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"AN EXPLORATION OF THE PRINCIPLE OF CHANCE AS A STIMULUS TO THE CREATIVE ACTIVITY KNOWN AS SCULPTURE"

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DECLARATION

This thesis "An Exploration of the Principle of Chance as a Stimulus to the Creative Activity Known as Sculpture", has been completed by myself; it has not been accepted in any previous application for a degree; the work, of which it is a record, has been done by myself, and all quotations have been distinguished by quotation marks and sources of information and reference acknowledged.

ALLAN WATSON
19th May, 1992

CONTENTS

CHAPTER 2 (cntd)

CHAPTER3 (cntd)

APPENDICES 247

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS (cntd)

LIST OF TABLES

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Abstract

This research is concerned with the utilization of chance as a stimulus to encourage experiment and discovery in sculpture. The aims of this research project were: to examine the role of chance within the creative process and previous artists' use of chance; to develop and test a 'chance orientated device' which can introduce chance into any sculptor's creative process; to consider the results of such tests and postulate as to the efficaciousness of such a device.

An initial interest in chance came about through the author's personal experience of making sculpture and the fact that the author derived greater pleasure from the end product when to some extent its final form had been determined by factors beyond the author's control. Also, such work appeared to receive more favourable peer judgement and praise than work in which chance had played no part. These events aroused a curiosity as to why chance appeared to have such a positive effect upon the author's creative process and whether or not this effect could be enhanced, and extended to other sculptors.

A critical review of literature concerning the scientific study of creativity revealed that chance was recognised as a contributory and often catalytic factor in all fields of creativity, whilst a review of previous artists' use of chance identified the deliberate use of chance in a number of processes, products and philosophies of major art movements and influential artists throughout the twentieth century. It was concluded that chance was a significant yet neglected factor within the creative process, with little accreditation to be found.

The methods that previous artists employed to introduce chance had been based upon idiosyncratic techniques which lacked the cohesion and objectivity which the principle of chance demanded. In order to rectify this, the author proposed the development of a 'chance-orientated interactive device' (C.O.I.D.), which possessed the ability to introduce chance into any person's creative process by exploiting the decision making process inherent within creativity. The device, known as ARP (Art as Random Process), exists in 'Hypercard', an Apple Macintosh application which allows non-linear organization of information in relational structures of either text, image, or sound, and has been designed to introduce chance into both the mental and physical processes of making sculpture. ARP exploits the principle of chance by offering the user an opportunity to receive random selections from various alternatives, all of which (both actually and theoretically), relate to the production of sculpture (for

example, the user could receive a randomly selected material, a randomly selected shape, or a randomly selected place, etc). By making use of such chance processes, the user is freed from personal likes and dislikes because ARP provides chance combinations of elements that they perhaps would not have chosen themselves. By encouraging users to consider 'random selections', ARP aims to stimulate creativity by acting as a 'habit breaker' to the more experienced sculptor, and as an 'eye-opener' to the less experienced sculpture student.

The development of ARP has involved several experiments (using both author and others as participating subjects), which not only tested the design of the device, but attempted to measure the difference, if any, between sculpture produced by purely 'personal decision making procedures', and sculpture produced by 'chance effected decision making procedures'. Ultimately, ARP has been tested and endorsed by a number of prominent sculptors, the majority of whom found ARP to be fascinating, relevant and stimulating. The prototype has successfully demonstrated the immense potential for the future development of ARP, not only within the sculptor's studio, but as an educational device (in any creative profession), and as a methodological 'tool' for further research.

The thesis is supported and extended by an exhibition of sculpture made by the author (both 'personal' and 'ARP inspired"), so that a final comparison may take place as to the effectiveness of ARP as a stimulus to creativity.

(There is no visual documentation of this exhibition in the thesis, should this material be required please contact the author.)

1.0 CHAPTER 1 - INTRODUCTION.

1.1 Aims of the research.

The theme of this research emerged from the author's personal experience of making sculpture and is concerned with the use of chance as a stimulus to encourage experiment and discovery in the sculpture studio. The motivation for the research stemmed from the author's intrigue as to just why chance should contribute to his creative process in such a positive and beneficial manner, and whether or not such an effect could be extended to other sculptors. The hypothesis, that chance may stimulate and enrich creativity, determined that the aims of the research were as follows:

to review the use of chance and randomness in the decision making process and to consider why it should be useful in the creation of works of art;

to identify and categorize specific decision making points inherent in the production of a piece of sculpture and to deliberately introduce chance into the creative process;

to compare the outcome between decision making as it is effected by controlled deliberation, and decision making as it is effected by controlled chance (part of the final submission shall be an exhibition of sculpture representing both 'personal' and 'chance effected' work);

to investigate if the use of chance in the creative process can:

(a) widen artistic boundaries by expanding limits of consideration.
(b) increase creativity through focusing upon choice.

1.2 Glossary.

Throughout the thesis it should be noted that the the author wishes the following terms to be interpreted as follows:

(a) the term 'creative process' is used to denote the series of actions directed towards making a piece of sculpture, and as such, includes both 'thinking' and 'doing'.

(b) the term 'chance' is used to denote any action within the creative process which causes an event to result in any way which is not controlled by the artist's will or intention, and as such may manifest itself in a number of different disguises, such as accident, disorder, indeterminacy, randomness, or spontaneity.

(c) the term 'sculpture' is used to denote any product in any medium and method which is intended by the maker to be sculpture. Due to the enormously wide range of styles that the term 'sculpture' has come to represent (i.e from figurative bronzes to conceptual installations), it should be understood that within the context of this research, no particular genre or style is favoured, and that no type of sculpture is intended to be more desirable than any other, e.g. object orientated, performance based, permanent, ephemeral, figurative, abstract, formal, conceptual, etc.

(d) the term 'model' is used to denote a visible and tangible representation of the decision-making process associated with sculpture. Due to the particularly strong associations, both in terms of 'research terminology' and 'sculpture terminology' that the term 'model' may evoke, it was decided that the term 'chance-orientated interactive device' (C.O.I.D.) would be used.

(e) the term 'chance-orientated interactive device' (C.O.I.D.) is used to denote the combination of the above 'model' and an external randomizing mechanism.

1.3 Structure of thesis.

The structure of the thesis (see fig.1), is as follows; chapter 1 (the introduction) provides an insight into the author's motivation for undertaking the research and briefly examines the concept of chance itself. Chapter 2 (literature review), is divided into Sections A and B. Section A reviews the literature concerning the scientific study of creativity, especially in relation to 'fine art', whilst Section B examines previous artists use of chance, their processes and resulting products. Chapter 3 deals with the methodology of the research, namely, the development and testing of a 'chance-orientated interactive device', whilst chapter 4 discusses the results of this development and postulates as to the pertinence of such a device and draws conclusions about the research as a whole.

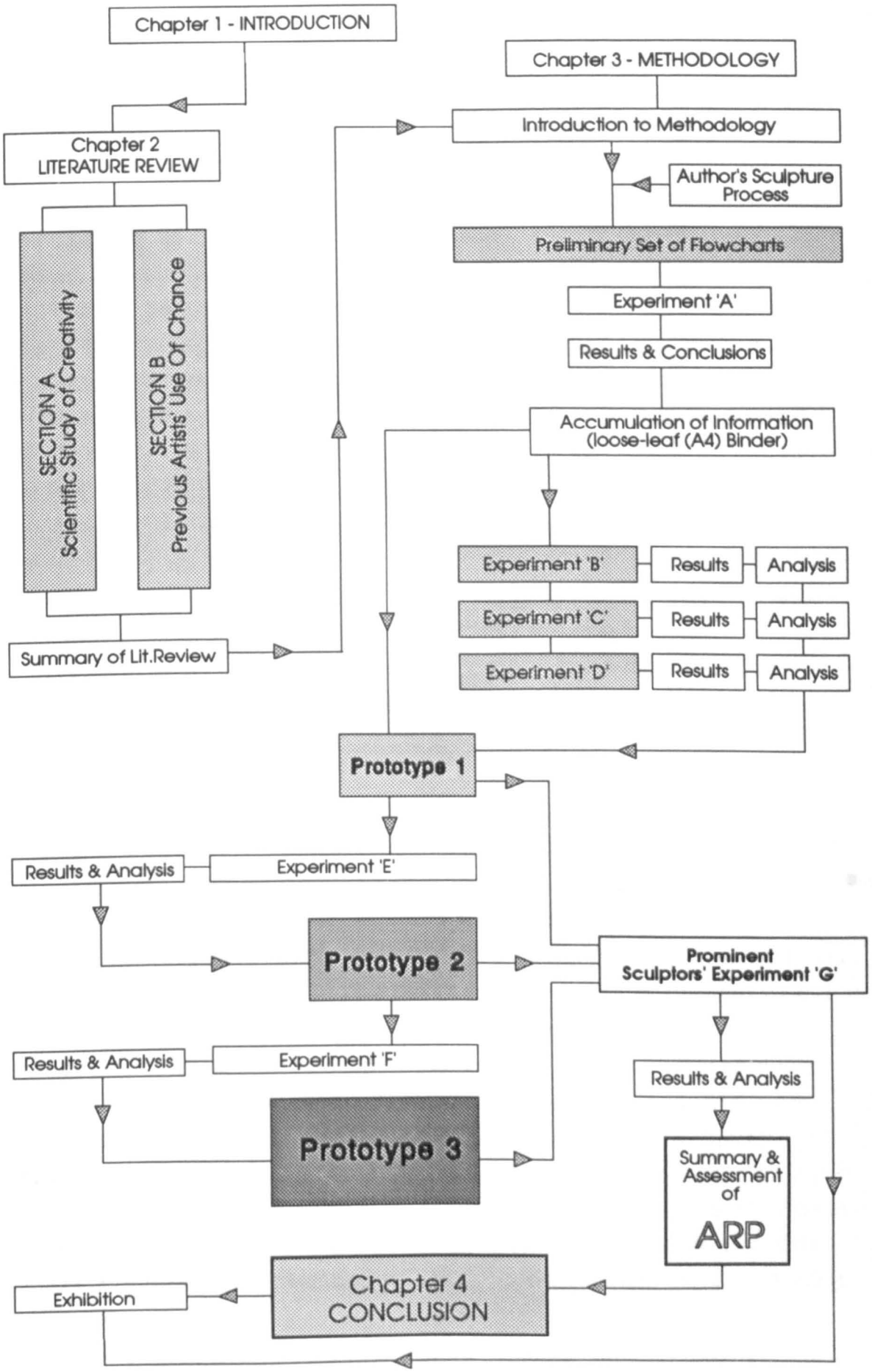

Fig.1 Structure of Thesis

1.4 A curiosity is aroused.

An initial interest in chance came about through the author's personal experience of making sculpture, both as an undergraduate and post-graduate student. Over a period of approximately five years, there was a slow realization by the author that he received greater pleasure from the end product, when, to some degree, its final form had been influenced by factors beyond the author's control. If one may use an analogy between the making of a piece of sculpture and that of a path, stretching from 'A' to 'B' (where 'A' is the germ of an idea, and 'B' the envisaged 'finished' sculpture) the author found that chance events or influences encountered along this path, enticed him off the route to 'B', and on to what he considered to be more interesting and exciting destinations, i.e. 'C', 'D', or 'Z'. This personal satisfaction with chance was further reinforced by the fact that such sculpture appeared to receive more favourable peer judgement and praise than work which had 'safely' negotiated the 'path' - devoid of 'chance intervention' - therefore ending up at 'B', entirely as originally intended. An extended personal narrative describing the presence of chance within the author's creative process is included as Appendix 1.1; however, in order to provide an example at this stage, figs.2, 3, and 4 represent examples of work produced during that period, whilst their connection with chance is described below.

Many pieces of work produced during that time came about as a result of the chance juxtaposition of numerous 'objects' which had found their way into the author's studio. Fig.2 is an example of a piece of sculpture which came about through just such a process of 'unintentional juxtaposition'. The sculpture consists of three distinct parts, the bottom section is a plastic cup which at one time had been used to pour wet plaster and had therefore been completely immersed in the substance, and thereafter forgotten about until some wet concrete mix was 'dumped' on top of it - the middle section. The uppermost section is also made of concrete, and was initially formed by pouring some leftover concrete mix into a cavity that had been made in a lump of clay. The resulting solid was then, at some time (perhaps months later), placed on top of the other two, and the sculpture was complete. There had been no intention to make such a piece, it simply came about as a result of a series of unguided actions which had been executed with no specific purpose in mind, no guiding 'vision' or conscious aim.

Original in colour.

Fig.2 Allan WATSON - Untitled - 1988

Fig.3 is a piece of work which demonstrates a favourite practice of the author, namely, using whatever material happens to be available; in this instance, waste material obtained from a wood carver. In general, the author attributed greater significance to 'source material' (anything that provides inspiration for, or becomes part of, a later work) when it had been 'found' (i.e. discovered by accident), rather than 'sought' (i.e. discovered by design). In this instance, the author had not made any attempt to deliberately find 'wood shavings' possessing those particular qualities, rather, once they became available to the author, he decided to use them.

As well as using traditional drawing instruments (such as a pencil or pen), where the hand has direct physical contact with the image being drawn, the author developed a preference for 'instruments' which could contribute to the creation of the image itself (i.e. computer or photocopier). By denying direct physical contact the author was never in complete control of the image being drawn. Fig.4 is one of a series of computer drawings in which the resulting shape owes much to the inability of the rather cumbersome 'mouse' to draw exactly what the author set out to draw.

As these examples demonstrate, the degree to which chance intervened during this period can only be described as minimal, (and to some artists may even appear a natural and intrinsic part of the creative process, demanding little examination); however, the cumulative effect of such events, along with the fact that chance seemed to have been present at the most abrupt and rewarding changes of direction in the development of the author's work, led to an interest and curiosity as to the nature of chance and the reasons why it should have such a profoundly beneficial effect upon his creative process.

1.5 Two types of chance.

Throughout the period discussed above, the author did not actively encourage chance to any great degree, but simply welcomed it's unpredictable occurrence. Such an approach however, maybe representative of only one 'type' of chance. In the simplest terms, there may exist two types of chance -'undeliberate' and 'deliberate'. The former - 'undeliberate chance' - is indicative of an instance in which chance enters into a person's creative process unexpectedly and beyond a person's control (i.e. as above), whilst the latter - 'deliberate chance' - is indicative of an instance in which chance is deliberately invited by the artist into

Original in colour.

Fig.3 Allan WATSON - Untitled - 1988

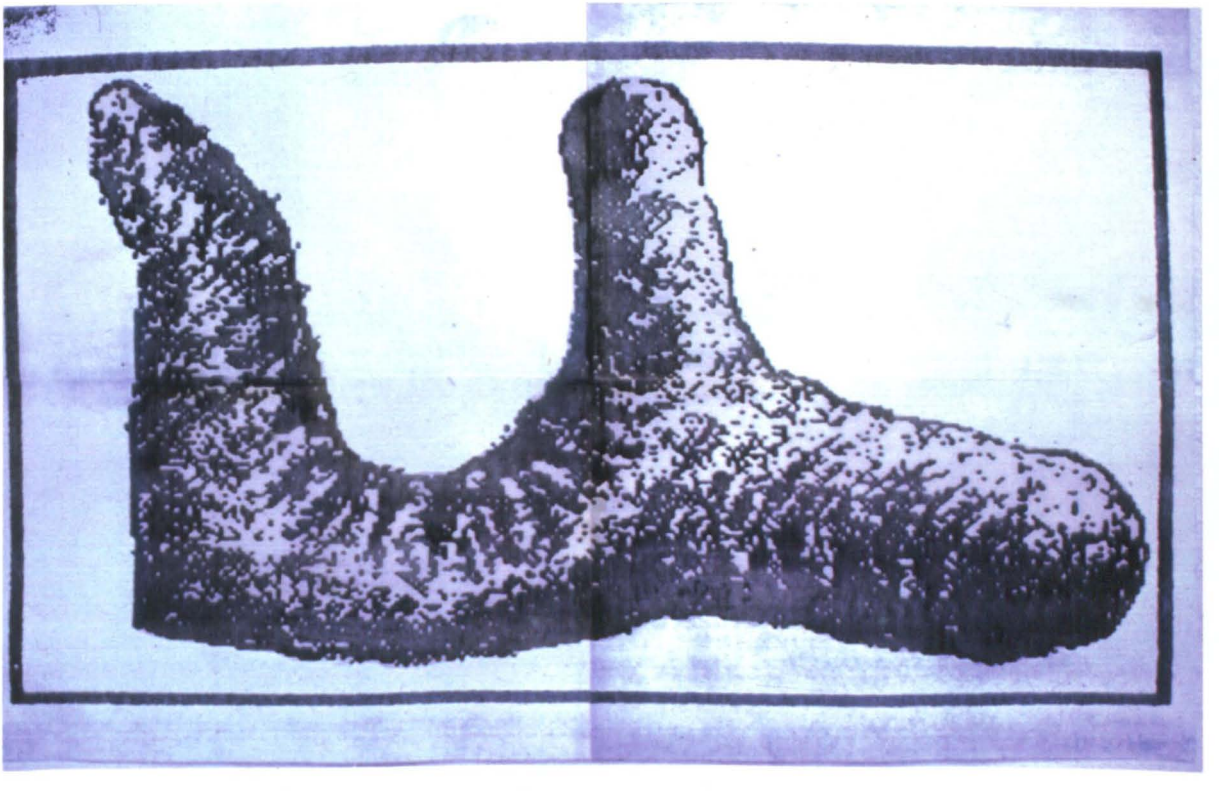

Fig.4 Allan WATSON - Computer Drawing - 1988

his/her working process, i.e. the artist may work hurriedly, or invite accidents to occur, or select an element at random.

1.6 The phenomenon of chance.

The concept of chance may be described as a universal phenomenon that pervades our everyday lives in a variety of different disguises. Not only does it form the basis of a multimillion pound entertainment industry, (i.e. 'gambling', 'bingo', 'television game shows', 'football pools', and 'national lotteries') but throughout history it has been the focus of much philosophical and scientific interest, still active today. A brief examination of this scientific interest now follows, touching upon physics, biology, mathematics, and philosophy, and hopefully demonstrating something of the omnipotent nature of chance.

During the twentieth century, discoveries in the field of particle physics altered mankinds' view of the universe from that of a deterministic world, in which everything was predictable, to that of a non-deterministic world in which randomness became a basic physical law of the universe. Determinism, which had been supported by Newtonian mechanics, was based upon the assumption that 'given perfect knowledge of what an object is doing now, one can predict exactly what it will be doing in the future.' - (CAMPBELL, 1983). According to DAVIES (1988) the idea of a predetermined universe has a 'profoundly depressing aspect to it' and he goes on to explain why:

> "If the entire past and future condition of all matter is uniquely determined by its condition at any one instant, then our future must obviously be predetermined in every last detail. Every decision we make, every random whim, must in reality have been arranged billions of years in advance to be the inevitable outcome of a staggeringly intricate but fully determined network of forces and influences."

The consequence of a deterministic world is the denial of chance and indeterminacy in favour of a pre-destined order. In an article entitled 'Randomness in the Twentieth-Century', BORK (1967) states that the deterministic view became increasingly threatened by 'several events early in this century' which 'made randomness prominent in physics'. The events which Bork refers to include Albert Einstien's 1905 paper entitled 'Investigations on the Theory of Brownian Movement' (the irregular random motion of microscopic

particles suspended in fluid), the development of quantum mechanics, which HAWKING (1988) claims '. . introduces an unavoidable element of unpredictability or randomness into science', and the 'uncertainty principle' (HEISENBERG, 1927) which, according to Bork, 'relinquishes the possibility of predicting exactly the outcome of an atomic (or molecular) system'. DAVIES (1988) summarises the 'quantum revolution' by stating that it 'demolished' the idea that 'the world unfolded in a way determined by its present state' and replaced it with the idea that 'the future is inherently uncertain'. Such a view was not acceptable to everyone, however, as Davies reports:

> "So unpalatable did this inherent chanciness of nature seem to Einstein that he refused to believe it throughout his life, dismissing the idea with the now famous retort 'God does not play dice'."

Physicists were not the only profession to encounter disbelief due to the involvement of chance. In the field of evolutionary biology, Charles Darwin's theory of evolution by natural selection (DARWIN, 1980) seemed to suggest that the very existence of life itself was not due to God's creation but apparently to the random mutation of genes. Disciples of Darwinism however are keen to stress that natural selection does not involve chance; DAWKINS (1986) for example in 'The Blind Watchmaker' sets out to 'destroy this eagerly believed myth that Darwinism is a theory of chance'. In Chapter 3 - 'Accumulating small change', Dawkins explores the popular phrase 'given enough time, a monkey bashing away at random on a typewriter could produce all the works of Shakespeare' and concludes that

> "Chance is a minor ingredient in the Darwinian recipe, but the most important ingredient is cumulative selection which is quintessentially *non*random."

However, not all biologists agree. In 'Chance and Necessity' MONOD (1972) states that

> ". . . chance alone is at the source of every innovation, of all creation in the biosphere. Pure chance, absolutely free but blind, at the very root of the stupendous edifice of evolution . . . "

In the field of statistics, the desire to discover the 'laws of chance' manifest themselves in various 'theories of probability', a subject touched upon by BRECHT (1966) who mentions Cardano, Galileo, Pascal, Fermat, De Moivre, Laplace, and Gauss, as key figures in the history of probability theory. However,

CAMPBELL (1983) warns that 'even today, in spite of impressive accomplishment, the theory of probability rests on insecure foundations' and all theories are highly controversial.

Another area in which chance plays a prominent part is Eastern philosophy. Whilst it is suggested by the author that Western philosophy has been concerned more with metaphysical speculation, focusing upon rationality and reason, Eastern philosophies have focused more upon the respect of Nature and the recognition that 'man is an irrational animal'. CAPRA (1983) describes the essence of Taoism as 'Acting in harmony with nature' which meant 'acting spontaneously and according to one's true nature. . . trusting one's intuitive intelligence'. Similarly, Capra tells us that 'The perfection of Zen is . . to live one's everyday life naturally and spontaneously.' These quotes come from Capra's celebrated text 'The Tao of Physics' in which he compares 'the parallels between the intuitive wisdom of Eastern mysticism and the rational knowledge of modern physics'. Capra suggests that the two foundations of 20th century physics - quantum theory and relativity theory - force us to see the world in a similar way to the Eastern view; one would now expect Capra to include 'chaos theory' as a third foundation since it appears to confirm the importance of spontaneity within the universe, an entity which Eastern mystics have valued for centuries.

Some of the most recent scientific 'discoveries' have concerned themselves with randomness. In 'The Fractal Geometry of Nature', the French mathematician MANDELBROT (1983), unhappy with traditional Euclidian geometry - which could not 'describe the shape of a cloud, a mountain, a coastline or a tree' - replaced it with 'fractal' geometry:

> ". . . a new geometry of nature which describes many of the irregular and fragmented patterns around us. The most useful fractals involve chance and both their regularities and irregularities are statistical."

GLEICK (1988) author of a popular and best selling book, 'Chaos', explains the complex mathematical significance of the 'Mandelbrot Set' in the chapter entitled 'Images of Chaos', and describes how the computer generated images which have been produced by the 'Mandelbrot Set' 'became a kind of public emblem for chaos' (see fig.5). Whilst simple geometrical equations produced circles, ellipses and parabolas, the Mandelbrot Set, involving a process of magnification, produced an infinite variety of patterns, similar to many found in nature, which Gleick describes as 'a miracle of miniaturization in which every

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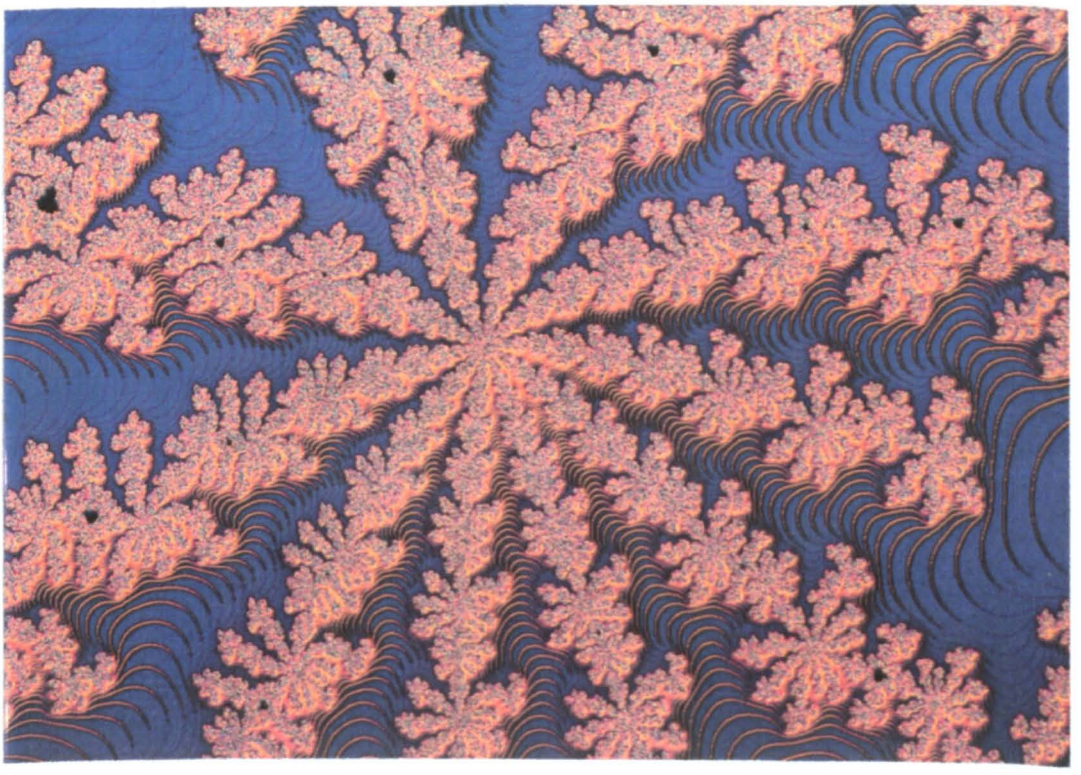

Fig.5 'Coral Snowflake' - an example of a fractal image.

new detail was sure to be a universe of its own, diverse and entire'. Gleick suggests that the twentieth century will be remembered for three things: as well as the theory of relativity and quantum mechanics, chaos theory will be remembered because it is global in nature and appears to be everywhere:

> "A rising column of cigarette smoke breaks into wild swirls. A flag snaps back and forth in the wind. A dripping faucet goes from a steady pattern to a random one. Chaos appears in the behaviour of the weather, the behaviour of an aeroplane in flight, the behaviour of cars clustering on an expressway, the behaviour of oil flowing in underground pipes. No matter what the medium, the behaviour obeys the same newly discovered laws."

These 'newly discovered laws' however, rather than confirm 'true randomness', seek to find an order, and consequently a reason as to why order may arise spontaneously from a chaotic system, or chaos may arise spontaneously from an ordered system. ARNHEIM (1962) highlights the practice by artists to 'fashion the human figure . . according to traditional canons of measurable proportion', and points out that such 'rules' were 'derived from mathematics, which formulated the secrets of the cosmos.' If, as it now appears likely, that a fundamental 'secret of the universe' is randomness and chance, should not the false 'rules' be abandoned?

1.7 Recap.

The research was generated by the author's intrigue as to why chance should contribute to his creative process in such a beneficial manner, whether the frequency of its appearance could be increased, and whether it could be made beneficial to other sculptors as well? It is obvious how in one way or another, chance surrounds our everyday lives, therefore it is not surprising that the concept of chance has attracted, and continues to attract, the interest of both scientists and artists alike.

2.0 CHAPTER 2 - LITERATURE REVIEW.

The literature review is divided into two sections, A and B. Section A deals with the scientific study of creativity in relation to visual art whilst Section B examines previous artists' use of chance, their processes and resulting products. Fig.6 illustrates the principle contents of the literature review.

2.1 Introduction to Section A.

The objective of Section A of the literature survey is to critically review the literature concerning the psychology of creativity, that is, the scientific study of or relating to the mental activity involved in creative thinking and doing. The reason for this is to identify areas of the creative process in which it has been suggested by previous authors that chance may contribute to the success of such processes and to assess the degree to which such opinions may be considered valid. Throughout this section it should be noted that criticism does not stem from a claimed expertise in psychology but rather from the 'informed perspective' of the author's experience as a practicing sculptor, knowledgeable about and involved in the creative process itself.

2.2 General overview.

An initial study of the literature concerning creativity [by means of ART INDEX, ART BIBLIOGRAPHIES MODERN, on-line search ART LIT INTL (RILA) 75-88] indicated the available material not only to be immense in volume but also extremely diverse in approach. In order to extricate relevant material from within this myriad of research some parameters had to be established. A text was judged pertinent if any of the following three criteria were satisfied:

1. it was concerned with studies of or relating to 'fine art' and creativity;

2. it was concerned with studies of or relating to chance and creativity;

3. it was concerned with studies of or relating to the components and mechanisms of the thought processes intrinsic to creativity.

The identification of relevant material was further assisted by the following two texts, both of which provide a comprehensive overview of research into

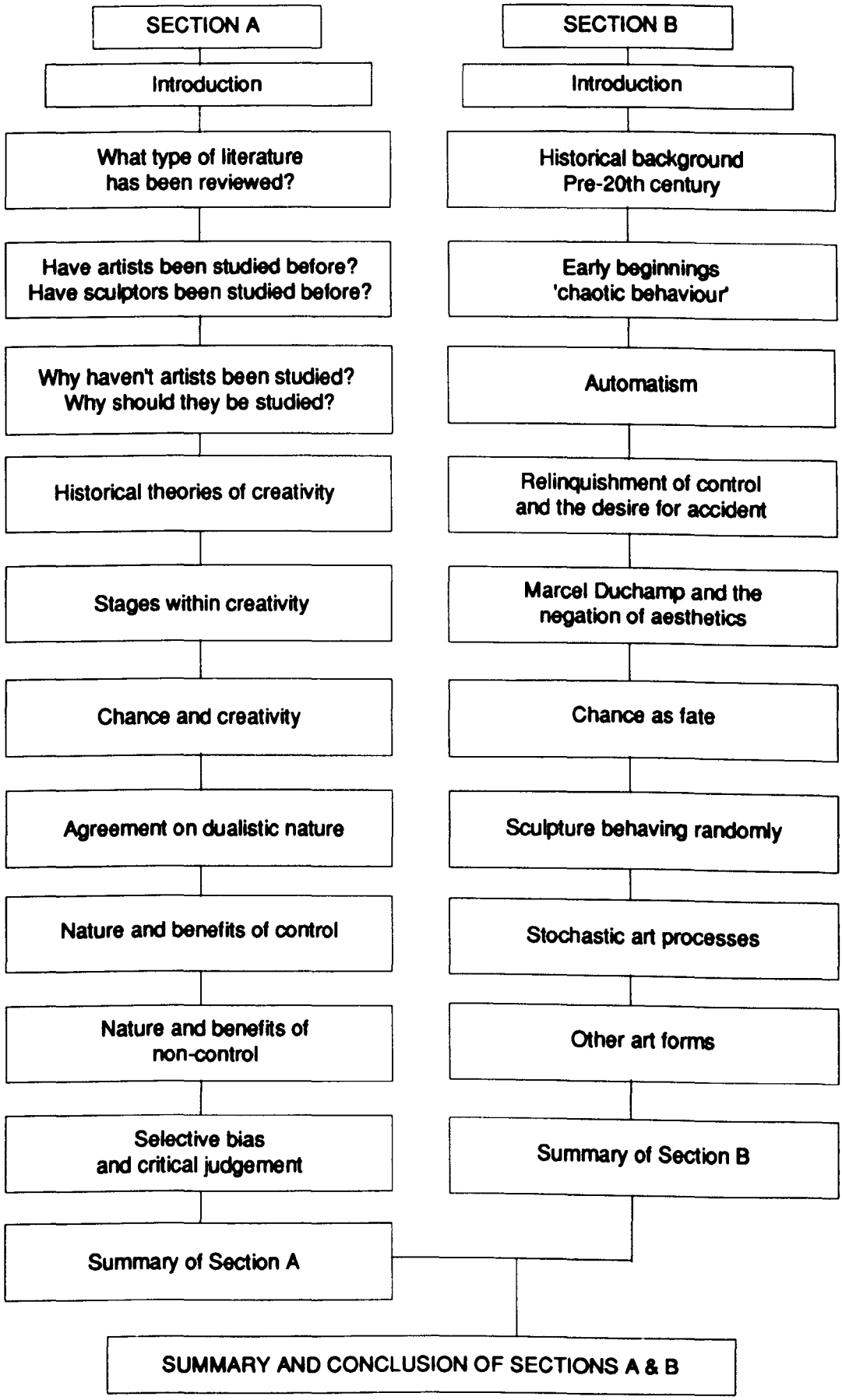

Fig.6 Structure of literature review.

creativity as well as demonstrating the complexity and diversity of the subject. FINDLAY & LUMSDEN (1988) list six previous approaches to the study of creativity and innovation (see below), and include a summary of key texts, methodologies used, major conclusions, and problems outstanding in each approach. The six distinct approaches are:

Sociology/Cultural Anthropology/History of Science & Art.
Neurobiology.
Evolutionary Biology.
Artificial Intelligence.
Cognitive Psychology.
Social Psychology.

In 'What Do We Know About Creativity?' TARDIF & STERNBERG (1988) highlight the major agreements and disagreements between earlier authors. They separate their study into four distinct approaches; creative process; creative product; creative person; creative place. The requirements of this research determined an interest primarily with literature which dealt with creative processes and cognitive psychology, as these are both concerned with the investigation of the 'thinking' involved in creativity.

The ability to identify areas with which the research was not concerned helped to eliminate irrelevant texts or parts of a text. For example, it can be categorically stated that the research is not concerned with the relationships between motivation and creativity, or personality traits and creativity, or intelligence and creativity.

2.3 Have artists been studied before?

The majority of literature was found to concern itself with the sciences (scientific theory and invention, mathematical formulae, problem solving, etc) rather than the arts (music, literature, visual art) In the recent survey TARDIF & STERNBERG (1988) found that

> ". . . the most frequently discussed 'products' of creative thought . . are solutions to problems, responses on creativity tests and explanations for phenomena; close behind come technological inventions and artifacts, novel ideas, and new styles, designs, or

> paradigms. . . fine arts received only half as much attention from the current authors as scientific and laboratory problem solving."

When 'fine art', e.g. painting, sculpture, etc. does become the focus of attention it is primarily painters and paintings rather than sculptors and sculpture which are studied. A typical example of this bias is ROTHENBERG (1979) who, out of 35 individuals refers to 27 painters and only 5 sculptors. Similarly GHISELIN (1952) includes only one sculptor out of 38 individuals in his study. The cause of this bias may have something to do with the fact that all painting shares similar physical processes resulting in a similar type of product whereas sculpture encompasses an extreme variety of physical processes resulting in an extreme variety of product. Thus painters provide researchers with a far more consistent product than sculptors. No text was discovered which devoted itself to the processes and products peculiar to the art of sculpture even although the creative process involved in making sculpture is distinctly different to the creative process involved in painting. By focusing entirely on the creative process involved in making sculpture this project should go some way towards redressing this imbalance.

The main reason that authors give for preferring the sciences to the arts is the nature of the product that artistic creativity presents. Unlike mathematical formulae or solutions to set problems a piece of art cannot be subjected to an ultimate proof or 'correctness' as it belongs to the realm of personal perception rather than the realm of ascertainable fact. DE BONO (1967) states that

> "In a way, science is a superior form of art, since the beauty of a new idea is no longer a matter of opinion or fashion."

In order to avoid any problems with 'fashionable' art, the quality of which history has yet to prove, authors have preferred to study historically established figures such as Leonardo, Rembrandt, Cezanne and Picasso rather than contemporary artists who they seem to view with a degree of uncertainty. ROTHENBERG (1979) mentions the American 'Pop' artist Claes Oldenberg (b1929), but declines to focus on his work because

> "Oldenberg is sometimes considered not to be serious and therefore a difficult creative artist to evaluate . . ."

Considering that Oldenberg is a sculptor of international repute with work in many of the principal art galleries throughout Europe and America, to suggest

that he is not serious would appear to be a serious misjudgement by Rothenberg. Perhaps, like the public in general, researchers have had difficulty in coming to terms with some of the more recent 'isms' of art such as 'minimalism' or 'conceptualism'. To date, such movements seem to have been ignored along with any investigation into the more extreme forms of the avant-garde, which by its very nature, is experimental and radically different, ironically, qualities related to creativity itself. It appears that any processes and products which stray from traditional methods or views of what art should be are unacceptable in the task of investigating creativity. This research however recognises the more recent developments in contemporary art and indeed, one of the main aims is to encourage experimental and challenging working methods as opposed to tried and tested methods which may be described as 'safe'.

As well as the product deterring would be researchers, a lack of co-operation by the artists themselves is often cited as a reason not to study them. GARDNER (1982) suggests these three reasons why artists do not feature more prominently :

> "Among the individuals who have proved extremely difficult to study under ordinary conditions are artists; such creative persons are few, display little sympathy toward empirical investigators, and possess skills of such fluency that they defy dissection and analysis."

Although BEARDSLEY (1965) acknowledges that

> ". . . much of our best and most useful information about creative processes does come from artists."

in the very next sentence he goes on to dismiss the views of artists themselves;

> "The trouble is that, for reasons of their own, they are often inclined to the most whimsical and bizarre statements, and seem to enjoy being deliberately misleading."

ARNHEIM (1962) is another who subscribes to such a conspiracy;

> "Artists, in particular, have learned to tread cautiously when it comes to reporting the internal events that produce their works. They watch with suspicion all attempts to invade the inner workshop and to systematize its secrets."

Such an unflattering portrait of the artist as an unwelcoming individual who does not wish to assist in the investigation of what it is they do is unfortunately not an ill-founded rumour. It is substantiated by such comments as this one in an essay entitled 'On Sculpture & Primitive Art', by the sculptor Henry Moore (in HERBERT, 1964);

> "It is a mistake for a sculptor or a painter to speak or write very often about his job. It releases tension needed for his work. By trying to express his aims with rounded-off logical exactness, he can easily become a theorist whose actual work is only a caged in exposition of conceptions evolved in terms of logic and words."

This belief, that artists are secret about what they do, perhaps accounts for the fact that generally speaking artists were not considered a worthwhile vehicle of the creative act. However, not all researchers subscribe to such an opinion, indeed, some regard artists as ideal subjects to study because the creative process can be viewed as it happens. GETZELS & CSIKSZENTMIHALYI (1976) decided to study painters and sculptors because:

> ". . . we expected to be able to observe the creative process more clearly with them than with any other group of potentially creative people. The media in which painters and sculptors work, and their behaviour while working, are more accessible than the media and the behaviour of scientists, poets, or musicians."

That the creative process is 'visible' would seem to apply especially to sculpture due to the physical manipulation of material that is involved. The tactile interaction that occurs is not simply a means to an end, the physical manifestation of an idea, but is in itself a learning experience which may influence an idea or generate a new one. Because of this visible process and the author's experience in this field, the processes and products associated with the art of sculpture were judged a valid and pertinent subject for research.

2.4 Theories of creativity in a historical context.

Creativity has only been the focus of considerable research since World War Two. GUILFORD (1950) tells us that

> "Of approximately 121,000 titles listed (in Psychological Abstracts) in the past 23 years, only 186 were indexed as definitely bearing on the subject of creativity."

This lack of research has changed considerably, especially during the past thirty years, however, it is evident that no one universally accepted or definitive theory of creativity exists. On the contrary, theories of creativity abound; however, there is a great deal of disagreement between authors, what JOHNSON-LAIRD (1988) calls 'an amalgam of vagueness and incompleteness' in their hypotheses.

ARNHEIM (1962) identifies three distinct periods in the historical evolution of theories of creativity. The earliest attempts centred around the supernatural and the divine. Arnheim quotes (along with many other authors) the passage by the Greek philosopher, Plato, who describes a poet as a person whose 'mind is no longer with him', and has 'the Muses' madness in his soul'. In other words, the poet himself was not responsible for his work but rather an external force, i.e. a god, took possession of him. Mere mortals did not in themselves have at their command the necessary power to create. As Arnheim points out, Plato did not include painters and sculptors in the 'creative' company of poets, philosophers, and musicians, but as craftsmen who did not require inspiration, only rules.)

One would assume that any notions of divine or supernatural intervention have no place in today's literature, however, allusions to it still appear, as these titles illustrate, suggesting that creativity is still not fully understood: 'The Emerging Goddess' (ROTHENBERG, 1979); 'The Magic Synthesis' (ARIETI, 1976); 'The Creative Vision' (GETZELS & CSIKSZENTMIHALYI, 1976); 'The Act of Creation' (KOESTLER, 1975).

From the belief that creativity came from external sources, Arnheim proceeds to the second major development which was associated with the Romantic movement, which he suggests

> ". . . formally introduced the decisive shift that . . . inspiration no longer comes from the outside but from the inside, not from above but below. . ."

The Romantic movement arose in the late 18th century in revolt against the Neoclassical values of order and discipline, authority and tradition. In the Age of Enlightenment when it was thought that all knowledge could be attained through reason, Romantic artists emphasised the concepts of individuality, subjectivity, self-expression, and above all, the recognition that man was an irrational

animal. Creativity emerged from within as an eruption of 'spontaneous overflow of powerful feeling.' (WORDSWORTH, preface to Lyrical Ballads, 1800).

Arnheim's third identifiable major historical development in the theory of creativity is the advent of depth psychology - the study of unconscious motives and reasons such as in the work of Freud and Jung. Although at first this may have appeared to the Romantics as scientific confirmation that creativity did indeed arise from within, any agreement between the two camps ends there; whilst psychologists believe that any mental process, no matter how irrational it may seem, is subject to general laws of functioning, Romantics would protest at any attempt to de-personalise the creative process. Such protest is still evident today especially when a topic such as the use of computer technology in art is discussed. From the author's personal experience of using computers for drawing, etc, it is reported that such activity is viewed by other artists with a great deal of suspicion, perhaps in the belief that in using a computer one immediately transfers the artist's creative responsibility to the machine. This is of course absolute nonsense, the computer is simply another 'tool', incapable of doing anything without the guiding and creative control of the user.

2.5 Stages within the creative process.

Several authors divide the creative process into distinct stages. WALLAS (1926) suggested a four stage process of preparation, incubation, illumination, and verification. These would appear to be regarded as the standard or classic stages and can be identified in other research. For example see ARIETI (1976) who cites Rossman (1931) - seven steps; Osborn (1953) - seven steps; Taylor (1959) - five levels; Stein, (1967,1974) - three stages. BEARDSLEY (1965) reports that although such stages were distinguished by PATRICK (1935) in her study of poets, the stages were not distinct:

> ". . . the most remarkable feature of her material, it seems to me, is precisely the opposite. All four of these activities are mixed together; they are constantly (or alternately) going on throughout the whole process."

Within the structure of this review the four stages; preparation, incubation, illumination and verification are discussed in the sections concerning; selective bias, chance and the generation of ideas, insight, and critical judgement respectively.

2.6 Chance and creativity.

Several texts were found to acknowledge the role of chance as a contributory factor to creativity, especially within the field of scientific research. For example, as early as 1896, MACH published a paper entitled 'On the part played by accident in invention and discovery', and similarly, CANNON (1940) produced 'The Role of Chance in Discovery'. In a more recent text, 'Chase, Chance, and Creativity', AUSTIN (1978) offers his experience of chance in medical research as a more realistic representation of the 'haphazard and unpredictable complexity' of research than 'the tidy, asceptic research accounts that fill our libraries'. Unfortunately no equivalent text regarding artistic creativity seems to exist even although many artists similarly acknowledge the role of chance in their creative processes. For example, the Spanish painter and sculptor, Joan Miro (JEFFETT, 1990) writes:

> "Use things found by divine chance: bits of metal, stone, etc, the way I use schematic signs drawn at random on the paper or an accident that is the only thing - this magic spark - that counts in art."

Austin identifies four different types of chance, presenting them in a table entitled 'Various Aspects and Kinds of Good Luck', however, Austin is primarily concerned with chance as it occurs naturally and serendipitously, that is, the discovery of 'A' whilst looking for 'B'. Whereas Austin's chance may be described as 'undeliberate', that is, something happening unexpectedly, this research is primarily concerned with 'deliberate chance', that is, something desired but randomly instigated.

The use of chance as an aid to thinking has been vigorously encouraged in a number of texts by DE BONO (1967); for example, 'The Use of Lateral Thinking'. Lateral thinking may be defined as new ideas arrived at through flexible classification and a willingness to explore different and even seemingly useless possibilities. De Bono suggests that:

> ". . . the purpose of chance in generating new ideas is to provide one with something to look at which one would not have looked for".

and advocates a number of ways in which to introduce chance including

> ". . . purposeless play, exposing oneself to a multitude of stimulants, and the deliberate intertwining of the many separate lines of thought that may at different times occupy the mind."

From the author's point of view, although much of 'The Use of Lateral Thinking' seems to be an exact description of the thinking processes involved in making sculpture, such comparison is discouraged by de Bono himself who states that 'creative thinking in the true artistic sense has not been used as an example of lateral thinking because the outcome is too subjective'.

2.7 Chance and the generation of ideas.

A strong case has been presented by several authors who believe that the generation of a creative idea can only be explained as the product of a chance process operating within the mind itself. In relation to WALLAS'S (1926) four classic stages, ideas are formulated during an 'incubation' stage, that is, where the constituent parts of an idea go through a 'mental churning' over which the conscious mind has little or no control. It is such 'mental churning' which is proposed to be of a random nature, haphazardly linking various combinations until a successful combination is found. JOHNSON-LAIRD (1988) reports that

> " . . . the generation of ideas at random has been proposed by several authors as the only possible creative process (Bateson, 1979; Campbell, 1960; Skinner, 1953). . . "

This tradition originated with CAMPBELL (1960) who proposed a theory of 'blind variation and selective retention' and extends to the work of SIMONTON (1988) who suggests that 'the fundamental generating mechanism in creativity involves chance permutations of mental elements'.

2.8 The dualistic nature of creativity.

A recurring theme throughout many of the theories reviewed is the dualistic nature of creativity, the recognition that the creative act fluctuates between two polarities, either of which may be dominant at any one time, and without either true creativity cannot occur. Whilst one polarity represents all that is rational, controlled, planned, skilful, and intellectual, the other polarity represents all that is irrational, spontaneous, intuitive, unforeseen and chaotic.

HOWARD (1982) christens these two classic views of artistic creativity as the 'Athena Theory', and the 'Penelope Theory'. The former (named after the Greek goddess Athena who sprang full-grown and armour clad from the brow of Zeus),

represents 'spontaneous inspiration', whilst the latter (named after the faithful wife of Odysseus), represents the 'honed skills and abilities required to produce mature works of art summed up in the maxim, practice makes perfect.'.

A more universal nomenclature of the two principles are those suggested by NIETZSCHE (1967), in, 'The Birth of Tragedy'. The 'Dionysian force' may be defined as of, or relating to, the set of creative qualities that encompasses spontaneity, irrationality, and the rejection of discipline, etc, whilst the 'Apollonian force' may be defined as of, or relating to, the set of creative qualities that encompasses form, reason, and harmony, etc.

The main disagreement between authors is the degree of importance attributed to either of these opposite yet complementary principles, whether one is more necessary than the other. The two extremes are well illustrated by KOESTLER (1975) who quotes the following two statements regarding the nature of creativity, the first by George Bernard Shaw:

> "Ninety per cent perspiration, ten per cent inspiration",

the other by Picasso:

> "I do not seek, I find." (Je ne cherche pas, je trouve)

The first is indicative of hard systematic labour and consciously controlled activity whilst the second represents undirected and less purposeful behaviour: stumbling blindly around. The two opposing points of view illustrate the fact that the extent to which one type of activity dominates the other may differ widely from artist to artist. If the 'art' produced by both Picasso and Shaw is considered to be highly creative then it can be assumed that neither 'perspiration' nor 'inspiration' is necessarily more desirable than the other nor that an ideal ratio between the two exists since both extremes appear equally capable of producing highly creative works of art. From the author's experience as a sculptor, both statements are equally valid; time may be spent on a consciously directed activity involving hard systematic labour until the goal is achieved, whilst at other times, activity may be characterised by a lack of direction, yet suddenly something is discovered. Although both approaches have proved successful, in the author's experience it has been the latter which has resulted in decisive shifts of direction and ultimately more satisfactory work.

Similarly, in the literature on creativity, the degree of importance attributed to either principle varies from author to author, however, there is a strong consensus that each polarity is dependent upon the other and that the two apparently conflicting principles must exist side by side. HOWARD (1982) summarises the situation perfectly;

> ". . . there is an element of 'control' to be reconciled with the 'unforeseen'. And therein lies the creativity paradox: that the artist both knows and does not know what he is up to . . ."

Although this project aims to encourage the 'unforeseen' it is not out of a desire for unorganised chaos. Chance is seen as a method of increasing the unforeseen, the uncertain and the unknown yet retaining overall control.

2.9 The nature and benefits of control.

What are the characteristics and benefits of 'control'? What are the characteristics and benefits of 'the unforeseen'? That conscious control and purposeful intention are essential elements of creativity cannot be denied. A person does not suddenly and inexplicably discover that he/she has made a piece of sculpture! ROTHENBERG (1979) states that;

> "No one creates anything without deliberately setting out to do so. The idea of automatic or unintentional creating is an impossibility."

As well as a conscious intention to make art Rothenberg also reports that a person must attain a 'high degree of knowledge of his field' which, for the visual artist means

> ". . . knowledge of art history, art materials, and technical matters of design, drawing, colour, and visualization. . ."

Although KOESTLER (1975) acknowledges 'the achievements of which skilled routine are capable' he rightly warns against complete reliance upon it;

> "By working tirelessly to improve his technique, the pupil or imitator may. . . equal or sometimes surpass the master in technical perfection. But technical virtuosity is one thing, creative originality another. . . . genius consists not in the perfect exercise of technique, but in its invention."

Although it can be said with a great deal of certainty that control and planning are prerequisites of creativity, many authors agree that such behaviour in itself is unlikely to yield creative results;

GHISELIN (1952) comments,

> "Production by a process of purely conscious calculation seems never to occur. It cannot and ought not to be rejected as impossible, but it does not fit the facts reported almost universally and in every field of creative work."

whilst EHRENZWEIG (1967) suggests

> ". . . a purely conscious control of the working process is neither desirable nor possible."

and ARNHEIM (1966) points out that

> ". . . psychologists agree that probably no work of art that deserves the name has ever been produced, or can ever be produced, entirely at the level of consciousness."

A process which is planned, controlled and executed entirely on a level of consciousness is recognised as straying towards a process associated more with 'craft', [by which is meant 'the power to produce a preconceived result by means of consciously controlled and directed action' COLLINGWOOD (1958)] rather than that of a creative artist. This is not to suggest that craft is devoid of creativity, but rather that in the execution of a craft there is a desire to control the process to the extent of excluding the 'unforeseen' so that a similar type of product may be reproduced efficiently and competently and at will. A strong case encouraging the role of craft in art is put forward by HOWARD (1982) whose stated aim is 'to reinstate the inestimable importance of craft in art'. It may be the case that the value of control, planning, and directed activity is inestimable, however, as we have seen, it should in no way be considered exclusive.

Another deterrent to singular reliance upon 'purely conscious control' is illustrated by a quote from the sculptor Henry Moore (GHISELIN, 1952), which suggests that consciously directed behaviour may, paradoxically blinker the artist, whilst 'stumbling about blindly' may result in new opportunities:

> "Out of the millions of pebbles passed in walking along the shore, I choose out to see with excitement only those which fit in with my existing form interest at the time. A different thing happens if I sit down and examine a handful one by one. I may then extend my form experience more by giving my mind time to become conditioned to a new shape."

This implies that maintaining conscious direction - looking for pebble shapes he already likes - limits Moore to what he already knows, whilst suspending conscious aim - picking up a handful at random - introduces him to new forms which have always been there but he has previously ignored. One method of suspending conscious aim is to use chance, and it is this method which this research aims to evaluate. By subjecting various options to random choice the artist may have to consider something which he/she would not have selected by personal choice alone, perhaps due to internal influences such as habit, or external influences such as cost. The idea that chance can be used as a 'habit-breaker' is examined in greater detail in the section dealing with selective bias (see 2.17).

2.10 The nature and benefits of the unforeseen.

If conscious intention, attainment of skills, and goal directed activity are indicative of 'knowing' processes, what are the 'not knowing' processes intrinsic to creativity? The following five terms are all common nomenclature used throughout the literature and are characteristic of behaviour absent of conscious control. Due to the ambiguity surrounding each term and for the purpose of this survey only, it has proven beneficial to relate each term to a specific type of behaviour; although, it must be stressed that these definitions are not claimed to be universal but applicable only in the context of this research.

a) the indeterminate - activity without conscious aim;
b) the spontaneous - activity without conscious control:
c) the insight - unexplainable mental leaps;
d) the intuitive - judgement devoid of conscious reason;
e) the unconscious - non-conscious motives;

2.11 a) indeterminacy - working without conscious aim.

Although the artist is aware of aiming to make a piece of art and may have the

adequate skills and the necessary facilities to execute an idea, it is agreed by many authors that artists still do not know very much about what it is they will eventually make. For example: TOMAS (1958) says

> "Although he seems to himself 'aiming' at something, it is not until just before he affixes his signature or seal of approval to his work that he finds out that this is the determinate thing he was all along 'aiming' at . . . "

whilst ROTHENBERG (1979) comments,

> "Almost never does the creative artist know very much about the product he will eventually create."

and COLLINGWOOD (1958) points out,

> "Yet they (works of art) are made deliberately and responsibly, by people who know what they are doing, even though they do not know in advance what is going to come of it."

There would appear to be no doubt that the artist nearly always has a vague yet capricious goal at which to aim. This raises the issue of preconception within the creative process: does the artist have a completely formed image prior to commencing physical activity or does the work emerge out of the physical activity itself? HOWARD (1982) goes so far as to suggest that 'creativity implies the absence of preconception', however, although some artists' statements support this view others indicate the opposite, whilst a third group report experiencing both situations;

> "The picture is not thought out and determined beforehand, rather while it is being made it follows the mobility of thought." (Pablo Picasso, in: GHISELIN, 1952)

> "Being a carver, I do have a complete conception in my mind of the form I'm making before I start a carving or, indeed, making any work. It is, I suppose, simply a faculty one happens to be born with - being able to see mentally all around the form before one begins." (Barbara Hepworth in: ASHTON, 1985)

> " . . sometimes I see it and then paint it. Othertimes I paint it and then see it. " (Jasper Johns in: ASHTON, 1985)

> "I sometimes begin a drawing with no preconceived problem to solve,

> with only the desire to use pencil on paper and make lines, tones and styles with no conscious aim . . . Or sometimes I start with a set subject . . .and then consciously attempt to build an ordered relationship" (Henry Moore in: HERBERT, 1964)

The variation and contradiction in the above statements serves to highlight the fact that each and every artist possesses an extremely personal working process which may differ greatly from person to person. This suggests that a definitive theory of creativity is neither possible nor desirable.

BEARDSLEY (1965) discusses both the 'propulsive theory' - where the artist is propelled forward by uncontrollable inspiration, resulting in whatever, and also the 'finalistic theory' - where the artist is guided by a vague vision. Although acknowledging that the two may both exist, he does not subscribe to either theory. More importantly he acknowledges that 'the crucial controlling power at every point is the particular stage or condition of the unfinished work itself, the possibilities it presents, and the developments it permits.'; and there lies the crux of the matter - the artist can never predict what he/she is going to do because he/she thrives on an ever-ready willingness to change, an ability to constantly redirect his/her aim, resulting in an ever active indecisiveness. TOMAS (1958) also subscribes to this theory;

> ". . . creative activity is controlled, but not by virtue of the fact that the artist already envisages the result . . That the artist's choices are controlled by a whole that is not-yet-there is not a fact but a theory. What control consists in is the making of critical judgements about what has so far been done."

The evidence from artists themselves overwhelmingly support this view. The artist Ben Nicholson (1894-1982) for example, (ASHTON, 1985), illustrates the importance of being aware of what is happening now rather than envisaging what is going to happen in the future:

> "You cannot ask an explorer to explain what a country is like which he is about to explore for the first time: it is more interesting to investigate the vitality of the present moment than to predict its precise future development . . . "

The following passage by the American sculptor, David Smith (1906-1965) (ASHTON, 1985), although rather long, provides an excellent account of the uncertainties within his process:

> "I do not work with a conscious and specific conviction about a piece of sculpture. It is always open to change and new association. It should be a celebration, one of surprise, not one rehearsed. . . . When I begin a sculpture I am not always sure how it is going to end. I do not often follow its path from a previously conceived drawing. If I have a strong feeling about its start, I do not need to know its end, . . . If the end of the work seems too complete, and final, posing no question, I am apt to work back from the end. . . Sometimes . . I begin with only a realized part, the rest is travel to be unfolded . . The conflict for realization is what makes art, not its certainty, nor its techniques or material. I do not look for total success. If a part is successful, the rest clumsy or incomplete, I can still call it finished . ." (1952)

There can be no doubt that the creative process involves indeterminacy, however, if the above testimony is to be believed, it is not so much a case of the artist not knowing what he/she is making but rather not wanting to know. The author's experience of making sculpture reflects and supports this view; that the artist welcomes the unexpected because of an aversion to predictability. Again, chance is seen as a method of avoiding predictability through selection of the unknown or unexpected.

2.12 b) spontaneity - working without conscious control.

The second 'unforeseen' element occurring within the creative process is spontaneity, denoting that the artist is not in control of what he/she is doing. That 'spontaneous' or 'automatic' processes are essential elements of creativity cannot be denied: GHISELIN (1952) reports that -

> ". . . Shelley, Blake, Ernst, Henry James and many other artists of great note or little have described some considerable part of their invention as entirely spontaneous and involuntary - that is, as automatic. . . such automatism is reported by nearly every worker . . . and no creative process has been demonstrated to be wholly free from it."

The view that automatic or involuntary processes occur during the creative process was found to be universally accepted by most authors, however, there is a consensus of opinion that, like conscious control, such processes are incapable of producing finished creative products on their own. Accounts of incidents by persons claiming full and spontaneous creation are viewed with incredulity by most authors (i.e the writing of the poem, 'Kubla Khan' by the

Romantic poet, Samuel Taylor Coleridge). TOMAS (1958) for example questions the validity of Nietzsche's claim (NIETZSCHE, 1979), that he wrote 'Thus Spake Zarathustra' in the manner thus described;

> ". . . something profoundly convulsive and disturbing suddenly becomes visible and audible with indescribable definiteness and exactness. . . Everything occurs without volition."

Tomas does not doubt that this completely blind and automatic process took place, what he does doubt is the artist's ability not to alter or adjust it in any way either during or after the occurrence, and therein lies a major area of dispute: to what degree is an artist aware of what he/she is doing whilst acting in a spontaneous manner? Tomas is of the opinion that human nature is incapable of truly spontaneous behaviour because as soon as such procedures commence, critical judgement and conscious control start to assess what has been done and therefore influence what will come next. To illustrate this point that an 'editing' process takes place, he parodies a famous line from the 'Rubaiyat', a poem by the Persian poet, Omar Khayyam (1050-1123),

> "The moving finger writes, and having writ
> Moves on. But lo ! It stops a bit.
> Moves back to cross a T, insert a word.
> The moving finger's acting quite absurd."

Even if it were possible that no alterations or amendments did take place during the writing of 'Thus Spake Zarathustra', Tomas points out that Nietzsche still had to make the most critical judgement of all: was it a piece of work which he was willing to endorse?

ARNHEIM (1966) does not question the spontaneous process itself, but uses the following example to illustrate that an entirely spontaneous process is a fallacy because conscious control, deliberation, and alteration must occur as a post-spontaneous activity:

> "In 1957, the sculptor Jacques Lipchitz exhibited 33 pieces, of which he said in the catalogue that they originated 'completely automatically in the blind'. Nevertheless, he called them 'semi-automatics' because he had subjected them to a good deal of what the Freudians would call secondary elaboration."

What Arnheim means by 'secondary elaboration' is the conscious activity of selecting only those 'spontaneous' works which were suitable for bronze

casting, making any necessary adjustments, or identifying a predominant image and altering it until it became clarified. If such conscious control, deliberation, and alteration does not occur, then, according to Arnheim;

> "An artist . . . would be like an aeolian harp, whose strings are randomly put into vibration by the forces of nature."

The implication of this statement, that spontaneity is likely to throw up random and unpredictable results, extraneous to the artist's consciously controlled activity, does not appear to be a popular theory. A more typical view of the spontaneous is provided by DEWEY (1958) who considers that spontaneity is the result of 'complete absorption in subject matter' and 'the result of long periods of activity'. The implication of this statement is the complete opposite to spontaneity as a random and unpredictable event. Here it is implied that the spontaneous is not a matter of caprice but is inextricably linked to the artist's conscious intentions and interests that occupied his/her mind in the period leading up to the spontaneous outburst. GHISELIN (1952) also supports this view suggesting that

> ". . . spontaneous and involuntary production . . . far from being a sign of diminished, imperfectly functioning consciousness, is a healthy activity supplementary to conscious invention and in no way inconsistent with it."

ARIETI (1976) is another author to rationalise spontaneity, suggesting that

> ". . . spontaneity means a certain range of possibilities immediately available to a person's psyche because of that person's intrinsic qualities and past and present experience. . . What seems to be due to chance is totally or to a large extent the result of special combinations of biological circumstances and antecedent life experiences."

The conclusion that can be drawn from the above statements is that the results of spontaneous activity are, to a certain degree, predictable, controlled by the individual's past experiences and current conscious interests and desires. However, there is still one completely unpredictable element regarding spontaneity; the timing and frequency of its occurrence. It is impossible to act spontaneously at will, the artist can only let it happen: he/she cannot force it to happen.

2.13 c) insight - unexplainable mental leaps.

A third type of behaviour that the artist has no control over is insight, although, other terms such as 'inspiration', 'revelation', or 'mental leap' may also be used. In relation to WALLAS'S (1926) classic four stages, insight relates to 'illumination'. They are all indicative of an event which has been universally reported: an often sudden and complete understanding of a problem. Insights are characterised by the fact that they occur beyond conscious thought and seemingly without any apparent effort.

TARDIF & STERNBERG (1988) report that the majority of authors they studied acknowledged the occurrence of insights, however, the importance authors attributed to such happenings varied between:

> ". . . those who imply that creativity is little more than building on an initial insight to those who deny that moments of insight have any importance whatsoever. The majority view, however, falls in between, with flashes of insight discussed as small but necessary components of creativity."

Attempts to explain the nature of the mental processes responsible for producing insights are thoroughly examined by PERKINS (1981) who focuses upon three distinct theories : - the 'still-waters' theory, the 'blitzkrieg' theory, and the 'better mousetrap' theory. The 'still-waters' theory attributes insights to unconscious thinking which takes place over a long period of time, whilst the 'blitzkrieg theory' attributes insights to a type of unconscious thinking which takes place at a very rapid and compressed pace. In contrast to such ideas, that insights occur in a 'special place' or at a 'special pace', Perkins prefers to attribute insights to 'the ordinary mental processes of recognizing and realizing'; however, when more is recognized or realized than would ordinarily be expected, the names mental leap and insight are used.

Perkins also challenges several theories which suggest that insights are the result of 'the mind's extraordinary powers'. He names such theories 'better mousetrap theories' and cites the following examples; Koestler's bisociation (1960), Arieti's paleologic (1976), de Bono's lateral thinking (1967), and Rothenberg's Janusian and homospatial thinking (1979). The substance of these theories all suggest a special mental process which conceives 'opposite or antithetical ideas, images, or concepts simultaneously' (Rothenberg's Janusian thinking). Perkins again prefers to adopt a more rational approach,

whereas the above theories 'avoid ponderous reasoning', he suggests that

> "Far from being contrary to insight, reasoning is an important means to insight, and often a neglected one. Reasoning is a better mousetrap."

Although the mechanics of insight may be vague, what is clear is that insights cannot be summoned at will. Several authors discuss certain conditions or states of the mind that have been reported as of being conducive to the occurrence of creative leaps: for example GUILFORD (1967) mentions an abandonment of controlled thinking, such as daydreaming, relaxation after intense concentration, or shifting one's attention from the problem at hand. Numerous anecdotes exist regarding peculiar environmental or physical stimulants, however, these can only be looked upon as idiosyncratic habits and cannot be treated with any great deal of seriousness.

A condition which does have particular relevance to this project is incidental stimulation: the conscious observation of an object or event which sparks off a creative insight by the viewer. Such occurrences are again well documented, the most famous perhaps being the anecdote of Archimedes in his bath. GUILFORD (1967) provides us with three examples which demonstrate that such chance observations may instigate a new idea, or lead to greater understanding concerning a previous idea:

> ". . . as in the case of Keats, writing 'Ode to a Nightingale' after hearing one sing, and of Mendelssohn, who was inspired by the sight of a trumpet vine. Then there was Newton and the falling apple."

From the above evidence it is suggested that although such behaviour cannot guarantee their occurrence, the observation or consideration of a chance object or event, may contribute to creative insights, therefore, the selection of elements by chance, as explored by this research may help in the generation and understanding of ideas.

2.14 <u>d) intuition - judgement devoid of conscious reason.</u>

The fourth type of behaviour over which it is suggested the artist has no conscious control, is intuition. It is a term particularly associated with the making of art, and, in the context of this research, represents the process of arriving at

decisions immediately and assuredly, without any deliberation or conscious reasoning. Whereas to deliberate is to judge, to intuitively decide is not to judge, it is simply a feeling 'from within' that persuades the artist to prefer one thing rather than another. It is because of this lack of rational explanation that it can be said that the artist who follows his/her intuitive feelings is to some extent, not in conscious control. Even the phrase 'following one's intuition' implies that it is a process of being led rather than of leading.

The nature and importance of intuition is thoroughly examined by PERKINS (1977) who questions its validity. In 'The Limits of Intuition' he sets out to clarify the many 'myths and realities' which surround the subject including the notions that: 'it allows a surety and accuracy that reasoning cannot approach'; 'intuitive judgements dominate the process of art making'; and that 'intuition and reasons are at odds'. On evidence gathered from 'process tracing studies of novice and professional poets and visual artists' Perkins identifies several crucial characteristics which appear to contradict such claims.

Firstly, intuition does not imply 'special certainty', on the contrary, 'intuition could leave one feeling uncertain as well as sure' and there was frequent 'irresolution and reconsideration' about intuitive feelings.

Secondly, intuitive judgement dominates the making of art only if 'it means making rational evaluations which mix reasons with intuitions'.

Thirdly, intuition is neither sound nor unquestioningly reliable, common sense tells us that every individual's intuitions cannot be correct:

> ". . . some people may have many unusually sound intuitions. Individuals like Beethoven or Einstein recognized artistic or scientific truths missed by most of their contemporaries. But one cannot argue for the certainty of intuition in general by appealing to special cases. Many mediocre figures of art and science were also guided by and felt sure about their intuitions."

Perkins concludes that 'intuition and reasons alike prove prominent in making art'. He answers the question 'is being more intuitive always useful?' with a resounding 'no', suggesting that 'doubting and challenging one's intuitions may contribute more.' In summary, intuition, the 'inner voice' may be respected but it should not be relied upon as a superior form of judgement.

2.15 e) the unconscious - non-conscious motives.

The fifth element of which the artist can never be fully in control is the mind itself, particularly that part which is known as 'the unconscious', a term which has come to mean many things. The unconscious is considered by some to contain the 'secrets of creativity'; TARDIF & STERNBERG (1988) report that

> "As with insight, the expression of the unconscious is sometimes conceived of as the key to creativity. . . .the consensus lies in between, with unconscious elements existing and being important for creativity but not the essence."

PERKINS (1981) suggests that there is nothing unusual about the role of the unconscious in creativity because:

> "Not only creative thinking, but everything we do . . requires the support of hundreds of covert mental processes. The unconscious is always where most of the action is, for anything".

For Perkins then creativity cannot be explained away by the mysterious unconscious because although we may not know how it functions, it operates all the time. A rather more Romantic view is put forward by NEUMANN (1959) in 'Art and the Creative Unconscious'. In this book Neumann assigns to the unconscious mind a will of it's own, reminding one of the early theories of creativity which attributed creativity to divine intervention:

> "We know that the creative power of the unconscious seizes upon the individual with the autonomous force of an instinctual drive and takes possession of him without the least consideration for the individual, his life, his happiness, or his health."

COLLINGWOOD (1958) is another who talks about the unconscious as a distinct and independent entity:

> ". . . that the artist's work is controlled by forces which, though part of himself and specifically part of his mind, are not voluntary and not conscious but work in some mental cellar unseen and unbidden by the dwellers in the house above, is extremely popular; not among artists but among psychologists."

The consequence of the unconscious is that it may guide and control the artist

without the artist being fully aware of its influences. As ARNHEIM (1962) points out - 'no one's own mind is directly accessible, one knows only the surface layers'. Perkins refers to a study by NISBETT & WILSON (1977) informing us that 'such experiments revealed that the subjects had little awareness of the real influences on their actions'. Such statements would imply that no matter how certain an artist believed he/she was in complete conscious control, there are always underlying influences at work as a result of the unconscious mind.

One of the most popular methods of exploring the unconscious is 'free association', a spontaneous mental process in which ideas, words, and images suggest others ideas, etc. This technique was known to the Surrealists who were interested in any method that could be used to explore the unconscious, including the use of drugs; however, the Surrealists will be discussed in greater detail in Section B of the literature review.

2.16 Summary of the indeterminate, the spontaneous, insights, the intuitive, and the unconscious.

The aim has been to explore the nature and benefits of each of the above terms. The conclusions that may be drawn regarding each of the above may be briefly summarised as follows:

The indeterminate - The artist may have a vague idea of where he/she is heading; however, because of the unfolding of the process itself, and a willingness to explore new avenues and change direction, the artist can never be certain about what it is he/she is going to make.

The spontaneous - What at first may appear to be a random outburst of creative activity, is in fact the product of saturation in the subject matter.

Insights - The occurrence of insights may be unpredictable but the content of the insight refers to the person's conscious interests and problems at the time.

The intuitive - The artist possesses an 'inbuilt feeling' which tells him/her when something is 'right' but this feeling is not followed blindly, it is just as likely to be ignored as respected.

The unconscious - The artist can never claim to be in complete conscious control because of the part of the mind known as the unconscious which exerts a permeative influence upon all his/her creative actions.

Although all of the above occur naturally within the creative process and may to varying degrees be described as 'uncontrollable', any attempt to actively and deliberately encourage the above automatically means that conscious attention is focused upon them, resulting in their negation, since their very existence depends upon the absence of such conscious attention. The deliberate use of chance is seen as a more efficient method of increasing the 'unforeseen' whilst occurrence of any of the above is to be welcomed as usual.

2.17 Selection & critical control.

One of the most powerful controlling factors within creativity is the decision making process which operates at both the selective stage - associated with WALLAS'S (1926) 'preparation' stage and representative of the collecting and gathering of information that may eventually form an idea; and the critical stage - associated with Wallas's 'verification' stage and representative of deciding whether something is successful or not.

The importance of selection within the creative process is recognised by several authors; DEWEY (1958) tells us that 'It is everywhere accepted that art involves selection', whilst PERKINS (1981) says that 'Doing the work of creating means doing the work of selection'. What is it then that is selected? The answer to this question is simple: anything may be selected which the artist considers to be relevant or of interest. One might assume that the artist is free to choose whatever he/she likes, however, as KOESTLER (1975) points out this may not in fact be the case:

> "Theoretically, the range of choice before him is enormous. In practice, it is narrowed down considerably by the conventions of his period or school. They are imposed on him not only by external pressures - the public's taste and critic's censure - but mainly from inside."

Koestler uses the term 'hidden persuaders' to describe the effects of internal influences upon the artist, which he claims

". . . permeates the whole personality, shapes his pattern of vision, determines which aspects of reality should be considered significant, while others are ignored . . ."

Since the intuitive and the unconscious were discussed in the previous section this section will concentrate on another 'hidden persuader' - habit and routine. During the course of making a piece of sculpture there are innumerable decisions to be made, many of these may receive prolonged conscious deliberation, however, many decisions may also be determined without conscious awareness but as a matter of habit or familiarity. Many authors point out the incongruity between habit and creativity, for example, PERKINS (1981) suggests that 'Challenging the preselection ought to be business as usual for the genuinely creative person'. Unfortunately, although it is generally accepted by psychologists that a willingness to explore new ideas are key characteristics of creativity, the art world itself seems to prefer to encourage habit by rewarding those who consolidate one idea rather than explore many. This tendency has been highlighted by LUBBOCK (1991), the art correspondent for 'The Independent on Sunday' newspaper. Writing about the most prestigious visual art prize in the UK, The Turner Prize, Lubbock states:

"The short-list represents what might be called 'instant establishment'. This is a manoeuvre by which the art world reassures itself: by promoting art which is up-and-coming and has at the same time already plateaued. . . . . So the best thing is to get your act together as quickly as possible. Don't wait around exploring widely and idly. Solve it! Find some unusual notion or sensation, some variant of style, formulate a technique - and then keep at it till it becomes your trademark. And no more than one trick, mind: that might suggest a lack of conviction. What (the selected artists), have in common is the possession of a single idea - hatched early - limited, stable, repeatable."

Obviously consistency and an individual style are important considerations if an artist is to become successful, however, it is suggested that consistency should not be confused with similarity, which is what appears to be being rewarded by the Turner Prize. Many artists produce work that is experimental and varied whilst retaining an individual style. Consistency need not necessarily be concerned with the nature of the product but rather the quality of the product, whilst the artist's unique idiosyncrasies and personality traits will ensure a characteristic style no matter what the circumstances.

How many interests and 'aspects of reality' should any one artist be concerned

with? DEWEY (1958) believes that it is unimportant that certain aspects may be ignored by an artist because:

> "Other artists have other interests, and by their collective work, unembarrassed by fixed and antecedent rule, all aspects and phases of experience are covered."

This seems to reinforce the 'one idea' situation by implying that since 'artist A' is concerned with 'interest A' then 'artist B' need only be concerned with 'interest B'. Since many authors emphasise the importance of inquisitiveness, exploration, and a sense of discovery within creativity, it would appear logical that such behaviour be encouraged, and indeed this may be the case; unfortunately, as in the case of 'The Turner Prize', artists observe that their peers are being rewarded for doing the opposite.

2.18 The critical stage.

Decisions are also made by the artist as to whether a particular effect or piece of work is, by their own criteria, successful or unsuccessful. GUILFORD (1967) describes it as a 'perpetual system of checks and balances' a view also shared by COLLINGWOOD (1958) who describes it as

> ". . . a vigilant and discriminating eye, which decides at every moment of the process whether it is being successful or not."

Although TARDIF & STERNBERG (1988) report that a common characteristic among creative people is 'an aesthetic ability that allows such individuals to recognise 'good'. . .' not every artist has been endowed with such an ability! Such 'inbuilt taste' is perhaps considered in the lay sense to be the essence of artistic creativity, however, as we shall see in Section B of the literature review, many artists have strived to avoid such personal persuasion. As well as the rational and the intuitive, JOHNSON-LAIRD (1988) introduces a third element into the decision making process and one which artists have used to override 'the aesthetic ability to recognise good': namely, the arbitrary choice. He states that ' . . . to be creative is to be free to choose among alternatives'; however, decisions regarding critical judgement are subject to the same internal and external pressures that we have discussed in the selective stage suggesting that freedom of choice may not be so free. Johnson-Laird goes so far as to suggest that creativity is not just being free to choose but being free to decide

how to choose. The artist may either, a) make a rational decision, b) an intuitive decision, or c)

> ". . . make an arbitrary choice either plumping at random for one alternative or selecting an external randomizing mechanism."

According to Johnson-Laird however the human mind is particularly poor at 'plumping at random' because of the same internal and external influences which the person wished to avoid in the first place, therefore the use of an external randomizing mechanism is necessary if a truly random choice is desired. Although it may seem paradoxical, the way in which this research has decided to use chance is via a highly structured external randomizing mechanism in an attempt to avoid both the internal and external factors that influence artistic decisions. It was stated earlier that the critical stage decides whether something is successful or not. The use of chance in the aesthetic stage challenges such decisions in the belief that the 'inner voice' which tells the artist what is good may not necessarily be right, and that a more rewarding road may lie towards that which the artist is unsure about rather than that which he/she knows is 'good'.

2.19 Summary of Section A.

Literature concerning the study of creativity showed itself not only to be immense in volume but also extremely diverse in approach, and, the majority of literature was concerned with the sciences rather than the arts. Rather disappointingly, 'fine art' in general, and sculpture in particular, did not feature prominently in such research. When 'fine art' did become the centre of attention, researchers tended to focus upon painters and painting rather than sculptors or sculpture. By focusing entirely on sculpture, this research should go some way towards redressing this imbalance.

Three main reasons were examined as to why artists had not been studied: firstly, many authors found the nature of the end product unsatisfactory as the creative value or success of a painting or sculpture is largely based upon subjective opinion rather than objective fact; secondly, many authors and researchers considered artists themselves to be unco-operative participants, unwilling to reveal much about their process; and thirdly, artists' explanations of their creative processes were considered to be too subjective and prone to 'romantic' or 'mystical' verbosity.

Previous research had seemingly ignored contemporary artists and art movements (especially those far removed from the conventional idea of what art should be), in favour of historically proven 'genius', i.e. Rembrandt, Picasso, etc. It is suggested however, that, since by its very nature, the 'avant-garde' exemplifies qualities most readily associated with creativity - i.e. experiment and radical departure from the norm - it merits as much attention as historically established art.

With regard to general 'theories of creativity', it is evident that no universally accepted or definitive theory exists, and of those that do, there is much disagreement. Perhaps the one area that many authors do agree upon is the 'dualistic' nature of creativity, that is, the recognition that a dynamic interchange occurs between two opposite yet complementary forces. In the simplest terms, these two polarities may be labelled 'control' and 'non-control', summarised by the statement - the artist both knows and yet does not know what it is he/she is trying to make. Most authors were in agreement that neither 'control' or 'non-control' were likely to result in creativity on their own but must exist side by side. History suggested that an ideal ratio between the two did not exist, as artists displaying extremes of both forces had produced equally 'great' works of art, therefore neither polarity could be said to be more desirable than the other. Evidence that the ratio between 'control' and 'non-control' varied not only from person to person, but fluctuated from time to time within the same person, confirmed the approach that this project had adopted - that every individual artist possesses a uniquely personal working process, which is perhaps the reason why a universal and definitive theory of creativity can never be discovered.

Five specific types of behaviour traditionally associated with creativity (indeterminacy, spontaneity, insights, intuition, and the unconscious), and representative of 'non-control', were examined in some detail. It was concluded that they were not as uncontrolled as perhaps generally assumed, for example, spontaneity was by some authors considered to be an outburst stemming from saturation of subject matter rather than an unconnected affair.

A common characteristic shared by the above types of behaviour was the fact that they could not be summoned at will, as soon as a conscious attempt was made to induce, for example, spontaneity, such conscious attention negated any possible occurrence, as such behaviour depended upon the absence of consciousness. It was concluded that completely automatic creation was a fallacy.

Statements by sculptors often reflected an aversion to predictability and a willingness to change direction. Contradictory statements regarding the same topic were quite common, once again demonstrating the fact that each individual has their own, uniquely personal process.

Many authors divided the mental phase of the creative process into distinct stages [the most familiar being WALLAS (1926) - 'preparation', 'incubation', 'illumination', and 'verification'], and evidence was found which suggested that chance was operating, to some degree, within at least three stages, namely, 'preparation', 'incubation', 'illumination'. The evidence ranged from authors who proposed that the actual generation of ideas came about as a result of random processes operating deep within the mind, to the acknowledgement of chance as a catalyst often responsible for prompting creative 'leaps', and the acknowledgement of the importance of serendipity, that is, the accidental discovery of 'B', whilst looking for 'A'.

Several texts were discovered which testified to the importance of chance within the creative process, however, these were primarily concerned with scientific discovery rather than artistic production. Chance was also recommended by several authors as a means of generating new ideas or solving problems, as it presented information which may otherwise not have been examined.

Decision making played a crucial role throughout the creative process, however, such decisions were influenced by many 'hidden persuaders', which, if one wished to escape them, necessitated the use of an 'external randomizing mechanism' as the human mind is very poor at making a truly arbitrary choice.

2.20 LITERATURE REVIEW - SECTION B.

2.21 Introduction.

The objective of this part of the literature survey is to critically review, in a historical and contemporary context, artists' conscious exploitations of chance and the resulting art works (see fig.7). Background reading revealed that since around the beginning of the 20th century chance procedures have been employed in an extensive range of the arts including painting, sculpture, printmaking, musical composition, theatre, literature, poetry, dance, film, photography, and design. Although this research is primarily concerned with fine art (painting, printmaking, and especially sculpture), outstanding individual advocates of chance in other areas of the arts, for example, the composer John Cage (perhaps the most extreme and enthusiastic supporter of chance in any field), cannot be ignored.

Source material for this part of the survey comes from published statements by artists themselves, and critical analysis by art historians and critics. The information came from a variety of literary sources such as artists manifestoes, exhibition catalogues, art periodicals, and more substantial reviews of major artists, art movements and 'schools'. Although no text was discovered which devoted itself entirely to the role of chance in art, a considerable number of directly relevant articles, essays, and sections of texts were found. By far the most comprehensive survey was located in a catalogue published on the occasion of an exhibition entitled 'Chance and Change: a century of the avant-garde' (BOGLE, 1985), held in Auckland City Art Gallery, New Zealand, (25th October - 8th December 1985). Bogle provides an informative historical background followed by a more detailed examination of individual artists and their particular approach to using chance. In discussing 'Aleatory Art' (from the Greek root 'alea', a dice) he refers to another key survey, 'Chance-Imagery' by the American artist George Brecht (published in 1966 but written in 1957) which he describes as 'a landmark of literature about the subject'. In this small pamphlet, BRECHT (1966) not only deals with the artists who have used chance and their reasons for doing so, but examines chance in a broader context in relation to statistics, science and philosophy. Of particular interest to this research is a section entitled 'Ways of Invoking Chance' which details such methods as the use of coins, dice, cards, and random numbers etc.

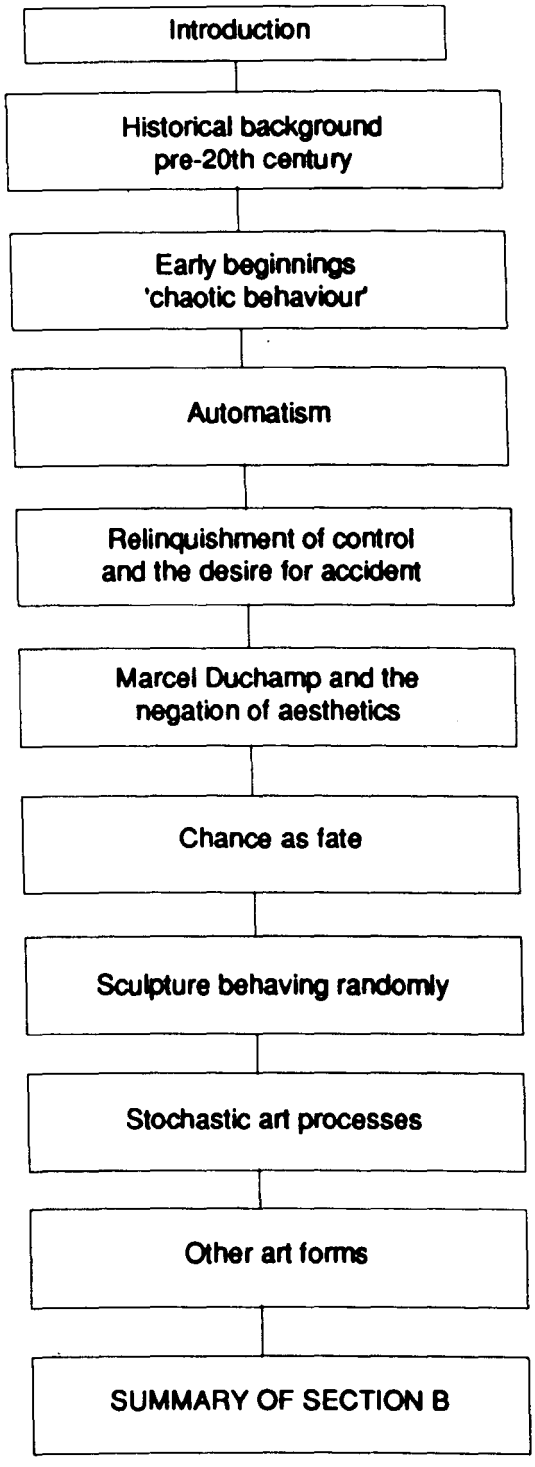

Fig.7 Structure of literature review - Section B

According to the introduction in the Auckland City Art Gallery catalogue this was only the third major exhibition to adopt the theme of art and chance. The first took place at the Institute of Contemporary Art of the University of Pennsylvania at the end of 1970 and was called 'Against Order: Chance and Art', whilst the second took place at Rijksuniversiteit, Utrecht in 1972 and was called 'Toeval' (Chance).

The catalogue accompanying the American exhibition also includes an essay, 'Against Order: Poetical Sources of Chance Art' by PINCUS-WITTEN (1970) however, rather than examine 'the techniques, methods or styles' that artists have used, it rather disappointedly devotes most of its enquiry to the 'desire for 'disorder' as it occurs in poetical episodes of influential authors of the later nineteenth and early twentieth centuries'. (Details of the Dutch exhibition have been extremely difficult to trace and unfortunately no information about it can be offered.)

Organisers of the American and Australian exhibitions stress the importance and influence that chance processes have had in the making of art. Writing in the foreword of the American catalogue, PROKOPOFF (1970) states:

> "Over the course of nearly a century the deliberate introduction of chance elements and procedures into aesthetic structures has had a growing significance in all the arts. Today chance can be accounted as a major factor in contemporary artistic theory and practice."

Similarly, WILSON (1985) in the introduction of the Auckland exhibition writes:

> "The exploration of chance phenomena, of indeterminacy, of randomness, of controlled accident, and the exploration of change and movement is one of the most fascinating chapters in the history of 20th century art."

Such enthusiasm is to be welcomed, however, if it is accepted that the exploration of chance is a 'major factor' and one of the most 'fascinating chapters' of 20th century art then there would appear to be some discrepancy between the role it has played and the credit it has been given since only three 'major' exhibitions, specifically examining the 'phenomena', have taken place. That the 'phenomena' has apparently been ignored by the more influential, 'heavyweight' art establishments (i.e. MOMA, New York; Pompidou, Paris; Tate, London), would seem to suggest that it has not yet been accepted into

mainstream 'art history' but is unfortunately still considered just an interesting 'quirk'. It is the aim of this section of the literature review to challenge such a view by demonstrating that chance procedures have been used in a variety of means and for a variety of purposes by a significant number of artists throughout the 20th century and therefore deserves attention and respect.

2.22 Historical background - pre 20th century.

The period to be reviewed, as indicated by the previous quotations from Prokopoff, and Wilson, was dictated by the subject itself, that is to say, it was only from around the beginning of the 20th century that artists began to surrender conscious artistic control and experiment with chance procedures. Such experiment coincided with the dawning of the 'modern' movement, that is, the swing away from an art of imitation and representation to one of expression and abstraction. In the literature concerning art and chance however there are several historical precedents in which chance imagery is mentioned favourably and to which many authors repeatedly refer.

2.23 Projection of meaning onto random shapes produced by Nature.

The historical precedents mostly relate to the projection of meaning onto an ambiguous image, a topic which GOMBRICH (1972) thoroughly explores in the chapter entitled 'The Image In The Clouds' in which he discusses all of the most popular episodes. The following passages are referred to by Gombrich, along with other authors such as Koestler and Arnheim, perhaps because of the prestigious reputation of their author, Leonardo da Vinci:

> "How to increase your talent and stimulate various inventions. . . Look at walls splashed with a number of stains, or stones of various mixed colours. If you have to invent some scene, you can see the resemblances to a number of landscapes, adorned with mountains, rivers, rocks, trees, great plains, valleys and hills, in various ways. Also you can see various battles, and lively postures of strange figures, expressions on faces, costumes and an infinite number of things, which you can reduce to good integrated form."

Another passage, also by Leonardo:

"Do not despise my opinion, when I remind you that it should not be hard for you to stop sometimes and look into the stains of walls, or ashes of a fire, or clouds, or mud or like places, in which, if you consider them well, you may find really marvellous ideas. The mind of the painter is stimulated to new discoveries, the composition of battles of animals and men, various compositions of landscapes and monstrous things, such as devils and similar things, which may bring you honour, because by indistinct things the mind is stimulated to new inventions" (Treatise on Painting c1498).

A similar tale is recounted by MARQUSEE (1977) in the introduction to 'Alexander Cozens A New Method Of Landscape' (see 2.24), who quotes the following passage by the 11th century Chinese artist Sung Ti:

"You should choose an old tumbledown wall and throw over it a piece of white silk. Then morning and evening you should gaze at it until, at length, you can see the ruins through the silk, its prominences, its levels, its zig-zags, and its cleavages, storing them up in your mind and fixing them in your eyes. Make the prominences your mountains, the lower part your water, the hollows your ravines, the cracks your streams, the lighter parts your nearest points, the darker parts your more distant points. Get all these thoroughly into you, and soon you will see men, birds, plants and trees, flying and moving among them. You may then ply your brush according to your fancy, and the result will be of heaven, not of man."

The suggestion made by Leonardo that 'indistinct things' stimulate the mind seems to support the view, discussed in Section A of the literature review (see 2.11), that not only does the artist not know very much about what it is he/she is eventually going to create, but that he/she does not want to know. Similarly, in the section entitled, 'Relinquishment of Control and the Desire for Accident' (see 2.34), it is suggested that some artists are stimulated by uncontrollable and unpredictable results.

2.24 Projection of meaning onto random shapes produced by intention.

From the stimulation of the mind by the random patterns that are to be found in nature, Gombrich proceeds to discuss artists who aimed to stimulate the mind by random patterns that were made intentionally. GOMBRICH (1972) informs us of a German Romantic poet, Justinus Kerner (1786 - 1862),

". . . who used inkblots on folded paper to stir his imagination . . and

wrote a number of poems on the weird apparitions which these products suggested ".

A most enthusiastic advocate of a similar type process was the English landscape painter Alexander Cozens (1717-1786) - see figs.8 & 9 - who in 1786 published a book entitled 'A New Method Of Assisting the Invention in Drawing Original Compositions Of Landscape' (reproduced in, MARQUSEE, 1977). Cozens was aware of Leonardo's statements about the stains on walls, etc, however, he believed that his method was superior to Leonardo's because the inkblots were produced by the artist's will:

> "I presume to think, that my method is an improvement upon the above hint of Leonardo da Vinci, as the rude forms offered by this scheme are made at will; and should it happen, that a blot is too rude or unfit, that no good composition can be made from it, a remedy is always at hand, by substituting another."

The point that Cozens makes, that the inkblots could be repeatedly produced until a 'good' one was achieved, raises one of the fundamental issues concerned with using chance; whether the artist accepts everything that chance produces, or whether he/she accepts only that which appeals. By introducing an element of selection, Cozens automatically undermines the principle of chance; the blot is not simply a random shape but a special random shape that has been selected by the artist's conscious mind. The truly random nature of the inkblot is further undermined when Cozens admits that the artist is to some degree in control of the shape he/she is supposedly creating randomly:

> "An artificial inkblot is a production of chance, with a small degree of design. . . in making blots it frequently happens, that the person blotting is inclined to direct his thoughts to the objects, or particular parts, which constitute the scene or subject . . The consequence of this is an universal appearance of design in his work, which is more than necessary to a true blot."

As well as guiding the production of random shapes and then perhaps selecting out of many, the artist's mind is also in control of what the random shape may suggest to the artist. Gombrich and many other authors cite the psycho-analytical technique known as the Rorschach inkblot test (named after the Swiss scientist, Hermann Rorschach, 1884-1922), which invites subjects to interpret ambiguous shapes. In the introduction to the modern edition of Cozens book MARQUSEE (1977) writes

original in colour

Fig.8 Alexander COZENS - a random ink blot.

Fig.9 Alexander COZENS - the finished drawing inspired by the above ink blot.

> "A more clinical but by no means contradictory explanation of the blot technique was proposed by . . Rorschach. He found that people will 'read' or 'project' into chance configurations of inkblots their own deep concerns or preoccupations. Human beings, we now realize, are inclined to construe visual forms according to their previous experience; . . Cozens himself explained that blotting does not work by chance alone. . ."

Because an ambiguous shape may suggest different things to different people and it is assumed that whatever a person sees reflects something of their own personality it is believed that art may become more personal through the intervention of chance. This idea that chance encourages personality rather than denying it is discussed further on in the work of Marcel Duchamp (See 2.35 & 2.36)

2.25 The accidental and the unplanned.

The remaining pre-20th century episodes refer to what may be described as the achievement of effect through accident rather than intention. GOMBRICH (1972) once again refers to Leonardo's 'Treatise on Painting' (c1458): he describes a studio talk between Leonardo and Botticelli who discuss an anecdote attributed to the Roman writer Pliny the Elder (23-79 A.D.). Pliny, it is claimed, extolled the use of chance in the inventions of art:

> ". . . a painter who laboured at representing the foam at the mouth of a dog laboured in vain until, in despair, he threw a sponge at the panel and, lo! achieved the desired result."

Botticelli argues that if such an effect can be achieved by simply throwing a sponge there is no need to learn anything else, however, Leonardo does not agree. Although accepting that a random form may be useful as an aid to artistic invention, Leonardo argues that accident is in itself, not enough, emphasising that 'What matters is rather what he can make of it'. Gombrich goes on to point out that it is not the accident that is important, it is the artist's ability to recognise the accident and his/her decision to build upon it and keep it.

An excellent manifesto entitled 'The New Arts, or The Role of Chance in Artistic Creation' written in 1894 by the Swedish dramatist, August Strindberg (1849-1912), is another often referred to text which confronts the issue of accident and intention. In this essay (STRINDBERG, 1968), Strindberg relates several

incidents which demonstrate the benefits of working without predetermined aim and allowing accident and chance to play its part, including the following, rather lengthy extract:

> "On arriving at Marlotte, a well known artist's colony, I go into the dining room to look at the very famous painted panels. There I see: portrait of a woman, a) young, b) old, etc. Three crows on a branch. Very well done. Later I see what it is about. Moonlight. A rather bright moon; six trees, stagnant water with reflections. Moonlight then. . . . . But what is it? This very question leads to the first excitement. It is necessary to search, conquer; and nothing is more delightful than fantasy in movement. . . What is it? The painters call it 'palette scrapings', which means: When he has finished, the artist scrapes together the remaining pigments and, if his heart tells him to, makes any kind of drawing out of them. I stood overjoyed in front of this panel at Marlotte. The colours had a harmony - very understandable, since they belonged together in a painting. Freed from the pain of finding the right colours, the artist's soul spends all its forces in seeking shapes; and as his hand manipulates the spatula at random - still keeping nature's model in mind without trying to copy it - the result reveals itself as a charming mixture of the unconscious and the conscious. This is natural art: the artist works like capricious nature, without predetermined aim."

This revealing passage raises the whole question of predetermined aim, and whether or not the artist is better off without it. Although working in such a way may be possible at odd moments, any conscious attempt to do so for any prolonged period would automatically nullify the attempt.

A final episode worthy of note, again because of its author's reputation, is the invention of a musical dice game (Musikalisches Wurfelspiel) by the prolific Austrian composer, Mozart. First published around 1793, it is subtitled as an 'Instruction for composing waltzes or German dances using two dice, without musical knowledge or any understanding of musical composition'. The fact that no knowledge or understanding is required can only be claimed because, as NORTHCOTT (1991) states, there are certain hidden restraints and 'the randomness is quite skilfully rigged', however, the number of permutations remain quite large. Although Northcott admits that not every scholar is convinced that Mozart actually devised 'Wurfelspiel', he claims that a schematic sketch does survive in his hand. If indeed Mozart did invent such a game then, along with Leonardo da Vinci, it can be said that two of the greatest creative minds that the world has ever seen recognised chance as a stimulus to creativity.

The incidents that have been discussed, although few and far between, nevertheless highlight some of the fundamental issues surrounding the use of chance and which, as we shall see, remain valid throughout the 20th century. For example, the varying degrees of willingness to accept whatever chance produces, and the belief that chance reveals the unconscious mind. Since these episodes are well known it might be assumed that they have been taken seriously; however, it is suggested that they are often mentioned for their novelty value rather than out of a genuine respect for the possible potential that such processes might offer.

2.26 Early beginnings - 'chaotic behaviour'.

In the early years of the 20th century, part of the artistic community began to challenge social and artistic convention through the presentation to the public of theatrical performances that were characterised by behaviour which could only be described as chaotic. Structure, logic, intellect, and calculated intention were replaced by the unrehearsed, the irrational, the primitive, the spontaneous, and of course, chance. Whilst conventional theatre avoided chance, the artists, poets, and musicians who presented such 'evenings' did all they could to encourage it. The two key 'schools' which employed such methods were; Futurism, an Italian artistic and literary movement (founded in 1909), which celebrated the coming of the machine age and rejected all traditional aesthetic values, advocating the destruction of museums; and Dadaism, an international artistic movement (founded in Zurich in 1916) characterised by nihilistic gesture and provocation.

The flavour of Futurist performances is set out in two manifestos; 'The Variety Theatre 1913' and 'The Futurist Synthetic Theatre 1915', both written by the leader of the Futurist movement, the Italian poet and writer Emilio Marinetti (1876-1944). A detailed history of Futurist 'evenings' is to be found in GOLDBERG (1988) who discusses the years Marinetti spent in Paris from 1893 to 1896, when he came into contact with 'eccentric artists, writers and poets', such as Alfred Jarry (1873-1907), founder of the 'theatre of the Absurd' and a philosophy known as 'Pataphysics' which 'challenged social and artistic convention by irrationality and absurdism'. Marinetti was friendly with Jarry and particularly influenced by the performance of his play, 'Ubu Roi', in 1896, its non-conformity generating violence, uproar, and great scandal. As Goldberg points out, Futurist evenings were to have a similar effect.

The aim of Futurist Theatre as stated by Marinetti (APOLLONIO, 1973) was 'to compress into a few minutes, into a few words and gestures, innumerable situations, sensibilities, ideas, sensations, facts and symbols'. The manifestos propose numerous methods to ensure the eradication of all logic, tradition, and sanity, both on stage and off;

> "Systematically prostitute all of classic art on the stage, performing for example all the Greek, French, and Italian tragedies, condensed and comically mixed up, in a single evening. . . . Play a Beethoven symphony backwards, . . . Boil all of Shakespeare down to a single act. . . . Have actors recite 'Hernani' tied in sacks up to their necks. Soap the floorboards to cause amusing tumbles at the most tragic moments."

> ". . . spread a powerful glue on some of the seats, . . . Sell the same ticket to ten people, . . Offer free tickets to gentlemen or ladies who are notoriously unbalanced . . likely to provoke uproars with obscene gestures . . . "

Such 'recipes' not only attack the traditional values of art but of course the entire values upon which the civilized and rational world is based.

A technique which Synthetic Theatre incorporated and which was to be used by both the Dadaists and the Surrealists, was the concept of simultaneity, whereby various actions, separate from each other, are carried out simultaneously in time and place, for example, two poems being read out aloud at the same time, thus rendering each incomprehensible.

As we shall see, the belief that chance is one of the fundamental governing laws of life is one of the most popular reasons why many artists have used chance; similarly, the Futurists desire for such behaviour as described above, arose out of the belief that life itself was chaotic. In the 'Futurist Synthetic Theatre 1915' manifesto (in APOLLONIO, 1973) Marinetti states:

> ". . . it's stupid to act out a contest between two person's *always* in an orderly, clear, and logical way, since in daily life we nearly always encounter mere *flashes of argument* made *momentary* by our modern experience, . . .which remain cinematic in our minds like fragmentary dynamic symphonies of gestures, words, lights, and sounds."

Marinetti worshipped the 'swift actuality' of 'improvisation' and 'lightning-like intuition' which he saw as the only way to avoid 'arresting or repeating oneself'

therefore ensuring 'incessant invention'. Anything which was 'extensively prepared' was despised, as was the attainment or perfection of a skill:

> "*It's stupid* to allow one's talent to be burdened with the weight of a technique that *anyone* (even imbeciles) *can acquire by study, practice, and patience.*"

The importance of Futurist Theatre to this investigation is the recognition of the spontaneous and the immediate as opposed to the planned and the rehearsed; the Futurists encouraged things to happen by chance rather than by design. They did not appear to use chance systematically, but rather allowed it to occur naturally, as it does in everyday life.

2.27 The Cabaret Voltaire.

The origins of Dada can be traced to Zurich, where in 1916 many members of the artistic community had fled to escape the First World War. The first performance of the Cabaret Voltaire, a nightly cafe-cabaret, took place on the 5th February, 1916, and, during the next five months, involved collaborative projects and performances by Hugo Ball, Tristan Tzara, Marcel Janco, Emmy Hemmings, Richard Huelsenbeck, and Jean Arp. The Cabaret Voltaire has certain similarities to Futurist evenings, in that they both revelled in apparent chaos which often generated riotous results. The following description by Jean Arp (in GOLDBERG, 1988) gives a suitably representative account of the proceedings,

> "On the stage of a gaudy, motley, overcrowded tavern there are several weird and peculiar figures representing Tzara, Janco, Ball, Huelsenbeck, Madame Hemmings, and your humble servant. Total pandemonium. The people around us are shouting, laughing, and gesticulating. Our replies are sighs of love, volleys of hiccups, poems, moos, and miaowing of medieval Bruitists. Tzara is wriggling his behind like the belly of an oriental dancer, Janco is playing an invisible violin and bowing and scraping. Madame Hemmings, with a Madonna face, is doing the splits. Huelsenbeck is banging away non-stop on the great drum, with Ball accompanying him on the piano, pale as a chalky ghost."

The underlying principle behind the Cabaret Voltaire was one of dissolution, anarchy, and the destruction of all traditional art values. Life was absurd so why not act absurd! and chance was seen as an important means to achieve this.

2.28 Dada.

In 'Dada: Art and Anti-Art' RICHTER (1978) devotes three chapters to the subject, entitled 'Chance I', 'Chance II', and 'Chance and Anti-Chance'. In 'Chance I' Richter relates the following anecdote of Jean Arp discovering the powers of chance, although he does not claim this to be the 'invention' of the use of chance:

> "Dissatisfied with a drawing he had been working on for some time, Arp finally tore it up, and let the pieces flutter to the floor . . . Some time later he happened to notice these same scraps of paper as they lay on the floor, and was struck by the pattern they had formed. It had all the expressive power that he had tried in vain to achieve. How meaningful! How telling! Chance movements of his hand and of fluttering scraps of paper had achieved what all his efforts had failed to achieve, namely *expression*. He accepted this challenge from chance as a decision of fate and carefully pasted the scraps down in the pattern which chance had determined."

Such an event may have happened thousands of time before throughout the history of art, however, it was Arp's 'prepared' mind which realised the significance of the event. In his early work, which is well documented by READ (1968) Arp was already heading towards free and spontaneous composition. Read reports that Arp, in collaboration with his wife to be, Sophie Taeuber, produced a number of 'water-colour drawings composed of squares and rectangles . . . juxtaposed horizontally and perpendicularly'; in 1916, the same year he 'discovered' the laws of chance. As figures 10 and 11 demonstrate, there is little difference between work produced by Arp prior to 'discovering the laws of chance' (fig.10), and work that was eventually produced by such 'laws (fig.11), however, for Arp, the squares arranged by chance had far greater meaning than those arranged by his own hand as he considered chance as the 'highest and deepest of laws', older and wiser than mankind, which, at that particular moment in time was apparently attempting to destroy itself.

This new discovery was immediately adopted by the Dadaists who were fascinated by the origins of this apparently autonomous force. In 'Chance II' RICHTER (1978) describes the interest that the Dadaists had in chance as a mental phenomenon and their curiosity as to its origin:

> "Was it the artist's unconscious mind, or a power outside him, that had spoken? Was a mysterious 'collaboration' at work, a power in

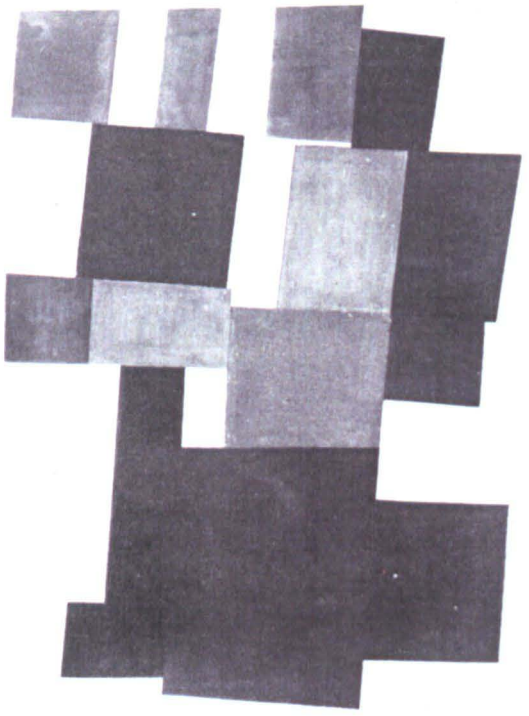

Fig.10 Jean ARP - *Static Composition* - 1915

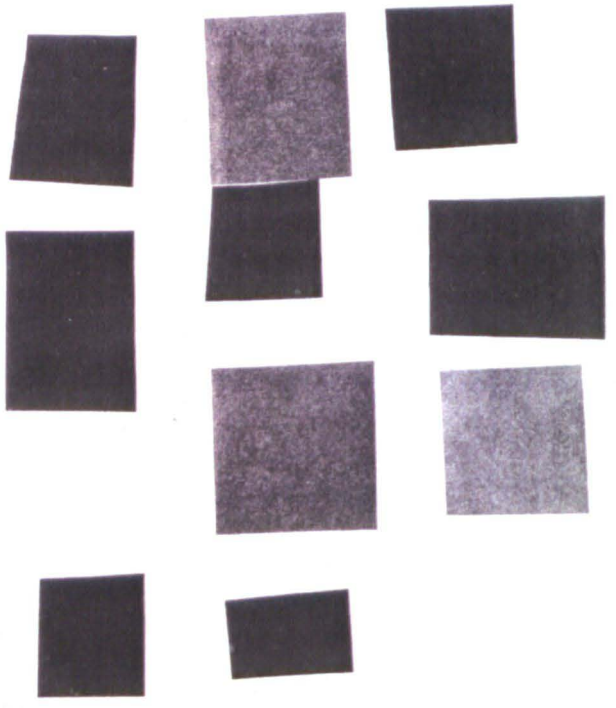

Fig.11 Jean ARP - *According to the Laws of Chance* - 1916

> which one could place one's trust? Was it a part of oneself, or a combination of factors quite beyond anyone's control?"

Richter's main conclusion is that they believed chance to be the 'voice of the unconscious': chance was a direct route to the 'inner eye and ear', transcending 'the barriers of causality and conscious volition'. Richter does not suggest that chance is controlled by the unconscious, but rather, chance is a means by which to gain access to the unconscious.

In the third section, 'Chance and Anti-Chance' Richter suggests another reason for using chance; to restore to the work of art its 'primeval magic power', its immediacy, which the Dadaists felt had been lost through the centuries to highly rational forms of art such as classicism, etc. Chance was seen as a way to return to a primitive state of mind, however, Richter admits that a complete break from conscious volition was an impossibility:

> "Proclaim as we might our liberation from causality and our dedication to anti-art, we could not help involving our whole selves, including our conscious sense of order, in the creative process, so that, in spite of all our anti-polemics, we produced works of art."

The intrusion by the 'conscious sense of order' was not a problem however, Richter suggests that it was in fact the essence of Dada, resulting in 'a situation of conflict', a complementary 'interplay of opposites' such as existed between 'premeditation and spontaneity'.

From the point of view of this research the Dadaists are not only important because they were the first group of artists to consciously encourage the use of chance, but perhaps more importantly because their experience demonstrates that conscious control can never be fully eliminated. Richter claims that chance was to be used 'not as an extension of the scope of art', but that is indeed what happened because, although Dada proclaimed the dissolution of art, it could not help but make it, therefore advancing its cause.

The processes, products, and philosophies of Dada may be further explored in the many texts which have been written on the subject. This research is primarily concerned with the Dadaists use of chance, and each artist discovered their own way in which to use it, however, these will be discussed in the forthcoming sections. In the meantime it is beneficial to follow the tradition of 'chaotic behaviour' which started with these Futurist and Dadaist 'evenings' and

can be traced through to the present day by way of 'Happenings' and 'Performance Art'.

2.29 Happenings.

'Happenings' were prevalent in New York during the 1950's and 1960's when visual artists turned their attention to performing in theatrical situations. The dictionary defines a 'happening' as 'an improvised or spontaneous display or performance consisting of bizarre and haphazard events'. The first such 'happening' probably took place in 1952 at Black Mountain College, North Carolina, where the participants included the composer John Cage, the painter Robert Rauschenberg, and the dancer and choreographer Merce Cunningham. The evening consisted of several simultaneous events including, reading poetry, playing unusual musical instruments, reading texts relating to Zen Buddhism, and pouring buckets of water. The introduction of chance came about through minimal preparation and the vague nature of instructions given to the performers, with the result that anything could happen. Artists associated with 'happenings' include; Allan Kaprow (fig.12), Robert Whitman, Claes Oldenberg, and Jim Dine. [For a comprehensive survey of such events see HENRI, 1974.] Although extremely varied in content and approach, the principle aim of such events was to allow the unexpected to happen, and a principle means of achieving this was by chance, in the guise of improvisation and unpreparedness. However, the apparent willingness to welcome spontaneity and chance into some of these 'happenings' would appear to be in question. For example, in discussing a work by the artist Allan Kaprow, entitled '18 Happenings in 6 Parts' (1959), GOLDBERG (1988) informs us that:

> ". . . the term 'happening' was meaningless: it was intended to indicate 'something spontaneous, something that just happens to happen'. Nevertheless the entire piece was carefully rehearsed for two weeks before the opening, and daily during the week's programme."

Obviously it is not suggested that all such happenings were as rehearsed and prepared as this example would seem to indicate, but it serves to demonstrate a recurring feature, that is, artists may not be entirely willing to accept everything that chance throws at them, therefore, they find the representation of chance a far easier option than chance itself.

Fig.12 Allan KAPROW - *The Courtyard* (Happening) - 1962

One way of ensuring chance itself is to work in a situation that cannot be rehearsed. An example of this was a performance entitled 'Coyote' (1974) by Joseph Beuys (1921-1986) in which he spent a week in a gallery sharing the same space with a wild coyote (see fig.13); obviously the coyote could not be told what to do! As a 'happening' or piece of performance art, this was one of the more celebrated events and one which is continually referred to, both in the context of performance art and Beuys's personal work.

2.30 Fluxus.

Closely related to the 'happening' is a movement known as 'Fluxus', a group of international artists who organized 'Fluxus' festivals from 1962 onwards in both Europe and America, and of which Beuys was a member. The name is taken from the Latin word meaning flowing and disintegrating and the principal philosophy behind the group was the opposition of all tradition and professionalism in art. Prominent participants in Fluxus included George Maciunas, George Brecht, and Nam June Paik. The nature of Fluxus is personified in the work of Nam June Paik (b1932) who was responsible for events such as Joseph Beuys playing the piano with an axe on the occasion of Paik's first one-man show (Galerie Parnass, Wuppertal, 1963) or 'Violin Solo' (1962) in which the violin was not played but physically destroyed.

Since the 1960's 'Performance Art' has become an art form in its own right. Although not necessarily associated with chance procedures, nevertheless, many 'performances' may involve chance or elements of chance. There is no need to examine performance art in any great detail, sufficient to say that it is the successor to the tradition of artists acting and performing in a spontaneous manner.

2.31 Automatism.

Surrealism arose in the 1920's having developed out of Dada. Whereas Dada may be said to have been inspired by anger and anarchy, Surrealism may be said to have been inspired by the unconscious and the dream. One of the many methods with which the Dadaists had explored chance was a process which involved writing down whatever came into one's head. This technique however, known as 'free association', is more readily linked to the Surrealists who used

Fig.13 Joseph BEUYS - *Coyote* - 1974

the term 'automatism' to describe such 'verbal gushing'. The term perhaps originated from the 'Manifesto of Surrealism' written by BRETON (1972) who described Surrealism as:

> "SURREALISM n. Psychic automatism in its pure state, by which one proposes to express verbally, by means of the written word, or in any other manner - the actual functioning of thought. Dictated by thought, in the absence of any control exercised by reason, exempt from any aesthetic or moral concern." (1924)

It is often considered that Automatism is more readily applied to the verbal than the visual, and certainly, both the Dadaists and Surrealist produced large quantities of poetry by automatic means. However, there was a great deal of difference between the Dadaists use of such techniques and those of the Surrealists. SHORT (1980) in 'Dada and Surrealism' even goes so far as to suggest that:

> ". . . all the main differences between Dada and Surrealism crystallized around the significance to be attributed to automatism."

Whereas Dadaist poetry allowed for the disruption of syntax, repetitive use of single words, onomatopoeia or simulated African speech, Surrealist automatic poetry was of a much more scientific nature originating from Andre Breton's early psychiatric studies and knowledge of the Freudian technique of free association. For example, the first Surrealist literary work of this nature, 'Les Champs Magnetiques' by Andre Breton and Philippe Soupault (1919), resulted from the different effects achieved by varying the speed in which their 'thoughts' were transcribed.

Although much of the best automatic work is in literary form, the technique was applied to the visual arts as well. BOGLE (1985) describes several automatic image-making techniques which the Surrealists adopted. These include; '*Exquisite Corpse*' - where artists drew a section of a picture without knowing what the other artists had drawn: '*Frottage*' - a technique invented by Max Ernst which involved dropping pieces of paper at random on the floor and then making a rubbing (see fig.14). The variety of textures stirred Ernst's imagination, as demonstrated by this quote from him: (which bears great similarity to the Leonardo passage regarding damp stained walls, see 2.23.)

> "There my eyes discovered human heads, animals, a battle that ended with a kiss (the bride of the wind), rocks, the sea and the rain,

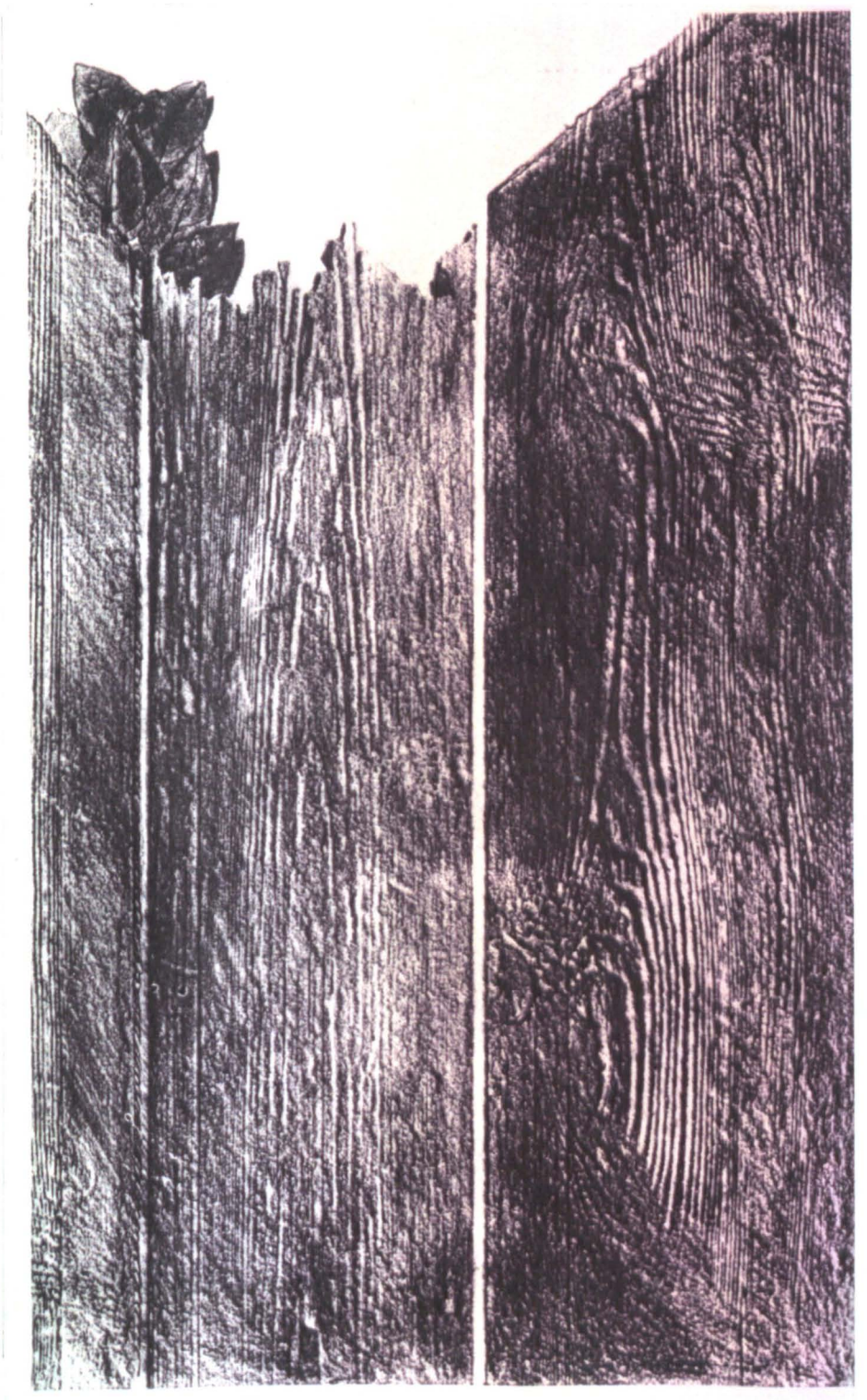

Fig.14 Max ERNST - example of frottage - *Hugging the walls* - 1926

> earthquakes, the sphinx in her stable, . . . a shawl of frost flowers, the pampas."

'*Decalcomania*' was invented by Oscar Dominguez (1906-1957) and involved 'spreading gouache on a sheet of paper, laying another sheet on top, pressing. . . ,then peeling the two apart to reveal an 'accidental' image'. Bogle goes on to mention a few other techniques such as using smoke from burning candles and the tilting of paper to manipulate liquid ink. What is suggested by Ernst's statement however is that the initial random rubbings are not an end unto themselves, but are used to stir the imagination. This follows what we have already seen in the earlier review when it was suggested that the true value of spontaneity depended upon the 'secondary elaboration' which followed (see 2.12). Once a random rubbing has suggested an image in Ernst's mind, it could then be deliberately exploited with full conscious purpose.

In a dictionary article on Automatism it is claimed of Andre Masson's series of drawings produced between 1923 & 1924 (fig.15), that he 'allowed his pen simply to travel upon the paper'. Similarly, the Phaidon Dictionary of 20th Century Art (1973) includes the following statement about the same artist:

> "With Miro he produced 'automatic' drawings. These allowed the free movement of the pen line, without pre-thought or condition of any kind."

These rather alarming claims suggest that it is possible to draw with no guiding intervention from the mind whatsoever, however, such claims cannot go unchallenged. As previously discussed in Section A, full 'automatic' production is an impossibility. SCHNEEDE (1973) makes the point that automatic writing or drawing was not the 'purely spontaneous act it was purported to be . .' and that a more honest description of such procedures would be 'semi-automatic' whose real value lay in the ability to 'liberate the imagination and get inspiration started'. Not only do such processes 'liberate the imagination' but they act as a habit-breaker by introducing new elements into the conscious mind. Although Masson's series of drawings may be called automatic, it is suggested that they are only automatic to a limited degree, and that, as with Ernst's 'frottage', conscious purpose intervened at some stage. Although referring to literature, it may be assumed that the following passage by Peter Burger and quoted by SCHNEEDE (1973) applies to visual art as well: 'Whatever preoccupied the Surrealists in their conscious minds also dominated their automatic texts'. As soon as a mark is made the artist is conscious of it and any subsequent actions

Fig.15 Andre MASSON - Automatic Drawing - 1925

which follow cannot help but consciously take into account what is already there. Because of this it may be safe to assume that a purely 'automatic' process in which consciousness plays no part is a fallacy since human hands are incapable of working independently of the conscious mind.

An article by WECHSLER (1977) 'Surrealism's automatic painting lesson' details the history of the Surrealist painters after they moved to America and the subsequent adoption and development of automatic painting techniques by the Abstract Expressionists.

Since the main aim of Automatism, as defined by Andre Breton is the absence of control by reason or preoccupation with moral or aesthetic criteria it may be useful to briefly examine the phenomenon of art made by machines, which of course are not aware of moral or aesthetic criteria. It is stressed that this area is not directly related to automatism since the principle aim of automatism is to reveal the unconscious and of course a machine does not have an unconscious to reveal.

2.32 Machines and art.

Jean Tinguely (1925-1991) a Swiss sculptor who specialised in kinetic mechanical constructions, produced a series of automatic drawing machines known as 'meta-matics' (fig.16) which allowed visitors to produce abstract drawings when operated (fig.17). Tinguely also made two large automatic machines: 'Meta-matic No 17' which produced 40,000 drawings at the Biennale de Jeunes in Paris in 1959 and; 'Cyclomatic' which was operated by two cyclists and produced an abstract drawing one mile long at the I.C.A. galleries in London, also in 1959. BOGLE (1985) refers to these meta-matics, describing their 'erratic jerky movements' and pointing out about the abstract drawings that 'no two of which are alike'. This may be the case, however, the importance of Tinguely's drawing machines lie not so much in the drawings produced but in the machine itself. As HULTEN (1987) points out 'Machines that manufacture art touch the very kernel of our civilization' as art is considered to be a symbol of culture and taste: the exclusive property of man.

The relationship between computers and art was a topic touched upon earlier and which is now encountered again. In an article 'Machines and Art' REICHARDT (1987) discusses the work of Harold Cohen, an artist who has

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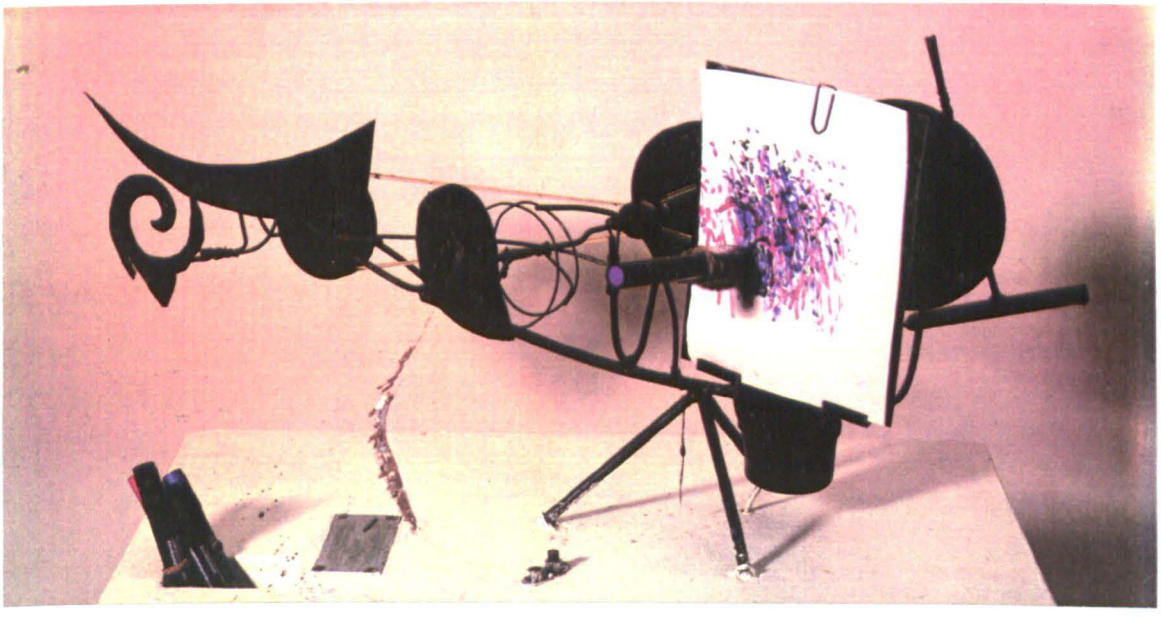

Fig.16 Jean TINGUELY - *Meta-matic No. 8* - 1959

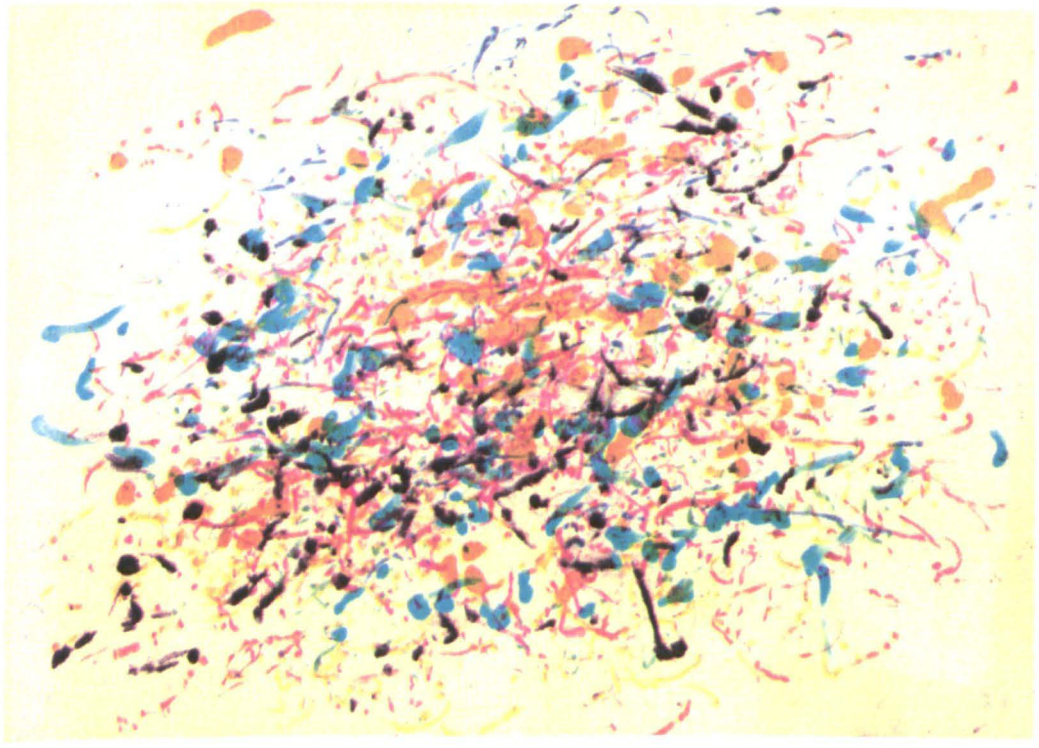

Fig.17 Painting made in collaboration with *Meta-matic No.12* by J. Kosics

invented a computer controlled drawing machine or program, known as A.A.R.O.N. which is described as follows:

> "While a pen-holding cart manoeuvres about a large sheet of paper, its position and information about the placing of lines are continuously fed back to the computer. The program assesses what has been done and either continues or finishes the drawing. Each picture has a discernible character . . The program incorporates information about the laws of perspective and various technical constraints, e.g. that a line/shape hidden behind another shape must be invisible."

As Reichardt points out however, the program is 'deeply influenced by Harold Cohen, his creator'. Others too have noted that drawings produced by A.A.R.O.N. bore remarkable similarity to drawings previously produced by Cohen using more traditional methods. This demonstrates the fact that any machine must first of all be instructed, and inevitably, the creator's idiosyncratic biases permeate throughout the invention. Returning briefly to Tinguely's 'meta-matics, their behaviour was described as erratic and jerky, types of behaviour which is characteristic of all Tinguely's work: one cannot imagine Tinguely's machines producing gently flowing, delicate lines!

2.33 Spontaneity.

Central to the concept of automatism is spontaneity, the definition of which in this case refers to a working process in which the speed of execution is so great that it aims to eliminate mental control. Spontaneous activity features prominently in many art movements and groups in the past forty years, as demonstrated by the following extracts from the Phaidon Dictionary of Twentieth Century Art (1973):

Abstraction Lyrique - '...completely spontaneous. . . . compositions, in which painterly gesture predominates.'

Action Painting - 'a permanent record of a dynamic process carried out within a specific period of time.'

Art Brut - 'concept used to describe the kind of art forms found in the work of psychotics, children, and other amateur painters, which emerge spontaneously.'

C.O.B.R.A. - 'an international artists association. . . interested in folk and primitive art and in spontaneous expression.'

Drip Painting - 'the representation of action and of calligraphic movement . . . virtually diagrammatic lines of force.'

Informal Art - 'a term used in Europe from the early 1950's onwards to describe a new form of art which . . employs completely spontaneous techniques.'

Tachisme - 'derived from the French word tache (blob) . . . . a modern Tachist work is one in which, far from planning the composition in advance, the artist applies his paint in a completely spontaneous and dynamic manner.'

Evidence of continuing interest in spontaneity can be seen in the contemporary school of Neo-Expressionism, alternatively labelled 'Bad Art', whose members include the Germans, George Baselitz and Anselm Kiefer, the Italians, Sandro Chia, Francesco Clemente, and Mimmo Paladino, and the American Julian Schnabel. In a review of a recent exhibition by George Baselitz (D'Offay, London, May 1990), LUBBOCK (1990) examines deliberate spontaneity in painting. He acknowledges the value 'in mess, in improvisation, in spontaneous and unrepeatable gestures' but denies that it has anything to do with the 'authentic unconsciousness, a fulfilling of the Romantic ache to renounce the self, tradition, the civilised man'. Rather, the artist who uses spontaneous gesture knows what he/she is doing, and knows the effect he/she is trying to achieve, although the paint may be applied freely, the artist still exerts control and ultimately considers what is 'good or bad mess'. Lubbock puts the final nail in the coffin of the idea that the spontaneous is a free and automatic exorcism of the unconscious when he suggests that it is now just another convention:

> "The spontaneous style becomes - how ironically! - itself a manner, a traditional and highly conscious device, another (the most throat-cutting insult imaginable) ac*ademicism.*"

From this and the above examples it can be seen that reference is made mostly in connection with painterly techniques. This serves to highlight the problems that arise in employing spontaneity in the creation of sculpture. The fluidity of paint along with the flat surface of the canvas ensures that spontaneous application is easily undertaken - as we shall see in the next section, no matter how paint is applied, the resulting product, the painting, is uniform and stable.

The physical reality of traditional sculptural materials such as metal, stone and wood do not readily welcome the spontaneous. They cannot be welded, or carved, or constructed quickly, whilst other factors such as structural strength, safety, and gravity also exert their influence. There are of course plenty of materials which do allow for rapid or spontaneous creation, however, their very nature dictates an acceptance of ephemerality and all the problems associated with it.

2.34 Relinquishment of control & the desire for accident.

Spontaneity may be considered one way of making a 'mess', deliberate accident-inviting techniques may be considered another. Perhaps the most renowned technique of this sort is that made famous by the American Abstract Expressionist painter Jackson Pollock (1912-1956): dripping and splashing paint onto a canvas (fig.18). The benefits of accidental techniques in art have been recognised by EHRENZWEIG in a number of texts, for example, 'The Modern Artist and the Creative Accident' (1956) and 'The Hidden Order of Art' (1967), however, he does not consider such techniques to be incompatible with those of the past masters:

> "There is precious little true accident about dripping and splashing paint. Seen in this way a clever use of accident is as old as art itself. The most skilled techniques of 19th century art knew how to make use of seemingly uncontrollable techniques. The clever water-colourist delights in the untamable spreading of running wet colour."

As with Lubbock, Ehrenzweig views an artist's use of accident in an academic light whereby the artists true skill is the ability to recognise an accident's usefulness and thereafter control it. Certainly, although the first impression of a canvas painted by Pollock may suggest chaos and accident, there are many elements of which he was still very much in control, for example, the colour of paint used, the direction and velocity of 'drip', the dimensions of the canvas, etc., and also aesthetic decisions, as ARNHEIM (1971) points out:

> "Pollock's paintings of the late 40's show a random distribution of sprinkled and splashed pigment controlled by the artist's sense of visual order. He 'sees' to it that the overall texture is even and balanced and that the elements of shape and colour leave each other sufficient freedom."

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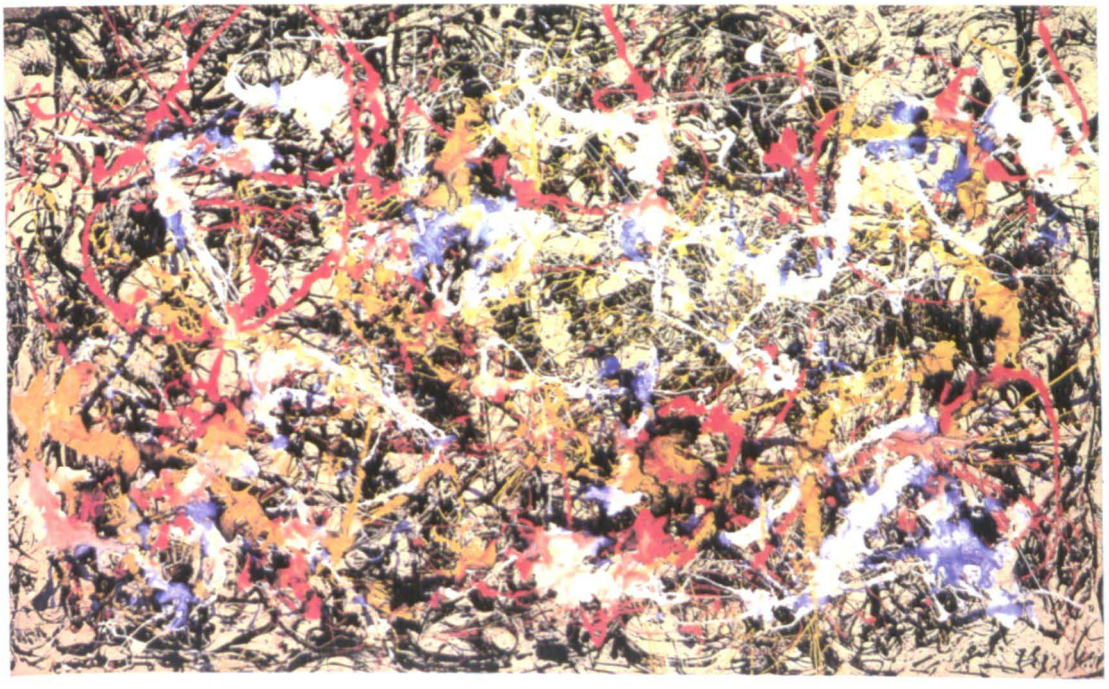


Fig.18 Jackson POLLOCK - *Convergence* - 1952

BRECHT (1966) however argues that much of what Pollock produced was due to 'predominantly chance events' arising from an infinite number of variables, including:

> ". . . paint viscosity, density, rate of flow at any instant; and direction, speed, and configuration of the applicator, to say nothing of the uniformity of paint. . . .in some of Pollock's paintings differently coloured streams of paint have flowed into each other after application, resulting in a commingling completely out of the artist's hands."

Ehrenzweig recognises the indeterminacy associated with creativity which was discussed earlier (see 2.11), and suggests there is a direct relationship between flexibility and accident:

> "The same unpredictable incident which may severely disrupt the planning of a rigid student and appear to him a 'frustrating' 'accident' will come as a welcome and indeed invited refinement of the more flexible planning of the mature artist."

In discussing the work of the Scottish sculptor Eduardo Paolozzi (b.1924) Ehrenzweig goes so far as to suggest that certain artists, such as Paolozzi,

> ". . . are not merely capable of working in this way, but need the stimulus of uncontrollable and unpredictable results in order to realise their true vision.".

Many artists have used particularly unorthodox means to get uncontrollable and unpredictable results. Although spontaneity implies lack of conscious direction it still suggests physical contact between the pencil or paint brush and the surface on which it is making a mark. Several artists have taken steps to distance themselves from the surface, thus lessening their ability to control what happens on the page. Perhaps the first and best known example of such 'distancing' are the cut-paper collages (fig.19) entitled 'According to the Laws of Chance' by Jean Arp (1916). The circumstances in which these collages came about have already been described in some detail, (see 2.28) but in summary, the composition was determined by allowing the individual shapes of paper to fall freely onto the page. From such a tentative start methods have become more and more extreme, perhaps none more so than those by the French artist Yves Klein (1928-1962) a major personality in the 'neo-dadaist' European school of 'new realism' which was concerned with the chance reality of life.

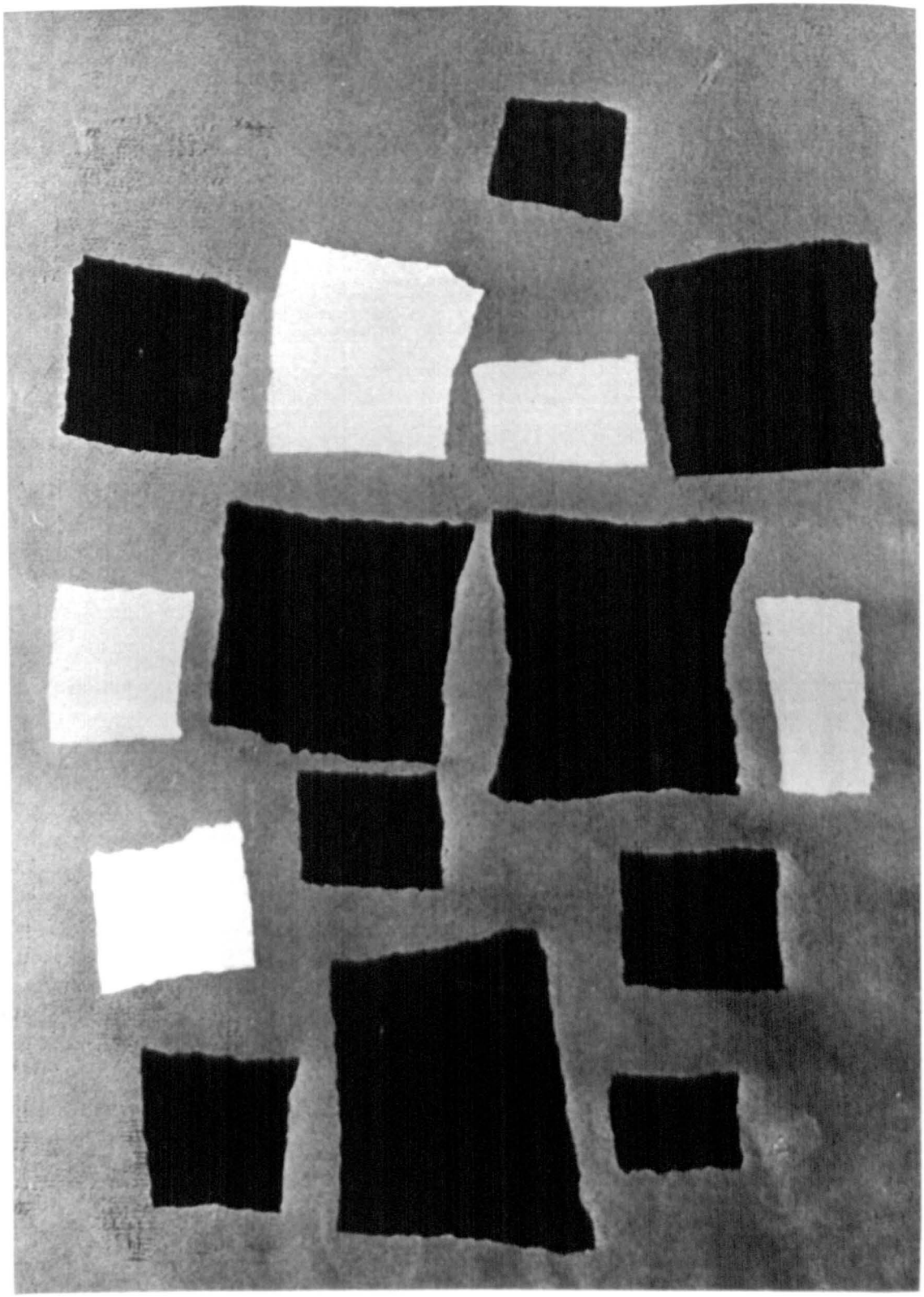


Fig.19 Jean ARP - *Collage with squares arranged according to the Laws of Chance* - 1916

Klein abandoned the paint brush in favour of an imaginative range of techniques: '*Anthropometries*' (1958-60) - a series of paintings described here by LUCIE-SMITH (1975)

> "At his (Klein's) direction girls smeared with blue paint flung themselves on to canvas spread on the floor. The ceremony was conducted in public while twenty musicians played Klein's Monot*one Symphony*, a single note sustained for ten minutes which alternated with ten minutes silence. The making of these *Imprints* is recorded in the film *Mondo Cane*."

'*Cosmogonies*' (1960) - produced by the action of raindrops on pigment, later fixed permanently: '*Peintures de feu*' (1960) - produced with the assistance of a flame thrower (fig.20); '*Wind of Travel*' (1960) - a newly painted canvas strapped to the roof of his car and exposed to the wind on a fast drive between Paris and Nice.

Even although the images that were produced are striking and arguably 'aesthetic' (fig.21), unfortunately, the unusualness of the methods employed may have blinkered peoples view of the actual paintings. LUCIE-SMITH (1975) suggests that:

> "Klein is an example of an artist who was important for what he did - the symbolic value of his actions - rather than for what he made."

This statement implies that the products of Klein's unorthodox processes were unimportant, however, this is far from the case. Many of Klein's paintings are to be found in major European and American galleries, and the work can be judged for itself in the catalogue of an exhibition held at the Centre Georges Pompidou, Musee Nationale d'art Moderne, Paris (3 March - 26 May 1983).

The above processes which Klein used, whether intentional or not, eliminated the conscious control of his hands. Other artists have concerned themselves with eliminating the conscious control of their eyes. Hans Richter (1888-1976) for example, challenged one of the most sacred rules of painting, that of colour theory. Writing about a series of paintings executed in the 1920's, RICHTER (1978) states:

> "I remember that I developed a preference for painting my 'Visionare Portraits' in the twilight, when the colours on my palette were almost indistinguishable. However, as every colour had its own position on

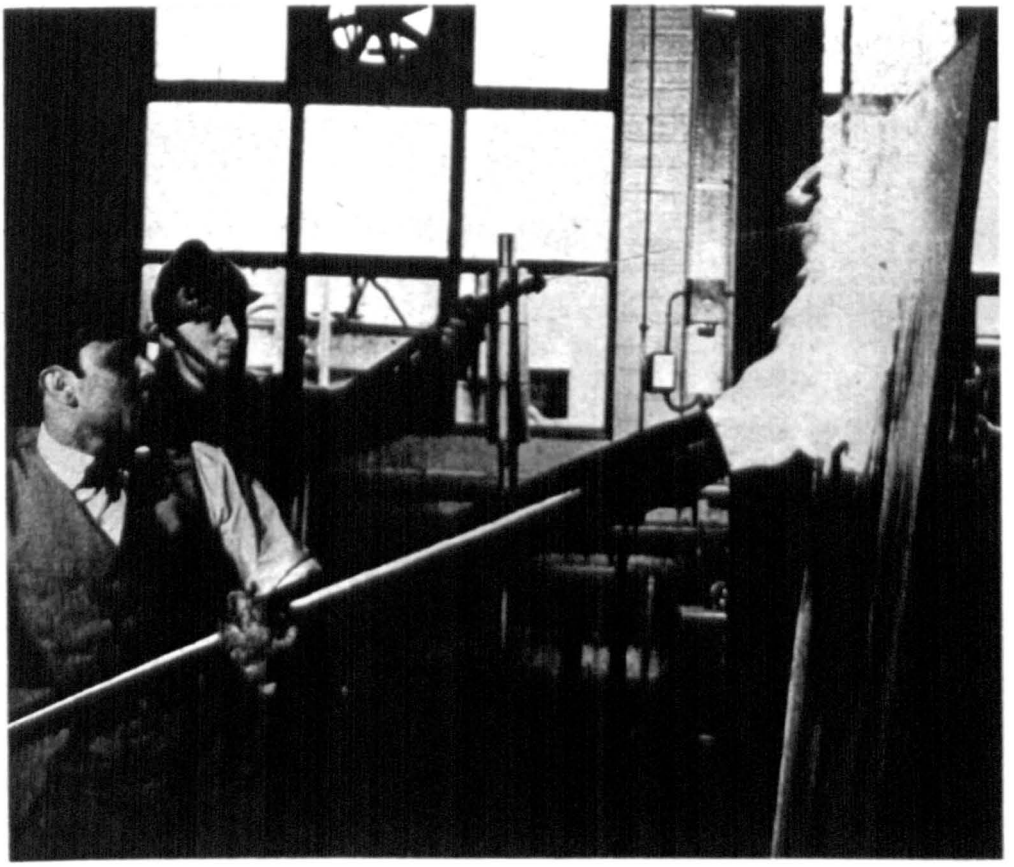


Fig.20 Yves KLEIN - In action with a flame thrower.

Original in colour.

Fig.21 Yves KLEIN - *Peinture feu sans titre* - 1961 - an example of a painting produced by the above technique.

> the palette my hand could find the colour it wanted even in the dark. And it got darker and darker . . . until the spots of colour were going on to the canvas in a sort of auto-hypnotic trance. . . Thus the painting took shape before the inner rather than outer eye."

By painting in the near dark, Richter felt that his actions were guided by the inner mind. Not being able to see the colours on the palette, nor presumably the colours he had already applied to the canvas, left his mind free to continue concentrating on painting what he was thinking rather than make critical judgements about what he had already painted. Such an apparently anarchic technique did not result in producing anarchic art however, the paintings bearing remarkable 'expressionistic' characteristics (fig.22), something at odds with the non-subjectivist ideals of Dada.

2.35 Duchamp and the negation of aesthetic.

The use of chance does not necessarily require to be always so crude and vigorous. One of the most influential artists of this century and one who is now examined in some detail, is Marcel Duchamp (1887-1968) a French painter, sculptor and theorist who exerted considerable influence on both Dada and Surrealism. TOMKINS (1965) suggests that Duchamp used chance with 'the same meticulous, painstaking attention to detail that a scientist might apply to a controlled nuclear experiment.' The scientific analogy is advanced further by Tomkins when he says that Duchamp formulated an 'amusing physics' based upon such concepts as 'oscillating density', 'uncontrollable weight', and 'emancipated metal'. Similarly, SHORT (1980) describes the 'chance based system of mathematical measurement' and 'own internal logic' of 'The Large Glass' (1915-1923) as:

> "An immensely elaborate joke, a game which throws doubt on the seriousness of all human endeavour, (it) is an amalgam of the arbitrary and the systematic, slyly suggesting that all systems are erected on arbitrary foundations."

BRECHT (1966) identifies three different types of mechanical chance processes, 'gravity', 'wind', and 'aim', which Duchamp used in various elements in the piece of work entitled 'The Bride Stripped Bare by Her Bachelors, Even' , also known as 'The Large Glass' (fig.23), a monumental glass and lead wire construction. Chance by 'gravity' was responsible for 'trois stoppages etalon', produced by holding taut, a one metre length of thread, one metre above a

Original in colour.

Fig.22 Hans RICHTER - *Visionary Self-portrait* - 1917

Original in colour.

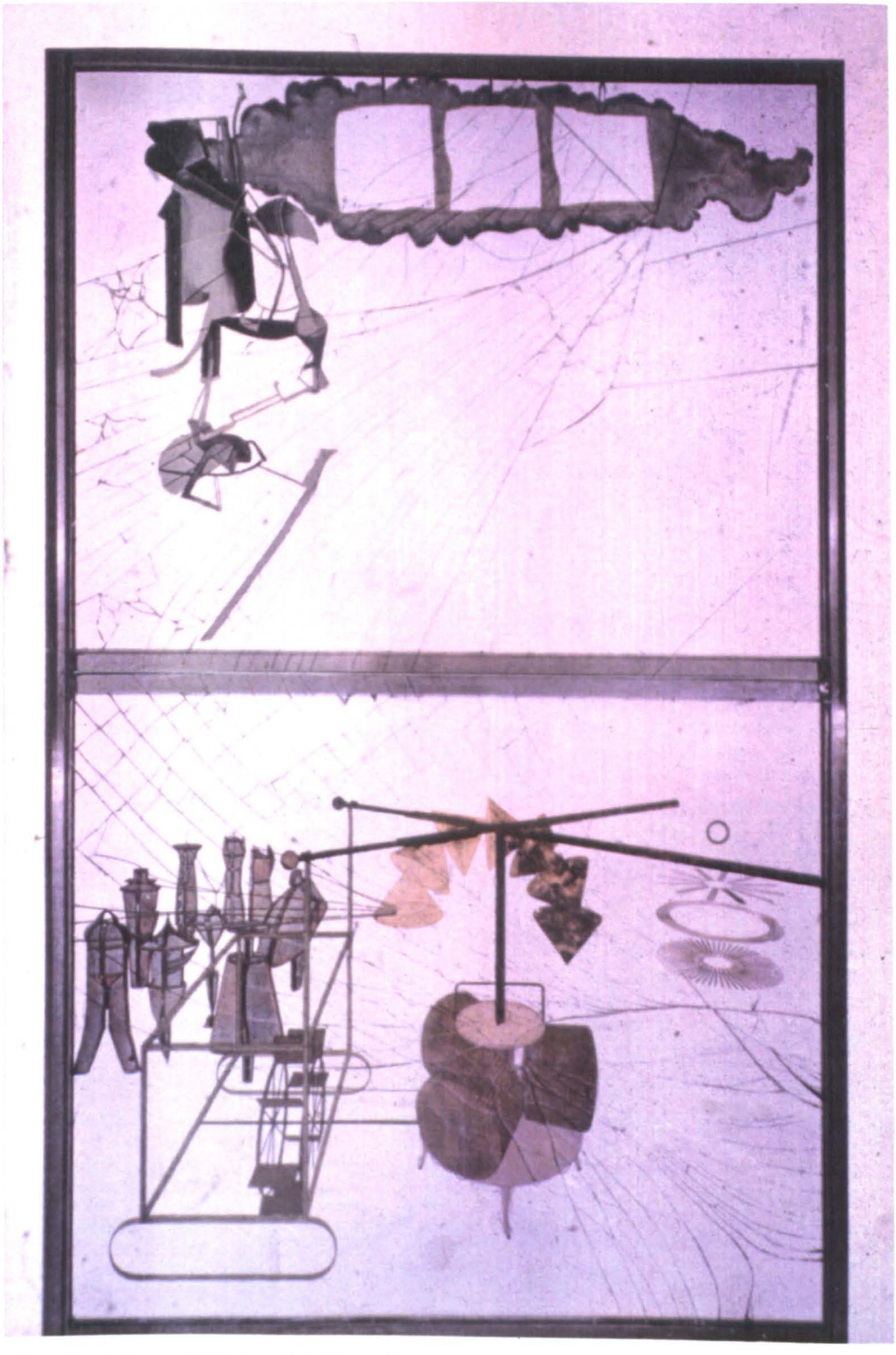


Fig.23 Marcel DUCHAMP - *The bride stripped bare by her bachelors, even.* 1915 - 23

canvas, letting it fall and fixing it with varnish in whatever position it may have landed. This process was repeated three times. Chance by 'wind' was responsible for the cloud formations on 'Large Glass': three pieces of mesh gauze were blown against a screen by air currents, presumably from a fan. Chance by 'aim' was responsible for the location of nine forms; matches dipped in paint were fired at the glass from a toy cannon. The precision of these processes do suggest a somewhat scientific approach, mainly through their objectivity because Duchamp accepted whatever happened. Unlike for example Cozens, who suggested that the ink-blots could be repeated until one was produced which was appealing, Duchamp's processes strove to eliminate that 'inbuilt ability to recognise good', which was discussed earlier (see 2.18):

> "I force myself to contradict myself so as to avoid conforming to my own personal taste."

Whether Duchamp liked the results or not was irrelevant, he accepted them, not just because it was chance, but because he believed that the results of chance revealed something of the maker's personality, as he has stated 'your chance is not my chance . . . just as your throw of the dice will rarely be the same as mine'. TOMKINS (1965) illustrates this idea further:

> "When Duchamp and his sisters amused themselves in 1913 by drawing the notes of the musical scale at random from a hat and then setting them down in the order drawn, the resulting composition, Musical E*rratum*, was in Duchamp's mind a light-hearted expression of their own personal chance rather than a purely random creation."

This idea was shared by other Dadaists, RICHTER (1978) refers to a method advocated by Tristian Tzara (1896-1963) whereby newspaper articles were cut up into individual words, placed in a bag and allowed to fall freely onto a table (fig.24):

> "The arrangement (or lack of it) in which the words fell constituted a 'poem', a Tzara poem, and was intended to reveal something of the mind and personality of the author."

The similarity between such methods described above and 'fortune telling' methods such as 'tea-leaves' or 'tarot-cards' is obvious, however, what is of greater significance to this research is the willingness by Duchamp or Tzara to accept whatever happens. This raises one of the most fundamental aspects concerning the deliberate use of mechanical chance processes, and that is the

VIII

To make a dadaist poem
Take a newspaper.
Take a pair of scissors.
Choose an article as long as you are planning to make your poem.
Cut out the article.
Then cut out each of the words that make up this article and put them in a bag.
Shake it gently.
Then take out the scraps one after the other in the order in which they left the bag.
Copy conscientiously.
The poem will be like you.
And here you are a writer, infinitely original and endowed with a sensibility that is charming though beyond the understanding of the vulgar.

Fig.24 Tristan TZARA - extract from *'Manifesto on feeble love and bitter love'* 1920 (in MOTHERWELL, 1981).

gulf that exists between the artist who accepts anything that such processes may produce, and the artist who selects only that which he/she considers 'good'.

The artist who accepts everything may invite criticism because it would appear that he/she is seen to be ignoring the very task he/she is supposed to do. The author suggests that the creativity may lie in the invention of the chance processes themselves and the type of effects they may produce rather than the skilful manipulation of the image.

Gravity, wind, and aim, were not the only manifestations of chance that helped shape 'The Large Glass'. In 1923 the two sheets of glass were broken during transit but Duchamp took it all in his stride and in 1936 he reassembled it. BOGLE (1985) concludes that :

> "Chance had achieved what Duchamp of his own volition had been unable to achieve - a truly objective physical manifestation of spontaneity."

Although 'truly objective. . .spontaneity' can occur through accident, one cannot of course spend all one's time waiting for such accidents to happen.

2.36 Readymades.

Duchamp is perhaps most notorious for what have become known as 'ready-mades', ordinary utilitarian objects promoted to the status of art objects purely because Duchamp had selected them, and importantly, decided to exhibit them; a bottle-drier; a hat-rack; a snow-shovel; a urinal (fig.25). The definition by Andre Breton is considered by many authors to be the best:

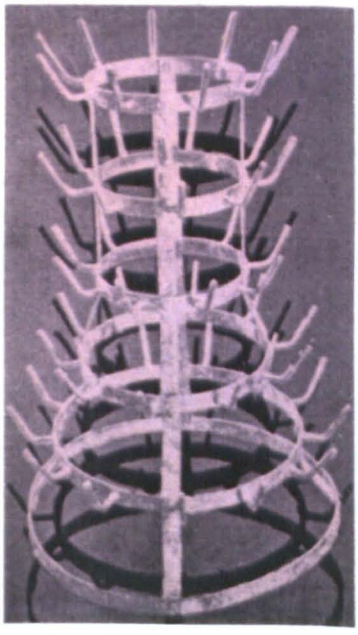
> "Manufactured objects promoted to the dignity of objects of art through the choice of the artist."

Such a simple gesture has generated an enormous complexity of interpretation and meaning, as TOMKINS (1965) notes:

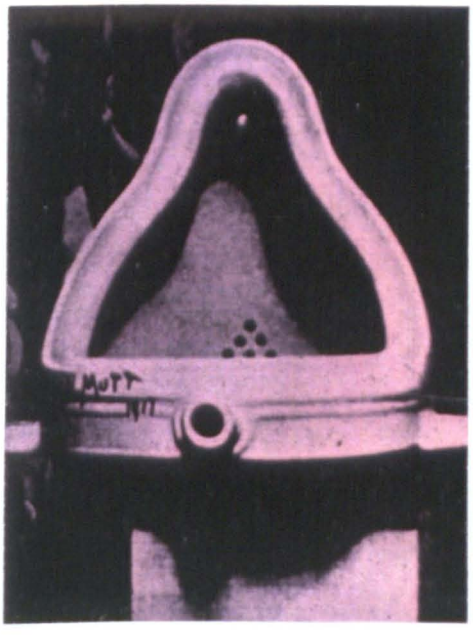
> "Thousands of words have been written in analysis and explanation . . . and their significance is endlessly debated."

However, this research will concentrate on just one of the many aspects of these 'ready-mades', that is, the selection process itself. Duchamp claims that

Bicycle Wheel - 1913



Bottle Rack - 1915



Fountain - 1915

Fig.25 - Marcel DUCHAMP - three 'ready-mades'

the choices were purely arbitrary decisions without any concept or intention of any kind, but this statement is often countered with the argument: there must surely have been some reason for choosing these particular objects? Of course, Duchamp did have a reason, choosing something without any concept or intention is a concept in itself. In an article examining the work of John Cage, Merce Cunningham, Robert Rauschenberg, and Jasper Johns, ROTH (1977) christens it the 'Aesthetics of Indifference' and cites Duchamp as the 'perfect model' whose 'ready-mades' personified the ideal of an artist's indifference to either personal taste or personal touch.

It may appear to some that the indifference with which Duchamp chose the 'ready-mades' showed a lack of care or concern and was therefore at odds with the pseudo-scientific processes which we have already identified in his work. However, his apparent 'couldn't care less attitude' is reconciled with his more precise processes because he considered all things to be both equally significant and insignificant. SANOUILLET & PETERSON (1975) describe Duchamp as epitomizing the Dadaist ideal by possessing a 'total absence of principles or prejudices' and a 'total impartiality' to the world as a whole. They go on to say:

> "For Duchamp, nothing fits a priori into a fixed context. The order of things is neither established, regulated, certain, nor above all definitive. "

Duchamp could accept the results of chance because he attributed special significance to whatever chance produced. This attitude reintroduces the idea of a deterministic world in which chance is replaced by the inevitable and the predestined: i.e. fate.

2.37 Chance as fate.

The belief that chance is one of the fundamental governing laws of life is one of the most popular reasons that artists have given for using chance. The Dadaists for example believed that art should not be an interpretation of life, but life itself. Jean Arp was the Dadaist who personified the idea that by using chance, the artist mirrored a fundamental governing law of life (ARP,1949):

> "Chance opened up perceptions to me, immediate spiritual insights. Intuition led me to revere the law of chance as the highest and

deepest of laws, the law that rises from the fundament. An insignificant word might become a deadly thunderbolt. One little sound might destroy the earth. One little sound might create a new universe."

These last three sentences in particular bear remarkable similarity to recent developments concerning chaos theory and in particular what has become known as the 'butterfly effect', a term made popular by GLEIK (1988) and which he defines as 'the notion that a butterfly stirring the air today in Peking can transform storm systems next month in New York'.

One method of incorporating this idea is to concern oneself with whatever chance happens to put in your way. The Dadaist painter, Marcel Janco (b1895-) used whatever discarded objects Nature happened to place in his path to create 'junk' sculptures and reliefs. Kurt Schwitters (1887-1948) also produced collages out of rubbish picked up from the streets, however, the manner in which Schwitters treated them was full of sensibility and subtlety and SHORT (1980) informs us that he was 'blackballed' from the Dadaist movement as he possessed what other Dadaists regarded as the unnatural desire 'to be considered an artist pure and simple'.

These early examples of Janco and Schwitters demonstrate what is now perhaps one of the simplest and most practical methods of employing chance, especially in relation to sculpture, and that is to use whatever materials happen to be available, rather than consciously seek out a material which has attractive characteristics. A good example of this philosophy, although not concerned with sculpture, is provided by the artist Robert Rauschenberg who, on tour with the dancer Merce Cunningham, created stage sets out of whatever happened to be lying around backstage at the particular venue they happened to be in.

2.38 Sculpture behaving randomly.

Most of the processes that have been discussed concerning either spontaneity, accident or mechanical chance, have been in relation to two dimensional imagery. As mentioned earlier, there is some difficulty in the integration of spontaneous techniques into the making of sculpture, however, the finished sculptural product may itself display qualities of chance and randomness, especially in the art of kinetic sculpture.

Jean Tinguely (1925-1991) was a Swiss sculptor who specialised in kinetic mechanical constructions cannibalised from redundant machinery. When operational they are unpredictable, may be self destructive, (as was 'Homage to New York' - 1960 - fig.26) and have been described as 'chance in action'. Tinguely may be considered one of the most prominent and influential kinetic sculptors of the twentieth century.

The work of George Rickey (b1907) may also be included here. Unlike the haphazard constructions of Tinguely, the sculptures of Rickey depend upon careful design and precision engineering. Once completed, the position and movement of certain elements depend upon the prevailing wind conditions (fig.27). Whilst Tinguely's constructions may be said act in an erratic or even frightening manner, Rickey's sculptures act in an elegant and balanced manner. Another example is that of the American sculptor, Alexander Calder (1898-1976) renowned exponent of the sculptural 'mobile', a suspended construction, delicately balanced, and set in motion by air currents (fig.28).

The above examples of kinetic sculpture all display a common problem: the nature of their engineered materials deny them the ability to behave truly randomly. Although it may be impossible to predict the exact position of the moving parts at any given time, their movement is unpredictable only to a certain degree, dictated by physical and mechanical parameters. BRETT (1968) provides an interesting account of some of the more extreme forms of kinetic sculpture which go some way in trying to overcome this problem by making use of 'living structures'. Two artists are of particular interest here, firstly, the Greek sculptor Takis (b1925) who made use of magnetism. In 'Magnetic Ballet' (fig.29), a positive and negative magnet 'express their duality spontaneously in dance patterns' as an electomagnet over which they are suspended is switched on and off. The second artist is David Medalla (b1942), and in particular a work called 'Cloud Canyons' (1964), which can be seen in fig.30. Brett describes it thus:

> ". . . continually-running air pumps pour out foam from a mixture of soap and water inside a group of of boxes of different heights. While the motors are running, forms are ceaselessly created, modified and destroyed . . . "

Unlike the fixed, semi-static\semi-kinetic sculpture of Tinguely and Rickey which can only behave randomly according to limits, Brett claims that 'Cloud Canyons' sets its own limits:

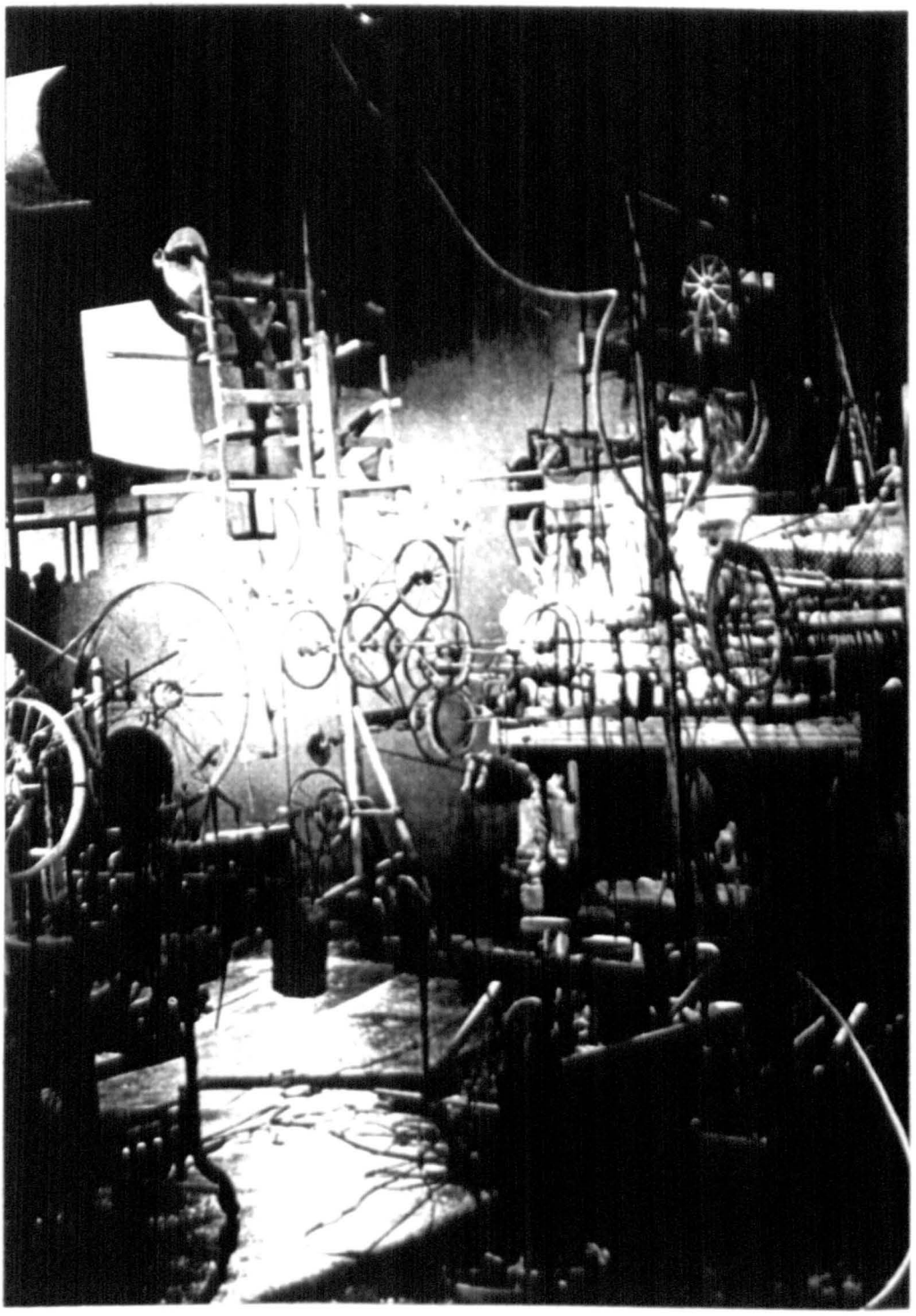


Fig.26 Jean TINGUELY - *Homage to New York* - 1960

Original in colour.

Fig.27 George RICKEY - *Double L Gyratory* - 1984

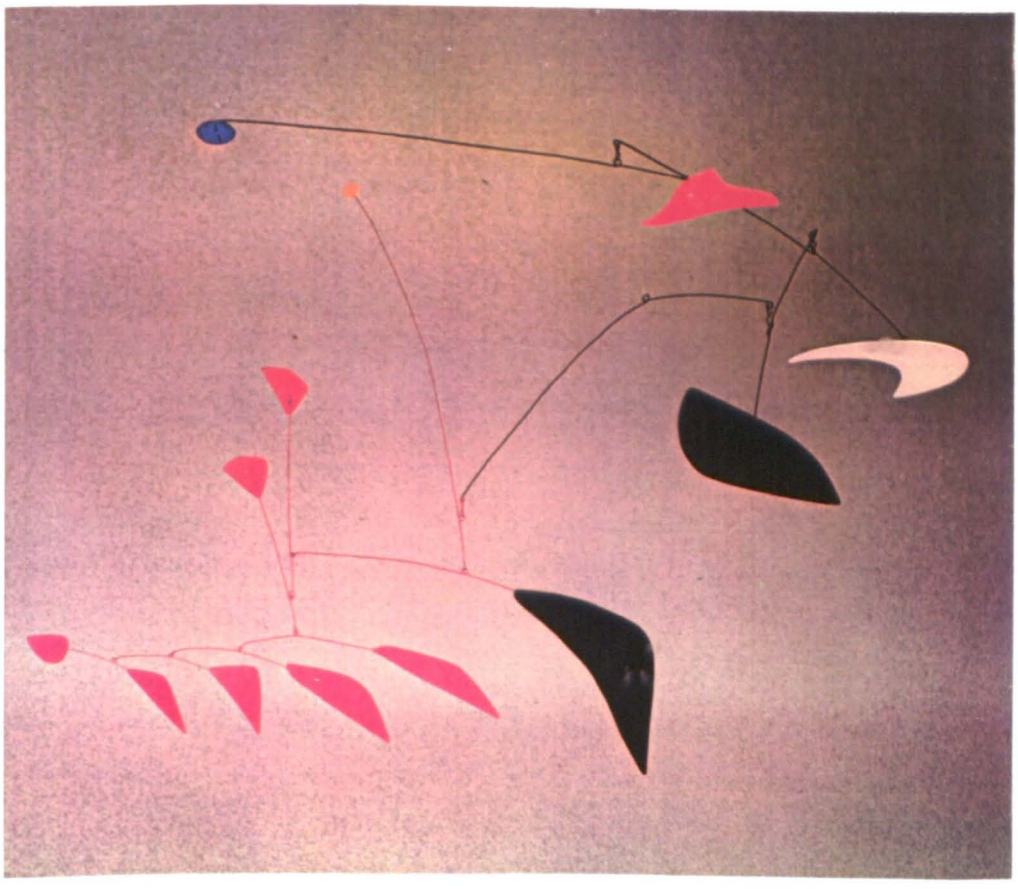


Fig.28 Alexander CALDER - *Mobile* - 1965

Original in colour.

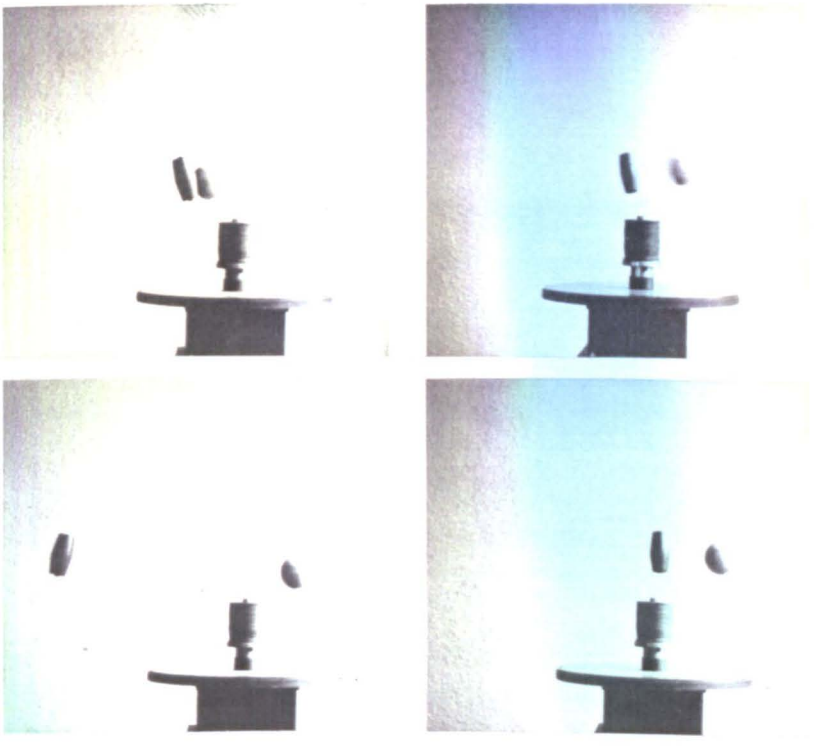


Fig.29 TAKIS - *Magnetic Ballet* - 1961

Fig.30 MEDALLA - *Cloud Canyons* - 1964

> "*It is a growing sculpture*: it doesn't have an enormous variety of changes . . but evolves from within . . *It exists only in the present*: Fresh sculptures are constantly coming into existence . . . *It is random:* Medall's foam is free to grow as it likes, . . It is outside the classical idea of order. . . "

Although 'Cloud Canyons' may represent the principals of chance better than the metal constructions of for example, George Rickey, the problem is of course one of permanence and ephemerality. What is acceptable for a short time indoors, i.e. 'Cloud Canyons', may not be acceptable as a permanent outdoor piece of sculpture.

2.39 Stochastic art processes.

During the 1970's a number of artists turned to using highly structured procedures which were governed by the laws of probability and involved the random permutation of a given number of elements within strict parameters. The results of such processes produced random arrangements or progressive variations through random permutation. Also known as 'systems' art, one of the more notable and lasting exponents of such processes is Kenneth Martin, (1905-1984) a British painter and sculptor who used highly mathematical and systemized methods involving numbered grids and subsequent random numerical selection. The following description, by WHELAN (1980) of how Martin produces an image is typical of 'systems' art:

> "His basic procedure has been to delineate a square grid on a sheet of graph paper and then to number the points of intersection within the grid. He next writes the numbers on slips of paper, which he proceeds to choose at random. The first number . . determines the intersection at which the first line begins, and the second number marks its termination. The following pair determines the length and direction of the second line, and so on."

Whelan goes on to describe various 'rules' which Martin used to introduce variety, however, a crucial point is made when he states, 'once Martin has established the rules for a particular work, he never deviates from them'. This typifies the attitude of the 'systems artist': process is all important. Even the use of chance is 'clinical' as Martin has stated:

> "I am not particularly interested in the philosophy of chance. Chance simply offers me a way of working."

Unfortunately, in the author's view, the fascination with 'structural processes' made much of the art produced under the label 'systems art' extremely dull, as represented by fig.31. [work of a similar nature may be found in 'Systems' an Arts Council Exhibition Catalogue (1972-73)]. It is suggested that the reason for this is a complete and utter reliance by the artists on rules, which, although chance orientated, do not allow for any degree of flexibility. In Section A it was concluded that creativity could not be achieved either by totally conscious means nor totally automatic means, therefore any chance based system, which employs very conscious means, must allow for input by the artist, otherwise the process becomes a simple matter of execution rather than a process involving discovery. Kenneth Martin is an ideal example of an artist who has made use of mathematically clinical methods yet has still retained overall artistic control and achieved expressive and aesthetic results, as can be seen in fig.32. In a booklet entitled 'Chance and Order': The Sixth William Townsend Lecture' (Waddington Galleries 1979) Martin expresses his fascination with 'chance and programmed structures' which he considers to create a tension between 'structural rules and fortuitous process'. However, rather than simply accept whatever the rules (which he made himself) produce naturally, the important aspect of Martin's work is that he 'explores with inventiveness' just what those particular sets of rules can do. And this is perhaps one of the most important aspects that should be understood when discussing the use of chance in such a deliberate way: chance is not used because the artist has an infallible trust in whatever chance happens to produce, but because the artist enjoys reacting to whatever chance might produce. The artist works with chance, and is not its slave.

Although not necessarily associated with systems art, the work of Mark Boyle (b1934) is worth discussing because of the unique relationship between chance and an apparently inflexible process. The work of Boyle (now known as 'The Boyle Family'), is most easily explained by this description of the work entitled 'Journey To The Centre Of The Earth' which can be found in WOODS, THOMPSON & WILLIAMS (1972):

> "Literally a global project . . launched in 1969. . .The purpose of this journey is to make 'multi-sensual' presentations of a thousand sites selected at random from the surface of the earth. These sites were selected by blindfolded members of the public throwing darts at an enormous map of the world."

After the enlargement of each random site and further random selection in a similar manner,

Original in colour.

Fig.31 Example of 'Systems Art' - Jeffrey STEELE - *Aallotar* - 1967

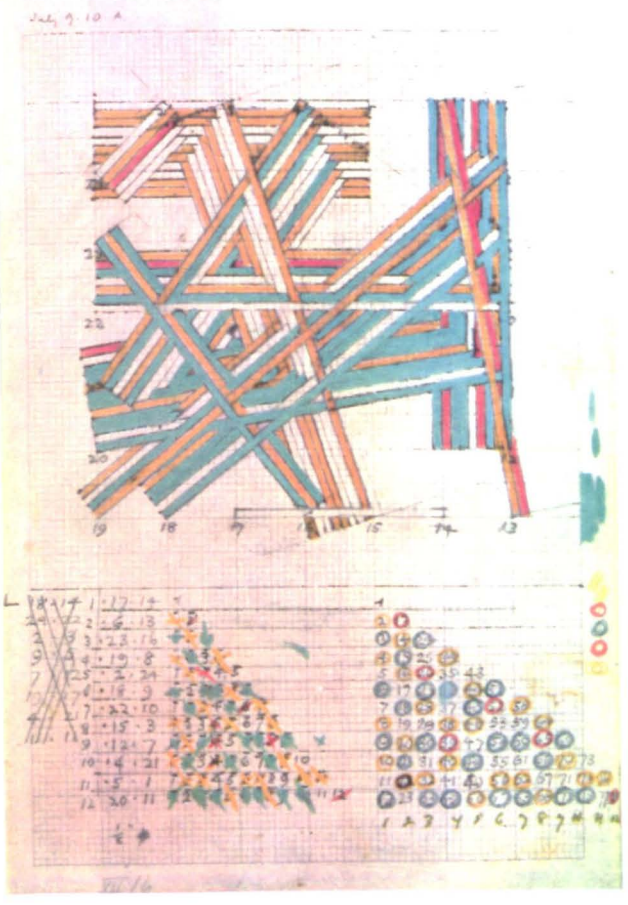


Fig.32 Kenneth MARTIN - *Chance and order drawing* - (date unknown)

> "Boyle and his assistants travel to each site, selecting at random an area six feet square. A multi-sensual presentation is then made, which includes digging, collecting live specimens, taking surface casts . . making records by photography and film, collecting plants and seeds, etc."

Apart from the selection process, chance itself is denied any existence in either the creative product or the finished product, indeed, the process of construction does not allow for any creative deviation whatsoever. Once the site has been randomly selected, the finished product is already known in every small detail, all that remains is for Boyle and his assistants to painstakingly recreate an exact replica, with a great deal of effort taken to make the artificial representation look real, as for example in fig.33.

2.40 Other art forms: music.

Although chance has been used in many different fields of the arts, within the scope of this research, and taking into consideration that it is primarily concerned with sculpture, only music shall be briefly examined since it is in this field that the leading exponent of chance procedures, perhaps in any area of the arts, is to be found: the American avant-garde composer, John Cage (b1912). Although there is a tradition of chance being used in the composition of music, known as aleatory, where elements are left to chance decisions (for example, the German avant-garde composer, Karlheinz Stockhausen, b1928), it is only in the work of Cage that all vestiges of control are abandoned.

In discussing the work of Cage, it is impossible not to discuss the influence upon him of Eastern philosophy, and in particular, Zen Buddhism, which Cage first studied in 1945. The principal teachings of Zen Buddhism may be all too briefly summarised as the active participation in, and immediate experience of, the objects, affairs and people involved in everyday life. Such influence is clearly visible in a statement referred to by TOMKINS (1965), where Cage claims the purpose of writing music was to:

> ". . . wake up to the very life we're living, which is so excellent once one gets one's mind and one's desires out of its way and lets it act of its own accord."

Tomkins suggests that most of Cage's work has been concerned with 'getting rid of his own tastes, imagination, memory, and ideas' and one of the ways in

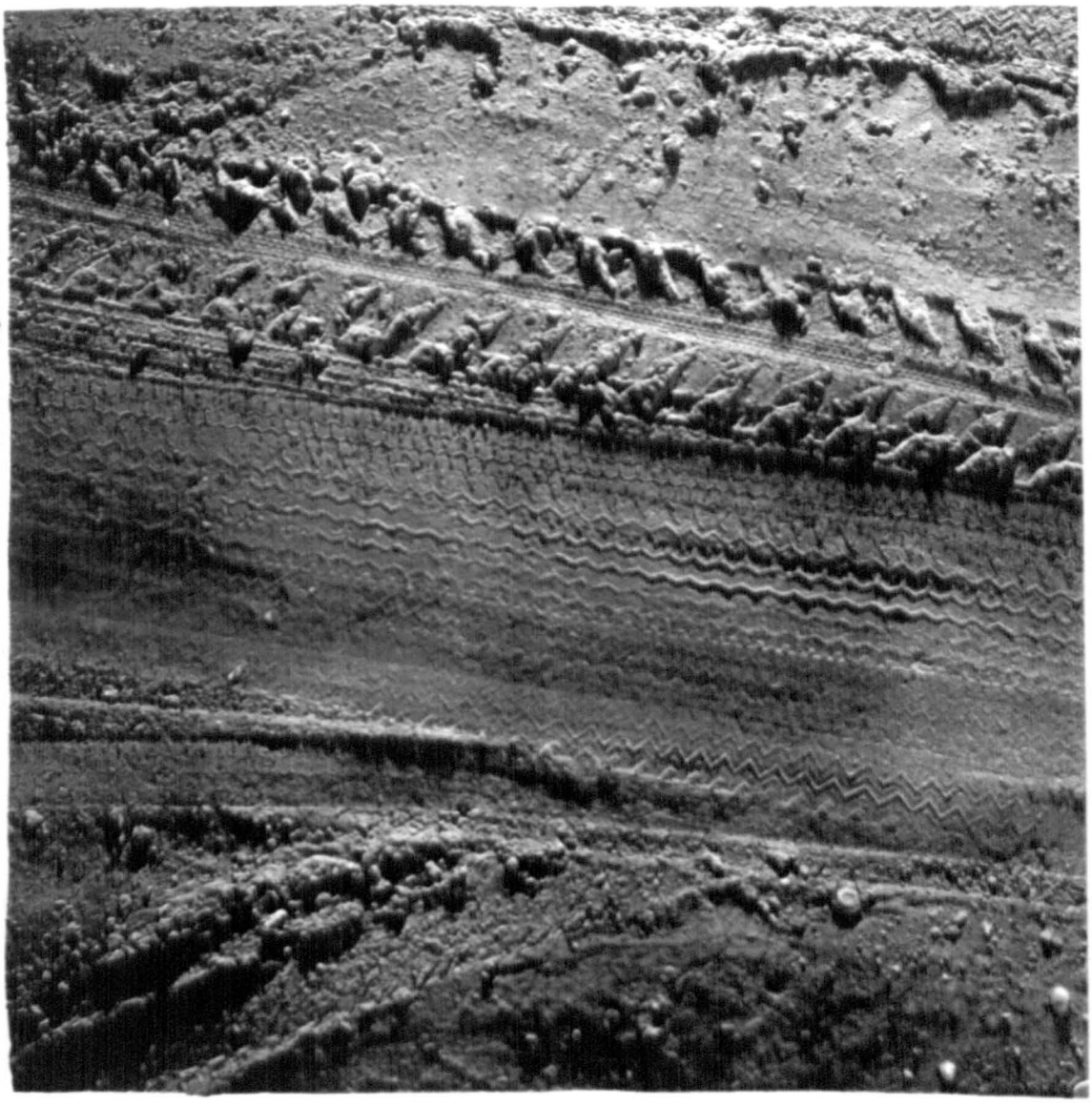


Fig.33 The BOYLE FAMILY - *The Swiss Site (The World Series)* - 1978/79

which Cage has managed to do this is through the use of chance:

> "In place of a self-expressive art created by the imagination, tastes, and desires of the individual artist, Cage proposes an art born of chance and indeterminacy, in which every effort is made to extinguish the artist's own personality; instead of the accumulation of masterpieces, he urges a perpetual process of artistic discovery in our daily life."

The means by which Cage has introduced chance have been extremely diverse. In ' 4'.33" ' (1952) nothing more is done than simply allowing the sounds of whatever environment the piece is being performed in to be heard. In 'Music for Piano' (1955) chance was introduced by marking the tiny imperfections of blank sheets of white paper. In 'Williams Mix' (1952) a large number of recorded sounds were spliced together in chance-determined ways. In 'Variations III & IV' (1963) any number of performers could make any sound using any sound producing means. Fig.34 represents a typical score, the result of chance operations. In the author's opinion, without a doubt, Cage is one of the most innovative composers of the 20th century, and much of his reputation has been established by his dedication to, and belief in, chance.

An essential tool throughout Cage's career and one which he has used in musical composition, printmaking, and writing is the 'I Ching' or 'Book of Changes', an ancient Chinese book of divination. The traditional method of 'consulting the oracle' is the deliberate introduction of chance through the tossing of coins. In a recent edition of the 'I Ching', WILHELM (1984) states that:

> "The idea of involving chance as part of the consultation process is repugnant to some people. None the less, it is, in my view, an essential part of the process because it requires one to respond to the unexpected . . . ."

Although chance plays its part it is not the essence of the I Ching, it is not chance itself which leads to new discoveries, but the cumulative interaction between chance and the mind. As Wilhelm states, the essential power behind the I Ching is autosuggestion:

> "The I Ching expands possibilities, opens options, exposes psychological blind-spots and aids lateral thinking. It requires one to use one's critical faculties . . It does not force itself upon one but presents its insights always with an implicit 'Does this make sense to

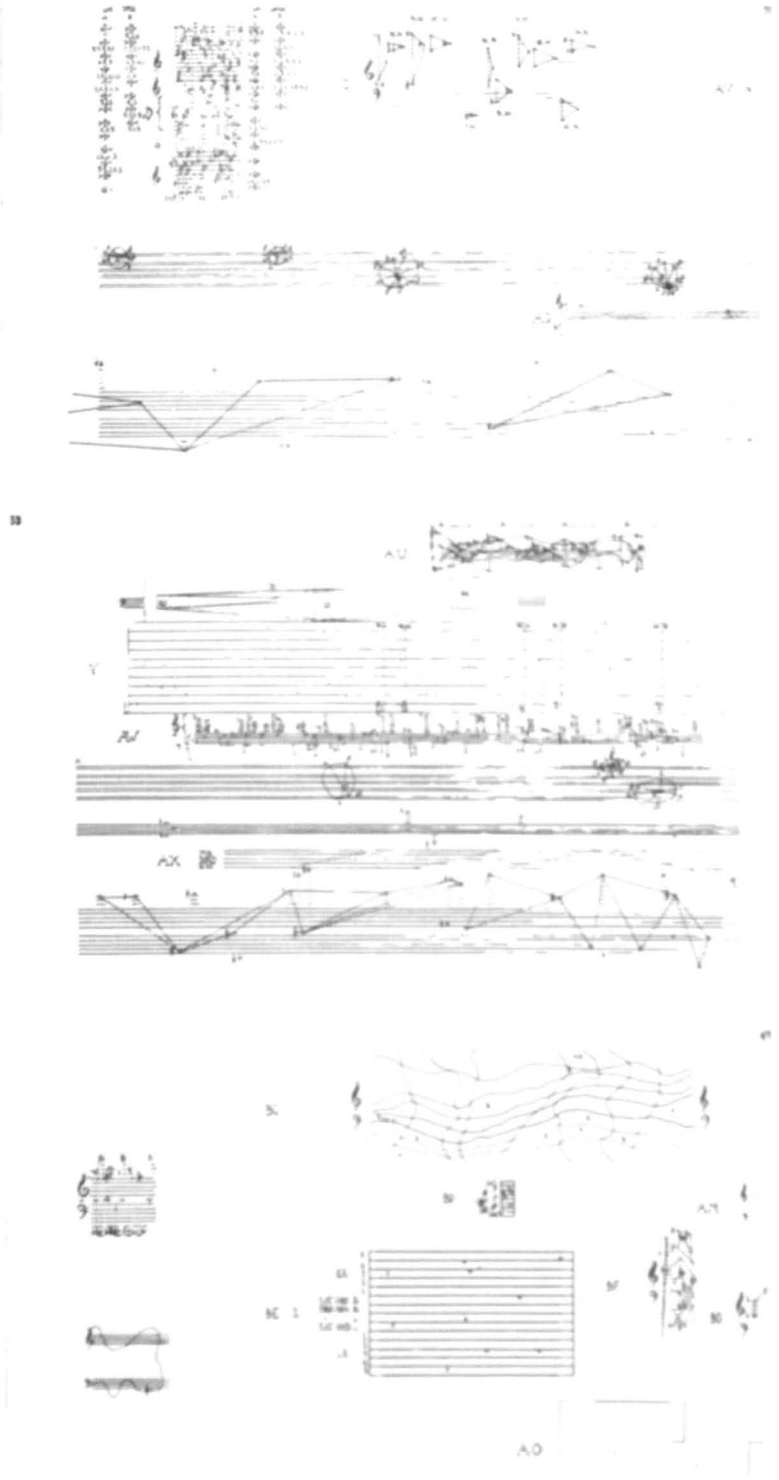


Fig.34 John CAGE - *Concert for Piano and Orchestra*, 1957-58
Solo for Piano, pp. 37, 38, 47

you?' It leaves the reader to draw conclusions: to accept or ignore its counsels."

Chance simply provides the unexpected and the unknown, forcing one to consider elements which may otherwise have been ignored. Within the complex psychological philosophy of the I Ching lies the simple desire of this research: to create a chance based system relevant to the production of sculpture, which, in the words of Wilhelm, is used when 'in need of solace or as a stimulus to explore alternatives in making decisions'.

2.41 Summary of Section B.

The accumulation of extensive knowledge of the products, processes and philosophies of many individuals or 'movements' has enabled the identification of a variety of approaches to the use of chance in art concerning the following aspects:

(a) the REASONS why artists have used chance;
(b) the METHODS that artists have used to introduce chance;
(c) the STAGE at which chance has been introduced;
(d) the LEVELS of receptivity to chance by artists.

These four factors can be summarised as follows.

2.42 (a) Reasons why artists have used chance.

The reasons why artists have used chance are extremely varied and sometimes contradictory, however, they may be summarised as follows:

1. To relinquish personal taste: in Section A it was stated that a common trait amongst creative individuals was an 'ability to recognise good', however, many of the artists who have used chance have done so in order to by-pass such an ability (e.g. the Dadaists).

2. To reveal something of the artist's sub-conscious personality: several artists have used chance in the believe that not only are the results unique unto the person who instigated the chance process but that the person is in some way responsible for what happens. Chance becomes an expression of the person's mind (e.g. Duchamp).

3. To relinquish personal ideas: in a similar way that it may eradicate an artist's 'taste', chance has been used to avoid the experience and the perceptions of 'the self'. The Dadaists for example wished to negate the artist's ego and encourage anonymity. Similarly, John Cage wished to explore everyday life rather than his own mind.

4. To relinquish personal control: artists have used chance because it provides the unexpected and the unknown, which has been identified as being conducive to creativity because it demands experiment and discovery. It interrupts the artist's will and intention which, rather than be considered a nuisance is considered a welcome intrusion.

5. To excite the mind and generate new ideas: chance, in the guise of vague and indeterminate imagery, has been used to stimulate the imagination, for example, Leonardo da Vinci or Max Ernst. That which is clear and definite demands little further effort.

6 To tap into the unconscious mind: the Dadaists and the Surrealists in particular believed that chance processes led to the 'voice of the unconscious', which they believed to hold more truthful reality and greater artistic promise than the conscious mind.

7. To mirror primitive thought: chance is seen as a way of impersonating the mind of primitive man where the mind is ruled by instinct rather than reason, logic, intellect, and all other attributes of the civilized mind. Chance represents a regression to an irrational state of mind, void of all reason.

8. To act naturally as in life: by letting things happen by chance, the artist is showing an affinity to one of the fundamental laws of life. Art should not simply be a representation of life, but life itself, and, since life is unpredictable, chaotic, and often apparently senseless, then so should art (e.g. The Futurists).

9. To challenge traditional aesthetics and artistic convention: the use of chance in art is the very opposite of what many consider art to be - for example, the skilful execution of a technique or superior aesthetic judgement. Although the use of chance may have been anarchic in the first half of this century, its use may now be considered somewhat orthodox, however, it is still a neglected area.

10. To utilize chance simply as another means of making art: the use of chance may now be considered as just another technique which can be used within the creative process (e.g. Kenneth Martin).

Any system which aims to introduce chance into the creative process should therefore take into consideration the range of possible reasons that artists may have for using chance and accordingly aim to cater for as many of these reasons as possible.

2.43 (b) Methods artists have used to introduce chance.

The ways in which artists have introduced chance may be split into two distinct categories. Firstly, techniques originating from internal means, that is, sources from within the artists themselves, and secondly, techniques originating from external means, that is, sources beyond the artist's control.

Internal sources.

Spontaneity: an outburst of creative energy, in which the artist has no apparent control over what is happening. What may appear to be due to chance however, is more probably due to a saturation of subject matter, resulting in a 'release' of built up pressure which has not been able to manifest itself previously, even although the artist may have spent considerable conscious effort in trying to do so.

Automatic processes: similar to spontaneity, but different in the respect that automatic procedures are the deliberate suspension of critical control, a kind of forced rapid thought which welcomes anything and everything which may come into the mind. Automatic procedures can be practiced at any time whilst spontaneity cannot be summoned at will.

Arbitrary decisions: throughout the creative process there are many decisions to be made, such decisions may be affected by reasoned judgement, intuitive feeling, or deliberate avoidance of either - arbitrarily, with complete indifference, each option then has an equal chance of selection.

Unpreparedness: the artist deliberately puts him\herself in a situation which cannot or has not been planned. The artist must approach such

situations with complete uncertainty and a willingness to accept anything which happens. The artist may also try to avoid pre-conceptions or premature ideas by not thinking about what he/she is going to do, in advance of doing it, preferring instead to rely upon the actuality of the moment.

Choosing the unknown: rather than work with that which is known, desired or preferred, the artist may deliberately decide to work with that which is unknown, unwanted or disliked.

External sources.

Accident: the artist may make use of accident or deliberately encourage accident, which, by its very definition means anything which occurs unintentionally and by chance.

Uncontrollable means: the use of any instrument or situation which may interfere with the the mind's control of the hand, or which distances the hand from the object of creation therefore denying its ability to guide and shape (e.g. dripping paint rather than applying it with a brush).

Given circumstance: acceptance by the artist to make use of whatever may come his/her way. For example, rather than deliberately set out to acquire a desired material, the artist using chance will use whatever material becomes available.

Letting others decide: similar to opting for an arbitrary decision, but in the desire for a purer form of chance, another individual may be consulted.

Random selection: similar to the above, but the decision is subjected to some sort of external randomizing mechanism. For example, dice, coins, random number generator, etc.

2.44 (c) Stages at which chance has been introduced.

There are three main points at which chance appears to have been introduced into the creative process:

1. Prior to creative activity: actions are determined by chance, the resulting activity may be completely devoid of chance interference (e.g. Boyle/ Systems Art).

2. During creative activity: decisions or actions whilst 'making' are influenced by chance (e.g. Arp, Duchamp).

3. Post creative activity: the product itself behaves according to chance, or may be randomly manipulated by spectator participation (e.g. Tinguely).

2.45 (d) Levels of receptivity to chance by artists.

The following four distinct groups are proposed as representative of artists' levels of receptivity to chance:

1. Total avoidance: the complete absence of chance (e.g. crafts people, or extreme forms of 'Systems' art).

2. Casual acceptance / selective use: the occasional integration of chance (e.g. the majority of artists).

3. Deliberate encouragement / selective use: chance becomes an integral part of process (e.g. Dada, or Duchamp).

4. Deliberate encouragement / total acceptance: chance predominates in the working process (e.g. John Cage).

2.46 Conclusions of literature review (Sections A and B).

The subject of 'fine art', and especially sculpture, did not feature to any significant extent in previous research into creativity, as a result, the processes and products peculiar to the art of sculpture were neglected. Similarly, the creative output of contemporary artists and art movements, especially those far removed from 'traditional' artistic practice, had also been ignored.

The subject of chance, although acknowledged in several texts as a contributory factor in the 'scientific' creative process, i.e. 'discovery', had not

been acknowledged to any great extent as part of the artistic creative process, although artists' statements would seem to suggest otherwise. It was concluded that chance had not received the recognition that it deserved.

Several types of behaviour, characteristic of 'non-control', so called because their outcome was often unpredictable and apparently random, were in fact guided by the artist's will and intention to some extent. Furthermore, such behaviour could only occur naturally since any attempt to deliberately encourage them automatically negated them.

Chance procedures are to be found in a substantial number of processes, products, and philosophies of many major art movements and influential artists of the 20th century. The international standing and critical acclaim which such artists receive would seem to merit respect for their interest in chance and for the subject to be considered in a serious light and further researched and developed.

Reasons for using chance have been extremely varied and often contradictory; chance has been used to generate ideas and to get rid of ideas; to destroy artistic tradition yet extend artistic boundaries: to reveal an artist's personality yet also to erase artistic personality. Perhaps one of the main reasons is that by using chance the artist is seen to be truly reflecting a basic law of the universe.

Chance has been introduced at all stages of the creative process and the methods used to introduce chance have been extremely varied; however, they have tended to be based upon idiosyncratic biases susceptible to the subjective influence of the artist. No evidence was found of a universal or systematic method involving a purely objective approach. Although many artists have used chance, they have done so only to a limited degree in either their total artistic output or in their level of selective control, indicating that chance has been exploited in the short term rather than respected in the long term. In the visual arts it would appear that there is no equivalent to the creative activity of, for example, the composer John Cage, who since first experimenting with chance techniques has continued to do so, showing no desire to return to previous levels of aesthetic or personal control.

The use of chance does not negate the role of the artist, rather, the disruptive nature of chance in itself may be regarded as a creative power by providing the artist with the unexpected, and opening up new possibilities by encouraging

experiment and change. The above evidence would seem to indicate that the use of chance within the creative process can be an important contributory factor to creative output, and therefore one which should be explored further.

3.0 CHAPTER 3 - METHODOLOGY.

3.1 Introduction.

From the literature review it is evident that far from chance being absent from the creative process, it is a contributory and often catalytic factor which many artists deliberately seek to employ. Firstly, although this is the case, the role of chance within the creative process has received a disproportionate lack of recognition, in both scientific research into creativity and art criticism and theory. Secondly, the methods that artists used to encourage chance lacked cohesion and objectivity which the principle of chance demands. This research seeks to redress this imbalance by developing and testing a chance-orientated 'model' with which to stimulate sculptural creativity. The development of such a device would not only enable anyone who wishes to introduce chance into their working process to do so, but would provide an insight into the creative process peculiar to the art of sculpture, which, it is suggested, has also been neglected in terms of research into creativity.

3.2 Previous research methods.

Examples of previous methods in the research of creativity include case studies of recognised creative individuals, or experiments in which an individual's reactions to a given set of circumstances is compared with another individual's reactions to the same set of circumstances. The latter method was judged to be unsuitable for this research because in it comparison takes place between creative products which have been made by different people. The aim of this research is to evaluate the effect that chance may have on an individual's creative process, therefore, comparison should only take place between pieces of sculpture and the processes involved in the development of an idea, which have been produced by the same person. Each individual is recognised as having a unique creative process; it was determined that sculpture produced by such methods should be referred to as 'choice products', because the sculpture would be produced as a result of 'personal' and preferred decision-making procedures. The introduction of chance into the same individual's creative process would result in what is referred to as 'chance products', because the sculpture would be produced as a result of 'chance effected' decision making procedures. In order to introduce chance into an individual's creative process, it

was determined that some form of 'external randomizing mechanism' would be required, which, throughout the duration of this research was referred to as a 'model'.

3.3 What is a model?

Due to the many associations which the term 'model' may evoke, it is necessary at this stage to clarify the meaning of the word. The term 'model' is understood to mean a simplified representation of a complex system, therefore, in the context of this research, the term 'model' refers to a simplified representation of the creative process associated with making sculpture. In principle a 'model' facilitates calculations and predictions, however, the aim of a model in this research is not to calculate or predict the outcome, but to enable the numerous specific elements within such a simplified representation to be subjected to chance procedures thereby effecting the process and, theoretically, making the outcome unpredictable. As stated previously, the term 'model' may evoke particularly strong associations, both in terms of 'research terminology' and 'sculpture terminology', therefore, to eliminate any possible misunderstanding, it was decided that throughout this thesis the term 'chance-orientated interactive device' or 'C.O.I.D' would be used.

3.4 Why develop a 'chance-orientated interactive device'?

1. The conclusions from Sections A and B of the literature review indicated that chance was an efficacious yet neglected factor within creativity. Chance processes had been practiced by a significant number of influential artists in the history of 20th century art, and the study of creativity by psychologists had revealed that certain characteristics associated with chance, such as indeterminacy, accident, irrationality, the unconscious, and spontaneity, did not only contribute to creativity but were necessary and vital ingredients. From this it was concluded that chance was a vital contributory factor in creative activity therefore a chance-orientated device would actively encourage the use of chance as a stimulus to creativity.

2. A further conclusion of the literature review was that the means in which artists had introduced chance had tended towards esoteric and idiosyncratic methods, which, although making use of chance, they did so on a very

subjective basis. Such methods were often the result of an individual's unique circumstances and involved specific techniques which were heavily influenced by the artist's personal taste and desires. Such methods, when repeated by others did not allow for a great deal of variation and were of genuine value only to those who instigated the technique in the first place. There appeared to be an obvious opportunity for a standardised method which could introduce chance. Such standardization would also ensure a more methodologically sound approach concerning research into chance and its part in the creative process.

3. With reference to Section B of the literature review, the degree to which chance has contributed to an artist's entire creative process can only be described as minimal. Throughout the creative process there are innumerable decisions to be made, however, only a few of these at any one time have been subjected to the influence of chance. If chance is to be used in its proper sense, then all elements within the creative process should be open to the influence of chance, not just some. By aiming to satisfy the 'non-biased' principle of chance, such a 'chance-orientated interactive device' would also go some way towards satisfying the necessary objectivity required in research methods.

4. The development of a 'chance-orientated interactive device' would enable a comparison between sculpture produced by 'usual' decision making procedures - (i.e. as a result of a sculptor's preferred working process), and sculpture produced by 'chance effected' decision making procedures - (i.e. as a result of using a 'C.O.I.D.'). In this sense a 'chance-orientated interactive device' is a methodological 'tool' which, through standardization allows comparison and evaluation.

Many research methods that have previously been used in the study of creativity have centred around laboratory type experiments which the author suggests, convey an artificial and 'test' like situation that has little relation to 'normal' creative procedures. The intention of this research to undertake experiments in as realistic and natural manner as possible determined that a 'C.O.I.D.' should not simply be designed as a research 'tool', but also as a device which artists found interesting, meaningful and useful. By aiming to develop a 'chance-orientated interactive device' that could be used by sculptors or as a research tool, two sets of criteria needed to be considered, although, as indicated below, by no means were they mutually exclusive:

3.5 Criteria concerning the design of a methodological 'tool'.

The rigorous nature of research dictates that any methodological 'tool' satisfies the following criteria:

1. Validity: a 'C.O.I.D.' must relate to the subject under examination, therefore in the context of this research, any such 'device' must be relevant to 'sculpture', 'chance' and the 'creative process'.

2. Reliability: a 'C.O.I.D.' must work in a consistent and dependable manner. It must do what it is intended to do - introduce chance by a standardised method and provide comparable results.

3. Verifiability: the use of a 'C.O.I.D.' must be repeatable so that others (researchers) can use it and confirm its objectivity and ability to achieve results.

3.6 Criteria concerning the design of a 'chance-orientated interactive device'.

The desire to combine the design of a 'methodological tool' with an 'everyday functional device' required that the following criteria, concerning 'sculpture' and 'chance', be satisfied:

1. Objectivity: a 'C.O.I.D.' must be 'independent' of the person using it. One of the principle reasons for using chance in the context of this research is to temporarily override both internal and external influences which determine why one thing is selected rather than another. Internal influences acting upon an artist may be defined as factors relating to the self, and for example, may include:

the overall guiding concept\idea
previous creative output
personal taste and preference
personal skill or capability
personal history and experience
personal knowledge (including art history)
behavioural preconceptions (acceptable activity)

External influences acting upon an artist may be defined as factors relating to others, and for example, may include:

peer encouragement\discouragement
contemporary art scene
period\culture values or expectations
personal career success
contemporaries' career success
practical considerations (cost, time, etc)
circumstantial considerations (availability of specialist machinery etc)

Because of such factors, the human mind is very poor at consciously trying to make a random choice, therefore, what is known as an 'external randomizing mechanism' must be used - so called because the individual using it has no way of controlling or influencing the outcome. BRECHT (1966) lists several types of such 'mechanisms', including coins, dice, bowl dragging, and random number generators. What is of interest here however is not so much the specific method used, but the fact that before a dice can be thrown, or a coin tossed, there must be a list of alternatives to choose from.

2. Comprehensiveness: a 'C.O.I.D.' should include 'anything and everything'. If the artist compiles a list on their own, the items listed are obviously subject to personal preference and knowledge, in other words, the same subjectivity over which he/she may be trying to escape. The artist could not for example include something on the list which he/she does not know about! Taking this into consideration, difficult though it may be, a 'C.O.I.D.' must try to incorporate as many possible elements which could practically and theoretically relate to the development and production of sculpture. Such comprehensiveness would also contribute to the ideal of trying to ensure almost unlimited scope.

3. Universal application: theoretically anyone should be able to use such a 'C.O.I.D.'. The challenge is how to design a standardised method with which to introduce chance into 'anyone's' creative process? Although general theories of creativity indicate that all artists share many common factors within the creative process, the author recognises that over and above the common creative process, each individual artist has a unique creative process. Taking this into consideration, any 'C.O.I.D.' would therefore have to relate to many different processes and many different sculptors. Similarly, a 'C.O.I.D.' must be seen to stimulate all types of sculpture, not just 'object' based work, i.e. 'lens-based', 'time-based', 'site-specific', or 'installation', etc.

4. Flexibility: a 'C.O.I.D.' should allow for change. If it is to be used creatively then it should relate to the creative process in as natural a way as possible. Since change and indeterminacy are integral characteristics of creativity then a 'C.O.I.D.' should cater for such eventualities. A 'C.O.I.D.' should not dictate but provide a system which encourages the user to engage in and subsequently act upon 'chance'. Unlike specific chance techniques, the outcome of which may be predictable to a limited degree (e.g. drip-painting) a 'C.O.I.D.' should allow for an individual's free interpretation of the results. Rather than dictate, channel, or smother creativity, the purpose of a 'C.O.I.D.' is the very opposite, to encourage freedom and experiment in the studio by acting as a habit-breaker and stimulus to creative thought.

5. Randomness: the principle of chance should be evident in the design but not to the exclusion of all personal preference. Referring once again to the summary of Section B of the previous chapter, four distinct levels of receptivity to chance by artists were identified, ranging from complete avoidance to complete acceptance and all points in between. This suggested that there would be little point in designing a 'C.O.I.D.' which only offered random choice as this may discourage users, therefore, an option of personal choice should be incorporated into the design, thus catering for all levels of receptivity to chance.

As stated earlier, by no means are the two sets of criteria incompatible with each other. The five criteria detailed: objectivity, comprehensiveness, universal application, flexibility, and randomness, can be directly linked to the three criteria detailed previously: validity, reliability, and verifiableness.

The validity demanded by the 'methodological tool', that is, the relevance to the subject, is satisfied by the comprehensiveness, flexibility, and randomness demanded by the 'chance-orientated interactive device'. Similarly, the reliability and verifiableness demanded by the 'methodological tool' is satisfied by the universal application and objectivity demanded by the 'chance-orientated interactive device'.

3.7 Precedents for the design of a 'chance-orientated interactive device'.

From the literature review it was concluded that no evidence could be found of a single, universal, standardised system which could be used to introduce chance

specifically into the artistic creative process. Several instances were discovered however which hinted at possible developments. For example, in discussing degrees of randomness, BRECHT (1966) states that if an artist so desired, he/ she could use various random methods to:

> ". . . determine the field material (canvas, paper, etc), size and shape of the field, medium, colours, method of application of the medium (brush, drip, etc), components of the method (brush width, applicator dimensions, etc), and any other characteristics of interest."

Although the above process is concerned only with two dimensional imagery, it is obvious that a similar principle could be applied to three dimensional activity. The above description by Brecht supplies an ideal format for the design of a 'chance-orientated interactive device', that is, the breakdown of the creative process into increasingly specific choices.

GOLDBERG (1988) refers to the American dancer and choreographer Ann Halprin, who apparently used a system which involved 'putting everything on charts, where every possible anatomical combination of movement was put to paper and given numbers'. These were then presumably subjected to random selection. The reference to 'putting everything on charts' supplied the first visualization of a 'chance-orientated interactive device'.

A more relevant precursor to this research was a piece of work which the author made in 1984, entitled - '552 Words To Make Sculpture With' (see fig.35). It was intended to demonstrate the enormous variety of things which could be used to instigate the making of sculpture, and, although there was no suggestion that the contents be selected by chance, in retrospect it would now appear to be the original prototype for the design of a 'chance-orientated interactive device', especially in terms of type and range of contents, albeit a crude and simplistic version.

3.8 Re-cap on the role of a 'chance-orientated interactive device'.

In summary, the role of a 'chance-orientated interactive device' must satisfy two objectives:

a) it must be a methodological 'tool' - which can introduce chance into a person's creative process thereby allowing comparison between sculpture

552 WORDS TO MAKE SCULPTURE WITH by ALLAN WATSON OCTOBER 1984

Matter
Mass
Particle
Germ
Weather
Heat
Cold
Light
Shade
Shadow
Animal
Bone
Fur
Pelt
Feather
Cobweb
Fire
Spark
Flame
Ember
Freeze
Frost
Water
Oil
Shore
Beach
Splash
Cost
Rock
Alabaster
Slate
Cobbles
Iron
Steel
Rust
Chrome
Funnel
Mirror
Motor
Nylon
Perspex
Net
Plastic
Cable
Sheet
Whitewash
Calico
Epoxy-resin
Substance
Fuel
Felt
Candle
People
Speech
Tissue
Reach
Crowd
Rice
Flour
News
Magazine
Publication
Roof
Partition
Stage
Obstacle
Junk
Litter
Periscope

Rubbish
Bell
Pellet
Contour
Mark
Silhouette
Optical
Magnify
Film
Weight
Decay
Superficial
Impulse
Parliament
Movement
Spread
Push
Reflex
Patience
Dream
Carbon
Prism
Sky
Air
Space
Heaven
Sun
Ray
Gas
Helium
Oxygen
Smoke
Cloud
Steam
Vapour
Odour
Smell
Hell
Lightning
Humidity
Fog
Mist
Wind
Gale
Balloon
Ice
Rain
Stream
Bubble
Tap
Marble
Pebble
Boulder
Cement
Mineral
Nails
Tin
Pig Iron
Copper
Macadam
Glaze
Linen
Resin
Fabric
Lace
Thread
Polythene
Primer
Clothes

Putty
Costume
Soda
Bleach
Baize
Canvas
Hair
Language
Touch
Mask
Macaroni
Potato
Ketchup
Journal
Text
Corner
Channel
Tunnel
Platform
Pail
Razor
Computer
Package
Pulley
Tile
Geometry
Map
Stencil
Lens
Microscope
X-ray
Nonsense
Shake
Vibration
Order
Damage
Stain
Rage
Puzzle
Emotion
Colour
Mime
Earth
Land
Hill
Moor
Marsh
Mountain
Ground
Country
Desert
Garden
Grass
Moss
Ditch
Sand
Pavement
Soil
Turf
Grit
Road
Park
Place
Cave
Cliff
Liquid
Puddle
River
Fish

Trickle
Stone
Pit
Brick
Chalk
Fossil
Ore
Aluminium
Pipe
Magnet
Machine
Glue
Grease
Rope
Fibre
Rags
Crayon
Tinsel
Dye
Varnish
Stitching
Wax
Tar
Woman
Man
Spleen
Blood
Speak
Lard
Sauce
Cereal
Media
Page
Television
Room
Fence
Dam
Furniture
Kite
Mangle
Skip
Box
Sail
Graph
Degree
Sound
Quiet
Shape
Telephone
Hate
Ball
Chance
Labour
Perforated
Spin
Fusion
Mind
Memory
Sleep
Bitumen
Basalt
Grout
Landscape
Lawn
Grave
Mould
Clay
Compost
Peat

Mud
Subsoil
Ashes
Ceramics
Dirt
Outdoor
Night
Time
Dark
Dawn
Season
Dusk
Day-light
Breath
Vacuum
Nature
Ocean
Saliva
Surf
Fluid
Drought
Granite
Sandstone
Rubble
Concrete
Metal
Nuts & Bolts
Brass
Automobile
Diamond
Lacquer
Leather
Polystyrene
Sacking
Pitch
Plaster
Wire
Acetate
Chain
Enamel
Acid
Charcoal
Algae
Asbestos
Transparent
Catgut
Skeleton
Talk
Flesh
Range
Margarine
Vegetable
Custard
Radio
Banner
Print
Chimney
Pillar
Wall
Waste
Pedal
Bucket
Electric
Peg
Crack
Outline
Mural
Noise
Reflection

Shout
Telescope
Mess
Solid
Gesture
Rend
Motion
Frequency
Squeeze
Insanity
Me
Texture
Crust
Bollards
Chaos
Wood
Fruit
Plants
Timber
Sticks
Leaves
Root
Twig
Bark
Forest
Branch
Log
Plank
Post
Splinter
Hedge
Bush
Pulp
Stake
Board
Fungus
Pole
Spar
Raft
Sea
Tidal
Irrigate
Canal
Graphite
Agate
Powder
Dust
Girder
Rivet
Bronze
Tube
Gold
Glass
Material
Jute
Paper
Tape
Scrim
Plasticine
Wool
Polish
Bandage
Elastic
Mesh
Straps
Vaseline
Flux
Cigarettes
Skin

Distance
Laugh
Span
Meat
Barley
Corn
Manifesto
Pamphlet
Poetry
Passage
Ceiling
Dyke
Jar
Container
Rail
Piano
Torch
Bottle
Crate
Line
Sharp
Hum
Rattle
Silence
Applause
Ruin
Sphere
Narrative
Raw
Spiral
Spray
Press
Option
Madness
Torture
Dentures
Blanket
Alcohol
Plywood
Acorn
Balsa
Cane
Cork
Bamboo
Nut
Pampas
Hemp
Trellis
Pile
Straw
Sponge
Snow
Silt
Shale
Petrol
Paraffin
Salt
Paint
Varnish
Foam
Chemicals
Iceberg
Shell
Wave
Sink
Dew
Quarry
Air-brick
Slab

Coal
Lead
Spring
Forge
Can
Silver
Laser
Hessian
Rubber
Paste
Cloth
Denim
Slime
Soap
Card
String
Foil
Patches
Garment
White
Clothes
Crystal
Girls
Taste
Queue
Walk
Jelly
Bread
Pasta
Mail
Word
Gadget
Floor
Step
Gate
Packet
Wheel
Pin
Radar
Bomb
Plate
Ball
Measure
Transfer
Whistle
Music
Echo
Cassette
Scratch
Suction
Illusion
Mutant
Speed
Friction
Suspend
Logic
Pain
Concept
Corrosive
Projectile
Starch
Micro
Porn
Perform
Copier
Hi-fi
Temp.
Photos
Aerosol

Fig.35

that has been produced by 'preferred' decision-making procedures, and sculpture that has been produced by 'chance-effected' decision-making procedures.

b) it must be chance-orientated - which uses the principle of chance to encourage users to consider elements, or combinations of elements, theoretically relating to the production of sculpture, which the user may have previously ignored or been unaware of. The device aims to stimulate sculptural creativity by acting as a 'habit-breaker' and an 'eye-opener'.

Although no evidence could be found of a previous standardised system, several sources hinted at the possible format of such a device, for example, Brecht provided a clue as to how the contents might be structured, Halprin provided a clue as to what such a device might look like, whilst an earlier piece of work by the author provided a clue as to the type and variety of contents that such a device might contain.

3.9 Author's role in the methodology.

The author's role in the methodology falls into two main categories, firstly, 'author as participating subject' in which the author's personal creative process is subjected to self-analysis and, secondly, 'author as participant observer' in which the author records and documents the effect of chance, as introduced by a 'C.O.I.D.', on other participants. Whilst the participation of the author in experiments is obviously subjective, the role of other participants is intended to provide more than one perspective and therefore produce a more balanced and accurate view of the topic.

3.10 Introduction to experimental stages.

In order to design a 'C.O.I.D.', an analysis of a sculptor's creative process was required; therefore, making use of the informed perspective of the author, a self-analysis took place. Although this could be seen to be too subjective, the reason that the author was preferred for this role rather than another sculptor was the fact that the author's thoughts and reasons were more readily accessible than those of someone else. Analysis occurred over a period of time and involved active experiment and reflection on process and product. The

author's previous experience of using chance in the process of making sculpture had been limited to 'undeliberate' chance, that is, the natural occurrence of unexpected events (see appendix 1.1). Obviously the use of such sporadic and intermittent techniques provided by 'undeliberate' chance were not rigorous enough in terms of research, which called for a more methodical and methodologically sound approach, therefore a transitional period of time elapsed early into the research when the author gradually became acquainted with and tentatively explored a new type of chance: 'deliberate' chance.

3.11 Stage 1 - Self analysis.

During this period the author's creative process was subjected to self-analysis in an attempt to answer the question - what is the nature of the process intrinsic to making sculpture? One of the conclusions reached was the somewhat obvious fact that sculpture involved both mental and physical activities, which nevertheless still need to be defined:

Mental activities are any thoughts concerned with the production of sculpture, and may be directed towards elements ranging from concepts and ideas to practical considerations such as scale or material.

Physical activities are any attempt to transfer such thought, as produced by mental activities, into tangible or visible existence, and may range from two dimensional representation requiring only a few seconds in execution, to three dimensional representation requiring an indeterminate period of time to complete.

The relationship between mental and physical activities may be described as one of dynamic interchange in which both activities act upon and influence one another. Action is directed by thought which in turn may be directed or altered by action. This dynamic interchange is particularly true in the field of sculpture because of the handling and manipulation of materials.

3.12 Decision-making.

A further conclusion of self-analysis was the importance of the decision making process that necessarily occurs within the creative process, regarding both

ideas and physical entities. Throughout the creative process mental activity results in a number of possibilities, which, when subjected to deliberation, may or may not come into existence. Following this decision stage further selection from a number of physical possibilities must take place in order to determine the concrete form of the sculpture. A decision 'for' is also a decision 'against': of the many ideas which are judged worthy of physical existence many are not; similarly, the physical manifestation, the piece of sculpture, is but one permutation of many possibilities.

Assuming that the creation of a piece of sculpture can be represented by a sequence of decisions it follows that each of these decisions could theoretically be determined by chance, therefore the next question which had to be answered was - whilst making sculpture, what concerns demand decisions?

3.13 Starting points.

One must first of all make decisions about ideas, however, it is obviously impossible to randomize what is going on in another person's mind. As stated in Section A of the literature review, 'a person does not suddenly and inexplicably discover that they have made a piece of sculpture', similarly, an idea does not generally spring from nowhere. Rather, it is the product of an artist's experience and thought, which has been activated by something which has entered into his conscious or unconscious mind: in other words, there must be a 'starting point'. A starting point can be anything at all, but for example, may be determined by an individual's personal interests and experiences, or through political, social, or aesthetic motivation, etc. Obviously a person does not just have one starting point, rather, it is the influence upon, and synthesis with, other starting points which leads to new ideas. Within the context of this research, such 'starting points' will be referred to as 'elements of consideration' which is understood to mean anything which a sculptor may take into consideration whilst deliberating over the making of a piece of work. As was stated earlier, one cannot randomize another individual's thought processes; however, one can randomize the raw information which an individual may think about - by supplying that individual's conscious mind with random 'elements of consideration'.

3.14 Stage 2 - Preliminary design of a 'chance-orientated interactive device'.

The first step in the design of a 'C.O.I.D.' was an attempt to answer the following question - during the physical activities involved in making a piece of sculpture, with what are decisions concerned? (assuming that an idea already exists). This question resulted in a further six questions:

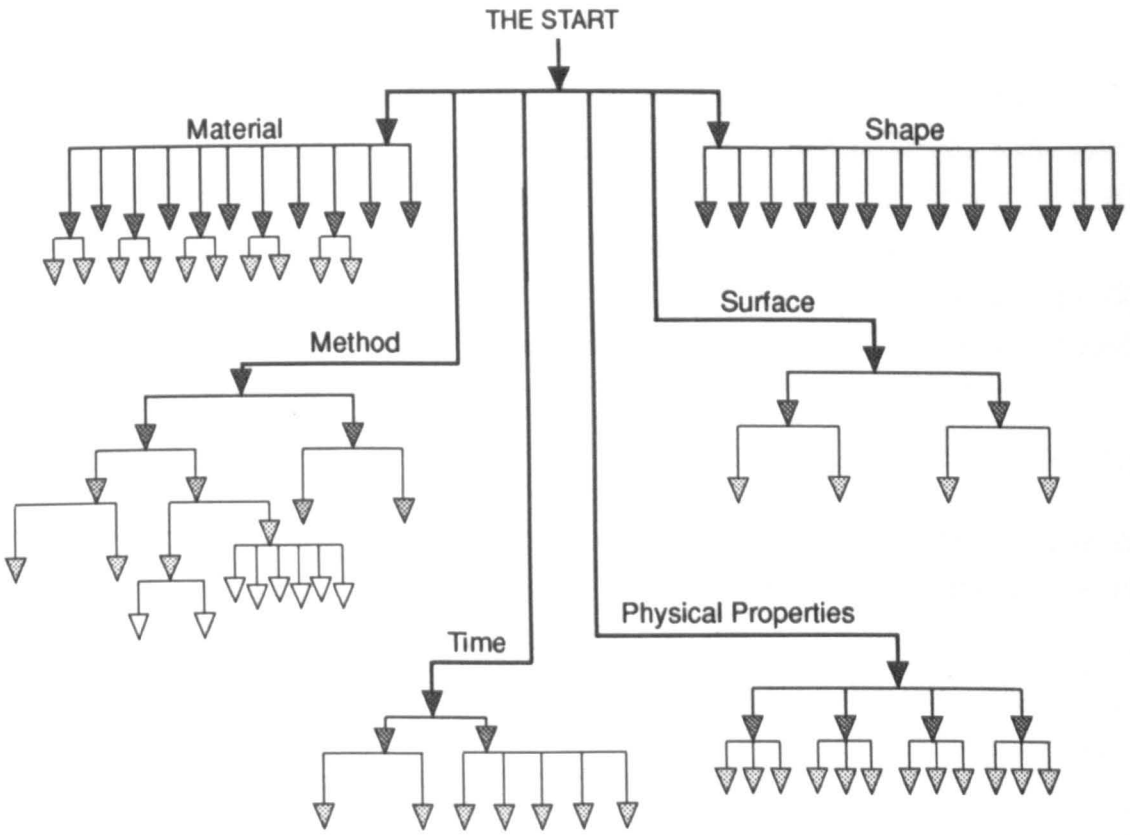
Question 1: Of what material is it to be made?
Question 2: How is it to be made?
Question 3: How much time is there to make it or how long will it last?
Question 4: What size is it to be?
Question 5: What will its surface look like?
Question 6: What shape is it going to be?

These six questions resulted in the creation of the following six categories: MATERIAL; METHOD; TIME; PHYSICAL PROPERTIES; SURFACE; and SHAPE. The general content of each of these categories is listed below:

MATERIAL: elements relating to materials.
METHOD: elements relating to techniques and tools.
TIME: elements relating to time periods (how long to make, etc).
PHYSICAL PROPERTIES: elements relating to size, quantity, etc.
SURFACE: elements relating to colour, texture, etc.
SHAPE: elements relating to shape, form etc.

The validity of these categories was tested out on practicing sculptors, sculpture students, and also more 'objective' persons (having little or no knowledge of sculpture); although the categories were regarded as acceptable to start with, by no means were they considered to be comprehensive. (Throughout the development of the 'C.O.I.D.', the taxonomy has required much thought, however, at this early stage the above six categories and their contents were judged suitably relevant as a point for departure. The philosophy and development of the taxonomy is discussed later in greater detail.)

Each of these six basic categories were then subjected to a similar type of analytical questioning, which resulted in each category being divided into sub-categories, which were subsequently divided again. This process of splitting each category into increasingly specific levels of information produced a 'tree' type structure which is represented in fig.36.



▼ A triangle indicates a decision-point at which two or more alternatives are offered. All decision-points may be selected either by choice, or chance.

Fig.36 Structure of 'flowcharts'

This information was subsequently arranged into a series of large flowcharts (approx. 60" x 24") in which all options were listed and all decision points were clearly marked. Each 'decision point' offered the user three possible ways to make a decision: firstly, by personal choice - a preferred option is selected; secondly, by chance - an option is selected randomly; or thirdly, to decide by chance whether to make a random or personal choice. This third option was included as it was seen as a way of randomizing the entire process even further. The flowcharts also included lists of the various combinations that were possible from the options that were offered. These were originally created to aid random selection, however, they also demonstrate the great variety of combinations which may be generated. As stated earlier, the flowcharts were on a rather large scale, however, for the purpose of this document they have been compressed into an A4 format (see appendix 3.1), whilst a sample is reproduced in fig.37.

The following sections not only present the results of each experiment, but also an immediate analysis of those results, as the conclusions from one experiment determined the format and development of future stages.

3.15 Experiment 'A'.

A total of 12 participants were invited to test the design of the flowcharts. The participating subjects, both male and female, were all connected with the sculpture department of the sponsoring establishment, and between them, covered a wide range of sculptural experience, styles, status, and age. The tests were undertaken in a controlled manner, throughout which the author adopted an observational role, documenting the user's random and personal choices and assisting in the practical mechanics of making a random choice (making use of a number of devices such as coins, dice, and a random number generator of a computer). Special care was taken by the author neither to encourage 'random choice' nor discourage 'personal choice' in order not to influence the participants' behaviour. The results from these tests are presented in tables 1-4, which display the status of each participant, along with a variety of information relating to what they selected and whether such decisions were personal or random.

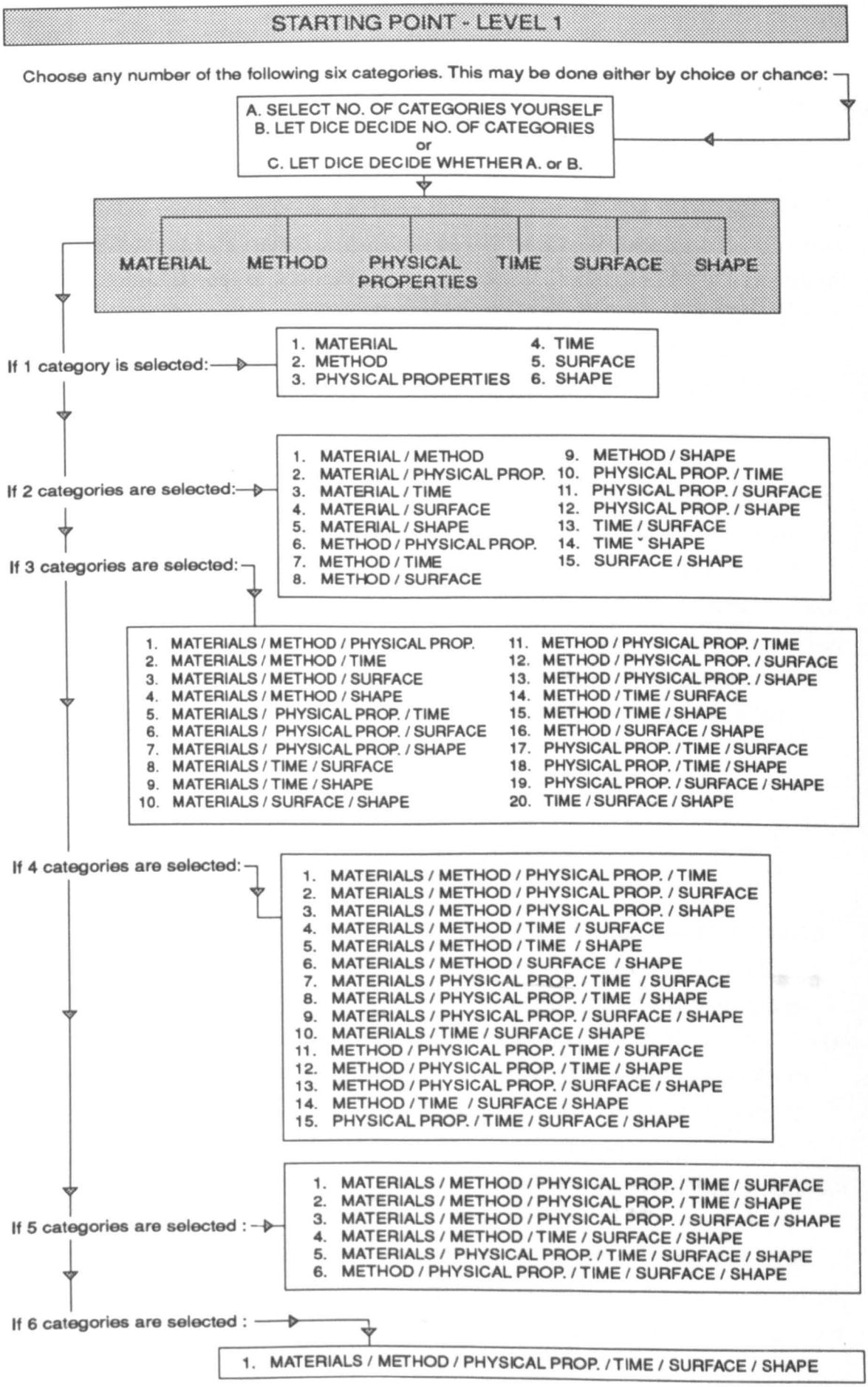


Fig.37 Sample of 'flowcharts'

3.16 Table 1 - General results.

Table 1 presents general information produced by Experiment 'A'. For example, it can be seen that the highest number of decisions made by an individual participant is 26, whilst the lowest number is 10. Similarly, the greatest number of elements of consideration is 25 whilst the least is four. The figures at the bottom right-hand side reveal that a total of 143 personal decisions were made whilst the total number of random decisions was 81, indicating 63.9% personal choice and 36.1% random choice. The most popular category, MATERIAL was used by eight participants, whilst TIME, PHYSICAL PROPERTIES, and SURFACE were used by seven, METHOD was used by five, and SHAPE only by three.

Examining the selected 'elements of consideration', the flowcharts produced a wide range of results - both 'usual' and 'unusual', for example, in the category TIME, selections include '6 days', '12 weeks', and '6 hours', time elements which may be considered 'usual' in the production of sculpture, however, TIME also produced selections such as '32 seconds' and '6 million hours', which may be considered 'unusual', however, perhaps unexpectedly, these 'unusual' selections were not entirely due to random choice, and similarly, the 'usual' selections were not entirely due to personal choice.

3.17 Table 2 - Results in order of experience of participants.

Table 2 examines whether any difference occurred between the experienced (five practising sculptors) and less experienced participants (seven sculpture students). The results are displayed in order of experience, however, it was concluded that the data did not reveal any measurable difference in how the two groups used the flowcharts, for example; - sculptors averaged 35% random choice whilst students averaged 34.3%; sculptors averaged 18.8 decisions whilst students averaged 18.6; sculptors averaged 10.2 elements of consideration whilst students averaged 10.7. The lowest percentage of random choice by a sculptor was 0%, and by a student also 0%, whilst the highest percentage of random choice by a sculptor was 71% and by a student 62%. These figures would seem to indicate that experience did not seem to have an effect on the participants' use of the flowcharts; satisfying one of the criteria for the design of such a 'chance-orientated interactive device', namely, that anyone could use it.

Table 1. Experiment 'A' - General results.

General results (participants in alphabetical order)										
PARTICIPANT	MATERIAL	METHOD	PHYSICAL PROPERTIES	TIME	SURFACE	SHAPE	No. of decisions in total	No. of personal decisions	No. of random decisions	No. of elements of consideration
A1 - 4th Year Student	Shellac Ice Cubes Saliva Snow Fungus Moss Mould Tuber Newsprint Tissue	No selection	No selection	6 Days	Gnarled Wrinkled Course Slippery	No selection	15	10	5	15
A2 - Sculptor	Wax Willow Paraffin Pig-iron	Construction hand - Binding	23 Feet Length	No selection	Natural Colour Natural Texture	No selection	21	15	6	11
A3 - Sculptor	Plywood Felt Water Bamboo Powder Zinc Celluloid	No selection	Volume 7 cubic inches	Object Life span 7 seconds	Bland Ridged Wrinkled Greasy Gelatinous Rough Crinkled Yellow Orange Red Scarlet Sienna Silver Blue	No selection	22	10	12	25
A4 - 3rd Year Student	No selection	No selection	Breadth - 4743 km Weight - 4 kg Volume 7.19 mm Surface Area 14 m2	No selection	No selection	No selection	17	10	7	4
A5 - 3rd Year Student	No selection	No selection	41 Kilogrammes 74 cubic mm 1 square foot	Construction time - 60 seconds Object life span - 6 million hours	No selection	No selection	21	8	13	5
A6 - 2nd Year Student	Molasses Fabric Polystyrene	No selection	No selection	6 hours	Natural Texture Yellow Orange Sienna	No selection	17	11	6	8
A7 - Sculptor	Acid Stubble Tracing paper	No selection	No selection	Construction time - 31 days Object life span - 9 days	Natural Colour Natural Texture	No selection	17	5	12	7
A8 - 2nd Year Student	Resin Margarine Pitch Tissue Tin-Foil Metal Fibre-glass Latex Glass Perspex	Interlock Solder Fuse Mushroom Inflate Boost Hammers Tinsnips Brush	No selection	No selection	No selection	Massive Enormous Mighty Immense Grandoise Stupendous	15	15	0	25
A9 - Sculptor	No selection	Surform	31 cubic metres	Construction time - 32 seconds Object life span - 18 weeks	No selection	Recumbant Scrawny Brobdingnagion	24	19	5	7
A10 - Sculptor	Softwood	Construction tool (power)	16 cubic metres	No selection	No selection	Littleness Largeness	10	10	0	6
A11 - 3rd Year Student	No selection.	Construction hand tool Saw	Breadth - 20cm Height - 45m	No selection	Applied Texture	No selection	19	11	8	5
A12 - 4th Year Student	Plants Seaweed Alabaster Chalk Silt Syrup Icicles Fat Putty Slime Mold	No selection	No selection	12 weeks	Polished Irregular	No selection	26	19	7	14
No. of times category selected	8	5	7	7	7	3	224	143	81	132

Table 2. Experiment 'A' - Results in order of experience.

Results in order of experience										
PARTICIPANT	MATERIAL	METHOD	PHYSICAL PROPERTIES	TIME	SURFACE	SHAPE	No. of decisions in total	No. of personal decisions	No. of random decisions	Random Choice as %
A2 - Sculptor	Wax Willow Paraffin Pig-iron	Construction hand - Binding	23 Feet Length	No selection	Natural Colour Natural Texture	No selection	21	15	6	29%
A3 - Sculptor	Plywood Felt Water Bamboo Powder Zinc Celluloid	No selection	Volume 7 cubic inches	Object Life span 7 seconds	Bland Ridged Wrinkled Greasy Gelatinous Rough Crinkled Yellow Orange Red Scarlet Sienna Silver Blue	No selection	22	10	12	54%
A7 - Sculptor	Acid Stubble Tracing paper	No selection	No selection	Construction time - 31 days Object life span - 9 days	Natural Colour Natural Texture	No selection	17	5	12	71%
A10-Sculptor	Softwood	Construction tool (power)	16 cubic metres	No selection	No selection	Littleness Largeness	10	10	0	0%
A9 - Sculptor	No selection	Surform	31 cubic metres	Construction time - 32 seconds Object life span - 18 weeks	No selection	Recumbant Scrawny Brobdingnagion	24	19	5	21%
A1 - 4th Year Student	Shellac Ice Cubes Saliva Snow Fungus Moss Mould Tuber Newsprint Tissue	No selection	No selection	6 Days	Gnarled Wrinkled Course Slippery	No selection	15	10	5	33%
A12-4th Year Student	Plants Seaweed Alabaster Chalk Silt Syrup Icicles Fat Putty Slime Mold	No selection	No selection	12 weeks	Polished Irregular	No selection	26	19	7	27%
A5 - 3rd Year Student	No selection	No selection	41 Kilogrammes 74 cubic mm 1 square foot	Construction time - 60 seconds Object life span - 6 million hours	No selection	No selection	21	8	13	62%
A11-3rd Year Student	No selection.	Construction hand tool Saw	Breadth - 20cm Height - 45m	No selection	Applied Texture	No selection	19	11	8	42%
A4 - 3rd Year Student	No selection	No selection	Breadth - 4743 km Weight - 4 kg Volume 7.19 mm Surface Area 14 m2	No selection	No selection	No selection	17	10	7	41%
A6-2nd Year Student	Molasses Fabric Polystyrene	No selection	No selection	6 hours	Natural Texture Yellow Orange Sienna	No selection	17	11	6	35%
A8-2nd Year Student	Resin Margarine Pitch Tissue Tin-Foil Metal Fibre-glass Latex Glass Perspex	Interlock Solder Fuse Mushroom Inflate Boost Hammers Tinsnips Brush	No selection	No selection	No selection	Massive Enormous Mighty Immense Grandoise Stupendous	15	15	0	0%

3.18 Table 3 - Results examining category selection.

Table 3 examines how the six categories were selected in order to identify any characteristic trends. Out of a possible six categories, the average number of categories chosen was three. The table shows whether the number and type of categories selected were a result of personal choice (P) or random choice [R], revealing that categories were either selected or rejected in one of five ways;

BLUE - number and type of categories selected entirely by personal choice;
RED - number and type of categories rejected entirely by personal choice;
GREEN - number of categories selected by random choice. Type of categories selected by personal choice;
ORANGE - number of categories selected by personal choice. Type of categories selected by random choice;
PINK - number and type of categories rejected as a consequence of random choice.

10 of the 12 participants selected the number of categories by personal choice (either 2, 3, or 4) whilst six of those 10 proceeded to select the type of category by personal choice as well. Two participants chose the number of categories by chance, and selected the type of category by personal choice whilst one participant selected the type of category using both random and personal selection. Only three participants allowed random choice to select the type of category, although they had all chosen the number of categories personally. No participant chose both number and type by random choice. 75% of participants selected either 3 or 4 categories, no participant selected from 5 or all 6 categories. 50% selected both number and type of category entirely by personal choice; 70% selected type of category by choice, whilst only 13.5% selected the number of categories by chance. In the early stages it would appear that participants had a clear idea as to the number and type of categories they wanted selections from.

Table 3. Experiment 'A' - Results examining category selection.

Participant	How categories were selected (R or P)		Results examining category selection								
	Number	Type	MATERIAL	METHOD	PHYSICAL PROPERTIES	TIME	SURFACE	SHAPE	No. of random decisions	No. of personal decisions	Random Choice as %
A3	4 (P)	4 (P)							12	10	54%
A10	4 (P)	4 (P)							0	10	0%
A6	3 (P)	3 (P)							6	11	35%
A12	3 (P)	3 (P)							7	19	27%
A8	3 (P)	3 (P)							0	15	0%
A5	2 (P)	2 (P)							13	8	62%
A4	1 [R]	1 (P)							7	10	41%
A9	4 [R]	4 (P)							5	19	21%
A1	3 (P)	2 (P) 1 [R]							5	10	33%
A7	3 (P)	3 [R]							12	5	71%
A11	3 (P)	3 [R]							8	11	42%
A2	4 (P)	4 [R]							6	15	29%

Selected by personal choice | Selected by personal/random choice | Selected by random\personal choice | Rejected by personal choice | Rejected due to random choice

Original in colour

3.19 Table 4 - Results in order of greatest degree of randomness.

Table 4 examines participants selection procedures within each category and reveals that although two participants selected all options entirely by personal choice, no participant surrendered completely to random choice. Only three participants made more random than personal choices, the highest ratio being 71% random/29% personal. Out of the 37 times that decisions within categories took place, randomness completely determined the selections only three times (represented by RED); personal decisions completely determined the selections 13 times (represented by BLUE); whilst a combination of both random and personal determined the selections a total of 21 times (BLUE/RED).

3.20 Conclusions of Experiment 'A'.

Although it is recognised that the above sample is too small to draw conclusions concerning the effects of chance on the creative process (no sculpture was actually made), the above information, along with participants' reaction to using the flowcharts enabled an assessment of the preliminary design of this 'chance-orientated interactive device'. The 12 participants generated a wide range of results: the most number of decisions made was 26, whilst the least was 10; the most number of 'elements of consideration' selected was 25, the least was four; 63.9% of decisions were personal, 36.1% were random, indicating a 2:1 ratio in favour of personal choice. The most popular category was MATERIAL, being used by eight participants, the least popular was SHAPE, being used by three participants, similarly, the most number of categories used by any one person was four, while the least number of categories used was one. These results suggest that participants were wary of making selections from too many categories, which, since an aim of the 'C.O.I.D.' is not to make users feel that they must make a selection from every category available seems to be a favourable design factor. Similarly, as stated before, the type of 'elements of consideration' that were selected ranged from those which may be considered 'usual', to those that may be considered 'unusual'. There was no apparent difference between how 'experienced' persons used the flowcharts, i.e. sculptors, and how 'inexperienced' persons used the flowcharts, i.e. sculpture students, indicating that anyone could use them. The flowcharts would appear to have gone some way in satisfying two of the original criteria for the design of a 'C.O.I.D.', namely, universal application and randomness, however, the flowcharts could not be said to satisfy the remaining three criteria, namely, objectivity, flexibility nor comprehensiveness.

Table 4. Experiment 'A' - Results in order of degree of randomness.

Results in order of degree of randomness									
Participant	MATERIAL	METHOD	PHYSICAL PROPERTIES	TIME	SURFACE	SHAPE	No. of random decisions	No. of personal decisions	Random Choice as %
A7	Acid Stubble Tracing paper			Construction time - 31 days Object life span - 9 days	Natural Colour Natural Texture		12	5	71%
A5			41 Kilogrammes 74 cubic mm 1 square foot	Construction time - 60 seconds Object life span - 6 million hours			13	8	62%
A3	Plywood Felt Water Bamboo Powder Zinc Celluloid		Volume 7 cubic inches	Object Life span 7 seconds	Bland Ridged Wrinkled Greasy Gelatinous Rough Crinkled Yellow Orange Red Scarlet Sienna Silver Blue		12	10	54%
A11		Construction hand tool Saw	Breadth - 20cm Height - 45m		Applied Texture		8	11	42%
A4			Breadth - 4743 km Weight - 4 kg Volume 7.19 mm Surface Area 14 m2				7	10	41%
A6	Molasses Fabric Polystyrene			6 hours	Natural Texture Yellow Orange Sienna		6	11	35%
A1	Shellac Ice Cubes Saliva Snow Fungus Moss Mould Tuber Newsprint Tissue			6 Days	Gnarled Wrinkled Course Slippery		5	10	33%
A2	Wax Willow Paraffin Pig-iron	Construction hand - Binding	23 Feet Length		Natural Colour Natural Texture		6	15	29%
A12	Plants Seaweed Alabaster Chalk Silt Syrup Icicles Fat Putty Slime Mold			12 weeks	Polished Irregular		7	19	27%
A9		Surform	31 cubic metres	Construction time - 32 seconds Object life span - 18 weeks		Recumbant Scrawny Brobdingnagion	5	19	21%
A10	Softwood	Construction tool (power)	16 cubic metres			Littleness Largeness	0	10	0%
A8	Resin Margarine Pitch Tissue Tin-Foil Metal Fibre-glass Latex Glass Perspex	Interlock Solder Fuse Mushroom Inflate Boost Hammers Tinsnips Brush				Massive Enormous Mighty Immense Grandoise Stupendous	0	15	0%

PERSONAL CHOICE RANDOM CHOICE

Original in colour.

In general terms the flowcharts functioned as intended: participants made use of all categories; random and personal selections were both used to varying degrees; and each participant received a unique combination of elements of consideration which, theoretically could be used as a starting point for a piece of sculpture (the participants were not required to make a piece of sculpture, however, a number of them reported that for several weeks after the experiment they found themselves thinking quite a lot about their 'selections'). The above results indicated that the basic concept of the 'C.O.I.D.' - the breakdown of the creative process into categories and sub-categories - was successful, however, observation by the author of participants using the flowcharts and feedback from participants themselves served to highlight three critical problems within the flowchart, namely, structure, content and format.

1. Structure - the layout of information in such a linear and sequential structure was excessively dictatorial. The pyramidical nature of the design (see page 116) meant that entry into the flowcharts was possible from only one point whilst the subsequent information stored within any one category was unrelated to that stored in another. The future development of the 'C.O.I.D.' should seek to interrelate all categories and information. The isolation and mapping of decision points, forcing the user to deliberate over every decision, was unrelated to the normal creative process; a developed 'C.O.I.D.' should aim to incorporate decision points in a more natural and unobtrusive way, for example, by assuming that users will know when they have to make a decision rather than the 'C.O.I.D.' repeatedly telling them to.

2. Content - the type of information received at an early level was too precise, neither allowing individual interpretation, nor taking into account practical considerations, e.g. in only the 3rd level of 'MATERIAL', one participant received the following selections - 'Wax', 'Willow', 'Paraffin', and 'Pig-iron' - obviously very specific selections. Generally the classification was unsatisfactory, e.g. confusion between 'Liquid' and 'Fluid', and the inclusion of 'Non-substance' in 'MATERIAL'; a more universal and comprehensive approach was required. The development of the 'C.O.I.D.' should aim to increase information which may be described as 'general' (allowing for wide interpretation and therefore more practical application) as well as including information which may be described as 'specific' (allowing for narrow interpretation therefore tending more towards conceptual application).

3. Format - the flowcharts were impractical to use due to their large size and the fact that in order to receive a random choice, some type of mechanism had to be employed (coins, dice, etc,), a process which was time-consuming and distracting and may have been regarded by some participants as a deterrent to making further random choices. It was concluded that the future 'C.O.I.D.' design should incorporate a built-in random choice facility which would require little or no effort to employ. The flowcharts were not self-explanatory and participants required the authors' assistance to use them. A main consideration in the design of a second 'C.O.I.D.' should be that the format is self-contained and its use is self-evident.

3.21 Stage 3 - Accumulation of information.

Taking into consideration the above conclusions the development of a second 'chance-orientated interactive device' commenced. Activity was focused in two main areas, firstly, the search for a suitable format in which to accommodate the 'C.O.I.D.', and secondly, the accumulation and classification of information.

3.22 Format.

The main consideration in the search for a suitable format centred around the desire to structure the information in a 'molecular' fashion as opposed to the 'linear' fashion of the flowcharts (the term molecular was used to convey the image of a non-hierarchic structure in which all parts are interrelated and equally viable). Ideally, entry into such a system should be possible from many points rather than just one and all categories and sub-categories should be related to one another. The search focused upon some form of computer based system, due to the fact that, not only does such technology have the capacity to store large amounts of information (by now an obvious prerequisite of a 'C.O.I.D.'), but such technology also offers random generating facilities, an obvious attraction.

3.23 Classification.

The information gained by the author through observation of, and discussion with, the participants in Experiment 'A' led to a renewed definition of the six categories which the flowcharts had contained, as well the introduction of three

new categories. METHOD and TIME remained the same, however, MATERIAL became known as SUBSTANCE as it was felt that the term 'material' might convey the impression that this category only contained those materials most readily associated with sculpture, i.e metal, stone, wood, etc. The term 'substance' was chosen as it seemed to suggest a more universal collection, i.e. 'all substances known to man'. PHYSICAL PROPERTIES became known as QUANTITY because it was realised that this category should contain references to any measurable entity, which for example, may include 'power', or 'sound', or, 'electrical current'; elements which are obviously not 'physical properties'. Two of the original categories, SURFACE and SHAPE were considered biased towards only encouraging formal, 'object based' sculpture, therefore they were incorporated into a new category to be known as QUALITY. Whereas elements within QUANTITY may be described as 'fixed entities', the category QUALITY was created to contain elements which were 'unfixed entities' i.e. dependent upon personal interpretation. The three new categories were: PLACE - obviously sculpture must be made somewhere, and put somewhere, this category was perhaps the most obvious omission from the flowcharts; SENSES - was created to ensure that all types of sculpture were seen to be encouraged. A major criticism of the original six categories was that they seemed to be preoccupied with formal concerns, the inclusion of a category dealing with the senses, ensured that 'less traditional' sculpture was also encouraged as such a category would include elements which related to sound and image manipulation, etc; MIND - whilst most of the categories may be said to concern themselves with the 'external world', that is, objective reality, this category was created to include elements relating to the complex 'internal world', that is, subjective feelings. This category would include not only personal emotions, but also religious, political ideas, etc. These eight categories may be briefly summarised as follows:

SUBSTANCE - types and condition of material.
METHOD - ways to manipulate substance.
TIME - length of time or actual time.
PLACE - where to make or where to put.
QUANTITY - numbers, sizes, measurements, etc.
QUALITY - descriptive characteristics.
SENSES - sight, sound, touch, taste, smell.
MIND - emotions, concepts, etc.

It was considered that these eight categories, although by no means definitive (a goal perhaps unattainable due to the extreme range of process and products to be found within contemporary sculpture), provided adequate scope to contain a truly wide variety of information theoretically relating to sculpture and were therefore used as the basis for the design of a second 'chance-orientated interactive device'. A considerable period of time was spent accumulating information regarding each category, however, whereas the information contained within the flowcharts had been gathered in a rather haphazard manner, the task was now approached in a methodical and thorough way. This involved the extraction of information from objective sources such as encyclopaedias, thesauri, almanacs, and other specialist reference books in an attempt to discover universal or standardized methods of classification. In contrast to the flowchart design, no attempt was made to structure the information in any way but was simply stored and classified in a loose-leaf (A4) binder whilst awaiting a suitable format.

3.24 Stage 4 - Testing the idea of a 'chance-orientated interactive device'.

Whilst the accumulation of information and the search for a suitable format continued, three controlled experiments were undertaken. Rather than test the design of the 'chance-orientated interactive device' (i.e. the flowcharts or 'loose-leaf' binder), these experiments were primarily concerned with testing the concept of such a device, that is, the idea of using an external randomizing mechanism to introduce chance elements of consideration into the decision making process inherent in creativity and to evaluate the results of this.

The first of these controlled experiments (hereafter referred to as Experiment 'B'), involved the author as participating subject, whilst the general public adopted the role of the 'C.O.I.D.' as a form of 'external randomizing mechanism'. The second experiment (hereafter referred to as Experiment 'C'), also involved the author as participating subject, however on this occasion the 'C.O.I.D.' was represented by the information which had been accumulated to date, and which was contained in the loose-leaf (A4) format. The third experiment (hereafter referred to as Experiment 'D'), involved a group of 5 secondary school pupils (with the author adopting an observational role) and in which the 'C.O.I.D.' was again represented by the collection of information contained within the loose-leaf (A4) format, as in the previous experiment. All three experiments were designed to produce two distinct types of sculpture:

'choice products' - produced during a 'control period' in which personal and preferred decision making procedures operate; and 'chance products' - produced during an 'experimental period' in which chance-effected decision making procedures operate. There now follows a summary and evaluation of each experiment.

3.25 Experiment 'B'.

The aim of this experiment was for the author to produce two distinct bodies of work - one as a result of preferred decision making procedures, the other as a result of chance effected decision making procedures - and to record and document the resulting processes and products for future analysis.

The project was undertaken out of doors, the nature of the area (a public space in the grounds of an arts centre), combined with financial limitations dictating the materials that were used - twigs and branches. Two days were spent gathering the material along with identification of a suitable site. The experiment was divided into two periods, a 'control period' and an 'experimental period', each consisting of two working days duration (approximately twelve hours each day). Selecting from the accumulated material and taking into consideration the time scale, during the 'control period' the author proceeded to produce sculpture under what were considered to be natural creative circumstances, making decisions based upon personal preference, taste and ideas. Due to the public nature of the event, a great deal of pressure was felt by the author, not to simply carry out the experiment, but to produce sculpture which the author was willing to put his name too, and which was therefore visually exciting. The sculpture produced during this 'control period' was subject to strict documentation, as the need to commence the second period with identical materials determined that these sculptures had to be recycled.

The elements under consideration at the commencement of the second period were as close to the first as possible. In this 'experimental period' however, instead of relying upon purely personal selection, the author offered alternative options to the passing public and their subsequent choices were acted upon. In this way the public adopted the role of an 'interactive device', acting as a randomizing tool (the 'C.O.I.D.' was not used in this experiment because no suitable version existed at that time - the flowcharts were obviously impractical to use out of doors). It should be stressed that the role of the public was an

indirect one in that they only selected from a given number of alternatives, for example:

> "Do I use all the material in front of me (around 300 twigs\branches) or just some?"
>
> "Do I use only curved twigs or only straight twigs or a combination of both?"

Many of the alternative selections that were offered had originated during the 'control period' but had at the time been dismissed by the author for various reasons: for example, during the first two days a conscious decision was made in favour of several small pieces rather than one large piece. This was a deliberate decision based on the assumption that by making several pieces at least one of them might turn out to be acceptable.

The experiment yielded a significant amount of both objective and subjective information for analysis:

a) visual documentation of the resulting sculpture - either 'choice' or 'chance' products: (colour slides/colour photocopies)

b) audio and written documentation of the author's thoughts and ideas during the process along with reasons for selecting one alternative rather than another. (A full transcript of all recorded statements made throughout this experiment is included as appendix 3.2).

c) interaction and feedback from public participants.

3.26 Results of Experiment 'B'.

The experiment yielded two types of sculpture: that which had been produced during the first two may be categorised as 'choice products' because it had been produced by personal decision-making procedures, whilst sculpture produced during the latter two days may be categorised as 'chance products' because part of the decision making process had been effected by chance. The two types of sculpture (figs.38 - 45) can be compared to see if there is any measurable or significant difference. The characteristics of each group are presented in Table 5.

These lists, along with the photographic documentation (figs.38 - 45), suggest that a significant difference occurred between the two periods. Although the degree to which chance played a part can only be described as minimal, and the way in which chance was introduced did not accurately reflect the way in which a 'chance-orientated interactive device' would introduce chance, it is suggested that the experiment did in fact confirm the idea of the 'C.O.I.D.'. By allowing an external randomizing mechanism (in this instance, the public) to influence decisions, the author produced a body of work ('chance products') different to that which was produced by purely personal decisions ('choice products'). It is not of interest to this research whether one group of sculpture was more successful than the other, however, what is of interest is the fact that the 'chance products' were by no means inferior to the 'choice products', but were substantially different in character.

3.27 Experiment 'C'.

Taking into account the experience and conclusions reached from Experiment 'B', a second project was planned. The aim of Experiment 'C' was similar to the previous project, which was, for the author to produce two separate bodies of work, one as a result of preferred decision making procedures - 'choice products' - and the other as a result of chance effected decision making procedures - 'chance products'. Whereas in Experiment 'B' the public were used to introduce chance, in Experiment 'C' a version of the 'chance-orientated interactive device' was to be used, which at this stage existed as a collection information which had so far been gathered in relation to the eight categories, and which was contained in a loose-leaf (A4) format, fig.46 represents a plan of the 'information' as used in Experiment 'B'.

The project was undertaken indoors, whilst the material used was clay (once again determined by financial limitations and ready availability of the material), a similar quantity being available during both periods. During days 1, 2, and 3 - the 'control period' - the author produced sculpture according to his own personal and preferred decision making procedures, the results of which were classed as 'choice products'.

During days 4, 5, and 6, - the 'experimental period' - the author again proceeded to make sculpture; however, this time, making use of the 'C.O.I.D.',

Fig.38

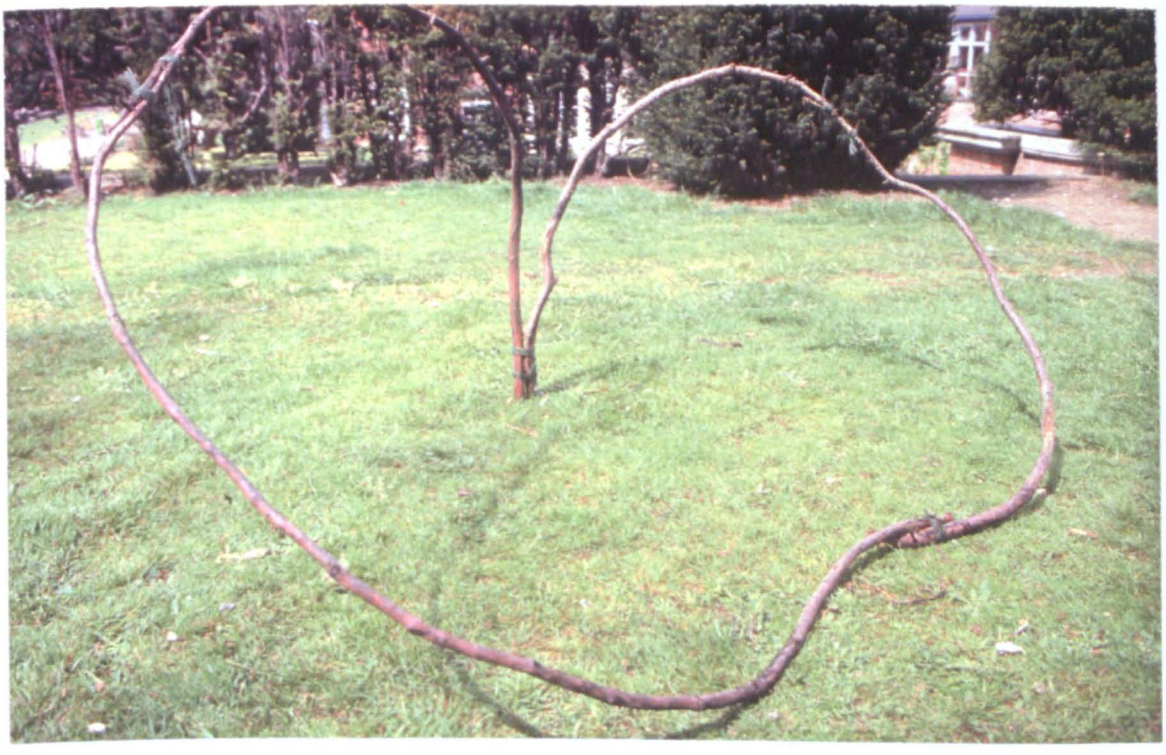


Fig.39

Examples of sculpture made by the author during days 1 and 2, based upon purely personal decision-making procedures.

Fig.41

Fig.40

Further examples of sculpture made by the author during days 1 and 2.

Fig.42

Fig.43

The piece of sculpture made by the author on day 3, based upon 'chance effected' decision-making procedures.

Fig.44

Fig.45

The piece of sculpture made by the author on day 4, also based upon 'chance effected' decision-making procedures.

CHARACTERISTICS OF 'CHOICE PRODUCTS'	CHARACTERISTICS OF 'CHANCE PRODUCTS'
Consisting of approx. **20 pieces of sculpture** in number.	Consisting of **2 pieces of sculpture** in number.
Predominantly **linear** and **spatial** in **form**.	Predominantly **solid** and **volumetric** in **form**.
Being **ephemeral** in their **construction**.	Displaying **labour intensive construction**.
Having a **minimal** or **simplistic structure**.	Having a reasonably **complex structure**.
Showing **selective** use of available **material** in both **number** of twigs used (not more than 4 in any one piece) and the **shape** of twigs (all extremely curved).	Showing **non-selective** use of available **material** (using **all 300** twigs and branches).
Limited visual evidence of 'creativity' (according to public perception).	**Greater visual evidence of 'creativity'** (according to public perception).
Non-associative or **non-representative** quality, i.e.abstract	Increased **associative** or **representative quality**,i.e suggestive of other objects.

Table 5. Characteristics of sculpture produced during Experiment 'B'

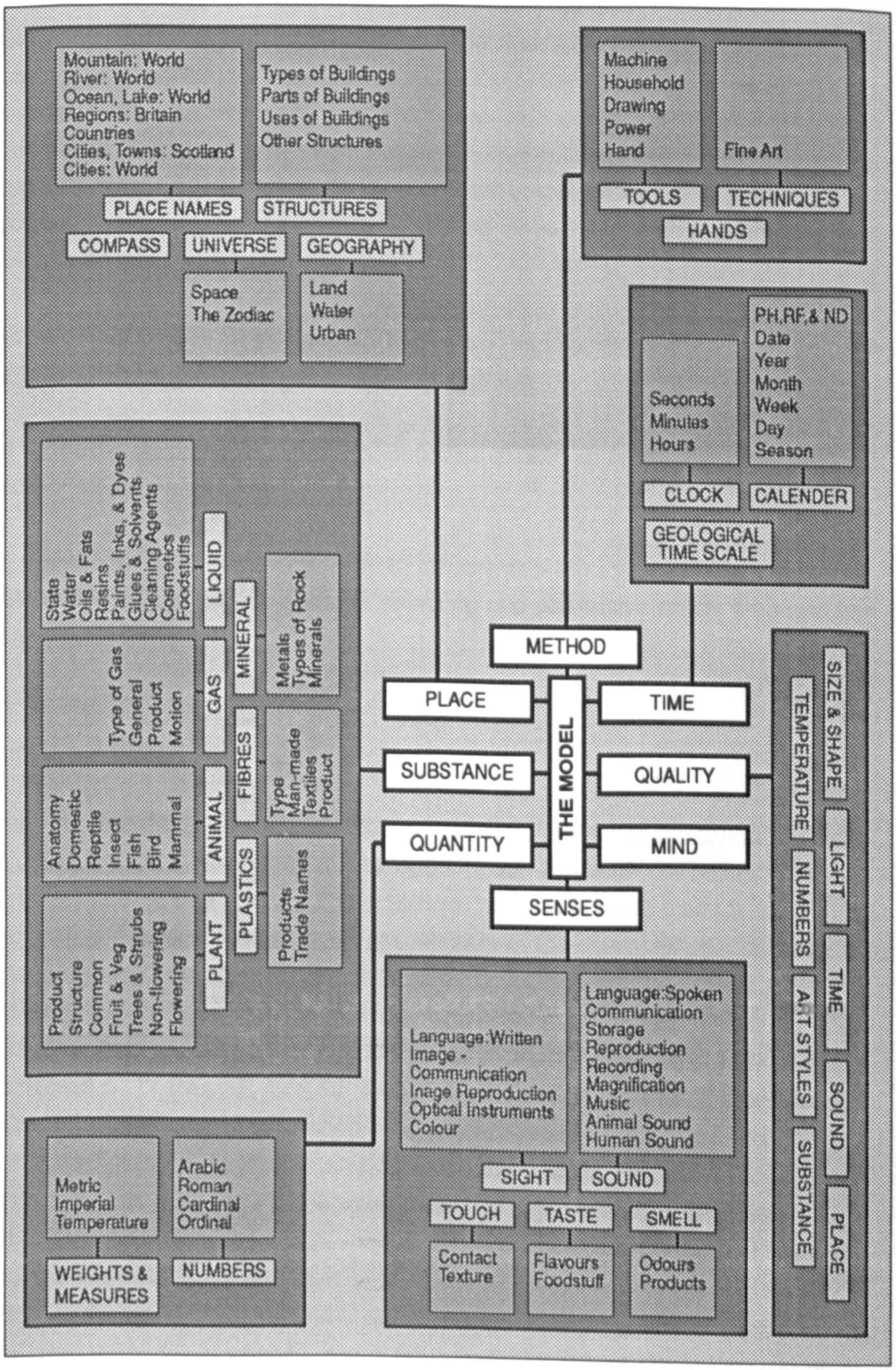


Fig 46. Plan of information as contained within the 'loose-leaf' (A4) binder, as used in Experiments 'C' and 'D'.

parts of the process were subjected to random selection. On the first day of the experimental period, for example, consultation of the category METHOD, resulted in 'destruction' being selected rather than 'construction', whilst the tools with which to 'destruct' were also chosen randomly (a list had to be compiled due to limitations imposed by the environment and accessibility). Similar random selection procedures occurred during days 4 and 5, the results of which were referred to as 'chance products'.

As with Experiment 'B', this experiment also yielded a significant amount of both objective and subjective information for analysis:

a) visual documentation of the resulting 'choice' and 'chance' sculptural objects: (colour slides, video tape)

b) audio and written documentation of the author's thoughts and ideas during the process along with reasons for selecting one alternative rather than another (see appendix 3.3).

3.28 Results of Experiment 'C'.

This experiment also produced two groups of sculpture: 'choice products' and 'chance products' as illustrated (see figs.47 - 53). Although the two groups were not distinct from one another, the sculpture from each group may still be compared, therefore, the author's assessment of the characteristics of each sculpture are presented in Table 6. These lists along with the photographic documentation demonstrate that there would appear to be little significant difference between the 'choice products' and the 'chance products'. Unlike Experiment 'B' however, it could not be said that either group had a distinctive set of characteristics or that any of the products clearly belonged to a particular group, perhaps due to the limited possibilities offered by the material, the failure of the random selections to stimulate, or the 'private' nature of the project (unlike the previous experiment which was carried out in a public environment, this experiment was undertaken in complete privacy, with no onlookers). The most useful piece of data that the experiment yielded was the participant's (the author's) reactions to what he had produced during the six days, for example, statements recorded during the 'control period' reveal a dissatisfaction with what has been produced:

Fig.47 A piece of sculpture made by the author during days 1 and 2, based upon purely personal decision-making procedures.

Fig.48

Fig.49

Two pieces of sculpture made by the author on day 3, also based upon purely personal decision-making procedures.

Fig.50

Fig.51

A piece of sculpture made by the author on day 4, based upon 'chance effected' decision-making procedures.

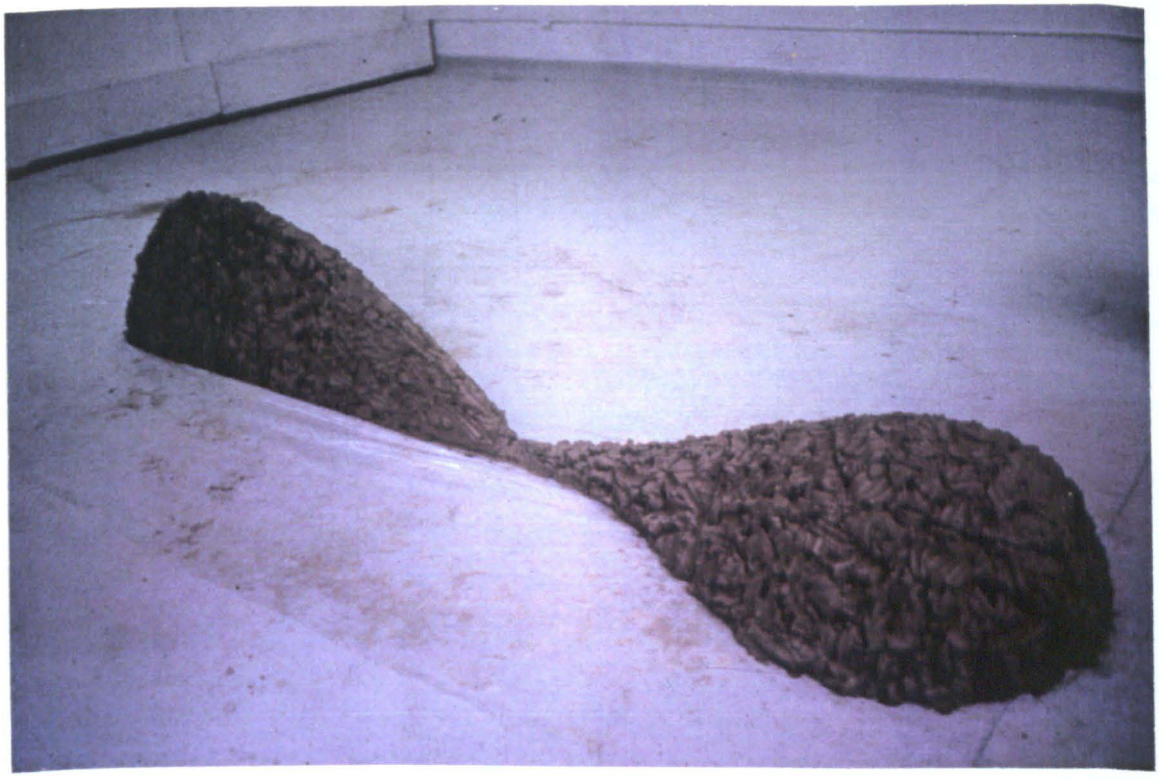


Fig.52

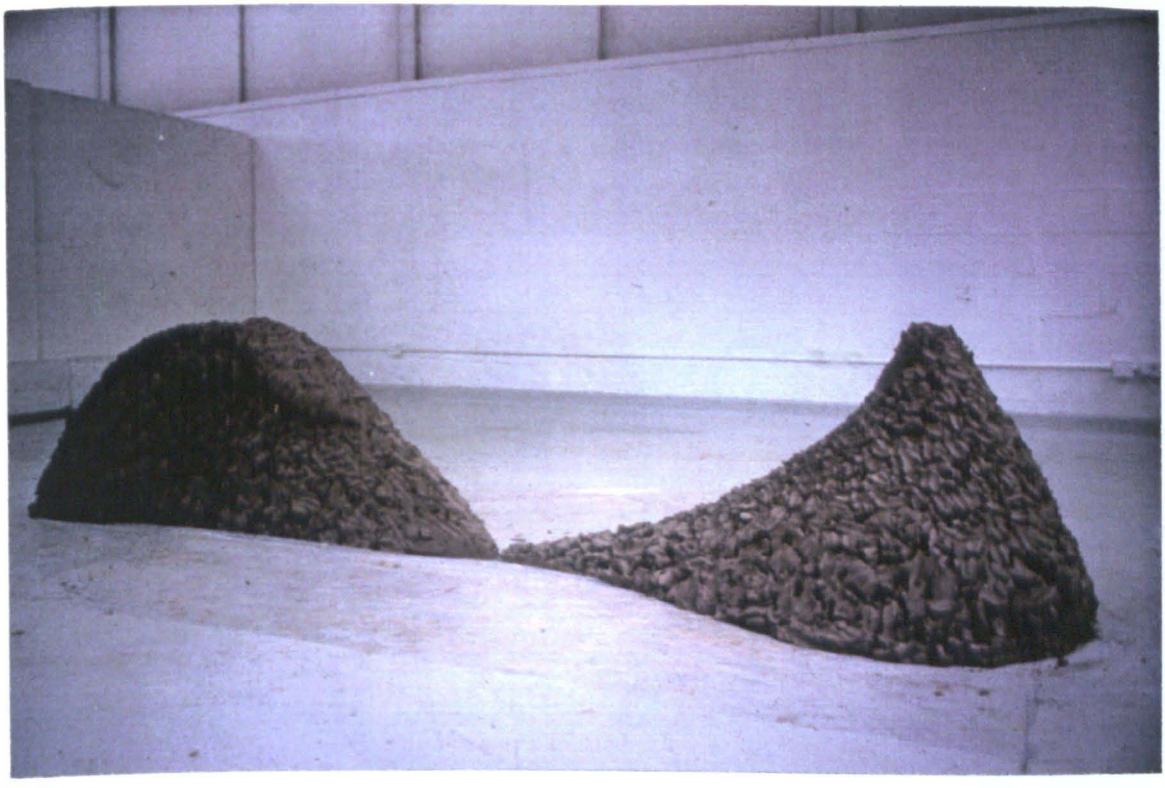


Fig.53

A piece of sculpture made by the author on days 5 and 6, also based upon 'chance effected' decision-making procedures.

<table>
<tr><th colspan="3">CHARACTERISTICS of 'CHOICE PRODUCTS'</th><th colspan="2">CHARACTERISTICS of 'CHANCE PRODUCTS'</th></tr>
<tr><td colspan="3">Consisting of 3 pieces of sculpture in number</td><td colspan="2">Consisting of 2 pieces of sculpture in number</td></tr>
<tr><td>Sculpture A</td><td>Sculpture B</td><td>Sculpture C</td><td>Sculpture D</td><td>Sculpture E</td></tr>
<tr><td>Predominantly cylindrical, tall, and thin in form.</td><td>Predominantly small and circular in form</td><td>Predominantly low and circular in form.</td><td>Predominantly vertical, square, and bulky in form.</td><td>Predominantly low, wide, and narrow in form.</td></tr>
<tr><td colspan="2">Being methodical and repetitive in construction.</td><td>Being haphazard in construction.</td><td>Being destructed rather than constructed.</td><td>Being methodical and repetitive in construction.</td></tr>
<tr><td colspan="2">Building up form using spherical clay balls, formed around an 'armature'</td><td>Using spherical clay balls, thrown onto the floor.</td><td>Scraping and hacking clay from a rectangular block.</td><td>Building up solid form using rough bits of clay.</td></tr>
<tr><td>Using approx. 50% of available material.</td><td>Using very little of available material.</td><td>Using very little of available material.</td><td>Using all available material.</td><td>Using approx. 80% of available material.</td></tr>
<tr><td>Considerable visual evidence of creativity.</td><td>Limited visual evidence of creativity.</td><td>Extremely limited visual evidence of creativity.</td><td colspan="2">Considerable visual evidence of creativity.</td></tr>
<tr><td>Having an obvious 'column' or 'chimney' type shape.</td><td>Having an ambiguous but abstract shape.</td><td>Having no recognisable shape.</td><td colspan="2">Having an ambiguous but abstract shape</td></tr>
</table>

Table 6. Characteristics of sculpture produced during Experiment 'C'.

"Not really happy with what I've done . . .too preoccupied with finding a process . . . .been too tentative and not really taken advantage of the material . . . nothing is really working . . . I feel I've chosen the wrong idea from the start."

whilst statements recorded during the 'experimental period' reveal a somewhat greater degree of satisfaction:

"My mind is already racing ahead and thinking about alternative ways of adding the clay . . this is a much more spontaneous and satisfying way to handle the clay. . . . feeling reasonably happy with what is going on. . ."

(A full transcript of all recorded statements made throughout this experiment is included as appendix 3.3). Obviously due to the subjectivity of the author not a great deal of significance can be attributed to such statements, nor the author's personal opinion that the 'chance products' were more successful than the 'choice products', therefore it was decided that the author should no longer be central to the experiments but rather adopt a more objective observational role. This decision determined the format of the next experiment.

3.29 Experiment 'D'.

This project differed from the two previous experiments, not only because the author was not the participating subject, but because of the design of the experiment itself. Experiment 'D' was designed in order to measure the differences, if any, between sculpture produced by students before experimenting with chance, and sculpture produced by students after experimenting with chance. The experiment took place over four days, the first of which (the 'control period'), produced 'choice products', whilst days 2, 3, and 4 (the 'experimental period'), produced both 'chance products' (days 2 and 3), and 'choice products' (day 4). There now follows a brief description of experiment 'D', however, a more detailed account is included as appendix 3.4.

Throughout day 1, each participant was required to make their own piece of sculpture and were offered a variety of materials and tools from which to choose. Any communication between student and teacher (the author), was limited to advice of a purely technical nature. No comments were addressed to the students which praised what they were doing or suggested to them possible ways in which to proceed, this ensured that the work they produced was as a

result of their own selection and judgement. At the end of day 1 each student had produced a 'finished' piece of sculpture. Two were of a 2 dimensional nature, two were of a 3 dimensional nature whilst the fifth piece was a combination of both. Scale ranged from approximately the same size as a human head to the largest piece which was approximately 5 feet by 4 feet. The results represented sculpture produced by purely personal decision making procedures and were photographed for future analysis. From the materials available, each student had used a combination of several materials rather than concentrating on just one or two. (Due to a photographic error there is no visual documentation of this experiment).

During days 2 and 3, the 'experimental period', the participants, aided by the author, produced several more sculptures, however, various conditions concerning how or what they made were determined by chance, for example, the available materials were listed and subjected to random selection, as was various aspects of 'place' (within the given environment). The sculpture produced during these two days was of a much more experimental and 'fun' nature, and represented 'chance products'.

On the final day participants received a similar 'brief' to day 1, which was, to produce a piece of sculpture, again based upon 'the head'. In similar circumstances to day 1, particiapnts were free to choose the materials and tools they preferred, whilst again, communication between student and (author as) teacher was limited to advice of a purely technical nature. The work produced on the final day represented sculpture which had been generated by personal decision making procedures ('choice products'), which, however, could have been influenced by the exposure of working with chance in the immediate past, days 2 and 3.

3.30 Results of Experiment 'D'.

This third experimental project was perhaps the least successful of the three, for a number of reasons. Firstly, the actual number of students taking part, 5, was disappointing, the project failing to attract the target number of 12 (the responsibility of the workshop organizers). Consequently the low number failed to generate an atmosphere of activity or sense of occasion which had been hoped for.

This project differed from the other two in that three types of 'product' were produced; day 1 resulted in 'choice' products; days 2 and 3 resulted in 'chance' products; and day 4 resulted in another set of 'choice' products. Table 7 presents the author's assessment of the characteristics of the sculpture produced during both 'control' and 'experimental' periods. The initial idea was to compare the 'choice' products of day 1 (a result of personal decision-making procedures) with the 'choice' products of day 4, which it was supposed would be different due to the fact that, since making the first 'choice' product, the subjects had experimented and worked with chance. Comparison between the 'choice products' of day 1, and the 'choice products' of day 4 suggest that a significant difference did occur, however, the change between them could not be said to be wholly attributable to their experiments with chance during days 2 and 3. For example, on day 1, the students did not use some of the more 'unusual' materials ('unusual' in their minds), however, on day 4, the materials used were more varied. This change however was most likely due to the fact that during days 2 and 3 they worked with certain materials for the first time, and by day 4 were more confident in manipulating them. Similarly, students 'D2' and 'D5' both produced rather 2 dimensional type sculpture on day 1, but on day 4, both produced sculpture of a definite 3 dimensional nature. This project did not measure the difference between 'choice' and 'chance' sculpture, but tried to evaluate whether the students could learn anything from working with chance (i.e. using chance as a demonstrative device, in order to show students the range of possible options within a given set of circumstances).

3.31 Summary and conclusions of Experiments 'B', 'C', and 'D'.

As was stated earlier, rather than test the design of the "chance-orientated interactive device' (i.e. content, structure, and format of either flowcharts or 'loose-leaf book'), these experiments were primarily concerned with testing the idea of such a device, especially the implications of using it in practical circumstances. The main conclusions that can be drawn from the above experiments relate to two concerns, firstly, the design of future experiments, and secondly, the effects of these experiments on the design of a 'C.O.I.D.'.

3.32 Design of future experiments.

All three experiments were successful in achieving what they set out to do,

Table 7. Characteristics of sculpture produced during Experiment 'D'

	'Control Period'	'Experimental Period'		
Participant	DAY 1 CHARACTERISTICS OF 'CHOICE PRODUCTS'	DAY 2 CHARACTERISTICS OF 'CHANCE PRODUCTS'	DAY 3 CHARACTERISTICS OF 'CHANCE PRODUCTS'	DAY 4 CHARACTERISTICS OF 'CHOICE PRODUCTS'
D1	Predominantly: life-size, spherical, linear, spatial, representational, and free-standing	Group Projects: am Participants undertake group projects, elements of which are determined by chance:one couple must make a 'head' that touches both floor and ceiling; another couple must make a 'head' that looks out of a window above a door; whilst the third couple must make use of a cupboard.	Chance influenced ' figure': smaller than life-sized, kneeling, curved.	Predominantly: slightly larger than life-size, head-shaped, solid, semi-representational, and free-standing
D2	Predominantly:large (5'x4'), 2 dimensional, angular, semi-representational, with one view point.		Chance influenced ' figure': life-sized, lying down, thin, elongated..	Predominantly: life-size, spherical, solid, semi-representational, and free-standing
D3	Predominantly:life-size, spherical, linear, spatial, representational, and free-standing.	Group Projects: pm Participants undertake another group project, elements of which are determined by chance: participants allocated a spot to stand on, from where they must work with each other to make another piece of sculpture, which turns out to be a very large arrangement of materials scattered across the floor.	Participants D3 and D4 discontinue. Group Projects: pm Paper structures, one concerned with height, the other concerned with 'twisting' the paper, and adding to the sculpture until time ran out.	
D4	Predominantly:large (3'x2'), 2 dimensional, non-representational, sparse arrangement, with one view point.			
D5	Predominantly:large (3'x2'), 2 dimensional low-relief, non-representational, painted, with one view point.		Chance influenced ' figure': life-sized, crouching, angular, volumetric.	Predominantly: larger than life-size, linear, spatial, semi-representational, and suspended.

which was, to produce two comparable groups of sculpture, however, a recurring problem was the fact that all three experiments were carried out in response to what may be described as 'fixed circumstances', which means that during the actual project, the introduction of chance was limited to 'randomizing' what was already there. The reason for this was mainly due to the fact that such projects had to be planned in advance (especially those involving collaborating establishments).

Experiment 'C' did not work as well as experiment 'B': whilst the public nature of experiment 'B' provided a certain pressure which ensured that the main concern of the author was to make 'good' sculpture, the 'private' nature of experiment 'C' meant that the author had more time to think about the experiment itself rather than concentrate fully on what was being made.

Experiment 'D' suggested that 'naive' subjects, that is, persons who were not sculptors or sculpture students, were not ideal participants in such experiments due to their inexperience of making sculpture and, allied to this, their inability to supply critical feedback. It was evident that until the 'C.O.I.D.' was in an advanced state, only 'experienced' individuals, that is, persons already familiar with making sculpture, should be used as participating subjects. The third experiment also served to highlight that in these early stages of development, experiments involving more than one individual at a time were unpractical.

It is suggested that the major reason for the third experiment not working as well as it might have done was the dual nature of the project, that is to say, the two objectives which the project set out to satisfy, namely; a) to provide a workshop for children which was exciting, educational, and offered something different to their usual artistic training, and; b) to undertake an experiment which measured the effects of chance on a person's creative process. The restrictions and requirements demanded by the second objective obstructed and hindered the satisfactory fulfilment of the first and vice versa. For example, during Day 1, the 'research' objective demanded that communication between student and teacher should not include encouragement or suggestion by the teacher which may have directly influenced the development of the student's work, whilst the 'workshop' objective demanded the opposite.

3.33 General conclusions.

In general, the conclusions reached from the above experiments were: a) only experienced sculptors or students of sculpture were acceptable as participating subjects; b) projects planned in advance i.e. 'fixed circumstances' did not generate a suitable environment in which to test the 'chance-orientated interactive device' because they did not offer enough flexibility; c) until the 'C.O.I.D.' was functioning as intended, it could not be used in an educational capacity; d) experiments should have only one main objective.

3.34 Effect of these experiments on the design of a 'C.O.I.D.'.

During Experiment 'B' the author's experience of allowing the public to make decisions was extremely valuable in emphasizing the importance of the relationship between choice and chance. If the author had simply asked the first member of the public 'what to make' the project may have simply become an unpleasurable chore (for example, one member of the public demanded 'eight galloping horses and a stage-coach'). It is suggested that the success of Experiment 'B' was due to the fact that the author remained in control throughout, but, respecting and responding to the chance decisions. Since the idea behind using chance is to stimulate rather than prescribe, the design of the 'chance-orientated interactive device' must ensure that the relationship between user and 'device' is one of active participation and interaction rather than passive obedience.

A consequence of the 'fixed circumstances' of all three experiments served to highlight one of the main problems concerning the concept of the 'chance-orientated interactive device' - its practical application in an everyday situation. The theory of such a device may be justifiable, but what happens when it supplies the user with an unattainable or unrealistic 'element of consideration' (which is almost certain to occur). As stated in the previous paragraph, the aim of using chance is not to instruct but to stimulate, indeed, the inclusion of unrealistic elements is an integral part of the 'C.O.I.D.'s' design, thereby forcing the user to confront the impossible and to adapt accordingly, in other words, to be creative. If a user happens to randomly receive some form of rare mineral as a material, they would not necessarily be expected to spend an inordinate amount of time, effort, or money, in trying to acquire the actual mineral, rather, they should be encouraged to interpret the selection in any way they wish, for

example, they may discover that the mineral is used in the manufacture of cement, which might encourage them to use that as a material.

This scenario, although acceptable, should not be seen as 'the norm', therefore, to ensure a high degree of practical application, the design should aim to incorporate a large number of general terms which allow for a wide range of interpretive possibilities. Furthermore, at every selection stage, the user should be made aware that by making further selections they may be reducing their chances of receiving a realistically obtainable selection.

In summary, in order for the 'interactive device' to function on a practical level, the design of the 'C.O.I.D.' must incorporate a substantial amount of general information whose meaning is ambiguous and open to interpretation, thereby enabling a flexible response. Furthermore, users must be encouraged to interact with chance, not simply accept what is prescribed, therefore the presentation of all information must aim to encourage users to engage in active thought, not only after use, but whilst using the 'C.O.I.D.' as well.

3.35 A format is found.

Throughout the period during which the above experiments took place, the search continued for a suitable format in which to realise the device, and eventually, a software computer package - 'Hypercard' (Apple Macintosh) - was identified as it seemed to meet all the necessary requirements (for a more detailed description of 'Hypercard' see appendix 3.5). This particular software was chosen for two main reasons, firstly, it allowed information to be organised in a non-linear and non-hierarchical way, and secondly, it enabled 'non-programmers' (i.e. the author), to create their own interactive applications. The possibility of seeking collaboration with a 'hypercard' expert was considered, however, the author felt that it was important that in these early stages the 'C.O.I.D.' be designed from a 'sculptor's' point of view, and that the possibility always existed to involve computer based experts if required.

The decision to use a computer based medium as a format for the 'C.O.I.D. was not without reservation. The historical relationship between 'fine art' and computer technology was not one which instilled great confidence, and suggested that adopting such a format may in fact deter potential users. Future tests were to prove this fear unfounded however, as the advantages of the

system outweighed the reservations that some sculptors had (see Table 10.3, page 173, and Table 11.8, page 197).

3.36 Stage 5 - ARP - Prototype 1.

After great deliberation it was decided that the Hypercard format of the 'C.O.I.D' would be christened ARP - an acronym for Art as Random Process - as well as sharing the name of Jean Arp, a prominent 20th century sculptor who used chance. The design of the initial ARP prototype could be separated into 3 main areas of concern; the visual interface, the explanatory sections, and the taxonomy and structure of information.

3.37 Visual interface.

In developing the graphic design of ARP an attempt was made to assist the user by incorporating some of the visual effects characteristic of Hypercard, for example, when a random choice is made, the on-screen graphics let the user know that a random selection was taking place. Similarly, simple visual effects indicative of 'opening' or 'closing' could indicate to a user whether they were going further 'into' the system, or whether they were coming 'out' of the system.

3.38 Explanatory sections.

As stated previously, one of the main design criteria was that a 'chance-orientated interactive device' should be 'self-contained', therefore integral to the design were two introductory sections. 'How to use ARP' aimed to explain to persons how to use Hypercard (complicated by the fact that it had to cater for persons with little or no computer experience), whilst the 'What is ARP?' section aimed to describe to people the concept behind ARP, how they should approach ARP, and what benefits they might expect to gain by using ARP.

3.39 Structure of information.

The information from the loose-leaf (A4) format was transferred into the Hypercard medium (during the early exploratory period, only information relating

to SUBSTANCE was placed in the system). This involved the classification of such information into increasingly explicit choices in a process similar to that used in the 'flowcharts'; however, unlike the 'flowcharts', a great deal of effort was now focused upon achieving a more universally acceptable taxonomy. Taking SUBSTANCE as an example, whilst the flowcharts offered 11 categories to choose from, including, 'STONE', 'PAPER', and 'LIQUID', etc, (quite specific types of material), at the same level, Hypercard now offered only 'ANIMAL', 'PLANT', 'MINERAL' and 'PHYSICAL STATE' (obviously quite unspecific types of material). Fig.54 illustrates this improved taxonomy, as well as providing a visual impression of the guiding principle behind the design of ARP, that is, the increasingly explicit breakdown of one category into sub-categories.

Every 'box' in fig.54 represents a 'card' (appendix 3.5 provides a brief introduction to Hypercard terminology), one of which, 'PLANT' - 'STRUCTURE', is reproduced in fig.55. This is a typical ARP graphic interface, in which a number of possible options are offered, in this case, six categories relating to the structure of plants: 'FLOWER', 'FRUIT', 'STEM', 'SEED', 'FOLIAGE', and 'ROOT'. To select any of these options by personal choice, the user simply 'clicks' the cursor on the desired option, whilst to receive a random choice, the user simply 'clicks the cursor' on the 'random choice' option. The selection of any category (by either personal or random choice), immediately accesses its related 'card' which subsequently offers the user a further set of options - in fig.55 for example, 'FOLIAGE' has been selected, therefore activating the 'FOLIAGE' card which offers a further eight options. If the user so wished, rather than proceeding to make a further selection concerning 'STRUCTURE', they could return to 'PLANT - TYPE' to select the foliage of a particular plant.

As soon as the two explanatory sections were complete and sufficient information was stored within SUBSTANCE, arrangements were made to test ARP to enable a preliminary assessment of the design and accessibility of the first Hypercard 'C.O.I.D'.

3.40 Experiment 'E'.

This experiment involved ten second-year sculpture students (from the sponsoring establishment), and was incorporated into a course project ('media investigation'), the aim of which was to explore different types of material. All 10 students were given the following brief:

'Original in colour'

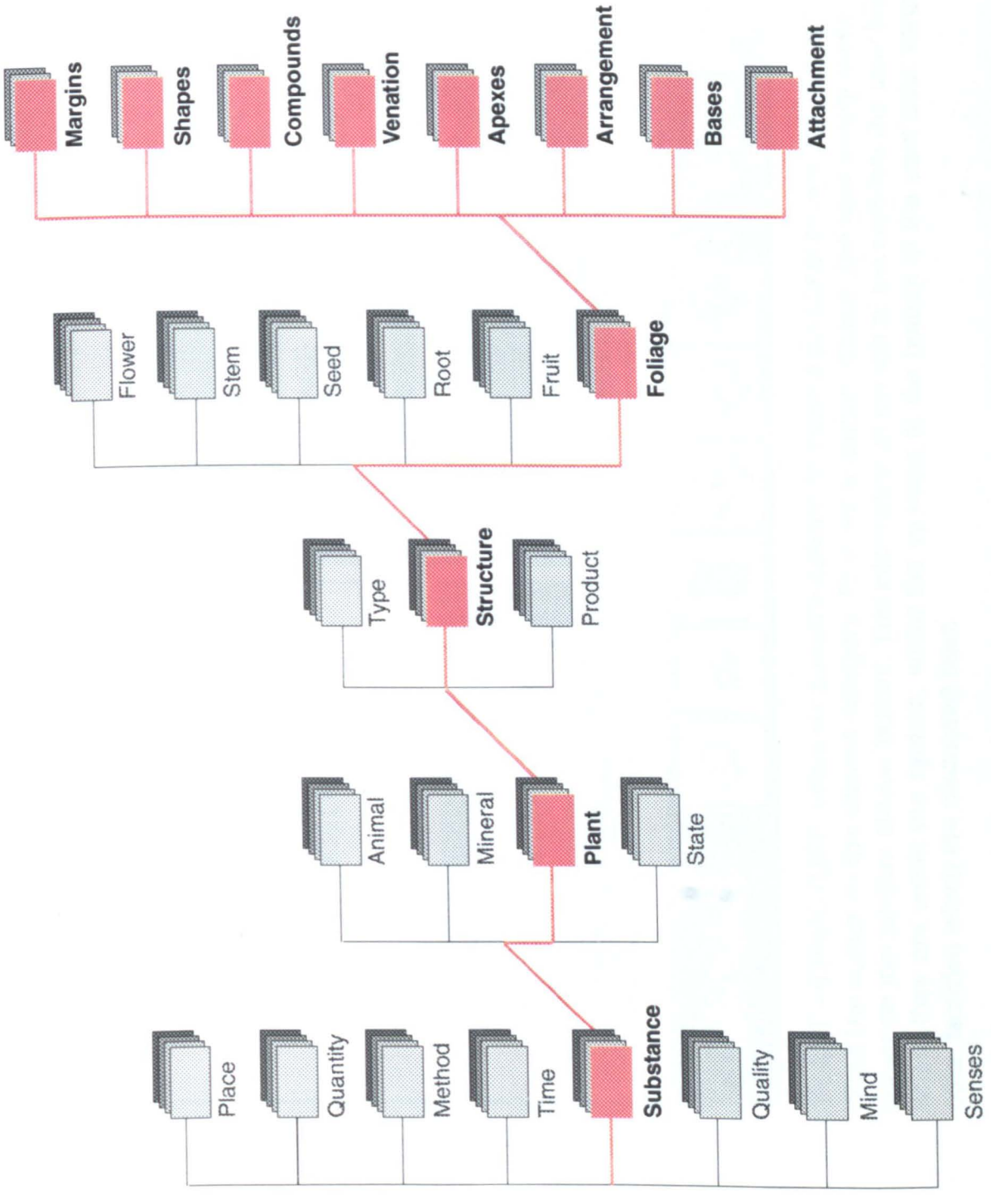


Fig.54 The above diagram displays the principle behind the design of ARP: the breakdown of categories into increasingly 'explicit' choices.

Fig.55 A typical ARP 'card' - 'PLANT - STRUCTURE'.

'PLANT - STRUCTURE' offers six possible options.To make a personal choice, the user simply clicks the cursor on the desired category. To make a random choice, the user simply clicks the cursor on the random choice 'button'. The information at the top of the card lets the user know where they are within the system, whilst the symbols at the bottom of the card offer various other facilities which are discussed later.

". . . to make at least one piece of sculpture which incorporated no less than five different types of material and which was based on the theme of the human head."

It was made clear to the students that any type of material was acceptable, thus allowing them to make use of what they had learned in preceding 'media investigation' (wood, plaster, metal, plastics, etc) or explore more unusual or unconventional sculptural materials if they so wished.

Five of the group were simply asked to produce a piece of work which satisfied the above brief (the 'control group'), whilst, the other five (also required to satisfy the brief), were to be allowed to use ARP (the 'experimental group'). The reason for this was an attempt to evaluate the difference, if any, between sculpture produced by students who used ARP and sculpture produced by students who did not. To avoid bias, the 'experimental group' were selected randomly, and were then invited to use ARP, one at a time, observed by the author, who noted the number of decisions made, whether such decisions were personal or random, and the resulting selections. In a similar manner to the experiment involving the flowcharts, the participants were neither encouraged to opt for random choice nor discouraged to opt for personal choice. After using ARP the 'experimental group' were instructed to continue with the brief. It was made clear to them that it was their decision as to whether they made use of their selected 'elements of consideration' or ignored them. The experiment represented the first use of ARP by persons other than the author, therefore the students who used ARP were asked to fill in a series of questionnaires in order to make a preliminary assessment of ARP's design and accessibility.

3.41 Results of Experiment 'E'.

The experiment provided two separate bodies of information, firstly, the actual sculpture produced by both the 'control' and 'experimental' groups and second, a series of questionnaires which the 'experimental' group had completed, concerning their use of ARP.

3.42 Sculpture - 'control' and 'experimental'.

Examples of the sculpture produced by the 'control' group are presented in figs. 56-59, whilst sculpture produced by the 'experimental' group is presented in figs.60-63. The characteristics of these products (in the author's opinion), are presented in Table 8.

In order to determine if there was any measurable difference between the 'experimental' sculpture and the 'control' sculpture, a multiple sort was undertaken. Participants in this test were presented with the following instructions:

> "Please look at these eight photographs of pieces of sculpture and sort them into groups in such a way that all the pictures in any group are similar to each other in some important way and different from those in other groups. You can put the sculptures into as many groups as you like and put as many sculptures into each group. It is your view that counts. When you have carried out a sorting please tell me the reasons for your sorting and what the sculptures in each group have in common. When you have sorted the photographs once I will ask you to do it again, using any different criteria you can think of. We will carry on as many times as you feel able to produce different sorts."

Thirteen lecturers from the sponsoring establishment carried out the 'sort', their disciplines covering all areas of both fine art and design. In total these participants made 95 'sorts', 86 of which were divided between eight common categories: 'type of material', 'form or shape', 'representational or abstract', 'visual impression', 'position/stance', 'colour of materials', 'like/dislike', and 'method of construction'. From these 95 'sorts', the eight sculptures were correctly separated into their two groups on only two occasions, one concerning 'colour of material', the other 'visual impression'. Similarly, the number of 'sorts' in which the sculpture was nearly grouped correctly (i.e. only one sculpture in the wrong group), was only 4, concerning 'like/dislike', 'visual impression', 'colour of material', and representational or abstract'. Since the students who had used ARP had only selected random materials, the 24 'sorts' concerning 'type of material' were examined separately, however, this revealed no tendency to separate the groups whatsoever. Such low figures would seem to indicate that whilst any number of the eight pieces of sculpture often shared

Fig.56 Sculpture made by participant 'E1'

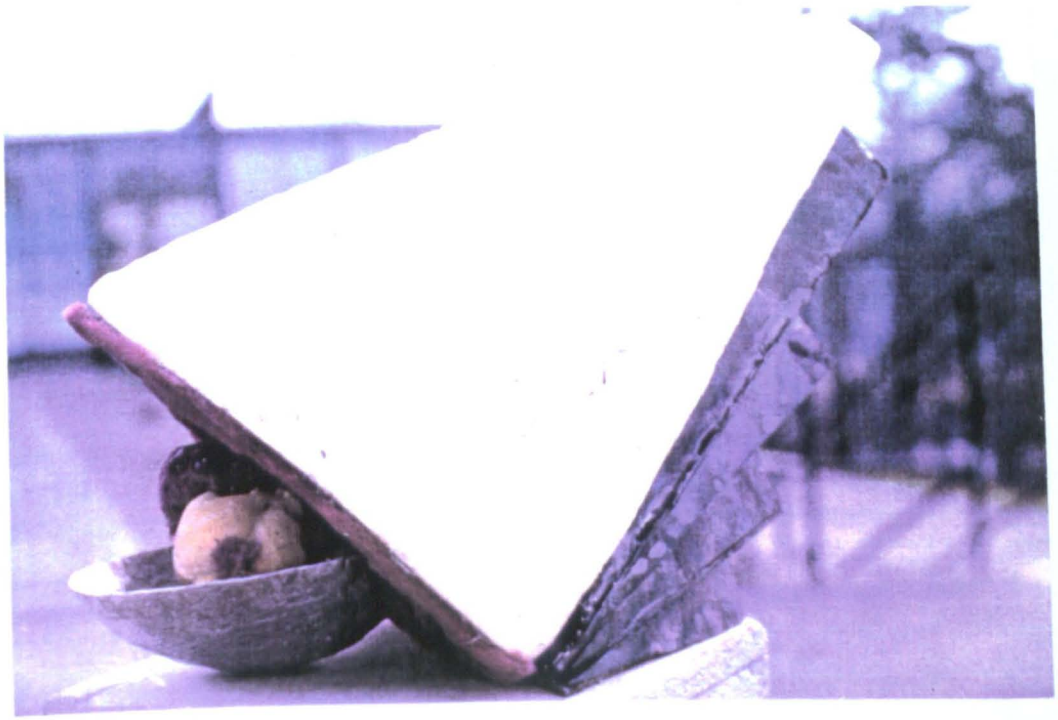


Fig.57 Sculpture made by participant 'E2'

Fig.58 Sculpture made by participant 'E3'

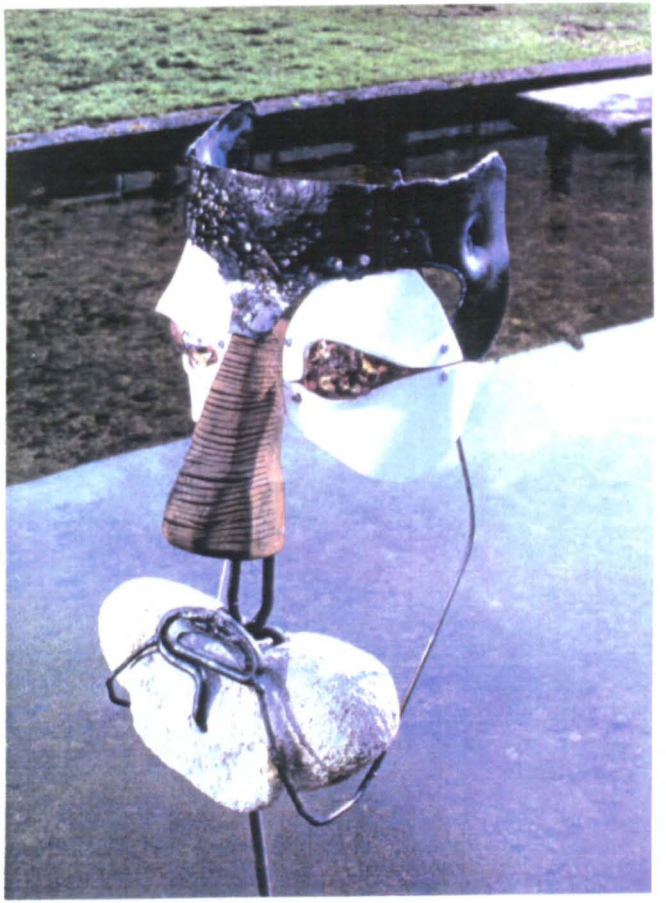


Fig.59 Sculpture made by participant 'E4'

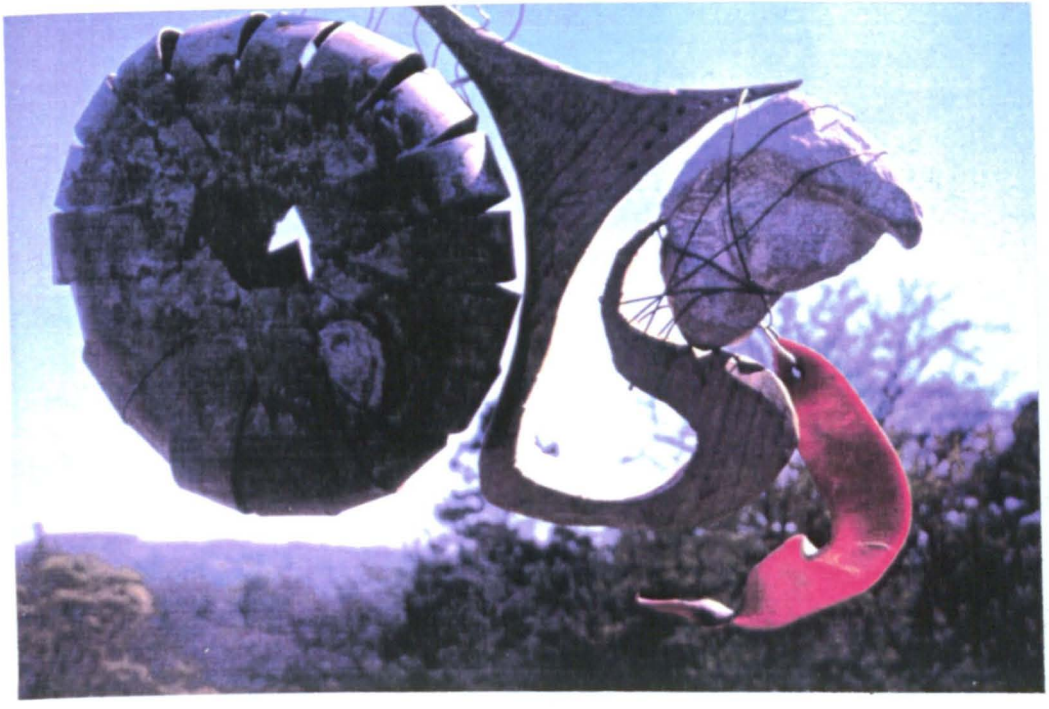


Fig.60 Sculpture made by participant 'E6'

Fig.61 Sculpture made by participant 'E7'

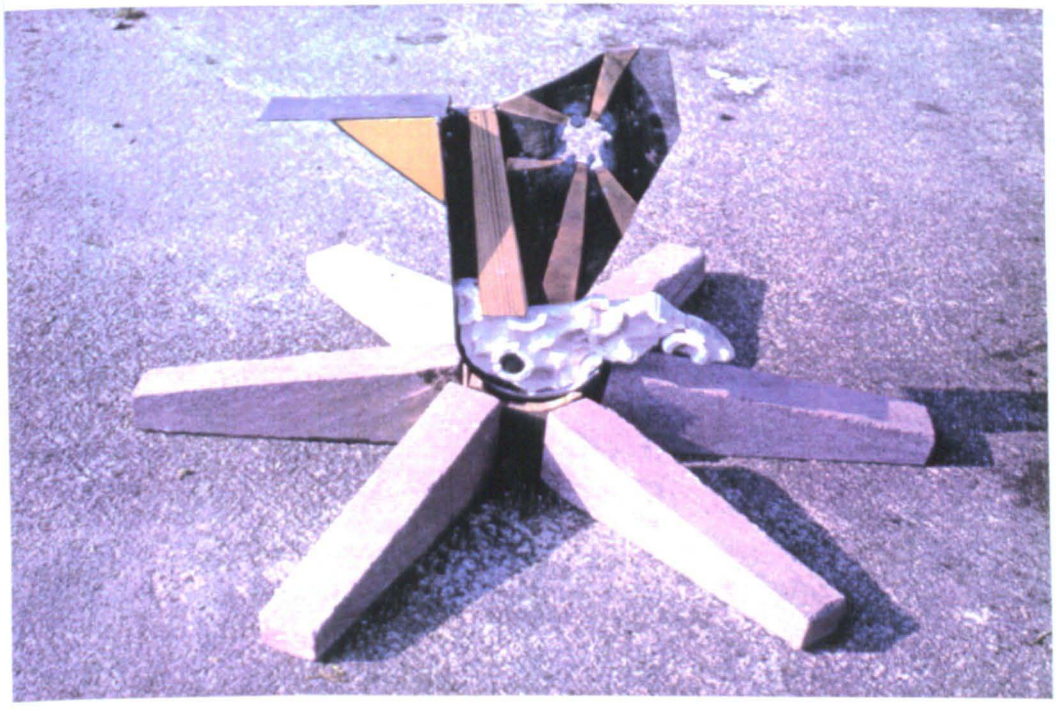


Fig.62 Sculpture made by participant 'E8'

Fig.63 Sculpture made by participant 'E10'

Participants		MATERIALS	CHARACTERISTICS
CONTROL GROUP	E1	Steel; Plastic; Wood; Concrete.	Free standing object; non-representational.
	E2	Metal; Plaster; Foam; Rubber; Velvet.	Free standing object; non-representational.
	E3	Photography; Vegetables; Cooking Utensils.	Free standing object; conceptual; humorous; representational.
	E4	Metal; Plastic; Wood; Stone.	Free standing object; representational.
	E5	Plaster; Wood; Slate; Metal; Porcelain.	(No slide.)
EXPERIMENTAL GROUP	E6	Wood; Metal; Plastic; Stone.	Suspended; representational.
	E7	Plaster; Plastic; Metal; Wood; Rope.	Free standing object; semi-representational.
	E8	Perspex; Copper; Steel; Wood; Plaster; Red Sandstone.	Free standing object; non-representational.
	E9	Perspex; Wire; Nylon.	Free standing object; semi-representational.
	E10	Grass; Metal; Plastic; Earth.	Outdoor site; ephemeral; semi-representational.

Table 8. Characteristics of sculpture produced during Experiment 'E'.

similar properties, the 'experimental' sculpture did not share any common 'chance related' characteristics that differentiated them from the 'control' sculpture.

The above evidence, along with the photographic documentation, appears to suggest that no significant difference could be found between the two groups, therefore implying that ARP did not significantly influence the students who had used it. This is substantiated by the results of a questionnaire which the 'experimental group' completed at the end of the five day project (see proforma - appendix 3.6). These reveal that only one student thought that using ARP had 'directly influenced their work', whilst two thought that using ARP had 'indirectly influenced their work'. The remaining two students thought that using ARP had had no influence upon their work whatsoever.

Table 9, which compares the materials that were selected through use of ARP, with the materials that the students eventually used, reveals little relationship between the two, which would seem to substantiate further the previous conclusion that using ARP did not appear to influence the students to any significant degree. Returning to the questionnaire however, 100% stated that using ARP had 'given them ideas for the future', and similarly 100% stated that they would 'like to use ARP again'. The reason for this apparent contradiction (that ARP would influence future work, but did not influence work undertaken in the project), could be that ARP was not yet working as intended; perhaps due to the limited amount of information contained within ARP at the time of the experiment; that the students did not consider the use of ARP relevant due to the incomplete state in which it was used (for example one student, stated 'I can see where it is going and look forward to its completion.'); the impractical nature of the 'materials' the students selected; or even the restrictions of the project itself (in relation to previous 'media investigation').

3.43 Questionnaires.

Immediately after using ARP the five students were asked to complete a questionnaire which was designed to find out about: a) students previous experience, and attitude towards computer technology, b) the clarity and success of the explanatory sections within ARP, and c) students' reactions to using ARP and their opinion as to the pertinence of such a device within the creative process. Students were also encouraged to add further comment if they wished.

Participants	MATERIALS SELECTED USING ARP	MATERIALS ACTUALLY USED
E6	Animal hair; Carnivore; Gas in motion; Less common mineral; Coniferous tree roots.	Plastic; Metal; Wood; Stone.
E7	Dragon's blood (gemstone) Cuttlefish & octopus	Plaster; Plastic; Metal; Wood; Rope.
E8	Diamond; Non-ferrous metal; Viscose liquid; Body fluid.	Perspex; Copper; Steel; Wood; Plaster; Red Sandstone.
E9	Foodstuff (animal); Viscose liquid; Powder	Perspex; Wire; Nylon.
E10	Gas in motion; Amphibian; Grains of rock.	Grass; Metal; Plastic; Earth.

Table 9. Comparison between materials selected by participants during use of ARP, and materials actually used.

3.44 Computer technology.

The questionnaires revealed that the 'experimental group' were relatively inexperienced in the use of computers, however, the author observed that all students used ARP with no apparent difficulty; three students thought that they were 'relaxed and in control', whilst two students stated that they were 'unsure of what was going on'. Concerning their attitude towards computer technology, two of the students stated an interest, whilst three were non-committal - no student displayed a total aversion to using it, although one student stated that he was 'rather sceptical' and had 'a few preconceived ideas' about its use. Another student commented that she 'didn't think it (computer technology), had much relevance to sculpture but now realise (having used ARP), that this is not so'.

3.45 Explanatory sections.

The two explanatory sections 'How to use ARP' and 'What is ARP?', proved most difficult to design. Since it can be assumed that potential users would encompass all levels of computer experience the 'How to use' section should be designed to cater for the individual who has never used a computer before. All five students reported this section at least 'satisfactory', and at the most 'excellent' - indicating that it adequately informed them how to use ARP, a fact substantiated by the author who observed that all students used ARP with no apparent difficulty, however, certain passages were observed to be oversimplified and unnecessarily long, resulting sometimes in confusion. One student stated that this section was '. . . a bit long and repetitive'. It was obvious that the design of the 'How to Use' section was far from perfect, however, the basic design proved to be competent.

The aim of the 'What is ARP?' section was to provide a clear and concise description of the nature and function of ARP. Students reported this section to be mostly 'satisfactory', suggesting that the basic design was competent, however, the failure of ARP to influence what the students produced, might, to some degree, be attributable to the contents of this section, or, a failure on the students part to read this section thoroughly. One student commented that they '. . . understood better after actual use of ARP'.

3.46 Using ARP.

Four students reported that it was 'always clear what to do', whilst no one found 'the category titles confusing', although two students said that they would have liked a better description of what each category contained. Only one student did not have a reasonable idea of where they were within the network. No student made use of the 'Note Pad' facility, although this may have been attributable to the fact that they were aware of the author recording their selections (for the author's observational purposes, rather than for their purposes), and therefore presumed that they did not need to do likewise.

3.47 Pertinence of such a device.

One student considered such a 'device' only relevant to sculpture on a conceptual level, however, two others thought it was relevant on both a conceptual and practical level, whilst the remaining two agreed that it was 'stimulating' and had suggested lots of ideas for sculpture. One student thought that ARP 'could be useful when stuck with an idea', whilst another commented that using ARP 'definitely gave me ideas I'd never thought of'. The enthusiasm shown for this extremely 'incomplete' prototype suggested that there would be considerable interest and demand were it to be further developed.

3.48 Conclusions of Experiment 'E'

3.49 The design of ARP.

The information obtained from these questionnaires along with observations made whilst the students were using ARP resulted in the following conclusions.

Prior to this experiment there was a worry that the potential users of such a 'device' might be deterred from using it because of personal attitudes towards using computers in art, however, this did not appear to be a problem with this particular group. Although the behaviour of the participating students whilst using ARP may be described as hurried and uncontemplative it is assumed that this would disappear with further use and outwith a project context.

The two explanatory sections, 'How to use ARP' and 'What is ARP?' appeared

to work sufficiently well, but, if anything, were over simplified and long-winded; it was obvious that these sections could be made more concise and comprehensible.

Regarding the main store of information, the tests indicated that the basic design appeared to be successful in as much that the students were able to 'browse' through the system, making both random and personal selections, and to do so with relative ease. However, several major faults, some of which had been expected, were either identified or confirmed:

a) Before ARP could function as intended it seemed to require an enormous amount of stored information. Students showed disappointment when after only several selections they could go 'no further'. Although a considerable amount of time was spent on collecting information it would appear that only a fraction of the ideal required data had been entered.

b) At every selection point users were offered the option to quit, however, nearly all the students continued making selections until they could go no further. The result of this was that the majority of selections were very specific and therefore impractical to implement. The students did not appear to consider carefully the 'category definition' which explains the consequences of what has been selected. None of the students accepted a general term from an early level, which would have required them to choose an 'element of consideration' from their own personal knowledge. Perhaps, ARP should be used several times (prior to actual use), to get over the initial curiosity of what each and every category contains.

c) The information in ARP (prototype 1), only existed in textual form and the students expressed a desire to see some visual information. 'Hypercard' has the capability to cope with graphic elements and this was considered to be a further possible development.

3.50 Stage 6 - ARP - Prototype 2.

The results and analysis of Experiment 'E' prompted a second phase of development for ARP, including implementation of the above conclusions. Placing sufficient information within each of the 8 principal categories was attempted to ensure that at least several selections could be made from each

category. Examples of visual information were incorporated into the system, and improvements were made to the graphic elements of the visual interface. During this period it became apparent that within the scope of this research, it would be impossible to develop ARP to a state considered anything other than a prototype. Experiment 'E' succeeded in pointing out that, for ARP to function 'as intended', it would require an almost infinite store of information, an obviously impossible goal to attain. Therefore, the second test of ARP was not based upon the assumption that it was finished, but rather, it was working as intended, but by no means was it complete.

3.51 Experiment 'F'.

The aim of Experiment 'F' was, once again, to test the design and functioning of ARP, and people's reaction to it. Unlike the previous project, participants were not asked to produce a piece of sculpture, but were simply observed using ARP and asked to complete a questionnaire.

3.52 General results.

A total of 21 persons were invited to use ARP, the statistical results of which are presented in Table 10.1. Considering each column in sequence, columns 2 & 3 reveal that the participating group consisted of twelve females and nine males, ranging in age from 20 to 49. Column 4 shows that 17 were sculpture students, three were 'sculptors', and one (listed as 'other') described his discipline as 'design / metalwork'. Column 5 indicates that the shortest period of time spent using ARP was 20 minutes, the longest was 70, with the average time of all participants working out at 39 minutes.

Column 6 lists the total number of decisions made; the least was 11, the most was 66, resulting in an average of 32. Columns 7 & 8 indicate whether these decisions were personal or random, showing that four participants made entirely personal decisions, whilst column 9 shows that only three participants made a significant number of random choices, working out at 42%, 53%, and 55% respectively. The bottom row shows that of all decisions made, only 14% were random.

Original in colour.

* S - Sculptor \ SS -Sculpture student \ O - Other

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Participant	Sex	Age	Status *	Time taken (minutes)	Total no. of decisions	Personal	Random	Random choice as %	No. of categories	Substance	Method	Time	Place	Quantity	Quality	Senses	Mind	No. of elements
F1	M	28	SS	45	12	8	4	33	2				2				1	3
F2	F	34	SS	40	31	18	13	41.9	8	1	1	1	1	1	1	1	3	10
F3	M	33	SS	30	34	29	5	14.7	8	1	1	1	1	1	1	1	1	8
F4	M	23	SS	25	11	11	0	0	3	1			1	1				3
F5	F	24	SS	40	32	31	1	3.1	8	1	1	1	1	1	1	1	1	8
F6	F	22	SS	45	64	59	5	7.8	8	1	4	1	2	2	3	4	1	18
F7	M	20	SS	60	44	44	0	0	7	4	2	1	1		6	1	1	16
F8	M	41	SS	35	35	29	6	17.1	8	1	1	2	1	2	1	1	1	10
F9	M	49	S	45	36	17	19	52.8	8	2	1	2	1	2	1	1	1	11
F10	F	20	SS	30	20	17	3	15	4	2	1		1				1	5
F11	F	21	SS	40	20	15	5	25	6	1		1	1	1		1	1	6
F12	M	24	SS	20	29	24	5	17.2	8	1	1	1	1	1	1	1	1	8
F13	F	37	SS	25	20	20	0	0	2							3	6	9
F14	F	22	SS	60	18	8	10	55.5	5	2			1		1	1	3	8
F15	M	20	SS	30	26	21	5	19.2	6	1	1	1			2	1	1	7
F16	F	26	SS	70	66	62	4	6.1	8	1	1	3	8	2	5	3	12	34
F17	M	39	O	45	55	53	2	3.6	8	5	2	2	1	5	3	4	2	24
F18	F	24	S	25	38	33	5	13.2	8	3	1	1	1	1	1	1	3	12
F19	F	30	SS	30	25	24	1	4	3	2						3	7	12
F20	F	26	SS	45	33	31	2	6.1	5			1		5	1	2	2	11
F21	F	30	S	35	26	26	0	0	4		3	1	2			6		12
Average				39 mins.	32.1	27.6	4.5	14%	6	1.8	1.5	1.3	1.6	1.9	2	2	2.6	11.2

Table 10.1 Statistical information of Experiment 'F'.

Columns '10 - 19' display information relating to selection of the eight principal categories and the number of selections made from these categories. Column '10' shows that the average number of categories chosen was six, the least being two, whilst nearly half (48%), of all participants made a selection from all eight categories. Column '19' lists the total number of 'elements of consideration' selected, the least being three, the most being 34, with an average of 11.

Columns '11 - 18' indicate whether a category was rejected (pink), or selected (blue - with a figure representing the total number of selections made from that particular category). This reveals that of the 128 occasions that categories were selected, 64% of the time, only one selection was made from each category. A total of three participants all made one selection from all eight categories. The least selected category was 'QUANTITY' (selected by 66% of participants) and the most selected category was 'MIND' (selected by 95% of participants). In terms of the least number of selections, the least used category was 'TIME' (20 selections), and the most used was 'MIND' (49 selections).

The above figures suggest that the design of ARP has been successful in allowing users to react to it as they wish. The results of this experiment range from participant 'F1', who only received 3 'elements of consideration' from two categories, to participant 'F16', who received 34 'elements of consideration' from all eight categories, indicating that it does not dictate how it should be used. The fact that 48% of participants made selections from all eight categories, indicate that, as with Experiment 'E', the participants initial (and instinctive), curiosity result in users 'exploring' as many of the categories and sub-categories as possible. Similarly, the high ratio in favour of 'personal' rather than 'random' selection, especially when the number of decisions is high (i.e. participant 'F6' - 59 personal/5 random; participant 'F16' - 62 personal/4 random; participant 'F17' - 53 personal/2 random) seems to indicate that users are more than intrigued by the accumulated information alone, with the result that the 'random choice' function is ignored because they are already stimulated by the simple act of having access to, and 'browsing' around, all this information.

3.53 <u>An examination of selected 'elements of consideration' in greater detail.</u>

As stated above, the selected 'elements of consideration', ranged in number from 3 to 34 (by any one participant). Participant 'F4' made 11 decisions (all

personal) from just three categories, resulting in the following selections;

'SUBSTANCE' - 'animal fibre'
PLACE' - 'bog'
'QUANTITY - 'mathematical number'

The above selections would obviously not present too much difficulty concerning practical application, however, as mentioned above, no random selections were made.

At the other extreme, participant 'F16' made 66 decisions, from all eight categories, resulting in the following selections;

'SUBSTANCE' - 'sheep's wool'
'PLACE' - 'oasis'/ 'sea'/ 'puddle'/ 'geyser'/ 'rapids'/ 'loch'/ 'weir'/ 'owl / nebulae'
'TIME' - '5 months'/ '17.43'/ '50'
'METHOD' - 'band-saw'
'QUANTITY' - 'brightness'/ 'gourdy'
'QUALITY' - 'echoing'/ 'crashing'/ 'enveloping'/ 'tingling'/ 'shocking'
'SENSES' - 'video'/ 'computer'/ 'distortion'
'MIND' - 'blemish'/ 'gluttony'/ 'sensualism'/ 'reward'/ 'dueness'/ 'duty'/ 'disrespect'/ 'selfishness'/ 'accusation'/ 'guilt'/ 'judge'/ 'penitence'.

Compared with the previous participant, the amount of information in the above selections would obviously be difficult to 'include' in one piece of work, however, since there are no rules forcing the user to do this, making so many selections should not be discouraged. Even if the user is encouraged to make a piece of sculpture by only one of the above 34 selections, then ARP will have worked.

3.54 Results of questionnaires.

The questionnaires (a proforma is included as appendix 3.7) aimed to gather information with regard to the following;

a) participants' experience and attitude towards computers;
b) their opinion as to the role of chance in their working processes;

c) participants' evaluation of ARP's two explanatory sections, and also the 'notepad' facility;
d) their experience of using ARP;
e) their opinion as to the pertinence of such a device;
f) suggestions as to what might improve ARP;
g) whether they would like to use ARP again.

Participants were also invited to add further comment if they wished, and these, along with the statistical results of the questionnaires shall now be discussed.

3.55 Participants' experience and attitude towards computers (tables 10.2 and 10.3).

Table 10.2 reveals that 90% of participants had used a computer at least once or twice, and that only two participants described themselves as experienced computer users. The success of all participants in using ARP with comparative ease (as observed by the author, and substantiated by the fact that all participants successfully made selections), indicated that any worries regarding the use of a computer as a format for a 'chance-orientated interactive device' were negligible. Table 10.3 shows that 66% of participants were 'interested in the potential of computers in art' whilst 19% were indifferent to their use, and 14% were against their use.

Participants' comments regarding the use of computers in art ranged from an anti-computer attitude, for example,

> "That one's ability in art might someday be measured by his\her computer expertise seems to me immoral."

and

> ". . . useful in design . . . however, as a medium for fine art I find them unacceptable."

to a pro-computer attitude,

> "I like the idea of something so cold and calculated being involved in art."

and

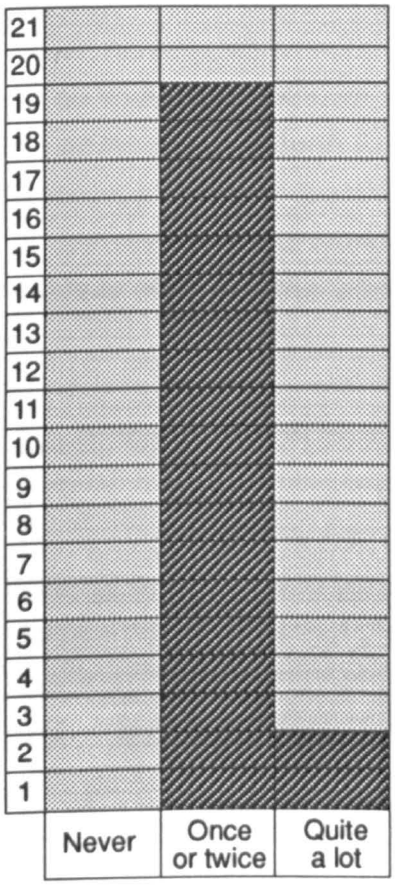


Table 10.2

Participants' previous computer experience.

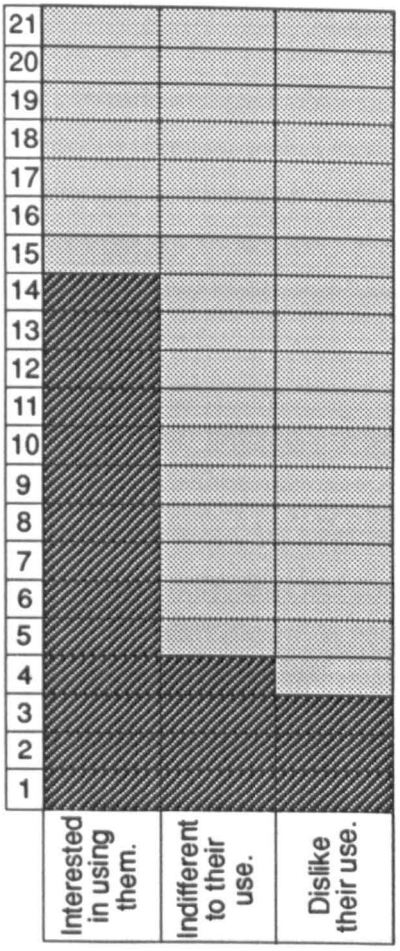


Table 10.3

Participants' attitude towards the use of computers in art.

"Not understood properly regarding their potential - should be used much more widely."

Some of the comments, for example, 'I've never seen any computer art that's interested me', demonstrate one of the main problems concerning the use of ARP, namely, convincing potential users that ARP itself does not have anything to do with what is known as 'computer art', where images may be made on or by computer. Although ARP exists in computer format, the concept of ARP is to encourage greater creativity by encouraging users to make 'real' physical work in the 'real' physical world, and not to make images of sculpture on a computer (unless of course the 'elements of selection' suggest that particular option).

3.56 Participants' opinion as to the role of chance in their working processes.

Table 10.4 presents the results of the question; 'Have you ever made use of chance or accident in your work?'. Rather surprisingly, 90% of those who answered, thought that chance and accident did play a part in their work, and the supporting comments revealed a wide spread interpretation of what chance was and how it entered into their process. Some participants pointed out the chance aspect of materials; '. . . surface finish, irregularities . . which generate conceptual images' and the '. . . acceptance of effects of time / wind / water'. Others pointed out chance aspects of process - 'Started out making one sculpture but ended up using the wood to make another', '. . .haphazardly pinning a piece together', and '. . . by trying techniques or ideas without being sure of the results'. One participant stated that '. . . what materials you have available or can afford' were chance circumstances which affected the final product. Several participants thought that chance was unavoidable, - '. . . can you help it - it always happens', whilst another participant stated that chance affected their process due to '. . . the accident of meeting certain people who give me different opinions'. One student denied the existence of chance altogether, - 'I believe everything happens for a reason and nothing is chance'.

Referring to Section B of the literature review (see 2.45), in which the author suggested that an artist's level of receptivity to chance could be separated into four distinct categories, the above statements would all seem to fit into the second stage, namely, 'casual acceptance/selective use'. Only one participant stated an interest in deliberately using chance: 'I was interested in structure

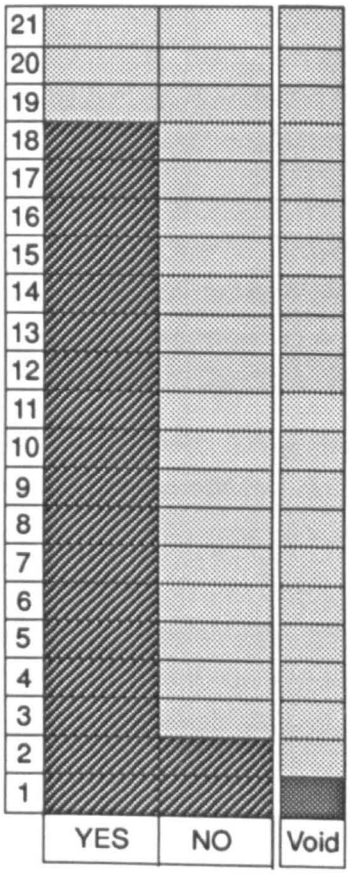


Table 10.4 "Have you ever made use of chance or accident in your work?"

versus random, with reference to games, i.e. dice based versus logic,' (equivalent to the 'deliberate encouragement/selective use' stage).

3.57 Participants' evaluation of ARP's two explanatory sections and the 'notepad' facility (tables 10.5 - 10.7).

Participants were asked to evaluate, on a scale of 1 to 10 (1 = poor, 10 = excellent), how well they thought the 'How to use ARP' section, the 'What is ARP?' section, and the 'Note Pad' facility functioned. Table 10.5 shows the results of the 'How to Use ARP' section. The table shows that 83% of those who used this section gave it a score of either 7, 8, 9, or 10, which suggests that it was functioning as intended. Written comment regarding this section ranged from; 'Very easy to use, self explanatory.', to 'A little too complicated, by the time I'd finished reading them I'd forgotten half of them.' As in Experiment 'E' however, the relevance of the contents of this section only became apparent once students actually began to use ARP, one participant stated, 'Not completely clear after reading first time, but became clear whilst using ARP', whilst another wrote that it '. . . all became clear once started'.

Table 10.6 presents the results of the 'What is ARP?' section, and shows that 79% of those who read this section gave it a score of either 7, 8, 9, or 10. Several of the comments however revealed that participants were still uncertain as to the purpose of ARP, - 'I'm still not sure what ARP is about.', 'wasn't sure about it', and '. . . could explain its potential better.'

Table 10.7 presents the results concerning the 'Note Pad', a facility of ARP which allows the user to write down what has been selected. Again, although the table shows that the 'Note Pad' was marked highly; 74% of those who used it scored it 7, 8, 9, or 10, the comments reveal greater dissatisfaction, ranging from complaints about size, - '. . . there wasn't enough room to list certain categories', to more complicated issues (in terms of programming), for example, that it 'Should record choices automatically. . .'.

Experiment 'F' - results of questionnaires.

Table 10.5 "On a scale of 1 - 10 how well did 'How to use ARP' explain what you had to do?"

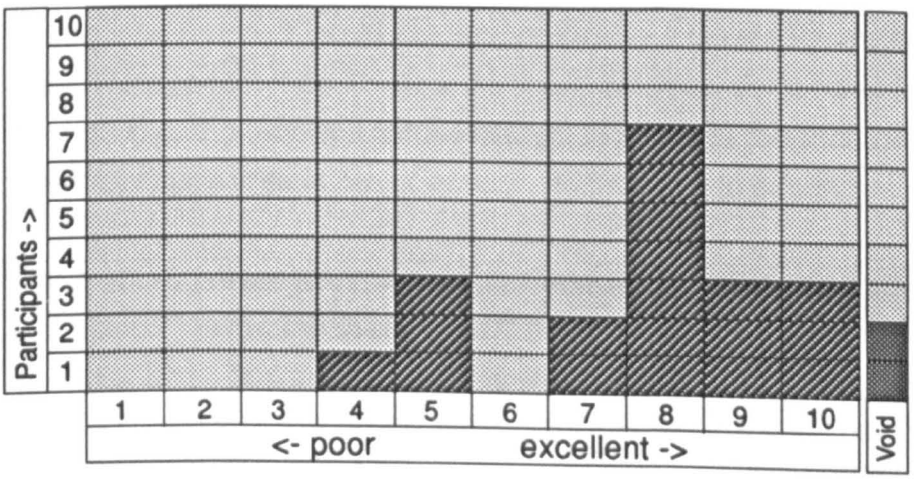


Table 10.6 "On a scale of 1 - 10 how well did 'What is ARP?' explain to you the idea behind ARP?"

Table 10.7 "On a scale of 1 - 10 how well did the 'Note Pad' function?"

3.58 Participants' experience of using ARP (tables 10.8 - 10.11).

Four questions related to the participants' experience of browsing through the information stored within ARP and their opinion as to the relevance of the category titles.

Table 10.8 presents the results to the question; 'Was it always clear what you had to do?' This reveals that whilst 33% thought it was always clear, 66% answered 'no'. Table 10.9 presents the results to the question; 'Did you always have a clear idea of where you were within the network?', revealing that 81% answered 'yes' and only 14% answered 'no'. Although this would seem to suggest that movement through ARP was not complicated, this is perhaps due to the somewhat limited amount of information stored within ARP. Several participants offered their opinion that ARP would require a great deal more information before it could function properly - 'I wanted more options. . annoyed when it stopped.', 'I don't know if it could be possible to have it extensive enough (i.e. the size of a large library)', and '. . . at the moment all it does is tease because their is never enough information to satisfy.'.

Table 10.10 presents the results to the question; 'Did you find the category titles confusing?', revealing that 71% did not, whilst 24% answered 'yes'. The results of Table 10.11 however, show that when asked; 'would you have liked a more detailed description of each category?' opinion was about even; 52% answered 'yes' compared to 43% who answered 'no'. In general terms, the participants were sometimes unsatisfied with the category titles, mainly when they contained elements which the user did not expect, for example, one participant states 'I was misled into taking certain choices'. This problem emphasized the difficulty in attaining a universal classification within ARP, whereby, categories clearly and unambiguously stated their contents. Although it was recognised that the taxonomy of ARP was far from 'clear and unambiguous', it was not considered to be too serious a problem. It is suggested that such a weakness, rather than detract from ARP, may in actual fact contribute positively to ARP, by being looked upon as an 'inbuilt erroneousness' which complemented the random nature of the device by confronting users with 'elements of consideration' that they had not expected to see.

Another participant felt that the contents and classification of such contents '. . . should come from different mind sources . . . ' (i.e. not just the author's), otherwise it would '. . . reduce the scope of awareness'. It is acknowledged that

Experiment 'F' - results of questionnaires.

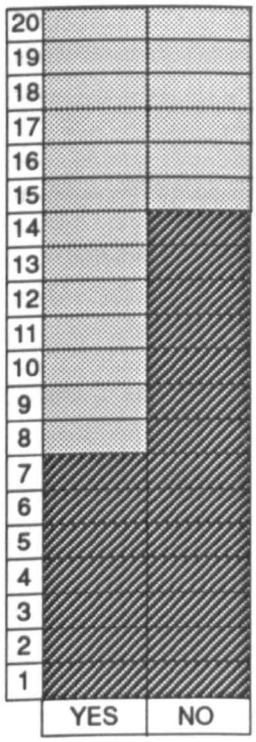


Table 10.8
"Was it always clear what you had to do?"

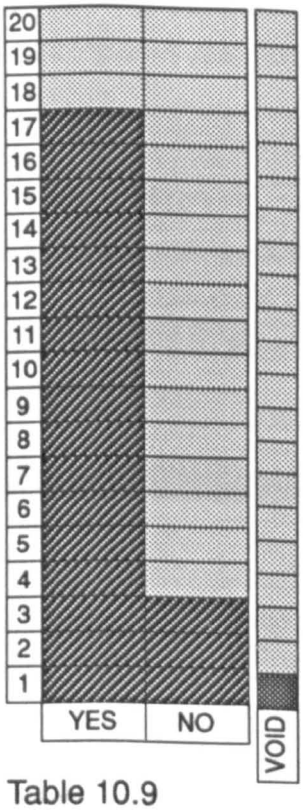


Table 10.9
"Did you always have a clear idea of where you were within the network?"

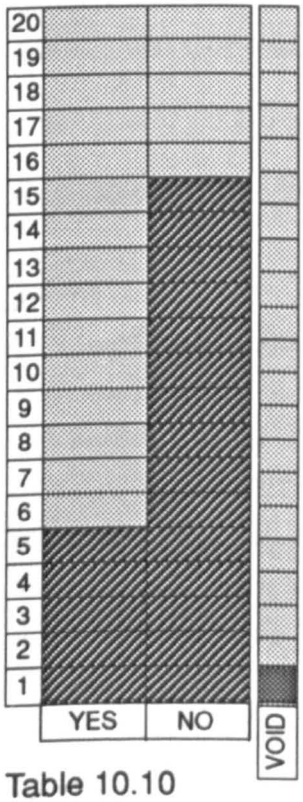


Table 10.10
"Did you find the category titles confusing?"

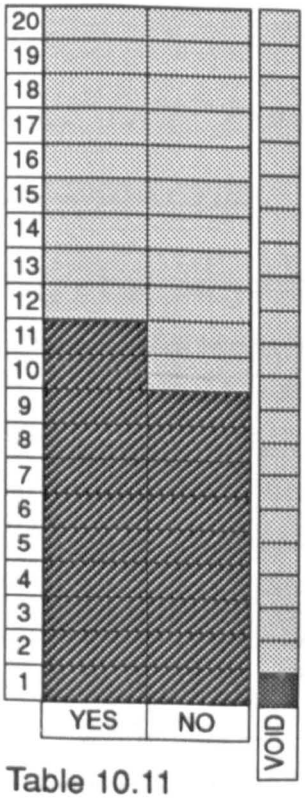


Table 10.11
"Would you have liked a more detailed description of category contents?"

the taxonomy may be open to such criticism, however, the contents were not simply based upon the authors personal knowledge, but were compiled following consultation with a number of relevant sources, such as encyclopaedias and other reference books.

Table 10.12 indicates that 62% of participants felt that, whilst using ARP they were 'relaxed and in control'; 29% admitted they were 'concentrating on using ARP rather than thinking about sculpture'. The written comments reveal that most participants felt that ARP would be most useful to them only after they had used it several times, for example,

> ". . . if I was more used to computers, and especially ARP, the programme might have been more thought provoking".

The circumstances in which the participants used ARP may also have deterred them from more serious contemplation, one participant stated

> ". . . the thing was just new to me and you (the author) were sitting there watching all the time and that pressured me."

Such comments confirmed the obvious, that to receive the full benefit of ARP, users would have to become familiar with it, and use it when they wanted to, rather than when asked.

3.59 Participants' opinion as to the pertinence of such a device.

Table 10.13 shows that no participant thought that using ARP was 'completely pointless', whilst only one participant agreed with the statement that 'using ARP was interesting but not relevant to making sculpture'. 14% agreed with the statement that 'ARP was relevant to making sculpture only on a conceptual level', whilst most participants, 43%, agreed with the statement that 'ARP was relevant to making sculpture on a practical as well as conceptual level'. 24% thought that 'using ARP has been stimulating', whilst the remaining 24% did not agree with any of the above statements, preferring to write their own comments. These, along with the other participants statements, ranged from those who considered ARP pertinent only to a limited degree,

> ". . . some relevance but really only on a superficial level."

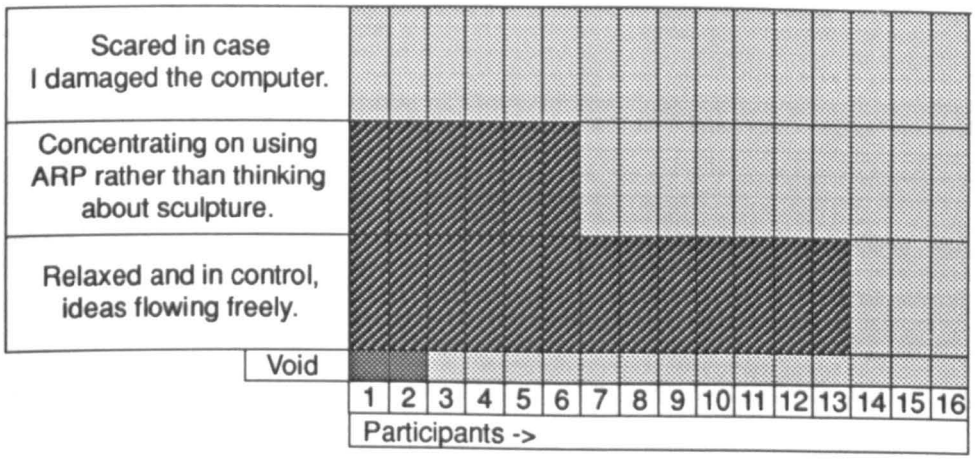


Table 10.12 "How did you feel when you were using ARP?"

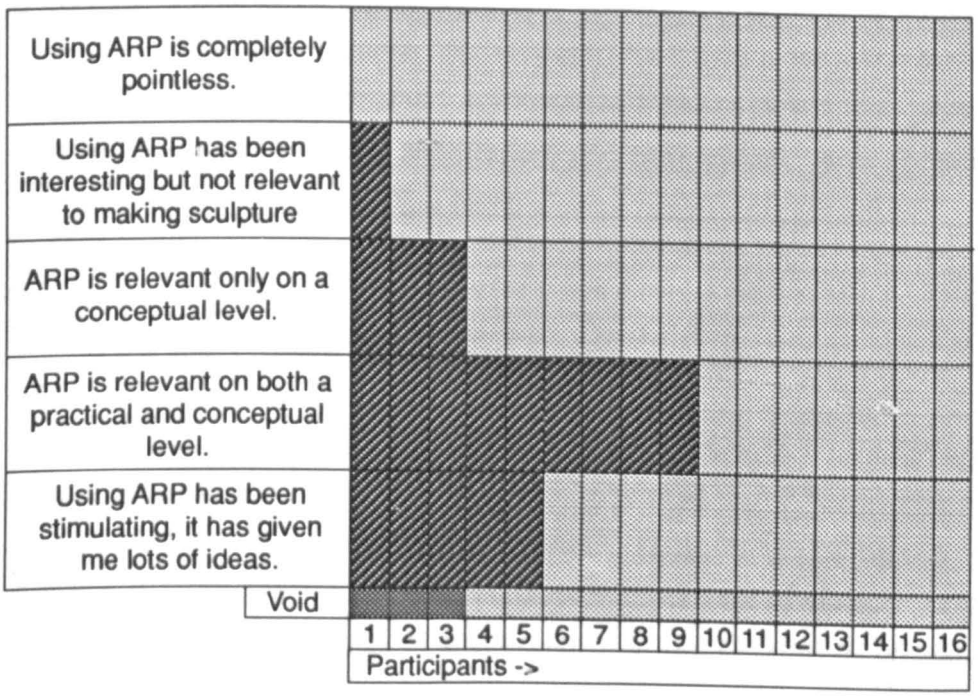


Table 10.13 "Which of the following statements do you agree with?"

to those who considered it pertinent to a greater degree;

> ". . . using ARP is interesting, stimulating and fun",
>
> ". . . very stimulating - created a mental springboard - has the germ of enormous potential.";
>
> ". . . a means of challenging your own established approaches to making sculpture."

One participant stated a personal reservation to such a device, 'do we really want all our answers on a disc on a plate in front of us?' The answer to this is that ARP does not provide any answers whatsoever; having used ARP, it is up to the user to 'create' a piece of sculpture from what ARP has suggested, the selections themselves do not constitute an answer!

3.60 Participants' suggestions as to what might improve ARP.

The majority of statements offering suggestions as to how to improve ARP referred to the content, especially the desire for more information (see statements above). Other suggestions included; '. . form as a principal category'; 'more in-depth information'; 'more options'; 'visual element'; 'graphics'; 'the use of colour, more illustrative'; and a 'drawing facility'. Although several participants described ARP as a 'simple system', one participant thought that ARP was 'too methodical and categorized' and consequently that the 'chance button was a little tame'.

3.61 Would participants like to use ARP again?

Table 10.14 shows that when asked 'would you like to use ARP again?' - 76% of all participants said 'yes' whilst only 14% said 'no'. The participants who answered 'no', did not provide any specific reasons why they did not wish to use ARP again, however, since such a device could not obviously be expected to appeal to everyone, it was encouraging that this figure was so low.

The participants were also asked to describe what they thought ARP was, their answers ranged from those who emphasized the highly structured nature of the system, describing it as - a 'computer programme' or a 'computer

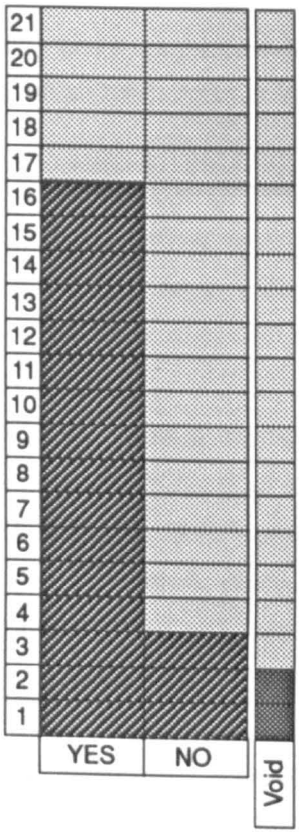


Table 10.14 "Would you like to use ARP again?"

questionnaire', to those who perceived it more as a reference facility, i.e. - 'an information source', 'an information bank', and 'a multiple choice', to those who emphasized its relevance to creativity, describing it as - 'an ideas sheet', 'an idea generator ', and 'an encyclopedia of possibilities'.

3.62 Conclusions of Experiment 'F'.

The interest and enthusiasm shown by participants who used ARP was very encouraging. The success of all participants in using ARP, by being able to move through the system, making both random and personal selections, demonstrated that the overall basic design had proved itself to be competent. Similarly, the wide range in both number and type of selected 'elements of consideration' suggested that users were 'interacting' with ARP and not simply following instructions.

By far the most common criticism was the small amount of information that ARP contained. Participants were disappointed when they were not offered any further sub-categories, and, although ARP contained reference to over ten thousand individual items of information, such a number was apparently far short of what would satisfy users, and still further short of what would be required if ARP was to be considered anything other than a prototype. It was not considered feasible to try to increase the informational content of ARP for the final experiment however, as the amount required to make any significant difference could not be achieved within the limits of this research.

The second most common criticism was the lack of visual information contained within ARP. As stated previously, 'Hypercard' has the facility to store visual imagery, however, ARP did not contain any at the time of Experiment 'F' due to the time-consuming nature of the 'scanning' process, coupled with the fact that the storage of visual images would have greatly increased the required 'memory' capacity of the computer. It was decided however that a certain amount of visual information should be placed within ARP simply to demonstrate the visual possibilities.

The results showed that a significantly low number of participants had made use of the 'random choice' facility - only 14% of all decisions were random, whilst only two participants made more random choices than personal (53% and 55% respectively). It is suggested that a reason for this may be due to the fact

users appeared to be preoccupied with, and intrigued by, the information itself. The ready availability and wide range of information seemed to be enough to 'stimulate' many of the participants, with the result that the 'random choice' facility was forgotten. In order to counteract this tendency, it was decided to build into ARP an additional facility, one which allowed users to decide randomly whether to make a random or personal choice. This had been a feature of the 'flowchart' 'C.O.I.D.', but had not been incorporated into the Hypercard 'C.O.I.D.' as it was considered unnecessary at that time, however, these tests seem to prove otherwise. Its re-introduction aimed to increase the number of random choices made, but not in an excessively dictatorial manner.

Participants in Experiment 'F' still showed little desire to stop making selections until they could go no further, although not to the same degree as the participants had done in 'Experiment E'. The problem remained as to how to get users to accept selections from the upper levels, i.e. those which contained general terms, rather than always end up making their selections from the lower levels. As with the above problem, in order to counteract this tendency, an additional facility was created, namely, one which allowed users to decide by chance whether they proceeded to make a further selection, or accepted the selection they had just received.

The author observed that participants' behaviour whilst using ARP was generally hurried and 'uncontemplative', and, although this was attributable to some degree by the authors presence and nature of the event, it was felt that an attempt must be made to ensure that users actually think about sculpture whilst using ARP, rather than afterwards. Although one participant requested that a 'drawing' facility be incorporated into the design (reasonably simple to accomplish), it was felt that the majority of potential users would be unfamiliar with using a computer to draw with, therefore, it was decided that in future, all users would be instructed to use ARP in conjunction with a sketch-book, so that notes may be taken and ideas worked out. This was not only seen as a solution to the problem of getting people to think about sculpture whilst using ARP, but also an ideal way of combining the more traditional method of drawing in a sketch-book with this 'untraditional' technique of working with a computer.

A final observation made by the author concerned the way in which participants approached ARP in terms of what they selected. The results seemed to fall into either of two categories, one of which was expected, the other was not. Firstly, some participants used ARP as intended i.e, they browsed through the

information, and made selections, either by personal choice or random choice, the result being that ARP introduced new 'elements of consideration' into their consciousness. However, several participants used ARP in a way previously unforeseen; rather than select 'elements of consideration' unknown to them, their selections only reflected their current interests and concerns at that time, apparently in the belief that ARP was some sort of 'sinister tutorial device'! - which revealed their innermost secrets for all to see.

Following these above alterations to ARP, it was considered ready to be used in a final experiment which would involve 'prominent' sculptors.

3.63 Stage 7 - Experiment 'G' (prominent sculptor's experiment).

Whereas experiments 'E' and 'F' were primarily concerned with testing the design and accessibility of ARP, Experiment 'G' aimed to assess the intended utility of ARP as a stimulus to encourage new sculptural creativity through the utilization of chance. A recurring criticism of ARP in previous experiments had been the lack of information within the system. Such criticism simply confirmed what the author already suspected, that the success of ARP was significantly dependent upon containing vast stores of information. Although the author was sympathetic to such criticism, it was recognised that it was beyond the scope of this research to significantly increase the quantity of information.

3.64 Description of Experiment 'G' and a proposed exhibition.

Throughout its development, ARP had mainly been tested on sculpture students. As a final 'test', it was proposed that a number of 'experienced' sculptors (that is, persons with an established creative process), should use ARP, and that the resulting sculptures should be presented in an exhibition. It was felt that, ideally, such an event should be an important part of the experiment; however, due to financial difficulties and circumstances beyond the author's control, the proposed exhibition could not be realised.

3.65 Criteria for selecting sculptors.

A letter was sent out to a total of thirty practising sculptors, inviting them to

participate in the experiment (see appendix 3.8). Two major factors influenced the decision as to the number and identity of those who were invited to take part: firstly, and most importantly, a desire to ensure a wide range of different 'types' of sculptor, and secondly, practical and financial considerations that such an undertaking would naturally involve (considerations based upon the assumption that an exhibition would occur), dictated that the majority of those invited were within a reasonably close geographical location. An initial list, drawn up by the author was added to through discussion with other sculptors and sculpture lecturers. Although it is recognised that the selection of sculptors may be open to criticism of expediency, due to the previous connections of the author with several of those invited, such criticism would be rejected by the author on a number of points: firstly, the familiarity is with the author, not the research (perhaps unavoidable in the 'small world' of sculpture): secondly, as professional persons, it was presumed that they would adopt a critical viewpoint: thirdly, there was no way of knowing who, out of the thirty invited sculptors, would actually take part, as this was subject to several factors (for example, it was presumed that if an exhibition was to go ahead, representatives of any art gallery involved would have considerable influence in selecting the participating artists).

The thirty invited sculptors therefore aimed at a wide representation of 'styles' (i.e. the sample included a stone carver, an installation artist, a person primarily known as a painter but who had recently began to exhibit sculpture, a person from a design background but with an interest in sculpture, a sculptor who had previously worked with computers, someone who had never used a computer.). Obviously it was not expected that all those invited would reply, however, in what was considered to be an excellent response, a total of seventeen persons indicated that they were interested in the idea behind the research and were willing to participate in the proposed experiment. Several others expressed an interest in the proposal but were unable to take part due to previous commitments.

Due to financial restrictions the actual number of sculptors taking part in Experiment 'G' was ten, however, it was thought that these ten practicing sculptors provided an extensive range of both sculptural 'style' and experience.

3.66 Description of experimental conditions.

During the actual experiment, which participants undertook individually, the author attempted to promote as informal an atmosphere as possible in order to try and encourage a natural and relaxed response. Following a brief explanation of ARP, in which the author familiarised participants with how to use ARP, participants were left to explore and use the system on their own. It was emphasised by the author that there was no preferred approach to using ARP, and that it was entirely up to the individual as to the number of selections made, and how they made them (either personal or random). Whilst using ARP, participants were requested to record their selections and indicate whether they had been made by personal or random choice. In addition, once they had finished using ARP, they were asked to fill in a questionnaire (see proforma - appendix 3.9).

3.67 General results of Experiment 'G'.

A total of 10 'experienced' sculptors used ARP, the statistical results of which are presented in Table 11.1. This reveals that the least experienced, 'G8', had been making sculpture for 4 years, whilst the most experienced, 'G9', had been making sculpture for 30 years. The average years of experience of all ten participants worked out at just over 14 years (all these figures refer to post-art school activity). The average length of time taken by participants was 62 minutes, the quickest being 30 minutes (G1 & G6), the longest being 95 minutes (G3). The total number of decisions by each participant ranged from 11, by 'G5', to 121, by 'G9'. The average number of decisions being 64. The least number of decisions made by personal choice was 0 (G7), whilst the most number of decisions made by personal choice was 91 (G9). Decisions made by random choice display a similar range of extremes, the least number of random decisions was 3 (G5), whilst the most was 92 (G4). Looking at the participants number of random decisions as a percentage of their total number of decisions, the figures reveal a wide range, from participant 'G10', who only made 14.3% random choice, to participant 'G7', who made 100% random choice (the first person to do so in any of the experiments). This experiment also contained the highest average percentage of random choices, 55.4%. (Experiment 'A' - 36.2%, Experiment 'F' - 14%).

1	2	3	4	5	6	7	8
Participant	Sex	No. of years experience.	Time taken (minutes)	Total no. of decisions	Personal	Random	Random choice as %
G1	F	9	30	39	20	19	48.7
G2	M	25	40	44	7	37	84.1
G3	M	15	95	89	19	70	78.6
G4	M	18	75	120	28	92	76.7
G5	M	10	50	11	8	3	27.3
G6	F	10	30	34	24	10	29.4
G7	F	5	81	51	0	51	100
G8	M	4	90	93	54	39	41.9
G9	M	30	90	121	91	30	24.8
G10	M	15	40	42	36	6	14.3
Average		14	62 mins.	64.4	28.7	35.7	55.4

Table 11.1 Statistical information concerning Experiment 'G'.

3.68 Results of questionnaires.

The following information has been obtained from the questionnaire that participants were asked to complete (see proforma, appendix 3.9). Pages 1-3 of the questionnaire sought to gather information regarding the participants' personal creative process, along with their experience of, and attitude towards, the use of computers in art, whilst pages 4-9 of the questionnaire sought to gauge participants' reactions to using ARP and their opinions as to the relevance and pertinence of such a device.

3.69 Table 11.2.

Participating sculptors were required to indicate their position, on a scale of eight pairs of 'sculptural' polarities, the characteristics which they felt best described their work. Table 11.2 demonstrates that as intended, the sample covered a wide range of sculptural 'styles', for example, out of the sixteen possible extreme points on the graph, nine have been circled. Similarly, out of 80 possible points (i.e. if all ten participants circled a different point), 44 have been circled, or 55%. The visual 'spread', evident in table11.2, along with the statistical information prove that the selected sculptors were a non-biased sample.

3.70 Tables 11.3 & 11.4.

Participants were asked to consider to the following statement:

> There are two types of chance -
> 'Undeliberate' chance - something happens unexpectedly.
> 'Deliberate' chance - you want something randomly.

Table 11.3 shows that when asked 'Have you ever made use of 'undeliberate' chance in your working process?' All participants answered 'YES'. Similarly, Table 11.4 shows that when asked 'Have you ever made use of 'deliberate' chance in your working process?', perhaps more remarkably, the response was the same, with all participants indicating 'YES'. Such an overwhelmingly positive response might prompt criticism that these persons were invited to participate as they were known to be sympathetic to the idea of using chance, but this is

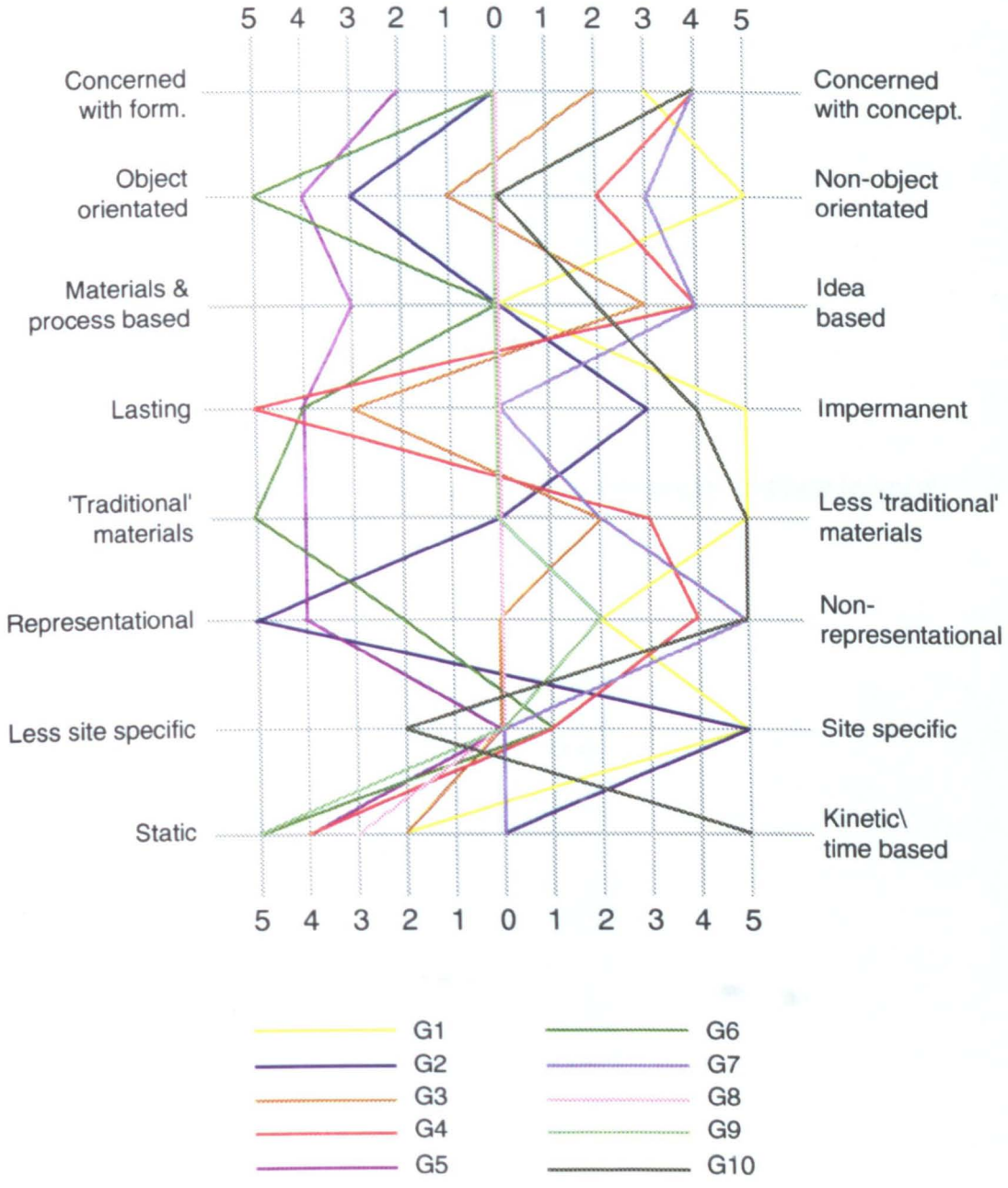


Table 11.2 Graph representing each participant's process.

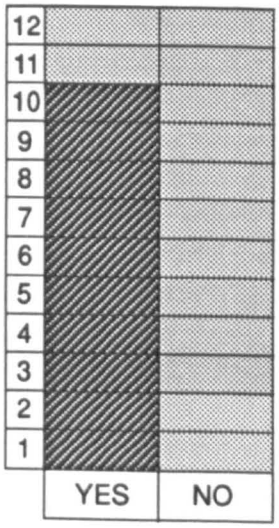


Table 11.3 "Have you ever made use of '**undeliberate**' chance in your working process?"

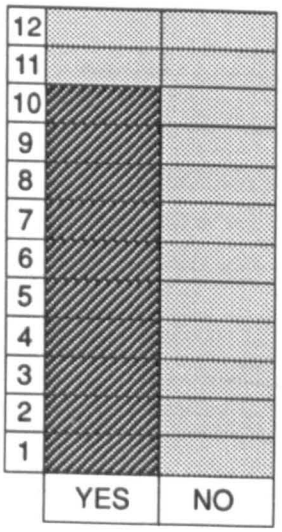


Table 11.4 "Have you ever made use of '**deliberate**' chance in your working process?"

not so. One participant stated that they thought chance 'Forms a natural part of my working process, which I believe is quite common?' Another comment highlighted one of the problems identifed previously with involving chance, that is, the physical nature of sculpture:

> "The use of 'deliberate' chance is limited when using 'traditional' materials so that while I would like to use it more often I am usually limited by the physical properties of the materials I use."

These results would seem to indicate that chance is an extremely common component, ever-present in many artists' creative processes, but receiving little or no acknowledgement of the contribution it has made - active but silent.

3.71 Tables 11.5 & 11.6.

The next two questions also aimed to find out more about the participants' personal working process in particular, and the creative process in general. They were asked to consider the following two statements:

> I always end up with what I set out to make.
> I rarely end up with what I set out to make.

and circle one number on a scale, which best described their process in relation to the above. As can be seen in Table 11.5, this resulted in a somewhat balanced response, with 50% tending towards 'Always', 20% tending towards 'Rarely', whilst the remaining 30% felt that their process demonstrated both cases equally. Participants' comments appeared to confirm the idea of an indeterminate goal, as identified in literature review. One stated that 'I always begin with an intention, . . .not knowing how the answer looks', whilst another stated 'I never set out with a finished product in mind - I always have an idea or theme to follow, . . '.

In a similar mode, participants were asked to consider the following two statements:

> My process always involves a great deal of planning.
> My process rarely involves a great deal of planning.

Table 11.6 again shows an extremely balanced response, with 40% of

Experiment 'G' - results of questionnaires.

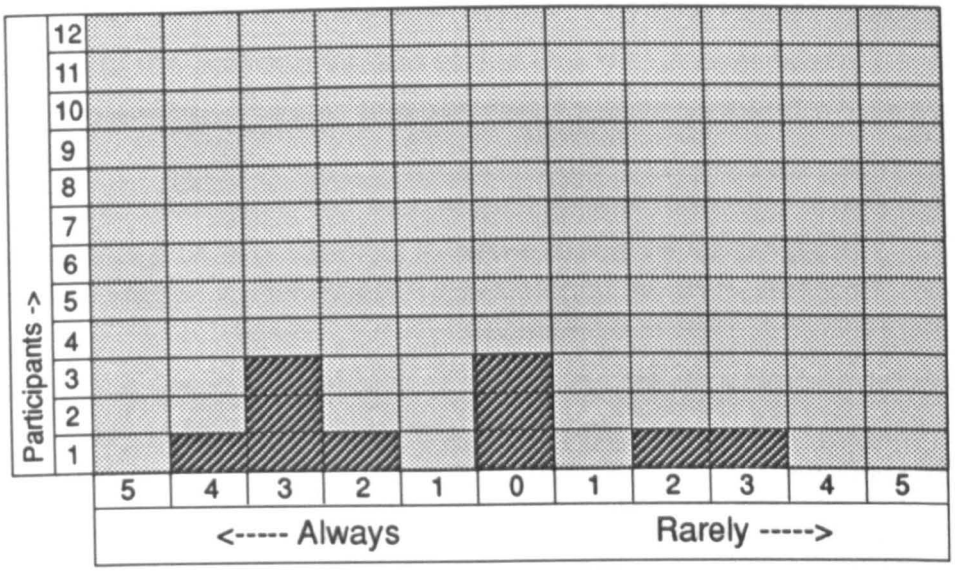


Table 11.5 "I **always** end up with what I set out to make."
"I **rarely** end up with what I set out to make."

Table 11.6 "My process **always** involves a great deal of careful planning"
"My process **rarely** involves a great deal of careful planning."

participants stating that they felt their process contained equal elements of both situations, whilst, 20% tended towards 'Rarely', and 40% tended towards 'Always'. One of the participants who stated that his process 'always' involved a great deal of planning, revealed that this was so as to enable the 'unexpected' to take place:

> "The careful planning attempts to leave space for, or create a condition whereby spontaneous reaction can be an ingredient."

Other comments confirmed the idea of a dynamic creative process in which the sculptor is ready to respond to any new possibilities which may present themselves at any stage; 'My process involves a certain amount of planning and also alterations and development, as the work progresses', and 'The idea is always strong, but careful planning would rule out opportunities opened up by breaks or other characteristics of the material.'

3.72 Tables 11.7 & 11.8.

The next two questions related to participants' previous computer experience and their opinion as to the use of computers in art. Table 11.7 shows that 60% had only used a computer once or twice, although the sample also included 'experienced' users, and one person who had never used a computer before. Table 11.8 shows that 80% of participants were 'interested in the potential' of computers in art, whilst the remaining 20% were 'indifferent'. Again, although this may appear to be a somewhat biased sample, the author did not deliberately set out to invite persons known to be interested in computers (indeed, of the original thirty invited sculptors, only two were known to work with computer technology). This high response is seen as an indication of the extent to which computers now seem to have been accepted as an artistic medium. A typical comment reflects a somewhat pragmatic approach, 'they are as good as they render the idea effective and successful.'

3.73 Table 11.9.

Although not a particular criterion of this experiment, Table 11.9 shows that the majority of users found ARP simple to use, a fact reflected in the comments also: 'very easy to use. . ', 'easy and enjoyable', etc. The simplicity was further

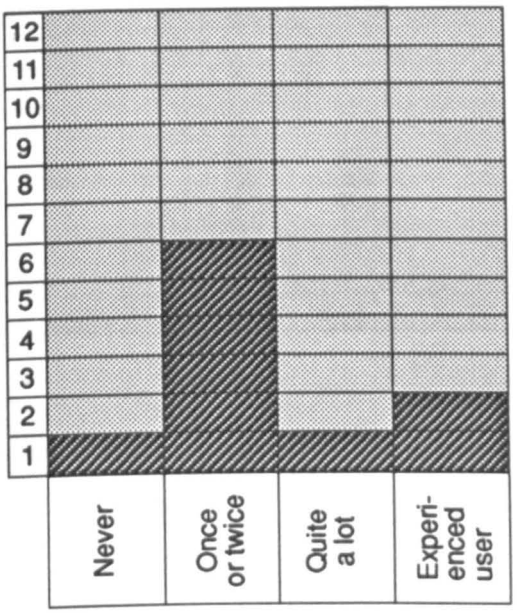


Table 11.7

Participants' previous computer experience.

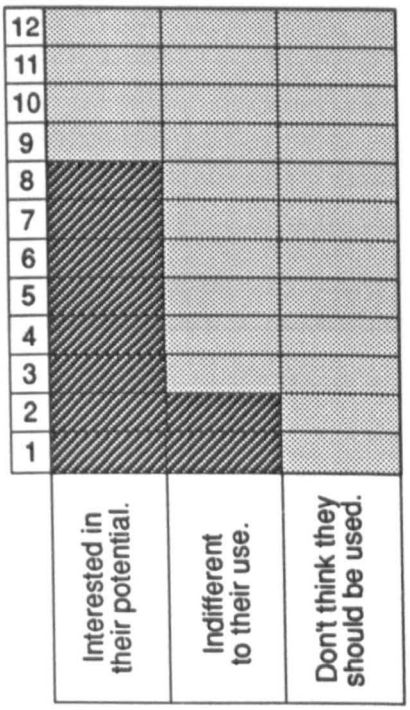


Table 11.8

Participants' attitude towards the use of computers in art.

Experiment 'G' - results of questionnaires.

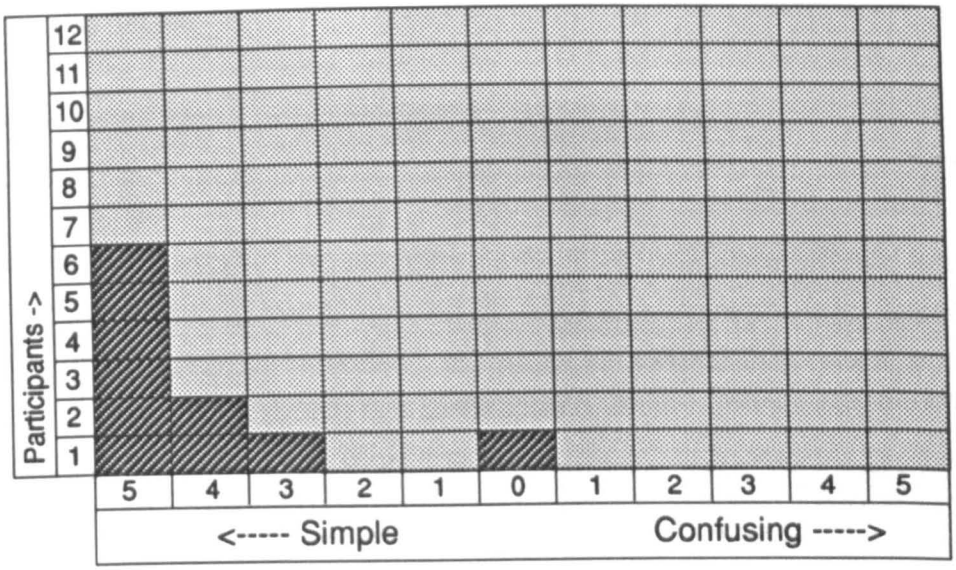


Table 11.9 "Did you find using ARP simple or confusing?"

Table 11.10 "How did you feel when you were using ARP?"

substantiated by the fact that during the experiments, at no time was the author called upon to assist.

3.74 Table 11.10.

This table shows that all of the participants felt that they were relaxed and in control, with 40% stating that they were thinking about sculpture (or 'painting or drawing' as one person commented), whilst the remaining 60% were 'not thinking about sculpture', which one participant felt was unnecessary, 'ARP (was) interesting as a concept other than one whose application is geared towards sculpture.'

3.75 Tables 11.11 & 11.12.

These questions were concerned with participants' opinions as to the categorisation and taxonomy of ARP. Table 11.11 shows that all ten sculptors considered the eight principle categories to be 'Satisfactory', however, Table 11.12 shows participants to be slightly less happier with the classification of information within each of the eight categories, with at least two persons indicating that they felt the taxonomy to be very 'Unsatisfactory'. The comments indicated that this response may have been instigated by the lack of information, rather than the classification of available information: 'I would like to chase a subject deeper', 'needs to be expanded', 'more extensive, more levels', and 'limited amount and variety.'

3.76 Tables 11.13 - 11.17.

The following five statements were presented to participants who were asked to select from one of six possible answers which, as one can see from the tables, ranged from 'disagree strongly' to 'agree strongly'.

Table 11.13 asked participants to respond to the statement - '*Using ARP has been completely pointless*'. As one can see, 80% of participants disagreed with this statement to some extent, whilst the remaining 20% agreed. (At this stage it should be explained that one participant, 'G2', ticked both 'disagree strongly' and 'agree strongly' not only in this question but the next four as well. The two

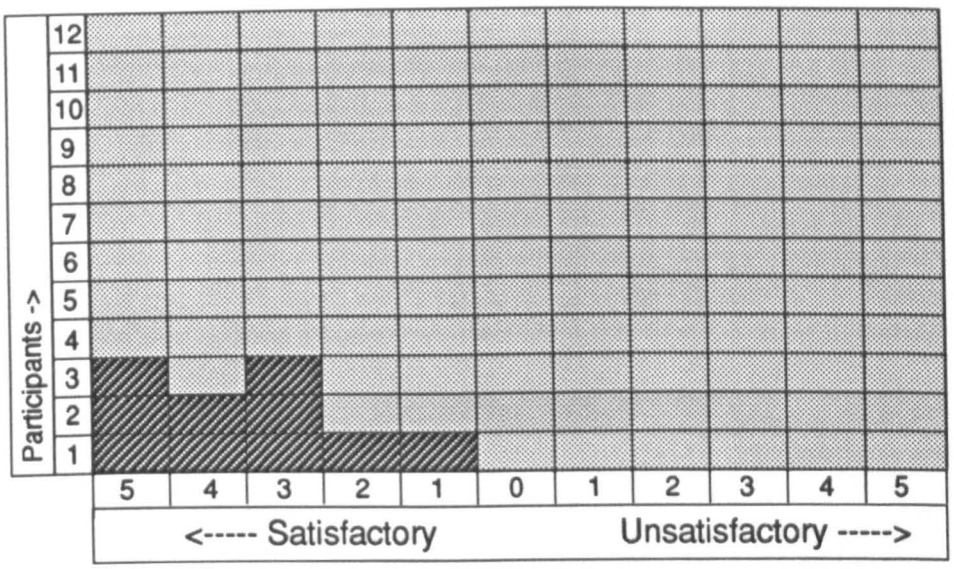


Table 11.11 "Did you find the eight principle categories satisfactory or unsatisfactory?"

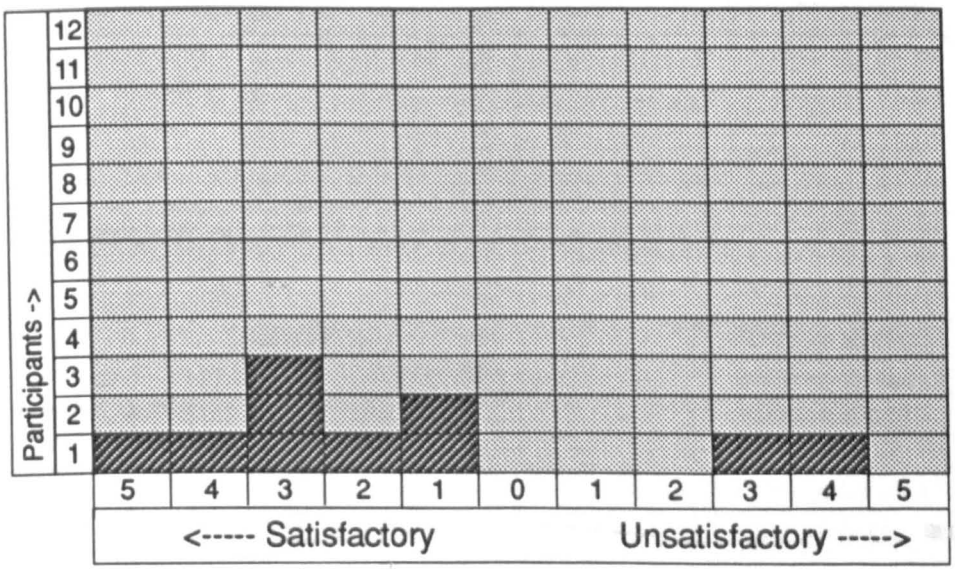


Table 11.12 "Did you find the classification of the other categories satisfactory or unsatisfactory?"

Experiment 'G' - results of questionnaires.

"What are your reactions to the following statements?"

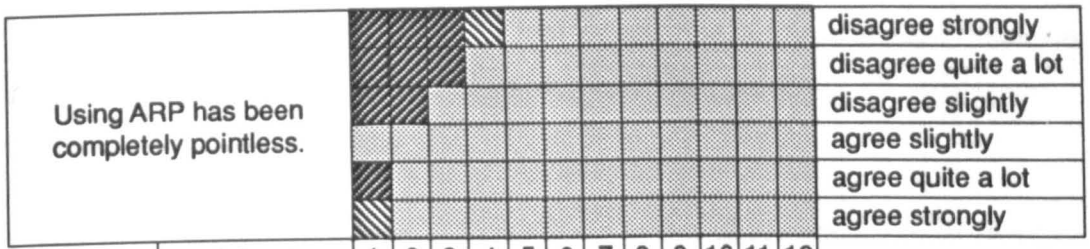


Table 11.13	Participants ->	1	2	3	4	5	6	7	8	9	10	11	12

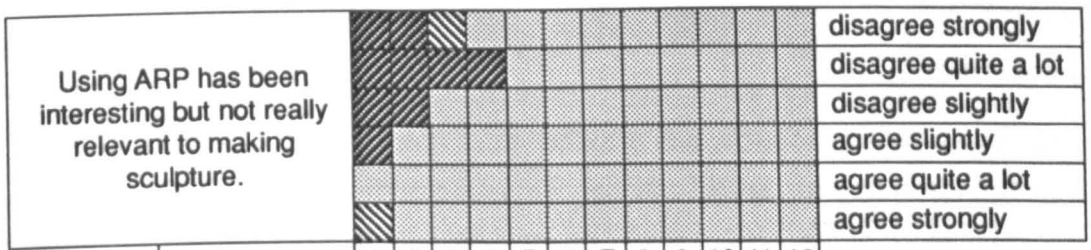


Table 11.14	Participants ->	1	2	3	4	5	6	7	8	9	10	11	12

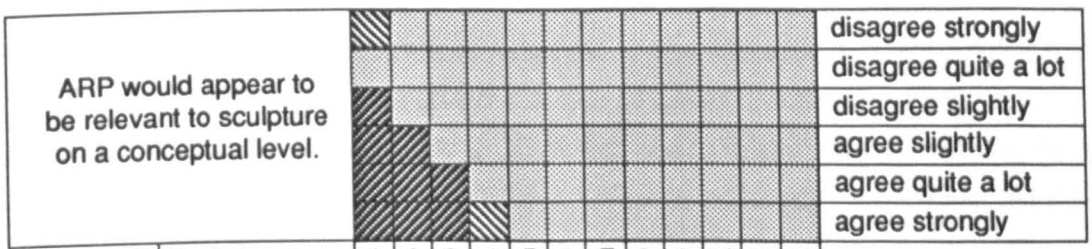


Table 11.15	Participants ->	1	2	3	4	5	6	7	8	9	10	11	12

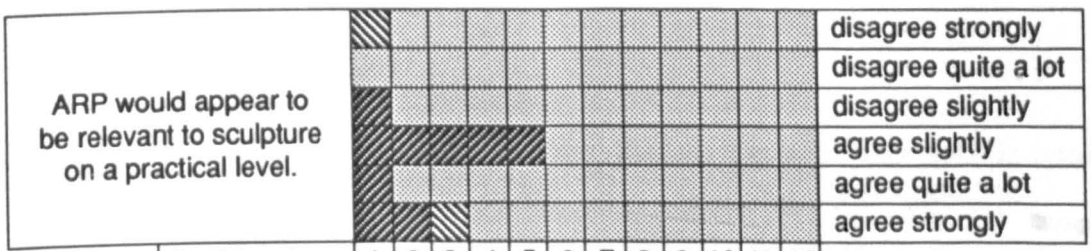


Table 11.16	Participants ->	1	2	3	4	5	6	7	8	9	10	11	12

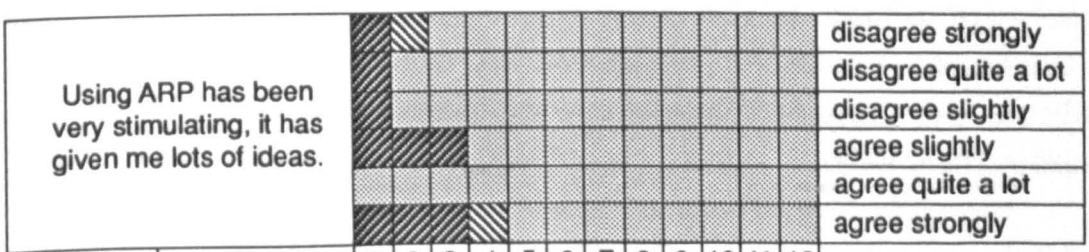


Table 11.17	Participants ->	1	2	3	4	5	6	7	8	9	10	11	12

lighter grey boxes in each table represents participant 'G2's answers).

Table 11.14 asked participants to respond to the statement - '*Using ARP has been interesting but not really relevant to making sculpture*'. Again, the majority of participants, 80% disagreed with this statement to some extent, however one person agreed slightly (excluding participant 'G2', who has already been discussed).

Table 11.15 asked participants to respond to the statement - '*ARP would appear to be relevant to sculpture on a conceptual level*'. 35% agreed 'strongly', 30% agreed 'quite a lot', 20% agreed 'slightly', whilst only one person (10%), disagreed 'slightly'.

Table 11.16 asked participants to respond to the statement - '*ARP would appear to be relevant to sculpture on a practical level*'. In this case, 50% of participants agreed 'slightly', 10% agreed 'quite a lot', and 25% agreed 'strongly'. Only 'G2' disagreed 'strongly', but of course, agreed 'strongly' as well.

Table 11.17 asked participants to respond to the statement '*Using ARP has been very stimulating, it has given me lots of ideas*' . Although 35% of participants agreed 'strongly', and 30 % agreed 'slightly', the remaining three participants disagreed 'slightly', 'quite a lot', and 'strongly', which meant that 35% disagreed with this statement to some extent.

3.77 Tables 11.18 - 11.20.

Table 11.18 records the response to the question 'Do you think ARP is useful to 'experienced' sculptors'? 70% of participants answered 'YES', whilst the remaining 30% felt unable to respond. A general agreement focused upon the success of ARP being dependent upon a sustained openmindedness of the person using ARP. One person thought it would only be useful to 'experienced' sculptors who were '. . . open to new possibilities', and another person that ARP would be '. . . more useful to sculptors who work with an open mind'. Another person commented that it was not particularly useful '. . . other than breaking 'bad habits' making 'lazy sculptors' think about alternatives', whilst one participant thought that 'The system could be useful to sculptors who feel their work is getting stuck in a groove . . '.

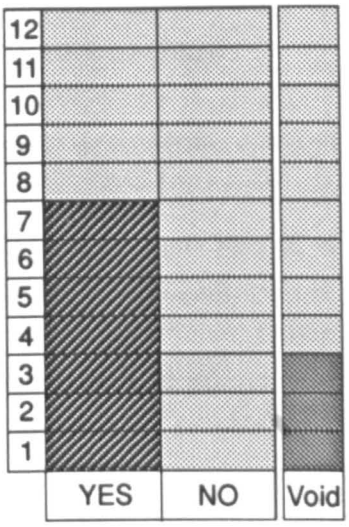


Table 11.18 "Do you think ARP is useful to 'experienced' sculptors?"

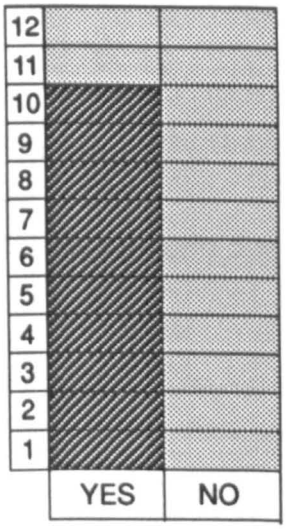


Table 11.19 "Do you think ARP would be useful as an educational device?"

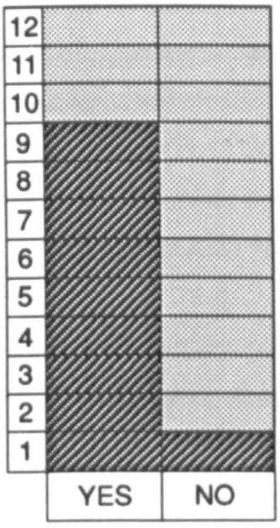


Table 11.20 "Would you like to use ARP again?"

In answer to a similar question 'Do you think ARP would be useful as an educational device?' Table 11.20 shows that an overwhelming 100% indicated 'YES'. Although one person stated 'I still prefer people as educational devices', other comments included 'Very useful in helping to stimulate thought processes and development of ideas'.

Asked whether or not they would like to use ARP again, Table 11.21 shows that 90% of participants said 'YES', whilst only one person said 'NO'. The reason that this participant gave for not wishing to use ARP again was due to the intimate nature of the sculptor's creative process:

> "My work is about things personal to me, that hold a personal magic. ARP's selections are too immediate and impersonal in most cases."

This important point is discussed in greater depth in the next chapter (see 4.12)

The questionnaire also invited participants to respond to the selections that they had made. In answer to the question 'What is your initial reaction to the selections?', comments ranged from 'Dismay', to 'appropriate' and 'Intrigued'. One participant made the rather obvious but important point 'I would not have made these selections without ARP'. The next question asked if the selections appeared relevant to their previous work. The comments tended to suggest that they did not, with answers ranging from 'No', 'Not at all', and 'Not particularly', to 'uncertain', 'partly', 'some do', 'approximately' and 'absolutely'. Asked whether they could make a piece of sculpture based upon their selections, nearly all participants answered yes, however, when asked wheter the prospect of making such a piece would excite them, attitudes changed somewhat. Although half answered with a straight 'yes', others aired slight reservations, whilst one participant said 'no', because the 'selection was limited in too many categories'. Asked whether there was at least one selection which they found particularly stimulating, answers again included both 'yes', 'no', and somewhere in between. One participant (who did not wish to use ARP again) stated the following:

> "In the material section the idea of using an 'unconsolidated material' - rock in pieces - (sand, gravel) - as part of a work could be very interesting and is something I haven't done before."

This is seen as strong evidence that ARP had achieved one of its intended aims: to 'implant' into the user's consciouness new and unknown elements from

which ideas may be formed, thereby stimulating creativity and propelling the user's work in new directions.

3.78 General summary and assessment of ARP.

The aim of this section is to compare the actual 'chance-orientated interactive device' which had been developed - i.e. ARP - with the criteria (as listed at the beginning of this chapter), which defined specific qualities that a 'chance-orientated interactive device' and a 'methodological tool' would have to satisfy.

ARP may be considered an attempt at a visible and tangible representation of the concerns associated with the creative process associated with making sculpture.The purpose of such a device was to enable chance to be introduced into a person's creative process so that, ultimately, a comparison could take place between sculpture produced by 'usual' decision making procedures - (i.e. as a result of a sculptor's preferred working process), and sculpture produced by 'chance effected' decision making procedures - (i.e. as a result of using ARP). The device set out to satisfy two sets of criteria: firstly, it was stated that in order for such a device to be acceptable as a 'methodological tool' it would have to display 'validity', 'reliability', and 'verifiability'; secondly, if it was to be considered a genuine 'chance-orientated interactive device' (which sculptors found interesting, meaningful, and useful), it must display 'objectivity', 'comprehensiveness', 'flexibility', 'randomness', and 'universal application'.

3.79 Synopsis of the development of ARP.

Although many artists had used chance, no evidence was found of a standardised method which could introduce chance into any artists' creative process and therefore no precedent existed, although several references intimated the possible structure, content and format that such a device might adopt. The development of ARP may be separated into seven stages:

Stage 1 - A self-analysis of the author's personal creative process emphasized the crucial role of decision making within the creative process. The term 'element of consideration' was invented to describe the numerous and varied factors which determine the characteristics

of a piece of sculpture (ranging from the concept of the piece to more mundane considerations such as cost).

Stage 2 - Six categories ('material', 'method', 'time', 'physical properties', 'surface', and 'shape'), containing relevant 'elements of consideration', formed the basis of the design for a series of large 'flowcharts' in which various combinations of the contents were listed and all decision points were clearly mapped. Experiment 'A' invited 12 participants to use the flowcharts.

Stage 3 - The results of Experiment 'A' concluded that the 'pyramidical' and 'linear' nature of the flowcharts were unsatisfactory and that the design adopt a 'molecular' type structure. A reorganization of the basic categories and a more methodical accumulation of information aimed to improve the taxonomy, whilst the search for a suitable format in which to realise such a device focused upon some kind of computer based system. Throughout stages 3 and 4, the 'device' was represented by the accumulated information stored in a loose-leaf (A4) binder.

Stage 4 - In parallel with the above activities, three experiments were undertaken. These tested the idea of ARP rather than its actual application, and provided valuable information concerning the design requirements of such a device - if it was to have any practical application. Experiments 'B' and 'C' involved the author as a participating subject, whilst Experiment 'D' involved a group of school children. All three experiments produced two types of sculpture - 'choice products' and 'chance products'.

Stage 5 - A computer based system, 'Hypercard' was chosen as an ideal format in which to realise ARP. Information concerning the category - 'substance' was transferred into a 'Hypercard' prototype and tested on sculpture students (Experiment 'E'). This revealed that the basic overall design was competent, and that students reacted favourably to the idea of such a device.

Stage 6 - Following Experiment 'E', information relating to the other seven categories was transferred into ARP, whilst improvements were made to other aspects of the design, especially the two explanatory

sections. When it was considered that ARP was in a reasonably functional state, Experiment 'F' was undertaken, involving 21 participants who were observed using ARP whilst their results and personal opinions were recorded.

Stage 7 - The results of Experiment 'F' prompted several alterations to the design, however, it was concluded that ARP was functioning as intended, and was considered to have satisfied the criteria for both a 'methodological tool' and a 'chance-orientated interactive device', and as such, could be used in a final experiment involving a number of 'prominent' sculptors (Experiment 'G').

In terms of a 'methodological tool', ARP proved itself to be valid, reliable, and verifiable. The participants who had used ARP in experiments stated that they believed ARP to be relevant to sculpture on both a conceptual and practical level, thereby demonstrating its validity. The results of the experiments suggest that ARP did what it was designed to do: it introduced random 'elements of consideration' into a person's creative process in a consistent manner, thereby demonstrating its reliability. ARP was a self-contained device, its use being simple and self-evident, as demonstrated by the considerable ease with which many different people had used it, suggesting that it was indeed verifiable.

In terms of a 'chance-orientated interactive device', ARP demonstrated that it satisfied the following criteria:

'objectivity' - although it was acknowledged that the taxonomy was weak, it was not entirely subjective, having attempted to identify universal patterns of classification. The ideal of ARP, to eliminate bias by containing as many 'elements of consideration' as possible, could not, realistically be achieved within the confines of this research (or perhaps even a lifetime).

'universal application' - experiments revealed no difference between how experienced sculptors used ARP and how less experienced sculpture students used ARP. Similarly, sculptors with varied sculptural styles and processes were able to use ARP.

'flexibility' - ARP did not dictate what to make or how to use ARP in any particular way. If the user wished to do so, their selections may have been all personal or all random or any combination of the two. They were allowed to make as many selections as they wished or as few selections as they wished. Users were free to interpret their selections in any way they wished, and to this end, ARP included very general terms as well as very specific terms. ARP tried neither to encourage nor discourage any particular 'genre' or style of sculpture.

'comprehensiveness' - the nature of the 'elements of consideration' stored within ARP covered a wide range of topics, ranging from physical entities such as types of material to more subjective and mental entities such as religious or political beliefs. It is acknowledged that although ARP contained over ten thousand individual 'elements of consideration', this was far from the ideal number which it was thought would be required if ARP was to be considered anything other than a prototype.

'randomness' - every decision point within ARP could have been selected by personal choice or random choice, whilst, in the final version of ARP, even those two options could be determined by chance. Furthermore, users could decide at every stage whether to quit or continue by means of random choice.

The final version of ARP (prototype 3), as used in the final experiment (and by the author), is incorporated into the thesis on 2 discs (appendix 4.1).

3.80 An exhibition of sculpture.

As explained previously, financial restrictions meant that actual work could not be commissioned from the participating sculptors in Experiment 'G', therefore it was decided that the author should mount an exhibition of sculpture based upon the original format of the proposed exhibition, which was, to test ARP by producing two separate bodies of work, one representative of personal and preferred decision making procedures, the other, representative of chance affected decision making procedures - as inspired through the author's use of ARP.

4.0 CHAPTER 4 - DISCUSSION AND CONCLUSION.

4.1 Overview of Chapter 4.

The simultaneous development of ARP in conjunction with the experiments required that the results of these experiments have already been analysed to some extent within the preceding chapter; however, whilst previous analysis was primarily concerned with the stage by stage results as they effected the design of ARP, Chapter 4 shall now examine the results collectively as well as discussing some of the wider implications of such a device. The structure of this chapter is as follows: Section 1 - the hypothesis is restated and put into context; Section 2 - the evidence from the literature review, from the experiments, and from results is analysed; Section 3 - the original contribution is stated and supported; Section 4 - the relationship of this to previous research is examined; and Section 5 - the future use of ARP, and development of an 'ideal' ARP, is speculated upon.

4.2 Section 1 - The hypothesis.

This research was undertaken in the belief that 'chance' played an important yet neglected role within the creative process. From the author's personal experience of making sculpture, 'chance' appeared to be a positive force, frequently exerting a formative influence by 'pointing' the way to exciting new departures and destinations, resulting in 'successful' sculptural products. To the lay person, and indeed, to many artists, chance has traditionally been regarded as one of the least artistic aspects of creativity, especially if 'art' is viewed as the considered execution of technical virtuosity and aesthetic judgement; however, it has been the aim of this research not only to prove that this is not so, but to demonstrate that chance can contribute to creativity in a positive and desirable fashion. In short, the hypothesis was that chance could enhance and expand creativity, thereby resulting in more exciting sculpture.

4.3 The reasons for using this particular method.

The review of literature concerning artists' deliberate use of chance supported the author's view, that chance could play an important role within the creative

process, as it was discovered that the subject had captured the attention of a substantial number of innovative and prominent artists who had produced a wide range of chance-orientated works. The chance-methods used to produce these works however, involved many different approaches and techniques, mostly based upon idiosyncratic processes, inextricably linked with the individual artist's personal style, as for example, in the case of Marcel Duchamp, and his 'amusing physics' (see 2.35).

There were several different approaches which this research could have used as the basis for development, but, for the reasons listed below, were thought unsuitable:

a) techniques involving the random or uncontrolled generation of images were dismissed because they were only concerned with work of a two dimensional nature, and obviously this research was primarily concerned with work of a three dimensional nature, i.e. sculpture.

b) techniques involving the random or uncontrolled generation of sculpture were dismissed because such techniques were not really practical: the physical laws involved in making sculpture made spontaneous or 'automatic' production more or less impossible.

c) sculpture which behaved 'randomly' was dismissed because this would restrict the area of interest to 'kinetic' sculpture.

The aim of this research was to develop a more universal system, so that any sculptor who wished to introduce chance into his/her work could do so. Rather than invent new 'chance techniques' or create 'chance sculpture', this research decided to concentrate on process rather than product, by aiming to introduce chance into the mind itself. The art object cannot exist without the idea, a product of the mind, and an idea itself is the combination of many components, a point richly illustrated in the following quote by Sir Joshua Reynolds (1723 - 1792, first president of the Royal Academy),

> "Invention, strictly speaking, is little more than a new combination of those images, that have been previously gathered and deposited in the memory: nothing can come of nothing: he who has laid up no materials can produce no combinations." (WARK, 1975)

[Although written in 1769, Reynolds belief that 'invention' stems from 'new

combinations', mirrors the theories of several modern authors, for example, Koestler's 'bisociation' or Rothenberg's 'Janusian theory' (see 2.13)]

4.4 What are the nature of these 'deposits'?

Reynolds refers to combinations of 'images'. However, this research prefers to refer to 'concerns', defined as: anything that interests and occupies the sculptor's thoughts with a view towards making sculpture. Such concerns may be extremely diverse in nature, ranging from those contributing to the generation of an idea itself, to concerns of a practical nature, stemming from the execution of an idea. Similarly, such concerns may be determined by the artist himself/herself or from an external source over which the artist has little or no control.

In 'everyday' circumstances this continual gathering and 'depositing' process originates from a multiplicity of sources, stemming from the person's conscious (and unconscious) observation of the everyday world (some of which, may of course have been observed by chance), which in turn is controlled by the sculptor's personal interests and preferences. This recurring process of having to select one possibility rather than another is obviously necessary if the sculptor is to make anything at all, but of course, the selection of one option means that others are rejected (a sculptor unable to make up his/her mind would be like 'Balaam's Ass': an imaginary beast placed by philosophers between two equal bundles of hay, the ass starved to death because it was unable to choose between the two). The range of concerns from which a person may choose, is of a potentially infinite number, however, due to selective bias operating within 'personal decision making procedures', the same options may be repeatedly dismissed without ever attracting the sculptor's conscious attention. By using chance in the selection process, many of these options which are usually discarded (for whatever reason, i.e. taste, habit, ignorance, etc), now have an equal chance of being selected. Therefore, it was the intended objective of this research to develop a method which could select such options by chance, rather than by personal choice.

4.5 The benefits of using chance to select unknown options.

The use of chance within the selection process was favoured in the belief that, in terms of creativity, it is stimulating to confront the unknown rather than the

known, the unexpected rather than the expected, the unwanted rather than the wanted. It is suggested that chance can provide many situations recognised as being conducive to creativity, for example:

a) chance can challenge one's usual habitual thinking, acting as a safeguard against stagnation.

b) chance can be used to provide important 'shifts of attention'.

c) chance can provide a new awareness.

d) chance can propel work in new directions.

e) chance can bring unlikely elements into conjunction.

It is assumed that if one always selects what is known, one will never discover anything new. By deliberately making use of chance in the generation of sculpture one can confront the unknown, the unusual, and the unexpected, whenever one desires.

4.6 The idea of a chance-orientated device.

A prerequisite if one wishes to make a random choice is that there must first of all be a selection of elements from which to choose. For example, Artist 'A' wishing to make a random choice must first of all draw up a list of possible options, however, if Artist 'A' personally draws up that list, obviously the contents cannot contain anything other than that which Artist 'A' is already aware. As Edward de Bono states, 'Chance interactions are unlikely to generate new ideas if the information input is strictly limited to relevant information . . .', therefore, if possible it is desirable for the list be drawn up by someone else, for example, Artist 'B', so that there is a possibility of the list containing options that are beyond Artist 'A's normal preconceptions. Of course, Artist 'B's lists could only contain options that he/she was aware of, hence the desire to develop an 'external randomizing mechanism', a universal device (i.e. applicable to, or affecting many individuals, conditions, or circumstances), which would consist of numerous options relating to the production of sculpture. With this in mind, central to this research has been the development of ARP (Art as Random Process), a chance-orientated device, whose intended function was to introduce chance into any sculptor's creative process. Since ARP has been developed

solely by the author, it is recognised that ARP may be open to criticism in that it only contains information within the author's awareness, (therefore being no better than Artist 'A's list), however, an attempt was made to overcome this problem by consulting recognised objective reference sources such as encyclopaedias, dictionaries, lexicons, thesauri, guidebooks, etc, etc. (see 3.23).

4.7 Section 2 - The evidence.

ARP was developed in stages, each involving an experiment to either test the idea of such a device, or latterly, the device itself. ARP contains two explanatory sections: 'How to use ARP' and 'What is ARP?' which introduces the user to ARP and the concept behind such a device. At the culmination of the research, ARP consisted of over 650 individual 'cards' (see appendix 3.5 for an explanation of 'Hypercard' terms), offering over 11,000 possible choices (information extracted from various reference sources as discussed in previous paragraph), in eight principle categories: Substance, Method, Place, Time, Quantity, Senses, Quality, and Mind. Every 'card' within ARP requires the user to make a selection from whatever number of alternatives are offered (this number may range from two, to over a thousand), and the user may make the selection by personal or random choice. The decision whether to make a random or personal choice may also be decided by chance, whilst another facility allows the user to decide whether to 'quit' or 'continue' also by chance. It is stressed by the author that, in its current state, ARP must only be considered a prototype, however, the degree to which it has been developed has not only proved competent in demonstrating the idea of such a device, but also suggests the potential of ARP for further development.

4.8 Does ARP work?

As stated above, the development of ARP involved several experiments, the results of which have proven ARP to be simple and easy to use, requiring little or even no previous computer experience. Of the 31 users who used ARP in the advanced stages, not one of them had any difficulty in using ARP, nor did anyone fail to make selections as requested. The results of these selections

demonstrated that sculptors were interacting with ARP in an individual manner as intended; figures relating to the ratio between random and personal choice include users whose selections were all random and users whose choices were all personal, whilst the majority covered a wide range in between. Similarly, the number of selections made varied greatly, with some people making just three or four, others making over thirty. Furthermore, different 'types' of sculptor have successfully used ARP, therefore demonstrating that the design possesses some degree of 'universal application' which goes beyond stylistic boundaries.

A further indication of the interest, relevance, and success of ARP is the extremely high proportion of users (a combined total of 80% in the penultimate and final experiments), who stated that they would like to use ARP again, especially if a 'further developed version of ARP' containing much more information became available.

4.9 Is ARP relevant?

Although the majority of experiments have been concerned with testing the design of ARP, the final experiment asked prominent sculptors how they felt about making a piece of sculpture based upon their ARP selections. All the participants said that they could make a piece of sculpture from their selections, furthermore, when asked whether this prospect excited them, only one sculptor answered 'no'; however, the person explained that this was due to the lack of information stored within ARP and was therefore not a criticism of the concept.

Several weeks after these participants (all practising sculptors), had used ARP, they were asked if they thought whether or not their selections had effected their work. Several replied that they had ignored their selections as they preferred to wait until they were in a position of having to use them (participants in this experiment had used ARP with a view towards making a piece of sculpture, unfortunately the proposed exhibition could not be realised). Replies such as 'I have completely forgotten about them, having 'shelved' them until required - i.e. at the making stage', and

> "I am deliberately not looking at them at the moment . . . I do not want to 'dog-ear' my selections by looking at them now, whilst I cannot physically do anything about them."

corroborate one of the established characteristics of artistic creativity which had

been examined, namely, that the artist prefers to react to present circumstances as opposed to planning or even thinking too far ahead (see 2.11).

Other participants' responses varied between one who felt the selections had little or no effect:

> "I feel that the selections that I made are of little real use to my own body of work . . . . The choices have occupied my mind on and off, but I feel they are quite irrelevant to my main pre-occupations or marginally relevant at best."

to another who thought that ARP may possibly have influenced work:

> "A month has elapsed and I look at my list of words and they seem to fit in to a current idea for a work about to be started. Has the work influenced the words or have the words influenced the work?"

to another who said that ARP had definitely influenced their work:

> "The selections derived from the ARP process has encouraged me to develop some earlier ideas. . . . . "

One participant felt that ARP had not only had an effect upon him, but had actually been an inspiration:

> "There are often times when I have little inclination to make sculpture and feel devoid of ideas - completely 'dried-up' (present time) I have thought several times about the selection ARP and I arrived at, and feel interested at the idea of responding to the criteria, therein, it would appear it has served as an inspirational device, in an otherwise uninspired person"

From the above evidence it is concluded that, even in such a rudimentary and vestigial state, ARP functions as intended, as both 'experienced' sculptors and 'less experienced' sculpture students who have used ARP have found it interesting, meaningful, and, to some degree, stimulating, however, participants comments included criticism and complements, both of which shall now be examined in some detail, beginning with criticism, which can be divided into two distinct groups - criticism of the concept of ARP, and criticism of the design of ARP.

4.10 Criticism relating to the concept of ARP.

Throughout the questionnaires, participants were encouraged to add further comments, several of which raised some of the more fundamental and underlying implications of such a device. These criticisms may be separated into the following seven areas:

1 - ARP is 'threatening',
2 - ARP is 'impersonal',
3 - ARP would result in 'superficial' sculpture,
4 - ARP is too 'systematic' and 'methodical',
5 - ARP is concerned with 'process' rather than 'product',
6 - ARP is 'impractical',
7 - ARP is 'unnecessary'.

4.11 1 - ARP is 'threatening'.

A few comments indicated a reluctance by some participants to allow their creativity to be interfered with, especially by a 'computer' (this could mean that creativity is still viewed in a secretive and romantic light). For example, one user thinks that there is something 'unnatural' about 'using a computer to stimulate the mind', whilst another user states:

> "A criticism would be the threatening nature of intervention in one's own divine space by technology."

however, they go on to say that such 'intervention', whether by computer or not, may not necessarily be negative:

> "This by its very nature is also ARP's strength because it could revive new awareness (an ingredient in any artwork of worth)."

Another interpretation of 'threatened' suggests that ARP in someway challenges the person's creative process by taking over some of the responsibilities, as suggested by this comment:

> ". . . do we really want all our answers on a disc on a plate in front of us?"

Of course, all the answers remain the responsibility of the individual, the

selected elements cannot exist as anything on their own - it is the user's response and subsequent transformation of the selections and their combinations into tangible sculpture that is important. As such, ARP is in no way intended to replace the creative process but is simply seen as an extension to the creative process. It may also be considered, that by using chance, the sculptor is avoiding his/her responsibilities as an artist since, they avoid the problem of having to make one selection rather than another. They may indeed avoid having to select, but, if they are to proceed to make a piece of sculpture, they must still decide what to do with their selections; it is unavoidable that the artist is always in control to some extent. Although ARP's use is primarily envisaged as voluntary, it may at times be desirable to control the use of ARP, within research for example, perhaps to gauge a user's reaction to different levels of chance, or within education, ARP may be used to set a project 'brief'.

4.12 2 - ARP is 'impersonal'.

A strong criticism of ARP came from one sculptor who stressed how important it was that their work stemmed from personal experience and that as such, using ARP was very impersonal:

> "My work is about things personal to me, that hold a personal magic; they often take a long time to emerge and are then closely associated with the material - ARP's selections are to immediate and impersonal in most cases."

The desire for personal experience was also echoed by others, for example:

> "I prefer for ideas to stem from experience of the environment."

There appeared to be a somewhat contradictory relationship between personality and chance: whilst some artists had used chance in order to 'free' themselves of their personality, others believed that chance actions 'reflected' their personality since every individual's chance was a unique product of the particular person who had instigated the 'chance action', i.e. flipping a coin or rolling a dice (or in this instance, using ARP). It is suggested that ARP encompasses both of these ideals: firstly, one of the reasons for ARP's existence was to free oneself from such personal bias (indeed, one of the main reasons for using chance is the attempt to mirror the condition known as 'Tabula Rasa' - the mind in its uninformed original state, void of all experience,

blank); secondly, using ARP may be immediate, but, any chance selections (especially combinations involving both personal and random), that a user makes becomes uniquely their own. Furthermore, in recognition that every individual artist has their own level of receptivity regarding 'how much' chance they are willing to adopt, a fundamental aspect of ARP's design was that users could make either personal or random choices, so as to allow the person who does not wish to stray very far from their preferred concerns to do so. Indeed, the participant who made the above statement regarding 'things personal to me', did in fact go on to admit that one of their ARP selections was very interesting and appealing, therefore, although they thought ARP too immediate and impersonal, ARP did in fact succeed in 'depositing' a concern within that person's consciousness, which was both new and relevant to that user's personal concerns - (the participant stated 'the idea of using an 'unconsolidated material' . .could be very interesting and is something I haven't done before').

4.13 3 - ARP would result in 'superficial', 'contrived', or 'frivolous sculpture'.

A number of comments (including the three below), questioned the nature and quality of the sculpture that might be produced as a result of sculptors using ARP:

> ". . . I wonder if the sculpture produced as a response might be a bit contrived or self-conscious."
>
> "Using ARP has some relevance but really only on a superficial level. However, it is an interesting concept and I think I would use it again."
>
> "It could very easily be used to restrict 'personal growth' for 'style' or fashion'. It could lead to frivolous work if not followed up with strong criticism, (or self criticism)."

Firstly, with regard to frivolity, it is envisaged that users would respond to their ARP selections in a serious manner, giving it the same professional attention as in their 'preferred' studio work. In addition it is argued that it may be beneficial if occasionally the artist allowed himself/herself to make work which was not 'serious' or rational, a kind of 3-dimensional brain-storming. Secondly, with regard to 'personal growth', sculpture produced as a response could never be completely and utterly devoid of the artist's personality, nor would such a scenario be desirable, otherwise all sculpture produced as a result of ARP

would be similar and anonymous. Rather, ARP relies upon the individual's response to ARP, and that response is expected to be conditioned and controlled by the artist's personality, therefore, even if ARP provokes the user to make something that is far removed from their usual work, it will still bear the signature, and most probably some characteristics of that particular sculptor.

As one user pointed out however, 'Its pointlessness is its value.' which again underlines the paradoxical nature of ARP. Perhaps it is best if one does not approach ARP too seriously or perhaps the user must recognise it's pointlessness to begin with, if they are to use ARP in a not too considered manner and escape from their normal pre-occupations.

Finally, for some users, the greatest value of ARP may be the actual act of using it, rather than the sculpture produced, as suggested by this participant who states:

> "Even if I reject the way of thinking created by ARP it has made me think a lot about my own creative process."

Although being confronted by such a different decision-making process may not necessarily alter the user's own personal process to any great extent, it undoubtedly causes the user to examine and question their process more than they would in 'everyday' circumstances.

4.14 4 - ARP is too 'systematic' and 'methodical'.

Another criticism is that using ARP is too systematic, methodical, and positivistic and therefore cannot truly reflect the creative process since the process of selection does not cater for the 'indeterminacy' and 'uncertainty' which had previously been linked to creativity (see 2.11). As one user suggests in the following comment:

> ". . . it does not encompass the endless, and often spontaneous, chain of changes that go to the making of an object."

ARP is indeed systematic and methodical, a fact which highlights one of ARP's many paradoxical characteristics: here is an extremely rational device intended to encourage irrationality (ARP's paradoxical nature may be compared to the 'dualistic' nature of creativity as previously outlined - see 2.8). Although ARP

may not 'encompass' spontaneity (it is unlikely that it ever could), by no means does it discourage it, rather, one of ARP's basic aims is to stimulate spontaneous reaction within the user by supplying the first 'link' in a 'chain of changes' rather than dictating what all the 'links' should be. Another person thought that the selections from ARP would be '. . . too much like working to a 'brief' . .', however, once more it is emphasised that sculpture produced as a response to ARP does not have to rigidly adhere to the 'brief': if whilst making an 'ARP sculpture', a spontaneous chain of events is set in motion which strays from the brief, then so much the better - ARP has been a stimulus.

Another criticism concerning the 'systematic' aspect of ARP is that it does not represent 'real' chance:

> "Using ARP is too methodical and categorized, therefore the chance button is a little tame."

This underlines another paradoxical characteristic of ARP; here is a device supposedly concerned with chance, yet one which is obviously a highly structured and organised system. Any mechanism which deals with 'deliberate chance' cannot produce something completely unexpected, for example, when rolling a dice, one cannot state with any certainty whether 1, 2, 3, 4, 5, or 6 will be uppermost, but, what one can say with absolute certainty is that it shall not be 7, 8, 9, 10, etc. ARP is similar to a dice in that they are both 'randomizing mechanisms', their randomness limited by their contents; however, by attempting to make the contents of ARP extremely vast, it is hoped that eventually, one would not be able to predict with any degree of certainty what selections ARP was likely to present.

Concerning ARP as a methodological device suitable for research, even although it is systematic and methodical (and computer-based), experienced sculptors have not only been able to use it, but found it easy to use, agreeable, interesting, relevant and stimulating, therefore proving that ARP is sympathetic to the creative artistic process, improving upon some of the 'unnatural', 'laboratory' type experiments of previous research.

4.15 5 - ARP is 'concerned with process rather than product'.

It was suggested that ARP is more concerned with process than product and therefore only relevant to certain sculptors who work in certain ways.

"It would seem ARP would be more interesting to sculptors whose main interest is the creative process, than those whose whole working method is toward a finished object."

This may be true, however, that is the very intention of ARP - to introduce chance into the creative process - but not to the detriment or neglect of the finished product; rather, it was assumed that the most effective way to produce 'chance sculpture' was to introduce chance into the process responsible for producing the sculpture, as it was assumed that without a 'process' the 'finished product' could not exist. [Marcel Duchamp's 'Ready-Mades' (see 2.36), may not have involved any 'making' processes, but still required the act of selection].

The suggestion that ARP may be more relevant to a certain type of sculptor, or one with an established style, is something which the design of ARP has strived to avoid, and indeed, the final experiment demonstrated that ten very different practicing sculptors were able to use ARP, and although each individual may have found it relevant to different degrees, not one sculptor found it completely irrelevant.

One sculptor thought that the success of ARP '. . . depends on the level of competence and flexibility of the sculptor'. Obviously ARP may be more appealing to sculptors whose work encompasses a flexible approach, however, hopefully ARP can not only sustain such flexibility but actually encourage it, perhaps increasing the sculptor's competence at the same time, since rigid thinking is recognised as a negative quality within creativity.

4.16 6 - ARP is 'impractical'.

Although never explicitly stated, there was a tendency by users to implicitly suggest that ARP was impractical since it avoided realities, for instance, many of the elements within ARP could be difficult to obtain, e.g. 'diamonds', combinations of elements may provide conditions impossible to satisfy, e.g. an extremely short period of time, whilst others elements may simply appear to be 'meaningless', e.g. regions of the earth's moon. Such circumstances are suggested to be one of the strengths of ARP: when faced with an impossible or impractical combination of selections, the user is forced to think laterally, if they are to come up with an alternative solution they must employ ways of thinking beyond habit. ARP therefore stretches the mind, by forcing people to think about 'fantastic' sculpture, letting their minds 'run wild'.

One sculptor pointed out that 'Sometimes the very specific classifications seemed a bit limiting', however, such 'limiting' of the user's options by ARP is seen as a healthy method of concentrating the user's minds and encouraging creativity in the belief that the 'cornered' mind must be more inventive than usual if a successful solution is to be found.

4.17 7 - ARP is 'unnecessary'.

The final criticism to be examined is that ARP is an overly complicated and unnecessarily extravagant method of introducing chance:

> "That one could introduce new ideas at random just as well by picking up an unfamiliar book and reading from it at random or in any number of other ways without having to consciously seek out a computer programme to help."

(Just such a system has been suggested by Edward de Bono - see DE BONO, 1979). The ability of the human mind to pick up a book completely at 'random' has already been questioned (see 2.18), and such an ability must be doubted even further if an individual wishes to make a series of sustained random selections. Furthermore, the act of randomly selecting the book is only one of an almost infinite number of actions that could be decided by random methods, and it is this infinity of decisions and options that ARP has attempted to reflect.

The same sculptor goes on to say that ARP '. . . could be useful to sculptors who feel their work is getting stuck in a groove or stale' but adds that '. . . a good holiday could have the same effect.' This is debatable (one could even use ARP to decide where to go on holiday), but ARP is more accessible and a great deal less expensive! Also, the contents of ARP are less restrictive than a holiday - for example, ARP contains references to the moon, the planets, stars and galaxies, as yet physically inaccessible!

4.18 Criticism relating to the design of ARP.

There were three main criticisms relating to the design of ARP: the lack of information available, the classification of the information which was available, and a lack of visual information.

4.19 Limited amount of information.

By far the most common criticism of all those who used ARP was the limited amount of information stored within ARP, a fact which often seemed to restrict their potential enjoyment:

> "I wanted more options . . . annoyed when it stopped."

> "I would like to chase a subject deeper . . ."

Many of the people who have used ARP have linked the success of ARP directly to the quantity of available information:

> "Only with a content that is vast would it ever fulfil its potential - not something one person could ever achieve."

> "I don't know if it could be possible ever to have it extensive enough (i.e. the size of a large library)"

One participant thought that there may be a danger if ARP did not have a sufficiently large enough information content:

> "It may lead people to think that these are the only alternatives in 'making' rather than an infinite number of alternatives which are constantly being discovered (needs a huge data-base with constant up-dates)."

Within the scope of this research the information content of ARP can never be infinite (although desirable), unlike the unrestricted interests of many people (see 4.36 - ideal ARP), and it is stressed once again that ARP is only a prototype.

4.20 Weak taxonomy.

The second most common criticism centred on the classification and categorisation of information. The following two comments demonstrate that many of those who used ARP were concerned by the fact that the contents of ARP had been the sole responsibility of the author:

"I think you need to be careful about your 'own choice' of categories. Your choices are not always bound to coincide with other artists, and therefore some way of incorporating and adding to the system would be useful."

". . . the suggestions should come from different mind sources to provide a whole spectrum of mind data rather than one person writing the program which then reduces the scope of awareness."

It is acknowledged that the taxonomy of ARP has been produced by the author, but, this was considered acceptable during the development of a prototype, where the main concern was to demonstrate the idea of such a device. As mentioned previously, the contents of ARP were accumulated from many different types of reference books, however, if ARP was to be developed further, one would obviously call upon the relevant 'experts' to supply the information within their particular subject area, i.e. a mineralogist could be consulted regarding the classification of minerals. The eight principle categories (which had been arrived at by the author through consultation with other sculptors), did receive some criticism, however, no one rejected them completely, therefore they may be regarded as satisfactory, although the addition of further categories should not be ruled out.

An alternative consideration however maybe that a 'weak' taxonomy can in actual fact complement the random nature of ARP, i.e. misleading categorisation will take people to where they did not think they were going, thereby re-introducing chance into an apparently ordered system and introducing an element of mischievous subversion!

4.21 Lack of visual information.

The third most common criticism related to a lack of visual information, a totally justified complaint considering that ARP is concerned with art, the most visual manifestation of creativity.

"There is definitely a need for a visual element . . ."

"I would have preferred a more visual 3-d graphic type image."

"Use colour - more illustrative."

Such criticism is understandable, again however, the practicalities of including large amounts of visual data were beyond the scope of this research (see 3.62). Obviously if ARP was to be developed further, a more visually based design must be considered a priority, in the meantime, examples of what a more visually orientated ARP might look like may be seen in Appendix 4.1.

There were also other criticisms, however, these were not commonly shared, and were often contradicted by other users, for example, some participants wished for more explicit instructions whilst others asked for less explicit instructions: one cannot please everybody! In general, perhaps the only recurring reservation which was shared by most participants was a worry about losing one's individuality to ARP. It must be stressed once more that ARP cannot produce sculpture, it is the user's reactions to the selections received from ARP that produces the sculpture, and as such, cannot help but contain a substantial reflection of the user's personality.

4.22 Compliments relating to ARP.

Perhaps the greatest compliment was that everyone invited to use ARP was able to do so, the majority in a relaxed and relevant way, with nearly all users finding at least something meaningful to their own personal sculptural interests. It was observed by the author that the overall impression by those who used ARP was one of 'fascination' and 'intrigue' with the device, and excitement at its future potential.

4.23 ARP proved to be 'fun' and easy to use.

Although some users had accused ARP of being 'systematic', and 'methodical', such criticism was redressed by many other users who found the experience of using ARP ' . . easy and enjoyable, . . ' and 'Very easy to use, self-explanatory', indicating that ARP was indeed accessible to any sculptor who wished to use it. One participant summed up ARP in the following way:

> "Using ARP is interesting, stimulating and fun. I am not sure if it is relevant to sculpture but do not feel it is irrelevant".

The 'fun' aspect of ARP does not in any way detract from ARP's more serious applications, rather, it is seen as confirmation that ARP is 'user friendly' and

does not intimidate (like much of today's computer technology). It is suggested that ARP is such a user-friendly (or even primitive), device due to the fact that ARP has been designed by a sculptor, sympathetic to the sculptor's needs, coupled with the ability of 'Hypercard' to enable a non-programmer to design their own 'program'.

4.24 ARP proved to be introspective.

The act of using ARP undoubtedly made people examine their own personal creative process. By providing so many options, ARP was regarded as useful in '. . . aiding decision making . .'. Another sculptor stated:

> "Using ARP helps to focus my decision-making, it seems to be a very useful tool towards developing ideas."

Some sculptors, rather than use ARP to generate new ideas, used ARP to '. . . restate existing ideas.', whilst others used it to challenge their ideas, describing ARP as:

> "A 'multiple choice' of what, where, who, how, and why in stretching or questioning your own ideas."

Another user described ARP as:

> "An encyclopedia of possibilities for thinking more broadly and more precisely forcing you to re-examine your decisions by offering many more options."

This quote identifies yet another paradoxical property of ARP: whilst widening the user's awareness, ARP simultaneously focuses their attention on very specific concerns, which, as one user pointed out, '. . . you would not deal with at your conscious level'. Therefore, as well as introducing the user to 'new' concerns, ARP can also make the user question their commitment to and original choice of 'familiar' concerns.

4.25 ARP proved to be stimulating.

The accumulated evidence from participants indicated that without a doubt using ARP was 'thought provoking', not only in an introspective manner, but

also ARP proved itself to be extroversive (directing one's interest outwards), encouraging users to look beyond their usual interests or concerns and thereby generating new awareness. An established 3-d designer and lecturer having used ARP commented:

> "Creativity is about starting points and synthesis, ARP stimulates starting points and is expansive . . .Very stimulating - created a mental springboard"

It is not claimed that all users felt this way, one participant stated rather adamantly that ARP, '. . . seemed to have no stimulating effect on the user in the area of ideas', however, the vast majority of participants found otherwise, with one even suggesting that ARP had provided 'Too many ideas . . .' whilst yet another commented:

> "Very easy to use and very stimulating, perhaps too much stimulation, I think I got a bit carried away with it."

Another user stated:

> "I found using ARP stimulating in itself without necessarily working towards making sculpture."

Yet another aspect of ARP is that it may be of particular use when the sculptor is having difficulty in realising an idea,

> ". . . it might actually prove useful during one of those mind blockage intervals even if you didn't actually use what was there but made your mind look for other alternatives."

In this context, ARP becomes a distractive activity, similar to absent-mindedly flicking through a magazine, however, ARP has the added benefit of being a 'unimaginably large' magazine, with special relevance to sculpture.

4.26 <u>ARP proved to make users question their habits.</u>

By displaying so many alternatives, the act of using ARP makes the user question their habits and preconceptions. The artistic creative process is full of indecision and an ever-ready willingness to consider the possibility of new developments. That ARP acts as a 'habit-breaker' is substantiated by the

following comments:

> ARP is "A means of challenging your own established approaches."
>
> ARP ". . . makes you question your 'habits' on a practical level, showing a wide range of alternatives."
>
> ARP ". . . can suggest different approaches to practical problems"
>
> ARP "Works well in showing how wide the possibilities are, making you reconsider initial decisions."

It has been suggested that questioning one's habit's should be 'business as usual' for the genuinely creative person, therefore, if ARP helps the artist do this, such a device must surely be welcomed and recognised as such.

4.27 ARP proved to bring about new awareness.

It may be that less-experienced sculptors (or students), do not have any established creative habits to question, however, they may have preconceptions as to what sculpture is or can be. In this sense sculptors have complemented ARP about its ability to present to their attention new elements:

> ". . . it offers a quick access to new perspectives, ideas and challenges."

By including many alternatives which may be considered 'impossible to obtain' or are 'apparently meaningless' (see 4.16) ARP succeeds in, as one sculptor put it:

> ". . . extending beyond mundane pre-occupations."

and therefore acting as an 'eye-opener';

> ". . . exposing you to aspects of your sculpture . . . which may not have occurred to you naturally."

The result of bringing to the user's attention so many alternatives obviously provides a means of extending one's options, however, as one sculptor pointed out, ARP is also -

"A means of limiting your options using chance."

Once again the paradoxical nature of ARP becomes evident, ARP simultaneously broadens and narrows the user's range of options, ARP simultaneously encourages freedom and restricts freedom: once the options have been selected, especially if by chance, theoretically they must be 'considered' (in reality of course, each and every option is open to the user's personal and therefore subjective interpretation).

4.28 ARP in education.

Several of the most complementary remarks concerned the use of ARP within education. The following comments are all by practicing sculptors or 3-D designers who share many years experience of teaching at college level:

". . . it has obvious potential as a teaching aid, isolating the elements and extending the horizon of each . . ."

"Has the germ of enormous potential."

"It offers enormous potential when the category information or database is expanded."

"I believe ARP would be of use to any artist, experienced or not, as it is an aid to the 'thinking' and 'creation' process."

Several users stressed that they considered ARP to be not only relevant and useful to sculptors, but that ARP could '. . . be equally applied in other fields' and by '. . . a variety of people'. Another user, again with many years experience in higher art education stated:

"I've thought about ARP quite a bit and now think that it has applications as a teaching aid for young students - across the fine art/ design barrier!"

Another user thought that not only does ARP cross both fine art and design, but many other areas of creativity as well:

"I think its applications would be particularly useful in education. Art, music, literature, engineering, architecture, any creative or 'making' area where alternatives are possible or desirable."

Another experienced sculptor and educationalist, although welcoming ARP as a worthwhile 'extension to training / experience' warned that ARP should never be considered 'a substitute' for training or experience. Such a sentiment would be whole-heartedly endorsed by the author who, rather than wishing to claim any 'magical' properties for ARP (i.e. that ARP is capable of transforming the user into a 'wonderful sculptor'), would prefer to stress that ARP's simple aim is to encourage the sculptor to sometimes choose the irrational rather than the rational, the unusual as opposed to the normal, the unexpected rather than the expected, in an effort to stimulate experiment and discovery in the sculptor's studio, thereby producing exciting and challenging sculpture.

4.29 Summary of criticism and complements.

All criticism and complements of ARP were accepted as valid, proving to be both useful and thought provoking, raising practical as well as more deep-rooted issues concerning the nature of creativity itself. None of the problems concerning the design of ARP were regarded as insurmountable, and the author is confident that given the necessary resources, these problems could be eliminated. Criticism concerning the concept of ARP is not so easy to 'correct', to begin with, the personal viewpoints of different individuals mean that more often than not, a characteristic which attracted the criticism of one user, at the same time received praise from another (highlighting one of the main problems that occurs when trying to develop a 'universal' device). The overall conclusion is that ARP has proved to be successful, and it is suggested that the criticism and complements, as detailed above, should be instrumental in any future development of ARP.

4.30 Section 3 - The original contribution.

This research has advanced the knowledge of the relationship between chance and sculptural creativity, and created a genuinely innovative device which utilizes the principle of chance in order to stimulate creativity. The evidence proves the hypothesis that 'chance can enhance'. The following gaps in knowledge have been filled:

1. Prior to this research, chance had received very little recognition as to it's role in the artistic creative process; however, evidence from the literature review

(highlighting that chance had been used by a number of prominent and innovative artists), and from the experiments (contemporary sculptors confirmed that chance played a part in their process), proved that chance can and does contribute to the creative process. The role of chance within the creative process had been previously understated and not tested in any systematic manner in a purely sculptural context - this research fills that gap.

2. Having proved that chance did contribute to the creative process, it became evident that, for artists wishing to use chance, no single objective method to introduce chance into the artistic process existed; therefore, ARP, a universal external randomizing device, was designed and developed by the author with the aim of filling that gap, by offering the facility to any sculptor wishing to use chance.

3. ARP is a novel and innovative device, which has been presented to, and enthusiastically received by, a number of contemporary sculptors who have tested and approved it. As well as being of interest to sculptors, whatever their experience, and even perhaps any creative profession, its potential has been recognised as a valuable educational device, if developed further.

4. There was a definite lack of research relating to the creative process peculiar to sculptors and sculpture. This research has began to fill that gap and also contributed to the wider knowledge of creativity.

The submission of this thesis is that the development of ARP is of a genuinely innovative nature, providing an original contribution to the understanding and development of creative artistic activity, especially relating to sculpture. There now exists a better understanding of the nature of chance in the sculptural process, and a device which can actively encourage this: ARP is a 'habit-breaker' as well as an 'eye-opener' and has great potential for future development, especially within education.

4.31 Section 4 - The relationship to previous research.

An unusual factor regarding this research is that it has been initiated from the informed perspective and viewpoint of the author as sculptor, rather than author as scientist as with much previous research into creativity. Although it is acknowledged that such a perspective may be criticised for being overly

subjective, it is hoped that the results complement more science-based research. As a sculptor, the author considered previous research methods that had been employed to 'measure' artistic creativity to be unrelated to the natural creative process as they seemed too limited in scope and the experiments had been undertaken in artificial circumstances. As a result of this, great effort was taken to develop a methodological device which not only satisfied the requirements of research, but also captured the artist's imagination, allowed complete freedom of response, and did not encroach upon their personal creative process too much. Unfortunately, the time required to develop and test such a device did not allow any time to use it extensively as as a research gathering information method; however, the possibility now exists for ARP to be used in further research. Whilst several authors acknowledged chance as playing a significant role within creativity, no study could be found which was devoted entirely to the role of chance within the artistic creative process. The results of this research into chance and sculpture however have mirrored the view of chance and 'medical research' as offered by AUSTIN (1978), who reported the creative process as being haphazard in character and often dependent upon chance supplying the necessary spark or signpost. This research also provides further evidence in support of those authors who already acknowledge the importance of chance, i.e. SIMONTON (1988). To those authors who prefer to stress the rational and controlled side of creativity, i.e. PERKINS (1981), hopefully this research emphasises that although control is necessary, by no means is it wholly desirable. ARP is a device which the author hopes would have appealed to many of the artists who have used chance in the past. The flexible nature of ARP means that it would be sympathetic to the personal styles of a variety of those artists, for example, one might imagine Marcel Duchamp using ARP in a 'pseudo scientific' manner, systematically and precisely following whatever ARP suggested, or, ARP's potential for producing the absurd and the ridiculous could perhaps have been used to determine the events for an evening at the 'Cabaret Voltaire'. At the other extreme, one could imagine ARP being used by 'The Boyle Family' as a means of receiving a random site, or by Kenneth Martin to receive a random set of numbers. However ARP is used, the evidence from this research proves that the use of chance methods to stimulate the mind, as advocated by DE BONO (1967), are every bit as applicable to making art as to the less tangible forms of creativity such as problem-solving or brain-storming.

4.32 What has been confirmed about the sculptor's creative process?

Participants' responses in questionnaires corroborated the existing evidence that had already been accumulated in the literature review; that the creative process involves indecision, uncertainty, desire for surprise, and a frequent willingness to change direction. A common characteristic shared by many of the participating sculptors was the fact that they '. . . never set out with a finished product in mind', a view re-iterated by the sculptor who stated a desire to '. . . find a surprise for myself in the end result . . .'. Even if the sculptor does set out with a finished product in mind, someone else emphasised that, in their experience, there were many barriers in the way:

> "Nothing of my own work has ever been how I intended so through many reasons either chance, accident or laziness they turn out different - how much control you can have is questionable."

One sculptor refers to this gap between the actual and the intended as the '. . . constant failure to attain the absolute' and considers this to be an important and necessary part of the creative process, a view shared by the author.

Several sculptors' comments indicate that whilst the physical manifestation of an idea may be extremely flexible - the underlying concept behind the idea was not:

> "I always begin with an intention . . . not knowing how the answer looks. I have no fixed pre-conceived idea of how an artwork *should* look, only that it should illuminate my understanding of the question."

> "What I set out to make is a statement, not an aesthetic object and that statement is the main goal to attain . . ."

In the first quote, the 'question' remains constant whilst different answers may be tried out; and again, in the second quote, the actual object is of secondary importance to the fixed 'statement' that the sculptor is attempting to communicate.

There was general agreement that planning was a necessary component of creativity, but such planning often attempted to incorporate a built-in 'alter my idea' clause. Most sculptors agreed that their process involved a lot of careful planning, not in order to avoid change however, but to allow for change.

"The careful planning attempts to leave space for, or create a condition whereby spontaneous reaction can be an ingredient."

". . . careful planning would rule out opportunities opened up by unexpected breaks."

". . . trying techniques or ideas without being sure of the results."

The willingness to change direction was seen by sculptors as a fundamental part of the creative process, necessary if the work was to progress and develop - sculpture (or any piece of art), was considered not just a simple case of realising an idea, but discovering the most satisfactory realisation. Unlike many professions, the artist may welcome when something turns out unexpectedly. Accidents, for example, were not viewed as disastrously as they may be in other professions: at a recent A.Sc.En.T. conference (Association of Sculpture and Engineering Technologies), one speaker (the sculptor, George Wylie), suggested that the fundamental difference between the sculptor and the engineer was, that, when the engineer dropped what he/she was making, he/she would most probably start anew, whilst the sculptor would pick up the pieces, examine them, and perhaps adapt his/her idea accordingly. Such 'sustained open-mindedness' allows sculptors' to enjoy and react to the reality of the present, rather than aim towards a desired future.

4.33 Has anything new been discovered about the sculptor's creative process?

An overwhelming number of participants (in experiments 'F' and 'G' combined - 90% from a sample of 30 persons), thought that chance did play a part in their creative process.

There was a recognition by most participating artists in this research that, in some way or another, chance played a part in their creative process, although it would seem that for the vast majority, it was simply an unavoidable part of their process, which they simply accepted or rejected, depending upon whether or not they liked the results. In the last experiment however, participants were asked to differentiate between 'deliberate' and 'undeliberate' chance. There is perhaps nothing startling about the fact that all 10 practising sculptors answered 'yes' - 'undeliberate' chance did occur their process, because of course, chance occurs in all walks of life, therefore, one cannot assume very much by its appearance in the sculptor's studio. However, much more revealing was the

fact that all 10 sculptors stated 'yes', they did make use of 'deliberate' chance, even although the extent to which they did so, varied from sculptor to sculptor, as demonstrated by the following comments:

> "Intentional use of chance in small ways . . . Unintentional use of chance constantly. . ."
>
> ". . . practically all work has some element of chance . . ."
>
> "Chance I feel is an important instrument in making sculpture and too often gets relegated to the background in my working process."
>
> "Chance comes into most operations in my work to a great extent, it is the level of acceptance of those chance happenings that vary enormously."

These quotes, along with the accumulated evidence, support and confirm the author's previously stated opinion, that chance played a significant role within the creative process.

4.35 Section 5 - The ideal and the future.

4.36 Potential for ARP's future development - the ideal ARP.

It is recognised that as it stands ARP is only a prototype, but, as such, has fulfilled its purpose of demonstrating the idea and intimating the vast potential of such a device. By taking into consideration the criticism and praise of those who have used this prototype, and by capitalizing on the most successful aspects whilst striving to eliminate the less successful aspects, it is possible to speculate as to what the future development of ARP might entail, and what an improved and 'ideal' ARP would be like.

Whilst the author felt it was important to design the prototype of ARP from the viewpoint and requirements of a sculptor, it is recognised that if ARP is to be developed further, a pre-requisite must be the expansion of the research to include collaboration with relevant and necessary computer expertise.

Several of the user's suggestions as to what might improve ARP, for example,

> "A way of recording the choices you have made . . . so that the process can work as fast as you think and limit the possibilities of self-censorship."

were outside the author's somewhat limited computer experience (and the scope of this research), but could surely be achieved with relative ease by more experienced persons.

Although the author shares the desire of some users to see ARP with

> "A more 'branching' or 'cyclical' structure, one which would defy linear advance/retreat progression . . ."

and with

> ". . . further labyrinthine passages to explore."

(which, again could be achieved with the correct expertise), it is suggested that such developments should not be at the expense of risking ARP's simplicity and accessibility. Anything too 'confusing' or complex may deter people from using ARP.

In order to try and achieve a truly objective and independent taxonomy, the future development of ARP would have to call upon multi-discipline expertise in the accumulation and classification of the contents. An additional point to be considered is the possibility of actually encouraging a 'weak' taxonomy so as to introduce a greater degree of randomness within the 'personal' decisions. By being deliberately misleading, users would end up with elements other than that which they were expecting. The possibility of increasing the 'randomness' of ARP exists, for example, 'mystery' options could become a feature of every card.

Ideally ARP would contain so much information (theoretically all possible 'elements of consideration', an infinite and therefore obviously unattainable quantity), that it was impossible to ever exhaust the combinations or explore all its passages, no matter how many times the person used it. The greater the number of options within ARP, the greater the chance of every user receiving a unique combination of elements.

One method of increasing the amount of data stored within ARP would be to

link it to other computer systems, which would again require relevant resources and expertise. However, several user's have suggested another possible way of increasing the content of ARP: to make it a requirement that those who use ARP - must add to ARP:

> "Greater depth and width of categories . . . and the ability of the user to add to these."

This would not only result in ARP becoming 'self-generating', but would also have the added benefit of contributing towards an improved taxonomy.

Ideally the information stored within ARP would be of a highly visual nature, possible using of colour, and taking advantage of recent developments in interactive multi-media.

4.37 Potential for ARP's future use.

If the above conditions were to be realised, it is suggested that ARP could be used in any of the following areas:

1. In further research as a methodological device - the invention and development of ARP has not left enough time to measure the effect that chance may have upon the creative process. ARP could now be used in further research, where, for example, the effects of different ratios of random and personal choice could be compared, or perhaps the observation of one sculptor using ARP over a long period of time.

2. As an educational device, not only for use by sculpture students, but also other areas of fine art, various design disciplines, and other creative professions, such as architecture, engineering, music, etc.

3. As a device which could be used by any experienced sculptor or artist (or any other professional), in which an individual wished to invite chance into their process. Due to the lack of access to computers that most artists would have, perhaps a guidebook to using chance could be based upon ARP, i.e. 'The Artists' Handbook of Chance'.

4. As a data-base of information relating to sculpture, where the chance element is always optional, but it may also simply be used for reference, i.e. as a guide to materials, tools, or technical processes.

4.38 Closing reflections.

Throughout the research the author not only became acquainted with the many nuances and problems that the deliberate use of chance involved, but also the nature and history of the subject. Chance was a widespread phenomenon prevalent throughout all levels of the universe: from the abstractly small world of particle physics to the abstractly large world of cosmology (indeed, recent discoveries in cosmology suggest that the 'expanding universe' may be expanding randomly). In relation to such grand concerns the simple objective of this research was to utilize the principle of chance as a stimulus to creativity: to make one think again, to question one's previous selections, to provide surprise, challenge, but above all - freedom of choice. The development of ARP has led to the author's greater understanding of the nature of creativity, the nature of chance, and the nature of sculpture, and looks forward to using ARP on both a personal and educational level, aware of the fact that ARP can only ever be a gesture towards chance - never chance itself.

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APPENDIX 1.1 AUTHOR'S PERSONAL NARRATIVE.

My initial interest in chance came about through my personal experience of making sculpture, both as an undergraduate and a post-graduate student. Over this period of approximately five years, there was a slow realization that I received greater satisfaction from the end product when to some extent its final form had been influenced by chance occurring at some stage during the making process. During this time I did not deliberately look for chance to any great degree, rather, my process relied upon the passive intrusion of 'undeliberate' chance, that is, things happening unexpectedly.

As stated above, my interest in chance evolved over a long period of time, however, in retrospect certain incidents have stuck in my mind as being instrumental in generating this curiosity, and several of these are described below.

A visit to a scrapyard: although full of potentially interesting bits and pieces, a trip to a local scrapyard was particularly unsatisfying, although I searched with great determination, nothing of interest was found. On the other hand, whilst out walking at weekends and not really thinking about sculpture, I came across many fascinating objects. The lack of success at the scrapyard led me to believe that the 'accidental' discovery of objects, materials, or images was more likely to yield something of interest than if I was consciously and deliberately looking for something.

Making do with what was available. Although this may have originally come about through a lack of money to purchase materials, it soon became part of my normal working process. Say for example that I required a piece of wood of a certain length. I could have gone to a timber merchant and purchased a length of wood which exactly fitted my requirements. On the other hand, I preferred to search around until I came across a piece of wood which approximately fitted my requirements. An added and attractive bonus of this second method was the fact that this 'found' piece of wood may already be a particular colour, or have old hinges on it, or have other smaller bits of wood attached. These of course would be allowed to stay, they added an unexpected element to my original design which I welcomed with great pleasure.

Letting circumstances dictate. The natural development from the above scenario was to let the idea evolve out of what was found. Towards the end of my fourth year degree course I enjoyed letting the circumstances dictate what I would make. Again, rather than go out and deliberately acquire a material to resolve an idea, I preferred to wait until a quantity of material came my way. Once this happened, I did not simply make a piece of sculpture based upon an old idea, but experimented and played with the 'found' material until an idea was suggested by the characteristics of the material itself.

In a similar vein, during my post-graduate year, I received a large packet of colourful felt pens as a Christmas present, my previous drawings could not in any way be described as colourful, and my initial reaction was to disregard them. However, when I considered that in my sculpture, I was making use of whatever came my way, I realised that I should make use of the felt pens. Surprisingly, I enjoyed using the colour and produced what I considered to be a highly rewarding series of drawings which eventually had quite an impact on some of my other work.

Making a drawing without realizing it. My first experience of this happened on an exchange visit to Cork, Eire. I had been making a series of sculptures which required sheets of paper to be laid onto a concrete floor and then rubbed with sticks of graphite. These sheets were then pasted onto a chicken-wire form, thereby giving a somewhat dubious impression of stone. On the first occasion, I absent mindedly set out to cover the entire sheet, however, about half way through I suddenly noticed the way in which I had gone about this had produced an exciting image in front of me. I then proceeded to make a series of drawings based upon this image and in a similar manner, however, presumably because I was now consciously setting out to draw a specific shape, they did not give me the same satisfaction as the first one, although the quality of the others may have been improved. I concluded that the success of the first drawing was due to the fact that *my mind was unconcerned about what I was doing because I thought I was doing something else*. Similar experiences have proved to be the most valuable to me, however, not as a result of consciously trying to make them happen, only at unexpected times.

Standing back. During my post-graduate year the interest in chance became more evident although I was still not really deliberately encouraging it. Throughout the year I explored the traditional techniques of casting and part of the appeal of such processes was the fact that to a very minimal degree the sculptor is removed from complete control. For example, one is never very sure about the surface quality or marks which may appear, especially when using plaster and concrete. I attempted at one stage to work in such a way that the form which emerged from the mould was a surprise to me. In order to try and achieve this, I worked in the negative, by hollowing out large sections of a polystyrene block, fitting them together, and then building up a concrete wall inside. Again, the resulting shape was only surprising to a very small degree, but it was still less certain than working in the positive.

I found that casting involved a similar effect to the drawing procedures described above, that is, it appeared that the mind was often unconcerned about something because it often presumed that what was being worked on was insignificant or for some other purpose. For example, I found that the moulds themselves had an extremely carefree quality about them, or, once a mould had been poured, the entire construction of dry plaster, wet plaster, string, and wedges, had an extremely attractive sense of immediacy and carelessness about it.

As well as more traditional casting techniques I also experimented by pouring plaster and cement into various types of container. Some of these, when poured, could not support the weight of the semi-liquid contents, and would often result in distortion of the original shape or if particularly weak, a complete collapse. Such 'disasters' often produced interesting results.

Unprepared panic. What is described above was perhaps the forerunner to another habit developed during that year. One of the hazards of working with plaster & concrete, etc, is that you may often mix up more than is necessary for the particular job in hand. Rather than throw this out, I would hurriedly find some use for it. Plaster especially gave me only a few minutes, sometimes less, to think of something to do with it. Very rarely did the results produce anything significant in themselves, however, at least two of my large concrete sculptures that were featured in my post-graduate show could be directly traced back to the results of such activity.

Distortion. Again, during my post-graduate year, a lot of my drawing originated on computer, and the computer printouts enlarged on a photocopier. During the enlarging process, which was to quite a large scale, the element of distortion could not be avoided. Although this did not directly effect the images that I was working on at the time, it did lead to an idea for a series of drawings which have yet to be executed. These include the enlargement of specs of dust, or the reduction of well known images to a certain degree followed by enlargement, therefore producing a distorted image of the original image.

Now, only in retrospect do all these incidents seem to share a common factor, that of chance. Probably there were many more examples but those chosen are only intended to give the reader a brief insight into how I became interested in chance in the first place.

APPENDIX 3.1 - FLOWCHARTS

STARTING POINT - LEVEL 1

Choose any number of the following six categories. This may be done either by choice or chance:

A. SELECT NO. OF CATEGORIES YOURSELF
B. LET DICE DECIDE NO. OF CATEGORIES
or
C. LET DICE DECIDE WHETHER A. or B.

MATERIAL | METHOD | PHYSICAL PROPERTIES | TIME | SURFACE | SHAPE

If 1 category is selected:

1. MATERIAL
2. METHOD
3. PHYSICAL PROPERTIES
4. TIME
5. SURFACE
6. SHAPE

If 2 categories are selected:

1. MATERIAL / METHOD
2. MATERIAL / PHYSICAL PROP.
3. MATERIAL / TIME
4. MATERIAL / SURFACE
5. MATERIAL / SHAPE
6. METHOD / PHYSICAL PROP.
7. METHOD / TIME
8. METHOD / SURFACE
9. METHOD / SHAPE
10. PHYSICAL PROP. / TIME
11. PHYSICAL PROP. / SURFACE
12. PHYSICAL PROP. / SHAPE
13. TIME / SURFACE
14. TIME ˇ SHAPE
15. SURFACE / SHAPE

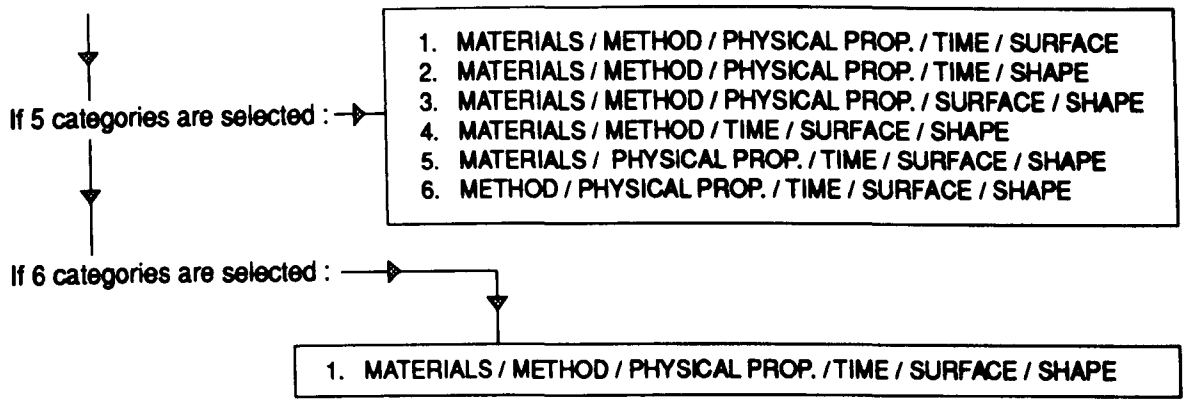
If 3 categories are selected:

1. MATERIALS / METHOD / PHYSICAL PROP.
2. MATERIALS / METHOD / TIME
3. MATERIALS / METHOD / SURFACE
4. MATERIALS / METHOD / SHAPE
5. MATERIALS / PHYSICAL PROP. / TIME
6. MATERIALS / PHYSICAL PROP. / SURFACE
7. MATERIALS / PHYSICAL PROP. / SHAPE
8. MATERIALS / TIME / SURFACE
9. MATERIALS / TIME / SHAPE
10. MATERIALS / SURFACE / SHAPE
11. METHOD / PHYSICAL PROP. / TIME
12. METHOD / PHYSICAL PROP. / SURFACE
13. METHOD / PHYSICAL PROP. / SHAPE
14. METHOD / TIME / SURFACE
15. METHOD / TIME / SHAPE
16. METHOD / SURFACE / SHAPE
17. PHYSICAL PROP. / TIME / SURFACE
18. PHYSICAL PROP. / TIME / SHAPE
19. PHYSICAL PROP. / SURFACE / SHAPE
20. TIME / SURFACE / SHAPE

If 4 categories are selected:

1. MATERIALS / METHOD / PHYSICAL PROP. / TIME
2. MATERIALS / METHOD / PHYSICAL PROP. / SURFACE
3. MATERIALS / METHOD / PHYSICAL PROP. / SHAPE
4. MATERIALS / METHOD / TIME / SURFACE
5. MATERIALS / METHOD / TIME / SHAPE
6. MATERIALS / METHOD / SURFACE / SHAPE
7. MATERIALS / PHYSICAL PROP. / TIME / SURFACE
8. MATERIALS / PHYSICAL PROP. / TIME / SHAPE
9. MATERIALS / PHYSICAL PROP. / SURFACE / SHAPE
10. MATERIALS / TIME / SURFACE / SHAPE
11. METHOD / PHYSICAL PROP. / TIME / SURFACE
12. METHOD / PHYSICAL PROP. / TIME / SHAPE
13. METHOD / PHYSICAL PROP. / SURFACE / SHAPE
14. METHOD / TIME / SURFACE / SHAPE
15. PHYSICAL PROP. / TIME / SURFACE / SHAPE

(cntd)



When selections have been made, proceed to either:

MATERIAL - Level Two
or
METHOD -Level Two
or
PHYSICAL PROPERTIES - Level Two
or
TIME - Level Two
or
SURFACE - Level Two
or
SHAPE - Level Two

LEVEL TWO - MATERIAL

If "MATERIAL" has been selected, choose any combination of any number of the following categories, either by choice or chance:

A. SELECT NO. OF CATEGORIES YOURSELF
B. LET DICE DECIDE NO. OF CATEGORIES
or
C. LET DICE DECIDE WHETHER A. or B.

TIMBER | CLOTH | PLANT | FLUID | PAPER | PLASTIC

NON SUBSTANCE | LIQUID | STONE | EARTH | METAL

If 1 category is selected there are 11 possible selections :

1. TIMBER
2. CLOTH
3. PLANT
4. FLUID
5. PAPER
6. PLASTIC
7. LIQUID
8. STONE
9. EARTH
10. METAL
11. NON-SUBSTANCE

If 2 categories are selected there are 55 possible selections :

1. TIMBER / CLOTH
2. TIMBER / PLANT
3. TIMBER / FLUID
4. TIMBER / PAPER
5. TIMBER / PLASTIC
6. TIMBER / NON-SUB
7. TIMBER / LIQUID
8. TIMBER / STONE
9. TIMBER / EARTH
10. TIMBER / METAL
11. CLOTH / PLANT
12. CLOTH / FLUID
13. CLOTH / PAPER
14. CLOTH / PLASTIC
15. CLOTH / NON-SUB
16. CLOTH / LIQUID
17. CLOTH / STONE
18. CLOTH / EARTH
18. CLOTH / METAL
20. PLANT / FLUID
21. PLANT / PAPER
22. PLANT / PLASTIC
23. PLANT / NON-SUB
24. PLANT / LIQUID
25. PLANT / STONE
26. PLANT / EARTH
27. PLANT / METAL
28. FLUID / PAPER
29. FLUID / PLASTIC
30. FLUID / NON-SUB
31. FLUID / LIQUID
32. FLUID / STONE
33. FLUID / EARTH
34. FLUID / METAL
35. PAPER / PLASTIC
36. PAPER / NON-SUB
37. PAPER / LIQUID
38. PAPER / STONE
39. PAPER / EARTH
40. PAPER / METAL
41. PLASTIC / NON-SUB
42. PLASTIC / LIQUID
43. PLASTIC / STONE
44. PLASTIC / EARTH
45. PLASTIC / METAL
46. NON-SUB / LIQUID
47. NON-SUB / STONE
48. NON-SUB / EARTH
49. NON-SUB / METAL
50. LIQUID / STONE
51. LIQUID / EARTH
52. LIQUID / METAL
53. STONE / EARTH
54. STONE / METAL
55. EARTH / METAL

If 3 categories are selected there are 165 possible combinations :

1. TIMBER / CLOTH / PLANT
2. TIMBER / CLOTH / FLUID
3. TIMBER / CLOTH / PAPER
4. TIMBER / CLOTH / PLASTIC
5. TIMBER / CLOTH / NON-SUB
6. TIMBER / CLOTH / LIQUID
7. TIMBER / CLOTH / STONE
8. TIMBER / CLOTH + EARTH
9. TIMBER / CLOTH / METAL
10. TIMBER / PLANT / FLUID
56. CLOTH / FLUID / NON-SUB
57. CLOTH / FLUID / LIQUID
58. CLOTH / FLUID / STONE
59. CLOTH / FLUID / EARTH
60. CLOTH / FLUID / METAL
61. CLOTH / PAPER / PLASTIC
62. CLOTH / PAPER / NON-SUB
63. CLOTH / PAPER / LIQUID
64. CLOTH / PAPER / STONE
65. CLOTH / PAPER / EARTH
111. FLUID / PAPER / NON-SUB
112. FLUID / PAPER / LIQUID
113. FLUID / PAPER / STONE
114. FLUID / PAPER / EARTH
115. FLUID / PAPER / METAL
116. FLUID / PLASTIC / NON-SUB
117. FLUID / PLASTIC / LIQUID
118. FLUID / PLASTIC / STONE
119. FLUID / PLASTIC / EARTH
120. FLUID / PLASTIC / METAL

(continued over page)

(3 categories - continued from previous page)

11. TIMBER / PLANT / PAPER
12. TIMBER / PLANT / PLASTIC
13. TIMBER / PLANT / NON-SUB
14. TIMBER / PLANT / LIQUID
15. TIMBER / PLANT / STONE
16. TIMBER / PLANT / EARTH
17. TIMBER / PLANT / METAL
18. TIMBER / FLUID / PAPER
19. TIMBER / FLUID / PLASTIC
20. TIMBER / FLUID / NON-SUB
21. TIMBER / FLUID / LIQUID
22. TIMBER / FLUID / STONE
23. TIMBER / FLUID / EARTH
24. TIMBER / FLUID / METAL
25. TIMBER / PAPER / PLASTIC
26. TIMBER / PAPER / NON-SUB
27. TIMBER / PAPER / LIQUID
28. TIMBER / PAPER / STONE
29. TIMBER / PAPER / EARTH
30. TIMBER / PAPER / METAL
31. TIMBER / PLASTIC / NON-SUB
32. TIMBER / PLASTIC / LIQUID
33. TIMBER / PLASTIC / STONE
34. TIMBER / PLASTIC / EARTH
35. TIMBER / PLASTIC / METAL
36. TIMBER / NON-SUB / LIQUID
37. TIMBER / NON-SUB / STONE
38. TIMBER / NON-SUB / EARTH
39. TIMBER / NON-SUB / METAL
40. TIMBER / LIQUID / STONE
41. TIMBER / LIQUID / EARTH
42. TIMBER / LIQUID / METAL
43. TIMBER / STONE / EARTH
44. TIMBER / STONE / METAL
45. TIMBER / EARTH / METAL
46. CLOTH / PLANT / FLUID
47. CLOTH / PLANT / PAPER
48. CLOTH / PLANT / PLASTIC
49. CLOTH / PLANT / NON-SUB
50. CLOTH / PLANT / LIQUID
51. CLOTH / PLANT / STONE
52. CLOTH / PLANT / EARTH
53. CLOTH / PLANT / METAL
54. CLOTH / FLUID / PAPER
55. CLOTH / FLUID / PLASTIC
66. CLOTH / PAPER / METAL
67. CLOTH / PLASTIC / NON-SUB
68. CLOTH / PLASTIC / LIQUID
69. CLOTH / PLASTIC / STONE
70. CLOTH / PLASTIC / EARTH
71. CLOTH / PLASTIC / METAL
72. CLOTH / NON-SUB / LIQUID
73. CLOTH / NON-SUB / STONE
74. CLOTH / NON-SUB / EARTH
75. CLOTH / NON-SUB / METAL
76. CLOTH / LIQUID / STONE
77. CLOTH / LIQUID / EARTH
78. CLOTH / LIQUID / METAL
79. CLOTH / STONE / EARTH
80. CLOTH / STONE / METAL
81. CLOTH / EARTH / METAL
82. PLANT / FLUID / PAPER
83. PLANT / FLUID / PLASTIC
84. PLANT / FLUID / NON-SUB
85. PLANT / FLUID / LIQUID
86. PLANT / FLUID / STONE
87. PLANT / FLUID / EARTH
88. PLANT / FLUID / METAL
89. PLANT / PAPER / PLASTIC
90. PLANT / PAPER / NON-SUB
91. PLANT / PAPER / LIQUID
92. PLANT / PAPER / STONE
93. PLANT / PAPER / EARTH
94. PLANT / PAPER / METAL
95. PLANT / PLASTIC / NON-SUB
96. PLANT / PLASTIC / LIQUID
97. PLANT / PLASTIC / STONE
98 PLANT / PLASTIC / EARTH
99 PLANT / PLASTIC / METAL
100. PLANT / NON-SUB / LIQUID
101. PLANT / NON-SUB / STONE
102. PLANT / NON-SUB / EARTH
103. PLANT / NON-SUB / METAL
104. PLANT / LIQUID / STONE
105. PLANT / LIQUID / EARTH
106. PLANT / LIQUID / METAL
107. PLANT / STONE / EARTH
108. PLANT / STONE / METAL
109. PLANT / EARTH / METAL
110. FLUID / PAPER / PLASTIC
121. FLUID / NON-SUB / LIQUID
122. FLUID / NON-SUB / STONE
123. FLUID / NON-SUB / EARTH
124. FLUID / NON-SUB / METAL
125. FLUID / LIQUID / STONE
126. FLUID / LIQUID / EARTH
127. FLUID / LIQUID / METAL
128. FLUID / STONE / EARTH
129. FLUID / STONE / METAL
130. FLUID / EARTH / METAL
131. PAPER / PLASTIC / NON-SUB
132. PAPER / PLASTIC / LIQUID
133. PAPER / PLASTIC / STONE
134. PAPER / PLASTIC / EARTH
135. PAPER / PLASTIC / METAL
136. PAPER / NON-SUB / LIQUID
137. PAPER / NON-SUB / STONE
138. PAPER / NON-SUB / EARTH
139. PAPER / NON-SUB / METAL
140. PAPER / LIQUID / STONE
141. PAPER / LIQUID / EARTH
142. PAPER / LIQUID / METAL
143. PAPER / STONE / EARTH
144. PAPER / STONE / METAL
145. PAPER / EARTH / METAL
146. PLASTIC / NON-SUB / LIQUID
147. PLASTIC / NON-SUB / STONE
148. PLASTIC / NON-SUB / EARTH
149. PLASTIC / NON-SUB / METAL
150. PLASTIC / LIQUID / STONE
151. PLASTIC / LIQUID / EARTH
152. PLASTIC / LIQUID / METAL
153. PLASTIC / STONE / EARTH
154. PLASTIC / STONE / METAL
155. PLASTIC / EARTH / METAL
156. NON-SUB / LIQUID / STONE
157. NON-SUB / LIQUID / EARTH
158. NON-SUB / LIQUID / METAL
159. NON-SUB / STONE / EARTH
160. NON-SUB / STONE / METAL
161. NON-SUB / EARTH / METAL
162. LIQUID / STONE / EARTH
163. LIQUID / STONE / METAL
164. LIQUID / EARTH / METAL
165. STONE / EARTH / METAL

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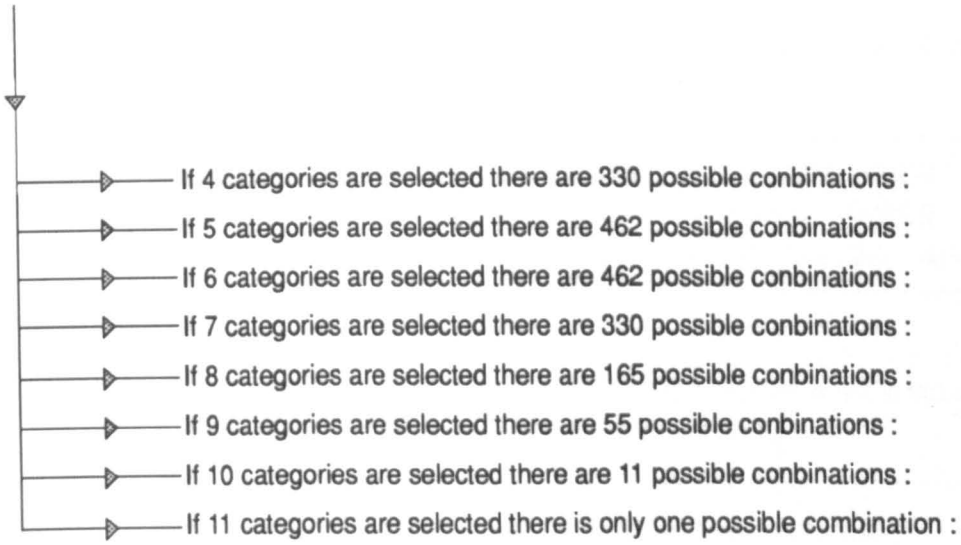


ALL POSSIBLE COMBINATIONS OF CATEGORIES : 2047

WHEN SELECTION HAS BEEN MADE PROCEED TO MATERIAL -LEVEL THREE

LEVEL THREE - MATERIAL

If "TIMBER" has been selected, choose any combination of any number of the following categories, either by choice or chance ("Timber 1") :

BALSA PLYWOOD SOFTWOOD HARDWOOD MAHOGONY EBONY
TEAK WALNUT OAK ELM ASH BEECH SYCAMORE MAPLE
POPLAR PINE FIR LARCH SPRUCE CEDAR ALDER WILLOW BIRCH

If "TIMBER" has been selected, choose any combination of any number of the following categories, either by choice or chance ("Timber 2") :

BRANCH BOUGH KINDLING LOGS PLANK SAWDUST
STICK TREE TRUNK TWIG WOOD NEEDLE CONE BOARD

If "CLOTH" has been selected, choose any combination of any number of the following categories, either by choice or chance ("Cloth 1") :

BAIZE COTTON WOOL CALICO CANVAS FABRIC FUR FELT HEMP
HESSIAN JUTE LEATHER LINEN NYLON NETTING SILK SACKING
WOOL YARN ELASTIC

If "CLOTH" has been selected, choose any combination of any number of the following categories, either by choice or chance ("Cloth 2") :

FLUFF CORD ROPE STRING TWINE THREAD

If "PLANT" has been selected, choose any combination of any number of the following categories, either by choice or chance :

BRACKEN BAMBOO BONE BARK CHAFF CANE CORK FOLIAGE FERN
FUNGUS FEATHER GRASS GRAIN HAY HUMUS IVORY LEAVES
LICHEN MOSS MOULD PLANT REED ROOTS SHRUB SEAWEED
STUBBLE STRAW SEEDS SPONGE THORN TUBER WEEDS BUSH
ALGAE HAIR VEGETABLE FRUIT

(continued over page)

If "FLUID" has been selected, choose any combination of any number of the following categories, either by choice or chance :

BUTTER BITUMEN BOOTPOLISH FAT GUM GREASE GLUE GROUT
JELLY LARD MARGARINE PITCH PLASTICINE PUTTY RESIN SOAP
TAR WAX PASTE SLIME PULP

If "PAPER" has been selected, choose any combination of any number of the following categories, either by choice or chance :

CARD CARBON CREPE NEWSPRINT PAPIERMACHE
TISSUE TRACING TIN FOIL CARTRIDGE

If "PLASTIC" has been selected, choose any combination of any number of the following categories, either by choice or chance :

ACETATE CELLULOID FIBREGLASS PLASTIC POLYTHENE POLYSTYRENE
PERSPEX SELLOTAPE RUBBER LATEX GLASS MIRROR

If "EARTH" has been selected, choose any combination of any number of the following categories, either by choice or chance :

CLAY EARTH MUD MORTAR PEAT SOIL SILT SAND
TURF SOOT POWDER DIRT DUST ASH

If "METAL" has been selected, choose any combination of any number of the following categories, either by choice or chance ("METAL 1") :

ALUMINIUM BRONZE BRASS CHROME COPPER IRON PEWTER
PIG-IRON STEEL TIN ZINC MAGNET LEAD

If "METAL" has been selected, choose any combination of any number of the following categories, either by choice or chance ("METAL 2") :

RUST SPRING WIRE BARBED WIRE SCREWS STAPLES
PINS RIVETS NAILS TACKS

(Continued over page)

If "STONE" has been selected, choose any combination of any number of the following categories, either by choice or chance ("STONE 1") :

ALABASTER BASALT COAL FLINT GRANITE GRAPHITE LAVA LIMESTONE MARBLE MINERAL ORE SLATE SANDSTONE CHARCOAL CHALK ASPHALT CEMENT CONCRETE BREEZEBLOCK PLASTER

If "STONE" has been selected, choose any combination of any number of the following categories, either by choice or chance ("STONE 2") :

BOULDER COBBLES EMBERS GRAVEL PEBBLE ROCKS RUBBLE SHALE BRICK GRIT

If "LIQUID" has been selected, choose any combination of any number of the following categories, either by choice or chance ("LIQUID 1") :

ACID BLEACH DEW DYE ICE ICE CUBES ICICLES MOLASSES OIL PETROL PARAFFIN PAINT RAIN RAINDROPS SHELLAC SALIVA SEA SYRUP TREACLE VARNISH WATER SNOW ALCOHOL

If "LIQUID" has been selected, choose any combination of any number of the following categories, either by choice or chance ("LIQUID 2") :

BUBBLE DRIP FROTH FOAM SPLASH PUDDLE TRICKLE

If "NON-SUBSTANCE" has been selected, choose any combination of any number of the following categories, either by choice or chance :

AIR CLOUD FOG FIRE GAS LIGHT NEON SMOKE STEAM VAPOUR WIND HEAT SHADOW ODOUR SMELL SKY WAVES SINK LASER FOREST LANDSCAPE NIGHT TIME DARKNESS OUTDOORS DAWN SEASON DUSK OCEAN DAYLIGHT WHISPER VACUUM MACHINE RIVER CLIFF CAVE DESERT MOUNTAIN SPACE SUN BEACH SHORE-LINE FROST FUEL PEOPLE SPEECH NEWS OBSTACLE JUNK BELLS COSTUME LANGUAGE TOUCH TEXT CORNERS MEDIA TELEVISION FENCE MANGLE BOX SAIL FLY FLESH RANGE RADIO ELECTRICITY DISTANCE LAUGHTER POETRY CONTAINERS MUSIC TASTE WALKING GADGET FLOOR WHEEL BALL CONTOUR SILHOUETTE FILM MAGNIFICATION WEIGHT DECAY MOVEMENT PATIENCE DREAMS GEOMETRY MAPS NONSENSE VIBRATION DAMAGE STAIN RAGE PUZZLE COLOUR SOUND TELEPHONE CHANCE FUSION MEMORY SLEEP NOISE REFLECTION MESS GESTURE FREQUENCY INSANITY ME CHAOS SILENCE APPLAUSE RUINS WHISTLE ECHO SUCTION SPEED CORROSION SUSPENSION MUTANT TRANSPARENCY

When selections have been made, proceed to Level Two of either Method, or Physical Properties, or Time, or Surface, or Shape - if they were chosen on Level 1

LEVEL TWO - METHOD

If "METHOD" has been selected, choose any combination of any number of the following categories, either by choice or chance ("Method 1") :

A. SELECT NO. OF CATEGORIES YOURSELF
B. LET DICE DECIDE NO. OF CATEGORIES
or
C. LET DICE DECIDE WHETHER A. or B.

CONSTRUCTION DESTRUCTION

If "METHOD" has been selected, choose any combination of any number of the following categories, either by choice or chance ("Method 2") :

A. SELECT NO. OF CATEGORIES YOURSELF
B. LET DICE DECIDE NO. OF CATEGORIES
or
C. LET DICE DECIDE WHETHER A. or B.

TOOL HAND

If "TOOL" has been selected, choose any combination of any number of the following categories, either by choice or chance :

POWER TOOL HAND TOOL

Possible combinations of "Method 1" and "Method 2" :

1. CONSTRUCTION
2. DESTRUCTION
3. TOOL (POWER)
4. TOOL (HAND)
5. HAND
6. CONSTRUCTION & TOOL (POWER)
7. CONSTRUCTION & TOOL (HAND)
8. CONSTRUCTION & HAND
9. DESTRUCTION & TOOL (POWER)
10. DESTRUCTION & TOOL (HAND)
11. DESTRUCTION & HAND

WHEN SELECTION HAS BEEN MADE, PROCEED TO METHOD - LEVEL THREE

LEVEL THREE - METHOD

If "Tool Power" has been selected, choose any combination of any number of the following categories, either by choice or chance :

ELECTRIC DRILL ROUTER JIGSAW CIRCULAR SAW POWER PLANE ORBITAL SANDER DISC SANDER BELT SANDER SCREW DRIVER ANGLE GRINDER CHAINSAW DISC CUTTER NIBBLER SOLDERING IRON ARC WELDER GAS WELDER

If "Tool Hand" has been selected, choose any combination of any number of the following categories, either by choice or chance :

TINSNIPS CHISELS PUNCHES FILES BRUSH SPIRIT LEVEL TROWEL PLANES SURFORM SCRAPERS SAWS STAPLE GUN HACKSAW BIT BRACE HAND DRILL GOUGES GAUGES SQUARES BEVELS SCREWDRIVERS ANVIL TONGS HAMMERS SPANNERS MALLETS AXES CROWBARS CLAMPS WRENCHES VICES PLIERS GLASS CUTTERS SCISSORS KNIVES

If "CONSTRUCTION" has been selected, choose any combination of any number of the following categories, either by choice or chance :

CONSTRUCT THROW UNITE ARTICULATE INTERLOCK WELD SOLDER FUSE CEMENT GLUE LACE KNIT SEW STITCH LINK LUMP ATTACH STAPLE CLIP FIX FASTEN TIE HOOK SCREW STICK WEDGE RIVET BOLT CLAMP BIND ENTWINE BUILD STACK PILE COMPOUND TIER MULTIPLY PLUG EXTEND INFLATE SWELL AMASS PLEAT ENLARGE PACK CRAM STUFF MOULD BLEND ELONGATE BURGEON SHOOT BURST EXAGGERATE EXPAND MUSHROOM INTENSIFY ADHERE ABUT ORGANISE SYNTHESIZE ASEMBLE FABRICATE JOIN

If "DESTRUCTION" has been selected, choose any combination of any number of the following categories, either by choice or chance :

DESTRUCT BREAK SPLIT RENT TEAR CRACK SLIT CUT DROP SEVER DISPLACE PEEL UNDO HACK SLASH PRICK STAB SAW CHOP CARVE SLICE CHIP TRIM SNIP SHAVE DICE RIP CRUNCH POUND SMASH SHATTER CRUMBLE SCATTER BEND BUCKLE WARP DISTORT DIVIDE PIERCE CLEAVE CRUMPLE CRUSH EXPLODE CONCERTINA SHEAR TWIST DISINTEGRATE BATTER SQUASH IMPLODE BURST SKIN COMPRESS SHRINK DEFLATE BURN SINGE INCINERATE MANGLE REDUCE TRUNCATE ATTENUATE

If "HAND" has been selected, choose any combination of any number of the following categories, either by choice or chance :

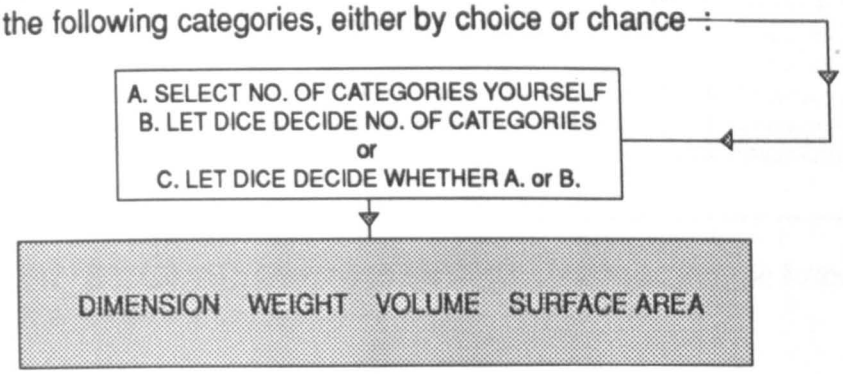
LEFT RIGHT BOTH

If "HAND" has been selected, choose any combination of any number of the following categories, either by choice or chance :

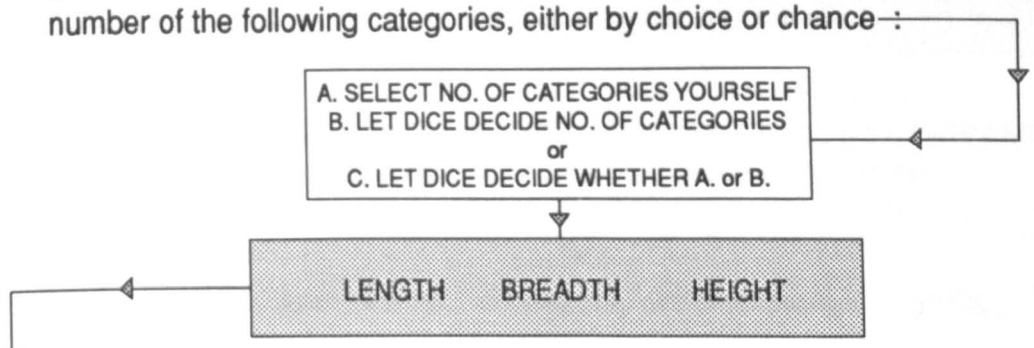
FINGERS THUMBS KNUCKLES FISTS PALMS NAILS

LEVEL TWO - PHYSICAL PROPERTIES

If "PHYSICAL PROPERTIES" has been selected, choose any combination of any number of the following categories, either by choice or chance :



If "DIMENSION" has been selected, choose any combination of any number of the following categories, either by choice or chance :



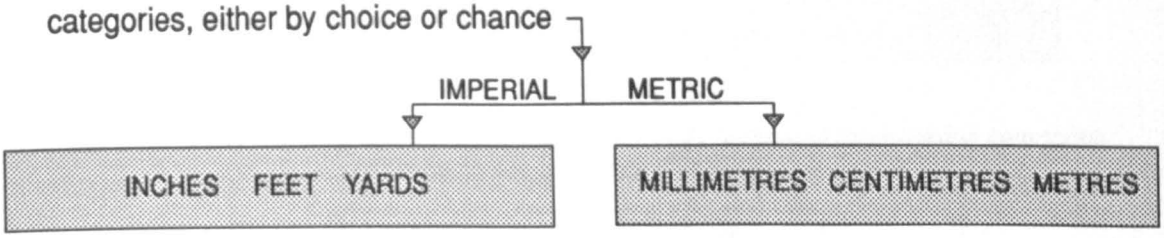
Possible combinations of the above categories :

1. Dimension (length)
2. Dimension (breadth)
3. Dimension (height)
4. Dimension (length & breadth)
5. Dimension (length & height)
6. Dimension (breadth & height)
7. Dimension (length & breadth & height)
8. Weight
9. Volume
10. Surface area
11. Weight & Dimension (L)
12. Weight & Dimension (B)
13. Weight & Dimension (H)
14. Weight & Dimension (L\B)
15. Weight & Dimension (L\H)
16. Weight & Dimension (B\H)
17. Weight & Dimension (L\B\H)
18. Volume & Dimension (L)
19. Volume & Dimension (B)
20. Volume & Dimension (H)
21. Volume & Dimension (L\B)
22. Volume & Dimension (L\H)
23. Volume & Dimension (B\H)
24. Volume & Dimension (L\B\H)
25. Surface area & Dimension (L)
26. Surface area & Dimension (B)
27. Surface area & Dimension (H)
28. Surface area & Dimension (L\B)
29. Surface area & Dimension (L\H)
30. Surface area & Dimension (B\H)
31. Surface area & Dimension (L\B\H)
32. Weight & Volume
33. Weight & Surface area
34. Volume & Surface area
35. Weight & Volume & Dimension (L)
36. Weight & Volume & Dimension (B)
37. Weight & Volume & Dimension (H)
38. Weight & Volume & Dimension (L\B)
39. Weight & Volume & Dimension (L\H)
40. Weight & Volume & Dimension (B\H)
41. Weight & Volume & Dimension (L\B\H)
42. Weight & Surface area & Dimension (L)
43. Weight & Surface area & Dimension (B)
44. Weight & Surface area & Dimension (H)
45. Weight & Surface area & Dimension (L\B)
46. Weight & Surface area & Dimension (L\H)
47. Weight & Surface area & Dimension (B\H)
48. Weight & Surface area & Dimension (L\B\H)

(continued over page)

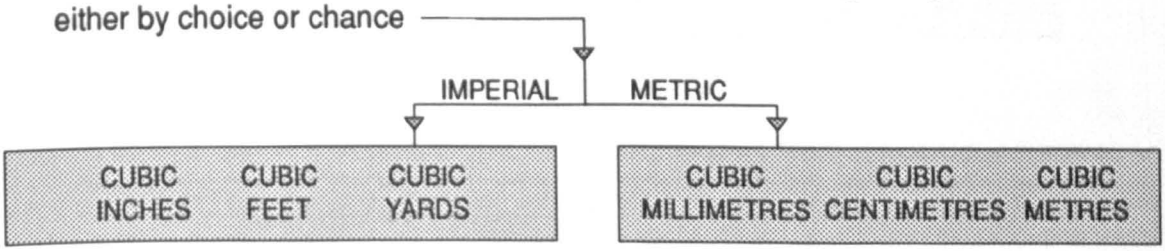
49. Weight & Surface area & Dimension (L)
50. Weight & Surface area & Dimension (B)
51. Weight & Surface area & Dimension (H)
52. Weight & Surface area & Dimension (L\B)
53. Weight & Surface area & Dimension (L\H)
54. Weight & Surface area & Dimension (B\H)
55. Weight & Surface area & Dimension (L\B\H)
56. Weight & Volume & Surface area
57. Weight & Volume & Surface area & Dimension (L)
58. Weight & Volume & Surface area & Dimension (B)
59. Weight & Volume & Surface area & Dimension (H)
60. Weight & Volume & Surface area & Dimension (L\B)
61. Weight & Volume & Surface area & Dimension (L\H)
62. Weight & Volume & Surface area & Dimension (B\H)
63. Weight & Volume & Surface area & Dimension (L\B\H)

If "DIMENSIONS" (L), (B), (H), have been selected, choose any of the following categories, either by choice or chance

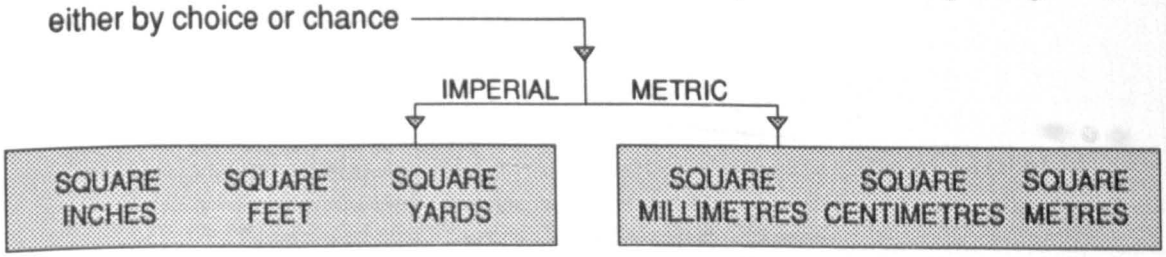


If "LENGTH" or "BREADTH" or "HEIGHT" have been selected, determine parameters from the sequence 0 to infinity, then choose any number within those boundaries either by choice or chance.

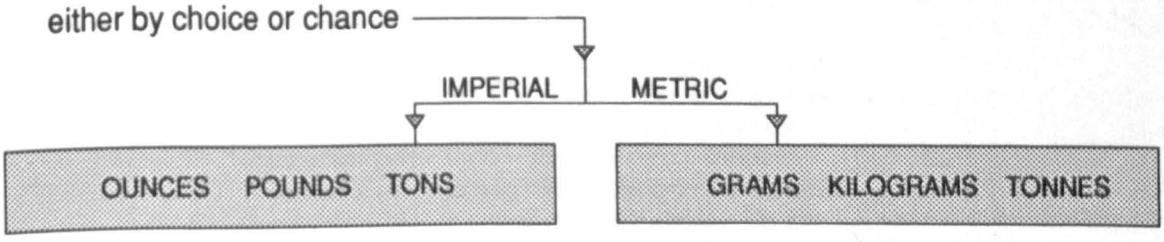
If "VOLUME" has been selected, choose any of the following categories, either by choice or chance



If "SURFACE AREA" has been selected, choose any of the following categories, either by choice or chance



If "WEIGHT" has been selected, choose any of the following categories, either by choice or chance



LEVEL 2 - TIME

If "TIME" has been selected, choose any combination of any number of the following categories, either by choice or chance ("TIME 1") :

A. SELECT NO. OF CATEGORIES YOURSELF
B. LET DICE DECIDE NO. OF CATEGORIES
or
C. LET DICE DECIDE WHETHER A. or B.

CONSTRUCTION TIME OBJECT LIFE SPAN

If "TIME" has been selected, choose any combination of any number of the following categories, either by choice or chance ("TIME 2") :

A. SELECT NO. OF CATEGORIES YOURSELF
B. LET DICE DECIDE NO. OF CATEGORIES
or
C. LET DICE DECIDE WHETHER A. or B.

SECONDS MINUTES HOURS DAYS WEEKS

Possible combinations of "TIME 1" and "TIME 2" :

1. Construction time = Seconds
2. Construction time = Minutes
3. Construction time = Hours
4. Construction time = Days
5. Construction time = Weeks
6. Object life span = Seconds
7. Object life span = Minutes
8. Object life span = Hours
9. Object life span = Days
10. Object life span = Weeks
11. Construction time = Permanent
12. Construction time = Seconds \ Object life span = Seconds
13. Construction time = Minutes \ Object life span = Seconds
14. Construction time = Hours \ Object life span = Seconds
15. Construction time = Days \ Object life span = Seconds
16. Construction time = Weeks \ Object life span = Seconds
17. Construction time = Seconds \ Object life span = Minutes
18. Construction time = Minutes \ Object life span = Minutes
19. Construction time = Hours \ Object life span = Minutes
20. Construction time = Days \ Object life span = Minutes
21. Construction time = Weeks \ Object life span = Minutes
22. Construction time = Seconds \ Object life span = Hours
23. Construction time = Minutes \ Object life span = Hours

(cntd)

(cntd)

24. Construction time = Hours \ Object life span = Hours
25. Construction time = Days \ Object life span = Hours
26. Construction time = Weeks \ Object life span = Hours
27. Construction time = Seconds \ Object life span = Days
28. Construction time = Minutes \ Object life span = Days
29. Construction time = Hours \ Object life span = Days
30. Construction time = Days \ Object life span = Days
31. Construction time = Weeks \ Object life span = Days
32. Construction time = Seconds \ Object life span = Weeks
33. Construction time = Minutes \ Object life span = Weeks
34. Construction time = Hours \ Object life span = Weeks
35. Construction time = Days \ Object life span = Weeks
36. Construction time = Weeks \ Object life span = Weeks
37. Construction time = Seconds \ Object life span = Permanent
38. Construction time = Minutes \ Object life span = Permanent
39. Construction time = Hours \ Object life span = Permanent
40. Construction time = Days \ Object life span = Permanent
41. Construction time = Weeks \ Object life span = Permanent

LEVEL THREE - TIME

If "CONSTRUCTION TIME" and "SECONDS" have been selected, choose any number from the following sequence, either by choice or chance :

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60

If "CONSTRUCTION TIME" and "MINUTES" have been selected, choose any number from the following sequence, either by choice or chance :

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60

If "CONSTRUCTION TIME" and "HOURS" have been selected, choose any number from the following sequence, either by choice or chance :

1	2	3	4	5	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21	22	23	24

If "CONSTRUCTION TIME" and "DAYS" have been selected, choose any number from the following sequence, either by choice or chance :

1	2	3	4	5	6	7

If "CONSTRUCTION TIME" and "WEEKS" have been selected, choose any number from the following sequence, either by choice or chance :

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52								

If "OBJECT LIFE SPAN" has been selected, choose one of the following two categories, either by choice or chance :

PERMANENT	TRANSIENT

LEVEL TWO - SURFACE

If "SURFACE" has been selected, choose one or both of the following categories, either by choice or chance:

A. SELECT NO. OF CATEGORIES YOURSELF
B. LET DICE DECIDE NO. OF CATEGORIES
or
C. LET DICE DECIDE WHETHER A. or B.

TEXTURE COLOUR

If "TEXTURE" has been selected, choose one of the following two categories, either by choice or chance:

NATURAL APPLIED

If "COLOUR" has been selected, choose one of the following two categories, either by choice or chance:

NATURAL APPLIED

Possible combinations

1. NATURAL TEXTURE
2. APPLIED TEXTURE
3. NATURAL COLOUR
4. APPLIED COLOUR
5. NATURAL TEXTURE & NATURAL COLOUR
6. NATURAL TEXTURE & APPLIED COLOUR
7. APPLIED TEXTURE & NATURAL COLOUR
8. APPLIED TEXTURE & APPLIED COLOUR

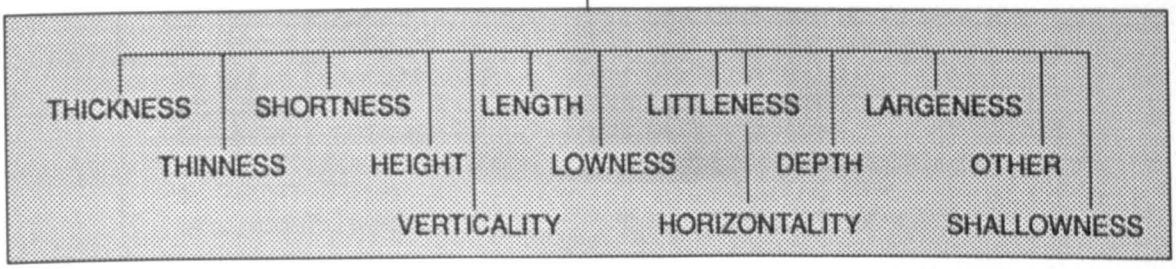
If "TEXTURE" has been selected, choose any combination of any number of the following categories, either by choice or chance:

SMOOTH SLIPPERY POLISHED SHINY BLAND EVEN VELVETY
BALD GREASY GELATINOUS ROUGH IRREGULAR UNEVEN
RIPPLING RUTTED BUMPY LUMPY NODULAR CRINKLED
KNOTTED GNARLED COARSE CRACKED LINED WRINKLED
CORRUGATED RIDGED JAGGED SCABBY

LEVEL TWO - SHAPE

If "SHAPE" has been selected, choose any combination of any number of the following categories, either by choice or chance:

A. SELECT NO. OF CATEGORIES YOURSELF
B. LET DICE DECIDE NO. OF CATEGORIES
or
C. LET DICE DECIDE WHETHER A. or B.



If 1 category is selected there are 13 possible selections :

1. THICKNESS
2. THINNESS
3. SHORTNESS
4. HEIGHT
5. LENGTH
6. LOWNESS
7. LITTLENESS
8. LARGENESS
9. SHALLOWNESS
10. VERTICALITY
11. HORIZONTALITY
12. DEPTH
13. OTHER

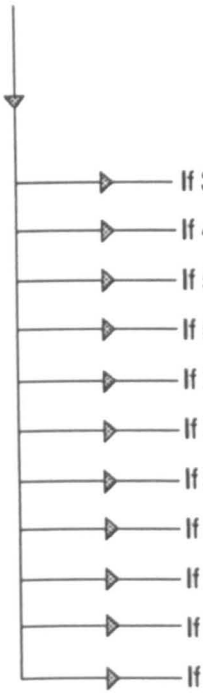
If 2 categories are selected there are 55 possible selections :

1. THICKNESS / SHORTNESS
2. THICKNESS / LENGTH
3. THICKNESS / LITTLENESS
4. THICKNESS / LARGENESS
5. THICKNESS / THINNESS
6. THICKNESS / HEIGHT
7. THICKNESS / LOWNESS
8. THICKNESS / SHALLOWNESS
9. THICKNESS / DEPTH
10. THICKNESS / VERTICALITY
11. THICKNESS / HORIZONTALITY
12. THICKNESS / OTHER
13. SHORTNESS / LENGTH
14. SHORTNESS / LITTLENESS
15. SHORTNESS / LARGENESS
16. SHORTNESS / THINNESS
17. SHORTNESS / HEIGHT
18. SHORTNESS / LOWNESS
19. SHORTNESS / SHALLOWNESS
20. SHORTNESS / DEPTH
21. SHORTNESS / VERTICALITY
22. SHORTNESS / HORIZONTALITY
23. SHORTNESS / OTHER
24. LENGTH / LITTLENESS
25. LENGTH / LARGENESS
26. LENGTH / THINNESS
27. LENGTH / HEIGHT
28. LENGTH / LOWNESS
29. LENGTH / SHALLOWNESS
30. LENGTH / DEPTH
31. LENGTH / VERTICALITY
32. LENGTH / HORIZONTALITY
33. LENGTH / OTHER
34. LITTLENESS / LARGENESS
35. LITTLENESS / THINNESS
36. LITTLENESS / HEIGHT
37. LITTLENESS / LOWNESS
38. LITTLENESS / SHALLOWNESS
39. LITTLENESS / DEPTH
40. LITTLENESS / VERTICALITY
41. LITTLENESS / HORIZONTALITY
42. LITTLENESS / OTHER
43. LARGENESS / THINNESS
44. LARGENESS / HEIGHT
45. LARGENESS / LOWNESS
46. LARGENESS / SHALLOWNESS
47. LARGENESS / DEPTH
48. LARGENESS / VERTICALITY
49. LARGENESS / HORIZONTALITY
50. LARGENESS / OTHER

(cntd)

(cntd)

51. THINNESS / HEIGHT
52. THINNESS / LOWNESS
53. THINNESS / SHALLOWNESS
54. THINNESS / DEPTH
55. THINNESS / VERTICALITY
56. THINNESS / HORIZONTALITY
57. THINNESS / OTHER
58. HEIGHT / LOWNESS
59. HEIGHT / SHALLOWNESS
60. HEIGHT / DEPTH
61. HEIGHT / VERTICALITY
62. HEIGHT / HORIZONTALITY
63. HEIGHT / OTHER
64. LOWNESS / SHALLOWNESS
65. LOWNESS / DEPTH
65. LOWNESS / VERTICALITY
67. LOWNESS / HORIZONTALITY
68. LOWNESS / OTHER
69. SHALLOWNESS / DEPTH
70. SHALLOWNESS / VERTICALITY
71. SHALLOWNESS / HORIZONTALITY
72. SHALLOWNESS / OTHER
73. DEPTH / VERTICALITY
74. DEPTH / HORIZONTALITY
75. DEPTH / OTHER
76. VERTICALITY / HORIZONTALITY
77. VERTICALITY / OTHER
78. HORIZONTALITY / OTHER



If 3 categories are selected there are 286 possible conbinations :

If 4 categories are selected there are 715 possible conbinations :

If 5 categories are selected there are 1287 possible conbinations :

If 6 categories are selected there are 1716 possible conbinations :

If 7 categories are selected there are 1716 possible conbinations :

If 8 categories are selected there are 1287 possible conbinations :

If 9 categories are selected there are 715 possible conbinations :

If 10 categories are selected there 286 possible conbinations :

If 11 categories are selected there 78 possible conbinations :

If 12 categories are selected there 13 possible conbinations :

If 13 categories are selected there is only one possible combination :

ALL POSSIBLE COMBINATIONS OF CATEGORIES : 8191

WHEN SELECTION HAS BEEN MADE PROCEED TO SHAPE -LEVEL THREE

LEVEL THREE - SHAPE

If "LARGENESS" has been selected, choose any combination of any number of the following categories, either by choice or chance :

BULKY MASSIVE WEIGHTY HEAVY OBESE CORPULENT PLUMP STOUT FAT CHUBBY CHUNKY GIGANTIC BROBDINGNAGION TITANIC HERCULEAN GARGANTUAN GIANT LARGE BIG GREAT JUMBO CONSIDERABLE AMPLE CAPACIOUS VOLUMINOUS BAGGY MONUMENTAL TOWERING MOUNTAINOUS ELEPHANTINE MACROSCOPIC MEGALITHIC HUGE IMMENSE ENORMOUS MIGHTY GRANDOISE STUPENDOUS MONSTROUS PRODIGIOUS MAMMOTH CUMBERSOME HULKING LUMBERING GANGLING LUBBERLY.

If "LITTLENESS" has been selected, choose any combination of any number of the following categories, either by choice or chance :

LITTLE SMALL PETITE DINKY ELFIN DIMINUTIVE MIMI PYGMY WEE TITCHY TINY TEENY STUNTED WIZENED SQUAT MICRO

If "LENGTH" has been selected, choose any combination of any number of the following categories, either by choice or chance :

LONG LENGTHY EXTENSIVE ELONGATED EXTENDED STRETCHED LANKY LEGGY

If "SHORTNESS" has been selected, choose any combination of any number of the following categories, either by choice or chance :

SHORT BRIEF SQUAT DUMPY LOW FORESHORTENED TRUNCATED

If "THINNESS" has been selected, choose any combination of any number of the following categories, either by choice or chance :

NARROW LEAN THIN ECTOMORPHIC WIRY MEAGRE SKINNY BONY SKELETAL SPINDLY WEEDY SCRAWNY SCRAGGY EMACIATED ANOREXIC WITHERED TENOUS FINE SLENDER

If "THICKNESS" has been selected, choose any combination of any number of the following categories, either by choice or chance :

BROAD WIDE EXPANSIVE ENDOMORPHIC THICK

If "HEIGHT" has been selected, choose any combination of any number of the following categories, either by choice or chance :

HIGH EXALTED LOFTY SUBLIME TALL LANKY COLOSSAL TOWERING SOARING

If "LOWNESS" has been selected, choose any combination of any number of the following categories, either by choice or chance :

LOW SQUAT CROUCHED SLOUCHING RECUMBENT PROSTATE FLAT LEVEL

If "DEPTH" has been selected, choose any combination of any number of the following categories, either by choice or chance :

DEEP PLUNGING ABYSMAL CAVERNOUS BOTTOMLESS IMMERSED

If "SHALLOWNESS" has been selected, choose any combination of any number of the following categories, either by choice or chance :

SHALLOW SLIGHT SUPERFICIAL INSUBSTANTIAL

If "VERTICALITY" has been selected, choose any combination of any number of the following categories, either by choice or chance :

VERTICAL UPRIGHT ERECT PERPENDICULAR ABRUPT RIGID

If "HORIZONTALITY" has been selected, choose any combination of any number of the following categories, either by choice or chance :

FLAT HORIZONTAL PLANE EVEN FLUSH SUPINE RECLINE LIE SPRAWL

If "OTHER" has been selected, choose any combination of any number of the following categories, either by choice or chance :

ANGULAR CROOKED SERRATED FORKED INDENTED SPIRAL INTRICATE INVOLVED COMPLEX COMPLICATED SOPHISTICATED ADORNED CURVED CURVACEOUS CIRCULAR ELLIPTICAL OVOID ROTUND GLOBULAR BLOATE PROTRUBERANT CONCAVE DEPRESSED STARK SIMPLE PLAIN ELEMENTAL UNCOMPLICATED AUSTERE UNFUSSY UNADORNED CONVEX UNIFORM BENT

APPENDIX 3.2 TRANSCRIPT OF TAPE - EXPERIMENT 'B'.

South Hill Park Arts Centre - Bracknell. 8th - 12th May 1990

TUESDAY 8th MAY.

Time:3.45 pm: "I've spent the day so far collecting sticks and taking them to another area which is obviously part of the arts centre and separate from the woods. Even Collecting the sticks I've been very selective although I've tried not to be, looking for attractive curves, angles, peculiar shapes, or certain lengths. I've also been grouping them according to the types of tree, for example, birch, Japanese cedar, rhododendron, which each have distinctive characteristics. Most of the day whilst gathering the material together it has been impossible not to think about what I could do with them although I have tried not to, so as not to start tomorrow with any definite preconceptions. I have decided however, I think, that instead of doing one large piece, I shall start off with a small or number of pieces. That decision is based on the fact that if I make a large one I may not complete it or it may go wrong. If I do a number of small ones, as well as exploring a number of ideas, the chances of producing at least one 'good' piece is increased. I also contemplated using the small lake, which is actually quite a large area of water, by producing a floating piece, however, when I mentioned this to Penny, she said that if I was to go ahead with this idea she would have to get in touch with the Nature Conservancy Council who were responsible for looking after it. On hearing this I tended to shy away from the idea. There would also probably be technical or practical problems involved in a floating piece therefore I dismissed the idea as I want to avoid any complicated structural or technical problems. I am going to buy some string today as one concession to a binding agent. The idea I have at the moment is just to explore the shape of the twigs and to build them into some sort of form. Hope to avoid structural problems by keeping heavier and larger sections on the ground. Aware of a certain pressure of working in the public glare, which is one reason for 'constructing' the material and not just simply laying or positioning. It's been very quiet today, the site I've chosen may be too quiet, but I didn't want to work in the main front lawn as it might be seen as an intrusion into the public's space. A consideration is the balance between a site in which hardly anyone passes through, and a site in which excessive amounts of people pass through therefore distracting me from my work."

WEDNESDAY 9th MAY

Time:7.10am: "As I said yesterday, whilst collecting the material I explored a number of possibilities, for example, it is tempting to work towards something grand, but for the reasons I've already explained I am going to start small. Rather than have a preconceived shape in mind, (although I've had a few) I am hoping to come up with unexpected results by trying different combinations and permutations of twigs. I am aware of the problems of trying to construct

anything of great height as problems arise such as it falling over onto people or kids trying to climb on it."

"I have sorted the twigs out into various categories, eg, curved, straight, crooked, or forked, and various lengths. They are also grouped according to the type they are, birch, cedar, etc. starting off on a small scale . . . . . "

Time:8.00am: "I've strung together two or three, I'm not very happy with the result, in fact I already have a sense of panic, I've abandoned the small piece and begun experimenting with larger branches, just placing them in different relationships to one another, according to what is physically possible and whether or not I like the result. The thing that bothers me about the small piece is that the areas covered in string look too tacky, they are too predominant as part of the whole. Also too fragile to move about or try in different positions . . its only got one possible base . . it's very cold as well which makes it unpleasant . . . and there are not to many people going about apart from those walking dogs."

Time:8.35am: "I've joined two sets together, each being made up of only two twigs, they both 'stand' rather than lie. I think I'll use the idea of only using two twigs to form a piece as a guiding 'rule'. There is a lot of trying different shapes and positions going on, so much so that it would be impossible to try and record each individual decision, I just keep trying different positions, different twigs, until I hit upon something I like . . still cold . . one of the biggest influencing factors is the limits imposed by only using string, it does not allow for any adventurous constructions."

Time 8.40am: "Just as I was tying together two twigs . . .the way the string fell, sparked off an idea of using loops . . so far I've been binding . . this different method of using the string could lead to a new type of shape. . "

Time 9.55am: "Apart from being cold (the heat wave of the past few days has now departed so the weather is a bit unexpected) . . .I have stuck by this rule of only using a very limited amount, two or three twigs, which means that the constructions are very linear . . at the moment I have five 'completed' or satisfactory arrangements, some of these have come quickly, others are the results of much trial and error, some have been abandoned all together and a fresh start made with new twigs. My plans at this stage are to make a number of these 'units' with the possibility of joining them together or positioning them in relationship to one another at a later stage. It is a bit like drawing in space because of the linear nature."

Time 11.00am: "Continuing to join just two or three twigs . . I now have six in a completed state . . .starting to visualize how they might relate to one another)in a circle, in a line ?) and whether or not they are physically connected. Of the total number of twigs in front of me (c310) I have only used about 16."

Time 12.05pm: "Just produced the most satisfactory arrangement (to me) so far, its very simple, spent the last 30 minutes trying to make it stand up involving

a complicated piece at the bottom, which, I've just discovered there is no need for at all as the way that it stands naturally (I didn't realise it did in fact stand up until it lent a certain way) appeals to me greatly . . it is basically two circular elements involving four points, and the way it sits means that three of these points are in touch with the ground whilst the third is up in the air. Now have 8 completed pieces . . .I shall keep on making more."

Time 2.50pm: "Well, I've joined a few more together, I am now running out of the most appealing twigs\branches, I could continue to produce simple constructions using only two or three twigs at a time, until all the twigs have been used . . .or I could now clear the area of unused twigs and begin to explore the possibilities of joining the individual arrangements together . . .which I think I probably prefer, mainly because I've already thought of them as coming together at some time . . .why . . because . . .they lend themselves to being joined up, the ends of twigs in the air suggest continuation. Also, maybe pressurised into doing something complicated rather than just simple, the public do not appreciate simple gesture with no obvious sign of skill or something they couldn't do. . . still not a nice day . . .what I've done since lunchtime is to consider the time factor. . . looking at what I've done so far and thinking that I still have another whole day. Another consideration is the quantity of string, in total I have six rolls, and I've already used quite a lot and I do not want to have to go back to Penny and ask for More. This robin has been watching me all day and keeps on perching on some of the 'sculptures', making them sway when it flies off. "

"I'm reasonably happy with what I have done so far, I look upon them as quick sketches. . . similar to drawing but in three dimensions."

Time 3.05pm: "I am going to move all of the twigs and branches I have not used across to another area so that I can have more space to set out the constructed pieces so far. This will take a while which will give me time to think without actually 'making'."

Time 3.15pm: "Just moving the twigs . . .happened to catch a glimpse of one of the pieces from an angle I hadn't seen it from before and suddenly something looked missing . . by tidying up the space I have found myself looking at what "I've done from new positions, it is only now I realise that when making them how much I've stuck to a limited viewpoint. In this case I seen a section against the sky which suggested something to me so I will now try it out."

Time 3.35pm: "Still shifting the twigs, another idea came into my head just by noticing the way I had laid one of them down . . however I don't think I'll try it out . . .I don't think it would work."

Time 4.45pm: "After a promising start this morning, the weather has been cold and raining most of the afternoon. I've finished clearing the space and positioned the 'finished' pieces, a dozen in number. The plan for the rest of the night is maybe to make a few more, not do anything drastic, waiting until

tomorrow morning when I can come in and see what I've done with a fresh eye. I'm quite happy with what I've done, although at the back of my mind I feel that to other people they will appear too insignificant, although they are the product of only a days work. . . I wanted to do something which involved a lot of exploring rather than the execution of one initial idea."

Time 6.30pm: "After various alterations I now have 10 'finished' pieces which complement one another . . all based on curves . . I think they would work well indoors . . . I am having difficulty taking slides of them because of the brown of the twigs against the greenery of the site. I could use colour on them tomorrow . . .but . . I feel that such decoration is unrelated to what they are made out of and where they are."

THURSDAY 10th May.

Time 7.30am: "As expected, the pieces I produced yesterday have been vandalised, either broken up or thrown around. Most of the passers by I spoke to yesterday, along with people from the arts centre said that anything within the art centre was susceptible to vandalism. Even although it is annoying, in a way it has solved a problem for me as I am now faced with a different situation this morning to what I left last night, I know some of the pieces were not working so now I don't have to make the decision to destroy them as this has already been made for me."

"Starting to think about tomorrow, I am a bit worried whether or not it is going to work, firstly, the number of passers by is extremely small . . .and secondly, how to actually engage them . . whether you ask them to judge on the sculpture, should this bit go here or here, most of them would dismiss what it is you are doing as useless anyhow . . so I think the solution is just to give them a list of alternatives and ask them to select one. The key point is to make sure the alternatives offered are, a) workable, and b) not too restrictive."

Time 9.15am: "Pouring with rain, very wet and miserable to work in . . I've been working since 7.30 now, the vandalism hasn't proved too much of a problem . . it was quite good in a way . . giving me the same twigs to work with. I managed to salvage three pieces, and alter another two due to suggestion from their post-vandalised state. Most of the process at the moment is trying to find arrangements that appeal to me . . placing twigs in positions, and whether or not they stand up. They are all very 'curvacious' which as well as being a result of the type of twigs I'm using, also reflects a number of drawings I've been doing in Aberdeen during the past few months. Obviously a great deal of control going on. Not sure about the plan for the rest of the day . . . the rain is not very conducive or stimulating. . . ."

Time 11.00am:."Thinking about using other materials from the woods, such as fragments of twigs or old leaves . . .placing them on the grass in relationship to the linear elements . . .although I think this might be an excuse to do something else rather than resolve what I have got in front of me . ."

Time 11.55am: "Stopped raining . . for the past couple of hours I've been working on a piece and not getting anywhere with it . . I've been trying to combine two separate pieces . . . I know what it is that I want to do but the physical reality of them will not allow it, and the compromises are not close enough to the imagined visualization . . not much change from earlier today . . five completed pieces. I don't seem to be in the right mood . . .the problem is to do with the way it sits . . it won't balance."

Time 1.10pm: "Thinking about tomorrow again and how I will approach it. Thinking about what I've done so far, I've been very selective in the twigs I've used, I've used only a few, mainly due to the fact I've been after curved structures . . .looking around at all the pieces, they are either made up of two, or four twigs, all flowing, not representative. I think for tomorrow I shall have to examine what I have done these past two days and trace the alternatives I have dismissed so that they may be included in any options offered. I think it is important to remember that tomorrow I shall be exploring the alternatives that I have dismissed - out of the many different things that you could do with 300 twigs, I have done this. Tomorrow, the role of me as maker cannot be denied. What I make still belongs to me and exists as a result of me. I still have overall responsibility for what the sculpture looks like."

Time 2.30pm: "Thunder and lightning . . I now feel that what I've got in front of me reflects my decision making and personal taste, whether the work is of a high standard or not is insignificant . . . ."

Time 3.45pm: "I now feel that what I've done will be sufficient, they now exist as individual pieces and are not connected or situated beside one another in any way, for this reason I have started to take slides of them individually rather than as a group. Penny came to have a look and said she liked the simplest ones best, I agree, although I feel unhappy about saying so as it will seem to be that I am siding with someone else's taste."

Time 4.05pm: "Decided not to make any more, including yesterday I have made around 15 pieces, of a similar nature, they all bear similar characteristics . . .circular, number of twigs, construction, ephemeral, size, shape, I shall spend the rest of today taking slides and dismantling what I have done, as I wish to start tomorrow with exactly the same choice as I had yesterday morning. After discussing it with Penny it has been decided to move down to a potentially busier and more open area directly in front of the main building."

FRIDAY 11th MAY.

Time 7.20am: "The day of reckoning . . the first thing I found myself thinking about as I was walking to the site was that I must remember that the piece that I make over the next 2 days is a piece that I want to make, there is no point in making something which does not excite me . . therefore all that is happening is that hopefully I am going to make something which I might have made over the

past 2 days but didn't. I am going to move the material down to a site closer to the arts centre, and during the next few hours I hope to engage some of the passers by to select some given alternatives for the initial stages. I think that most of the decisions could be made in the early part of the day . . or the most important ones . ."

Time 8.00am: "I have decided that the first question asked is whether I make one large piece or several small pieces, if the latter answer is given, the number of pieces will be determined by the house number of another passer by. (still shifting twigs)"

Time 8.15am: "Once a decision has been made it must be stuck to . . (still shifting twigs)"

Time 8.30am: "First question asked . . *over the next two days will I make one large piece or several smaller pieces* ? . . .answer - one large piece. Immediately beginning to think about what this means, what are the implications ? . . I am now forced to make one big piece, an option I dismissed early on Wednesday morning."

Time 8.45am: "Second question asked . . *do I use all of the twigs in front of me or just some of them* ? . . answer - all of the twigs. I now have to build one large piece of sculpture using all the twigs of which there are over 300 varying in length from 12 inches to around 12 feet."

Time 9.25am: "Third question asked . . .*should the structure involve open space or enclosed space* ? . . . answer - open space."

Time 9.30am: "Fourth question asked . .*do I use the twigs as they are, or am I allowed to alter them by breaking them* ? . . .answer - I am allowed to alter them."

"After having four decisions chosen for me I already have got in my head a visual image of what the structure I am going to build might look like, however, the thing I am thinking of is a very flat piece and that is only one of many possibilities."

Time 9.50am: "Nobody going about at all . . .quietly going over in my head, as I sort out the twigs into various lengths, what I am going to do, I think this is where I am drawing most upon my previous work, for example, there is a rubbish bin nearby which could be used as a receptacle in which to place the twigs in some sort of arrangement, a technique I have used before. I think it may be time to actually start to make a structure and see what happens."

Time 10.20am: "Fifth question asked . . . *should it be a predominantly horizontal piece or a predominantly vertical piece* ? . . .answer - a predominantly vertical piece. The person asked thought that sculpture worked best when it 'stood up' especially when higher than people."

Time 10.30am: "Sixth question asked . . *should it be a predominantly curved structure or a predominantly square structure, or a combination of both* ?. . .answer - predominantly curved. The person asked stated that curves were more natural than straight lines."

Time 10.35am: "Thinking about a curved structure, freestanding, vertical, and inner space, I have begun to make a piece, on quite a large scale, sort of like a bowl."

Time 12.30pm: "The structure is well under way, at the moment I am not asking any more options as I feel I have enough. At this stage, because I am working on a larger scale much more time is having to be spent on the structure, that is to say that most of the twigs being positioned and tied at the moment are for structural rather than aesthetic reasons."

Time 2.45pm: "At the moment the structure is made up of vertical and horizontal ribs with space in between them, therefore I asked the seventh question . . .*do I cover them up completely or do I cover some of them* ? . . .answer - some of them. At this point I could ask further questions relating to which ones were covered, however I already have an idea which involves covering those ones towards the top of the rim, whilst those at the base are left open . . .to achieve a top heavy feeling along with definition of the rim which signifies the edge of the inner space."

Time 4.00pm: "I've spent all afternoon adding more and more twigs to the structure, there has been no need to ask any more questions, I am concentrating on getting strength into it, along with a curved and circular feel, and a concentration of twigs towards the rim. It is a very repetitive process."

Time 6.30pm: "Finished for today, I am quite happy about what I have done so far, I have only used about a third of the twigs available. The structure I have at the moment will provide a good basis for tomorrow, when by asking more questions its eventual finished form will be decided. Obviously the problem of vandalism has been worrying me as in order to complete the experiment I need this section to start of tomorrow with."

Time 8.30pm: "We have just tried to put the piece indoors, however this has proved unsuccessful as it is too big. Since we cannot do this we have taken it to a more secluded part of the grounds where less people are likely to find it, hoping it will not be discovered. I tend to think it will still be vandalised."

SATURDAY 12th MAY.

Time 7.30am: "The piece that I made yesterday, as expected, has been smashed up. This kind of ruins the rest of the day in that it spoils the experiment. I don't know if it is worthwhile doing anything else today, what ever I get done will not be substantial, morale is very low. Whilst I make up my mind

what to do I am going to dismantle the broken piece and take the individual twigs back to where the rest of them are."

Time 9.30am: "All the twigs are back to the site, I have decided that I might as well do something, so, I shall begin again, using the same options that were chosen yesterday and try to satisfy them in one day rather than the two. Obviously the time scale will necessitate a quicker construction method if I am to use all the twigs."

Time 12.30pm: "Earlier in the morning I began the piece with what looked like an upside down open umbrella, without even thinking about what the eventual shape would look like. The fact that I only have a day means that I am making decisions much quicker and without worrying to much whether or not they are the right decisions. My main consideration is to have a finished construction which satisfies all yesterdays requirements. For the past hour and a half, three children have been helping me, bringing the next twigs for me to tie on, as well as tying some themselves. I don't think this would have happened unless I had this more relaxed and freer attitude which is a result of the fact that I am not being so careful over this piece as I know what will happen to it tonight."

Time 5.00pm: "I've spent the rest of the afternoon using up all the twigs. I have been very careful in trying to achieve a tight and ordered shape, a very repetitive process. During the latter stages I was just setting the twigs on rather than tying them, more children have been helping."

Time 6.00pm: "Used all the twigs, the piece is finished. I have taken plenty of slides. I have given the finished piece to some children, (the ones who are continually being thrown out of the arts centre) saying it is theirs and they can use it as a gang hut. They are already tying other twigs onto it and discussing what else they can do with it, they really like it."

"I heard later that ironically this piece stayed undamaged for three nights before it was destroyed."

APPENDIX 3.3 TRANSCRIPT OF TAPE - EXPERIMENT 'C'.

Grays School of Art - Aberdeen - 1st - 8th August 1990

WEDNESDAY 1st AUGUST

Time: 9.30am: "So far all I have done is to prepare the studio space, put some polythene on the floor mainly for keeping the clay damp, which may turn out to be a problem. Also brought in two bankers. Obviously it has been difficult not to think about what I'm going to do these next few days, I've had a few thoughts in my head, which, after thinking about them, I decide not to ignore as it is all part of the natural creative process to think ahead, you cannot switch thought on and off at will. One of the ideas I had a couple of days ago, or to be more precise it was just an image in my head, was to roll out the clay into large flat pieces and then fold it. However, I think the first thing to do this morning is to empty the clay bins to see exactly how much material I have got to work with."

Time: 9.37am: "That is the entire contents of the first bin emptied . . . . 42 blocks, having seen this I don't think there is much point in emptying out the other three bins as I can now visualize just how much clay there is in total . . . quite a substantial amount really . . . I think I'll try balancing some of them . . no particular reason. . just to be doing something. . ."

Time: 9.45am: ". . . just finished tossing them about in the air . . not very productive but at least it has altered the geometric similarity that the blocks had before . . .I didn't really expect to come up with anything . . .I'll put the clay back in the bin now."

Time: 9.50am: "I think what I am after is a method of using the clay, a process, which will ultimately dictate the shape or form of the sculpture . . in other words so that the process is responsible for a characteristic look . . another idea I had a few days ago was a gigantic 'coil' pot . . or something made out of coils anyway."

Time: 9.54am: "The trouble with any such structure is going to be getting strength into it . . I don't really want to use any sub-structure, if not I'd have to roll very thick coils in order for it to work. I'll start on a small one anyway to try it out. I'd really like it to be a self-destructing piece. . keep building it until it collapses."

Time: 10.35am: "Not very exciting at the moment . . a bit worried about the time scale, it's not really fast enough for what I had in mind, not quick enough for me, and it means bending down all the time. I can see potential in it . . I'm not sure . .I'll probably keep on with this one till about lunchtime just to see if anything happens."

Time: 10.54am: "I'm going to abandon this . .its only up to a height of about 4 inches and its already starting to wobble . . the main problem is that I would like

to get something quite high before it crumbles . . . which may mean having to build a solid structure."

Time: 11.00am: "I'm not really keen on building a solid piece, before I resort to that, I say resort because I feel it is an easy option, I'll try rolling some clay out into flat pieces and see how easy it is . . it will probably stick . . ."

Time: 11.08am: "Just carrying out some little experiments . . rolling the clay and folding it . . . seeing what sort of shapes are formed . .I can see a couple of possibilities almost immediately . . especially on a large scale . .I would like a reasonably substantial structure . . I have got quite a lot of clay . . .anything big however immediately presents problems with structure . . unless I introduce some supporting material such as chicken wire, but I'd rather not."

Time: 11.35am: "Spent some time playing about with small maquettes, mainly folding . ..but they would only work on a large scale which I feel is impossible to carry out . . I think what I could do, rather than rolling the clay flat is to roll it into little balls . . and there is this cardboard tube which I could use as a substructure to give strength by building the clay around it . . the process would be relatively quick I think, I should get height. I am resolved to using some form of aid if I am to get any height whatsoever."

Time: 12.01pm: "While sitting here doing this mundane task which I have just given myself I thought that here I am covering a cardboard tube . . . of course it could be anything, what about familiar objects. The idea sprang from thinking about whether this 'outercladding' should follow closely the shape of the tube or whether I should start to deviate from the tube. Perhaps a simple object, nothing complicated . . once I get this tube done I might try something else, perhaps a bucket . . I can imagine the space filled with several objects all treated in a similar manner."

Time: 12.06pm: "For the first time since I started this morning I feel a bit of enthusiasm for what I am doing . . . I have a reasonably quick process . . .physically comfortable . potential to develop the idea further and hopefully end up with something exciting." (Rest of the day spent on the slow process of covering the tube)

THURSDAY 2nd AUGUST

Time: 9.30am: "Set myself the goal of reaching the top of the tube by lunchtime . . .I'll consider then how to proceed. At this moment I feel there is little sculptural interest in the form . . . it may have to go higher . . as high as possible? Still interested in one of my initial ideas which was to keep on building until it fell down, however the tube has ruined that idea to some extent. A previous piece that I made in 1984 keeps coming to mind . .a simple column with a sphere sitting on top of it, but off centre. Once I finish this piece I could cannibalise it to make another which will speed up the process . . hopefully make several pieces before the end of tomorrow."

Time: 11.30am: "Completed up to the top of the tube, quicker than I thought, the fact that it is still steady has tempted me to go higher . . a quick browse through the studio has resulted in this pipe which will fit inside the existing tube . . taking the height to just under seven feet . . without any structural problems. I'm not entirely happy with what I have got in front of me which is why I think it is worth trying to go higher in an attempt to improve it. Such a tall column type form is constantly occurring in my work . . perhaps I should do a series." (Rest of the 2nd day spent covering the second stage.)

FRIDAY 3rd AUGUST

Time: 9.00am: "Not really happy with what I've done . . I think I made a big mistake when I added the second pipe . . I should have stopped at that height. There are a few options open to me this morning which I have been thinking about . .I can continue up to the top . . or I could dismantle it to use the already formed 'balls' to cover some other objects . .I think one reason that I haven't produced anything that I'm happy with is that I was to preoccupied with finding a process . .been too tentative and not really taken advantage of the quantity of material . . . can I salvage something before this afternoon. "

Time: 10.20am: "I've completed up to the top . . just in time as the bottom is starting to fall apart . . which was one of my original aims, but of course because of the inner structures it hasn't collapsed properly. I'm not happy with the shape, I definitely should have stopped after the first tube . . I'll look for some other objects now . . a bucket is close to hand."

Time: 11.26am: "Well nothing is really working out, the bucket is completely covered but without any startling results."

Time: 11.30am: "I don't think there is any point in pursuing this . . I feel I've chosen the wrong thing to do from the start . . nothing has really worked out to any satisfactory degree, rather disappointing."

Time: 11.32am: "For the remainder of the day I'm just going to have a little fun . .try out an idea I've had for a long time . . throwing small pieces of clay onto the floor, from a distance . . so that I have very little control over the shape . . the decision to do this is strongly influenced by the fact I am being filmed . . since there is no real end product the process needs to be recorded. There is a circle drawn out on the floor which I shall use as a starting point." (Rest of the day spent 'throwing', reasonably satisfactory, wish I had spent the entire three days doing this.)

MONDAY 6th AUGUST

Time: 9.53am: "The start of using the model to see what I'm going to do . . .in its current state the model consists of six categories which I could possibly choose from. SUBSTANCE is fixed of course, and to some extent so is TIME. The first

one I am going to choose is METHOD . .the first decision to make is whether what I am going to do is 'PRODUCT' or 'PROCESS' orientated. (just to clarify these terms, if 'product' is chosen then I must work towards a completed piece, if 'process' is chosen then I am not required to 'finish' a piece as such, rather, all stages and actions during the day are to be considered of equal importance). The result of this dice-decision is 'PROCESS'. Thee next decision is whether I just use my hands or am I allowed to use some form of tool ? The result of this dice-decision is 'TOOL'. A further selection could be made regarding 'HAND TOOL' or 'POWER TOOL' however the circumstances dictate that the use of power tools is not a really viable option, therefore I shall choose 'HAND TOOL' "

"The next decision is whether what I am to do is a 'CONSTRUCTION' or a 'DESTRUCTION'. The result of this dice decision is '"DESTRUCTION'. Having made only 3 dice determined decisions concerning Method I feel that I have enough to start."

Time: 10.02am: "Because it is 'DESTRUCTION' I will have to put all the clay into one block, that in itself could be a problem . . what shape the original block is will affect the shape of what I do . . .I could submit the amount of clay I use to the dice but I think the fact that I have four bins is in itself a sufficient 'random' factor. What I am going to do now is to get all the clay and build it into one large block."

Time: 11.00am: "That is three of the four bins emptied . . the clay in the fourth bin is a bit wet so I will leave it for now. Do I leave the surface of the block rough or do I smooth it over ? The result of this dice-decision is to smooth it over, therefore I can now use the wet clay from the fourth bin to tidy up the surface and smooth it down."

Time: 11.55am: "That is the basic block finished . . .the next step is to decide which tool I am to use in its destruction. I shall make a quick list of possible options . . I can't use the list in the model as there is no point in choosing something that is unavailable so I'll just have a quick look around the studio . . .I've compiled a list of ten possible tools to use, these are:

STICK
WIRE
HANDSAW
KNIFE
SHOVEL
SCRAPER
HAMMER
SCALPEL
SLEDGE HAMMER
HAND DRILL

I have decided to throw a dice to see how many of the ten I use . . the result of this dice-decision is 4. The four tools chosen by the dice are 'HAMMER', 'SCALPEL', 'SCRAPER', and 'KNIFE'."

"I feel I should make a decision which will affect how fast I work . . during the course of the day do I 'destruct' one block or several . . the result of this dice-decision is 'one', therefore I have the rest of today to 'destruct' this one block."

Time: 12.30pm: "Spent some time examining the potential of each tool, to see if by using it on the clay there is a particular effect which I could exploit . . the hammer is not much good, it sticks quite hard in the clay. One idea is to keep on hitting the top of the block to flatten it. The scalpel is probably to small to be of any good unless I want to do some intricate carving. The scraper is quite good, I could scrape away at the block until it is gone. The large knife is the most effective."

Time: 1.30pm: "Decided to use the knife to slice the block from the top down, into four sections, two cross cuts, might also use the scraper to shape the resulting four stumps into some sort of shape."

Time: 3.01pm: "The first of the four 'lumps' has just fallen off . . .it is a pity I couldn't have sliced all the way to the bottom, the clay is just to heavy."

Time: 3.07pm: "There goes the second 'lump' . . using the hammer to flatten out the two remaining 'lumps' . . .could be developing into some sort of chair ."

Time: 3.24pm: "The third 'lump' has just gone . . "

Time: 3.27pm: ". . and the fourth one. Considering the time I shall just put the remaining clay back into the bins."

TUESDAY 7th AUGUST

Time: 9.20am: "Yesterday whilst I used 'METHOD', today I am going to use 'QUANTITY'. The first section of 'QUANTITY' deals with 'WEIGHTS AND MEASURES' . . there are a number of possible choices here, for example, 'IMPERIAL' or 'METRIC' . . . I am going to choose 'METRIC'. From the various measurements I am going to select the following: 'LENGTH', 'BREADTH', 'HEIGHT', 'AREA', 'WEIGHT', and 'VOLUME'. The result of the dice decision to select one of these options is that 'BREADTH has been chosen. What I could do now is proceed to acquire, by means of the dice, a random metric measurement which would give me a size for 'BREADTH', however, what I prefer do to is to leave the choice at that level as I like the idea of making something broad, i.e. wide, . . instead of being 'wide' in relation to me, I think I will exploit the fact that the video camera is here therefore I shall make something that is wide in relation to what the camera can see. Concentrating on 'BREADTH' means that all the other dimensions are flexible, the prime concern is to make it broad."

Time: 9.40am: "Started to lay a straight line of clay down onto the floor, stretching from one side of the tv screen to the other."

Time: 10.00am: "My original intention was to build up the 'wall' equally, however, in these early stages of building it my mind is always racing ahead and thinking of alternative ways of adding the clay, for example, I could build up the two ends, or the middle, or just one side. If the two sides were built up then they could be wider than the middle, so the structure was wide from the front and sides . . . also the possibility of developing the shape."

Time: 3.25pm: "Feeling reasonably happy with what is going on, certainly compared to everything else I have done in the past few days. It has changed considerably since this morning, from the initial starting point it has developed into a distinctive shape of two parts, one rounded and bulbous, like a mound, the other thinner and more linear. At the moment I am quite content to keep adding more clay and watching the shapes develop. I was intending to start a new piece tomorrow but I think I will probably continue with this, mainly because I feel it is the best thing I have done, especially concerning the process, I don't know what I was doing the first three days, this is much more spontaneous and satisfying way to handle the clay. I'm not sure whether the term 'broad' still applies, but I don't really think that is important, it started me off and whether or not 'broad' is visible at the end of the day I feel to be irrelevant."

WEDNESDAY 8th AUGUST

Time: 9.12am: "The last day of the experiment, reluctant to start a new piece. I'm going to use 'QUANTITY' again, but this time 'NUMBERS'. The model offers the following list, 'ARABIC', 'ROMAN', 'CARDINAL', and 'ORDINAL'. For simplicity I'll choose 'ARABIC', which offers a choice of either 1, 2, 3, 4, 5, or 6 digit numbers. The result of this dice decision is '3', The result of acquiring a random number by the dice is '263', therefore whatever I do today must have some connection with that number. I could divide what I already have into 263 pieces, . . and reassemble it, . . .or make 263 new pieces. . . I think as I still want to continue with this piece in front of me I shall add 263 more bits of clay to it, or as there are two parts to it I could add 263 pieces to just one part, or the other, or both. The result of this dice decision is 'both' . .so I shall add 263 pieces of clay to both sides and that will be it completed. "

Time: 2.30pm: "263 pieces added to both sides, . . might as well start to dismantle it, end of experiment."

APPENDIX 3.4 DESCRIPTION OF EXPERIMENT 'D'.

Aberdeen City Arts Department - Aberdeen - August 1990

It was felt necessary to provide a theme from which to work. 'The Head' was chosen because it was felt that it offered adequate scope for varied and individual interpretation, as well as being a familiar and accessible motif. Rather disappointingly, the number of students that took part was five, four of whom were aged 17, the other, 15.

On day 1 of the project (control period) the students received the following brief:

"MONDAY - DAY 1 - SELF MOTIVATED

> During Day 1 you are invited to make a piece of sculpture using ideas which are suggested to you by the title: 'THE HEAD'. From the various materials and tools that are in front of you, you are free to choose whatever materials appeal to you, and to use them in any way you like."

The following materials and tools were provided:

1 roll of newsprint	2 rolls of double sided tape
1 roll of polythene sheet	1 roll of parcel tape
1 roll of chicken wire	1 roll of carpet tape
1 roll of corrugated cardboard	1 container of PVA glue
12 sheets of cardboard (8'x4')	1 container of wood glue
6 x 8" lengths of dowel	1 roll of string
1 roll of copper wire	1 roll of twine
1 roll of plastic coated wire	2 packets of panel pins
1 box of aluminium wire offcuts	1 staple gun
1 bag of wood offcuts	1 hammer
1 bag of balloons	4 x scissors
Assorted polystyrene chips	4 x craft knives
Quantity of newspaper	2 x wire cutters
Roll of paper	12 x paint brushes
Quantity of scrim	Pencils
Quantity of ribbon	Marker Pens
Selection of paints	2 pairs of gloves

On day 2 of the project ('experimental period') the students received the following brief:

"TUESDAY - DAY 2 - GROUP ACTIVITY

During Days 2 & 3 we shall work together as a group, this time the materials we use and how we use them shall be decided by throwing a dice or flipping a coin, in other words we shall be using chance. By doing this we shall be able to explore unusual combinations of different materials as well as the effects that different tools have on different materials."

At this stage the students were shown the 'interactive device' (i.e. the book format which had been used in the 'clay' project). Due to the 'fixed circumstances' of the project, along with the current state of the 'ID' it was unfeasible to make practical use of it, however, by showing the contents of it to the students it hopefully drew their attention to the many considerations which making a piece of sculpture may involve.

The way in which chance was introduced was to subject what was already there, that is, the 'given circumstances' to random selection and/or combination. This was achieved by discussing and listing all the 'fixed', elements of consideration, for example, a total of seventeen materials were listed:

1) newsprint
2) sheets of cardboard
3) corrugated cardboard
4) dowel
5) copper wire
6) blue wire
7) chicken wire
8) aluminium wire
9) polystyrene
10) newspaper
11) balloons
12) roll of paper
13) polythene
14) wood
15) scrim
16) paint
17) tape

By throwing a combination of die and coins the random number of materials chosen was 9, and the random selection of these nine were:

1) dowel
2) corrugated cardboard
3) polythene
4) blue wire
5) polystyrene
6) newsprint
7) roll of paper
8) copper wire
9) wood

Having randomised the materials for sculpture, the next step was to randomise some aspect of 'Place', another 'fixed' element, therefore all areas within the room that were possible 'sites' that a piece of sculpture could relate to were listed:

1) wall	5) window
2) floor	6) window sill
3) ceiling	7) cupboard
4) door	8) columns

Again using a combination of die and coins a random number of the above was chosen - in this case 4 - and then randomly selected resulting in the choice of:

1) ceiling	3) window
2) floor	4) cupboard

The dice was then used to separate the students into teams of two and designate each team with a 'site'. The result of this was as follows:

Team 1 - students A + C \ floor + ceiling

Team 2 - students D + E \ cupboard

Team 3 - student B + Author \ windows

Further random choices were carried out by Team 1 to acquire the exact spot on which to build their sculpture, and by Team 3 in selecting a specific window, and whether 'the head' was to look out of the window or in towards the room. A random choice was made whether to produce a sculpture based on the whole head or part of it, the result was the whole head.

In summary then, each team had to produce a sculpture based upon the whole head, which related to their given 'site' and only using the 9 materials previously chosen. This particular task was finished about 2.30 pm. the results represented sculpture produced by chance affected procedures. The second project during Day 2 was of a more light hearted and fun nature. Students were allocated an area of the floor (using random methods) out of which they were not to move. Using materials selected by the author and working as a group they then proceeded to produce another piece of sculpture, again based on 'the head'. Their restricted movement along with the distance between them which came about as a result of the random selection of 'co-ordinates' meant that normal creative behaviour had been interfered with, for example, materials had to be thrown to one another, access to tools was ruled out, as was any form of construction. The sculpture produced was a very large arrangement of materials on the floor.

On Day 3 students C + D failed to turn up therefore reducing the number to three. The students received the following brief ('experimental period'):

"WEDNESDAY - DAY 3 GROUP ACTIVITY

> Yet again making use of dice we shall look at some of the aspects we must think about when making sculpture such as the size of the sculpture (eg, big or small), and the shape of the sculpture (eg, fat, thin, long, short, tall)."

The first project on day 3 investigated the random combination of shape and form. Each student was given an identical quantity of material to work with: 1 sheet of cardboard (8'x4'); 1 sheet of chicken wire (4'x2'6"); 1 length of dowel (8'); 1 length of copper wire (8'), and access to tape, string, staples, and tools etc. In order to provide a fresh challenge the brief for that day allowed them to make a sculpture based upon 'the figure'. Five positions that a figure may adopt were listed:

1) sitting
2) kneeling
3) lying down
4) standing
5) squatting

Several terms relating to shape were also listed:

1) tall
2) short
3) thin
4) fat
5) long
6) square
7) circular
8) angular
9) curved
10) big
11) small

These two lists were then subjected to random selection and assigned to a student, resulting in the following combinations:

Student A - lying down\tall
Student B - squatting\square
Student E - kneeling\ circular

The students then had to produce a piece of sculpture from the materials provided and which displayed the above characteristics and by 1.30 pm these conditions had been satisfied. The second project of day 3 involved the use of only one material, paper, along with tape and string. A random choice was made from the following :

length	breadth
height	volume
surface area	

Height was chosen. A period of time was then spent in trying to build a structure as high as possible using the materials selected earlier, paper, string, and tape. The height achieved was just under 6 feet, made possible due to the use of 'guy ropes', introduced by student B.

The starting point for a third project was the random selection from the following list of possible ways to use the paper:

Folding	Knotting
Twisting	Rolling
Scrunching	Tearing
Curling	

The random choice was 'twisting', therefore the students started to construct a figure out of twisted paper. The nature of the material, paper, determined that the figure lie on the floor rather than stand vertical. Another element of chance came about through the decision to keep on extending the length of the arms and legs until the end of the day, rather than just make them the size that they should have been. This resulted in the arms and legs reaching over 30 feet in length, transforming it from a recognisable figure into an abstract form.

On the last day of the project ('experimental period') the students were given the following brief:

"THURSDAY - DAY 4 - SELF MOTIVATED.

> Taking into account what has happened during DAYS 2 & 3, you are invited to make a second piece of sculpture, again based on the title - "THE HEAD". Once more you are free to choose the material or materials you want to work with and how to use them. "

In a similar way to day 1, communication between student and (author as) teacher was limited to advice of a purely technical nature. At the end of the day the results represented sculpture that had been produced by personal decision making procedures but which had been exposed to experiments with chance in the immediate past.

APPENDIX 3.5 HYPERCARD.

These programs let you easily create applications in which information is organsied in a non-linear way, making it easier to interact with, and navigate through. Links between different information elements based on their relationship to one another, allowing you to find information by association rather than making an explicit request.

Hypercard (Apple Computer U.K. Ltd.)

Hypercard is a flexible design environment that allows you to create a visual, intuitive user interface for accessing and using almost any kind of information. The information is organised on 'cards' that incorporate text, graphics, and images. Information on the cards is linked by designing buttons that reference other buttons, cards, or stacks and provide a rich, multilevel view of a set of information. Hypercard allows non-programmers to create visual interactive learning materials that take full advantage of external media support to augment and illustrate the concepts being presented.

The Apple Guide to Multimedia Development Tools. 1990

APPENDIX 3.6 Proforma of questionnaire used in Experiment 'E'.

ARP - Pre-Use Information

Name Discipline

Age Year of course

Have you ever used a computer before?

[ ] Never
[ ] Once or twice
[ ] Quite a lot
[ ] Experienced user

Which of these computer terms are you familiar with?

[ ] Mouse [ ] Click [ ] Icon
[ ] Window [ ] Menu

Do you have any strong opinions regarding the use of computers in art?

[ ] Interested in it
[ ] Don't take much notice
[ ] Absolutely hate it

Other comments . . . .

Have you ever made deliberate use of chance when making sculpture?

[ ] Yes
[ ] No

If you have please say briefly why you used it as well as how

Experiment 'E' - Questionnaire - Page 1

ARP - User Evaluation

HOW TO USE

How well did this section explain to you how to use ARP?

[ ] excellent [ ] good [ ] satisfactory

[ ] fair [ ] poor

Other comments . . . .

WHAT IS ARP

How well did this section explain to you what ARP is supposed to do?

[ ] excellent [ ] good [ ] satisfactory

[ ] fair [ ] poor

Other comments . . . .

USING ARP

Was it always clear to you what you had to do?

[ ] Yes [ ] No

Did you find the category titles confusing?

[ ] Yes [ ] No

Would you have liked a more detailed description of what each category contained?

[ ] Yes [ ] No

Did you always have a reasonably clear idea of where you were within the network?

[ ] Yes [ ] No

Did you make use of the Note Pad facility?

[ ] Yes [ ] No

How did you feel when you were using ARP?

[ ] Relaxed and in control
[ ] Unsure of what was going on
[ ] Scared in case I damaged the computer

Other comments . . . .

Did you feel that using ARP was . . . .

[ ] completely pointless
[ ] interesting but not relevant to making sculpture
[ ] relevant to sculpture only on a conceptual level
[ ] relevant on both a conceptual and practical level
[ ] stimulating. It has given me lots of ideas for sculpture

Other comments . . . .

How many personal selections and how many random selections did you make?

[ ] all personal
[ ] mostly personal
[ ] about equal
[ ] mostly random
[ ] all random

Would you say that using ARP **directly** influenced the piece of sculpture that you have produced?

[ ] Yes
[ ] No

If 'yes', in what way . . . .

Would you say that using ARP **indirectly** influenced the piece of sculpture that you have produced?

[ ] Yes
[ ] No

If 'yes', in what way . . . .

Did using ARP give you any ideas which you feel you might use in the future?

[ ] Yes
[ ] No

If 'yes', could you give some details . . . .

Would you like to use ARP again?

Are there any suggestions you would like to make which you think would improve ARP . . . .

Appendix 3.7 Proforma of questionnaire used in Experiment 'F'.

ARP - Pre-Use Information

Name Discipline

Age Male\female

How long have you been making sculpture?

Have you ever used a computer before?

[ ] Never
[ ] Once or twice
[ ] Experienced user

Do you have any strong opinions regarding the use of computers in art?

[ ] Interested in their potential
[ ] Indifferent to them
[ ] Absolutely hate the idea of using them

Other comments . . . .

Have you ever made use of chance or accident in your work?

[ ] Yes
[ ] No

Other comments . . . .

Experiment 'F' - Questionnaire - page 1

ARP - User Evaluation

On a scale of 1 to 10 (1 = poor, 10 = excellent) how well did the 'HOW TO USE' section explain to you how to use ARP?

1 2 3 4 5 6 7 8 9 10

Other comments . . . .

On a scale of 1 to 10 (1 = poor, 10 = excellent) how well did the 'WHAT IS ARP' section explain to you what ARP is about?

1 2 3 4 5 6 7 8 9 10

Other comments . . . .

Was it always clear to you what you had to do?

[ ] Yes [ ] No

Did you find the category titles confusing?

[ ] Yes [ ] No

Would you have liked a more detailed description of what each category contained?

[ ] Yes [ ] No

Did you always have a reasonably clear idea of where you were within the network?

[ ] Yes [ ] No

On a scale of 1 to 10 (1 = poor, 10 = excellent) how well did the 'NOTE PAD' facility function?

1 2 3 4 5 6 7 8 9 10

Other comments . . . .

What was the ratio between personal and random decisions?

[ ] All personal
[ ] Mostly personal
[ ] About equal
[ ] Mostly random
[ ] All random

How did you fell when you were using ARP?

[ ] Relaxed and in control, ideas flowing freely
[ ] Concentrating on what I was doing rather than thinking about ideas for sculpture
[ ] Scared in case I damaged the computer

Other comments . . . .

Which of the following statements do you agree with?

[ ] Using ARP is completely pointless
[ ] Using ARP has been interesting but not relevant to making sculpture
[ ] ARP is relevant to sculpture only on a conceptual level
[ ] ARP is relevant to sculpture on a practical as well as a conceptual level
[ ] Using ARP has been stimulating, it has given me lots of ideas for my own sculpture

Other comments . . . .

ARP - User Evaluation

Would you like to use ARP again?

[ ] Yes
[ ] No

Are there any suggestions you would like to make which you think would improve ARP ?

Comments . . . .

How would you describe what ARP is to someone who has not used it?

How long did you spend using ARP?

APPENDIX 3.8 - Letter inviting sculptors to participate in Experiment 'G'.

Dear Sculptor,

For the past 3 years I have been engaged in a research project entitled; "An Exploration of the Principle of Chance As a Stimulus to the Creative Activity Known as Sculpture". The project, initiated by my own experience of making sculpture, is now in its final stages and I would like to invite several established sculptors to participate in a final 'experiment' which will take the form of an exhibition. Negotiations are currently underway with Aberdeen Art Gallery, and, if successful, an exhibition (and appropriate funding) will be held sometime in 1993.

The innovative product of my research has been the development of a purpose built 'tool' called ARP (Art as Random Process), which has been designed to introduce chance into both the mental and physical processes involved in making sculpture. Throughout the creative process a constant selection process takes place which ultimately determines what the finished sculpture will be like, for example, what material shall I use ? What size shall it be ? How shall I make it ? ARP contains large amounts of information relating to such aspects and enables the user to make either random or personal selections. The principle of random choice operating within ARP is seen as a 'habit-breaker' and stimulus to creativity, gently forcing the user to consider new or unusual or unlikely combinations of elements which either complement current ideas and interests or instigate new ones. Although ARP is computer based it is stressed that it does not do anything creative, it is simply the most efficient device for storing large quantities of information. Previous experience of computers is not a necessity as ARP is extremely easy to use.

Throughout its development, ARP has mainly been tested on sculpture students, as a final 'test' it is proposed that several 'experienced' sculptors use ARP, and that the resulting sculpture be presented in an exhibition. As well as making a piece of sculpture based upon their use of ARP, each sculptor will be invited to supply a second piece which they consider to be typical of their work. This will enable a comparison between sculpture that has been produced by purely personal decision making procedures and sculpture that has been produced by chance effected decision making procedures.

At this stage it would be appreciated if you could indicate whether or not you would be interested in participating in this project. If you are, please contact me at the above address as soon as possible,

(Due to financial problems the proposed exhibition could not be realised.)

APPENDIX 3.9 Proforma of questionnaire used in Experiment 'G'.

ARP - Art as Random Process 1

Name -

How long have you been making sculpture?

The following polarities are characteristics which are sometimes used to describe sculpture. Please circle one number on each line which you feel best describes your work. (0 would indicate that your work displays both characteristics equally, whilst 1, 2, 3, 4, or 5 would indicate a preference for one of them: 1 = slightly, to 5 = definitely)

Concerned with form				<---------->			Concerned with concept			
5	4	3	2	1	0	1	2	3	4	5
Object orientated				<---------->			Non-object orientated			
5	4	3	2	1	0	1	2	3	4	5
Material & process based				<---------->			Idea based			
5	4	3	2	1	0	1	2	3	4	5
Lasting				<---------->			Impermanent			
5	4	3	2	1	0	1	2	3	4	5
'Traditional' materials				<---------->			Less 'traditional' materials			
5	4	3	2	1	0	1	2	3	4	5
Representational				<---------->			Non-representational			
5	4	3	2	1	0	1	2	3	4	5
Site specific				<---------->			Less site-specific			
5	4	3	2	1	0	1	2	3	4	5
Static				<---------->			Kinetic\time based			
5	4	3	2	1	0	1	2	3	4	5

Experiment 'G' - Questionnaire - page 1

Consider the following statement:

There are two types of chance -
'undeliberate' chance - something happens unexpectedly.
'deliberate' chance - you want something randomly.

Have you ever made use of 'undeliberate' chance in your working process?

Yes No

Have you ever made use of 'deliberate' chance in your working process?

Yes No

Any other comments . . . .

Consider the following statements.

I always end up with what I set out to make.

I rarely end up with what I set out to make.

Please circle one number which describes your process in relation to these statements.

5 4 3 2 1 0 1 2 3 4 5

<------ Always Rarely ------>

Any other comments . . . .

Consider the following statements.

My process always involves a great deal of careful planning.

My process rarely involves a great deal of careful planning.

Please circle one number which describes your process in relation to these statements.

5 4 3 2 1 0 1 2 3 4 5

<------ Always Rarely ------>

Any other comments . . . .

Have you ever used a computer before?

[ ] Never
[ ] Once or twice
[ ] Quite a lot
[ ] Experienced user

Do you have any opinions regarding the use of computers in art?

[ ] I don't think they should be used.
[ ] I'm indifferent to whether they are used or not.
[ ] I am interested in their potential.

Any other comments . . . .

Did you find using ARP simple or confusing? Please circle one number -

5 4 3 2 1 0 1 2 3 4 5

<------ Simple Confusing ------>

Any other comments . . . .

Did you find the eight principle categories satisfactory or unsatisfactory? Please circle one number -

5 4 3 2 1 0 1 2 3 4 5

<------ satisfactory unsatisfactory ------>

Any other comments . . . .

Did you find the classification of the other categories satisfactory or unsatisfactory? Please circle one number -

5 4 3 2 1 0 1 2 3 4 5

<------ satisfactory unsatisfactory ------>

Any other comments . . . .

How did you feel when you were using ARP?

[ ] Tense and unsure about what I was doing.
[ ] Concentrating on what I was doing, therefore unable to think about sculpture.
[ ] Relaxed and in control, but not really thinking about sculpture.
[ ] Relaxed and in control, thinking about sculpture.

Any other comments . . . .

What are your reactions to the following statements:

Using ARP has been completely pointless.

☐	☐	☐	☐	☐	☐
disagree strongly	disagree quite a lot	disagree slightly	agree slightly	agree quite a lot	agree strongly

Any other comments . . . .

Using ARP has been interesting but not really relevant to making sculpture.

☐	☐	☐	☐	☐	☐
disagree strongly	disagree quite a lot	disagree slightly	agree slightly	agree quite a lot	agree strongly

Any other comments . . . .

ARP would appear to be relevant to sculpture on a conceptual level.

☐	☐	☐	☐	☐	☐
disagree strongly	disagree quite a lot	disagree slightly	agree slightly	agree quite a lot	agree strongly

Any other comments . . . .

ARP would appear to be relevant to sculpture on a practical level.

☐	☐	☐	☐	☐	☐
disagree strongly	disagree quite a lot	disagree slightly	agree slightly	agree quite a lot	agree strongly

Any other comments . . . .

Using ARP has been very stimulating, it has given me lots of ideas.

☐	☐	☐	☐	☐	☐
disagree strongly	disagree quite a lot	disagree slightly	agree slightly	agree quite a lot	agree strongly

Any other comments . . . .

Do you think ARP is useful to 'experienced' sculptors?

Yes ☐ No ☐

Any other comments . . . .

Do you think ARP would be useful as an educational device?

Yes ☐ No ☐

Any other comments . . . .

What are your main criticisms of ARP?

What is your initial reaction to the selections?

Do they appear relevant to your previous work?

Would you be able to make a piece of sculpture based upon these selections?

Does the prospect of making a piece of sculpture based upon these selections excite you?

Is there at least one selection which you find particularly stimulating (If so, which one) and is this selection 'new' to you or have you been concerned with it previously?

Are there any suggestions you would like to make which you think would improve ARP?

How would you describe ARP to someone who has not used it?

Would you like to use ARP again?

Yes ☐ No ☐

If your answer is 'no', why not . . . .

Thankyou for your help.

What is your reaction to the selections that you made now that a week has elapsed since you used ARP? Have they occupied your mind at any time or have you completely forgotten about them? Please comment . . .