The Computer as an Irrational Cabinet

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ABSTRACT

This thesis and its accompanying project are concerned with the use of digital technology in the representation of material culture. The thesis aims to find ways of using such technology that are appropriate to our present needs and to its potential. The computer is a technology which we understand, interact with and relate to through metaphor. I propose that many of the metaphors through which we understand it invoke the idea of an enclosed space. The use of such a trope might seem suitable when using computers for representing museum collections, or material culture in general, since it invokes the enclosed space of the museum. I examine how this idea of enclosure is manifested in computer developments such as virtual reality and artificial intelligence. I also look at how these developments are congruent with perspectival modes of visual representation privileged in the modern era. I argue that such metaphors and forms of representation, whether manifested in visual arts, the museum, or computer applications are problematic, bound up as they are with modern western ideas of mastery and transcendence, which are presently being subjected to critiques from various quarters.

Throughout the modern era there have been forms of representation which have contested the dominant visual mode of modernity. These include the art of the Baroque in the seventeenth and eighteenth centuries and, in this century, the work of the Surrealists. In contrast to the rational, orthogonal space of modernity, both these deal with complex and fragmented representations of spaces and time. Such developments have been discussed as forms of representation appropriate to contemporary concerns about knowledge They also have a corollary in computing developments, such as multimedia and hypermedia, Yet, I argue, those working in multimedia have in the main failed to exploit the potential of such developments to enable new ways of representing knowledge. I propose looking to both the Baroque and Surrealism to find pos-

sible models and strategies for use in multimedia in the representation of material culture. In relation to this I describe practical work done in conjunction with this thesis which uses these models as the basis of a piece of multimedia software for the representation of material culture.

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PREFACE

This PhD submission was made possible by a three-year research studentship awarded by the Centre for Electronic Arts at Middlesex University in 1992, under the title 'The Virtual Museum'. This was intended to study possible applications of computer multimedia to museums and galleries.

The practical component was undertaken as part of the Virtual Teaching Collection, a project funded as part of the Technology in Teaching and Learning Projects (TLTP) initiative by the Higher Education Funding Council for England (HEFCE), and developed at the Cambridge University Museum of Archaeology and Anthropology in conjunction with the Department of History and Philosophy of Science.

I wish to acknowledge the help of and thank my Director of Studies Professor John Lansdown, and my two supervisors, Jon Bird and Stephen Boyd Davis. From Cambridge I wish to thank Dr Robin Boast, director of the VTC project as well as Dr Sam Lucy, Dr Michael Wintroub and Dr Lester Thomas, my colleagues on the project. I also wish to thank Dr Avon Huxor from Middlesex, Beverley Butler of UCL, Alex Morrison of Cognitive Applications Ltd, and Neil Aberdeen of TUI Ltd, for discussions, comments and advice.

Dedicated to the memory of my father, J.A.G. Gere, 1921 - 1995

INTRODUCTION

Nature of this PhD submission

This PhD submission, consisting of a thesis, and an accompanying project, is an example of a new genre of PhD submission, one which comprises of a piece or pieces of creative work accompanied by a written exegesis. The emergence of this kind of doctorate is predicated on the desire to enable creative work, as undertaken in the arts, to be recognised as having the same academic status as research in the sciences and the humanities. In theory this is, I believe, a reasonable idea, but in practice it presents a number of problems. The processes that enable creative work in, for example, the visual arts, design or music, are, arguably, not always susceptible to being described in terms appropriate to a doctoral submission. Such works often resist intellectualisation. This is not to suggest that works of this sort are not the product of a critical intelligence, or that they lack intellectual content, but rather that often the decisions which led to their emergence cannot be described in rigorous and definitive terms. There is also the problem of authorial voice. The neutral, academic, tone appropriate to a PhD thesis is often not appropriate to descriptions of personal decisions undertaken in the course of creative work. This neutral tone can often only be made to serve such an end through the use of tortured syntax.

In the particular case of this thesis there is, because of the subject matter, the nature of the practical work, and my approach to both, a large theoretical and academic component. The problem then is of showing the relationship between the theoretical and practical elements. This is not straightforward. In undertaking the practical work I was not always conscious of its theoretical underpinnings. Nor did I always have the practical work in mind when thinking through the theoretical aspects. Nevertheless they are closely related. The best analogy I can think is a topological one. The design was underpinned and

determined by theory without necessarily acknowledging or explicitly evincing it. This thesis is thus not intended to be just a description of the practical work, nor is the practical work intended simply as an illustration of the writing. Taken as a whole it can be understood as the record of a kind of dialectic in which practice and theory reflect upon, support and inform each other.

The Project

The PhD research was undertaken as part of a research studentship at Middlesex University, intended to study 'the Virtual Museum: Applications of Multimedia to Museums and Galleries.' It was understood that the researcher would produce both a practical piece of work that engaged critically with an aspect of the use of multimedia in relation to the museum, and a thesis which reflected upon the relevant issues.

The practical work is the interface design for a piece of software developed at Cambridge University, in the Museum of Archaeology and Anthropology and the Department of the History and Philosophy of Science. Archaeology and the History and Philosophy of Science are both areas in which actual artifacts are used in teaching. To this end in most such departments there are collections of appropriate objects used for teaching. In actual teaching collections as they exist in universities and university museums objects are often fragile and rare and access is normally limited to those researching, studying or teaching in the institution in which the collection is housed. Furthermore the constitution of the collection is often subject to the vagaries of curator's and donor's choice of objects and the limitations set upon availability of such objects, through the institution's own financial constraints and the mechanics of the marketplace. Like all museum collections teaching collections are thus full of shortcomings, anomalies and lacunae.

A group composed of members from both the aforementioned areas at Cambridge proposed to develop what they called the 'Virtual Teaching Collection' by which they hoped to overcome at least some of the problems described above. By amalgamating in digital form several different collections in the same subject area more balanced and complete collections can be assembled. By placing such virtual collections on easily transportable media such as CD-rom many more people can have access to them. Obviously virtual collections do not offer the experience of being able to handle actual objects, but through rich visual archiving, three dimensional imaging and so on such collections can stand as a good substitute when the real thing is not available, as well as offering access to larger sets of objects than found in a single collection. Above all the main object of the project was not just the assembly of digital archive material, but the development of sophisticated tools with which to view and manipulate the collections, as well as to give access to links and additional material.

Alongside these practical intentions the project was intended to explore more theoretical ideas concerning the nature of museums and representation. Both its immediate, practical aims of this project and the issues it wished to look at, were allied to ideas I had been developing in my initial PhD research. Though it had a specific concern with teaching collections I felt that it could usefully become a platform from which to address broader issues concerning museums, digital technology and the representation of material culture.

The Thesis

This project is dealt with in detail in the last chapter of this thesis. In the previous chapters I describe what I see as the theoretical and cultural issues in the relationship between digital technology and material culture. This is both a theoretical exegesis and an account of the thought processes that underpinned

the design of the project.

In the first chapter I argue that the computer, unlike other technologies, is peculiarly and uniquely flexible of shape and use. Within the, very broad, limitations of software and hardware, a computer can be almost any shape and dedicated to almost any purpose. I suggest that this has meant that the shapes and uses in which the computer is actually manifested thus bear a great deal of cultural meaning. Such shapes and uses, relieved of the burden of physical laws and utilitarian concerns can reflect desires and concerns of the surrounding culture with flexibility. With this is mind I treat computer technology as a kind of text reflecting the culture out of which it emerges, and which can be read and analysed in textual terms. In particular I explore how the computer is conceived in terms of various metaphors, which are used to enable people to understand it in terms of other technologies, institutions and devices, and also to facilitate the conceiving of, and the designing of software. Many of the metaphors used thus are concerned with ideas of interiority and separateness. Similarly the shape the computer has assumed, in the last twenty years or so, also reflects such notions. I suggest therefore that underlying the various ways we approach and understand the computer is what I describe as a discourse of interiority and separateness.

In the next chapter I look at the historical roots of such a discourse. I propose that, with Ramus in the sixteenth century, a certain discourse of separateness is initiated that continues with Descartes, Newton and Locke. This is manifested in several different ways, including the closed systems of science and the transcendent Cartesian ego. By tracing the development of the computer, at least as a concept, back to the seventeenth century I show how it too was part of this discourse. I show how this continues to be manifested in developments such as artificial intelligence, virtual reality and cyberspace. I then discuss the museum as another manifestation of this discourse, and how modern pre-

sumptions about the spatial display are manifested in both it and Cyberspace.[1]

In the third chapter I look at the way many of the presumptions concerning space, perspective and subjectivity, which underlie virtual reality and Cyberspace and, arguably, the museum, have been questioned in the last hundred or so years. I show how the computer itself, despite being a paradigmatic rationalist machine, has also, since its inception, engaged in ways of understanding and representing knowledge which run counter to rationalist certainties. In particular I look at non-linear forms of representation such as hypermedia and multimedia, and how these relate to the present debates about knowledge held under the aegis of postmodernity, particularly as argued in relation to the museum. To find a solution to what I see as the shortcomings of work in this area, I look to the strategies undertaken in relation to the museum by the Surrealists, and the guest-curated shows in museums and galleries which currently use some of these strategies.

In the fourth chapter through the work of Walter Benjamin I connect the Surrealist interest with museums with an ancestor of the museum, the curiosity cabinet. The cabinet is a site in which arrangements of objects can be seen to represent structures of knowledge and thinking other than those taken for granted. I also suggest that the cabinet in particular makes a useful model for use in the representation of material culture in a postmodern era concerned with problematics of knowledge and representation. Following this I argue that much computer-generated graphics and design already manifest a Baroque sensibility. Combining this idea with Benjamin's exploitation of allegory and emblematics I propose the Baroque cabinet of curiosities as a model for multimedia in the representation of material culture. It is this model which forms the basis of the practical work describe in the last chapter.

Notes

[1] I have defined what I mean by modernity in appendix 2

CHAPTER ONE

Museums and Digital Technology

The relation between the museum and digital media constitutes the site of a kind of forcefield. The power and presence of the museum exerts forces which holds the discussion of digital media within certain limits. This is necessary, since the definition of such media is often fluid and changeable, and resists being pinned down. With the concept of digital media held in place, albeit temporarily, by this forcefield, questions about culture, epistemology, metaphor and so on can be posed and answered. An understanding of what digital media is and might be can be gained through analysing how it differs from the museum. At the same time this might produce a new understanding of what a museum is and what it might be.

The Museum as an institution is expressive of certain ways of structuring knowledge and is deeply implicated in concerns about knowledge and representation[1]. It also, arguably, embodies notions of knowledge spaces and other metaphorical spatial structures, which are much discussed in relation to virtual reality and cyberspace. Computer technology would thus seem to have much to offer museums. It is therefore not surprising that such institutions have been quick to exploit computers, both as tools for research and as a way of presenting information to the public. There are several different ways in which computer technology is presently being exploited in relation to the display of material culture.[2]

Cataloguing represents the first use of computers in museums. This reflects the computer's manifestation as a text, as opposed to a multimedia machine. In one sense all the computer enabled was the transfer of the standard collections of 3" x 5" card files which, in general, had been how museums cata-

logued their objects, into the computer. Despite being in a nonmaterial digital format, rather than physically on paper, the records are ostensibly the same[3]. Yet the computer enabled 'a totally new way of thinking about artifact records'[4]. In a paper catalogue, the objects have to be listed under, and ordered by one of the available domains. This could be by location, date, date of accession, location in the museum and so on, depending on the needs of the museum. Those responsible for cataloguing have to make a decision according to their needs. This decision will have an effect on how the material is understood. Through digital means new ways of understanding the material can be formulated. Cataloguing, a seemingly straightforward and even banal activity, is an important issue in relation to epistemology and the 'order of things', and other aspects of knowledge bought into question both by the uncertainties of postmodernity[5] and by the possibilities and changes afforded by new technology. At one level the computer simply makes cataloguing and the searching of catalogues much easier. But that ease brings with it both potentials and problems that, in effect, change our relation with the knowledge with which we invest objects. This change in relations underlies, and is implicit in, many of the claims made for digital technology, especially in relation to multimedia and hypermedia.

The shift from using computers simply as cataloguing tools to using them as media for the representation of knowledge about material culture is part of a larger shift in how computers are marketed and used. The idea of the computer as a visual medium initiated by Xerox and Apple in the nineteen seventies, and the rise of the personal computer in the seventies and eighties, led to the development of computer multimedia as a commercially-viable industry[6] . Since then there has been an explosion of multimedia development, not least in the museum world. Large numbers of museums and galleries in this country and abroad have installed or intend to install interactive displays of one sort or another. Some, such as the National Gallery's Micro Gallery, are intend-

ed to introduce the user to the whole collection. Others, such as the Victoria and Albert's 'Images of China's Past and Present' are situated in a specific department, and are only relevant to that department's collection. Some accompany temporary exhibitions, or constitute temporary exhibits in themselves, such as the Tate Liverpool's 'Sculpture Interactive'[7]. Interesting and innovative work has been done in the United States in using interactive technology in Holocaust museums.[8]

Museums and others have also started to produce commercial products devoted to art and antiquities. Some of these derive from kiosk displays in museums. A good example of this is MicroSoft's Art Gallery, which is a CD version of the National Gallery's Micro Gallery. Other museums, such as the Louvre and the Smithsonian have produced or licensed interactive products, on CD-rom and CDi respectively[9]. Production of such items outside of museums is clearly complicated by issues of copyright, though there are products devoted to fine art and material culture that are not centred on museums or galleries. The Multimedia corporation is, for example, producing a number of CD-roms devoted to the in-depth analysis of single works of art. Interestingly many of the interactive encyclopaedias now being produced exploit the metaphor of the museum for their interface[10].

Another place in which museums are beginning to take an interest is the World Wide Web on the Internet[11]. Though at the moment hampered by poor interfaces, inadequate interactivity and slowness the Web has been and continues to be a fertile environment for the exploration of ideas and concepts[12]. Relieved of the burden of commercial considerations sites on the Web can be far more experimental than products such as CD-rom. A large number of sites have been set up concerned with the representation of visual material. Some originate from museums, galleries or universities. Some are virtual galleries of material culled from other places. Others are devoted to virtual art. Sites pro-

liferate and disappear with comparative rapidity.[13]

One type of production, whose commercial exploitation is hampered by technological constraints, but would seem an obvious use of the technology in this area is virtual reality[14] . The 'virtual museum' where the user is afforded the sensation of moving through a physical space would seem a natural application of computer technology to museums and galleries. One of the most famous of such displays is the *Virtual Pompeii* display at San Francisco's H. M. de Young Museum[15] . As a research project Apple Computers produced their 'Virtual Museum' in which the user could manoeuvre around a computer-generated space to look at objects. The computer artist Jeffrey Shaw has also made some interactive pieces based on the idea of the gallery. More recently Apple have developed software to create photographic-based, as opposed to computer-generated, kinds of virtual environments[16].

As is evident from this brief account digital technology has something to offer in a purely practical sense to institutions and individuals in the business of ordering, cataloguing and displaying objects. But the degree to which, and the manner in which such institutions and individuals have embraced this technology suggests that something more complex is going on. I suggest that there are a number of congruences, and perhaps even a kind of isomorphism between the computer and the museum, that may explain the enthusiastic exploitation of computer technology by people involved in such institutions.

The Computer as Text

In order to explore this idea we need a way of approaching the computer other than purely in terms of technology. In order to consider it out of this context I take a semiotic approach, in which the computer is a sign within a system of signification, defined by its relation to and difference from other signs, rather

than simply a piece of technology. In fact, because of the complex set of meanings accruing to the computer I treat it as a kind of text which can communicate many meanings. Such an approach is heralded by the German critic and philosopher Walter Benjamin.

> Every expression of human mental life can be understood as a kind of language, and this understanding, in the manner of a true method, everywhere raises new questions. It is possible to talk about a language of music and of sculpture, about a language of justice that has nothing directly to do with those in which German or English legal judgments are couched, about a language of technology that is not the specialized language of technicians. Language in such contexts means the tendency inherent in the subjects concerned-technology, art, justice, or religion-toward the communication of mental meanings.[17]

This approach is similar to that of Michel Foucault who uses a linguistic model to analyse the discourses in which phenomena, such as circumstances, events, objects and machines are manifested. To this end he devised a theory of 'discursive formations', which treated such phenomena as statements within a field of discourse[18]. These involved four basic elements which define how such entities are understood and manifested in specific cultural circumstances; the objects statements are about; the authority such statements have; the concepts through which they are formulated; and the themes they develop.[19] Following Foucault the Australian sociologist Stephen Hill has discussed at length the idea of technology as text.

> Unless we know what the machines are for, and how to use them, they remain as rusting and inconvenient pieces of matter that we must negotiate our way around in everyday life - in the same way that we avoid junkyards and derelict buildings. The tool or the machine in this sense embodies a cultural text that is set within the grammar of the background system, but remains unreadable in everyday life unless we know the action-and-meaning cypher.[20]

The idea of technology as text is, I believe, particularly apt for the computer. Most technologies conceal their textual nature behind the solidity of their

appearance, and the fixity of their purpose. Though they are enunciated out of the 'grammar of the background system', their status as enunciation, as text, is occluded. To begin with, though, new machines reveal their textual nature by being understood in terms of previous technologies and models. In other words they are understood metaphorically[21].

Fisher (1991), following Kubler (1962) employs the linguistic term 'drift', originally defined by Sapir (1921)[22], to discuss how we use such models and metaphors to deal with novel states of affairs or objects. Fisher points out that these are usually dealt with by being placed in an existing sequence. He gives as an example the word 'airport', which deals with the existence of a place from and to which people fly. By use of the suffix 'port' the airport is being understood in terms of the seaport. Thus it is placed in a sequence of ideas that include portable, portage, porter, port, seaport and airport. By being locked into a historical sequence some control over its novelty is secured. The use of the suffix port in the case of airport is, to begin with, metaphoric. But as the term airport becomes transparent, that is as its anchoring to the seaport metaphor is forgotten it allows 'port' to drift away from its attachment to the shipping and the sea.[23]

Some objects are harder to place into such sequences. One way to do so is to assign it a name that places it in a sequence negatively, for instance 'wireless', which places a new technology in a sequence of wired communications technology - telegraph, telephone - by pointing out that it does not need wires. A similar point can be made about the term 'horseless carriage'. In both these cases the sequence in which the objects thus named had been placed were soon seen to be inadequate or irrelevant, and they were assigned new names, 'radio', 'car', 'bus'[24] . For most objects being described and metaphorised by being placed in a sequence with other objects is not problematic. With simple problem-solving devices - drinking vessels, bridges - their essence remains the

same, however much materials and techniques of construction develop. Others, such as cars, radios, telephones, either meet more efficiently a need previously catered for by other means, for example transportation, or develop a new purpose by which they are consequently defined.[25]

The computer presents a different set of problems. This is because of its unique ontology as a technology. The only possible description of what a computer is is a place where computing takes place. Computing itself can best be defined as a process where data is entered into a device, whereupon the device can store it, manipulate it, store or output the result of the manipulation. Anything that does this is a computer.[26] Obviously what we mean, at least at the moment, by a computer is a device that is almost certainly electronic, and most probably digital and binary. Nevertheless failing to be one or all of these would not stop it being a computer, as long as it fulfilled the necessary functions of computing. This is, I argue, very different to other modern technologies. In one sense a car is just a machine that transports people from *a* to *b*. But so is a bus, or a van, or a golf cart. Certain physical factors determine whether a people-transporting vehicle is a car, as opposed to any other sort. Unlike the car the computer can be any shape possible within the actual limitations of the technology.

Thus one might say 'The Computer does not exist'. Computers clearly exist. What does not exist is any kind of platonic form of 'The Computer'. It can be and is manifested in any number of physical forms, from small elements in washing machines, parking meters and so on, through to massive parallel-processing supercomputers. Indeed as the computer becomes ever more part of our lives it disappears into other objects.[27] But there is a paradoxical corollary to this. Whatever shape computers appear in they are physical objects. Computing is a physical process, however it might appear otherwise.

It is in the concatenation of these two facts that the computer's peculiar ontology resides, and thus its particular relationship with metaphor. It has to take on a physical form, but, within very broad limitations, that can be almost any form possible. Thus it can only ever be temporarily or contingently anchored to a particular sequence of previous technological phenomena. This means that a secure identity can never be secured for it that would allow it, as in the case of a car or a radio, to escape the necessity of being defined and understood through metaphor. What this suggests is that the form it does take says a great deal more about the needs of the culture in which it is produced than it does about the technology itself. Each configuration of physical elements that comes to mean 'the computer' at any one time can express immediately and vigorously ideas of the surrounding culture. The actual technology is now so compact that there are practically no physical constraints to the computer's shape or size. But, this notwithstanding, a particular shape or configuration of shapes comes to mean 'the computer' at any particular time. Twenty years ago 'the computer' might have invoked images of sterile white rooms full of cupboard-sized boxes filled with whirring tapes (figure 1). Now it is more likely to suggest a personal computer, whose combination of TV-style monitor, keyboard (and possibly mouse) and box containing the actual workings, has become the visual metonym of the technology.

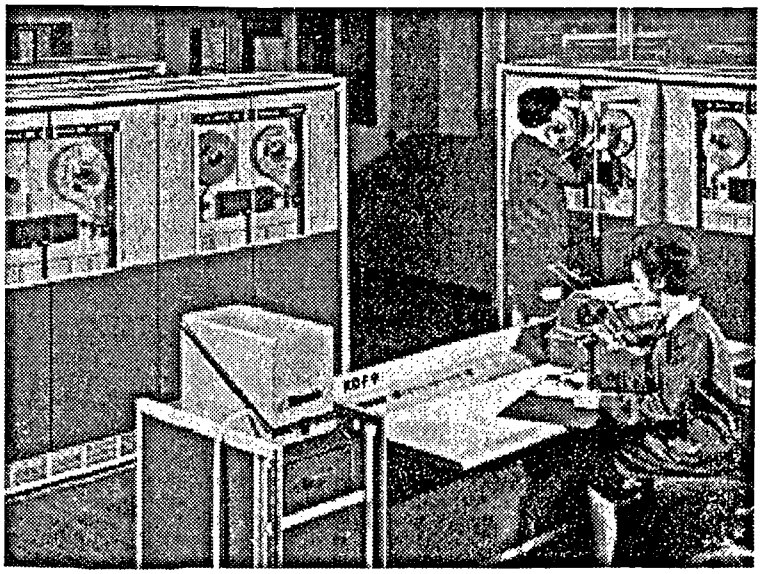

Figure 1. A 1960s computer setup

Throughout its history the computer has gone through some extraordinary changes of shape, size and use. From the room-sized, valve-driven computers

of the nineteen forties and fifties to the personal computers, laptops and palmtops of today is an astonishing line of development (figure 2)[28]. In the beginning the design of the computer was entirely predicated on the crude necessities of the technology. It had to be vast, since it operated through the use of large numbers of valves. The inconvenience associated with using the computer in the ways necessitated by its design lead to attempts to find new ways. These were often derived from metaphors based on other technology, such as displays derived from the idea of radar to allow information to be visualised, or input devices taken from typewriters to enable greater ease of data input. The exploitation in turn enabled new perceptions of the technology. The exploitation of radar technology for example enabled the idea of the computer to shift from being just a 'number cruncher' to being a visual instrument and medium[29]. To take another analogy from linguistics the computer is an example of a *parole* from the *langue* of contemporary technology. It is a *parole* composed of quotations[30] . Thus, arguably, the shape the computer takes reveals much about the culture which produces it. As a text it can be read to reveal cultural needs and desires. Examining the different forms the computer has taken through its history will reveal not just the aforementioned needs and desires, but also the way the computer as a text came to be enunciated in the way it now is. Though, as demonstrated by Fisher and others, all new technology is understood through metaphors derived from previous models, the computer is unique, because of its fluid nature and lack of fixity, in the degree to which it is continuously defined through metaphor. Richard Coyne writes.

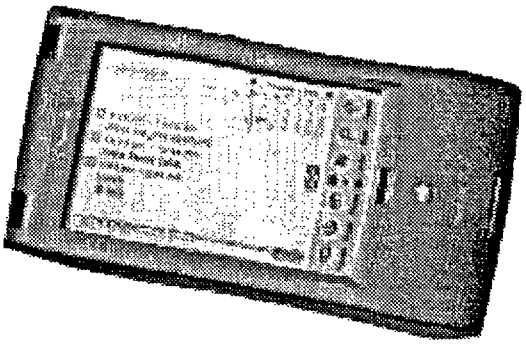

Figure 2. An Apple Newton Palmtop

> We can fashion whatever we want out of the computer–a desktop, a filing cabinet, a stage play–much as we can make almost anything out of words. In other design areas, such as architecture or mechanical engineering, the designer feels more constrained by tools, techniques, mate-

> rials, and a physical setting. It seems that principle and method assume greater importance. By way of contrast, the medium of the computer-software designer is pure, malleable strings of electrical impulses, subject to laws, but waiting to be fashioned through whatever metaphors we desire.[31]

Metaphor is important in all aspects of computers. As Coyne also points out.

> The structures of the operating system and other computer programs and subroutines are commonly designed as a network of (invisible) objects. These objects have properties, generate and receive "events," and send "messages" to one another. They take on meanings of the software designer's own choosing, ranging from the abstract (such as the algebraic variable x) to the more concrete, though bizarre, "demons" or "autonomous agents" that monitor what is going on in the computer system and act in response to some problem. Computer hardware can also be considered in metaphorical terms. Many electronic components are named after familiar entities: memory, gate, chip, processor, and so on. In these senses, the entire computer system is imbued with metaphor, from the structure and configuration of hardware to icons and designation of objectlike names attached to program subroutines.[32]

One of the original metaphors for the computer, and possibly the most powerful, was that of the giant brain. Its force derived from the emergence of the computer at a certain time and within a certain cultural context. The building of the first actual computers came at more or less the same time as two highly influential theories were expounded, Claude Shannon's Information Theory in 1948[33] and Norbert Weiner's Cybernetics[34] in the same year. The former was concerned with the most efficient way of sending information electronically, through wires or through the air. His work particularly concerned the notions of entropy and redundancy in conveying information, and how they can best be circumvented. Weiner's work was to do with the idea of self-regulating systems and their attempt to achieve equilibrium.

Weiner's definition of a system encompassed the electrical, chemical, mechanical, biological, even the economic. Information theory was one of the complementary sets of ideas that made up cybernetics. Cybernetics, though highly

technical as an idea seized the public imagination 'as a magic key which would unlock the secrets of what had happened to the world in the past decade.'[35] It is easy to see how attractive such ideas might be to those working with the computer. Indeed the new technology seemed to be paradigmatic of Weiner's notion of self-regulating systems, so much so that the term cybernetics was, at one point, almost synonymous with that of computing. Weiner knew and admired Alan Turing, the mathematician whose 1936 paper 'On Computable Numbers, with Application to the *Entscheidungsproblem*'[36] presented one of the first models of the modern computer, and acknowledged his help in the introduction to his book on cybernetics. It was within this climate that in 1950, having seen the theoretical machine he described in 1936 become reality, Turing proposed that such machines might eventually manifest human-like intelligence. This view appeared in a paper entitled 'Computing Machinery and Intelligence'[37] published in the journal *Mind*. In it he envisaged a game in which an interrogator would have to guess which of two other players was a man and which a woman entirely from written replies to questions he posed. The man's role was to fool and the woman's to try and convince the interrogator. He then suggested a version, played through teletype terminals, in which a machine was one of the players, which would be programmed to convince the interrogator that it was human. Turing postulated that if it succeeded it would be for all intents and purposes intelligent and, furthermore, conscious.[38]

Out of this idea of Turing, as well as Weiner's concept of cybernetics and other contemporary thinking, came the branch of computing known as Artificial Intelligence. The idea was to create programs which would encapsulate facts about the world in the language of logic, and rules concerning those facts and how to respond to them. If programmed in sufficient depth and with sufficient complexity a machine would start to evince intelligence.[39] There were initial successes, that seem to bode well, but more ambitious projects almost always

failed. In a way that may seem over ambitious now, at least to some, exponents of AI confidently expected to have produced a computer that evidently possessed intelligence and consciousness, at least by the end of the century.[40]

In a later chapter I will discuss what I see as the epistemological framework that allows the operations of the mind to be thus understood. What is interesting here is the relationship between AI and metaphor. Weiner's Cybernetics and Shannon's Information Theory existed in a certain framework of technology and culture. The concepts which underpin both ideas, such as entropy, had been discussed and theorised in the last century by people such as Sadi Carnot, Rudolf Clausius and Claude Boltzmann.[41] But they had done so in terms of heat and energy, thus using the models available from mechanical industry. Shannon and Weiner's ideas are similarly predicated on models of communication and information. Arguably such models dictate how phenomena are understood and characterised[42]. Weiner's theories allowed a wide range of phenomena to be understood in a certain metaphorical framework. Among these is how we understand the workings of the mind. In the context of such thinking the computer appears such an obvious model for the mind that its metaphoric aspect is forgotten. It becomes a 'paraphor', a metaphor whose metaphoricity is occluded or forgotten[43]. Thus the metaphorical statement 'the mind is like a computer' gets elided into the statement 'the mind is a computer'. In a very limited sense it might be a useful idea to understand the brain as a computer, as long as one remains aware that this is a metaphor. Whether AI is realisable or not it lead to the first metaphorising of the computer. If the mind is a computer, then the computer is a mind.[44]

It was so persuasive that it could be argued that its metaphoric status was forgotten. The computer was understood as a brain, not just similar in some respects to a human's, but capable of evincing intelligence equal or greater than a human's, and even manifesting consciousness. The science dedicated to

this notion, artificial intelligence (AI) has not, I would argue, succeeded in achieving this aim, at least yet. What has happened is that with the failure of AI to deliver what it originally promised, and the transformation of the computer into a different sort of machine, new metaphors have been imposed. Over the last twenty years the computer has metamorphosed from a vast and mysterious device, to which access was restricted and difficult, to a small 'user-friendly' device for use in the office or home. Accompanying this change has been a number of developments in how the computer was used and what it was to be used for. Most important perhaps was the emphasis by people such as Apple's Stephen Jobs, following the lead of Englebart and Kay and the scientists at XeroxPARC, on the idea of the personal computer as a visual device. The Alto, the computer designed at XeroxPARC, which became the basis of the Apple Macintosh, had a 'bit-mapped' graphic display. This is where the computer has in its memory a record of the state of every single pixel, the mosaic elements out of which the computer's display is constructed. This meant that what the Alto could display was not limited to crudely-realised lines of text, as with most personal computers, but could display complex graphics. With this innovation the computer became in effect a visual machine, no longer a kind of brain, but a surface upon which marks could be inscribed. This alteration of how the computer was perceived through metaphor had important implications in how it was used and understood. Stephen Levy, in his account of the Macintosh Computer describes the conception through metaphor of one of the most important tools in personal computing.

> Metaphor, it turns out, is the key to making computers comprehensible. It was not until the late 1970s when two Harvard Business School students named Dan Bricklin and Bob Frankston used a metaphor easily accessible to people who worked with money-accountants, economists, bookkeepers, and anyone who ever wrote a business plan-that personal computers crossed the line from a hobbyist obsession to a compelling tool. The metaphor was that of a spreadsheet-the grid of rows and columns of figures by which one calculated profit and loss. Their electronic spreadsheet was called VisiCalc, and it had many advantages

> over its paper counterpart, not the least of which was that it liberated users from tediously having to recalculate the entire spreadsheet to reflect changes caused by changing a single number. This freedom allowed people to experiment without penalty; and actually changed the perception of a spreadsheet from a document of hard costs into a modelling tool by which one tested business scenarios. The software metaphor was not only superior to the real thing. . . it *became* the real thing. Now, when people speak of spreadsheets, they do not refer to the green graph paper where spreadsheets used to live-those are useless now. Spreadsheets are tools on a computer.[45]

VisiCalc's spreadsheet was possible with the conception of the computer as a visual tool or space. To those working within the paradigm of the computer as a giant brain, or similar metaphors, such a development I suggest would be impossible. As important as VisiCalc was to the success of personal computers, in particular the Macintosh, was desktop publishing. This is the technique that allows somebody to design and 'paste up' paper publications while sitting at a computer. Its introduction into the world of newspaper-, magazine- and book-publishing has made a large number of different skills, such as type-setting, redundant. It is, like VisiCalc, derived from the idea of the computer as a visual tool, and from the metaphors that enables.[46]

The idea of the computer as a surface upon which to inscribe marks has changed not only the kind of software available but the way the computer has been characterised. No longer a brain, it has become understood instead in terms of a book, a theatre or similar medium of expression. This metaphor has gained particular force with the rise and increasing popularity of interactive multimedia. It has found expression in theoretical exegeses (Bolter, 1991, Landow, 1992). It also resonates with the current interest in the transformative effect of information technologies, in which the computer can be seen as part of the third great communications revolution, following literacy and printing (Ong, 1982, McLuhan, 1965). A good example of both these ideas is found in this quote from Landow.

> Over the centuries scribes, scholars, publishers and other makers of books have invented a range of devices to increase the speed of what today we call information processing and information retrieval. Manuscript culture gradually saw the invention of individual pages, chapters, paragraphing, and spaces between words. The technology of the book found enhancement by pagination, indices, and bibliographies. Such devices have made scholarship possible, if not always easy or convenient to carry out... Electronic text processing marks the next major shift in information technology after the development of the printed book. It promises (or threatens) to produce effects on our culture, particularly on our education, criticism, and scholarship, just as radical as those produced by Gutenberg's movable type.[47]

There are a number of problems with this passage. Not least is the fact that it evinces a problematic belief in an uncomplicated idea of progress. Landow subsumes the book under the category of information technology, thus in effect describing the book as a kind of proto-computer in order to ease the introduction of the computer as book metaphor. This exemplifies Kubler and Fisher's idea of sequence, albeit in a retrospective way. The book is placed in a sequence, that of information technology, which culminates in the computer. This metaphor is interesting, and problematic, inasmuch as it operates to a large extent negatively. Landow and others compare the computer to the book to the book's detriment. The computer enables ways of accessing information not possible with print technology. These include non-linear access, hypertext, the exploitation of moving images, sound etc... Above all there is the idea of infinite amounts of information, open, linked and cross-referenced accessible through the computer, made possible by the Internet. It is this lack of closure that most excites theorists of digital media. Yet at the moment the most popular way to 'publish' for the computer is on closed, portable media such as CD-rom. As a physical object the CD-rom can be treated as a commodity, and sold like a book.

Another interesting, though less widely used metaphor, is that of the computer as theatre. Its main exponent is Brenda Laurel, a theorist of interactive media

who argues for it in her book 'Computers as Theatre' (1991). She compares the kind of interactions people undertake with computers, and the expectations these generate, to the experience of drama and the theatre. What is worth noting for the purposes of this thesis is the direct comparison between the experience of using a computer and watching a play in a proscenium arch theatre. This is because in such a theatre, as in a computer 'the technical magic that supports the representation... is behind the scenes.' She also says that

> Its not just that the technical underpinnings of theatrical performance are unimportant to audience members; when a play is "working" audience members are simply not aware of the technical aspects at all. For the audience member who is engaged by and involved in the play, the action on stage is *all there is*... In this sense, plays are like movies. When you are engrossed in one, you forget about the projector, and you may even lose awareness of your own body. [48]

It is interesting to note immediately how this understanding of the theatrical experience is at odds with much of modern thinking in that area, particularly for example in the work of Bertolt Brecht. Brecht's aim was to expose the workings of the theatre in order make manifest the rhetorical character of drama, and to shock the audience out of exactly the kind of forgetting Laurel alludes to. This passage suggests that Laurel adheres to an understanding of media and representation in which the mechanics of signification are invisible, and that for her such ideas are not problematic.

The objects I have described through which the computer is metaphorised, the brain, the book and the theatre, all invoke notions of interiority and exteriority, openness and closure, separateness and conjoinedness. These notions are found not just in the metaphors with which we understand the computer but in its metonymic aspects as well[49] .

As a text the computer can be analysed in terms both of metaphor and metonymy. Along the metaphoric line lie the metaphors through which the

computer is understood, the brain, the book, the theatre and so on. Along the metonymic line lie the contiguous associations with the computer as an object or process, such as the box housing the computer itself, the monitor, the keyboard, the process of digital calculation itself.

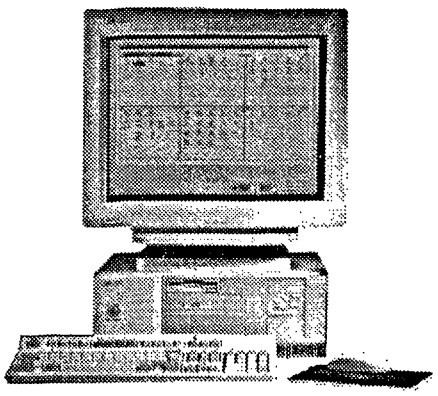

Figure 3. A typical modern PC setup

The typical personal computer is usually made up of three main components, a screen, a keyboard, often used in conjunction with a mouse, and a container housing the actual computer (figure 3). To the lay user the functioning of this last is concealed. Little is revealed by opening it up. It has no moving parts, nor is there much indication of what it actually does. Nevertheless it is where the actual computing takes place. The box contains binary data stored as configurations on the surface of a magnetic disc; copies are made of this data in a place where it can be operated on rapidly and the data is manipulated and transformed by the central processor. The changed data is stored back onto the original disc. As long as it works the computer can be understood as a kind of black box, the engineering term for a component which is known to do what it is supposed to do, so its internal workings are of no concern. Thus a user, one would imagine, is aware only of their interaction with the screen and the keyboard, with the box's mediation between these two devices being effaced.

The other elements, the keyboard, the screen and so on, are there to turn human input into the computer language of binary, and output that binary as writing, sound, imagery or whatever. All the user's interactions take place between these elements, the keyboard, or other input device, and the monitor, or other output device. The box sits between these other devices, mediating their connection and relation, without, apparently, making its presence known in the process of computing.

Though the user can have no unmediated access to the operations in the box, they are aware of it. Its presence makes itself felt through the other devices, and through the various forms of interaction with those devices. The idea of the box and of interior space manifest themselves throughout the gestures, interactions and interfaces, the *praxis*, through which we act with the computer.[50] When the user sits at the computer I would argue that he or she is given the sensation of looking into a space, rather than, as in the case of television, at a screen.[51] This may seem paradoxical, considering what the TV usually shows is moving images of reality, which might seem more conducive of the illusion of space. But I would argue that the fact that the user can manipulate objects on the screen, whether that means making text appear or disappear in the simpler kind of interfaces, or manipulating cursors and windows, tends to deny the sense of the screen being flat. This creates an entirely different relationship between user/viewer and screen than with TV. The TV viewer sits at some distance from the monitor and more or less passively watching the screen. This passivity, and the apparently unmediated realism of what it shows, means the viewer experiences the screen as having no relation to the rest of the TV behind. The computer user on the other is knowingly interacting with the machine,

Thus it could be argued that the computer has two kinds of interior space; the literal space filled with the various electronic devices mentioned above, which is obviously 'real', and yet which we do not usually see, interact with or understand, and a virtual space which in most senses does not exist, and yet is phenomenologically more real for us. This space is a metaphoric representation of the magnetic configuration of the media within the computer. Even with command line systems like MS DOS[52], which might appear transparent and unmediated, it remains highly metaphoric. In all systems, from text-based command line to highly graphic representations the metaphor is spatial. In the

operating system used by the VAX computer[53], for example, as the user is given the sense of moving in and out of spaces where files are stored, even though all interaction is through typing text commands.

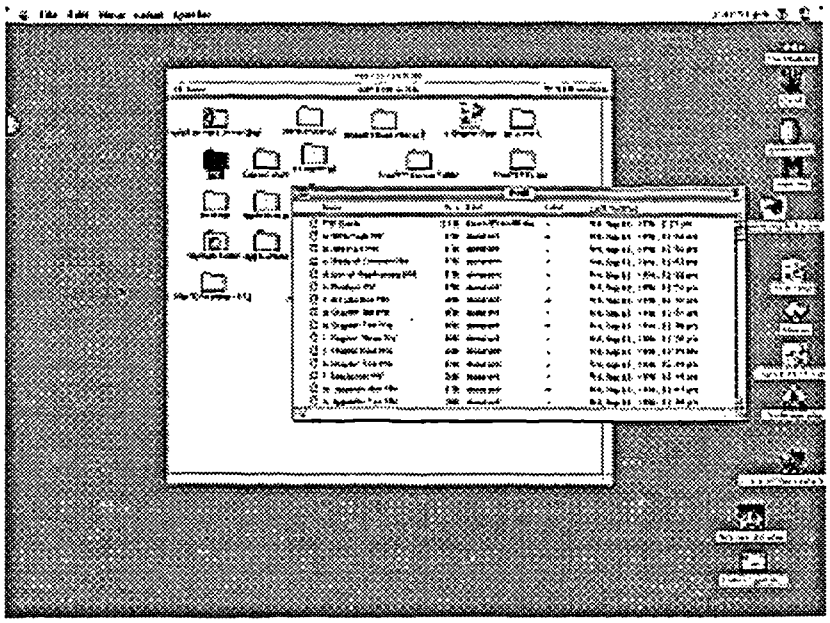

Figure 4. The Apple GUI

The kind of interface most widely used now is explicitly spatial. Known as graphical user interfaces (GUIs) (figure 4), they were developed by researchers at Xerox's Palo Alto Research Centre in the nineteen seventies, following on from the work of Douglas Englebart in the previous decade. In the Apple Interface for example any storage medium, the computer's hard disk for example, is represented as an icon, a small image or symbol, on the screen. By double-clicking on the icon the user can 'open' up the disk, or whatever, to see what is inside it. In it there may be applications or files, represented by different icons, or folders, which can also be opened up to reveal their contents. Thus the sense of spatiality, closure and 'boxiness' is made explicit.

This notion of spatiality is also found in much computer software. Many games for example are set in enclosed spaces. A good example is a game called *Doom*, in which the player is required to negotiate his or her way through a threatening environment of passages and rooms while being attacked by various enemies. Less threatening are virtual environments such as Cosmic *Osmo* and *Myst* which the user can explore (figure 5). The genesis of these games and environments, and indeed of much of the whole games industry, can be

traced back to the MUDS or 'multi-user-dungeons', which were text-based games, played across university networks in the States, in which players had to negotiate their way through various landscapes and interiors[54].

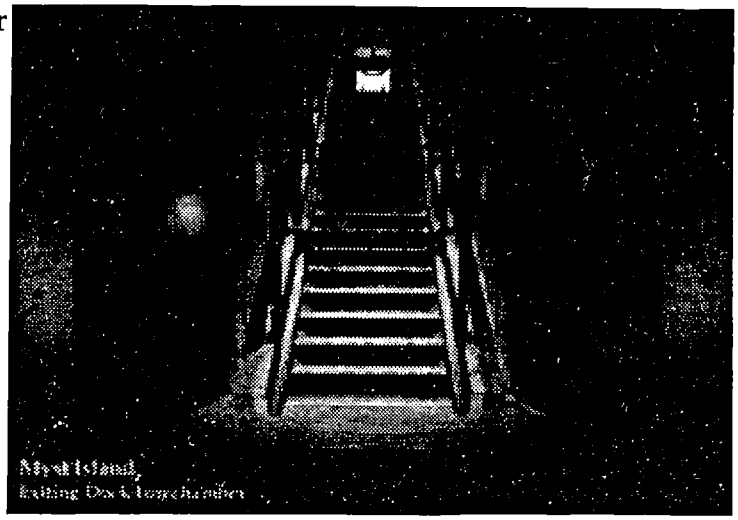

Figure 5. Screenshot from Myst

There are a number of more fundamental ways in which the computer can be said to manifest ideas of interiority and separateness. For example it is a digital machine. This means that it manipulates and stores data in discrete elements and discontinuous scales.[55] The computer furthermore is not just a digital, but a binary, digital machine. This means that all data is represented by strings of information units in one of only two states. These states could be thought of as on/off; black/white; yes/no. The obvious reason why computers are binary is that in the beginning of computing it assured reliability; if a circuit need only be read as either high or low it has a greater margin of error and less chance of being read inaccurately. As a binary digital machine the computer embodies the tendency to understand the world in terms of discrete entities and binary oppositions, initiated by Plato,[56] and which has since been one of the presiding characteristics of western epistemology. For example Boolean logic, the system devised by George Boole in the first half of the nineteenth century, which has become the basis of binary computer logic, classes are determined in terms of 'P or not P', i.e. in terms of ex- or in-clusion within a definition. Lakoff suggests that our experience of being embodied selves is the basis of our grasp of such logic. As Lakoff puts its 'Everything is either inside a container or out of it.'[57]

Conclusion

What I have suggested so far is that the computer, as a physical object, through the metaphors with which we understand and characterise it, through the metonymies associated with its shape, through the interfaces and software that are designed for it and through the fundamental symbolism of digital and binary logic, is bound up with ideas of containing, boundaries, space and separation. I suggest that these different ways of understanding and characterising the computer can be subsumed under a single trope or figure, that of the box. The box can perhaps be characterised in this context as a metametaphor, a metaphor which encompasses all the other metaphors. In the following chapters I use this figure of the box as, to mix my metaphors, a prism or lense through which to focus on the various issues which are the concern of this thesis.

Notes

[1] Hooper-Greenhill (1992) in particular has undertaken a foucauldian analysis of how the way that museums structure and represent knowledge is bound up with questions of power and epistemology

[2] For overviews of the idea of the Virtual Museum see Museum News November /December 1994

[3] Chenhall and Vance, 1988, p 10

[4] Chenhall and Vance, 1988, p 13

[5] This is discussed by Hooper-Greenhill (1992) and Walsh (1992). See also appendix 2 for my understanding of modernity and postmodernity

[6] Multimedia and hypermedia are the names given to the capacity of the computer to deliver information in a variety of ways; text; graphics; video; animation; sound and so on, as well as the ability to make multiple links between discrete portions of information. Above all it is interactive, meaning that the user is enabled to take decisions about how, to what extent, and in what order, the information is accessed and presented. It is one of a number of related developments in computing as a medium for representation. For an account of the range of work being done in this area see Cotton and Oliver (1993). For a good account of the development of such computer applications see Woolley (1993).

[7] For an overview of interactive displays in the museum see Museum News July/August 1994

[8] For instance in one holocaust museum visitors are given a card which contains the number of a holocaust victim. By entering this number in various work stations around the museum the visitor can discover what happened to the victim at different points. For literature about interactives in holocaust museum see Weinberg and Elieli (1995)

[9] CD-rom (Compact Disc Read Only Memory) and CDi (Compact Disc interactive) are based on the same technology as the audio CD, and are formats for storing comparatively large amounts of data on compact discs. These can be read by a computer, much like any other kind of data medium, though they cannot be written to.

[10] Again see Cotton and Oliver (1993).

[11] The Internet is the worldwide system of connected computers, through which people can communicate through electronic mail, or publish material by setting up 'sites' on the 'World-wide Web'. These are

displays of material, images, text, sound and animation, which are situated on computers linked to the Internet. They can be 'visited' by any user on the Internet provided they are using appropriate software, such as Mosaic or Netscape. Almost all sites have 'hotspots', areas of text indicated by being a different colour to the body of text, which, by clicking on, the user can jump to other sites.

[12] Much effort is being expended by computer companies and researchers at the time of writing in finding ways of networking three-dimensional Virtual Reality structures over the Internet. Already there is an agreed form, or 'mark-up language', VRML, which encodes information describing such spaces in a universally agreed and understood manner. Such ideas, should they succeed, may be attractive to people interested in putting museum collections on the Internet.

[13] For an account of art and museums on the Internet see .Net magazine, April 1995, and Museum News, May/June 1995

[14] Virtual Reality (VR) refers to the computer-generated, mathematically-derived spaces and landscapes with which the user can interact and through which they can apparently move as if in a real space. This might happen in a flight simulator, or through using a 'headset', a device consisting two cathode-ray monitors worn over the eyes.

[15] See Museum News November/December 1995 and Archaeology September/October 1995

[16] QuickTimeVR is software that will 'knit together' 360 degree views of a scene, horizontally and vertically, to allow a viewer to move round the view seamlessly

[17] Benjamin, 1979, p 107

[18] This idea is enunciated most directly in Foucault, 1976, pp 30 - 94.

[19] Gutting, 1989, pp 231 - 232

[20] Hill, 1988, p 42

[21] Metaphor is the substitution of one term by another. It was first discussed in depth by Aristotle in the *Poetics* and the *Rhetoric*. It was one of the parts used in rhetoric, the art of speaking. Aristotle, like Plato before him, found rhetoric problematic (Ricoeur, 1978, p 11). He placed rhetoric both in opposition to philosophy, and bound up with it, 'rhetoric is philosophy's oldest enemy and its oldest ally' (Ricoeur, 1978 p 10). Philosophy is concerned with expressing the truth about the world, whereas rhetoric is about the use of persuasive language. In short what Aristotle initiates is a distinction between the truth and the vehicle in which that truth is expressed. This distrust of metaphor pervaded much philosophical thinking until recently. Only in the second half of the nineteenth century did metaphor begin to be appreciated not simply as special poetic form of language, but the basis of language itself.

[22] Fisher , 1991, p 100

[23] Fisher, 1991, p 105

[24] Fisher, 1991, p 106

[25] Fisher, 1991, p 106 - 7

[26] Until comparatively recently the principle definition of a computer was a person who engaged in computing. A machine undertaking the same task was differentiated by an adjective such as electronic or digital.

[27] At the moment much effort is being taken to combine the computer with the TV to produce a kind of hybrid device.

[28] For an account of the development of the computer, see Palfreman and Swade (1991)

[29] Palfreman and Swade (1991)

[30] These terms are taken from the linguistic theories of Fernand de Saussure, who divided language into three parts; *langage* meaning the entire field of linguistic activity; *langue* meaning a language system such as English or German, with its particular vocabulary, grammar, principles of construction; and *parole* meaning a specific utterance within a such a structure.

[31] Coyne, 1995, p 250

[32] Coyne, 1995, pp 249-250

[33] Shannon (1948)

[34] Weiner (1948)

[35] Hodges, 1985, p 403. The 'past decade' was the forties and 'what had happened' was World War Two.

[36] Turing (1936)

[37] Turing (1950)

[38] Hodges (1986) p 266

[39] The history of AI is well documented, enthusiastically in McCorduck (1979) and Johnson (1986) and critically in Dreyfus (1992) among others.

[40] McCorduck, 1979, pp 329 - 357

[41] Campbell, 1983, pp 34 - 43

[42] For example the fact that the DNA chain is understood as a code is not a self-evident truth about deoxyribonucleic acid, but rather reveals the framework of our understanding as essentially metaphoric. DNA is, as Dr Brian Balmer, lecturer in the Philosophy of Science at UCL has described it (in conversation), 'just gloop'.

[43] This term was explained to me by Dr Avon Huxor

[44] The idea of the computer as giant brain, or mind machine, was one of the staples of science fiction in the forties and fifties. The idea of the computer as a brain remained the basis of the understanding of computers until recently. There are numerous examples in science fiction film and writing. Isaac Asimov considered the issue of machine intelligence in the *Robot* series of short stories. Arthur C. Clarke expressed views of the power of such machines in short stories such as *The Nine Billion Names of God.* Perhaps the most powerful expression of this idea and also perhaps its most powerful critique is in Stanley Kubrick's classic science-fiction film '2001 A Space Odyssey'. HAL 9000, the intelligent computer on the space ship, is arguably the main character of the film. In a move typical of Kubrick it not only has the best lines but also seems the most engaging and even human of all the characters. The scientists and astronauts in the film are seemingly emotionless and almost autistically incommunicative. HAL is a cogent expression of the computer as giant brain. The crew on the space ship converse with it as with another human being. It is apparently responsive in human terms, even emotional. Despite this in the end the machine cannot reconcile its apparent humanity with the demands of its underlying logic. In the end it murders almost all the crew Jon Bird (in conversation) has pointed out the connection between HAL and the figure of the monolith in the film. This monolith is a black slab that appears at crucial moments in human history to direct leaps in human evolution in some mysterious manner. What it is and how it works is beyond the comprehension of those confronted with it. Thus, like HAL, it is, and indeed resembles literally, a black box, the engineering term for a piece of technology whose inner workings are of no consequence to what it does, as long as it works. The humans respond to HAL as they respond to the slab, without really understanding what is happening. Because HAL has been made to appear human they do not understand how different and incomprehensible it is.

[45] Levy, 1995, p 69

[46] Levy, 1995, pp 211 - 217

[47] Landow, 1992, p 19

[48] Laurel, 1990, p 16

[49] In a paper entitled 'Two Aspects of Language and Two Types of Aphasic Disturbances' (1980) Roman Jakobson, the linguist and founder of the Prague School of Structuralist Linguistics, noted that language functions because of the particular relation between the participants, 'the addresser and the addressee', in communication. In order for a linguistic communication to be understood there must be a common code understood by both the addresser and addressee. However, both parties need to know more than just the code itself. They need to know the context, so that they will have at their disposal the associative references relevant to that context. According to Jakobson such references in any message are of two different types. One type substitutes one term for another, based on a proposed similarity or analogy between the two, the other substitutes one term for another based on proximity or contiguity between the two. As Jakobson says.

> 'The development of a discourse may take place along two different semantic lines: one topic may lead to another either through their similarity or through their contiguity. The METAPHORIC way would be the most appropriate term for the first case and the METONYMIC way for the second, since they find their most condensed expression in metaphor and metonymy respectively.' (Jakobson, 1980, p 90)

[50] In a number of books such as *Technics and Praxis* (1979) and *Postphenomenology* (1993) Don Ihde has explored this idea of praxis in relation to technology

[51] I derive my observations in this passage from personal experience, and experience of teaching multimedia to students and observing how they react to computers, and from conversations with fellow practitioners and researchers.

[52] MS-Dos stands for MicroSoft Drive Operating System. An operating system is the software that enables the computer to start up, and to use other software, such as word processors and so forth. MS-Dos was the operating system used by IBM in their first generations of personal computer, and is still used in their present computers, though more sophisticated graphical interfaces are now more widely used.MS-Dos is a 'command line' system requiring the user to type in instructions at a prompt from the computer, in order to undertake any action.

[53] The VAX is a 'mainframe', a type of large computer used typically by large institutions such as universities. It is the paradigm of centralised computing inasmuch as the actual computer is housed at some central point in the institution, with users connected to it through 'dumb terminals', monitor and keyboard arrangements, which, through clever management of the computer's time, give the impression to the user that he or she is sitting at the actual computer as the sole user

54 Turkle, 1995, pp 181-2

55 Digital derives from the Latin for finger, and as Wilden points out using our fingers as counting devices was the first example of digital computing (1972 p156). Analog devices such as the clock, the thermometer and the accelerator pedal manipulate data in continuous quantities in a manner analogous to the real situation their data represents.

56 Plato's role in instigating dualism is investigated by a number of feminist philosophers, including Plumwood (1993) and Irigaray (1985)

57 Lakoff., 1987, pp 272 - 273

CHAPTER TWO

The Museum, the Computer and Modernity

In the last chapter we saw how the computer, in terms of hardware, software, interface design, and even the very nature of binary, digital computation itself, is understood through metaphors of enclosure and separatedness. This would seem a potentially useful basis for designing multimedia systems for representing museum collections. Museums and galleries are often described in terms of interior spaces, boxes, as in, for example O' Doherty's characterisation of the gallery space as a 'white cube'[1]. Such images invoke the idea of the museum or gallery as an enclosed container or space in which objects are stored. This is similar to the how the modern personal computer is characterised as a 'space' in which objects such as files and programs are stored.

The museum is a modern institution. It emerges out of the cabinets of curiosity and *kunstkammer* of the sixteenth and seventeenth centuries[2] . Hooper-Greenhill, following Foucault, has shown how its emergence is concomitant with the supersession of the Renaissance by the classical *episteme.* Its modernness is evinced in its separateness from the world. As such it can be seen as similar to many other objects of the period.

> The many striking examples of boundaries in the early modern period of objects demand a similar contemplation of something in radical separation from the world at large. The curtain that rises and falls in the modern theatre, the covers of a book that separate a discourse in a way that can never be done in a culture of oral performance, the frames that surround paintings and make them the quintessential visual objects, after the seventeenth century all reflect not only the notion that an object must be free standing, isolated, but the more essential scientific notion that only closed systems have order and explainable identity.[3]

According to Walter Ong the origins of this 'scientific notion' of 'closed systems' was largely the result of printing, and the closure and packaging of

knowledge that printing enabled[4]. Anthony Wilden expands this to include the...

> ... rise of individualism, the invention of perspective, Protestantism, the discovery of alphabetical order for dictionaries, the ordering of practical and abstract knowledge in the Encyclopédie, the invention of interchangeable machine parts, the standardisation of weights and measures, Linnaeus' ordering of the species, the substitutions of legal codes and constitutions for spontaneous common law, and the creation of standardised tasks in the factory system.[5]

According to Ong much of the basis of this thinking can be traced back to the work of the Renaissance philosopher Petrus Ramus (1515 - 1572), otherwise known as Pierre Ramée. Ramus , though not recognised as a great thinker, was highly influential in different ways. For Ong he was largely responsible for specific spatial models of knowledge and analysis.

> Ramus had insisted that analysis opened ideas like boxes. It is certainly significant that the post-ramist age produced so much more than its fair share of books identified by their titles as "keys" to one thing or another. In this same age the notion of "content" as applied to books is extended, so that statements, the words of which statements consist, and concepts or ideas themselves are habitually considered as "containing" truth. An epistemology based on the notion of truth as "content" begins to appear. Out of the twin notions of analysis is bred the vast idea-, system-, and method-literature of the seventeenth and eighteenth centuries. This literature consists of treatises on practically all conceivable forms of knowledge labelled indiscriminately "ideas', or "systems" or "methods" of the various subjects, and conceived of as box-like units laid hold of by the mind in such a way that they are fully and adequately treated by being "opened" in an analysis.[6]

It is thus to Ramus that Ong ascribes the beginning of what he calls closed-system or closed-field thinking.

> Ramus' close-field thinking is absolute and imperious, welling out of unconsciousness drives for completeness and security, (and thus in some ways regressive to the self-enclosed, infantile stage represented by the uroburos, the serpent with its tongue in its mouth-the thumb sucking infant.)[7]

The close-field thinking of Ramus spread mainly in Protestant Europe, and had a great influence on Descartes and Bacon, and other thinkers responsible for developing new methods of scientific enquiry. From Ramus in the sixteenth century, through Newton and Kant through to the last century science and philosophy has attempted to construct totalised and closed systems of knowledge.[8]

Ong points out how the...

> ...closed system paradigm was encouraged by the new science of the sixteenth and seventeenth centuries in its reliance on seemingly closed-system mathematics: the physical universe was assimilated to a closed system, or, rather, a system of systems, each operating on purely mathematical laws.[9]

This constituted one of Descartes's main strategies to gain certainty of knowledge about the world, which was to base reason and knowledge on mathematical principles and thus avoid the mediating and, for him, obscuring part played by language in their formulation. His ideas towards this end are encapsulated in his posthumously published *Regulae ad directionem ingenii* (*Rules for the Direction of the Mind*).

> The Regulae aims at the development of a generalised logic and a new symbolic language, patterned on mathematics, but interpreted in a more abstract and general sense, as *universal mathematics, (mathesis universalis).* This conceptual interpretation of mathematics sets up a new perception and standard of things, which is not derived experientially from them, but which is rather imposed upon them as an axiomatic order to which they must submit. *Universal mathematics* becomes the basis for Descartes's elaboration of a new philosophical discourse and subject in the *Discours* and the *Méditations*..[10]

Artificial Intelligence

It is because of such ideas that it becomes possible to formulate the concept of

the computer. If thinking can be represented in terms of mathematics, and if mathematics, as a logical system, can be automated, then it is possible to build a mechanical mind, a thinking machine. Writing about the science of thinking machines, artificial intelligence, Vernon Pratt states that

> ...the conditions for thinking about it [AI] were not realised before the great revolution in the Western conception of the world which occurred in the seventeenth century and with which we associate with the rise of modern science. The reason has nothing to do with scientific and technical advance bringing feasibility to a hitherto fantastic project. It is the project itself, the very idea that thinking might go inside a machine, that is born in the seventeenth century revolution. [11]

The man most responsible for the development of such ideas at that time was Gottfreid Leibniz (1646 - 1716) the German logician and mathematician. Leibniz was not a follower of Descartes; he was opposed to him on many grounds, and influenced by him in other ways. Descartes laid the ground of instrumental and mathematical reason which dominated seventeenth-century thinking, and constituted the point from which Leibniz developed his thinking. Leibniz was one of the first people to actually try building calculating machines. His most famous practical attempt was the Leibniz Wheel.[12] He also spent much of his time devising possible universal languages which anticipate some of the principles behind modern programming languages. Indeed what Leibniz conjectured was the possibility of mechanising reason. He developed a system of logic in which all logical relationships could be expressed in mathematical terms. He further anticipated that it would be possible to combine this with a machine similar to his calculating engine and crank out answers to any problem as long as it could be expressed in logical terms. Leibniz believed that once the totality of knowledge in the world had thus been represented then science as a project would be complete. The whole of knowledge could then be made available in perfect transparent clarity in a comprehensive encyclopaedia. All questions and all disputes could then be solved by calculating, using combinations of logical simples to arrive at the

necessary understanding[13].

Leibniz's project of the mechanical reasoner only became practically feasible this century. Early kinds of electronic computing devices were built in the nineteen-thirties, and the development of the technology was much advanced by military demands in the second world war, in encryption, munitions and, not least, the development of atomic weapons. Though first understood only as a calculating machine, the electronic computer was being developed, as we have seen in chapter one, at a time when a number of ideas, such as Norbert Weiner's concept of Cybernetics and Claude Shannon's information theory, were being developed. These along with ideas propounded by Alan Turing led to the rise of artificial intelligence (AI) as an area of research. As the quote from Pratt above suggests AI derives directly from the concept of the transcendent subject as formulated by Descartes and others. It is predicated on the idea that mathematical logic can represent the structure of the world and the mental processes with which we apprehend that structure. A disembodied consciousness is passive, receiving a mirror image of the world, rather than interacting with it. Dreyfus opines that the problems of AI derived from this predication.

> An old rationalist dream was at the heart of the problem. GOFAI [Good Old-Fashioned Artificial Intelligence] is based on the Cartesian idea that all understanding consists in forming and using appropriate symbolic representations. For Descartes, these representations were complex descriptions built up out of primitive ideas or elements. Kant added the important idea that all concepts are rules for relating such elements, and Frege showed that rules could be formalised so they could be manipulated without intuition or interpretation. Given the nature of computers as possible formal symbol processors, AI turned this rationalist vision into a research program and took up the search for the primitives and formal rules that captured everyday knowledge.[14]

Markova has also argued that AI is deeply indebted to Cartesian ideas of passivity and disembodiment.

> There is a close parallel between the philosophical views concerning the passivity of the mind and the presuppositions of information-processing approaches to cognitive processes. The assumption of the seventeenth century philosophers that external and internal stimuli impinge upon our senses and that these accept information for further processing has also been adopted by modern psychologists concerned with the study of cognitive processes. The statements of the empirical philosophers , such as 'impressions strike upon the mind', or 'ideas enter the mind through the senses', have been altered into the more modern one, 'information enters the cognitive system through sensory processes', but the gist of the statement remains the same.[15]

Thus AI embodies the Cartesian notion of the mind as a space in which impressions are received, a 'passive vessel' or 'storehouse'[16] , with a limited capacity. Thus it exemplifies the discourse of interiority's concept of the mind as an interior and closed off space[17]. AI comes out of a particular discursive structure. Descartes's ideas of transcendence, closure and certainty dominate the AI project. At the heart of Descartes's ideas is the desire to escape the mediating influences of language and bodily experience, which contemporary writers such as Montaigne, and later philosophers, such as Hegel, and in this century Merleau-Ponty, see as crucial to self consciousness.[18]

Virtual Reality

Another area of development in computing, Virtual Reality (VR), is equally derived from the Cartesian notion of the transcendent subject, and as such equally contingent upon cultural constructions of reality and the world. Like AI it is predicated on the idea that a set of facts about the world, in this case concerning our visual experience of it, that can be reconstructed in the computer. VR is based on the idea of using computer techniques of representing space in such a way as to give a user a sense of being in a real place. This has meant developing interfaces, such as headsets, which enabled the user to feel immersed in the computer scene, and to develop fast enough hardware and

software to respond to user's movements in 'real time'. Some form of VR had actually been around since the mid sixties. In 1965 a researcher at MIT Ivan Sutherland built the first head mounted CRT display, a device which could relay the movements of a user's head to a computer, which in response could redraw a three dimensional scene on TV screens mounted immediately in front the user's eyes[19]. Other early VR applications included the flight simulator, a device for training pilots, where the computer-generated landscape seen by the 'pilot' could alter in immediate response to how she or he operated the controls. Flight simulators were early examples of VR because airlines could afford the large and expensive computers capable of real-time graphics[20].

There were other, more idiosyncratic developments in the sixties and seventies such as the reality devices of Morton Heilig and the artificial reality installations built by Myron Krueger. Mostly during this period its development, being costly, was mainly restricted to big businesses, NASA, the military and well-endowed universities. But by the end of the eighties personal computers were fast enough to support VR. Appropriate hardware such as headsets were developed by companies like Jaron Lanier's VPL. Anybody with a few thousand pounds could experience existence in a virtual world, necessarily crude, but responsive to the user's moves[21].

In the late nineteen eighties and nineteen nineties it became possible to make VR systems which were comparatively cheap and accessible. Great claims were made on VR's behalf. Its future use was described in communications, medicine, information dissemination and even sex.[22] But VR, for all its proclamations of being a revolutionary idea, is arguably no more than the latest manifestation of a centuries-old culturally determined way of representing space. The principles underlying VR go back to the fifteenth century. It was then that Alberti codified the techniques to allow painters to represent reality based on the way light hit the retina.[23] He suggested that an artist imagine a

plane of glass between himself and the scene he wished to reproduce and to copy the shapes as they appear on the glass[24] . This is a powerful way of representing space, yet some argue it remains a code, one among many; one also with no preeminent claim to representing reality better or more accurately than others[25]. As Steve Neale puts it in his book *Cinema and Technology*.

> It is an ideal of space, of position and, indeed, of vision itself. An ideal; for not only is perspective as a system false to the movement of the eye in constructing for it a fixed and static position, it is false, also as a system of representation inscribed on a two-dimensional surface to the curvilinear nature of the sphere of vision.[26]

As a code it embodies the understandings, needs and desires of the culture which produced it. Francastel writes.

> ...It is men who create the space in which they move and express themselves. Spaces are born and die like societies; they live, they have a history. In the fifteenth century... Western Societies organised in the material and intellectual senses of the term, a space completely different from that of the preceding generations; with their technical superiority, they progressively imposed that space over the planet. [27]

Albertian perspective was predicated on the notion of a disembodied viewer, one whose physical self is no longer of account in his experience of perception. His[28] view is also monocular and static, which as Neale points out is false to the binocular, saccadic nature of physiological vision. It is these factors that allow space to be understood and represented mathematically. Martin Jay has pointed out that...

> ...a number of implications followed from the adoption of this visual order. The abstract coldness of the perspectival gaze meant the withdrawal of the painter's emotional entanglement with the objects depicted in geometricalized space. The participatory involvement of more absorptive visual modes was diminished, if not entirely suppressed, as the gap between spectator and spectacle widened. The moment of erotic projection in vision-what St. Augustine had anxiously condemned as "ocular desire"-was lost as the bodies of the painter and viewer were forgotten in the name of an allegedly disincarnated, absolute eye.

> Although such a gaze could , of course, still fall on objects of desire... it did so largely in the service of a reifying male look that turned its targets into stone. [29]

This notion of privileged spectators gazing onto a scene from which they are separate and transcendent, was of great significance for Descartes. Indeed the influence of Albertian perspective on Descartes and the importance of Descartes' consequent visualist paradigm is such that 'Cartesian Perspectivalism' has become a term to describe Cartesian philosophy.[30] Richard Rorty has pointed out how 'the intellect inspects entities modelled on retinal images...In Descartes's conception–the one that became the basis of 'modern' epistemology–it is representations which are in the mind.'[31] Jay points out that Descartes may thus have been responsible for founding the speculative tradition of identitiarian reflexivity, in which the subject is certain only of its mirror image.

An analysis of this idea of the separate and trancendent subject, and its relation to scientific knowledge, led Heidegger to formulate his notion of the 'Age of the World Picture'. In the essay of that name Heidegger characterises scientific modernity as being capable, unlike the Greek and mediaeval epistemes, of perceiving of the world as a picture, owing to the emergence of man[32] as a subject, who sets himself in front of, and separate from, the world of objects. This particular stance enables man to have an instrumental relationship towards the world, which he can treat as a 'standing reserve' for his use and exploitation.

> Where the world becomes picture, what is, in its entirety, is juxtaposed as that for which man is prepared and which, correspondingly, he therefore intends to bring before himself and have before himself, and consequently intends in a decisive sense to set in place before himself... Hence world picture, when understood essentially, does not mean a picture of the world but the world conceived of and grasped as a picture.[33]

The Camera Obscura

For all the proclamations of its status as a revolutionary technology VR is arguably deeply rooted in the ideology of scientific modernity, as initiated by Descartes. It is, like AI, a seventeenth-century idea. Arguably it most resembles a paradigmatic apparatus of that century, the *camera obscura* (figure 6),

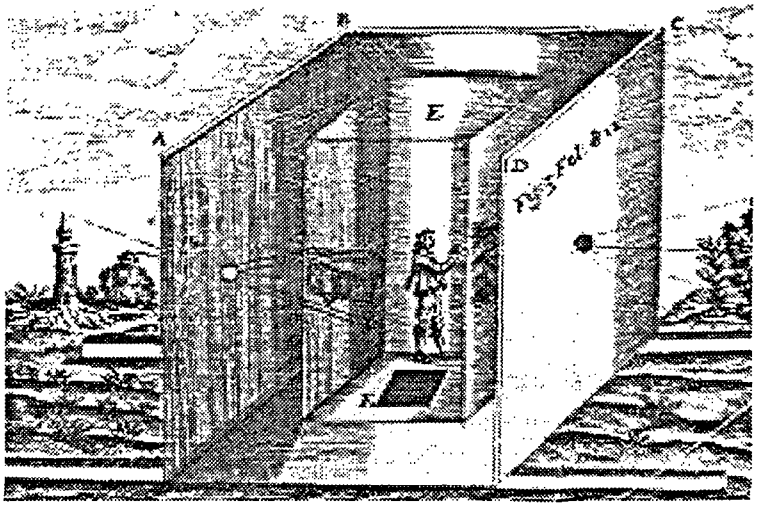

Figure 6. A camera obscura

the enclosed chamber in which images of the outside world are projected through lenses. Jonathan Crary has examined the importance of the camera obscura in forming the epistemological paradigm of the observer/subject which emerged with modernity.[34] He points out that for two hundred years it subsisted as a philosophical metaphor, a model for rationalist and empiricist thought. He says that...

> ...[t]he space of the camera obscura, its enclosedness, its darkness, its separation from an exterior, incarnate Descartes's "I will now shut my eyes, I shall stop my ears, I shall now disregard my senses." [35]

Crary expresses thus the relationship between the model of the camera obscura and the discourse of interiority.

> ...the camera obscura is bound up with a metaphysic of interiority. It is a figure for the observer who is nominally a free sovereign individual but who is also a privatized isolated subject enclosed in a quasi-domestic space separated from a public exterior world. It defined an observer who was subjected to an inflexible set of positions and divisions. The visual world could be appropriated by an autonomous subject but only as a private unitary consciousness detached from any active relationship with an exterior.[36]

I suggest that it is no coincidence that the museum began to emerge at the same time as the *camera obscura* and the paradigm of albertian-cartesian perspectivalism[37]. The sense of separateness, closure and transcendence that typifies that paradigm is found also in the museum. It is like the privileged spectator gazing onto a scene from which he is separate and transcendent. As Pearce remarks discussing the history of the modern museum.

> The European relationship with the material world appears to be intimately bound up with two of the distinguishing features of the European tradition. The first of these is its willingness to view the world of matter as external and 'objective' to the knowing human subject, a notion fundamental to modern European philosophy since Descartes.[38]

The reliance on retinal images that Richard Rorty describes as the basis of 'modern' epistemology is related to the reliance on the actual visible presence of the object in the museum. 'The point of collections and museums... revolves around the possession of 'real things''[39]. Thus one might say that the museum, like the Cartesian mind, is a space in which objects from the outside world are contained and placed in structures to reflect an understanding of that world. In keeping with the discourse of scientific reason this structuring and understanding are understood to be logical and complete, or at least to aim towards an idea of completeness. Museums and museum displays have not, at least until recently, been visibly authored. The displays are presented as a reflection of the outside world in the unmediated chamber of the gallery space.

> Exhibition, the belief that knowledge can be laid out as a demonstration in temporal three-dimensional space and that this is morally desirable and promotes the development of fresh knowledge, is itself a meta-narrative of the modern world. It is an overarching image which transcends the individual topics upon which any particular exhibition might concentrate. Exhibition is a characteristic construction of the age, like the printed book, the framed picture, the secular musical or theatrical performance. It is the opus which demonstrates the work of collection and curation, and the creation of the lattice of reference and interre-

lationship, which requires controlled space for its exposition.[40]

The museum can perhaps therefore be understood as a kind of *Cyberspace*, in which knowledge is ordered and represented in the form of three-dimensional objects in a three-dimensional space, and through which users can move. The actual term Cyberspace was originally coined by the science fiction writer William Gibson. It can, and has been taken to mean, any set of electronic connections enabling communication, such as the telephone system. More usually it refers to future application of virtual reality technology to the structuring and display of data, accessible to users through a future form of the Internet. Gibson describes it thus.

> Cyberspace. A consensual hallucination experienced daily by billions of legitimate operators in every nation, by children being taught mathematical concepts... A graphic representation of data abstracted from the banks of every computer in the human system. Unthinkable complexity. Lines of light ranged in the nonspace of the mind, clusters and constellations of data. Like city lights, receding...[41]

This concept has often been quoted with approval by many people working in the field of computers; this for instance is Michael Benedikt, Professor in the School of Architecture at the University of Texas, from a paper given at the 'first Cyberspace conference', held in Texas in 1990.

> ...it is proposed that the creation of Cyberspace is not only good, but necessary, and even inevitable step... toward providing the maximum number of individuals the means of creativity, productivity and control over the shapes of their lives within the new information and media environment...[42]

Benedikt is aware, along with other advocates of Cyberspace, that Gibson's conception paints a far from encouraging picture of a future that contains such technology. Here information is a commodity controlled by vast corporations, who defend their virtual data citadels like crusader castles against the incur-

sion of hackers, known as console jockeys, and missile-like viruses. This does not stop Benedikt, or others, advocating the development of cyberspace

As a 'proto-cyberspace' the museum is, in my opinion, an ideal object through which to criticise the thinking behind Cyberspace, as, similarly, Cyberspace enables a critique of the museum. This is evinced as well as anywhere by Apple Computer's *Virtual Museum.* (figure 7). This was a project set up between Apple Computers and New York University to demonstrate some

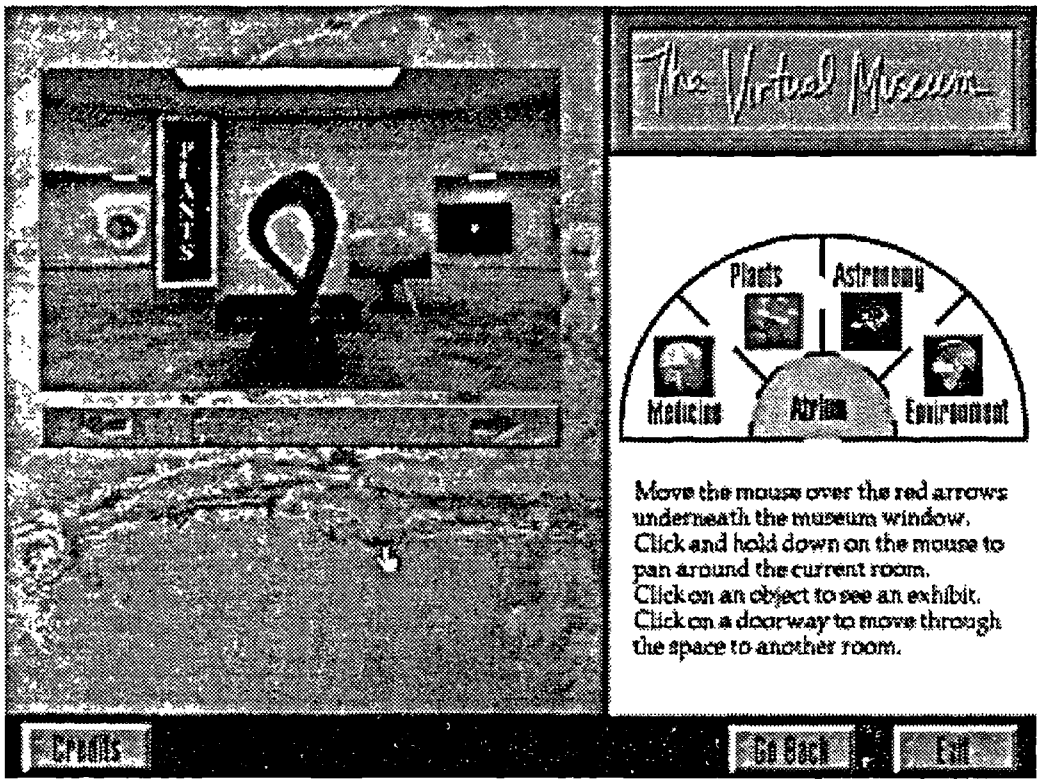

Figure 7. Screenshot from Apple's Virtual Museum

ideas being developed at Apple concerning the representation of three-dimensional spaces. It also purported to represent a new way of showing museum collections on computer. The collection of objects in their system is shown as being situated in a three-dimensional model of an imaginary museum, in which the user can move around by clicking the mouse while pointing the cursor at whichever object they wish to approach. At first sight this may seem reasonable, since this is how an actual physical museum works, yet it fails to question the basic assumption that the way museums arrange and display

objects is satisfactory. In a museum an object can only be physically situated in one place, even though it might be relevant in many contexts. Furthermore it is an inevitable consequence of our physical being that to get from one place to another we must pass through all the places that lie in between. Thus objects in museums are not only placed in only one context, but almost inevitably in some kind of linear narrative imposed by the order of rooms. Perhaps more insidiously the simple narratives enforced by such static arrangements are congruent with enlightenment notions of progress. Philip Fisher describes this idea cogently.

> Architecturally, the museum is made up of rooms and paths. Once the pictures face us in a line on the wall we can convert rooms to paths by moving sideways from the entrance around the room, flattening it out, in effect, onto the wall. Viewing the pictures sequentially as we move from room to room, we follow the room numbers, the centuries, the schools. In so far as the museum becomes pure path, abandoning the dense spatial rooms of what were once *homes*, or, of course, the highly sophisticated space of a cathedral, it becomes a more perfect image of history, or rather the single, linear motion of history preferred since Winckelmann.[43]

In the National Gallery, for example, the notion of the history of art as a progression towards ever greater levels of sophistication is implicit in the chronological arrangement of the galleries. This is further emphasised by the order in which the visitor is encouraged to move through the gallery. If they use the Trafalgar Square entrance the most obvious and easiest route is starting with the rooms on the left, which contain the Italian Primitives, and proceeding round to the impressionists at the end. Implicitly or explicitly this arrangement suggests that the history of art consists of progress towards ever greater triumphs of mimetic representation. This suggestion would have been even stronger before the 'epistemological break' of impressionism, and even they are concerned with objective truth in visual representation.

Such a metaphor is more problematic, than might at first appear. The

metaphor of the box or interior space suggest the way in which the museum is a privileged space, separated out from the world it seeks to represent. Aspects of this have been a theme of many writers from the beginning of museological criticism. Sherman shows how the 'first full-fledged critic of art museums' Quatremère de Quincy was proclaiming that museums drained the life out of objects almost as soon as the modern museum emerged[44]. Similar criticisms can be found in, among others, Valéry (1960) and Adorno (1982). Fisher shows how in a museum the meaning of an object is reduced to one or two dimensions of its multidimensional complexity. For example a sword can be displayed as a weapon alongside other weapons, or as an example of metalwork, or as a ritual object, or placed in a specific cultural context, as, for example, a typical artifact of its country of origin. Museum displays can effectively show one of these contexts, but it is hard to imagine one which could encompass effectively all these aspects of the object. Whatever context the object is shown, in a museum it is decontextualised, removed from any world in which it operates properly as an object and laid to rest in an afterworld for objects. Museum and gallery spaces are, as Pearce puts it 'a closely defined production, following their own clearly marked conventions, which form their own mode of showing and telling, with characteristic limitations and possibilities.'[45]

Such 'virtual museums' recreate the experience of the classical museum in which our bodies are of no consequence except to move us from one spectacle to another. We cannot experience objects in a museum other than visually. We gain no knowledge of them haptically or bodily, rarely even audially. Objects in museums are displayed, usually behind glass, or some other barrier, entirely for the benefit of the eyes. In a museum we thus become a disembodied Cartesian eye. Bohrer makes an explicit comparison between the kind of visual representation offered by the museum and the idea of presence as used in literary deconstruction, most notably by Jacques Derrida. He quotes Christopher Norris's definition of presence as 'a God's eye view that would finally tran-

scend all mere relativities of time and space', as defining the museum's assembly of objects.[46]

Conclusion

I have taken the view that there is a connection between the interior but disincarnate mind of Descartes, and the kind of perception of space as envisaged by VR, and projected for Cyberspace. Far from being a revolutionary technology both merely realise Cartesian notions both of representing the world through mathesis, and of separating the viewer subject from the world of objects. VR, like its predecessor, perspectival painting, imposes an ideologically determined vision of the world that is intimately bound up with instrumental rationality. Like AI it expresses not just a modern sensibility, but a specific early modern Cartesian vision of the world. Both AI and VR are bound up in the discourse of separateness, closure and transcendence that characterises Cartesian philosophy.

The museum also aims to be separate, transcendent, as well as relying on the presence of the actual object and the primacy of vision, all of which are characteristic of modernity. Thus it would seem an ideal candidate for representation as a kind of Cyberspace. But the kinds of space and representation of which Cyberspace and the museum are both manifestations are increasingly being critiqued, both in terms of their underlying ideology and their inadequacies to the task of representing knowledge.

Notes

[1] O' Doherty, 1968
[2] Hooper-Greenhill, 1992
[3] Fisher, 1991, p 156
[4] Ong, 1977, p 330
[5] Wilden, 1972, p 213
[6] Ong, 1958, p 315

[7] Ong, 1977, p 331.

[8] Wilden, 1972, pp 215 - 217 and *passim*

[9] Ong, 1977, p 331

[10] Judovitz, 1988, p 40

[11] Pratt, 1987, p 1

[12] This was a cylinder bearing nine ridges on its surface, parallel to its axis. The first extends the whole length of the cylinder, the next not quite as far and so on. A toothed wheel is arranged to mesh with the ridges of the cylinder. The number of ridges it meshes with depends on exactly where on the cylinder's axis it has been located. When the cylinder rotates so does the toothed wheel, but only as far as is allowed by the number of ridges on the cylinder that its teeth have engaged. Thus its degree of rotation can be keyed for any number from zero to nine.

[13] Pratt, 1987. Neither Leibniz's logic nor his calculator succeeded. Nevertheless he initiated a series of developments which culminated in the computer. His work was highly influential on later developers of mechanical calculators, as well as those concerned with logic. Preeminent among these were George Boole and Charles Babbage. Boole succeeded where Leibniz had failed in producing an algebraic language of logic which could make statements about the classes of things. (Pratt 1987). So successful was it that it constitutes one of the main planks of logic used in the computer. Until the invention of the modern computer Babbage was seen as a Victorian eccentric, Leibniz's work with mechanical calculators was more or less ignored, and Boole was completely forgotten. The study of logic was confined to the philosophers. With the invention of the computer this changed, and the various projects of Boole, Leibniz and Babbage were revived.

[14] Dreyfus, 1992, x - xi

[15] Markova, 1982, pp 67-8

[16] Markova, 1982, p 73

[17] Markova sets the Cartesian model of consciousness,which held sway until Kant, against that of Hegel. Hegel sees the emergence of consciousness as coming through the struggle for recognition from other consciousnesses. He posits that consciousness cannot exist in isolation and is made aware of itself by interacting with the objects of the world, from which it can differentiate itself. As long as that consciousness is interacting only with objects it cannot achieve true self consciousness, since it cannot achieve true recognition of its consciousness from objects (Singer 1983 pp 56 -8). Only by recognition from another consciousness can true self consciousness be achieved. It is through language that one recognizes the other as equal to oneself (Markova p132). Dreyfus similarly attacks AI through the work of a number of philosophers including Heidegger and Wittgenstein. These philosophers all reacted against the closure and certainty upon which Descartes and Kant constructed their philosophies.

[18] Jon Bird has pointed out how AI also does not acknowledge the work of Freud in delineating the unconscious processes in thought

[19] Rheingold, 1991, pp 103 -109

[20] Rheingold, 1991, pp 203 - 204

[21] Rheingold, 1991, pp 155 - 174

[22] This can be seen in Sherman and Judkins, (1993), and Rheingold (1991), both of which make grandiose claims on behalf of VR, whilst also issuing caveats

[23] It has to be pointed out that the classical world used a form of perspectival representation. See White (1972) pp 236- 273. There is some debate as to how developed this system was. My argument is concerned with how VR takes on the ideology inherent in Albertian perspective

[24] Alberti, 1966

[25] This is a debatable point of view. Erwin Panofsky in his 1924 essay 'Perspective as Symbolic Form' (Panofsky, 1992) was one of the first to put forward the idea of linear perspective as one possible way of rendering space among many, one that is specific to the culture that produced it. His ideas have been highly influential, but more recently writers such as the perceptual psychologist Margaret Hagen have claimed that geometrical renderings of space are actually natural (Hagen, 1986).

[26] Neale, 1985, p. 18

[27] Francastel, 1970, pp 136-7

[28] I use the male pronoun deliberately here.

[29] Jay, in Foster, 1988, p 8

[30] Jay, in Foster, 1988, p 4

[31] Rorty, 1980, p 45

[32] Here also I use the male pronoun deliberately.

[33] Heidegger, 1977, p 129

[34] Stephen Edwards has done work at Leeds University which has criticised Crary's understanding of the role of the camera obscura, particularly in relation to the development of the camera

[35] Crary, 1990, p 43

[36] Crary, in Foster, 1988, p 33

[37] The 'Museum Age', according to Germain Bazin does not actually start until the late eighteenth century, with the opening to the public of the Royal collections in France during the Revolution (Bazin, 1967). Nevertheless it was the scientific and epistemological revolution of the seventeenth century that made the modern museum possible; see Hooper-Greenhill (1992)

[38] Pearce, 1992, p 29

[39] Pearce, 1992, p 24

[40] Pearce, 1992, p 139

[41] Gibson, 1984, p 67

[42] Benedikt, 1991, p 121

[43] Fisher, 1991, p 9, authors own italics

[44] Sherman, in Sherman and Rogoff, 1994, p 124

[45] Pearce, 1992, p 139

[46] Bohrer in Sherman and Rogoff, 1994, p 199

CHAPTER THREE

Critique of Perspectivalism

In the last chapter I examined how both the museum and the computer can be seen to exemplify a certain way of understanding and representing the world, one bound up with instrumental rationality, and with claims of access to transcendent truths. Such an understanding of the world is problematic. In Heidegger's formulation the Cartesian subject confronts the world as a picture. Nietzsche was among the first to point out the problem with the visual and perspectival metaphors underpinning western metaphysics.

> Let us be on guard against the hallowed philosopher's myth of a "pure, will-less, painless, timeless, knower"; let us beware of the tentacles of such contradictory notions as "pure reason," "absolute knowledge," "absolute intelligence." All these concepts presuppose an eye such as no living being can imagine, an eye required to have no direction, to abrogate its active and interpretative powers-precisely those powers that alone make of seeing, seeing something. All seeing is essentially perspective, and so is all knowing.[1]

Nietzsche thus introduced the spectre of relativism into the supposedly pure Cartesian notion of transcendent vision. He invokes a vision of monadical viewpoints, each separate and with a separate vision, but lacking Leibniz's divine determinism. *The Genealogy of Morals*, in which Nietzsche wrote the above passage, was published in 1887. He was writing at a time when the Cartesian model of representation and epistemology was starting to be challenged, in art, philosophy and in understanding in general. Jonathan Crary (1990) has shown how in the early nineteenth century a number of circumstances combined to bring the then dominant Cartesian model of vision to a crisis, and to allow its supercession by a new paradigm. These circumstances included research into the physiological aspects of vision and the development of the camera. Crary suggests that the radical reconfigurations of vision that

are normally understood to surface with modernist painting in the 1870s and 1880s, in fact emerge in the 1840s. What Crary particularly focuses on is the collapse of the idea of the *camera obscura* as a model for vision and epistemology, a position it had held since the time of Descartes. Without denying the historical connection between the *camera obscura* and the camera in terms of technological development he suggests that the camera brought about an entirely different paradigm of vision and subjectivity.[2]

> The "real world" that the camera obscura had stabilised for two centuries was no longer... the most useful valuable world. The modernity enveloping Turner, Fechner and their heirs had no need of its kind of truth and immutable identities. A more adaptable, autonomous and productive observer was needed in both discourse and practice-to conform to new functions of the body and to a vast proliferation of indifferent and convertible signs and images. Modernization effected a deterritorialization and a revaluation of vision.[3]

At the same time as the changes Crary describes were taking place other seemingly stable ideas were being challenged concerning space. Most radically among these were the laws of geometry devised by Euclid which suggested a universal and homogeneous space. Euclid's laws had, for two millennia, been accepted as true and immutable. Kant, for example, thought these laws necessarily true and were therefore synthetic judgments *a priori*. But one of Euclid's postulates contained weaknesses which enabled other geometries to challenge Euclid's claim to be the only true system. The fifth postulate is an axiom that states that it is possible to draw only one straight line parallel to a given straight line in the same plane. In 1830, at the same time as Crary shows that the study of the physiology of sight was changing the understanding of perception, the Russian mathematician Lobatchewsky refuted Euclid's fifth postulate by proposing other axioms allowing the development of a two-dimensional geometry in which a number of lines could be drawn through any point parallel to another line on the same plane. In 1854 the mathematician Reimann devised another form of geometry that defied Euclid's laws[4].

In the late nineteenth century, at the time Nietzsche was proclaiming the relativism inherent in perspectival metaphysics, painters were trying to find ways of representing space congruent with the new paradigm of subjectivity. Cézanne, in particular, sought to render space in a manner that respected the flatness of the surface, and the subjective responses of the artist while still showing a recognisable space. In Cézanne, and other impressionists and post-impressionists, the 'deterritorialization' and 'revaluation of vision' described by Crary finds its most cogent expression[5] .

At the turn of the century scientists such as Poincaré and Mach defined spaces other than the geometric; visual, tactile and motor spaces in Poincaré's case and visual, auditory and tactile in the case of Mach. At the same time Einstein was working towards the full development of his theory of relativity, which would shatter the homogeneous, enclosed, Newtonian universe. Indeed throughout the nineteenth century the closed systems that had dominated western science and philosophy were under critical scrutiny. The ordered universe of Descartes, Leibniz, Newton and Kant became increasingly untenable. Their, in Ong's words 'closed-system or closed-field thinking' 'welling out of unconsciousness drives for completeness and security' is no longer adequate to the needs of and possibilities offered by art, science and philosophy[6].

Collapse of a Space

By the beginning of this century these various developments had effected some of the ways the world was represented and understood.

> The fact is that around 1910 a certain space was shattered. It was the space of common sense, of knowledge, of social practice of political power, a space thitherto enshrined in everyday discourse, just as in abstract thought, as the environment of and channel for communications; the space too, of classical perspective and geometry, developed from the Renaissance onwards on the basis of the Greek tradition

> (Euclid, logic) and bodied forth in Western art and philosophy, as in the form of the city and town... Euclidian and perspectivist space have disappeared as systems of reference, along with other former 'commonplaces' such as the town, history, paternity, the tonal system in music, traditional morality and so forth. This was truly a crucial moment.[7]

This shattering of space found obvious expression in the visual arts. The futurists attempted to represent the dynamic appearance of movement and speed, especially as enabled by the new technologies of transportation. The Cubists continued the work of Cézanne in representing space in a manner both subjective and recognisable.

> The two pioneers of cubism, Picasso and Braque, incorporated the innovations of Cézanne and the cinema and brought about the most important revolution in the rendering of space in painting since the fifteenth century. They abandoned the homogeneous space of linear perspective and painted objects in a multiplicity of spaces from multiple perspectives with x-ray-like views of their interiors.[8]

Donald Lowe sees cubism as part of a perceptual revolution which...

> ... transformed the bourgeois field of perception. In a number of quite different, unrelated disciplines, visual, rational linearality was overthrown. What emerged in this stead can best be characterised as multiperspectivity, i.e., the acceptance of different perspectival relations within a single discipline... This new perceptual field, constituted by an electronic culture, by the extrapolation of hearing and seeing, is prevailing over the old bourgeois field of perception... [9]

Some of these different modes of representation have found corollaries in recent developments in computing. Over the last ten years the computer has become a medium for another way of structuring and representing knowledge, known as hypertext, hypermedia and multimedia. These are the different names given to the capacity of the computer to deliver information in a variety of ways, text, graphics, video, animation, sound and so on, as well as making multiple links between discrete portions of information. Above all they are interactive, meaning that the user is enabled to take decisions about

how, to what extent, and in what order, the information is accessed and presented. By harnessing the power of the computer in this way we can dramatically change the way we access information. The user of such a system can choose his or her own path through the increasing mass of data, making associative leaps between ideas in a way that could not be represented in terms of classical Albertian-Cartesian spatial representation.

Though it has only recently become a practical possibility the concept underlying hypermedia and multimedia can be traced back to an article written by Vannevar Bush, a special advisor to Roosevelt, and published in 1945 in the *Atlantic Monthly*.[10] [11] In this article, entitled 'As We May Think', Bush described his ideas for a mechanically linked information retrieval service, which he named Memex. This service would allow the operator to input text, drawings and notes through a dry photocopier or through head-mounted stereo camera spectacles. This information could be stored in a microfiche filing system. Several files could be displayed at a time, and a simple code would store linked or related files. Though Bush's concept of the Memex system was in terms of the photo-mechanical technologies then available, he anticipated much of the technology that would characterise computer hypermedia. As well as the above ideas Bush also envisaged data compression, information exchange with other users and voice recognition[12] . Most importantly Bush introduced the notion of 'associative indexing'. In 'As We May Think' he declared that the human mind...

> ... operates by association. With one item in its grasp, it snaps instantly to the next that is suggested by the association of thoughts, in accordance to some intricate web of trails carried out by the cells of the brain.[13]

The most important aspect of Bush's system was the power given to the user to make trails through the mass of information and record those trails, which can be followed and annotated by other users. It is this capacity in particular

which has come to characterise hypermedia and multimedia as we now understand it.

Bush's ideas were a crucial influence on a generation of computer scientists and thinkers, preeminent among them Douglas Englebart, Theodor Nelson and Alan Kay. Englebart had read 'As We May Think' while serving in the US Army as a radar technician. This along with his army experience enabled him to come to a radical understanding of the potential of computers.

> When I first heard about computers, I understood from my radar experience during the war that if these machines can show you information on printouts, they could show you that information on the screen. When I saw the connection between a television-like screen, an information processor and a medium for representing symbols to a person it all tumbled together in about half an hour. I went home and sketched a system in which computers would draw symbols on the screen and I could steer through different information spaces with knobs and levers and look at words and data and graphics in different ways. I imagined ways you could expand it to a theatre-like environment where you could sit with colleagues and exchange information on many levels simultaneously. God! Think how that would cut you loose in solving problems! [14]

By 1968, as part of his Augmentation project, devoted to developing systems for the 'augmentation of man's intellect' Englebart's inspiration led him to develop the NLS (oN Line System). This system contained many of the features which came to characterise hypermedia, including the mouse, windows, electronic mail, word processing and hypertext.[15]

The term hypertext was coined by Theodor Nelson in the 1960s, to describe the new form of non-sequential writing made possible by the computer. He later coined the term hypermedia to suggest the incorporation of other media types, such as pictures, sound and animation. Nelson's contribution was particularly crucial in the development of these ideas. His major project, which he called Xanadu, called for the totality of the world's knowledge to be digitally

encoded and stored from whence it could be piped to terminals all over the world. Users could then come and search through the database making associative jumps and links. New readings and thus new texts could be continuously created. Links a user makes would be preserved for other users to see and thus networks of, and links between items of knowledge could be constructed. Nelson's actual scheme has not been properly implemented, but it has been a great influence on how we now perceive hypermedia.[16]

Alan Kay was similarly influential with his notion of the Dynabook, a book-sized portable hypermedia system, which he modelled out of cardboard in 1968. Though never built as he envisaged it, the Dynabook has had a clear influence on the laptops and PDAs (Personal Digital Assistants, small hand-held computers like the Apple Newton) which are increasingly popular in the computer market. Subsequently Kay worked at the XeroxPARC research laboratories, where, under his guidance, his ideas and those of Englebart and Nelson were developed, including as well as the above, icons, software agents and scripting languages. Xerox failed to exploit properly the ideas developed under their aegis. They developed a full system of computers designed for use in the office, which incorporated the developments, but it was too expensive to succeed commercially[17]. The XeroxPARC ideas were subsequently taken up by Steve Jobs of Apple, who saw that they would be ideal for Apple's new computer, the Macintosh[18]. The success of the Macintosh, and the imitations its graphical interface has engendered, such as MicroSoft's Windows has meant that multimedia and hypermedia have become an important aspect of computing[19].

Hypermedia and Museums

In the last few years museums have begun to exploit the possibilities of multimedia and hypermedia. As a representative example of this I shall examine the

Micro Gallery in London's National Gallery[20]. Though by now some five years old it remains exemplary of the kind of work done in museums. It was intended by the National Gallery to be placed in their Sainsbury Wing, the building built onto the west side of the Gallery, paid for by the Sainsbury family, to house the Early Renaissance collection. The development of the system was sponsored by American Express.[21]

In the Gallery the system is accessible on twelve computers housed in a room

Figure 8. Screenshot from the Micro Gallery

on the mezzanine floor of the Sainsbury Wing. To use it the visitor sits in a chair facing one of the computer monitors. He or she is presented with a list of possible ways of viewing the collection. By touching the screen on the appropriate choice he or she can look at the collection either by artist, subject, or historical period and country (figure 8). The user can read about an artist (figure 9) and go straight to an entry on any of their paintings, by clicking on a small representation of that painting, go to other artist's entries, by clicking on their name. When an obscure word is clicked on a definition will pop up on screen . Each painting sits on a number of different axes, which can each be further

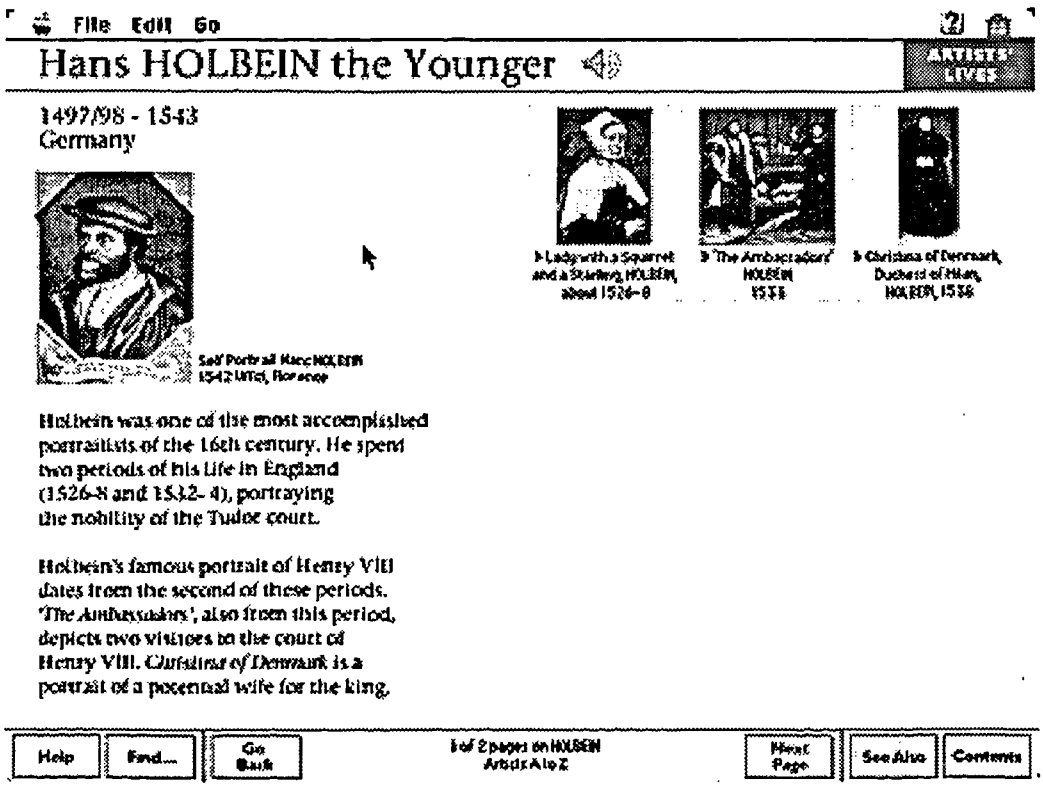

Figure 9. Screenshot from the Micro Gallery

explored (figure 10). There are also animations showing, for example, how the skull in Holbein's The Ambassadors should look as the viewer moves into the position to see it undistorted.[22]

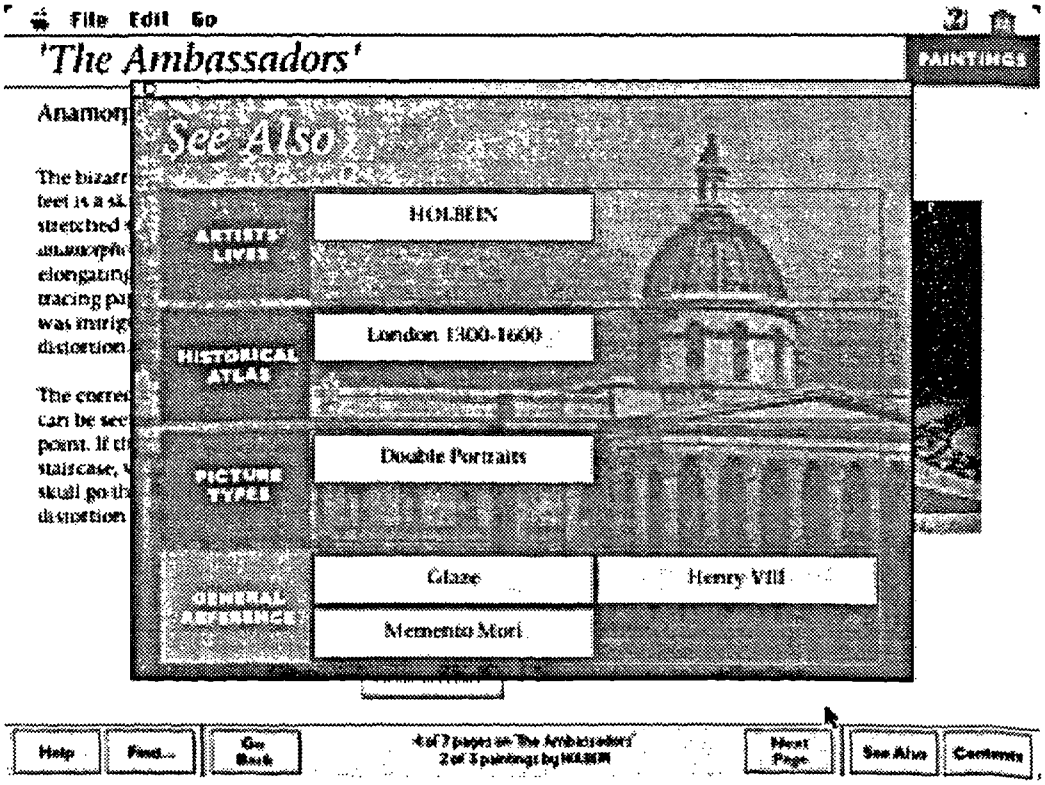

Figure 10. Screenshot from the Micro Gallery

This approach does, to some extent, deal with some of the problems concerning space and organisation I discussed in the last chapter. An artifact, or any chunk of information is not constrained to remain in one physical site and therefore in one context. There can be multiple perspectives on one artifact and multiple links off it. It suggests therefore a different kind of space to that offered by Cyberspace, one that is possibly more in keeping with our sensitivity to relative points of view. Yet such systems are also problematic in other ways. They are closed, offering the user no chance of real interaction, for the contents and links are all preordained by the writers or designers. Contrary to some of the claims made by many proponents of multimedia, which suggest that the user makes his or her own reading[23], these systems maintain the standard book-derived heirarchy of author and reader. Indeed it could be claimed that, barring the ability to use sound and moving pictures, there is nothing a multimedia system can offer that is not already found in a well-organised and indexed book.

Since the Micro Gallery there have been a number of similar projects in other museums. Cognitive Applications have produced Micro Gallery-style systems for the National Gallery of Washington, and the San Diego Museum of Fine Art. The Louvre in France has produced a CDRom about its collection (figure 11) as has the Chicago Gallery of Art. The Smithsonian has also produced a CDi product about its collections. These products and systems differ in content and approach. The Louvre CDRom, for example, concentrates far more on the Louvre as a building and the arrangement of works of art within it. Despite any such differences the same criticism such as those I have made about the Micro Gallery can be applied. These products also remain, effectively, books. In the case of these products I suggest that this means they present an understanding of the collection as permitted and legitimised by the institution. These are presented in the form of closed media, CDRom, or public access computers, to which a user has no more access than allowed either by the limi-

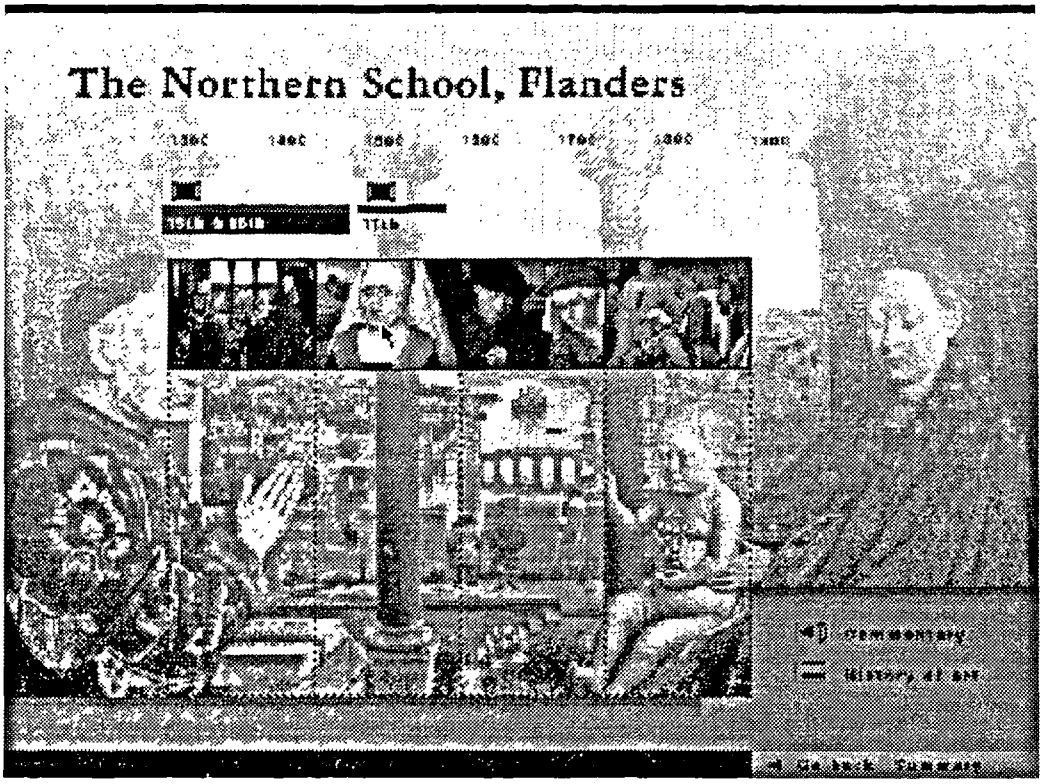

Figure 11. Screenshot from the Louvre Disc

tations of the medium, or that of the situation. In one sense this is not a legitimate criticism. It begs the question of why the National Gallery, or any similar institution, should develop and fund a multimedia system, or indeed any form of information device, video, book, which might undermine or criticise how they wish to present their collections? In developing the Micro Gallery the National Gallery has, arguably, performed a valuable public service by giving the public a useful and accessible guide to their collections; one that might draw in those who are possibly alienated by catalogues, or wish to find information quickly.

Yet the Micro Gallery cannot help but raise questions and promote unease about museums and the representation of knowledge. There are for example obvious questions about authority and legitimation. The system was funded by American Express and is sited in a building funded by the Sainsburys. The artist Hans Haacke has written about the relationship between business interests, sponsorship and the museum.

> Through naiveté, need, or addiction to corporate financing museums are now on the slippery road to becoming public relations agents for the interests of big business and its ideological allies. The adjustments that museums make in the selection and promotion of works for exhibition and in the way they present them create a climate that supports prevailing distributions of power and capital and persuades the populace that the status quo is the natural and best order of things. Rather than sponsoring intelligent, critical awareness, museums thus tend to foster appeasement.[24]

The way that multimedia is presently being used in and by museums would seem to be part of this process of fostering appeasement, rather than fostering 'intelligent, critical awareness'.[25] Haacke's critique is part of a larger debate concerning how museums present artefacts, and the kinds of hierarchies and valuations suggested by the presentations. At the same time as Haacke sees museums colluding, however unconsciously, with big business to sustain the idea of the 'status quo' as the best order of things, that order is subject to much debate and discussion. The problems of collecting, categorising and the museum in general in a postmodern world are the subjects of a number of works including those by Karp and Levine (1991), Walsh (1992), Hewison (1982), Pearce (1992), Vergo (1989), and Hooper-Greenhill (1992). In these works the museum is discussed as revealing itself as an institution of power and enframing. Such critiques reflect the sense that the 'museum experience is no longer a transparent and untroubled phenomenon.'[26] They acknowledge that the museum is subject to the same doubts about perspective, power and meaning as other aspects of western culture. In particular its claims to having a 'Gods eye view' has become increasingly contested. Yet the use of multimedia in museums seems in general concerned to present just such a view.

It seems to me that multimedia is potentially a more radical and liberating medium than its present use might suggest. Its potential as such has been discussed by a number of writers of a broadly postmodernist persuasion. Yet little of the available product shows evidence of this potential. Paradoxically the

museum may be the place in which such potential could be realised. Hans Haacke writes that...

> ...Even though [museums] may not agree with the systems of beliefs dominant at the time, their options not to subscribe to them and instead promote an alternative consciousness are limited. The survival of the institution and personal careers are often at stake. But in nondictatorial societies, the means for the production of consciousness are not all in one hand. The sophistication required to promote a particular interpretation of the world is potentially also available to question that interpretation and to offer other versions. As the need to spend enormous sums for public relations and government propaganda indicates, things are not frozen. Political constellations shift and unincorporated zones exist in sufficient numbers to disturb the mainstream.[27]

The computer is assuredly a powerful 'means for the production of consciousness'. Possibly more than other such means, it offers the potential both to question particular interpretations of the world, and to offer new and different versions. This is owing both to the ways of manipulating information, and the means of distributing that information made possible by digital technology. Yet so far, at least as far as representations of material culture is concerned, it has failed to fulfil its potential in this way. Such representations remain, as we have seen, bound up in structures of authority and closure. This is both partially owing to and evinced by the powerful metaphors of the museum and the book which are employed, it would seem by default, in such matters. What is needed are different metaphors and different strategies which might enable new ways of looking at such material.

Collage and the Ruins of the Museum

A method to find these is to examine the museum as a metaphor, not in the terms in which it presents itself, but with attention to its contradictions and *aporiae*.[28] The museum as an institution is sustained by its ability to homogenise heterogeneous elements into a coherent whole. Yet this is, accord-

ing to Eugenio Donato, a fiction

> The set of objects the *Museum* displays is sustained only by the fiction that they somehow constitute a coherent representational universe. The fiction is that a repeated metonymic displacement of fragment for totality, object to label, series of objects to series of labels, can still produce a representation which is somehow adequate to a nonlinguistic universe. Such a fiction is the result of an uncritical belief in the notion that ordering and classifying, that is to say, the spatial juxtaposition of fragments, can produce a representational understanding of the world. Should the fiction disappear, there is nothing left of the Museum but "bric-a-brac," a heap of meaningless and valueless fragments of objects which are incapable of substituting themselves either metonymically for the original objects or metaphorically for their representations.[29]

Similarly Douglas Crimp writes that 'the history of museology is a history of all the various attempts to deny the heterogeneity of the museum, to reduce it to a homogeneous system or series.'[30] Stripped of its pretensions the museum is reduced to what Paul Valéry described as a 'strange organised disorder'[31]. He compared the museum to a room where ten orchestras play simultaneously, each vying for the attention of the listener[32]. Each object in a room, jealous and demanding attention, 'kills all the others around it'[33]. Crimp, Donato and Valéry has described the contradiction, the *aporia* at the heart of the museum as an institution. Despite its pretensions to order and meaning the museum by its nature is a chaotic institution, in which objects, taken from their original and intended locations, vie for the visitor's attention.

> [The museum's] project is doomed from the start because representation within the concept of the museum is intrinsically impossible. The museum can only display objects metonymically at least twice removed from that which they are originally supposed to represent or signify. The objects displayed as a series are of necessity only part of the totality to which they originally belonged. Spatially and temporally detached from their origin and function, they signify only by arbitrary and derived associations. The series in which the individual pieces and fragments are displayed is also arbitrary and incapable of investing the particular object with anything but irrelevant fabulations.[34]

This view might seem to render the the concept of the museum redundant. Yet

out of these 'ruins of the Museum' it may be possible to construct an effective and questioning strategy for the representation of material culture. As we have seen earlier in this chapter the Cubists attempted to develop a style of painting adequate to problems of perception and relative points of view in a world where the previously prevailing world-view had been shattered by changing concepts in time, space and reality, and concomitant developments in philosophy.[35] In developing analytic cubism, Braque and Picasso introduced into their paintings the technique of collage, 'By most accounts...the single most revolutionary formal innovation in artistic representation to occur in our century'[36]. Collage is defined as the transfer of materials from one context to another, and montage their dissemination of these borrowings through their new setting. What these techniques enable is a form of representation adequate to the new understandings of the world described earlier in the chapter. In place of the unified, linear and harmonious vision of linear perspective is one that is fragmented and heterogeneous, one that does not attempt to mimetically reproduce the real. Such a form of representation is not just the solution to the technical problems of analytical cubism, but reflects broader problems of epistemology and representation that had been, as we saw above, discussed since the early nineteenth century[37].

Collage has been described as the predominant, all-pervasive device of 20th-century arts[38]. As a technique it was used by artistic movements from Cubism, Futurism and Dada through to Fluxus, Minimalism and the New Object movement[39]. Gregory Ulmer has examined how collage can be seen to inform work in areas beyond that of the visual arts. He has pointed out the use of collage by, among others, Roland Barthes, John Cage and Jacques Derrida[40].

An obvious place for the exploitation of such strategies and techniques is the museum. As Valéry, Donato and others point out museums are places where incompatible objects are placed together to vie for attention. They are, albeit

unintentionally, three dimensional collages. It is possibly for this reason that museums were a source of fascination to Surrealists. Collage was central to the Surrealists' strategy for disrupting the given order of things. They quoted with approval the poet Lautreamont's famous definition of beauty as 'the chance encounter on a dissecting table of a sewing machine and an umbrella.'[41] Max Ernst defined collage as 'the coupling of two realities, irreconcilable in appearance, upon a plane which apparently does not suit them.'[42] The Surrealists employed such techniques for a number of purposes, to 'disturb the principle of identity', to disrupt the appearance and order of the world, and to question the concept of authorship[43]. These were part of a more general strategy to 'attempt to blow up the autarkical sphere of art and to force a reconciliation of art and life'[44].

The anthropologist and cultural critic James Clifford describes surrealism as 'an aesthetic that values fragments, curious collections, unexpected juxtapositions...'[45] . The kinds of 'curious collections' that the surrealist were particularly fascinated by were anthropological and ethnographic. Clifford has traced the relationship between the Surrealist movement and the development of ethnography as a discipline in France in the first part of this century[46]. In particular he examines the development of the ethnographic museum out of the work of surrealists and surrealist-influenced thinkers such as Michel Leiris, George Bataille and others associated with the Collège de Sociologie[47]. The thinking of early French ethnographers such as Marcel Mauss had close connections with that of surrealist fellow travellers like Georges Bataille and Michel Leiris. These close connections were pursued in collaborations between Bataille and students of Mauss such as Alfred Métraux. It was in this fertile environment that the moribund Trocadero museum, where Picasso had viewed the African masks he used in *Les Desmoiselles d'Avignon*, was reorganised and, later, the Musée de l'Homme founded. The magazine *Documents*, edited by Bataille, combined ethnographic and surrealist concerns. It applied

surrealist techniques of juxtaposition and inventive recombination to images of objects from different cultures in order to question and subvert the codes and ideologies that underpin reality. Clifford describes the journal as 'a playful museum that simultaneously collects and reclassifies its specimens...The journal's basic method is juxtaposition - fortuitous or ironic collage. The proper arrangement of cultural symbols and artefacts is constantly placed in doubt."[48]
[49]

Strategies of collage, montage and juxtaposition have been found in work done in museums and galleries. An example of such work is that undertaken by Fred Wilson, an African-American artist who uses museum spaces and collections to comment upon the difference between how Western and non-Western objects are represented. In order to do so he takes objects out of their normal settings within the museum and places them in situations in which their meaning can be questioned[50]. An artist who has used similar techniques to different ends is Joseph Kosuth, one of whose practices has been to curate shows in which artifacts are juxtaposed in such a way as to foreground aspects of their meaning that are normally concealed. Such was his 'The Play of the Unmentionable' at the Brooklyn Museum, where works ranging from erotic Japanese prints to salon nudes through to Larry Clark photos were placed together, one of the intentions being to question the divide between erotic art and pornography[51]. There was also Eduardo Paolozzi's show 'Lost Magic Kingdom' at the Museum of Mankind in London, which he juxtaposed objects from its collection with his own works and *objets trouvé*[52]. To this list we might also add work by Peter Greenaway in various museums around Europe[53] , and installations by Marcel Broodthaers, whom we shall return to in the next chapter[54], the *musées sentimentales* of Daniel Spoerri[55], and the work of Christian Boltanski[56]. Though the intentions of these shows were very different, as indeed are the subject positions from which they operate, the strategies they use can be seen to derive at least in part from Surrealism and ethnograph-

ic Surrealism.

Whatever their individual intentions these exhibitions and events can be seen, among other things, as a response to the problematic nature of the museum and the kinds of classifications and representations it contains. Such events have the potential to question and even subvert the systems of meaning and categorisation which museums impose on their collections, and through which, arguably, they play their part in maintaining the hegemony of the dominant ideology. These are kinds of privileged interventions in which someone outside the curatorial stockade is allowed to disrupt the order of objects in a collection in order to erect, in the manner of the *bricoleur,* their own systems of organisation.[57].

Conclusion

The rational totalised space of Alberti and Descartes, that underpinned modern scientific rationality, and with it the museum, has been shattered. In its place is a fragmented sense of space, sensitive to the multiplicity of alternative perspectives, and to contradictions therein. This space has been manifested in modes of representation from Cubist art, modernist fiction and film, and through hypermedia and multimedia, in the computer. Though multimedia has been used in the representation of museum collections, its potential to come to terms with the contradictions and difficulties inherent in such institutions has not been exploited. A possible strategy for enabling such exploitation is through collage, montage and juxtaposition, especially as understood and used by the Surrealists. Surrealism both took the museum as a focus of its critique of society, and influenced later generations of those working in the context of the museum.

Notes

[1] Nietzsche, 1956, p 156

[2] Crary's views are critiqued by Stephen Edwards at Leeds University

[3] Crary, 1990, p 149

[4] Kern, 1983, pp 132 -13

[5] Kern, 1983, pp 141 - 142

[6] Kern, 1983, pp 135 - 136

[7] Lefebvre, 1991, p 25

[8] Kern, 1983, p 143. At the risk of subsuming complex developments into a simplistic argument, it can be seen that there were parallel developments in, for example, cinematography, especially with the work of the Russian directors Sergei Eisenstein, whose concepts of montage were highly influential, and Dziga Vertov, and in literature, through the writings of authors such as James Joyce. (See Lowe 1982, pp 110 - 139)

[9] Lowe, 1982, pp 110-111

[10] Bush, 1945. The copy of this essay I read was from the World Wide Web (at http://www.isg.sfu.ca/~duchier/misc/vbush/vbush-all.shtml). Obviously this form of research access makes it hard to cite page numbers

[11] John Lansdown has suggested that H. G. Wells idea of the world brain, which was published in 1936, also contributed to the formation of the idea of hypermedia, and paricularly the World Wide Web

[12] Bush, 1945

[13] Bush, 1945

[14] Quoted in Cotton and Oliver, 1993, p 23

[15] Cotton and Oliver, 1993, p 23

[16] Cotton and Oliver, 1993, p 24

[17] Cotton and Oliver, 1993, p 25

[18] For an account of the development of the Macintosh see Levy (1995)

[19] Levy, 1995, pp 249 - 252

[20] Though by now several years old the Micro Gallery remains exemplary of how museums use multimedia. I might equally well have used other examples such as the Louvre CDRom, or the V & A Glass Gallery system, or many others, but the lessons remain the same.

[21] The actual work was undertaken, under the *aegis* of the Gallery's Education Department, by a team consisting of two art historians, who worked with the curators, an editor, a designer and various assistants. The software was designed and built by Cognitive Applications, a multimedia company from Brighton. The system cost in the region of half a million pounds and took three years to develop.

[22] My understanding of the Micro Gallery's history and structure is derived from having worked on the project in its final stages, as a scanner and graphics assistant and through discussions with both Alex Morrison, director of Cognitive Applications, and Neil Aberdeen, the project designer.

[23] Landow for example quotes Gary Narchionini, a hypertext developer.

> 'hypermedia is an enabling technology rather than a directive one, offering high levels of user control. Learners can construct their own knowledge by browsing hyperdocuments according to the associations in their own cognitive structures.' (Landow, 1992, p 135)

[24] Haacke, in Wallis, 1986, p 71

[25] This is partly owing to economics. Multimedia products are expensive to produce. They require teams of well-paid, specialised workers, programmers, editors, producers, designers and writers, as well as expensive equipment, and time. Such products are highly labour-intensive, and much time needs to be devoted to making sure they actually work. In the case of CDRoms there is also, at least at the moment, a comparatively small number of potential customers, limited to those who own a computer and a CDrom drive. Thus any such product, in order to make money, must appeal to as many of those customers as possible. Thus simple economics achieves what sponsorship and the need to appeal to the public does in the case of public displays in the museums. It assures that any product has to appeal as large an audience as possible, and in doing so has to forego alienating depth, subtlety or critical awareness.

[26] Karp and Lavine, 1991, p 45

[27] Haacke, in Wallis, 1986, p 73

[28] I use this term as employed by the philosopher Jacques Derrida to refer to 'blindspots or moments of self-contradiction where a text involuntarily betrays the tension between what it manifestly *means to say*

and what it is nevertheless *constrained to mean.*' (Norris, 1987, p 19)

29 Donatio, in Harari, 1979, p 223

30 Crimp, 1993, p 54

31 Valéry, 1960, p 202

32 Valéry, 1960, p 203

33 Valéry, 1960, p 204

34 Donato, in Harari, 1979, pp 223- 224

35 See Hoffman, in Hoffman, 1988, pp 1 - 3

36 Ulmer, in Foster, 1985, p 85

37 See Kuspit (in Hoffman, 1988, pp 39 - 57) about the relationship between the concept of relativity and collage.

38 Ulmer, in Foster, 1985, p 84

39 Waldman, 1992

40 Ulmer, in Foster, 1985, pp 83 - 110

41 Waldman, 1992, p 159

42 Foster , 1993, p 81

43 Foster , 1993, p 81. For accounts of the history of Surrealism see Nadeau (1987), Ades (1982), Waldberg (1965), and Foster (1993). For specific discussions of the use of collage in Surrealism see Waldman (1992, pp 154 - 193)

44 Habermas, in Foster, 1985

45 Clifford 1988 p. 118

46 Clifford, 1988, pp 117-151

47 Denis Hollier has edited an anthology of publications by the Collège de Sociologie (Hollier, 1988)

48 Clifford 1988 p132

49 The application of Surrealist methods to ethnography and the museum was arguably as influential as their use in the fine arts. Chaney and Pickering suggest that Mass Observation, the British social documentary project of the nineteen thirties is an example of surrealist ethnography. Surrealist techniques and ideas were also clearly an influence on the work of Claude Lévi-Strauss, who was á friend of many of the surrealists, and shared their war-time exile in New York. Clifford has noted the the importance of the work, much of it ethnograpical, of Georges Bataille in the 'ongoing relation between cultural analysis and early surrealism in France. It links the 1920s' context to a later generation of radical critics, including Michel Foucault, Roland Barthes, Jacques Derrida, and the Tel Quel group.' (Clifford, 1988, p 127). The Surrealist focus on categorisation and juxtaposition is clearly an influence on Foucault in writing *The Order of Things*. In the Introduction he alludes to Lautreamont's famous dictum about the chance encounter of the sewing machine and the umbrella, thus acknowledging his debt to the Surrealist's interest in categorisation.

50 For an account of Wilson's work see the article by Donald Garfield in the May/June Issue 1993 of Museum News. Incidently Wilson claims as a major influence the book *The Predicament of Culture* by James Clifford, which contains the account of ethnographic surrealism quoted above

51 Kosuth (1992)

52 Museum of Mankind (1985)

53 Greenaway (1994)

54 For accounts of Broodthaers work see Crimp, 1993, pp 44 - 66 and Goldwater (ed), 1989

55 These are described by Martin, in Cooke and Wollen, 1995, pp 54 - 67

56 Boltanski (1990)

57 They can be seen as corollaries to bids to reorganise museum and gallery collections to enable new understandings of the material. Examples of this kind of activity include the André Meyer Gallery of 19the Century Art at the Metropolitan Museum, which incited hostile comment from art historians such as Hilton Kramer for placing salon artists such as Gerôme alongside recognised members of the canon such as Goya and Manet. Controversial in a similar manner, and for similar reasons, was the Musée D'Orsay in Paris See Crimp, 1993, pp 43 - 47

CHAPTER FOUR

Surrealism and Digital Technology

In the last chapter I suggested that strategies used by the Surrealists might prove useful for the representation of material culture on digital technology. It is possible to argue, as Susan Sontag does writing about photography[1], that the influence of Surrealism has largely shaped our current modes of aesthetic production and reception. Film, painting, advertising, television, photography all show evidence of being influenced by Surrealism. For these reasons it is perhaps not surprising that such an influence can be seen emerging recently in digital technology. Indeed such technology might seem expressly designed to facilitate the application of surrealist strategies of montage, collage and juxtaposition. This is because of one of the fundamental characteristics of the computer, the fact that it is a digital machine. This means that it manipulates and stores data in discrete elements. Thus any digital object, for example a word processor file, a piece of digitally recorded music, or a digital image can be edited and manipulated with extreme precision. Moreover any such object, or part of an object can be copied and reproduced with no loss of quality, so much so that it is impossible to determine which is the 'original' and which the copy. Such capabilities make it extremely easy to combine or juxtapose different elements.

Since the computer's emergence in the nineteen eighties as a visual and textual medium, rather than a' number cruncher', there have been many developments which exploit these capabilities. Word processing enabled a transformation in the way people thought about writing through simple capacities such as copying, cutting and pasting text[2]. Somebody using a word processing package can choose an amount of text of any length and either copy it, leaving it where it is, or 'cut' it, taking it out of its present position, and 'paste' it else-

where. Simple as these capabilities may seem they have had a profound effect on how people write and indeed regard the process of writing[3]. So called 'paint packages', software for the processing of digital images, enable designers to manipulate and alter such images with enormous power and precision, and to layer, merge or juxtapose different images seamlessly[4]. Digital music packages allow analogous operations to be performed on music. These various developments have often had quite a profound effect on the media in which they operate. Yet such abilities are still, in the main, understood and used as tools to enable the production of finished artifacts. What I propose is that the capacity of digital media to enable montage, collage and juxtaposition should be exploited as an end in itself. This might manifest itself as software in which users were enabled to make and display juxtapositions of different and disparate objects, in order to explore the meanings thus engendered.

But in the representation of material culture such strategies run risks, especially in the context of mechanical reproduction. These are discussed by Douglas Crimp writing about Malraux's 'Museum Without Walls' (figure 12), a concept that would seem to anticipate the digital display of museum and gallery collections. In his eponymous essay André Malraux finds in photography the potential for a whole new approach to art and aesthetics. His eponymous museum is, simply, the mass of photographic reproductions of works of art. It would be able to obliterate distinctions of scale, to concentrate on details and fragments, as well as to easily cut across the categories and distinctions enshrined in the museum[5]. Malraux was, as Douglas Crimp puts it, 'enraptured by the endless possibilities of his Museum, by the proliferation of discourses it could set in motion, establishing ever new series of iconography and style simply by reshuffling the photographs.'[6] Such a concept raises questions of authority and meaning in the representation of material culture, which are made more pressing by the capacity of digital media to manipulate data very quickly, and thus to enable such 'reshuffling'.

Figure 12. André Malraux and his *Musée Imaginaire*

Broodthaers's Museum

Any effective use of Surrealist techniques of montage and juxtaposition in digital media would need to be more critical acute and intellectually robust, otherwise it runs the danger of becoming a playground for meaningless and subjective juxtapositions. The beginnings of such an approach might be found in the work of the Belgian artist and activist Marcel Broodthaers. Broodthaers was interested in looking at museum practices, and how they connected to the marketplace, partly by interrogating the museum's past. He exhibited a number of "museum fictions" from 1968, consisting of nonexhibitions, parodic statements, and written statements. In doing so 'he exposed the ordering of knowledge produced by museums as a strategy of power.'[8] He 'was particu-

larly concerned with the way in which museums institutionalize a discourse justifying art's isolation from society'.[9]

Figure 13. A display from Broodthaers's Eagle Museum

One of his "museum fictions" was called the 'Musée d'Art Moderne, Section XIX Siècle, Département des Aigles', of which one part - the Section des Figures - was subtitled *Der Adler vom Oligozän bis Heute* ("The Eagle from the Oligocene to the Present"). It was composed of 266 objects representing eagles, borrowed from "real" museums and private collections, including Broodthaers's own. It included a 'vast diversity of objects - from paintings to comic strips, from fossils to typewriters, from ethnographic objects to product logos'[10]. The juxtaposition of these elements, can, according to Douglas Crimp, only seem "surreal". Thus, Crimp continues, 'The Section des Figures demonstrates the oddness of the museum's order of knowledge by presenting us with another "impossible" order.'[11] He quotes Foucault's description of his inspiration for his book The Order of Things.

> This book arose out of a passage in Borges, out of the laughter that shattered, as I read the passage, all the familiar landmarks of my thought-our thought. This passage quotes a 'certain Chinese encyclopedia" in which it is written that "animals are divided into: (a) belonging to the Emperor, (b) embalmed, (c) tame, (d) sucking pigs, (e) sirens, (f) fabulous, (g) stray dogs, (h) included in the present classification, (i) frenzied, (j) innumerable, (k) drawn with a very fine camelhair brush, (l) et cetera, (m) having just broken the water pitcher, (n) that from a long way off look like flies." In the wonderment of this taxonomy, the thing we apprehend in one great leap, the thing that, by means of the fable, is demonstrated as the exotic charm of another system of thought, is the limitation of our own, the stark impossibility of thinking that.[12]

According to Crimp Broodthaers achieves a similar effect by alluding to the Wunderkammer and Cabinets de Curiosités of the Renaissance and Baroque period. Crimp points out that the...

> ...Section des Figures does not, of course, return to the Wunderkammer. But it does recollect the heterogenous profusion of its objects and the museum's reclassification of them during the nineteenth century.[13]

Following Foucault he writes that 'the site that allows us to juxtapose heterogenous entities is that of discourse, and that discursive formations undergo historical mutations of such magnitude to render them entirely incompatible with each other.'[14]

The Irrational Cabinet

The magnitude of this incompatibility is evinced in the attitude of many writers of museum history to curiosity cabinets, which has often been either confusion or contempt. They are described as, for example, the 'product of a saturnine disordered mind', or as 'unsystematic and idiosyncratic in composition'[15]. Recent work, particularly by Hooper-Greenhill[16] and papers collected and edited by Impey and McGregor[17], has been done to show that these curiosity, or 'irrational' cabinets are not random collections of eccentric objects, but as meaningfully structured and ordered as a modern museum, albeit in the context of a different epistemological structure. In particular in her book *Museums and the Shaping of Knowledge* Hooper-Greenhill does much to rescue cabinets and *wunderkammer* from such treatment by showing their underlying rationality in the terms of their surrounding episteme. As Hooper-Greenhill points out this rationality suggests an order of things that is profoundly other than that which we understand.

> ... 'The confused and disordered' 'cabinets of curiosity' can be better understood as 'cabinets of the world... The rationality that explains the structure of knowledge that informed the 'cabinet of the world' can be understood, at least in part, through a combination of several elements. These include the epistemological practices of the Renaissance *episteme* (interpretation, resemblance, esoteric knowledge); mnemonic techniques (places and images); and models of the world presented through two-dimensional (Fludd), and three-dimensional (Camillo) exemplars.[18]

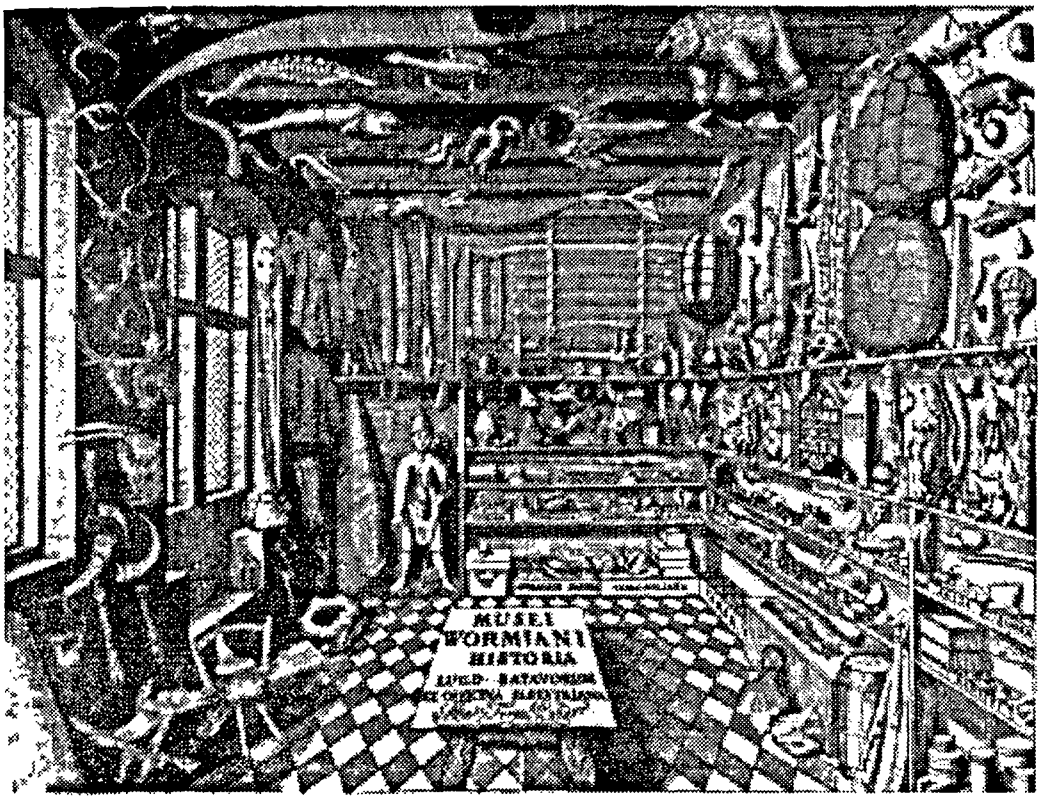

Figure 14. Worm's Museum; a typical cabinet of curiosities.

Despite Crimp's notion of the 'magnitude of incompatibility' between these cabinets of curiosity and kunstkammer and the modern museum, they have been of increasing interest to people working in or around museums recently. They are often invoked by artists, such as Broodthaers and those mentioned in the last chapter, Spoerri, Paolozzi, and Kosuth, to which list one might add Joseph Cornell, Susan Hiller, and even Damian Hirst and his cabinets of shells. Such a revival of interest would seem to accompany interests in the discursive and rhetorical nature of museums, and the forces which underlie the orders of knowledge they represent. Some go further. The cultural historian Stephen Bann, writing about the rhetoric of display, acknowledges the cabinet as a 'highly relevant model' for the modern museum, sharing that institution's 'intimate concern with particulars-eccentric in its coverage and modest in scale.'[19]. He takes for granted 'the relevance and interest of the cabinet of curiosities for contemporary concepts of visual display'.[20]

Despite this interest such cabinets are as enmeshed in the discourses and power structures of the premodern period as the museum is in those of the

modern. To suggest them as a model for arranging and displaying objects for contemporary purposes would seem still to be a permit for meaningless and subjective juxtapositons. Broodthaers alludes to these institutions as a way of shocking the viewer out of taking for granted the structures and taxonomies of the modern museum. They can act for the viewer as Borges's encyclopædia does for Foucault (and his readers). Broodthaers' 'museums'and the cabinets they resemble do not, on the face of it, offer a coherent alternative for museum practice.

What the cabinet of curiosities does offer is an understanding of the relation between language and the world that differs from that manifested in the modern museum. This is exemplary of the epistemic structures of the Renaissance and Baroque periods. They were concerned with what Foucault calls the discourse of resemblance. That is to say they were concerned with delineating and representing the concept of the world as a display of connected and related signs. Hooper-Greenhill writes that

> During the Renaissance, writing was the privileged epistemological structure. Objects had marks written upon them, signatures, messages, that demanded reading and interpretation. Natural and artificial things were thought of in much the same way as manuscripts and texts. An accumulation of objects and an accumulation of texts signified in the same way, and were displayed mixed together in the same spaces... images carried the same messages as words, sometimes words were used, sometimes pictures. In Giganti's 'museum' in Bologna, the objects and texts together represented the unity of the world. In Imperato's 'museum' in Naples, what we would now call objects and what we would now call books said the same thing: the stuffed and mounted pelican told the same story as the words of Physiologus. [21]

With the rupture between the Renaissance and Classical epistemes the manner of understanding the world changes.

> The activity of the mind...will no longer consist in drawing things together...but, on the contrary, in discriminating, that is, in establishing their identities, then the inevitability of the connections with all the suc-

cessive degrees of a series.[22]

Thus the world is no longer conceived of as consisting of signs to be read, 'a complex of kinships, resemblances, and affinities, and in which language and things were endlessly interwoven', but of objects and phenomena to be analysed and understood using a common unit or a position in an order. This new understanding is reflected in the museum as it develops during the seventeenth century, and into the eighteenth. The arrangements of objects, described by some later historians as 'irrational', that characterise the curiosity cabinets, is replaced by a 'rational' organisation, a taxonomy, reflecting the mathematic, scientific understanding of the world.[23]

One result of this is that definite boundaries between disciplines are erected. Another relates to the way that the understanding based on analysis and mathesis occludes or denies the mediating effect of language. Thus objects in the museum are no longer, as in the curiosity cabinet, explicitly metonymic of the world outside. They are not signs to be read as rhetorical figures in a larger text, but rather as objects whose meaning is sufficiently explicit in their material and historical reality. What matters in the museum is the physical presence, the actuality, of the objects. An artifact such as Cassiano dal Pozzo's Paper Museum, in which the objects are representations by artists on paper of objects and phenomena, would not, in the modern sense, be a museum (except inasmuch as the representations in a reflexive move, themselves constitute museum objects).

A Baroque Paradigm

The cabinets of curiosity are, at least in part, Baroque institutions. Though they originated in the Renaissance, they 'prospered during the baroque period'[24]. The French philosopher Christine Buci-Glucksmann has detected what she

calls a 'baroque paradigm'[25] which 'asserts and establishes itself within 'modernity'', and which she finds particularly evident in the works of Walter Benjamin, Charles Baudelaire, Jacques Lacan and Roland Barthes[26]. As a style the Baroque is according to Martin Jay, 'Sensitive to the interpenetration of the discursive and the figural - for example, in richly decorated emblem books - it registered an awareness of the impurities of both that was well in advance of its time.'[27] Jay writes that...

> ...The rise of hermeneutics, the return of pragmatism, the profusion of linguistically oriented structuralist and poststructuralist modes of thought have all put the epistemological tradition derived from Descartes very much on the defensive.[28]

He continues that 'if one had to single out the scopic regime that has finally come into its own in our time, it would be the "madness of vision" Buci-Glucksmann identifies with the baroque.'[29] According to Jay for Buci-Glucksmann it is 'precisely the baroque's subversion of the dominant visual order of scientific reason that makes it so attractive in our postmodern age.'[30] This 'Baroque paradigm' can also, arguably be seen in the development of computer applications such as multimedia and hypermedia.

The Baroque and Hypermedia

In the first two chapters of this thesis I examined some of the metaphors associated with computers and multimedia. I suggested that the computer is understood as a kind of interior space, not unlike a museum. I suggested that this determined the kind of software developed, such as virtual reality and artificial intelligence, which in turn impose ideologically determined visions of the world on computer practice, that are intimately bound up with instrumental rationality. These expressed not just a modern sensibility, but a specific early modern Cartesian vision of the world. They are bound up in the discourse of clarity, and transcendence that characterises Cartesian philosophy. It

is paradigmatic of classical vision. As such it is also paradigmatic of the certainties of the scientific culture out of which it developed.

Hypermedia and multimedia on the other hand are, I suggest, expressive of other ways of representing and understanding the world, ways that could be characterised as Baroque. For example they invoke one of the most baroque of motifs, the labyrinth.[31] By the very nature of their organisation multimedia/hypermedia systems are labyrinthine.[32] In a hypermedia system the user is confronted with screens which lead possibly to many other screens. He or she is not given any sense of a coherent whole, nor of a structure which could be made visible. Each view is opaque, concealing the multiple paths that lead off it. There also is no illusion of depth in multimedia. Unlike in virtual reality the screen does not pretend to be a window onto a three-dimensional reality.[33] Rather the language with which that reality has been described has congealed, to reveal itself as the source of that reality. It makes us aware of what Rudolf Gasché calls the 'tain of the mirror'[34], the materiality of the medium of representation.[35]

Allegory

One of the main rhetorical tools through which the Baroque use of language expressed the material of the medium of representation was allegory. Jonathan Culler defines allegory as 'a form which demands commentary, goes some way in providing its own.[36]' It is usually compared, often to its detriment, to the symbol which is perceived of as 'an organic unity of or harmony seldom found in the world: a fusion of the concrete and the abstract, of the appearance and reality, of form and meaning.' Allegory on the other hand 'stresses the difference between levels, flaunts the gap we must leap to produce meaning, and thus displays the activity of interpretation in all its conventionality.'[37] Allegory is the trope through which Broodthaers's museum addresses the museum's

occlusion of its rhetorical nature and the presentation of its classification as 'adequate to a nonlinguistic universe'. .

> Because of the arbitrary selection of the exhibition's components, as well their widely differing geographical and temporal origins, the individual objects necessarily remain separate from one another. Whereas in their original collections they may be thrown together solely on the basis of being assigned the same classification according to the established terms of cultural and intellectual history-which is how the art museum functions-in Broodthaers's experiment they are withdrawn from this system and, by virtue of their common subject matter, enter into previously unknown combinations. The old order, the apparently self-evident taxonomy of cultural Specimens, has been fractured. The principle of classification that formerly contained them has been exposed as fiction. Its place is taken - but undogmatically, merely as an example, with no claims to permanence - by another equally fictional order...[38]

If Broodthaers's museum is a fiction then it is an allegorical fiction. Buchloh writes of Broodthaers's...

> ...versatility in imbuing visual signs with historical material concretions and including their full range of their inherent dialectics (the contradictions of the reality from which they arise as ideological meaning as well as their own contradictory nature in shaping and determining that reality and our reading of it... No sign seems to have the same meaning twice, no semiological element is secured.[39]

Benjamin, Allegory and Surrealism

Broodthaers's use of allegory as a dialectical tool echoes much of the work of the German critic, philosopher and essayist Walter Benjamin. Indeed such are the similarities that both Crimp and Sherman have suggested that Broodthaers's work realises many of Benjamin's ideas. Benjamin's work is a point at which the Baroque, allegory and Surrealism all meet. In his first major work, written for his *habilitation*,[40] published in English as 'On the Origins of the German Historical Drama'[41] Benjamin attempted to rehabilitate allegory against the claims of symbolism. He did this through a study of seventeenth-

century German Baroque drama. According to Benjamin such dramas present beauty as an illusion, life as full of vanity, worthless and bound towards decay and death, which comes as a welcome release. To do this such works use not symbolism, but allegory. In contrast to the symbol allegory does not exist in a self-sufficient relation to the idea it seeks to represent, but needs completion from an outside source, the allegorist. The meaning of the allegorical image is not self sufficient, all meaning has ceased to be self evident. Benjamin made explicit comparisons between the Baroque and elements of modern artistic practice, in particular montage.

> Benjamin saw affinity between the allegoric imagination of the German baroque dramatists and the artistic needs of the twentieth century; first in the melancholy spirit of the former, with its emblematic but inscrutable insignia, which he rediscovered in Kafka; then in the cognate principle of montage which he found in the work of Eisenstein and Brecht. *Montage became for him the modern, constructive, active* unmelancholy form of allegory, namely the ability to connect dissimilars in such a way as to "shock people into new recognitions and understandings.[42]

Benjamin's theory of montage was further developed in the context of his interest in the technology of mechanical reproduction and its relation to the work of art. He examined this issue in several different works, most famously in his essay 'The Work of Art in the Age of Mechanical Reproduction'[43]. Here Benjamin discusses how photography, by enabling the mass reproduction of works of art, deprives them of their 'aura', that is to say their ritual or cultic function, and thus their 'customary historical role... in the cultural legitimation of traditional social formations.'[44]. As Benjamin says the 'The uniqueness of a work of art is inseperable from its being embedded in the fabric of tradition'[45]. Benjamin sees the capacity for the mechanical reproduction of images, as manifested in photography and film, as potentially a force for liberation.

> ... mechanical reproduction emancipates the work of art from its parasitical dependence on ritual. To an ever greater degree the work of art reproduced becomes the work of art designed for reproducibility. From

> a photographic negative, for example, one can make any number of prints; to ask for the "authentic" print makes no sense. But the instant the criterion of authenticity ceases to be applicable to artistic production, the total function of art is reversed. Instead of being based on ritual, it begins to be based on another practice-politics.[46]

Benjamin saw the potential for political use of mechanical reproduction in particular in film, of which he remarks that the...

> ... The spectator's process of association in view of these [moving] images is indeed interrupted by their constant, sudden change. This constitutes the shock effect of the film, which, like all shocks, should be cushioned by heightened presence of mind.[47]

In film, according to Benjamin, the 'meaning of each single picture appears to be prescribed by the sequence of all preceding ones, which is similar to the way that in picture magazines 'captions have become obligatory. And it is clear they have an altogether different character than the title of a painting.'[48]

In a similar vein Rosalind Krauss writes that 'The Photograph heralds a disruption in the autonomy of sign. A meaninglessness surrounds it that can only be filled in by the addition of a text.'[49] Like the object in the museum the photograph, *despite its claims to represent reality, is nothing but a fragment, a piece of bric-a-brac*, to which meaning can only adhere through interpretation. With the addition of a caption the photograph becomes like another concern of Benjamin's, the Baroque emblem, which Buck-Morss describes as 'a montage of visual image and linguistic sign, out of which is read, like a picture puzzle,

Figure 15. A Baroque allegorical emblem, form Cesare di Ripa's Iconologia

what things "mean"'[50] The emblem is an allegorical, as opposed to symbolic, device.

It is with these elements that Benjamin approached the notions of montage and juxtaposition proposed by the Surrealists. Benjamin takes the Surrealist techniques, but eschews surrealism's descent into mystical transcendence.[51] Margaret Cohen presents an image, drawn from Benjamin's letters, of Benjamin as a Fortinbras who 'armed with the two-edged sword of dialectical reason... enters into battle against surrealism's haunted Hamlet, lost in ghosts, dreams and the seductions of aesthetic representation.'[52] In Benjamin's hands montage becomes a didactic tool for political ends rather than an aesthetic technique., which he employed in one of his main didactic tools, which he called "Dialectical Images" or "Dialectics at a standstill". This was a technique of taking elements of everyday life out of their normal contexts and rearranging them in new constellations, thereby divesting them of their familiarity and stirring into an active and critical posture.[53]

Benjamin intends that this method should have an estranging or shocking effect on objects: it should temporarily freeze them as slides under the microscope of the critic, lift them momentarily from their natural environment in order to make them relevant for the present. The principle of estrangement is inherited from the Surrealist techniques of montage and juxtaposition. With these "shocking " juxtaposition of everyday objects in Benjamin's 'Dialectics at a Standstill', these objects come to demand a unique, critical consideration.[54]

Though he never wrote about museums in any detail, in various parts of his oeuvre Benjamin does discuss collecting. He talks of the 'stupid and passive' private collector for whom an object exists only as they own it and can exist as capital. He also criticizes the public art collection, which he describes as 'less objectionable socially and more useful academically' than private collections[55].

But these public collections, as represented by the museum, wrest...

> ...objects from their original historical contexts not as an act of political commemoration, but in order to create the illusion of universal knowledge. By displaying the products of particular histories in a reified historical continuum, the museum fetishises them...[56]

In a note for his unfinished 'Arcades Project'[57] Benjamin describes what he sees as a positive kind of 'personal' collector, one who liberates things from the bondage of utility, renders them useless so as to be able to unravel the secret historical meaning of the things they accumulate[58]. In the Arcades Project Benjamin becomes this kind of collector[59]. Benjamin 'collects' the objects in the Arcades Project not to possess them, nor to use them in the creation of an illusion of historical knowledge but, as Adorno describes it, to 'awaken congealed life in petrified objects... but also to scrutinise living things so that they... abruptly release their significance.'[60] If Benjamin is understood as a collector, and the Arcades Project not as notes for a book, but as a collection, then he is his positive type of 'personal' collector. Benjamin treats the arcades themselves as the site of a collection. 'One observes the Parisian arcades as if they were possessions in the hand of a collector.'

It is possible to speculate that digital media may have offered Benjamin the ideal site to undertake his kind of collecting. Gregory Ulmer observes that 'Walter Benjamin foresaw what a number of contemporary commentators have suggested - that hypermedia does for scholarship what photography did for portrait painting... [it] frees scholars from the labour of compilation and indexing - as painters were freed from the primary task of representing the visible world - in order to invent new functions and styles for Discipline discourse'[61]. He quotes Benjamin's observation that...

> Today the book is already, as the present mode of scholarly production demonstrates, an outdated mediation between two different filing systems. For everything that matters is to be found in the card box of the researcher who wrote it, and the scholar studying it assimilates it into

his own card index. [62]

This statement could be seen to anticipate Vannevar Bush's *Memex* system described in chapter three. Certainly like much of his work it bears a resemblance to ideas underlying hypermedia. It is Benjamin who remarks that

> One of the foremost tasks of art has been the creation of a demand which could be fully satisfied only later. The history of every art form shows critical epochs in which a certain art form aspires to effects which could be fully obtained only with a changed technical standard, that is to say, in a new art form.[63]

Five years after Benjamin's suicide Vannevar Bush wrote 'As We May Think', the paper which formed the basis of the development of hypermedia. Nearly fifty years after his death hypermedia and multimedia are now available forms of writing and representation. Much as Benjamin believed the work of Dada artists anticipated in pictorial and literary means what was later properly realised in film, so perhaps hypermedia and multimedia are the means to realise Benjamin's ideas about collecting and representing material culture.

Conclusion

As we saw in the first chapter the computer is often characterised and understood as a kind of space. I suggest that the cabinet of curiosities, the so-called "irrational" cabinet is an appropriate model for that space than the traditional museum in the representation of material culture. As such it can operate on several levels;

• As a metonym of the idea of incompatible orders of knowledge, the acknowledgment of which makes us aware of the discursive nature of the museum;

• As a model of a personal collecting space appropriate to the positive idea of collector as expounded by Benjamin

• As a structure whose concern with signification is appropriate to a postmodern concern with textuality and rhetoric.

The computer can become a space for a modern 'emblematics', where elements are juxtaposed in different configurations to engender new meanings. By combining the power of digital technology with the surrealist and benjaminian techniques of juxtaposition, montage and collage it will enable in a powerful and accessible way the questioning and deconstruction of how we represent object and material culture, whether in the context of museum and gallery collections or outside their walls.

In the next chapter I describe the CABINET project which aims to realise the ideas described in this chapter within the context of a piece of software designed for the representation of material culture.

Notes

[1] Sontag, 1973, p 105,

[2] An interesting and little-discussed aspect of digital texts is the concept of 'live text'. This refers to text being coded in such a manner as to enable it to be manipulated as text, as opposed to being encoded as a pattern of pixels on the screen, which can only be manipulated as a mark. This distinction is one that is mostly only of practical importance to multimedia developers and graphic artists and others concerned with the digital manipulation of both text and image. Nevertheless I believe it might have some interesting ontological ramifications.

[3] For descriptions of some of the philosophical ramifications of word processing see Heim (1987) and Poster (1990, pp 99 - 128)

[4]The effect of digital image manipulation on aesthetics and on our diminishing trust of photography as a truth medium is discussed by Mitchell (1992) among others.

[5] Malraux, 1974

[6] Crimp in Foster, 1985, p 53

[7] Crimp gives as an example a lecture by Robert Rosenblum given in 1966, where he juxtaposes two slides, one of an oil sketch of a cobbled street by Gustave Caillebotte, and one of an abstract painting by Robert Ryman, to prove that the former anticipates the grid abstraction of the latter. This kind of comparison, made possible by photography, is made very easy by the use of the storage and search capabilities of digital media. (Crimp in Foster, 1985, p 50)

[8] Sherman in Sherman and Rogoff, 1994, p 139

[9] Sherman in Sherman and Rogoff, 1994, p 139

10 Crimp, 1993, p 220

11 Crimp, 1993, p 220

12 Foucault, 1970, p xv

13 Crimp, 1993, p 225

14 Crimp, 1993, p 222

15 Quoted in Hooper-Greenhill, 1992,

16 Hooper-Greenhill, 1992

17 Impey and McGregor, 1977

18 Hooper-Greenhill, 1992, p 131

19 Bann, in Cooke and Wollen, 1995, p 15

20 Bann, in Cooke and Wollen, 1995, p 15. A good example of using the metaphor of the cabinet in a modern display is the *Materia Medica* show at the Wellcome Institute, a selection of artist's working using medical imagery, which was subtitled 'A New Cabinet of Medicine and Art'.

21 Hooper-Greenhill, 1992, p

22 Foucault, 1972, p 56

23 Hooper-Greenhill, 1990

24 Bazin, 1968, p 325

25 The Baroque is a period that dates, according to Bazin, from the decline of Italian Mannerism to the rise of Neoclassicism, or roughly from 1575 to 1775. The term 'baroque' itself is supposed to derive from the portuguese 'barroco' meaning an irregular pearl . Until recently the Baroque was regarded as a degeneration of the Renaissance art it followed. It was only in the second half of the nineteenth century that art historians such as Cornelius Gurlitt and Heinrich Wölfflin rehabilitated the Baroque. Wölfflin defines the Baroque style in terms of a dualism with the classical style defined in five pairs of opposites (classical on the left): linear and pictorial; plane and depth; closed form and open form; form which is weighed down and form which takes flight; unity and multiplicity. He also presents the classical and baroque not only in terms of historical style, but as two opposing principles in art, that are above history.

26 Buci-Glucksmann, 1994

27 Jay, 1993, p 47

28 Jay, in Foster, 1988, p 18

29 Jay, in Foster, 1988, p 19

30 Jay, in Foster, 1988, p 19

31 Calabrese describes the *Enciclopedia Einaudi,* an Italian encyclopaedia with an unconventional form of organisation.

> The encyclopaedia was not designed as a list of finite entries, nor as a closed block of essays, but as a geography of thematic *knots*, each represented by a condensation of interrelated themes placed eccentrically in the total system. Each entry thus refers to a knot, and the paths between entries constitute a labyrinth. Knot and labyrinth therefore become the structural image of knowledge itself: an open, interdisciplinary knowledge, in movement, and constantly at risk of becoming disoriented.

Though this description refers to a print product it could easily describe a multimedia/hypermedia system.

32 The similarity between multimedia/hypermedia systems and baroque forms of representation have begun to be noted. Erik Davis, a writer on subcultures and technology, writes about the 'codes, hypertexts, simulated spaces, labyrinthine network architectures, baroque "metaphors", colossal encyclopaedias of memory' offered by the new medium . He has adapted the term 'allegorical machinery' to describe multimedia/hypermedia interfaces

> Earlier literary commentators used the term "allegorical machinery" to describe both the overdetermination of allegorical narrative and the fated mechanical nature of its agents. Computer interfaces can also be seen as allegorical machinery-both fuse (and confuse) images with abstractions, tend toward baroque complexity, contain magical or hyperdimensional operations, and frequently represent their abstractions spatially. Like allegory, interfaces blend mimetic symbols (in the Mac's case, trash cans and folders) with magical symbols (a phoenix in a didactic alchemical engraving is no mere image, but like an icon in HyperCard, "Opens" onto a particular operation or unit of information) Davis, in Dery, 1993, pp 592 - 593

33 In this context it is interesing to note that the kinds of graphic design associated with multimedia can also be characterised as baroque. This is owing to the development of particular graphics software packages, such as Adobe Photoshop, for the Apple Macintosh, which allow for the development of rich and

complex graphic design. They has been responsible for a particular style of graphics, for use both on screen and in print, one that is highly stylised, mixes text with image, uses complex layering, distortion and patterning. Some of its more well-known exponents include Neville Brody and the Face magazine, the Cranford School of Design and Emigré magazine from California. Sometimes subsumed under the general name 'the new typography' it suggests a belief in the inability of information and its medium to be separated. Rather than attempting to deny the materiality of the medium it celebrates it. This acknowledgment of the relation between language and the world it seeks to describe is characteristically baroque.

34 Gasché, 1986

35 This notion of the Baroque as an appropriate paradigm for contemporary epistemology has found other advocates. Omar Calabrese has has defined and analysed postmodern culture in terms of being 'neo-baroque' . He finds examples of the baroque sensibility in disparate phenomena ranging from American soap operas to fractal geometry. Calabrese follows the work of Wölfflin to suggest that "baroque" can be understood

> not only, or not exactly, as a specific period in the history of culture, but as a general attitude and formal quality of those objects in which the attitude is expressed. In this sense the baroque might be found in any epoch of our civilisation. "Baroque almost becomes a category of the spirit, in contrast to "Classical"

One phenomenon that Calabrese does not specifically examine in his book is hypermedia and multimedia. I would suggest that it expresses well his idea of the neo-baroque as a category of form. It does so in contradistinction to virtual reality, which I discussed in chapter two.

36 Culler, 1992, p 229

37 Culler, 1992, p 229

38 Borgemeister, 1987, 154

39 Buchloh, 1980, p 156

40 A German postdoctoral qualification that enables the bearer to become a *privatdozent, or unsalaried* teacher, in a universlty.

41 Benjamin, 1977

42 Mitchell, in Benjamin, 1977, xiii

43 Benjamin, 1977, pp 219 - 254

44 Wolin, 1994, p 187

45 Benjamin, 1977, p 225

46 Benjamin, 1977, p 226

47 Benjamin, 1977, p 240

48 Benjamin, 1977, p 228

49 Krauss, 1988, p 205

50 Buck-Morss, 1993, p 161

51 Cohen, 1993, p 179

52 Cohen, 1993, pp 179 - 180

53 Wolin, 1994, p 124

54 Wolin, 1994, p 125

55 Benjamin, 1977, p 67

56 Crimp, 1993 p 204

57 The 'Arcades Project' was intended to be a history of capitalism through the material evidence of nineteenth-century paris. It occupied some twelve years of Benjamin's life and unfinished at his death by suicide at the Franco-Spanish border, while fleeing the German advance into France. All Benjamin left was a collection of notes . These are published as volumes 5 and 6 of the Gessamalte Schriften, his collected works, A account of the work has been written by Susan Buck Morss (Buck Morss, 1991). The fact of its incompletion could be explained by its author's premature death. But its history suggests that other factors were responsible. The material itself and Benjamin's manner of working on it and using it made it impossible to complete. It is possible to creatively misread the intentions of the *Passagen-werk*, and see it as a new form of writing, which at the time of Benjamin's working did not, and could not exist.

> In the *Passagen-werk*, Benjamin has left us his note boxes. That is, he has left us "everything essential." The *Passagen-werk* is a historical lexicon of the capitalist origins of modernity, a collection of concrete, factual images of urban experience. Benjamin handled these facts as if they were politically charged, capable of transmitting revolutionary energy across generations. His method was to create from them constructions of print that had the power to awaken political

consciousness among present-day readers. Because of the deliberate unconnectedness of these constructions, Benjamin's insights are not-and never would have been-lodged in a rigid narrational or discursive structure. Instead, they are easily moved about in changing arrangements and trial combinations, in response to the altered demands of the changing "present." His legacy to the readers who come after him is a nonauthoritarian system of inheritance, which compares less to the bourgeois mode of passing down cultural treasure as the spoils of conquering forces, than to the utopian tradition of fairy tales which instruct without dominating

58 Quoted in Crimp, 1993, pp 201 - 202

59 Douglas Crimp claims that Benjamin explicitly designates the Arcades Project as a collection. Crimp, 1993, pp 202 - 203

60 Adorno, 1991, p 233

61 Ulmer, 1994, p 29

62 Ulmer, 1994, p 29

63 Benjamin, 1977, p 239

CHAPTER FIVE

Theory into Practice

This chapter describes the practical part of the PhD. It also describes the relationship between the theoretical elements and this practical part. In the previous chapters I have attempted a critique of the museum and of digital technology in relation to the surrounding epistemology and culture. The intention in this critique has been to expose the ideology and the structures of thought which determine how these institutions and apparatuses were and are developed, understood and used. In particular it has been concerned with how cultural factors and models detemine how digital technology is used, and how this is evinced in relation to the representation of material culture. It has also been intended to enable an understanding of how they might be better used in relation to each other.

This critique constituted an argument in its own right. But it has also been an account of the thought processes underpinning the practical work. This is not to suggest that I worked patiently through these theoretical ideas, and, when satisfied, embarked on the work of design. The relationship between theoryand practice is, as I stated in the introduction, a complex dialectic, and in this case each was instrumental in the development of the other over the period of the PhD research. But the presentation of a clear narrative appropriate to a PhD has necessitated this structure, in which accounts of the theoretical and practical are separated, and in which the chronological relationship between development of the theory and of the practical work is simplified.

Process of Design

To undertake the practical work necessitated the use of a practical skill, that of

an interface designer. Interface design refers to the process of designing how the computer and the user communicate with each other. It necessitates devising ways of bridging between the binary code of the computer and human language. Interface design is a different process to other kinds of design. Though it has elements of both it is neither graphic design, nor product design. The nature of the computer is such that, within certain broad constraints, it is possible to enable it to do almost anything. The interface designer does not have the constraints, nor the developed and defined forms and guidelines that a graphic designer has when, for example, designing a book. Nor are there the straightforward physical limitations and requirements experienced by the product designer. The interface designer is, in theory, presented with an enormous amount of choice and freedom, with all the disadvantages as well as advantages that that suggests. With this freedom comes the possibility of confusion and obscurity, which is compounded by the very different and obscure nature of binary information and calculation. This is why metaphor is useful for giving computer users a model from other media or the physical world to help them in communicating with the computer.

In actuality the choice open to an interface designer is limited by the available equipment and expectations. As noted earlier in this thesis for a number of reasons the computer has been manifested as a certain shape, and a certain configuration of devices, the monitor, box, keyboard and mouse, which suggest an idea of interiority. Accompanying this, as noted earlier, is how software and interface design also promote the idea of the computer as an interior space. These facts determine how the computer is actually used. They impose not only certain modes of action, but also certain metaphors on the design.[1]

As evinced in earlier parts of this thesis, this problematic and loaded notion of an interior space has dictated my approach to the question of the digital representation of material culture. Chapter two described how the idea of an interi-

or and separate space is congruent with the notion of the museum, and how this has cultural and epistmological ramifications. The next chapter described alternatives to this structure found in recent art and philosophy, in particular that of the Surrealists. In the fourth chapter these ideas were developed further through the work of Walter Benjamin, Marcel Broodthaers and through their use of allegory.

In particular this part of the thesis invoked the curiosity, or 'irrational' cabinet that preceded the museum. In terms of the theoretical aspects of the thesis the cabinet represented an alternative kind of space to the museum, where different kinds of displays and structures could be erected. The cabinet, combined with other elements, surrealist and other uses of juxtaposition and montage, and renaissance and baroque 'emblematics', also offered a potential metaphor for the design of the practical work. As a metaphor it made possible working with ideas of spatiality without getting stuck with the problems and impositions of the museum as a space. With this in mind I intended that the practical work should have the following characteristics.

• It should use to the full multimedia's capacity for complex arrangements of information. In place of the museum or gallery's static, single, physically determined arrangement, numerous, complex and multidimensional arrangements should be possible.

• It should exploit the computer's ability to store, manipulate and sort complex information very quickly to avoid instating the hierarchical relationship between those disseminating information and those receiving it found in most media and institutions such as the museum

• It should instead enable a user to have a much closer relationship with the information by being able to make serendipitous discoveries, juxtapositions

and to assemble and arrange material in different structures, thus giving her the power to examine and deconstruct the various categories and taxonomies with which we understand the order of things.

• The focus on the material object should be replaced by an understanding of objects (or rather images of objects), texts, film and all other forms of representation as of equal weight. Thus such representation's nature as signification, foregrounded by being in a digital form, can be acknowledged.

The VTC and Cabinet

The chance to realise these ideas came in the shape of the Virtual Teaching Collection project at Cambridge University.[2] The project's intention was to design software for departments in which actual artifacts are used in teaching. Departments have collections of such objects. In actual teaching collections as they exist in universities and university museums objects are often fragile and rare and access is normally limited to those researching, studying or teaching in the institution in which the collection is housed. Furthermore the constitution of the collection is often subject to the vagaries of curator's and donor's choice of objects and the limitations set upon availability of such objects, through the institution's own financial constraints and the mechanics of the marketplace. Like all museum collections teaching collections thus have many shortcomings, anomalies and lacunae.

With the 'Virtual Teaching Collection' the project group at Cambridge hoped to overcome at least some of the problems described above. By amalgamating in digital form several different collections in the same subject area more balanced and complete collections can be assembled. By placing such virtual collections on easily transportable media such as CD-rom many more people can have access to them. Obviously virtual collections do not offer the experience

of being able to handle actual objects, but through rich visual archiving, three dimensional imaging and so on such collections can stand as a useful substitute when the real thing is not available, as well as offering access to larger sets of objects than found in a single collection. The project's aim was to assemble digital archive material, and to develop sophisticated tools with which to view and manipulate the collections. I was invited to be the designer on the project[3].

The Structure

After a process of design, programming and discussion[4] the final structure of the system was arrived at. It is divided into three parts

- The software in which the tools and viewing mechanisms are located;

- CABINET files, called 'collections', in which the information about and pointers to the material are recorded;

- The mass of material itself, pictures, text files audio, animations etc... which sit in separate folders.

There is a potential source of semantic confusion between the 'collections' and the folders of material. It might at first seem more obvious to call the folders of material 'collections'. It was that argued that, on the contrary, the 'collections' were where the inchoate mass of material was given structure. Without this structuring they were not in any sense collections, just groups of files. Furthermore the user only had access to these groups of objects as CABINET collections through the 'collection' files.

One of the main concerns was to offer alternatives to the normal hierarchies of

user/reader and author. Any user of the system can in theory open an already existing collection, start a new collection from scratch, edit, change or add to an existing collection, use an existing collection as the basis of a new collection, or combine elements of two or more collections together. In order to explain in greater detail what CABINET enables a user to do it is best perhaps to go through the various possibilities. In order to make a new collection the user needs to assemble material into a folder on his or her computer. This material can be pictures, in the form of Pict files[5]; Quicktime[6] and QuicktimeVR files[7]; audio files; text files, which themselves can contain pictures; in fact any non-application-specific Macintosh filetype. It is also possible to include application-specific files such as Director animations. CABINET itself cannot run these files, but can open up the appropriate software to run them. If a user is assembling a collection of, for example, archaeological remains their material may consist of scans of photographs of the objects, Quicktime capture of video of the sites where they were found, texts about the objects, QuicktimeVR three-dimensional views of the objects, as well as Director interactive animations explaining aspects of archaeology, or spreadsheets tabling archaeological data.

Having assembled some material the user opens CABINET, and imports it all and thus creates a 'collection'. Next the user creates a database form by opening the Database Editor. This is a tool with which the user can decide what fields a database should comprise (figure 16). This entails giving each field a name and deciding what kind of information it should be able to hold; short text; long text; integer; decimal; date; list, in the case where there are limited choices. Doing this creates a database form. Each object, of whatever sort in the collection has this form automatically attached to it.

By opening a 'search window' the user can now look at all the objects on *palettes*, page-like displays with grids of *picons* (picture icons, small representations of the object). These can be paged though by clicking on an arrow (figure

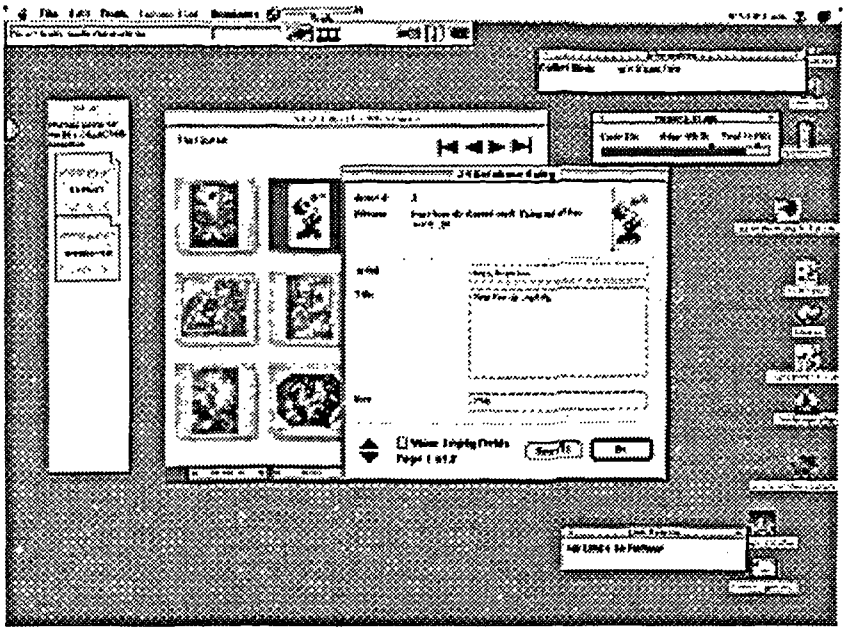

Figure 16. Cabinet's Database Editor

17). Then the user may select any image, and view or edit its attached database form. Once this is done the collection is now ready for the user to sort, browse and make specific searches through and display the results of these actions either as images or text records. 'Sorting' simply sorts the order in which the collection is displayed alphabetically or numerically according to which database field is chosen. 'Searching' allows the user to search by any database field (figure 18). Choosing to search by a field description brings up an appropriate tool or dialogue. For example searching in an archaeological collection by date of accession will display a 'timeline', a visual representation of the date range in question, with indications of when objects were accessioned (figure 19). The user can drag across the timeline to select a date range. Other searches will produce a dialogue box that will allow the user to key in a term to search for, but it also generates a list of all the terms under that field in the database, upon which the user can click to select. This last capacity is important in that it

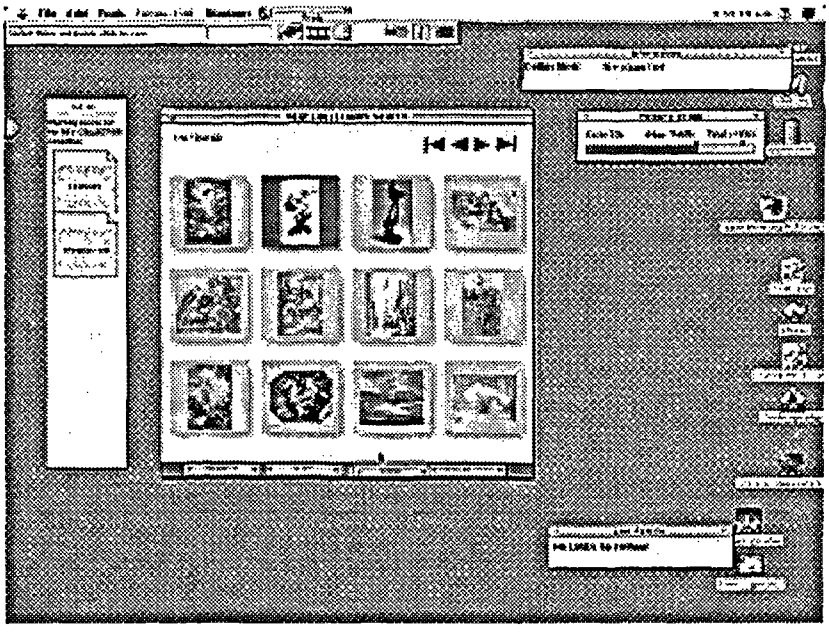

Figure 17. Cabinet's picon palette

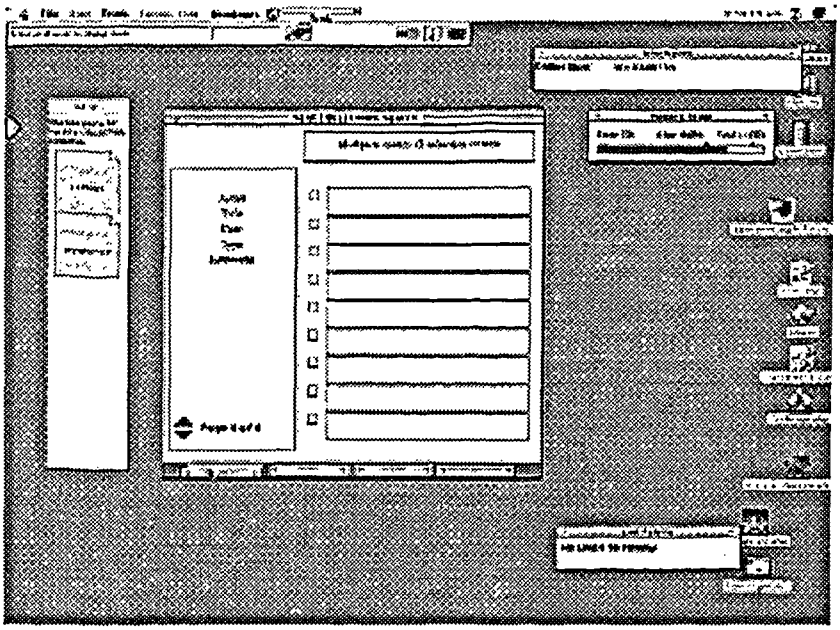

Figure 18. Cabinet's search box

means the user does not have to know exactly what they are looking for. The user can assemble a number of these searches which will operate in conjunction with each other, and can be turned on or off, to make complex combinatorial searches. The result of any search can then be displayed in a search window as picons. Double-clicking on a picon will bring up the full-sized version in a separate windows (figure 20). Within the limitations of the software, RAM and screen space any number of images, texts or whatever can be displayed at once.

But the above, arguably, does no more than a standard visual database. There are several capacities that make CABINET more than that. One is that as well as sorting and searching the user can also link an object, 'hypermedia fashion', with any other object in the collection, or another collection. This could mean another object in the database, other views of the same object, or to texts (which might or might not consti-

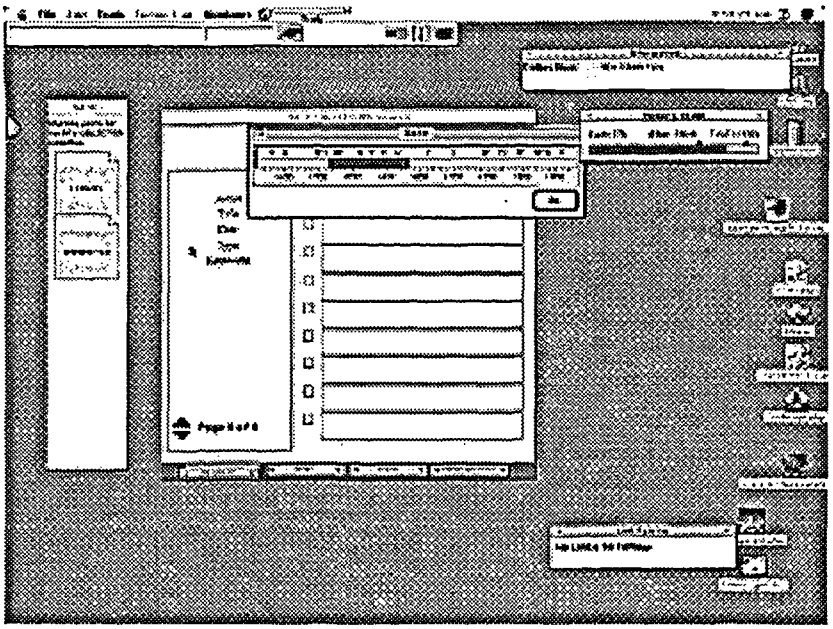

Figure 19. Cabinet's timeline

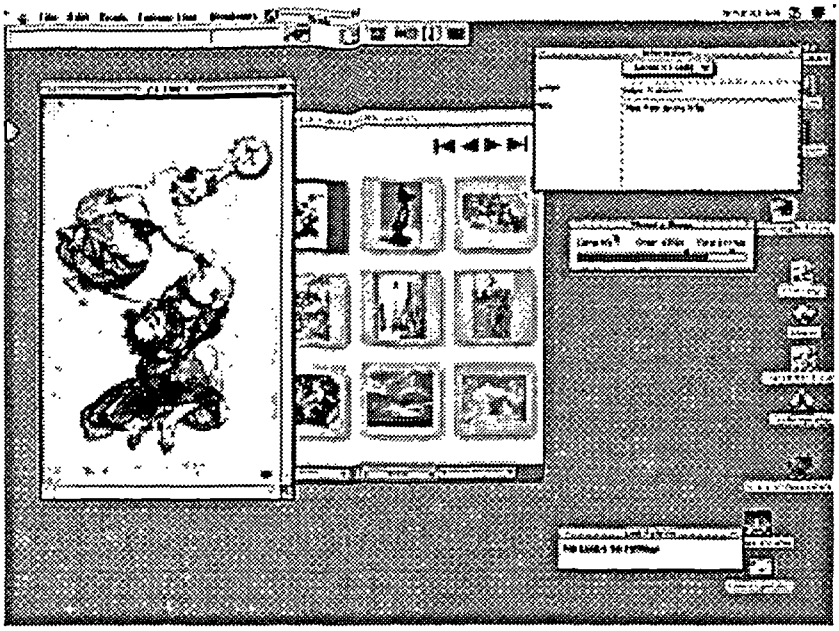

Figure 20. Full-sized representations

tute objects in themselves). In order to make a link the user finds and displays the first object he or she wishes to link, brings up the 'Edit Links' tool, finds the picon of the second object, and drags it into an area on the 'Edit Links' tool window. This attaches a link from the first object to the second (figure 21). When displaying any object it is possible to bring up a window to show if there are any links from that object. These are displayed as picons on that links window, which can be double-clicked to display the full version. At the moment, as the software stands, it is not possible to construct links from specific sections of a picture, though this is something that is acknowledged as desirable. It is however possible to make hypertext links in texts from single words, sentences, illustrations within the text and so on. This is done in a manner similar to the above process. The user finds and displays the text which they wish to link from, selects the specific piece of text, a word, the name of an object, highlight it, bring the 'Make Hypertext Link' tool, find the object to be linked to and

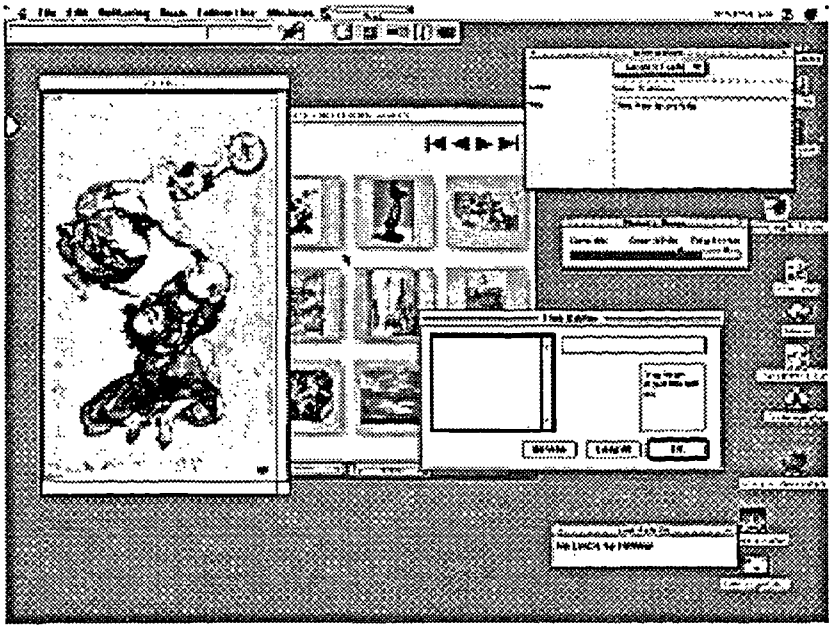

Figure 21. Cabinet's Links Editor

drag its picon into the window on the tool (figure 22).

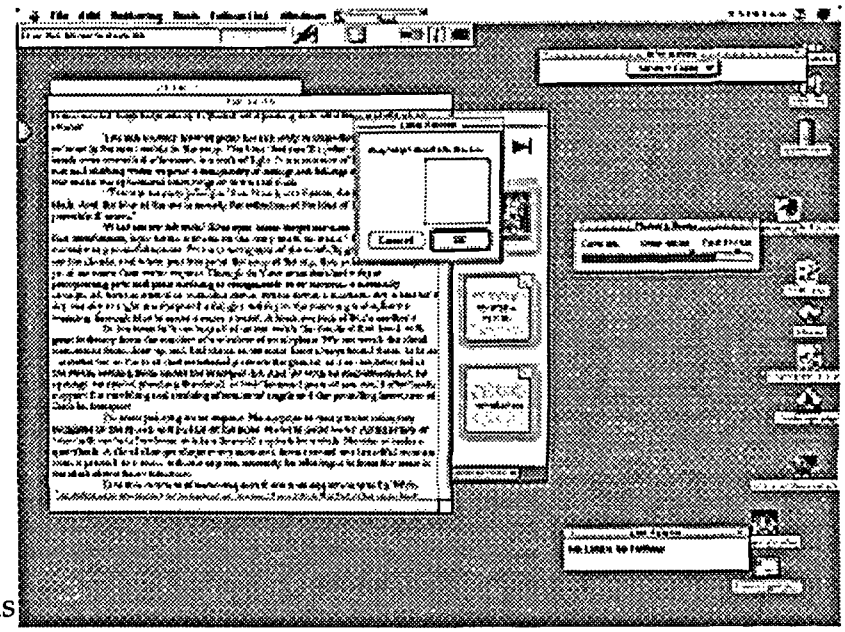

Figure 22. Cabinet's Hypertext Link Maker

Designing how users make and follow hyperlinks and hypertexts made it necessary to confront some problems in the concept of hypermedia and hypertext. Exploiting the computer's capacity for hypertextual jumping between objects and information can lead to incoherence. In arguments about hypertextuality the power of the computer is often set against the constricting and archaic form of the book. A comparatively successful hypertext system, such as the Micro Gallery was designed as a series of flat linear structures with simple jumps between them. This solution was arrived after months of experimenting with structures of all sorts of different complexity and shape (including three dimensional interfaces).[8] Within its limitations it works. Another less successful example of hypertext is the hypertext version of Jay Bolter's book Writing Space[9]. This piece of writing, which concerned the future of text in a digital age, was produced simultaneously as a printed book and an electronic hypertext. In comparison to the paper version, the hypertext, which enables the reader to jump from topic to topic, is confusing and difficult to read.

With these examples in mind the preferred solution for CABINET was that each piece of text could be read from beginning to end, and would contain a coherent argument. It will be possible to link to other narratives, and to see all the narratives pertinent to, say, an individual object. Different narratives may

disagree or conflict, and they would all be clearly authored and contingent. The same narrative could be attached to different objects. The important point was that each text was in itself a coherent whole. If the user chooses to read it from beginning to end they will have read something that in itself makes sense. They may choose to compare several such texts or jump between texts. But, because the system uses windows, rather than being composed if flat opaque, page-like screens, they will always be able to return to the first narrative. Thus the use of a windows interface enables us to avoid a difficult aspect of hyperlinking, especially in the case of text.

Another capacity that was thought desirable for CABINET to have was that the user should be able to start a new collection and drag objects from any other collection into it, or simply drag objects from one collection to another. In a sense this was one of the most important parts of the software. Through such an ability the user could become their own curator. This idea ran into problems which are indicative of difficulties, both practical and theoretical, in my ideas for the projects. The question arose of whether, when the image of an object was placed into another collection, the database information was placed with it. If a new collection was being made entirely out of objects from one larger collection, no problem arose. But if a collection was being assembled from several different sources then the situation became difficult. If a collection was comprised of objects described under different sets of database fields then any kind of comprehensive searching and sorting became impossible. The problem was that the ability of the user to assemble collections from disparate sources was an important part of the underlying concept. The eventual solution was that, where possible, database fields in different collections should be treated as similar enough to be amalgamated into a new database set. For example fields such as date, location, size and so on, were transportable across collections. Though this does not address the problem entirely, it does go some way to finding a solution.

As well as searching, sorting, linking and making new collections, users are enabled to produce different kinds of materials for teaching and research. At its most simple this meant that any text or image could be copied and pasted into a word-processing file or a multimedia production. Collections of objects could be assembled to make an onscreen 'slide show'. Though the equipment is obviously cumbersome in comparison to actual slide projectors, the potential benefits of using computer-generated 'slide shows' are, in theory, great. Any lecturer who has used slides will know the difficulties of assembling and giving a slide lecture. Using a system such as CABINET makes finding the appropriate images easy compared to searching through drawers of slides. In a networked institution these could be sent rapidly and easily to the lecture room, rather than transported in a slide carousel. And there can be benefits in the lecture room itself. Though the lecturer could devise an order, he or she would not have to adhere to it. If a question concerning an object or image that had been shown previously arose, rather than reversing the carousel back to the slide in question, the lecturer could simply jump to it. Several images could be shown at once, to enable comparisons. If an object or image is discussed which is not part of the original slide show, the lecturer could use the network to find it.

Some ideas turned out not to be realisable. One was to allow users to produce what we called 'Exhibitions'. These would be displays of material from collections, which can be arranged on screen, in a manner analogous to designing a gallery display. Exhibitions were intended as *Cabinet's* own unique kind of output. The idea of Exhibitions had to be abandoned because of a lack of time, the difficulty in envisaging exactly how they would look and work and the problems of programming such an idea. Another unrealised idea was called 'clusters and constellations'. These would be more meaningful ways of displaying links. The idea was to have palettes showing the relationship between a cen-

tral, solar object and a constellation of objects around it. To a certain extent this constituted a solution to some problems of spatial representation. Rather than placing all objects in a three-dimensional space each is placed in a kind of microspace, centred on the 'solar' object. It was intended that some gesture made on a constellation object, a single mouse click for example, would make that the solar object, and display an appropriate constellation. Thus one could move through a collection of objects in a complex but readable and graphically coherent space. For various, practical, reasons this did not get into the final software. Despite this it is a possible solution to some aspects of the spatial display of knowledge structures and relationships, one that might preserve the complexity of those relations, without necessarily becoming incomprehensible.

CABINET and cabinets; practice and theory

CABINET was intended to do two things. One was to do what was required for the Virtual Teaching Project. The other was to address the issues raised in the previous chapters of this thesis. The important question here is to what extent CABINET tries to undertake the latter, and to what extent it succeeds. Clearly the name chosen for the software deliberately alludes to the curiosity cabinets described in the last chapter. The term 'irrational cabinet' was coopted from the work of Hooper-Greenhill to describe a way of collecting and structuring material that differs fundamentally from that of the classical and modern museums. Thus it is metonymic of other ways of thinking, that might seem irrational to us. As such it has the potential power to shock us out of the sense of naturalness adhering to our own taxonomies and museum structures. Also as a rhetorical or textual space it had an appropriateness for an era in which rhetoric has again become understood as central to epistemology. This rhetoricality and textuality is also appropriate as a model for collections entirely composed of representations. The representations of objects on screen are not the objects themselves, nor even adequate as representations in themselves. They

are signs referring to the object. Their status as signs becomes apparent when accompanied, emblem-like, by captions, and textual exegeses. This understanding of the emblem also invokes its understanding by Benjamin as a kind of proto-montage, and its part in his conception of the dialectical image.

With the design of CABINET it was possible to realise some of these ideas. One of the crucial debates in the project was about the status of various kinds of representation. Would there be any kind of hierarchy of representations, with perhaps a particular view of an object having primacy, being in a sense *the* object, and other views, and other ways of viewing, such as QuicktimeVR 3D views, being secondary? Were written texts to be secondary sources lacking the privilege of visual representations? In the end it was decided that the representations themselves were the objects in the 'collections', and any kind of representation had equal claim to be considered an object. This made CABINET a very different kind of space to a real museum. Rather than trying to reproduce in any way the idea of focussing on actual objects, supported and explained by texts and other material, CABINET acknowledges the textuality and rhetoricality inherent in digital media (indeed in all media, and in a foucauldian sense, all human discourse). Whether photographs, diagrams, written texts, animations or whatever, all the representations are texts to be read as such. This also opened out the kinds of contents CABINET might display beyond the concentration on the static material object of the museum, to moving images, sounds or indeed anything that can be digitised. Thus CABINET can be compared not so much to a museum, but more perhaps to the rhetorical spaces of the cabinets of curiosities.

One of the aims in CABINET was to erode the traditional author/reader hierarchies. Users can be authors or readers or both simultaneously. They have the power to assemble, categorise, link and structure collections themselves, either from scratch or from other collections. Here the original cabinet of curiosities

makes a good model as a space assembled by an individual, with possible idiosyncratic purposes, as opposed to the authoritarian institution of the museum, or the closed and authored system of the book, whose form is reproduced in commercial CDRoms. Perhaps most important was the ability to link and juxtapose elements. This enables CABINET to become a vehicle for the strategies of montage and emblematics. A user can link a text to a picture, or indeed any number of texts to one picture, thus, for example allowing a number of different meanings to be potentially attached to that representation. Similarly two (or more) pictures can be linked so that from their juxtaposition new meanings might be inferred. The intended model of use is of groups of separate images juxtaposed with texts which comment upon, and set themselves up in a dialectical relationship with the images. These combinations of images and texts themselves can act in a dialectical relationship with other groups of image and text. The total meaning of such a system of images and texts would lie not in a linear or totalised argument, as in a book, but in the dialectical relationship between all the elements.

Conclusion

There are clearly problems with CABINET. It has raised issues for which it has not found an adequate answer. In a sense this is the point of combining practice with theory; to find such problems, and to confront them. There is for instance the difficult question of authority. If you set up a system of knowledge to which anyone can contribute or alter, who or what legitimates that knowledge?. The immediate practical answer lies not in CABINET itself but how institutions determine use and access. This does not however address the broader issues. The need to do so becomes more pressing, especially as electronic media with its deconstruction of traditional hierarchies of information production and consumption, becomes more widespread. There are other problems, of design for example. In particular the difficulty of representing

complex relationships between objects without sacrificing clarity. Despite these misgivings I believe CABINET offers possibilities in the representation of material culture not found in other media, or in other uses of digital media in this area. To quote Hans Haacke's phrase, the computer, like the museum, is a powerful 'means for the production of consciousness'. As he also remarks 'The sophistication required to promote a particular interpretation of the world is potentially also available to question that interpretation and to offer other versions.' It is through endeavours such as CABINET perhaps that such questioning and offering of alternatives can take place.

Notes

[1] This problem also arises in relation to the design of software. For reasons also discussed in chapter two the imposition of metaphors is both necessary and ubiquitous in such design. It pervades every aspect and cannot be avoided. Yet again what I consider important is to remember that certain metaphors are being imposed. A problem with designing for interactive multimedia is that the tools available to non-programmers impose, sometimes insidiously, limiting metaphors of action. A good example is the 'industry standard' multimedia design tool Macromind Director. It was originally intended to enable people to produce digital video. Its capacity to produce interactive works was added later. But its basic interface remained, and indeed remains, that of a tool for producing linear narratives. A similar, though different, problem is found with HyperCard, a tool produced by Apple computers for, among other aims, enabling users to build simply and quickly interactive programs. Its basic metaphor is that of the 3" x 5" rolodex card, upon which another metaphor, of the electronic button, has been imposed. In both these cases not only do these metaphors impose practical limitations on what a user can do with the software, but also often limitations on what they can imagine can be done with it. One area where this is obvious is in degree shows for interactive media design courses in art schools, where for various reasons, facility of use, support for colour and so on, Director is the software of choice. This leads to shows in which the work is all alike, and all clearly the result of using Director.

[2] For a description of this project see appendix 1

[3] The designer's role in such a project can be divided, roughly, into four parts. One, as I have intimated above, is to devise and appropriate a conceit or metaphor upon which to base the design. The second and third parts, which are closely connected to the first as well as to each other, are to design the structure and the interaction. The structure can be characterised as a mapping of all the separate parts and how they are connected. The interaction refers to how users get from one part to another, what links there are between separate parts, and how users get back and how to stop them feeling lost, and what tools the user might have access to and how they might use them. The last part is the actual look, which is closely connected to the first part, and is concerned with colours, fonts, font sizes, and screen grids and templates. It does not in this case involve programming, or the supply of content.

[4] Described in appendix 1

[5] A Pict file is a standard still digital image format used on Macintosh computers

[6] A QuickTime file is a standard format used on Macintosh computers for storing moving images

[7] A QuickTimeVR stores three-dimensional photographic images on Macintosh computers

[8] Information gained through conversations with Alex Morrison, head of the company responsible for the Micro Gallery software, and Neil Aberdeen, designer on the project

[9] Bolter, 1991

CONCLUSION

In some senses it is paradoxical to talk about conclusions in relation to a field such as multimedia. It is a consequence of examining a new technology that things often change faster than they can be written about. The term 'conclusion' suggests ideas of closure and finality that are simply not relevant. In deference to tradition I shall call this final section a conclusion, though it is more of an indication of possible future developments, a crossroads rather than a terminus.

At this particular moment there is a definite sense of being at a crossroads as far as digital technology and the representation of material culture is concerned. In the summer of 1996 the government announced its intention to develop a strategy for use of information technology in museums into the next century and beyond. Such a move offers the possibility of progressive and radical developments, though there is no guarantee that either this, or any possible future government would interested in such. This is not least a matter of hegemony, in the sense defined by Gramsci[1]. Museums are one of the institutions through which those in power promote and further their interests, by promoting a certain view of the world.[2] I suspect that if they understand this no government, conservative or otherwise, is going to fund technology which threatens the operation of this hegemony, (though such a prediction runs the risk of being a hostage to fortune). Nor is it to be supposed that museums would wish to relinquish their position of authority and power. Yet digital technology present a serious potential challenge to how information is structured and disseminated and therefore to the maintainance of hegemony by those in power.

Yet there are possibilities and developments which might exceed the control of the government and institutions like the museum, and enable the promotion of

alternative and dissenting voices. A previous government-sponsored project, the Internet, designed originally to enable communication between government offices, companies and universities even after a nuclear strike, has become possibly the most important and powerful source of free speech extant. This is even more surprising considering that it was originally developed by the American Defense Department. Indeed it is the area of networked communications that such might enable a liberating and empowering use of digital technology.

These developments suggest the possibility of change in our relationship with digital media as fundamental as that accompanying the rise of the personal computer. The PC suggested ideas of possession and spatiality. Applications and files were objects sitting in an enclosed space, which belonged to the PC user. It was, I suggest, this spatiality and enclosure that determined how multimedia was used and understood. Accordingly the *multimedia* industry at first concentrated largely on CDRom and other closed, portable media. This context informed both the theory and the practice. Since the industry was still concentrating on the idea of delivering these closed objects to other more or less closed objects, personal computers, the sense of enclosure and seperatedness was strong. It was this sense that made the argument comparing computers and multimedia to the enclosed space of the museum possible.

Network-based computing suggests the beginnings of another paradigm, one that dissolved the distinction between inner and outer. Though it is true that when exploring the World Wide Web through Netscape, or another browser, one is encouraged to think that one is 'visiting' 'sites', but with this there is a sense that one's computer has become porous. The private realm of the computer and the public realm of cyberspace become intermingled. In the vision of the network computer proposed by Larry Ellison at Oracle[3] the notion of the interior and exterior are removed altogether. The user will not own software

but access it through phonelines. Files he or she are working on, or have finished, will exist in effect only in cyberspace, to be accessed on-line.

It is possible that Ellison's vision might not translate into commercial reality, or that the Internet will not encroach further than it presently does on how we understand and use the computer. But it is also possible that these developments will have profound effects not just on how we use computers, but also on how we structure and understand knowledge. Though it is hard to predict how this could manifest itself, I suggest that some of the ideas outlined in the previous chapter might act as pointers to possible courses of action. Though this thesis was written and CABINET developed with more or less closed media in mind, I believe they are applicable to new developments in network computing. Indeed it is only with the widespread use of networks in museum contexts that some of the ideas in this thesis can be properly realised. In particular I suggest that CABINET could be scaled and adapted to work on the Internet.

Indeed it is possible to imagine a CABINET-style piece of software to enable, for example, all museums in the UK to be networked to allow schools, universities, researchers, members of the public, private users and so on access to a vast virtual collection, which they can explore in a variety of different ways. This would allow museums to place their records at the public's disposal, as well as relevant documents, interactive displays etc... all as objects in this virtual collection, and perhaps to link different objects, either in their collection or to those in other collections. It could give users access to the records, allow them to search using any relevant parameters and to make complex concatenated searches. It could also allow users to follow links through collections and from collection to collection and to assemble virtual collections of their own making. As well as these museums could make available virtual and interactive exhibitions/displays, pedagogical games and other forms of educa-

tive entertainment, and resource for multimedia and other developments, television, education etc...

Such a project would possibly be a valuable tool for museums and their audiences. But, more than that, it might be a way of changing how we look at objects and museums entirely. As already stated this thesis started with the idea that museums and computers are both spaces, separate from the world around them. Like objects in museums representations of objects on CDRoms and information displays and even on the World Wide Web can be 'visited' but they remain within their own museum walls. Pursuing this metaphor suggests that networks, if properly used can begin to dismantle these museum walls, and carry the objects within out into the streets. There, liberated from these confines, new uses can be found for these objects, and from them new truths can be divined.

Notes

[1] Gramsci (1971) pp 181 - 2

[2] For an account of the relationship between museums, hegemony and the present conservative government see Jon Bird's essay in Block on Hegemony and Art History, collected in Robertson et al, 1996

[3] Ellison believes that the desktop computer is going soon to be redundant to be replaced by a network of machines, in which data is stored remotely and users log on to work, whether from home or the office. See Wired Magazine, September 1996, p 44

APPENDIX ONE

The Virtual Teaching Collection Project

In 1993 the Higher Education Funding Council for England (HEFCE) invited bids from consortia of Universities to propose projects for developing information technology applications for education, to be funded by their 'Teaching and Learning in Technology Programme' (TLTP). At Cambridge University researchers and lecturers from the departments of archaeology and the history of science had come together to propose such project and gather together suitable participants. In order to make the bid the Cambridge group assembled a consortium of members from departments with appropriate collections in universities around Britain. These including the Universities of Oxford, Glasgow and London. The Centre for Electronic Arts at Middlesex University was asked to join the consortium to provide graphic and interaction design. As a member of that department researching the idea of the virtual museum, and holding similar ideas to those of the originators of the project I was invited to become the designer. I accepted, seeing that the intentions of the project were close to my own ideas about how such technology should be used in relation to the representation of material culture. I felt that I could both satisfy the requirements of the project and realise my own ideas. The consortium were successful in their application for TLTP funding, and a team was assembled to undertake the work. This consisted of a programmer, Dr Lester Thomas; a researcher from each of the two subject areas, Dr Sam Lucy for archaeology, and Dr Michael Wintroub for the History of Science; myself as designer; and Dr Robin Boast as coordinator. There was also a board of directors comprised of the various researchers and teachers involved in assembling the bid as well as representatives from the different institutions involved. Its capacity was mainly administrative and advisory and the core team was given a high degree of autonomy.

Technical Decisions

The platform, the kind of computer we were going to use, had already been chosen by the time I started work on the project. Luckily the platform of choice was the Apple Macintosh, which was not only the make of computer with which I was familiar as a designer, but also, in my opinion, the best and most appropriate for the work in question. Macintosh computers have been, and still are the machine of choice for those working in graphic design and multimedia. Most of the tools used in such areas had originated on the Macintosh. Apple had also devoted a lot of effort to making the hardware suitable for visual, graphic and typographical work. To program Lester Thomas used an application for software developers called Metroworks CodeWarrior. This, in essence, is a package that enables a programmer to write routines in C++, a popular and flexible programming language, for the Apple Macintosh Computer. It encompassed routines to enable the business of working within the constraints of the Apple Graphical User Interface easier.

Design Process

We quickly developed a *modus operandi*. I devised ideas about how the software should look, and how a user would interact with it, on paper. I then made an interactive mockup or storyboard on the computer, using Macromind Director, a software package designed to enable nonprogrammers to make interactive displays. We would then have a meeting of the team, possibly with some of the directors, in which we would discuss the ideas I had proposed. The programmer would suggest if they were feasible or not. The researchers would discuss if they met their particular needs and desires. Criticisms of and suggestion about the ideas were presented, and other ideas were put forward. If everybody was broadly happy the programmer would set about programming the ideas. When he had finished we would look at his work and see how

my ideas worked in actuality. We would then discuss changes and what people might want, and the process would start again. The design process led to a number of iterations of the design of each part element of the software, which, in turn, led to a number of iterations of the software. Though it went through a number of changes, as can be seen from the progress of design the basic elements remained more or less the same throughout.

APPENDIX TWO

Definitions of Modernity and Postmodernity

Since one of the main concerns of the thesis is the relationship between modernity and postmodernity it is necessary to define what I mean by these terms. The term 'modernity' is subject to a number of definitions[1]. Apart from its use simply to suggest what is happening now as opposed to what happened before, the term modern has been defined in a number of ways and for a number of contexts and applied to a number of different specific historical periods[2]. The philosopher Peter Osborne notes five distinct stages in the development of the idea and its application, ranging from the twelfth century to the period after the first world war[3]. A simpler way of understanding the term, at least in chronological terms, might be to posit a period of early modernity from the 15th century to the mid-17th century and a period of 'classic' modernity from the mid-17th century to approximately 1950[4] .

Within the context of this definition Susan Pearce has described modernity as a 'complex bundle of modes of thinking and acting', concerned with the development of metanarratives, overarching discourses through which objective realities and eternal truths could be defined and expressed[5]. Modernity is underpinned by the belief that there is an objective reality to which humans have access, and that humans can transcendently observe and understand that reality. This gives rise to the discourse of scientific knowledge and understanding through which objective realities and truths can be defined and expressed, and the idea that language is a mirror of objective reality and can express that reality without mediation or distortion. It also holds to a Judeao-Christian perception of time as linear rather than cyclical, and the notion of historical and human progress towards perfectibility, and technological mastery[6].

Such a definition suggests a view of history in terms of periodisation, as opposed to linear progress. A useful concept in this area is that of the *episteme*, the unconscious, but positive and productive set of relations within which knowledge is produced and rationality defined[7]. Specific *epistemes* can be defined by the observation of large scale congruence of intellectual activity in certain periods. Foucault discusses three specific *epistemes*, the 'Renaissance', approximately the sixteenth century, the 'Classical', from the mid-seventeenth to the end of the eighteenth century and the 'Modern', from the beginning of the nineteenth to the mid-twentieth century. The shift from one *episteme* to another, according to Foucault, is characterised by an immense cultural and epistemological upheaval.[8]

Both the museum and the computer are seen as paradigmatic products of modernity. Museums are 'a typical part of modern European cultural expression'[9]. They are unique in holding the actual objects, the 'true data... upon which... the materialistic meta-narratives [of modernity] depended for their verification'[10]. This is linked to the 'ability to display, to demonstrate, to show the nature of the world, and of man within it by arranging the collected material in particular patterns which reflect, confirm and project the contemporary world view' [11]. The computer is also characteristic of modernity. As a machine dedicated to the representation of information through symbolic logic it exemplifies the notion of reason as *mathesis*[12]. This idea, of dealing 'with the 'foreign' matter of reality by translating into reason's own terms'[13] starts with Descartes and continues through the Enlightenment[14] .

One of the contentions of this dissertation is that both the museum and the computer, as well as being paradigmatic of modernity, are involved in, and in the case of the computer possibly instrumental to, a shift away from that modernity, to new ways of acting and thinking, a new *episteme*, which at the moment is subsumed under the title postmodern. The use of the latter term

especially is contentious, and the view of history and culture it portends is by no means universally agreed upon. It can either be understood as the latest manifestation of modernity, or as a more profound change to a new kind of society, and a new kind of thinking, the nature of which we cannot predict. Many commentators have discussed postmodernity, and attempted to define it. Among the most notable of these are Jameson (1991) and Lyotard (1979). Jameson describes postmodernity as 'the cultural logic of late capitalism' in which the production of culture has been integrated into commodity production generally in order to satisfy an ever spiralling need for novelty and excitement[15] ; Lyotard studies the end of the hegemony of the metanarratives that have legitimised the ideology of modernity. In each of these cases, and in the case of other writers, the definitions may differ, but the sense of uncertainty and fragmentation is shared. The kinds of beliefs and understandings that sustained the hegemony of modernity, and concealed its discursive status, no longer seem supportable. The concept of postmodernism is important because, however ambiguous it is and however much debate it attracts, it is the rubric under which much discussion of both the computer and the museum presently takes place.[16]

Notes

1 The term itself derives from the Latin term *modernus*, which it turn derives from the word *modo*, meaning recently. According to the philosopher Peter Osborne it is 'best understood as a structure of historical time consciousness', one associated with 'the ideas of *innovation*, *progress* and *fashion* and counterposed to the ideas of *antiquity*, the *classical* and TRADITION' (Peter Osborne, definitiion for forthcoming dictionary of modern philosophy).

2 Habermas, 1989

3 Osborne, 1996

4 Pearce, 1992, p 2

5 Pearce, 1992, p 2

6 Pearce, 1992, p 3

7 This term was defined by Michel Foucault in *The Order of Things* (Foucault, 1970)

8 Foucault 1972. It must be pointed out that Foucault's definitions refer to France specifically. While following Foucault's notion of the *episteme*, and of epistemic rupture, I tend to subsume his classical and modern periods into a general period of modernity, following Pearce's definition above.

9 Pearce, 1992, p 2

10 Pearce, 1992, p 4

11 Pearce, 1992, p 4

[12] The concept of mathesis, which I shall deal with in greater detail in a later chapter, means a mental discipline based on mathematics.

[13] Docherty, 1993, p6

[14] Adorno and Horkheimer, 1979, pp 6-7

[15] Jameson, 1991

[16] Coyne (1995) has examined the design of computer systems in the light of postmodern thinking. Landow (1993) has looked at the relation between poststructuralist critical theory and hypertext. Poster (1989, 1995) has discussed the capabilities of digital technology in terms of various strands of postmodern theory. Turkle (1995) has examined the the kinds of decentered subjectivities enabled and encouraged by the internet. Plant (in Robertson et al, 1996) compares the structures of learning and education enabled by hypermedia and the internet to the 'rhizomatics' of Deleuze and Guattari.

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