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ASSIGNMENT OF WORLD WIDE WEB VIRTUAL MUSEUM PROJECTS IN UNDERGRADUATE GEOSCIENCE COURSES

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Abstract—Internet World Wide Web virtual museum projects are viable alternatives to the traditional term paper in undergraduate geoscience courses. Hyper Text Markup Language is so easy to use that students are not distracted from researching their topic, and are thus able to gather sufficient background data. In fact, the intelligent and creative integration of text and accompanying digital artifacts require a level of understanding of the material that is not often achieved during the writing of traditional term papers. Most significantly, the students are motivated to create high-calibre documents by the knowledge that their projects will be exposed to a global audience. © 1997 Elsevier Science Ltd

Key Words: Education, Teaching, Internet, HTML, Database.

INTRODUCTION

The concept of a universal information database has been bandied about by futurists for over 50 years (Hughes, 1993). These visionaries imagined a database that would not only be accessible to people around the world, but would also contain information easily linked to other pieces of information, so that only the most important data would be quickly found by the user (Hughes, 1993). In the 1960s, with the rise of the first computer networks, the idea was developed further, giving rise to the vision of a "docuverse" that could be navigated easily by users, revolutionizing all aspects of human information interaction. Only now has technology, as manifested by the World Wide Web (WWW), caught up with speculation.

The explosive development of the WWW on the Internet during the past 3 years has exceeded the wildest expectations of its originators (Fig. 1). For users, the WWW is a vast ocean of data and images, both useful and banal (Savola, Westenbroek, and Heck, 1995). One of the most powerful applications of the WWW is the storage and distribution of multimedia (Savola and others, 1996). The integration of text, images, sound, and video in millions of WWW home pages worldwide is turning the Internet into a large, globally distributed, and mostly public library. This development is unprecedented in the history of our civilization and may rank in significance with Gutenberg's invention of movable type in the 15th century.

From the perspective of educators, the potential of this tool as a teaching aid is unlimited. For example, during a discussion on the potential impact of climate change, a professor can call up real-time satellite weather maps (WSI Corporation, 1996) or sea-surface thermal imagery of the world's oceans (NOAA, 1996). From his or her office, a lecturer can as easily instruct, or interact with, a class down the hall, or in Havana, Hong Kong, or Harvey Station, New Brunswick. One of the most exciting teaching applications of the WWW is to encourage students to build their own Web sites. Students can collect an extensive array of resources at a single site, which can be explored with simple "point and click" skills. This activity is resulting in a powerful new kind of student-centered "constructionist" learning (McKenzie, 1995, 1996a). Because of their visual character, these learning sites are often described as Virtual Museums.

THE WWW VIRTUAL MUSEUM DEFINED

A virtual museum is made up of a collection of artifacts (almost anything that can be represented in digital form) and text resources, and follows a format that emphasizes the interpretation and explanation of themes. The digitized elements may include paintings, drawings, photographs, animation, graphs, recordings, video segments, newspaper articles, transcripts of interviews, numerical databases, and a host of other items. However, virtual museum should not be confused with a "virtual gallery". Virtual galleries provide opportunities for the

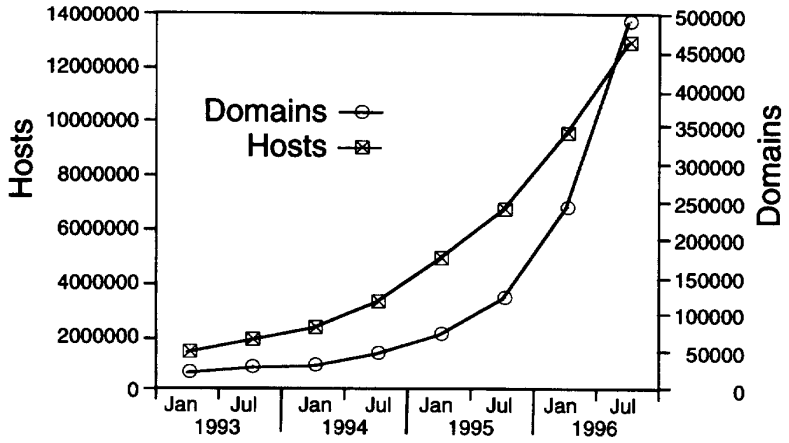


Figure 1. Plot of Internet hosts and domains created from biannual data collected by Network Wizards (1996) (http://www.nw.com/).

display and publication in digital form of student writing, or art, for example. However, virtual museums are more complex, offering a chance for students to plan, develop and publish a multimedia collection around some topic, time period, or question which deserves exploration (McKenzie, 1996a). Students act as "curators" and "designers" in a virtual museum, and as "picture hangers" in a virtual gallery.

The museum database also may offer links to resources around the world relevant to the display (McKenzie, 1995). Using electronic "street addresses" called Uniform Resource Locators (URLs), the absolute or relative locations of information can be accessed. For example, while visiting a display on the development of Western civilization, a visitor may, while viewing a large map of Europe, be able to click on Greece. This action may open a page listing dozens of Greek sites, including: weather reports, mineral resources, tourist guides, economic data, homicide statistics, or marine archaeological data. Click on one of these and the visitor can be whisked away to a different file server housed, perhaps, in Athens, Greece or Athens, Georgia. However, a virtual museum should be much more than a promotional gimmick designed to tempt physical visitors into the "real" museum, or to sell items from the gift shop. A true virtual museum should offer information which supports serious investigation. In short, an electronic visitor should be treated as a real visitor (McKenzie, 1996b).

IMPLEMENTATION OF A VIRTUAL MUSEUM IN THE CLASSROOM

During the winter semester 1996, I experimented with development of a virtual paleontological museum with my third-year undergraduate Evolutionary Paleoecology class. More than half of the class of 21 students took up the option of preparing a virtual museum display using Hyper Text Markup Language (HTML) in lieu of a traditional essay (Patterson and others, 1996). The impetus for assigning these projects was the success achieved previously with similar multimedia computer-based projects. Those earlier projects were compiled using the Apple Macintosh development tool Hypercard and were based on various paleontological themes. In fact, I still use several of the better Hypercard stacks as supplements to laboratory exercises, although these will be ported to the WWW in coming months. In addition, the few professionally produced virtual museums that appeared on the WWW in the last year or so demonstrated to me that the medium was ideally suited for this sort of exercise (see Carroll and Broadhead, 1996, and Hahn, 1996, for selected examples).

HTML-based projects are superior to Hypercard projects in a number of ways. First, it is easier to create results using HTML than with Hypercard (Patterson and others, 1996). In contrast to popular perception, HTML is not a programming language and is therefore not reserved for the technically literate. As noted in one HTML manual, "calling HTML a programming language is like calling a janitor a sanitation engineer—it sounds nice but anyone can learn to scrub a floor with a little knowledge and effort" (Savola, Westenbroek, and Heck, 1995). HTML is a "markup" language and uses the same vocabulary that English instructors employ when they use a red pen to mark missed punctuation, or where new paragraphs should begin. Since HTML is easier to master than Hypercard programming, students are able to concentrate more on the material in their display and less on the requirement of learning a programming language.

Secondly, because HTML is a "neutral" language, completely platform-independent, and transportable, students can create interchangeable results on whatever computer happens to be available (Savola, Westenbroek, and Heck, 1995). This is particularly valuable in the many computer laboratories, where there is a mixture of Macintosh, Windows, and UNIX computers.

Finally, students liked the idea that they were publishing something that many other people might see. This had the advantage that most students made an extra effort to avoid being embarrassed in front of their peers and the Internet community. Since the students were publishing their projects, issues that would never arise during preparation of a standard term paper, such as copyright infringement, had to be considered. Some students circumvented this difficulty by using their own photographs, or drawings. Others took advantage of the numerous images available on the net for free distribution. For photographs that students wanted to use from books, I advised them to write letters to the publishers. It is noteworthy that of more than 40 letters sent out to various publishers, only two publishers took the time to reply. Apparently, most publishers are either not interested in, too busy, or do not know how to deal with student projects such as these.

The results were, for the most part, excellent, although, as in all educational endeavors, some displays were executed with more panache than others. Examples of virtual museum display topics included: the Burgess Shale, Mass Extinction, Complexity Theory, Seismic Risk Assessment, as well as displays on sites of local paleontological interest. I created a "museum lobby" to provide a common entry point for visitors (Fig. 2). Another hour or so of my time was devoted to registering the new "Hooper Virtual Paleontological Museum" (named after Dr Ken Hooper, the first paleontologist in our department) with various web search engines such as Submit It! (1996), which allows registration with several search engines simultaneously. I then installed a counter so that I would have some idea as to the total number of visitors (e.g. WebCounter, 1996). I also created a visitor survey form using HTML so that I could obtain feedback from visitors passing through the site (Fig. 3). Then, the virtual doors to the Hooper Virtual Paleontological Museum (Patterson, 1996) were opened to the world. Nearly a thousand visitors accessed the site in its first 3 months of operation, and the rate of visitation has slowly increased as more people become aware of its existence. Over 100 visitors from all over the world, including most western European nations, Australia, Singapore, New Zealand, South Africa, and all over the U.S.A. and Canada, have also taken time to leave comments. Some visitors merely state how much they enjoyed the museum, whereas others, often fellow educators, add comments as to how future projects might be improved. Many of these ideas are excellent and will be implemented as part of next year's additions to the "museum". The ease with

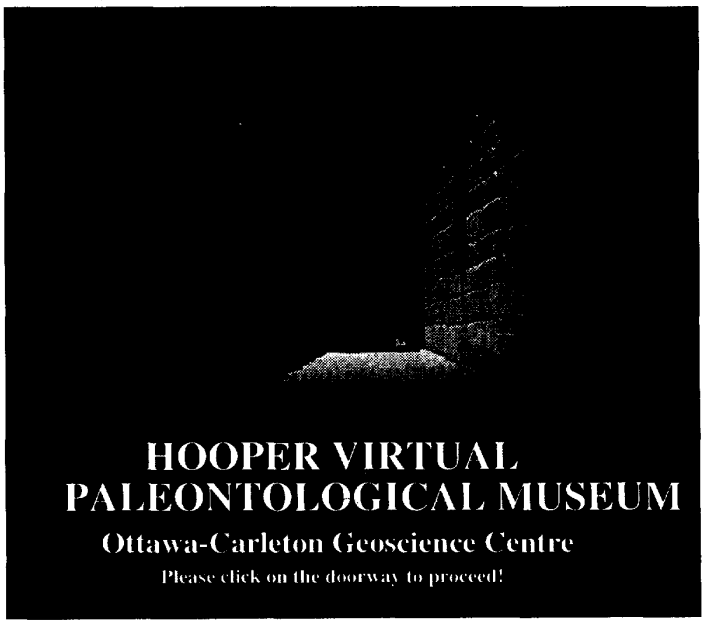
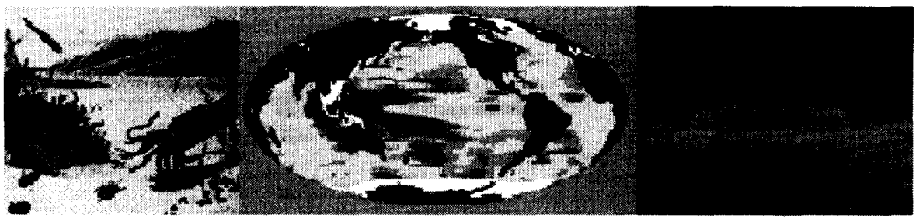
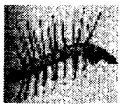


Figure 2. Perspective provided by doorway into this Greek archaeological site is appealing invitation to prospective visitors of Hooper Virtual paleontological Museum (http://carleton.ca/ ~ tpatters/Museum/lobby2.html).



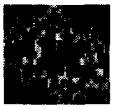
To examine a display click on the thumbnail illustration beside each heading. To visit a new display you must return to this part of the Hooper Virtual Paleontological Museum (HVPM) lobby. Enjoy your tour.

If you have time following your tour please fill in our visitor survey as you exit the museum.



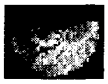
Burgess Shale
Hidden Treasure in the Canadian Rockies

Mass Extinctions
Cycles of Death Through Earth History



Complexity Theory
Impact of Spontaneous Self-Organization on Organic Evolution

Insect Flight
And Other Fascinating Entomological Facts



Cobalt Paleontology
Paleozoic Outlier in the Canadian Shield

Human Evolution
Emergence of Earth's Dominant Species

B.C. Indians
Micropaleontology in Marine Archaeological Studies

Arcellaceans
New Class of Paleolimnological Indicator

Ottawa Geology
The Paleozoic Carbonate Record

Earthquake Hazard
Micropaleontology in B.C.Seismic Risk Assessment

Champlain Sea
Quaternary Ocean Covered Ottawa

Caesaria Maritima
Ancient Harbor Paleoenvironment Project in Israel

Figure 3. Electronic "lobby" is required to provide common entry for visitors to displays in any virtual museum. Integration of thumbnail gifs and descriptive titles for topics helps visitor to select appealing displays to visit (http://carleton/ca/ ~ tpatters/Museum/lobby.html).

which educators can compare notes is another example of the pedagogical utility of the WWW.

The museum received favorable reviews from a number of sources, including Quain's reviews at Time Inc. (Quain, 1996) and linkages from numerous similar sites around the world. The museum was also made part of the Canadian Pavilion at the Internet 1996 World's Exposition (Blokzijl and others, 1996). The "Hooper Virtual Paleontological Museum" has thus expanded beyond its original mandate to become a major "free" publicity forum for our department, introducing us to a potential global student base and a general public that may not have heard of us otherwise.

Another major advantage that creating a WWW Virtual Museum display has over most other undergraduate projects is that they are dynamic, providing opportunity for ongoing activity and progress.

The same students can continue to build on the same project over their entire undergraduate career if they wish, and successive classes can build on their predecessors' work. In fact, several students have continued to work on their Web sites long after the grades were distributed for my paleontology course in the spring. I had not seen this level of enthusiasm for a student project prior to this exercise.

CONCLUSIONS

In conclusion, my experience with the assignment of WWW virtual museum projects to undergraduates was positive and an unqualified success. Because HTML is easy to use, students were not distracted from their main purpose: the researching and understanding of a paleontological topic. The preparation of virtual museum displays by students required as much library research as traditional term papers. The integration of well-written grammar with accompanying digital artifacts required a level of understanding of the material that is not often achieved during the writing of a traditional term paper. In addition, the displaying of their findings to a global audience motivated students to create documents of a higher caliber than normal.

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