Museums as Hypermedia
Interactivity on a Museum-wide Scale

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Good management begins with planning, and at the foundations of planning must lie an understanding of the nature of the institution: what its role is in society and how it goes about fulfilling that role. In my own institution, the Canadian Museum of Civilization (CMC) the driving vision of the Director, George MacDonald, was crucial to the project, during the '80s, to create a new museum responsive to the needs of the society it must serve. Of course, a guiding vision is not by itself enough; you must also instil it into the corporate culture. But I do not wish here to address practical issues such as getting management to "buy in", communicating the vision to staff, and ensuring fiscal and other resources are sufficient to achieve the goals implicit in the vision; although these things are vital to managing any project. Rather, I propose to restrict myself to the rationalization underlying the use of interactivity in museums. In creating a museum, all individual projects must fit into the overall picture, as parts of the puzzle. When faced by fascinating and seductive technologies such as those lying behind hypermedia, there is the temptation to climb the mountain just "because it's there". Before embarking on the climb, an institution should know what it expects to achieve, and how the venture contributes to its raison d'tre.

There is still a tremendous division of opinion within the museum world concerning a common mission. Without trying to fit the many different types of museum into one mould, it would be helpful - for purposes of forging a true community based on mutual support - to bridge some of the gulfs. There is distrust, amongst traditionalists, of any significant use of media other than original artifacts or specimens to communicate information about heritage; the traditionalist museum provides an largely passive experience to its visitors. Although audiovisual technologies are today quite common in museums, computers are only beginning to shake the image of being new-fangled. When I first came to CMC, in 1982, almost none of the staff had any computer literacy, and a MICOM word processor was high tech; today the roughly 300 personal computers and 5 multi-user host machines are not enough to satisfy staff demands. And we still have further to go in this revolution: we are only on the threshold of true networking in the museum, and still our Informatics and Audiovisual departments are separate - a discrepancy becoming increasingly problematical.

There is a growing appreciation that museums are not about objects, they are for people. Because they bring together many disciplines, many functions, it is difficult to summarize the role of museums. They are more than just collections, or research institutes, or centres

of education. Museologists often employ metaphors to communicate the essence of a museum. One that has been used is "the museum as medium"; however, when describing the type of museum we are in process of creating at CMC, I prefer a metaphor comparing museums and hypermedia [MacDonald and Alsford 1988, 1990(b)]. That comparison is what I would like to pursue here, for the light it throws both on the character of museums and on the applicability of hypermedia as a museum tool.

To begin with, I suggest that museums need to think of information, rather than of material objects, as their basic resource. This does not diminish the importance of objects, as a source of information (and museums' medium of specialization); yet it justifies the use of a wide range of media for preservation and communication of the memories of the past. It is important to remember than human culture cannot be fully represented through material objects alone; this in itself necessitates that museums be centres of multimedia (if I may be forgiven for using that term loosely), although there are inevitable limitations on museums' ability to portray culture holistically. Information does not exist in our environment in discrete, independent elements, but in the form of an intricately interwoven structure - an information complex [Malik and Thwaites 1988, 2]. Any experience of part of that environment is liable to supply information of various types: intellectual, sensory, aesthetic, emotional, and spiritual. It is within the nature of the act of understanding to dissect and classify; the way our brains process information favours this. Words and images are tools that the mind uses to isolate and parcel concepts, or elements of experience, which are converted into consensually understood symbols and used to model the world in communicating with others. The two types of symbol are processed quite differently in the brain, and are not really interchangeable - as has been found in a number of projects to create visual databases [Keefe 1990, 670; Lunin 1990, 711; Seloff 1990, 686, 693; Besser 1990, 786]. Whatever the type of input, the brain will modify information patterns received, discarding all but the key features, to create perceptual stereotypes, which can then serve as templates against which to compare new information patterns. This is not to deny that the incredible storage capacity and processing power of the brain allows it much flexibility in establishing links between templates to allow it to address new situations.

Although we hear much of visual literacy versus textual literacy, it is not a question of words or images being superior. They provide different and therefore complementary routes to knowledge. Despite the tendency to compartmentalize information, the ultimate aim is to understand everything as a functional whole: to reconstruct and recontextualize. This is reflected in what has been called the "wisdom continuum" [Traub 1990, 7], distinguishing between data (raw elements of information with no independent meaning), information (data organized within a structure of meaning), knowledge (integration, through purposeful relationships, of informational entities that can be applied to understanding experiences), and wisdom (procedural knowledge enriched with experience).

This categorization parallels another, which differentiates between stages of the learning process [Spiro 1988, 375-77]. The nature of introductory learning is to focus on information; that is, on providing a general orientation to a field, by communicating key information elements for memorization. By compartmentalizing information, a well-structured

knowledge domain is created that facilitates memorization, but (by emphasizing only the commonalities between cases) results in oversimplification and creates models that do not correspond to any specific real situation. Advanced learning, on the other hand, emphasizes the context-dependency of information and requires the ability to apply complex and interrelated concepts to individual cases; learners come to appreciate the unique circumstances of each situation and develop the cognitive flexibility that permits customized responses. Finally, expert learning occurs through extensive experience of different cases, and leads to wisdom.

The development both of museums and of hypermedia has in the past been driven largely by their technologies - if, by technology, we refer to computer hardware in the case of hypermedia, and collections management in the case of museums. A growing preoccupation with user needs, however, should mean that both will be more driven, in future, by educational theory. Interactivity, in the sense of active user participation in the learning process, must be an integral part of this. Certainly it is well enough known that participation can be one of the most effective learning strategies. Although hypermedia is an information management tool, in that it is a new way of structuring information of diverse kinds, its main advantage over conventional databases is in the way it allows users to access information and to learn about a subject. That is, as an interpretive tool.

If museums and hypermedia are both information systems whose task is to help users learn about one or more knowledge domains, exploration of the metaphor in the title of this paper may give a richer understanding of the nature of each. I would like to suggest shared characteristics, using my own museum as an example.

Firstly, both are information-intensive environments, embodying resources much vaster than any user can experience in a single exposure. In both cases, however, there is far more raw data in existence than has yet been captured in public access systems, so we are seeing what I would consider stop-gap solutions such as laser disc based inventories in which images have to be accessed through unsophisticated, hierarchical menus.

Whereas most media address individual sensory modes, hypermedia and museums each have the means to increase the number of senses targeted with information. This is not always an advantage, as it can increase the risk of information overload. But the brain is generally accustomed to processing multimedia information, and the variety accommodates different learning styles (e.g. the growing preference for visual over textual information) as well as provides the mental stimulation which holds attention. Visitors seek diverse experiences from museums: they may come to explore, to reverence, to be mystified, to be demystified, to enjoy, to be inspired, and so on. There is no single "right" information delivery system. Some needs can be met by systems in which visitors control the pace of delivery and have time to reflect on their experience - for instance, reading a text, or viewing a static exhibit. Other needs can be met by programmed delivery, in which the pace is pre-determined - such as the case of interpretive theatre or audiovisual presentations. Museums and hypermedia programs can benefit from including both types of information delivery, in ways that deliberately provide changes of pace. Interactivity does not need to

be present every step of the way; for introductory learners, passive receipt of information would be the normal mode.

Information delivery is conspicuously at the mercy of technological limitations, both in terms of storage capacity and transmission speed. This is especially true in a networking situation. Rather than devote a good deal of time and resources to creating stand-along multimedia systems, at CMC our strategy is to first establish the infrastructure for information delivery: an intelligent, wide-bandwidth network that we hope will serve us well for many decades. Construction of a new home for the museum, in the '80s, gave us the opportunity to design in conduit and install cabling at the beginning, rather than face hefty retrofitting costs later. The whole building is wired with coaxial, twisted- pair, and (most importantly) fibre-optic cable, in a star topology. Over 1200 outlets, distributed throughout the museum, are linked by this cabling to high- speed switching equipment in the Infocomm Centre, which also houses file servers, laser disc players, computer-controlled VCRs, and a CATV system. One or two small Ethernet LANs are already operating, but we hope to have the whole network operational by the end of this year and are currently looking at multimedia workstations to see which best meets staff needs for a working environment based on interpersonal computing. We expect the network to allow us not only to link together individual databases, but also to provide easy reconfigurability that will let us take information from any source and send it to any destination, as well as combine different types of information.

Layering of information is another characteristic of both museums and hypermedia; it helps guard against information overload. Where an institution's audience is the general public, it is important to design information systems to meet the needs of introductory and advanced learners. It has been suggested, with some reason, that hypermedia is more suitable for advanced learners than novices, because it reveals the complex interconnectedness of information, and requires judgemental skills to navigate through the information in a meaningful way [Huston 1990, 338]. But simpler interactive programs, designed for well-structured knowledge domains, can serve novices. In the museum context, however, the novice corresponds to the casual visitor interested only in browsing the main exhibits for a relatively brief period of time. This audience needs an orientation to main themes of a subject-area, through exhibits that communicate to several senses at once; a sequential and relatively highly programmed experience is not unsuitable for this type of visitor, and will have its greatest impact at the affective, rather than the cognitive, level. For visitors with more time to spend, more intent on cognitive learning, or paying a return visit, there must be another layer of information into which to delve. More specialized exhibits branching off the main circulation routes will serve them; so too will audiovisual and live presentations, participative opportunities, simple interactive computer programs, and audioguides geared to providing information in varying degrees of detail. The third layer of information is for advanced learners (such as scholars) and can be provided at workstations in the galleries or in study areas such as the museum library.

In the case of hypermedia, layering of information is the consequence of branching. There is an implicit structuring here - of main themes and related or peripheral topics - not

purely hierarchical, since the movement may be lateral as much as vertical, but more akin to cluster classification. We have tried to embody the same concept in some of CMC's exhibitions. The core exhibits in our History Hall are environmental reconstructions, such as streetscapes. Inside some of the houses, stairways lead to an upper floor where exhibits expand upon aspects of the main exhibits. For instance, above period rooms are non- contextualized displays of domestic furniture; and an area on the main circulation route representing the timber trade through loggers' shanty and sawmill is complemented by an exhibit of tools on the upper floor, a room within the sawmill containing exhibits on the life of loggers' wives, and an audiovisual presentation area showing the history of logging in a particular part of Canada. Similarly, we have explored the possibility of using window-wells - visual links between the History Hall and the First Peoples Hall below - to create cultural cross-references, such as an exhibit in the former representing European immigration into Ontario in the late 1700s, with views down onto an exhibit in the latter hall showing an Iroquois longhouse from the same region and period.

The ideal of hypermedia - associative access, in which every item of information can lead to practically every other, to respond to the idiosyncratic conceptual linkages made by each individual mind - takes it beyond the capabilities of a three-dimensional, real space like the museum. While the tendency of many visitors to roam through exhibitions as their fancy, or interest, takes them is well known, an architectural structure with solid walls, ceilings, and floors places practical limitations on the extent of spatial cross-referencing. But hypermedia systems too have not yet achieved their ideal of free-form linkages of information items. Although museums need to unchain themselves from the pre- determined and rigid-thought interpretations that hierarchical classifications are, they must be wary in trying to implement associative access; for to suggest to users that all linkages are equally significant is to abrogate the responsibility to interpret. We need to devise some kind of weighting system that allows users to follow the routes that best match their interests, yet points out which are the most meaningful, most enlightening, to pursue [Bearman 1989, 318]. The question of meaningful navigation is doubly difficult in the case of an image-base, because of the high level of subjectivity involved in describing the content of images.

Nonetheless, the information retrieval method of associative access - contextualization of a sort, and often compared to landscape navigation [e.g. Jones 1990, 30] - has its attractions, in terms of the possibility of approaching a subject from a variety of perspectives. In its movement away from stereotyping towards a fuller appreciation of reality we see the transition from introductory to advanced learning. The potential here is particularly important in a multicultural society, such as Canada is becoming, where the ability to perceive and appreciate alternative cultural viewpoints must be the basis for social cohesion. It is part of my museum's mission to foster intercultural understanding, by presenting differing perspectives; one way of doing this is to bring persons from different cultural backgrounds into communication (a low- tech form of interactivity).

The analogy of associative access with exploring a landscape leads me to believe that hypermedia is yet at a primitive stage, and its future lies in virtual reality systems. Discovery-based learning will operate at a higher level in virtual space (once the technology matches the vision); virtual reality technologies will broaden the scope of experiential learning

through, for example, surrogate travel or roleplaying, as prototype projects are already making clear. Again, the concepts of simulated environments and surrogate experiences find their equivalents in a growing number of museums, including my own, where it is believed that roleplaying is a potent way of helping people learn about other cultures; this is a type of interactivity (with a simulated environment) that we employ particularly with younger visitors, who are more partial to an enactive mode of learning. But even the apparently passive experience of watching interpretive theatre can provide for some intellectual and emotional participation on the part of audiences. Simulation will not in the foreseeable future have the full impact of reality - even the holodeck of Star Trek has its limitations - but the reality of our past has disappeared, and most of our knowledge of the past derives from simulations under the more respected title of "hypotheses".

The potential for creating extremely rich information environments and sophisticated methods of navigating through those environments is expected to empower users, by encouraging decision-making and exploration of a subject from different viewpoints, and thereby nurturing critical faculties. Although not new, this notion is only now beginning to take root in the museum world [Stapp 1990, 5]. My museum shares this goal, and its inherent distinction between learning and teaching. The purpose of CMC's interpretive theatre programme, for instance, is not so much to convey information as to provoke audiences to begin thinking about the dramatized issues, which they are encouraged to discuss with interpreters after each performance. However, I have yet to see any documented evidence that this empowerment is actually happening; it would be comforting were some confirmation available. One of the problems shared by museums and hypermedia programs (at least, those made accessible in public places) is that most users' attention is not held for long enough periods to take good advantage of an information-rich environment; information is merely skimmed, rather than explored in depth. This too supports the need for layering information, and for the belief that hypermedia best serves those few visitors who are interested in penetrating into the deepest layers. From my own observations at my museum, I conclude that interactive computer systems in the galleries receive only short duration sampling (and are therefore most useful when programs are structured so that discrete units of information can be retrieved quickly), whereas those in our library are used for longer study sessions. Although many of CMC's information resources are still in analogue formats - and there remain strong reasons for preferring analogue to digital in some contexts [Bearman 1989, passim] we are looking ultimately towards digitization, partly because of the contribution it can make to an empowering environment by allowing users greater ability to manipulate information. Better integration of media also argues in favour of digitization.

The point has often been made that interactive computer systems - particularly complex databases such as hypermedia and virtual realities - are at this time seriously deficient as regards user interfaces, a deficiency impeding ease of interactivity. This is an especially relevant concern in a museum, where the audience is a diverse one and will contain many who are not computer literate. More naturalistic input methods are needed, and in this area hypermedia development can learn from museums. Although the sense of touch (the source of our more specialized senses) is the most difficult for computers to deal with,

machine recognition of pointing - whether by hand or by sight - is now technologically feasible; a primitive version of pointing is already catered to by touch-screens, which are the standard for public interfaces to interactive computer systems at CMC. Voice communication is also on a near technological horizon. Museum visitors are well accustomed to using both methods as part of information retrieval in exhibitions. The issue of interfaces again illustrates the importance for interactive systems to be driven by user needs rather than by technological tradition. At the same time, neither museums nor hypermedia developers can afford to ignore that the expectations of users are pre- conditioned - that is, they have perceptual biases and technological preferences - by the commercial marketplace, which is driven by the entertainment industry. Again, for this reason, I am inclined to think an arguably premature transition to digital media (notably CD and its variants) inevitable.

Digital media are also favoured by the transmission factor. While there are plenty of stand-alone systems now in existence and some localised multimedia networks, much rarer but badly needed are wide-area networks and multimedia information utilities. No individual museum encompasses all knowledge; the same is true of individual hypermedia systems. To achieve the fullest potential of museums, as information resources, we need to surmount the challenges of technology and standards and move forward both in pooling resources, through telecommunications connections, and of reaching out to the public beyond museum walls. This too is why at CMC we have focused our attentions on creating the infrastructure of a network (along with television studios) capable of serving both internal and outreach needs.

I have seen some excellent low-tech museums. Today's new interactive technologies are not essential to museums, but at CMC we believe they can better help us serve our audiences and meet the goals we believe important to a institution with a responsibility as an information-provider. Both interactivity and new technology are trendy today, and it is important to resist them becoming ends in their own right. At the end of the day they are only tools to help museums achieve educational goals. But I believe that, as the high comparability of museums and hypermedia suggests, they are relevant tools, compatible with the purpose of museums.

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