CONCLUSION

If the monopolization of Internet navigation by commercial interests is allowed to continue, the next millennium may see the democratizing aspects of the medium decline to the point where it will be of little use, except for marketing communications.
—Jan Samoriski, 2000

The most important thing about the World Wide Web is that it is universal. By exploring this idea along its many axes we find a framework for considering its history, its role today, and guidance for future developments.
—Tim Berners-Lee, 2002

The internet is different than all the other communications and educational media. Of course it's different in that it's a platform that converges all media; it has unlimited space; it is relatively easy to create and distribute web content (after the initial wiring and computer expenses are outlaid), and it's a global medium—extending its reach to voices and people around the world. But the internet is also different in that, unlike any medium before it, the government backed it as a school technology. Never before had any educational medium been so fervently pushed and so richly financed, allowing it to be widely adopted in schools and businesses, and homes as well.

But with all the expense to get schools wired, and the expanded rhetoric about the information highway, where's the educational content? One could say it's everywhere and nowhere. Students think its everywhere, relying on the web for the bulk of their school research and social activities—their research projects are based on the content they find online. And why not? They are comfortable with this medium. They reap millions of search engine hits. They have their own searching shortcuts in place. Believing that search engines offer them a research utopia at their fingertips, students expect that search engines deliver information as promised: quickly and effortlessly, no matter who the content provider is. Influenced by flashy and appealing design elements, students play into advertisers' dreams. They determine web page credibility by the flashiest design, not the most comprehensive content. Consequently, they overlook incredible—yet plainly-designed—sites like the Internet Public Library, which has one of the most comprehensive newspaper, magazine and serial databases available online. They skip over ibiblio, which requires that they deep link into the web site's rich archives. As such, students are adopting a consumer, rather than an intellectual mindset in their approach to information. Although the packaging has no appreciable relationship to the content, students mistakenly perceive that it does. In other words, critical thinking goes out the window.

This is not necessarily students' fault, or the fault of their teachers. The problem is that delivering organized academic content to students—consolidating useful online information for the purposes of education alone—has not been a national priority. Indeed, educators in Walnutville and nationwide have a dilemma: similar to the adage that warns "don't bite the hand that feeds you," it's difficult to critique what you've asked for—or what you've been given. Educators feel obliged to focus on the positive aspects of the web—its power, its many outstanding web sites, its richness—not its advertisements, marketing schemes, deceptive

navigational tools, commercial clutter, and the relative lack of web site coordination for the purposes of education. The status quo of commercial domination of media technology seems just fine from the U.S. government's point of view—it has been since the radio era. Meanwhile, educators publish meek how-to guides to "good" web sites, but explicitly avoid concerted discussions about where online content is going, how this content should be harnessed for schools, and who should do the harnessing. To begin such a wholesale critique of the web and its commercial evolution requires a great deal of resolve. It means that we have to question the economic, political and social fabric of American life. To demand for better organized online content requires even more resolve. It means calling for a national educational portal, competing with commercial vendors, and insisting on public funding. None of this is easy, but this is what we have to do.

Steps to Take

Despite many educators' expressed annoyance and frustration with the increasing for-profit imperatives of the internet, it remains to be seen if educators have any solutions to the internet's troubling trajectory. I am proposing action in two areas that may help harness the internet for educational purposes, even as the commercial highway becomes more pronounced. The first area concerns web criticism, and the second area concerns web content.

Web Criticism

As illustrated by the Walnutville case study, teachers already have methods available for critiquing web pages. But to understand the entire internet from a critical perspective, the critique needs to be more expansive. This means finding ways to help teachers step from a critical reading of individual web pages to a *critical literacy* approach to the internet. Cervetti, Pardales and Damico (2001) make helpful distinctions between critical reading practices and critical literacy: Critical reading is all about figuring out the "correct" meaning of a text—be it a letter, a book, a TV sitcom, or hip hop lyrics. For example, a student reads a Shakespeare play in English class and tries to understand what Shakespeare *really* meant. In examining a text's truthfulness and reliability, critical readers can then evaluate its function in society. This is the way web page evaluation is currently taught in most classrooms—students are generally asked to decipher which web pages offer the most valid or "quality" factual data, and then they use the "best" data to write objective, fact-based reports on a single issue.

As Cervetti, et al. (2001) explain, critical literacy aquaints students with the social, historical, political, and economic dimensions of all texts. Far beyond trying to decode the true intentions of a text's author, critical literacy teachers ask questions about what the text is and can be for others, how it was written and organized, under what conditions it was written and organized, and for what purposes? Furthermore, students reading the texts are encouraged to ask what perspective the texts advance and whether these perspectives should be accepted:

> Learners begin to reflect critically on the nature of literacy and literacies as social practices. Once they recognize that texts are representations of reality and that these representations are social constructions, they have a greater opportunity to take a more powerful position with respect to these texts—to

> reject them or reconstruct them in ways that are more consistent with their own experiences in the world. (Cervetti, et al., p. 3)

Using a critical literacy approach to discuss online content, questions would be more in the realm of how and why web sites are constructed, how many target audiences can be identified, what are the design genres of a particular site, what persuasive strategies are in place to keep users engaged with a particular web page (see Luke, C., 2000, p. 427), and what information *isn't* present and why (see Burbules & Callister, 2000). In Burbules and Callister's words, a critically literate assessment of internet material uses discussions about misinformation, malinformation, messed-up information, and mostly useless information to highlight and reflect upon the procedures and criteria by which people identify information as "mis," "mal," "messed-up," or "mostly useless." Rather than pure evaluation (good vs. bad), it places all information on an ideological continuum.

High school teachers might apply critical literacy, for example, to a discussion of Johnny Appleseed—a popular character in U.S. elementary education. A search of his name on Google will deliver an abundance of sites—many targeting elementary (K-4) school teachers and students—that discuss Johnny Appleseed as a "folk hero." This is what I encountered on a June 2003 search of "Johnny Appleseed" on Google: The first hundred or so sites included promotional pages for the apple juice industry, teacher lesson-plan web sites (both commercial and nonprofit), and sites for organizations, nature trails, festivals, ecology clubs, and the like, that simply contained the "Johnny Appleseed" name. These sites typically described John Chapman (his real name) in limited terms—terms very similar to the 1948 Disney cartoon *The Legend of Johnny Appleseed*: He was a kind and generous man, but a bit of a loner, who planted apple trees, carried a Bible, went barefoot, and wore a pot on his head as a hat; he is famous for delivering apples to settlers by planting thousands of apple trees. The web site descriptions (the kind of "factual" information students are often told to look for on the web) were most often accompanied by a cartoon-image of a smiling Johnny Appleseed wearing a pot and eating an apple. Many of the sites also suggested a broad assortment of activities teachers and students can do with apples: make apple pies, eat apples, eat or make apple sauce, visit an apple orchard to pick (and eat) apples, and even invite a Johnny Appleseed look-alike to come to the classroom, hand out apples, and talk about Johnny Appleseed, the pioneer hero. All these sites appeared to be purely factual. They offered corroborating, objective-sounding information, and contact information for the web page creators. Some even posted web awards. One might conclude that these web sites—the most popular Johnny Appleseed sites on the web, according to Google's search engine method—reveal the truth about Johnny Appleseed. But in fact, they are merely perpetuating a myth that was established early in the 20th century, long after John Chapman died in 1845 (or thereabouts).

To better understand the mythology of Johnny Appleseed, it is helpful to turn to a book, not an internet site, for a fuller sense of how this man became canonized in U.S. culture. The book is called *The Botany of Desire* (2001), and is written by Michael Pollan, who, through historical investigation, personal musings, and his own knowledge of botany, has put together a much more complicated picture of John Chapman than any of the above web sources. For this history, Pollan also turned to books and print articles—now-forgotten biographies written between 1870 and 1955—which described John Chapman as a savvy businessman who professed the Swedenborgian doctrine (a sort of mystical mixture of Christianity and Buddhism); an entertainer and news informer frequently invited into settlers' homes; a strange man who may

have had a predilection for young children, especially girls; and—despite his burlap sack clothing and bare feet—a wealthy man. But the most interesting thing about Johnny Appleseed has more to do with apples than the man himself. As Pollan explains:

> it was a single botanical fact about the seeds themselves that made me realize that his story had been lost, and probably on purpose. The fact, simply, is this: apples don't "come true" from seeds—that is, an apple tree grown from a seed will be a wildling bearing little resemblance to its parent. Anyone who wants edible apples plants grafted trees, for the fruit of seedling apples is almost always inedible—"sour enough," Thoreau once wrote, "to set a squirrel's teeth on edge and make a jay scream." Thoreau claimed to like the taste of such apples, but most of his countrymen judged them good for little but hard cider—and hard cider was the fate of most apples grown in America up until Prohibition. Apples were something people drank. The reason people in Brilliant [Ohio] wanted John Chapman to stay and plant a nursery was the same reason he would soon be welcome in every cabin in Ohio: Johnny Appleseed was bringing the gift of alcohol to the frontier. (p. 9)

The botanical reality of apples, then, quite effectively disassembles the myth of Johnny Appleseed as the bringer of sweet-tasting apples to the frontier. Since hard cider was considered more sanitary than water, even children drank it by the bucketfuls. People and children on the frontier, in other words, were largely drunk. As Pollan reveals, it wasn't until the Temperance Movement in the early 1900s (which would lead to Prohibition in the 1920s) that hard cider would cease to become a popular U.S. beverage. And it was this movement against hard cider that forced the apple industry to create a need for apple eating, not apple drinking. The ensuing public relations campaign would popularize the slogan "an apple a day keeps the doctor away," associate the apple with good teachers and school in general, and retool Johnny Appleseed, the Swedenborgian missionary, into a Christian saint who delivered apples, not hard cider, to the frontier. Today, Johnny Appleseed is embraced as a child's hero and celebrated in elementary schools.

While never claiming his historical investigations got him "that much closer to the *real* John Chapman" (p. 6), Michael Pollan has managed to integrate Johnny Appleseed into a much broader cycle of economic, social and historical events. In understanding the many dimensions of this myth, students can understand how information exists on a spectrum; they can observe how each web site is no longer a factual document but an example of a myth perpetuated. They can go back to their Google search result list and see how many pages play into the sanitized version of Johnny Appleseed, and look for alternative versions of this story. It shouldn't come as a big surprise that the very first site returned in my Google search was the Processed Apple Institute's (aka: the apple juice industry's) promotional page (www.applejuice.org/johnnyappleseed.html), which tells the Disney version of the man, and even writes (perhaps erroneously) that John Chapman's favorite book was the Bible. With their new perspective, students can both see the error, but understand why that error exists. The world is a complex place and facts are malleable: understanding this malleability is the goal of critical literacy. Students investigate why and how certain information becomes status quo, and they learn to understand that some perspectives are marginalized in this process.

Critical literacy depends upon synthesizing a variety of voices and points of view. In this case, Michael Pollan's discussions can be placed in direct contrast to the many web sites, but also books and films, that romanticize and simplify John Chapman's life. However, analyzing Johnny Appleseed information on the internet can also be a critical lesson on the limitations of

the web itself as an "all-encompassing" information superhighway. If students try to find online web pages that go *against* the folk hero myth, as Michael Pollan's book does, they will have great difficulty. In 2003, only *one* web site among hundreds of a Google search offered a different, more complex perspective of John Chapman. Created by Professor David R. Williams (aka Dr. Dave), who teaches in the English Department at George Mason University, the site is marked by the infamous "tilde," and might suggest to some students an opinionated personal page. Indeed, the site is opinionated. "Anyone interested in cider in America needs to know the true story of America's number one appleholic, the first American hippie and religious freak, Jonathan Chapman." What Williams has posted, however, is an amazing primary document: the scanned version of the very first article written about John Chapman, "Johnny Appleseed: A Pioneer Hero," which was published in *Harpers* magazine in 1871. This is one of the very documents Pollan refers to in his own book.

It is a testament to the internet's versatility that this seldom-seen article, not in the public domain (meaning it is so old it isn't subject to copyright restrictions) is online. Williams' page, available at http://mason.gmu.edu/~drwillia/apple.html, is also a testament to the internet's commercialization: the page has become increasingly hard to find. In 2002 it was on the fifth page of a Google search. By 2003, Dr. Dave's web site, although still online, was not even considered among the first twenty-five pages (I gave up looking for it). The marginalization of this web site (and the overwhelming redundancy of other Johnny Appleseed information) can generate good discussions, one hopes, about the lack of depth and variety of web information available to a student using a search engine. In addition, the use of Michael Pollan's highly acclaimed *The Botany of Desire* (which was a bestseller in 2001) can beautifully reiterate the value and importance of books in the age of the internet. It seems clear that students' entire online research experience would change if they developed a knowledge base about a subject before they began hunting, via search engines, for information. Students could then make informed critical judgments about online material, and help them be more critical, on the whole, of the internet as a research tool.

One could also apply critical literacy to broaden a discussion about controversial steroid supplements such as creatine (baseball slugger Mark McGuire's supplement of choice), or diet supplements such as ephedra. Designer drugs fascinate high school students and, according to Walnutville teacher Steve LeRouge, are frequent student research topics, at least in his class. The following critical literacy exercise on ephedra (developed by Scott Harmsen of the University of Northern Iowa) asks students to conduct an initial Google search on ephedra. The search will, inevitably, yield page after page of commercial ventures that supply "facts" about ephedra's benefits (while simultaneously trying to sell the drug). Other pages will be more subtle, masking as research institutes or educational organizations while really attempting to change public opinion for the supplement industry's advantage. (A closer look at The "Ephedra Education Council," for example, reveals that it is backed by companies with a huge stake in the diet supplement trade.) Using web page evaluation strategies (e.g., who is the author/sponsor; how objective is the information), students would investigate a number of pages on their search result list. But for a critical literacy approach to this topic, evaluating these web pages would just be the initial step. Students would then attempt to find documents on as many sides of the issue as possible: the commercial vendors; the government regulators, the various medical organizations (such the American Medical Association or the American Heart Association) and the regular people sharing personal experiences. Since commercial search engines stack web sites in favor of commercial vendors (edging out other voices), students would need to investigate newspaper and

magazine articles, books, library databases, blogs, government resources, and a range of subject directories as well. Students would then develop a range of opinions using all the information gathered.

Next, students would begin investigating why certain opinions have prominence over others. To do this, they would need to check out the way these supplements have been regulated by two key industries: the Food and Drug Administration (FDA) and the Federal Trade Commission (FTC). With a little bit of probing on the FDA's site, they would be able to find information on the Dietary Supplement Health and Education Act (DSHEA). The act, which was passed in the mid-1990s, essentially allowed the FDA to stop regulating the supplement industry. As a result, there is little oversight on the industry; scientific testing is not required to test the safety of a dietary supplement. Because Congress required the FDA to look the other way, there is now an avalanche of untested diet pill products, many of which are advertised and promoted on the internet. After learning about the FDA's role in deregulation, students would then go to the FTC web site, the organization in charge of regulating trade practices. Here they would learn that the FTC is also largely required to turn a blind eye to the marketing and selling practices of this burgeoning and unsafe dietary supplement trade. They would learn, for example, that while the FTC was "concerned" about the explosion of unsafe diet pills, they felt that "self-regulation" was the best solution, and called upon (but did not require) media outlets to verify whether an advertisement was truthful or not before allowing it to be printed or broadcast (Harmsen, 2003).

In proceeding through these government web sites, and then relating current regulatory practices to the information on their search result list, students can better understand how government policy influences the kind of information they can find about Ephedra and other dietary supplements. They might want to investigate further into the lobbying efforts behind the DSHEA. They could look at newspaper and magazine articles at the time of the DSHEA decision, and document the controversy about the act. They might also consider an historical investigation, looking at the deluge of unregulated patent medicines in the 1900s, such as Lydia Pinkham's Vegetable Compound, that led to the creation of the FDA in 1906.

This kind of critical literacy investigation brings students into a much larger and complicated world of ideas. It takes their critique of an individual web page far beyond its adherence to credibility criteria and helps students understand that ideas are filtered through an economic, political and social framework. Furthermore, this kind of critical literacy allows them to explore areas of the web—such as government sites—that they would not necessarily reach through a search engine. It shows them that a few pages of one book, or the careful reading of a federal law, can be more valuable than a million web sites in terms of figuring out how our world works.

Moreover, if the web is de-mystified as an all-encompassing information superhighway, we can begin to understand how it is not a neutral resource, and how its commercialism impedes the medium's chances to become the educational medium it could be (see Robins and Webster, 1999). Critical literacy discussions about search engines, subject gateways, and the problem of paid placement would be valuable in the classroom (see Luke, A., 2000). Investigations into the heavyweight internet and media companies such as AOL Time Warner, Microsoft, Comcast and their vision of the medium's future, contrasted with other visions of the internet, would also be valuable. Explorations into the marketing tactics of such data-gathering companies as Doubleclick and Virtumundo, filtering services such as N2H2, and school portal services such as AOL@SCHOOL would be worthwhile, especially if students read, compared, and discussed company privacy policies, press releases, and annual reports—all of which are available on the

web. Lessons about the internet's history as the country's newest mass medium, especially in relation to preceding mass media, would help students place the internet in its proper context. Discussions about what role the web should have in education is also imperative in understanding the medium as a resource for information, ideas, and learning. Finally, as Robins and Webster (1999) suggest, we should extend the discussion beyond the technology. "We must be concerned to explore the limits of the technoculture in the name of values that are more important and worthwhile," they write. "Those values will be in part directed against the new technologies, but more importantly against the capitalist imperative that drives and shapes the new technology agenda" (p. 6). In sum, we're shortchanging students by not letting them in on the bigger picture.

Web-based assignments should change too, reflecting some of the explorations and discussions mentioned above. Assignments like the one Ted Rockenbrodt developed for his Developing Nations class, which asked students to pose as businesspeople and search for solely consumer information, only affirm to students that the internet serves (and should serve) commercial purposes. Furthermore, research projects, which traditionally require students to assemble objective facts gathered from the web (with web page evaluation assignments worked in between), should change too. I think it's important to help students understand the non-neutrality of all texts and regard the web as a place for opinions, not objective information, a place where the best developed arguments, not the slickest packaging, should gain their approval. As Kapitzke (2001) recommends, students should be gathering a multitude of perspectives rather than objective facts, and learning to synthesize these perspectives. With opinion-based assignments—assignments that require students to think interpretively rather than regurgitate facts—the tendency to plagiarize off the web would certainly decrease as well.

If educators still adhere to assigning traditional fact-based research projects, then they should at least discourage students from relying solely on web search engines for their research. Educators should ask students to read a wide range of resources and allow them enough time to carefully do this research (or condition students with research schedules). We should not allow students to exclude a whole history of established library holdings just because it's easier for them to type in a key word. If solid research is about triangulation, we should go beyond asking students to triangulate between web sources (as a few students in my study instinctually did), but triangulate between a number of library media in addition to the web.

Web Content

Another step to take is to steer students away from commercial search engines and acclimate them to subject gateways, which rely on content editors to organize web information into subject categories. The Walnutville students preferred the ease and speed of search engines, but—in terms of results—liked subject gateways. Unfortunately, these experiences with subject gateways were more accidental than planned. For example, Walnutville students found Lightspan and Britannica.com (before they both became fee-based in 2001) quite helpful in their online fact-finding missions. Even though they begrudgingly re-typed their key words into the portal's database (so time consuming!), they remarked at how perfect the gateway selections were that they found.

At the moment, however, educational subject gateways are, like search engines, dominated by commercial enterprise. The "free" subject gateway/school portal AOL@SCHOOL is overtaking both the commercial and noncommercial educational web portal scene, gaining

endorsements from a coterie of governors and administrators who are mandating that AOL@School become the default platform on school computers across districts and even states. Because it's not producing any original content, AOL@School has the relatively easy task of linking to already-established educational web resources—such as a PBS page on the Civil War—or drawing upon the links that other services (e.g., The Librarian's Index to the Internet, the Internet Public Library, and the National Science Digital Library) have been organizing for years. Again, it is the moneyed sites like AOL@School and Yahooligans! that can build strong brands with widespread advertising/public relations campaigns, large design budgets, and an attractive assortment of related services such as email and interactive games.

As the radio industry overpowered and absorbed educational stations and turned radio into an advertising-based medium, commercial subject gateways have a similar economic incentive to become *the* educational resource of choice, overwhelming nonprofit subject gateways and becoming the accepted standard in school, advertising and all. Less outrage over in-school commercialism today, as compared to the radio era, and a nonchalant attitude towards online commercialism among educators and students may very well smooth this process. Yet what will prevent these huge companies from reconsidering their "commitment" to education and the future of their "public service" portals?

As parent company AOL Time Warner continues to have financial difficulties—particularly in its AOL unit—the already limited AOL@School content will likely deteriorate. Yahoo!'s own history of reversing privacy terms is indicative of its obligation to the public interest (Baird, 2002). As its Yahooligans! subsidiary successfully overwhelms its nonprofit counterparts and gains more power as an all-purpose search tool and K-12 gateway, the company may decide that its educational mission is over. This is what happened to Microsoft's ambitious online education endeavor, Microsoft.com/education, which today is a rambling mess. Although the site still offers a paltry collection of lesson plans, these are mostly ideas on how to use Microsoft products. Disney's "Edu-station" venture is now a venue for Disney "learning" paraphernalia (e.g., the *Aladdin Storybook*; Pooh's Balloon Game for the classroom, a game about letter identification); and Apple's Global Education Network has found a niche as a fee-based online course service.

Today AOL@School, the leading commercial education portal, spends most of its energy "partnering" with other commercial educational initiatives, all of which have vested interests in promoting they're narrow online offerings. Generally speaking, when educational motives are supplanted with profit motives, the outcome may not be in the best interest of students. For these reasons, it's best to use, promote, and fund the significant number of *nonprofit* online subject gateways that currently exist to steer users to education-minded web pages and otherwise elusive material related to specific fields or disciplines.

Librarian-created subject gateways

Both public and academic librarians have been at the forefront of the web page sorting effort. Some initiatives have benefited from state sponsorship. The Michigan Electronic Library (MeL), for example, was one of the first subject-based catalogue on the internet, developed by librarians in 1992. KidsClick! was established within the Ramapo Catskill Library System in New Jersey. The site, which serves the K-12 community, is now maintained via the Colorado State Library. The Librarians Index to the Internet (lii) operates out of California's Public Library System and draws upon librarian contributors in California and Washington State. Other initiatives have developed out of large research universities. Perhaps the most well-known of this

genre is the Internet Scout Project (based at the University of Wisconsin) and the Internet Public Library (based at the University of Michigan's School of Information). Both projects serve the public library and K-12 communities. The Internet Public Library also works as a training ground for graduate students at the university, as well as a research tool for faculty.

Academic librarians are also heavily involved in broadly-defined subject gateways that mainly serve the needs of higher education. INFOMINE is based at the University of California and relies upon librarian input from a number of other universities; the Gateway to Online Resources is affiliated with the University of Iowa; and InfoTree is affiliated with Ohio University. Indeed, there is a lot of redundancy, with academic librarians at all major research universities offering some sort of internal gateway to selected web resources. All of these projects cover a vast selection of content categories (e.g., Arts and Humanities; Business and Economics; Computers and Internet), which are then divided into more specific subheads.

Meanwhile, the Online Computer Library Center (OCLC), the world's most prominent library cooperative (serving over 40,000 libraries worldwide with cataloguing services) has moved to integrate selected web links into its database. As such, users at an OCLC-affiliated library can find relevant academic web sites while they search for books and other library holdings. This idea is very similar to what Hillup media specialist Jill Whitmore was attempting to do with her own elementary school catalog—including all academic resources, web and others, under the same cataloguing system.

Finally, nearly every academic library at institutions of higher education, as well as many other museums and archives, are actively digitizing special collections and putting them online—all types of printed and written documents, as well as maps, photos, theses, journals, audio, film and video. Unlike the subject gateway model, which features external links to web pages, these digital repositories are internally generated: scientific contributions from the University of Bologna, photo collections of the Boston Gas Company from Boston College, a collection of poems by British women from the University of California. New academic content is being generated by libraries, societies and organizations by the hour.

Citizen-created subject gateways

While librarians and archivists are dedicated to the control and access of approved, "known" material, other noncommercial subject gateways eschew library knowledge and champion citizen and scholarly experts. The Open Directory Project, for example, is a grass-roots, open source movement phenomenon. Volunteer citizens, not librarians, add web pages to the directory and edit subject headings. "Citizens can each organize a small portion of the web," the project's web site reads, "and present it back to the rest of the population, culling out the bad and useless and keeping only the best content" (About The, 2003). The Open Directory's free and formidable index has long fed commercial search engines, which spider through these resources as they scour for web content. Another collaborative directory is ibiblio, which draws upon over one thousand volunteer contributors who tend to specialize in a particular field. As ibiblio director Paul Jones explained, "We think specialists in their fields understand what they're doing better than librarians do. We collect the best people—and their work" (Jones, 2003). Another example is the Merlot Project, which relies upon a community of volunteer professors to judge and advance web content. Each contributing scholar manages a subject area, and both annotates and rates selected web sites. Perhaps the fastest-growing open source movement is wiki (quick in Hawaiian), a social software trend that enables any user to edit and build a given web page within a wiki site. Wikipedia, for example, is a collaboratively-built

encyclopedia. Volunteer contributors change entries in an atmosphere of trust and public goodwill, and all former entries are archived so a user can see how a certain topic area has evolved.

Government-created subject gateways

A final and extremely important area of subject gateway activity involves government-driven projects. To date, the U.S. government has acted slowly and gingerly towards coordinating web content for education. This is in part due to minimal funding, but also in part due to a desire to do it right. Today, the most exciting federally-sponsored subject gateway projects in the U.S. are coming from (or are being enabled by) the National Science Foundation. The NSF is an apt place, perhaps, since it was this organization that bankrolled the internet's backbone until 1995. Specifically, it's the National Science Digital Library (NSDL), a branch of NSF, which has been granting web content initiatives since 2000. Mostly interested in funding projects related to undergraduate science education, the NSDL awarded $13 million to about 80 proposals in 2000, and by 2003 was awarding $23-4 million to about 200 project proposals—mostly projects aimed at making the digital science libraries of hundreds of U.S. universities and colleges accessible via the NSDL.

Beyond funding these individual projects, the NSDL has partnered with a myriad of noncommercial and commercial databases and services. Most are science-related, including MIT's Dspace, a digital capturing, preservation and distribution network; PBS Science, Infomine, the *New York Times*' Learning Network; and the Scientific Learning Corporation. Beyond amassing a considerable subject gateway network to serve undergraduate science, the NSDL is also branching out (slowly) to the humanities and K-12 audiences. Its partnership, for instance, with the Internet Scout Project. is an example of NSDL's potential as a national gateway. Based at the University of Wisconsin, the Scout Project has been compiling academic higher education and K-12 web sites since 1994. According to NSDL director Lee Zia, a key goal is to begin providing organizational glue to pull together these archives and bridge more relationships with the humanities, especially in connection with the National Institute of Museum and Library Services. "The words 'national' and 'science' are constraining us," he said, noting that despite the potential for the NSDL to create a more inclusive portal, it does not have a formal charter to move on to the non-science areas. Regardless of the NSDL's progress as a cohesive subject gateway, Zia has also been content to go slowly and cautiously. Seeing the NSDL as an organic, evolving creature, he fears that a well-meaning legislature will likely act on the over-promise of the NSDL interface:

> I make an analogy with Wal-Mart in order to illustrate how we want to be careful about our expectations. When Wal-Mart opens up a store, they open up a whole store, not just lightbulbs in aisle six. The NSDL is very different from a store that has a physicality to it…there are places to get stuff, there's a cash register. But in this new space, it will always evolve with the net. Once people go there to find something they can use, we have to make sure we have something to offer (Zia, 2003).

Two possible futures await the NSDL, as current funding under the NSF remains tenuous. First, it could become like the Library of Congress: completely funded in perpetuity in the public good. Indeed, Zia is now trying to stimulate funding for a national treasure. Second, it could become quasi-independent like the Smithsonian, which has a nonprofit component and is supported through other institutions. Whether the NSDL remains resolutely in science or

expands to a general education portal is another question. Currently, no other governmental body has moved to formally aggregate internet sites beyond the sciences.

While one would assume that the Library of Congress would be a natural place for coordinating and promoting a national subject gateway effort, the LOC has instead concentrated its efforts on making the Library's primary source materials available online. Its digital preservation initiative includes The American Memory Collection, The Global Gateway, and America's Library, all of which feature rich photographs, sound recordings, film clips, and other data that would otherwise remain deep within the Library's archives. "We have the goods," said LOC Digital Reference Specialist Elizabeth L. Brown, noting that the Library's mission is to now make these goods easily available via the internet. These digitization projects are significant contributions to education, but they focus inward rather than outward. And despite the value of this material, outreach efforts have been minimal: a summer education workshop for 50 teachers or librarians a year (since 1998), and a mailing to the social studies and English administrations in schools within the two counties around Washington, D.C.

The U.S. Department of Education has also begun some key subject gateway initiatives, but the focus is on teaching resources rather than organized links for students: the Gateway to Educational Materials (GEM), for example, provides access to over 25,000 Internet lesson plans, making it a one-stop browsing archive for teachers; the Federal Resources for Educational Excellence (FREE) is another teacher database that draws upon governmental web sites like the Library of Congress and the National Endowment for the Humanities; and the Virtual Reference Desk (VRD) is attempting to combine a web resource center—now painfully limited—with an option to email questions to librarians. In 2002 the U.S. Department of Education also began a five-year project with the University of Syracuse, the University of Washington, and the Online Computer Library Center (OCLC) Institute to combine GEM and VRD and "develop cutting-edge portal gateways to a broad range of online education resources" (Holmes, 2003). Once again, the main goal is to reach and serve teachers. All of these sites are still in their developmental phases and have a way to go before they are user-friendly.

Gateways in Europe and Australia

To date, nonprofit and government subject gateway projects throughout the U.S. have moved very slowly. Many nonprofit gateways, such as Infomine and the Internet Public Library, have directly competed against each other for the same limited grant money, a situation that has dampened the desire for collaboration. As Steve Mitchell, co-coordinator and managing editor of Infomine, remarked "The U.S. has a lack of focus, a lack of organization. The economic challenges are starting to mount, and there's a lack of leadership and vision" (2003).

Although the government-supported subject gateway initiatives in the U.S. may be disconnected and not well-funded, the European and Australian counterparts have benefited from a strong vision, collaboration, and healthy funding, especially in the area of higher education. The Dutch Electronic Subject Service (DutchESS); the Finnish Virtual Library (FVL), the Education Network Australia (EDNA), and the U.K.'s Resource Discovery Network, for example, are all nationally-supported subject gateway systems. Collaboration has come easy because both the education systems and the funding arrangements are centralized. Instead of grants, every involved institution operates under contracts.

Britain's Resource Discovery Network (RDN), for example, is supported through especially generous funding from the Higher Education Funding Councils for England, Scotland and Wales. Universities throughout the U.K. are responsible for the growth and update of

particular subject areas: ALTIS (University off Birmingham) deals with Hospitality, Leisure, Sport and Tourism; BIOME (University of Nottingham) covers Health and Life Sciences; EEVL (Heriot Watt University in Edinburgh) handles Engineering, Mathematics and Computing; GEsource (the Consortium of Academic Libraries in Manchester) is concerned with Geography and Environment; Humbul (Oxford University) is taking on Humanities; PSIgate (also located with the Consortium of Academic Libraries in Manchester) manages Physical Sciences and SOSIG (University of Bristol) is responsible for Social Sciences, Business and Law. Each of these University hubs is amassing thousands of "authoritative" academic web resources on their assigned subject area, with hundreds of active content experts from over 70 educational and research organizations contributing web links. The RDN initiative is actually only a small part of the U.K.'s larger Electronic Libraries (eLib) Programme, which is lavishing significant funds on academic libraries and institutions to digitize special collections, including theses and all forms of academic research. "The main remit is to provide a body of tangible, electronic resources and services for U.K. Higher Education," an introduction to the eLib programme reads, "and to affect a cultural shift towards the acceptance and use of said resources and services in place of more traditional information storage and access methods" (Introduction, 2001). The U.S. has not reached this level of coordination because its universities and colleges are either state or private entities (hence more discrete), and because the various independent subject gateway initiatives are grant, not contract-based, allowing for more creativity and innovation, perhaps, but also less consolidation and communication.

Even with widespread efforts to organize the web for non-commercial and research purposes, all subject gateways—even the ones in the U.K., will only be successful if people know about them and use them. At least in the U.S., subject gateway initiatives—especially the one dependent on state, rather than federal support—continuously struggle for funding. And without funding, commercial alternatives will surely have the upper hand. For example, a number of professors participating in the Merlot Project worry that corporate partnerships and advertising loom on the horizon, threatening the projects' independence and usefulness. The difficulty, of course, is to generate public awareness about the existence of noncommercial directories and why they are important to the future of the web and democracy. Merlot Project contributors do what they can to spread the word: one of their tactics is to wear buttons at conferences that say "Ask Me About Merlot." "I joke that it's like Amway," Merlot director Gerard L. Hanley told the *Chronicle for Higher Education*. "You get one person who then goes and sells to five other people, who each go and sell to five other people. As the math guys know, that's exponential—that's good" (Young, 2002).

In their book *Watch It: The Risks and Promises of Information Technologies* (2000), Nicholas Burbules and Thomas Callister advise against subject gateways, seeing these tools as a way of censoring content—limiting the kinds of material available on the web. Accordingly, they see any government-sponsored initiatives to set aside corners of the internet as nonprofit, or, in their words, "charitable zones" along the lines of the Public Broadcasting System, to be misguided, and even dangerous. "Certainly," they write, "government intervention raises its own dangers of ideological control" (p. 145).

But in the same breath, Burbules and Callister speak alarmingly at the future of online content that continues to be dominated by commercial interests:

> Who will sponsor the unpopular, the challenging, the critical voices that disagree with the interests and outlook of the sponsors? Who, for example, will sponsor the anti-

> McDonald's site? To what extent is the Internet playing a role in instilling users with a more commercial mindset themselves, becoming more enmeshed in the operations of capitalism?…Are schools in the business of inculcating students with the spirit of unbridled capitalism? Who gave them this charge? (p. 146)

The authors are well aware of the internet's evolution towards a medium that reflects the current state of television and radio. But by disregarding the efforts of so many nonprofit subject gateways to make valuable content available and accessible, they are letting commercial interests have the last word. Although they sometimes fall short of their alternative mission (Schechter, 1999), where else but on PBS and National Public Radio is there television and radio content that goes beyond boundaries and addresses unpopular ideas? Both networks, however, have to sweat every time they actually raise an unpopular idea. As Balas (1999) relates, the fight to retroactively create a Public Broadcasting Service in 1967 after television and radio were entrenched in commercial interests was not an easy one, and the results—a compromised PBS network serving "high culture" tastes, and programming marked by corporate sponsorship—fit a narrow definition of democratic expression. In fact, the major failing of PBS and NPR is that they are "public" in name only. In practice, the vast majority of their funding is private and predominantly from corporations, which affect their range of programming perspective.

Perhaps an even better example of a public forum are the nation's public libraries. Where else but in public libraries, including those in public schools and universities, can we find books that lead us to truly in-depth, unconventional and controversial subject matter? Even as the future of the internet looks more and more like commercial television, the metaphor that has sustained the medium's development has been the library—not a commercial bookstore, where only the popular is stocked—but a government-supported public library, where ideas are shared with less regard to their marketability.

Despite Burbules and Callister's concerns of censorship—indeed, public broadcasting is prone to political meddling (Schechter, 1999) and public libraries are subject to persistent censorship challenges (ALA, 2002)—publicly-supported media institutions still are able to present ideas that step outside the bounds of commercial media. On one level, a public internet directory/portal would attempt to bring together the efforts of so many individuals and organizations who are busily working on maintaining links to web sites that may otherwise be sent to the margins. An effective directory/portal would also help students juxtapose the misinformation, malinformation, commercially-sponsored information and irrelevant web sites—the real-world stuff popular among proponents of critical reading skills—so students can better make sense of our world. The potential of a noncommercial educational portal to help students understand the world we live in is enormous, in that it could provide a critical distance from the commercial spin of our everyday surroundings.

Despite all these considerable, and some might even say exciting, library-based, citizen-based, and government-supported subject gateway efforts, there is one glaring problem: many users simply don't like subject gateways. They don't like to deep link, finding this process disorienting and unwieldy no matter how useful the material they might eventually locate is. Moreover, users are so conditioned to hop on search engine portals and access the "whole web" that it would take a lot to affect a cultural shift towards subject gateway use: the appeal of immediate search engine results would win over every time. The good news is that solutions to these problems are coming fast and furious from the digital library and computer science communities. In fact, a new set of technology protocols and services are promising to

reinvigorate subject gateways, creating a movement that just might bode well for education and the information superhighway.

The Quiet Revolution

The buzz among a growing community of librarians is cross-searching: the ability to search across many subject gateway platforms at the same time. This new searching method looks and feels a lot like a search engine. Users type in key words and dynamically search (librarians like the word "harvest") across hundreds, even thousands, of different subject gateways located all over the web. If search engines crawl over an index, cross-searching tools harvest a database collective—a collective that could serve commercial or educational purposes. This technology is revolutionary because it has huge implications for the comprehensiveness and relevance of search results. In fact, a user (let's say a student) could enter a search engine-like environment, access thousands of academic sites, and not come across a single commercial entity.

The seeds of this movement have been around for some time. Engineers have been experimenting with ways to link metadata (databases with rich text files) within a library's own interface since 1988 using protocols such as the Lightweight Directory Access Protocol (LDAP), the Common Indexing Protocol (CIP), and z39.50. But more recently, a new cross-searching framework, called (in a rather cumbersome manner) the Open Archive Initiative Protocol for Metadata Harvesting (OAI-PMH), is one interoperability system being heavily tested in projects around the U.S. and throughout Europe. Beginning in 1999 as a way to spur discussions about maintaining, indexing and searching distributed collections of metadata, the OAI-PMH (OAI for short) system depends upon subject gateways to be "OAI-compliant." Once they achieve this compliance, they can be searched by way of a single database.

Meanwhile, other systems are emerging that can work alongside (or separate from) OAI for other cross-platform search options. One of these is iVia, an open source virtual library system developed by the people at INFOMINE. This is a very promising hybrid system that combines resources from expert-based subject gateways with resources from a search engine crawler. IVia identifies and provides descriptive information for important site, which in turn helps users find these sites. It does much of this automatically. As its creators write, "Systems like iVia may prove critical within the larger context of enabling those in the learning community, among others, to continue to reliably find what they need on the Internet." (Mitchell et al., 2003).

In the U.S., the National Science Foundation and the privately-funded Mellon Foundation are behind the OAI initiative, seeing it work in conjunction with other harvesting, search engine and cataloguing efforts. Mellon has allocated $1.5 million towards seven major OAI trials. One of them, developed by the University of Michigan Digital Library Production Services, is OAIster (pronounced "oyster," www.oaister.org), a vast collection of digital resources (including Taiwanese text archives, numerous map and photo collections, German theses, even a collection of sound recordings of Native Alaskan speakers). By 2003 over 185 obscure databases had become "OAI-enabled" to join the OAIster collective (their slogan: "find the pearls"). The National Science Foundation is also pushing to integrate OAI into the numerous subject gateways it has collected under the National Science Digital Library. Moreover, various organizations, such as the Coalition for Networked Information (CNI) and the Joint Conference on Digital Libraries (JCDL) are providing important international and national forums to discuss

the “transformative promise of networked information technology” (Coalition, 2003). Once again, gateway efforts across Europe are more organized and fully funded than in the U.S. The U.K. has united all its RDN hubs in an OAI-compliant collective, which in turn has been absorbed by the Renardus portal, a service funded by the European Union to unite high quality internet resources for higher education throughout all of Europe.

A variety of portal software programs, like the Scout Portal Toolkit in the U.S. and the PORTAL Project in the U.K. are also encouraging subject gateway portal development that will help organizations build subject gateways with minimal effort and add to the burgeoning subject gateway community. Commercial companies are also getting in on the scene. The company Ex Libris, for example, offers a cross-searching portal called MetaLib; Fretwell Downing Inc. has developed the Z-portal interface. This is just a sampling of the many developments—protocol, portal, and network—that have arisen to advance subject-gateway initiatives over the last few years.

Not surprisingly, there have been, and continue to be, difficulties, with cross-searching technology. One of these is deciding on a common protocol. OAI might quickly fade if it can’t adequately handle resource duplication between gateways. Then there is a question of standardizing subject headings, and figuring out ways to customize a subject gateway collective to different user groups. As Sue Davidsen of the Internet Public Library pointed out, the gateways geared towards higher education speak a different language than those geared towards the K-12 community. A user’s ability to choose different intellectual levels and languages is something, according to some librarians, that needs to be worked out (Davidsen, 2003). But perhaps mixing of levels is a good thing: it might allow students to feel like they’re dabbling in the “real world” of academic information, legitimizing the cross-searching portal as an all-encompassing academic navigation tool. Then again, it might turn them off of subject gateways completely. In any case, librarians, engineers, and computer scientists are in the early stages of this quiet revolution.

The OAI is just one initiative to make U.S. subject gateways less scattered. But, there still isn’t a national policy for educational internet content that even approaches the scale of the “educational challenge” to wire every school. Organizing web content is the next educational challenge. Let the work begin.