 8th 1978

Becky Cohen:
In your installation you have a medium sized computer controlling a small vehicle which is carrying a pen. This vehicle, or cart, is attached to the computer by a long cable so that it can receive drawing instructions. No two drawings made by the cart are alike, and this is because of the third and most important (though invisible) element of the installation which is the computer program you wrote. There are no drawings stored in the computer. This program is closely modelled on human drawing behavior and is not concerned with anything random or alien or with what might be imagined to be 'natural' to machines.

As an artist you have always been concerned with how people use their heads, and that preoccupation is present in this installation. When your cart finishes one figure and crosses the paper to find a place for a new one, or slowly shades the outline of a shape, it has every appearance of thoughtful intentionality. Since I know you don't want to mystify anybody, we should begin our exchange by talking about how it all works. Let's start out with what we can see. What is the relationship of the computer to the other devices in your installation?

Harold Cohen:
All the important activity takes place inside the computer, and, as you have said, that isn't actually visible. To manifest what it's doing, the computer needs to have some sort of display device, or output device, under its control. In this installation I have both a Tektronix graphic display and the cart, which I designed and built especially for exhibition use. I'm not much concerned with producing objects normally, and in my own studio I do most of my work on the graphic display.

The computer steers the cart around by sending it commands to drive its wheels at different speeds, so that it moves in short curves. But the wheels slip on the paper too much for the computer to be very sure where the cart is after a while, so it is designed to operate under a sonar navigation system. Twenty times a second the cart sends out a burst of ultrasonic noise. A specially-built microcomputer measures how long it takes the noise to reach the microphones in the four corners of the drawing, and figures out where the cart is. Instead of using the normal cartesian convention and telling the cart, 'go to point x,y', the main computer says, in effect, 'move the left wheel L mm, and the right wheel R mm, and then say where you are.' With this feedback system the computer is able to make the necessary corrections as it goes along.

BC:
I can see that using a small cart might be more expedient than having to move a large conventional drawing machine from place to place, but do you have other reasons for using a feedback system?

HC:
The way the cart operates really follows from fundamental attitudes which were established long before I thought about building it. The whole program operates in feedback mode, not just the part that controls the cart. It is fundamental to the method of generating 'freehand' lines, whether the computer is using the real cart on the floor or an idealised, make-believe cart on the display screen. The purpose of the program is to simulate human behavior, and it seemed to me only reasonable to insist upon adopting human modes down to the lowest level of physical articulation. That means feedback. Imagine yourself driving a car off a main road into a narrow driveway. You don't figure out a complete path, then close your eyes and hope for the best. You proceed in a series of steps, each designed simply to improve your position, and you keep checking all the way to see where you are in relation to where you want to be. That's a very close approximation to the way that the program generates the paths it needs in building figures.

BC:
So, if what you've described here is a lower-level activity in your computer program, that makes me wonder what you consider as higher-level activity. I'm interested in the structure of your program and, in particular, how observations and insights get turned into computer code.

HC:
The very lowest level of the program is the part which figures out a single step, a single pair of wheel movements, and sends it off to the cart. The program has to go through that level of the program many times in order to produce a single line, just as it has to construct several lines, at a higher level, in order to draw a single figure, and a number of figures in order to complete a drawing.

That hierarchical structure characterises the entire program. At any given instant it might be deciding what the next step in the current line should be, deciding what else to do to the current figure, planning a new figure, finding space in which to continue, or making decisions about the overall development of the drawing.

BC:
Is there a portion of the program at the head of the chain of command which knows what a drawing should be like, and gives orders to all the other levels of the program?

HC:
No, there isn't any single controlling part: the program as a whole is a control structure, in which the different levels exercise specific kinds of control. The lowest level will go on generating steps until the level above it recognises that the current line has been completed: then control is passed up to the next level, which will go on generating lines until it sees that the correct figure has been completed . . . and so on. These lower levels don't decide whether the drawing as a whole is complete, just as the topmost level of the program does not control the cart.

I'm not sure that I would want to say that the whole program, or any part of it, knows what a drawing ought to be like. The whole program describes the entire drawing process, but it wouldn't be possible to predict from the program what any of its drawings would be. I have to run the program to find out.

BC:
What you are suggesting, then, is that when you run your program it is capable of diverse results in the way that the rules of chess produce a very large number of different games, or that a language grammar produces a very large number of sentences.

HC:
Those are very apt analogs for how the program operates, not only in relation to the diversity of output, but also because they make clear that complex activities can be characterised by sets of rules. That is the key to your question about how insights get turned into computer code. There isn't really any difference between saying that we know how to do something, and saying that we know the rules for how to do it: although when we claim to know how to do something complex—drawing, for example—we don't normally bother to support the claim by listing our rules.

If you can list the rules, then you can write a computer program, since a rule is nothing more complicated than saying 'If such and such is the case I must do this.' 'If I see a red light when I'm driving I must stop.' 'If the cart is drawing a closed shape and another figure gets in the way, the program must try to close the shape without running across the other figure.' You'll see that both of these examples have the same things in common: they both recognise some particular condition in the domain of interest, and they both respond by changing the condition. You don't need a way of selecting a rule: it is invoked by the condition.

We all have many, many rules of this sort controlling our normal behavior, although we rarely have to think about how they get invoked. The computer does it simply by running through its list of rules—about 300 in this case—until it finds the appropriate one.

BC:
I think it's time I asked you to say what a computer is.

HC:
At the most superficial level it's a device for doing various things with numbers, some of which can be reserved for use as special codes: as instructions to the machine itself to perform various operations, and as symbolic names for anything you may want to deal with. Also, it can store those numbers in its 'memory', which means that a program of instructions can be built up which will manipulate the values of the symbols. Once you've done a little programming, it becomes clear that the computer can handle anything you can describe symbolically, and that makes it extremely powerful. One of its most important abilities is that it can examine the state of a symbol—its value—and act upon the basis of what it finds. That's what makes it possible to write rules of the kind we've been discussing.

In short, the computer is not simply an arithmetic machine, it is a general symbol manipulating device capable of extremely complex patterns of decision-making.

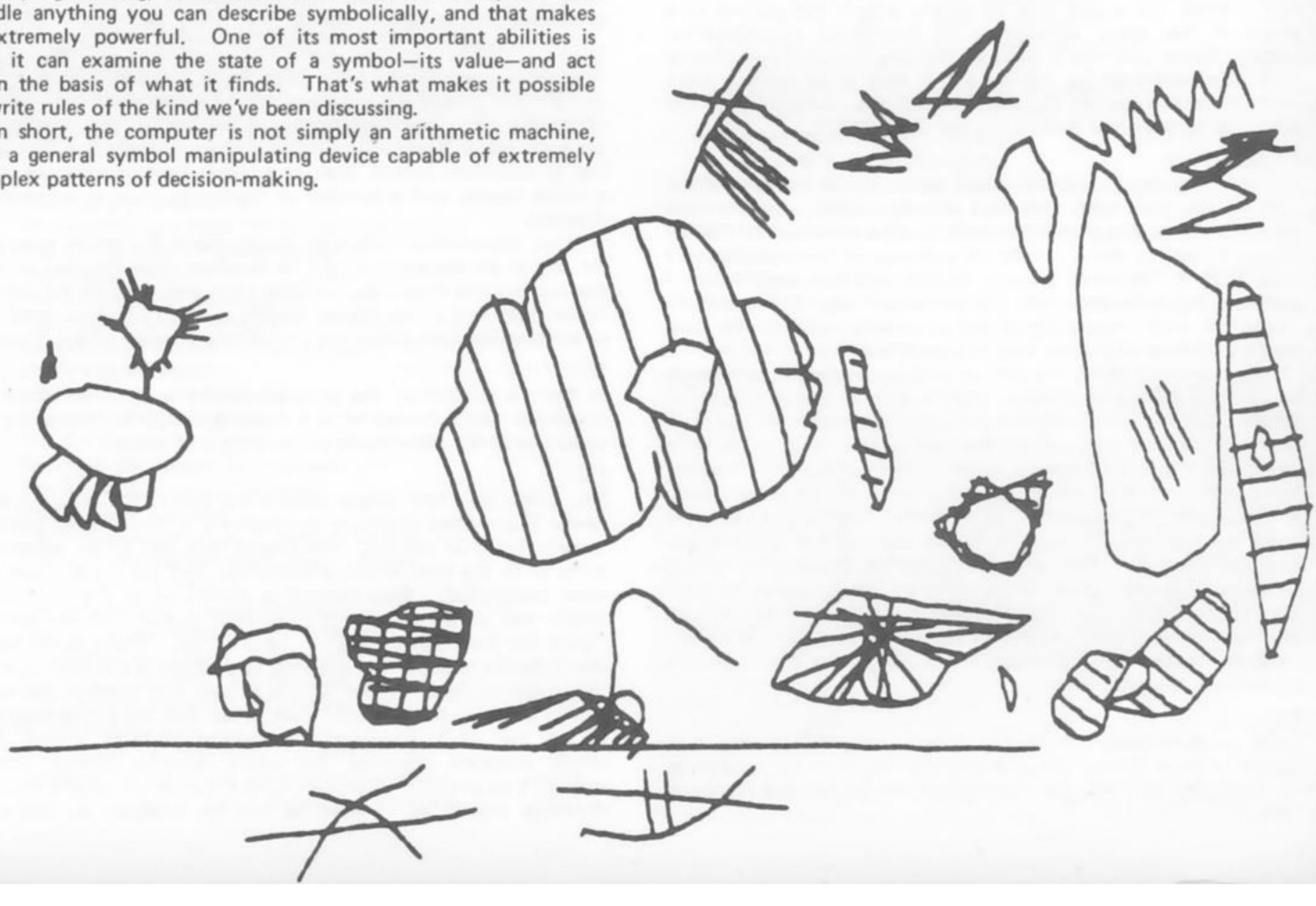
BC:
Why would an artist be interested in that kind of power? Why is computing valuable to you?

HC:
Mostly because of its explicitness, I think: the power it gives one to define the domain of investigation. If you write a computer program you can say with some exactness what part of the program is responsible for what result, and you can't do that directly with human behavior, particularly your own. It's almost impossible to examine your own mental processes while they are proceeding.

Of course, the machine is only valuable to me in relation to what I want to do with it, which has to do with long-standing preoccupations about the nature of image-making. For example, as an artist I am able to make some marks on a piece of paper, and the viewer may say, 'that's a face,' when we both know the difference between a face and a few marks on a piece of paper perfectly well. Can you imagine a transaction more fundamental to art? I spent a long time as a painter trying to grasp what I was actually doing to initiate and control it.

What the computer provided was a way of externalising, stabilising my speculations about image-making behavior: not only my own behavior, but what I thought I could see operating in drawings generally, and especially in childrens' drawings and in so-called primitive art. One is able to test one's speculations. What I do with the computer is called 'modelling' in science. A model is a limited dynamic description, a simulation, of a complex system, which can be run on a computer in order to see whether it behaves enough like the system itself to be considered adequate. In this case, the simulation seems adequate to the degree that most people have some difficulty believing that the drawings were actually made by machine.

BC:
When you were still exclusively a painter, you were unafraid of tools. You were always inventing them to solve special problems in studio work, and were always open to seeing ways of separating the boring or mechanical aspects of painting from the interesting stuff. I think, possibly because of your common-sense attitude towards machines, that you have become the first artist to consider computing a normal activity rather than an exotic one. But your attitude about machines now is different from the one you had ten years ago, before you got to know computers. I'm wondering how you would characterise the difference.



HC:
I always felt confident about machines, and I still do. On the other hand, I never was obsessed by them, or fascinated by them, and I'm still not. I did not come to computing via Art & Technology, but as a painter and with many of my most fundamental preoccupations intact.

So, if I have had an attitude towards machines as such, I think you would have to call it 'utilitarian', and say that it hasn't changed. That would hardly be a complete answer, though, since my understanding of what machines are has changed rather a lot. I used to think of them as objects whose properties were reasonably distinct from the properties of other parts of our environment; now I don't. It seems to me that the design of modern machines follows systemological imperatives which spring from the culture itself, and which express our beliefs about what we are and what our culture is. In this sense, machines have a great deal in common with social institutions like political systems or communication systems or health care systems.

One could not support such a view with the definition of 'machine' we learned in high school, which says that a machine is a thing for doing work, an energy transformation device. It isn't easy, and it wouldn't be helpful, to characterize a modern automobile in those terms because the energy transformation which it represents involves the labor expended in its acquisition, the labor expended in its building, the labor expended in producing the fuel it burns, and the generation of the fuel itself, to name only a few of the factors. In short, to say that an automobile is a collection of levers and pulleys powered by a thoroughly inefficient internal combustion engine is to say very little, even if it is correct.

If we were to adopt an alternative definition, and say that a machine is the embodiment of a system of functions, then things would become much clearer. The functional organization of your automobile does not possess unique characteristics, because moving you from here to there is not its unique function. It is merely one of a complex and extended set of functions which began to be exercised long before you bought the thing and will continue to be exercised long after it is sold for scrap. Very few of those functions are intended to serve your interests personally, and they may not serve the real interests of the society as a whole, either; but that's another issue. You were asking about my changing attitudes towards machines, and what I have been trying to say is that I see machines now as parts of a systemology which extends itself throughout the culture. In consequence, it also seems to me that we might valuably regard the machine as a sort of systemological microcosm of the society which produces it.

BC:
Do you think these new attitudes about machines have acted upon your sense of what an artist is?

HC:
It isn't just that my own sense of what an artist is has shifted: there has been a very real shift in what artists actually are, a very noticeable shift over the twenty-five years since I was a student. So, on the one hand, there is the question of what it means for me to say that I am an artist, and that has certainly been changing in parallel with other changing attitudes: on the other hand, there is the more general question of how I believe the self-image of 'the artist' has been changing with respect to machines. For me, the two are related. My own self-image responds negatively to the current self-image of the artist.

Yet there is a more general, underlying issue which needs to be raised in order to answer the question more fully. We have become massivly dependant upon machines in the 20th century, and I am inclined to believe that our sense of what a person is has changed as a result of that dependancy and the circumstances which produced it for the whole Western world.

One of the most critical problems to develop in the wake of industrialisation was the problem of complexity. The initial viability of mass-production rested upon the existence of a huge population, proliferating alarmingly from 1800 on, and itself confronted by similar problems of complexity. What kind of social organisation is appropriate to a city of two million, or ten million? How do individuals make their needs felt and their voices heard? How do they get fed, care for their sick, teach their children? The problems are as old as mankind, but the level of complexity is new, and it is a function of scale.

In industry, complexity arose both as a function of scale and as a result of the greater desirability of some products over others in the context of large urban populations. Given that a capital-intensive industry can produce automobiles at a price low enough for lots of people to afford them, what is the best way of designing and building them? And what attitudes should those people be persuaded to have towards so complex a machine? It must have become obvious rather quickly that desire and desirability are manipulable elements, and that an industry can generate the sense of any need it proposes to satisfy. The rise of an advertising industry was as indispensible to the marketing of automobiles as the development of highway building was inevitable.

Proliferation is not merely what happened to industrialisation, it is a fundamental aspect of its nature: a force without a counterforce. Industry's success was not in averting runaway complexity, but in making it possible to deal with more of it, and its design strategy was so successful that its shortcomings are only now becoming obvious. A complex machine can be conceived as a series of parts, and each part specified in terms of its interfaces with the parts around it. Each part can then be designed and built—and independantly marketed—by industries having neither concern nor responsibility for the machine as a whole. By the same strategy, that same machine can become part of an even more complex system of machines, and even generate new systems and new industries.

How far can this strategy for coping with complexity keep pace with the complexity it generates? Industry today grinds out an unimaginably vast array of different parts for different machines. A single catalogue from a single supplier in the electronics industry will list literally thousands of items. Yet repairing a modern machine is essentially limited to replacing a non-functional part with a new one, and its life is prescribed by the availability of spare parts. Complexity spawns complexity, until both machines and societies break down through lack of insight into how they work.

It is black-boxism. A black box, as the term is used in technology, is any device whose functions can be stated in terms of its input and its output, its interfaces with its environment. Black boxes don't fall from the sky, obviously. Every black box was designed by someone who knew what was inside it, and understood how it worked. But for the user, that understanding is not so much unavailable as it is irrelevant. You are required to know only what to put in at one end—gasoline, water, electricity, money—to get what you want—heat, icecubes, transportation, culture—to come out of the other. Black boxism has become a state of mind.

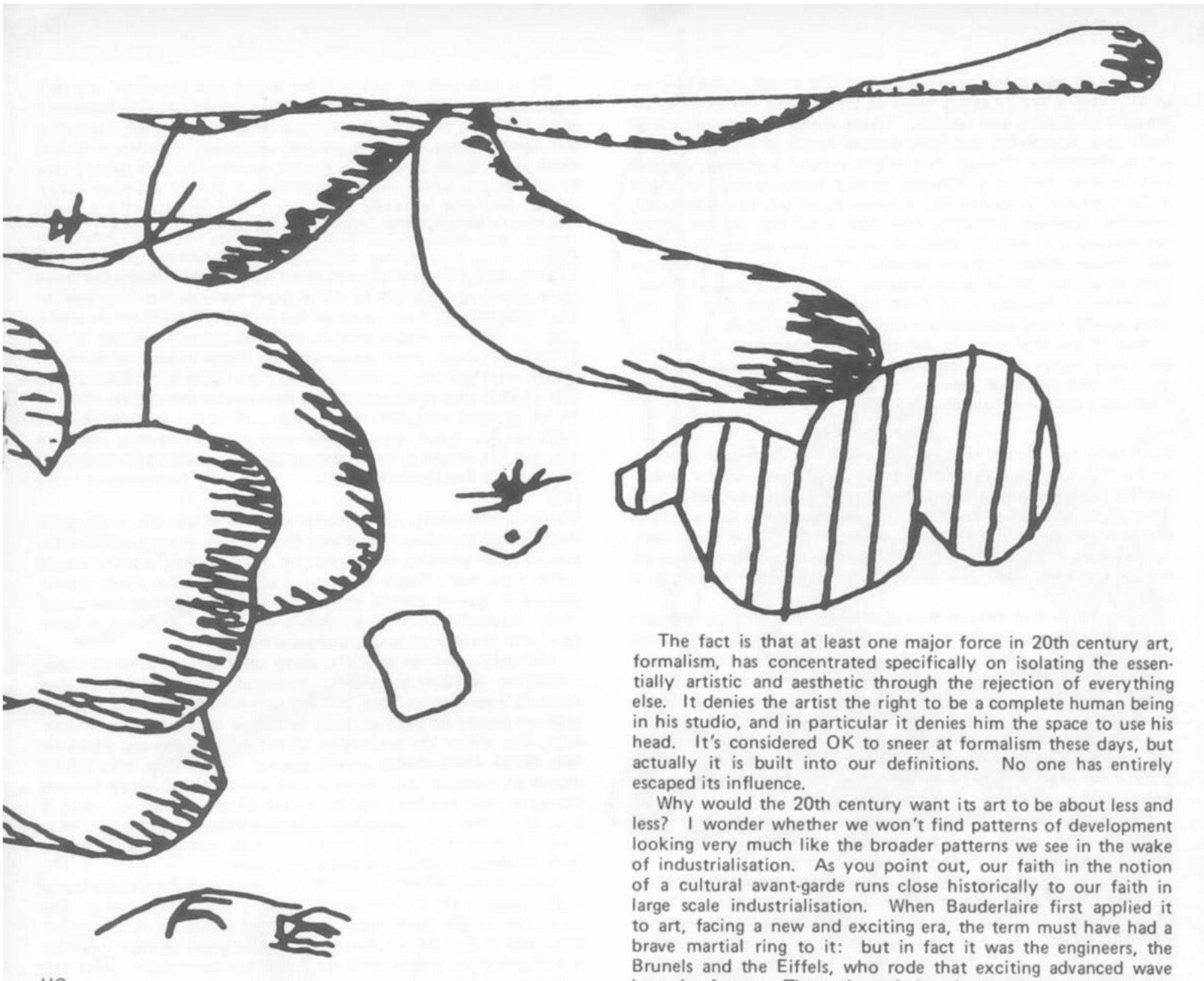
We are stuck in an environment of black boxes, an extended, interlocking array of mechanical and sociological systems which resists broad understanding and which tend to leave the individual isolated.

In the course of my own work, I find myself surrounded by computer specialists who scream for help if a disk-drive goes wrong, by disk-drive specialists who can't handle it if a disk controller breaks down, by hardware people who don't know how to program and by programmers who don't know the difference between an integrated circuit and a transformer. They'll all tell you that they are specialists, implying that one body of remarkable and abstruse knowledge is as much as one brain can assimilate. It's not true: there's more than enough room in any normal brain for ten times as much as it holds. But they've all lived in the 20th century, and they have all come to accept that any device, any body of knowledge, any ability other than their own has to be regarded as a black box.

Against this background you ask me whether my sense of what an artist is has changed. What I would hope to find is more flexibility, greater overview, a generosity of spirit that comes from a developed sense of what one is. What I find is that most artists are pretty much like any other specialists.

BC:
If you find artists to be exhibiting this black box symptom, are you willing to speculate on the causes? Are you suggesting that there is a narrowness about artists that is a result of their living in the 20th centruy? My own feeling is that during the time since I finished art school and made my own beginnings as an artist—five years now—there has arisen a kind of career hysteria of more than epidemic proportions, a sort of mass lusting after market and attention, which tends to sap intelligence from art-making itself, and channel it into self-promotion.

Another new condition in the art world which might indirectly contribute to black-boxism is its metamorphosis into a wide variety of disparate groups. We have performance artists, conceptual artists, photographer artists, artist photographers, marxist artists, body artists, feminist artists, video artists, project artists, post-conceptual artists, post-movement artists, and even painters and sculptors. It's not the variety itself, but what to do in relation to it that presents itself as a problem. There is criticism within groups but not across them. My suspicion is that artists are more isolated from each other now and less prone to a general questioning of art than during a time when a single dominant movement, like abstract expressionism or cubism or surrealism, might have allowed for more discussion. Even so, do you think that there is a common pose that artists take with respect to the rest of the world? And, possibly as a related question, do you think it's interesting that the rise and fall of the idea of an avant garde in art corresponds almost precisely with the rise and fall of our faith in large scale industrialisation?



HC:
In my own experience artists almost never talk about art. Mostly they gossip about career issues: who's in town, where's a good place to show, how do you get so-and-so to write about you. I'm not sure I really believe the abstract expressionists were any different. At the Artists' Club they had a great time playing intellectual, but they weren't very good at it. There are artists in New York now who won't show their work to their friends, but then I have a hard time imagining Picasso discussing cubism with Juan Gris in 1908.

So, I'm not sure that if artists are more isolated today it is because there seems to be no dominant movement which defines a domain of discussion. There is a dominant movement with a very well-defined domain of discussion. It's what you yourself would call careerism: and, if I've just seemed to say that it has always been right below the surface, I also have to say that I cannot remember any time in my own working life when it has been so blatantly out in the open. You might be right in drawing attention to an apparent diversity of terminology today, but you know I always felt that the playing out of abstract expressionism involved a lot of marginal differentiation and not very much consideration of basic premises. Perhaps what you are seeing now is the same thing in relation to careerism.

Your main point, though, is that careerism doesn't leave enough energy and intelligence for art. I would have to agree, but would have to ask whether we can be sure which is the cause and which the effect? What I mean is that art making—at least, the conventional forms of art making—might already have become an activity which resists the application of energy and intelligence. In the world of science, whole fields can cease to attract first-rate minds because nothing very interesting remains to be done in them, and the professional community knows quite well what there is to be done. The art community prefers the myth that anything is possible, but there is very little evidence to support it.

The fact is that at least one major force in 20th century art, formalism, has concentrated specifically on isolating the essentially artistic and aesthetic through the rejection of everything else. It denies the artist the right to be a complete human being in his studio, and in particular it denies him the space to use his head. It's considered OK to sneer at formalism these days, but actually it is built into our definitions. No one has entirely escaped its influence.

Why would the 20th century want its art to be about less and less? I wonder whether we won't find patterns of development looking very much like the broader patterns we see in the wake of industrialisation. As you point out, our faith in the notion of a cultural avant-garde runs close historically to our faith in large scale industrialisation. When Bauderlaire first applied it to art, facing a new and exciting era, the term must have had a brave martial ring to it: but in fact it was the engineers, the Brunels and the Eiffels, who rode that exciting advanced wave into the future. The artists of the nineteenth century were in full flight from industrialisation: The Pre-Raphaelites, seeking that remote point in the past where it all started to go wrong, laying the way for formalism by declaring contraposto to be a moral issue; the Impressionists painting a world of perpetual Sunday afternoon for an untroubled bourgeoisie. You would know from only very little painting and sculpture that a revolution was in progress. The cry 'Art for Art's Sake!' raised late in the century, represented an alienation a long time in the making.

'Art for Art's Sake', which still stands at the root of most artists' attitudes today, has involved the fixing of boundaries, the isolation of specialised bodies of knowledge and specialized attitudes. It has provided a guarantee that the artist need never again be answerable for his actions outside his professional circle, even though he will seek to sell his products outside it. It insists that the public, which puts its money into one end of the art machine, believes that what comes out of the other end is really what it wanted.

In short, the artist has adopted the same role as any other specialists, protecting and advancing the interests of his specialisation in a manner utterly characteristic of this machine dominated age. Even if that seemed a desirable state of affairs, we would still have to ask what the nature of the specialisation is. What does the artist know?

BC:
Well, there are still artists—who knows, perhaps the majority—who believe that artists don't need to know anything in particular, that all that's needed is genius. In this field, asking, 'What does the artist know?' comes close to asking, 'What are the artist's beliefs?' since knowledge has to be tested in order to be knowledge, and art hardly has a methodology for testing. There is possibly some hodge podge of 'knowledge' belonging to artists, but it fails to become a body of knowledge through lack of definition.

There are two things working against knowledge in the practise of art. One is the lingering myth of genius, and the other is the pressure of market and fashion. These things tend to encourage both very wonderful and very boring forms of irrationality in artists themselves, though that might answer a genuine cultural need, in that the rest of Western society seems to want its artists to be irrational on its behalf: emotional, gifted, temperamental, mystical, superior, irritating, beautiful, insulting. If the public has wanted that sort of artist, it has also paid an ironical price, being beaten down to the point where it no longer feels it has the right to ask the fundamental question, 'What is it about?' And, for different reasons, that little question is one that is only occasionally asked seriously within the art world itself.

But, if we still want to ask what the artist knows, perhaps we could come at the question from within a more limited domain, and ask what goes on in art schools? What do artists teach their students these days?

HC:
I've really lost touch with what goes on in European schools. In the U.S. one can put together some sort of overview by watching the students who apply to be admitted into graduate school after spending four years at various schools across the country, and one can make some general observations. It is quite rare, for example, to find a student with any serious background in art history, or even with any sense that the present is part of a continuum.

I am inclined to believe that students as a whole are engaged in a search for models for their own performance, not in a search for knowledge. Mostly it is the magazines which provide the source of models, though the teaching in a school can easily modify what the student decides to choose. Of course students need models for their own development; but the wholesale substitution of models for knowledge tends towards the unquestioning maintenance of beliefs and values. It provides a breeding ground for academic art, even when the students think they are being terribly advanced.

Obviously, people teach from the standpoint of their own positions, and instill in their students—whether by design or default—a semblance of their own value systems.

That says more than may be immediately apparent, though. A student in physics, say, or linguistics, needs to acquire a body of knowledge, in relation to which the attitudes of his teachers are unimportant. No one teaching physics will arbitrarily decide that his students don't need to learn calculus, the way that someone teaching art might decide that his students don't need to learn to draw, or to develop their own film. I know of several schools where enormous sums of money have been spent on media equipment, without any attempt on the part of the media faculty to design a media curriculum. Nor is this simply a matter of slackness. As you say, there are many artists—perhaps even the majority—who genuinely believe that artists don't need to know anything, and they are quite likely to pass on to their students the feeling that skills are for idiots.

Against this background, any teacher who proposes that a painting student actually ought to know what oil paint is might be regarded as very eccentric, and many otherwise responsible teachers are persuaded that their only true function is to give encouragement.

To a star-system oriented art world this situation may not seem problematic. How many new stars does New York actually want to make room for each year? Even for those who question the wastefulness there are no easy answers. The point is that there is no agreement within the art community as to what ought to be taught, what would constitute a proper training for an artist. And that is hardly surprising in the absence of any agreement—or even large-scale discussion—as to what art is for.

BC:
I think that your installation itself raises some significant questions about the nature of art and art-making, not the least of them concerning the relation of the artist to the rest of the population. Almost continuously, both artists and public in the Western tradition have preferred the motives and methods of artists to remain secret and oblique. You differ from this convention in that you want everything about your activity as an artist to be as open and clear as possible. You are encouraging the audience to have a more questioning response to art. You are offering the viewer a larger share in what you yourself would call transactions fundamental to art.

HC:
There is something intrinsically magical about the making of images, and therefore something intrinsically powerful about the people who practise image-making. Of course, society would rather have more magic than less, and would rather invest special powers in special people than not. There is nothing new about that. Marvellousness is absolutely central to art; it is in large part what the society wants and pays for.

Methodologies for marvellousness have always been abstruse, I imagine, whether in religion, medicine, art or mysticism; but methods have always been learned by the initiated. Which means that we should be talking about initiation into a body of knowledge, not about the possession of paranormal powers, when we talk about what makes artists special. People go into art by reason of cultural circumstance and personal preference for one life-style over another, not by virtue of divine calling. And if they are different from other people it is because they do what they do instead of doing something else, not because they are born different. Artists are made, not born.

There is an initiation. But it isn't clear that the initiate learns much beyond his or her part in keeping the system going. The condition of art today rests too heavily upon issues of personality, and the arrival on the scene of more great new personalities is not going to change that condition fundamentally. That can only happen when someone proposes the inclusion of a new body of knowledge which allows us all to make more sense of what we know.

I don't want these remarks to be interpreted on a trivial level. Laser technology constitutes a body of knowledge, but its inclusion hasn't done much for art-making because it hasn't revealed anything, hasn't allowed us any new insights. In fact, the whole Art & Technology game proved to be a sort of carnival, arriving in the morning with great fanfares and a tent full of gadgets, gone by the next morning leaving all unchanged.

BC:
We should also say that everything under the heading of 'computer art' has gone the same way. Perhaps it would be important to say here why you have never wanted anything to do with 'computer art'.

HC:
I've always maintained that if you can't make images without a computer, you probably can't make images with one, either. Skill in programming doesn't guarantee anything, any more than a knowledge of photographic chemistry makes great photography, or knowledge of paint chemistry makes great painting. The point is that you couldn't make an oil painting at all that would last five years unless you knew something about the way different pigments affect drying rates. The development of acrylic paint has done for painting what Kodak did for photography: you don't need to know anything much about the materials anymore, but you can't do very much by virtue of the materials either. Artists who are persuaded that they cannot, or should not, learn to program in order to use the computer are in a similar fix.

For an artist proposing to make images with a computer, the body of knowledge we should be considering is that which binds the nature of a program to the nature of an image, not simply programming skills, even though he can't do without them. 'Computer art' has never accomplished that binding, because it has always accepted the characteristic 20th century definition of the computer as a transformation device. To get an image out you have to put an image in. The binding of program to image is impossible, since a transformation process is indifferent to what is being transformed.

To use the computer as a transformation device is to use it on a trivial level. It is a completely general symbol-manipulating device, and allows the writer of a program essentially to define what the machine is any way he or she chooses. That generality gives the computer a very special significance as the first modern device which allows itself to be used as a sort of do-it-yourself design kit, rather than as a single fixed-function tool.

Of course, I want that way of seeing the machine to show in my work. It is central to what I do. Showing the machine's drawings, or even showing the machine making drawings without revealing what is actually going on would be like 'revealing' one's paintings wrapped up in brown paper.

But that is only one of many reasons why it would be silly, obscurantist, even immoral, deliberately to play into a 'Mr. Wizard' role. Who needs it? The human mind is wonderful: it becomes more wonderful as we know more about it, not less wonderful. The computer is amazing, it is a marvel. It is more marvellous an invention than any fairy story we could make up about it. To pretend that it is either more or less than it is—to say either that it is only a glorified adding machine or that it involves knowledge so abstruse that only the high priests, the wizards, the specialists can possibly acquire it—that is what guarantees that its applications will be reactionary rather than radical.

The art world as a whole continues to play the 'Mr. Wizard' game, not in relation to abstruse devices, but in relation to the nature of art-making activity. The art world is not in a radical posture today. Persuading people to ask 'how does it work?' in this last quarter of the 20th century is as radical as anything I can think of.

The ideas contained here were argued into their present form by Harold and Becky Cohen during their stay in Kassel for documenta 6. While it takes the form of an interview, the piece is jointly authored.
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CHARLES DODGE
SYNTHESIZED SPEECH RESEARCHER
by Kenneth Terry

As Aristotle noted long ago, everyday speech has its own melody and rhythm. But, with few exceptions, vocal composition through the ages has been dominated by songs and song-like structures.

Charles Dodge's synthesized speech music is one of the exceptions. By exaggerating and otherwise altering the contours of recorded speech, his work enhances the spoken word without transmuting it into song.

Three of Dodge's compositions—*Speech Song, In Celebration* and *The Story Of Our Lives*—use poetic texts by Mark Strand; and the compuser's latest work, *The Woburn Story,* sets words from a radio play by Samuel Beckett. Preserving the intelligibility of these texts is an integral part of Dodge's concept; without the words, none of the pieces would have much impact.

Dodge concedes that the abstract elements of these works—pitch, dynamics, timbre and rhythm—might not be regarded as music by themselves. But, after undergoing computer synthesis, he says, these attributes of speech sounds can enhance the meaning of words so that they convey the same level of emotion found in more conventional music.

"I think of these pieces not only as recitations of poems, but also as intensifications of feelings in those poems. I'm using the synthetic voice to broaden the emotional range of the words. When you recite a poem, you can raise or lower your voice, and include all manner of nuances in the recitation. But the synthetic voice broadens that range by including pitch articulation as one of the elements in the declamation of the poem. This would have to be recited in a way that only a (professional) singer could do (in order to achieve the same effect). In a way, it's getting back to a kind of Bardic (i.e., Homeric) recitation, where you sing the poem—in this case, electronically—as well as convey the words."

The first step in creating a synthesized speech work is to store a recording of someone reading a poem (or other text) in the memory bank of a digital computer. This is accomplished through the use of an analog-to-digital converter, which translates the wave-form of the speaker's voice into a series of discrete numbers.

Next, speech segments lasting about one-tenth of a second are analyzed by programs which extract their individual attributes. This analysis is so accurate, Dodge says, that it could serve as a basis for recreating the original speech sounds. However, the composer can also alter the pitch, duration and resonance (timbre) of those sounds in any way that suits his musical purpose.

Finally, after completing his "synthesis-by-analysis," Dodge runs the information through a digital-to-analog converter. This transforms the numbers into a fluctuating voltage which outputs signals on audio tape.

Suzanne Mead

Using this approach, Dodge created a wide array of both intelligible and abstract sounds in the works cited earlier. *In Celebration,* for example, incorporates a number of solo and choral voices (digitally mixed down). Spoken, whispered, pitched and glissed phrases are interspersed throughout the composition: several kinds of articulation are often heard simultaneously. In addition, the original speech patterns are transformed into abstract musical sounds, sometimes in the middle of an intelligible phrase.

In *Speech Songs,* Dodge concentrated on modulating the speech sounds themselves within the bounds of intelligibility. Here he demonstrated the plasticity of his medium by switching from one set of vocal characteristics to another without pause. As a result, the listener feels as if the same speaker were being inhabited by a succession of radically different personalities.

With *The Story Of Our Lives,* Dodge introduced yet another type of synthetic voice which is also used in *The Woburn Story.* Called "the voice of the book" in the former work, this is a terrifyingly nonhuman—but intelligible—sound which has two components: pitch and "noise." The pitch is fairly similar to that of the original speech sound before it was synthesized; the "noise" consists of many simultaneous frequencies. "You don't perceive it as pitch, but in terms of its density and the speed at which its frequency components change," Dodge notes. "It's like the sound of the surf or of the wind blowing through the trees."

Explaining how he created this mysterious, robot-like persona, Dodge says, "First I recorded a voice speaking the book voice. Then I fed an electronic sound through that which was composed of different frequencies that were constantly changing. And the synthetic voice filtered that (electronic sound) into speech patterns."

Dodge is not the only composer working in this specialized field. Certain pieces by Tracy Lind Peterson, for example, sound remarkably similar to Dodge's. However, the two composers' methods are somewhat different. Whereas Peterson runs his digital data through vocorders, extracting the phase of one voice and the amplitude of another, which he later cross-synthesizes, Dodge employs linear prediction to isolate the characteristics of speech.

Both Dodge and Peterson are experimenting with a larger avant garde tradition which has been labeled "text-sound" by Richard Kostelanetz and "compositional linguistics" by Kenneth Gaburo. The least "musical" practitioners of this genre are composers like John Cage and Lawrence Wiener: in their "text-sound" works, words are the chief ingredient. Obsession with rhythm and a more highly developed counterpoint of verbal meanings characterize pieces like Kurt Schwitters' *Ursonate* (1922-32) and Ernst Toche's *Geographical Fugue* (1930) and *Valse* (1962). Additionally, in the tape loop compositions, *It's Gonna Rain, Come Out,* and *Melodica* (all dating from 1965-66), Steve Reich used a phase-shifting technique to intensify the rhythmic and melodic qualities of recorded speech.

Dodge's synthesized speech sounds can also be compared to Arnold Schoenberg's Sprechstimme, a vocal technique that falls halfway between speaking and singing. Several opera composers, Dodge notes, have pointed out to him the similarities between his style and Sprechstimme; moreover, he himself feels that Schoenberg helped pave the way for "text-sound" works.

Nevertheless, what first attracted Dodge to the concept of synthesized speech was something that other electronic composers were doing with instrumental music. "I had been working in computer music since the mid-'60s, and people like John Chowning, Max Matthews and Jean-Claude Risé had been pretty successful in simulating musical sounds (electronically). Trumpet tones, percussion sounds and even some early attempts at string simulation were pretty good.

"Then there was a whole other field of speech research, where people were getting pretty good at simulating the sound of the human voice electronically. This was being done by people at the telephone company who were interested in learning more about the human voice and about communication channels. They were trying to reduce the band width of communication channels by simulating the sound of voices so that they would be transmitted over telephone lines with fewer bits of information. With that capability, they could have more telephone conversations going through the same channel simultaneously.

"What interested me was bringing the research in these two areas (electronic music and speech research) to bear on vocal music. Would it be possible to use a computer for vocal music?

"Initially, what I was trying to do was get a computer to sing like a trained vocalist. And when I was working on a piece of music which required that, it was a failure, because at that time our programming skills weren't developed enough. But then I found that, although the computer couldn't sing like Beverly Sills, it would make interesting speech sounds that were intelligible as English. So I put together a piece (*Speech Songs*) that didn't require professional-level singing, but which just made use of speech sounds and pitched vocal sounds—patterns that I found amusing and stimulating—and it worked marvelously."

Although Dodge has long been interested in electronic music, he was originally an instrumental composer. As a student at the University of Iowa, he was writing 12-tone music, inspired by the work of Schoenberg, Webern and other serialist composers. Then he heard some electronic music and wanted to try his hand at it. So in 1964 he enrolled at Columbia University in New York, where he now teaches.

"I was very struck by the music of Milton Babbitt, Edgar Varese and Mario Davidovsky," recalled the 35-year-old composer. "All three were working in New York then, and Babbitt and Davidovsky were at the Columbia Electronic Music Center."

After a year of studying electronic music, Dodge decided that synthesizers were not for him. He wanted to compose serial music, and he felt that synthesizers were not precise enough for his purposes. "I wasn't well-suited to the techniques of the electronic music studio," he recalls. "So I went to the computer to realize my ideas; and the first big piece I wrote was *Changes,* a serial composition."

As time went on, however, Dodge progressively abandoned the strict 12-tone mode. In *Earth's Magnetic Field,* for example, all the pitches are diatonic steps in the scale of C (although the overlapping of monophonic strands forms more than a few dissonant chords).

"I'm still interested in organizing the material in a composition, but I'm not using a method that is as describable as serialism," Dodge comments. "I'm interested in patterning that reinforces the emotional flow and communication in the piece, not as an end in itself. That's the difference, at least, between my serial music of some years ago and what I'm doing now."

Currently, Dodge finds himself in a transitional phase of his career. Having constructed a unique style of his own, he wants to investigate its potential in several related fields, including theater, video and dance. To date, he has made a videotape of *The Story Of Our Lives* (with Bill and Louise Etra) in which a male and female actor mouth the words to the synthesized tape while they act out the motions and feelings of the play's narrators. In addition, a dance troups is currently choreographing *Speech Songs.*

"I want to pursue all of these avenues," Dodge explains. "I feel like I've spent a long time working in the laboratory, developing engineering skills that most composers never have the time to develop, and now I'm bringing those laboratory skills out into the musical and theatrical arenas. I'm just in that process now."

RECORDING: IN CELEBRATION

IN CELEBRATION was composed during the first half of 1975. The composition is an attempt to capture the spirit and structure of the Mark Strand poem and to render it in a musically coherent way. The poem (see insert) has a two-part structure divided by the second occurrence of the phrase "You sit in a chair." The two parts of the poem may be distinguished from each other by the different degrees of passivity attributed to the "you," the person to whom the poem is addressed.

The setting portrays the change of emphasis between the parts of the poem. In the first part of the composition there is a variety of types of articulation, including spoken, whispered, pitched and glissed phrases, and a variety of textures from solo to choral. There is a rapid succession of types of treatment of words, and a prevalence of textures in which more than one type of articulation is heard together.

The enclosed soundsheet contains the first part of the two-part structure of IN CELEBRATION. From Synthesized Voices, Stereo LP #CRI 348, available from Composers Recordings, Inc., 170 West 74th Street, New York, NY 10023.

IN CELEBRATION

You sit in a chair, touched by nothing, feeling
the old self become the older self, imagining
only the patience of water, the boredom of stone.
You think that silence is the extra page.
You think that nothing is good or bad, not even
the darkness that fills the house while you sit watching
it happen. You've seen it happen before. Your friends
move past the window, their faces soiled with regret.
You want to wave but cannot raise your hand.
You sit in a chair. You turn to the nightshade spreading
a poisonous net around the house. You taste
the honey of absence. It is the same wherever
you are, the same if the voice rots before
the body, or the body rots before the voice.
You know that desire leads only to sorrow, that sorrow
leads to achievement which leads to emptiness.
You know that this is different, that this
is the celebration, the only celebration,
that by giving yourself over to nothing,
you shall be healed. You know there is joy in feeling
your lungs prepare themselves for an ashen future,
so you wait, you stare and you wait, and the dust settles
and the miraculous hours of childhood wander in darkness.

International Computer Music Directory

A 239-page volume entitled *Computer Music 1976/77: a directory to current work* has been compiled and edited by William Buxton and published by the Canadian Commission for UNESCO. Over 80 studios from 15 countries are listed, with information on hardware and software available, staff, funding, projects in progress, compositions completed, instruction offered, etc. Small studios in private homes are listed along with large installations at colleges, universities, and research institutions. Information was collected by means of a questionnaire. Copies of the book have been sent to all respondents to the questionnaire; others may obtain information on receiving a copy from The Canadian Commission for UNESCO, 255 Albert, P.O. Box/C.P. 1047, Ottawa, Ontario, Canada K1P 5V8. As is often the case with such reference works, some studios were inadvertently omitted in the initial survey. *Computer Music Journal* plans to include an updated appendix to this volume in a future issue. Studios which wish to be listed should contact William Buxton, Computer Systems Research Group, University of Toronto, Toronto, Ontario, Canada M5S 1A4.

AIMS AND MEMBERSHIP

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

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

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This issue of PAGE was edited by Kurt Lauckner.