Those of us who have been involved in the long courtship between higher education and information technology can recall many ups and downs in the last thirty years or so. We can recall the days when the notion of a “computer center” made sense, when there was a place where “the computer” lived, where attendants worked the mysterious mainframe, where our printouts were delivered rolled up in boxes like thick mail. We can recall the days of the first PCs dedicated to word-processing—Wang computers with daisy-wheel printers that clattered like little Gatling guns. We can recall the first Mac, holding out the promise that computing might actually be fun, a promise held out too by the first laser printers and desktop publishing. We can recall our introduction to e-mail and the Internet, to discussion groups and lists. We can recall when we first saw Mosaic, Netscape, and the World Wide Web. And it already seems hard to believe that there was a time when Word and PowerPoint and Excel were not a lingua franca, when PDF and Flash and MP3 files did not flow across fast networks.

By Edward L. Ayers and Charles M. Grisham

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At each step along the way, some of the more impressionable among us thought that one innovation or another would push us over the top, that we had finally gained the critical mass that would channel the undeniable power of IT into higher education. We watched as commerce was transformed, as entertainment was transformed, as personal communication was transformed, and we kept waiting for the moment when higher education would be transformed in the same way.

In particular, we waited for the time when the very heart of education—the classroom and the scholarship taught in that classroom—would be transformed. But despite the tremendous investments that all institutions of higher education have made in IT, despite the number of classrooms we have wired and the number of laptops we have mandated, the vast majority of our classes proceed as they have for generations—isolated, even insulated, from the powerful networks we use in the rest of our lives.

Moreover, the form in which scholarship appears has barely changed, despite all the revolutions in computing. Across almost every field, researchers, no matter how sophisticated the technology they use in discovery, translate those discoveries into simple word-processed documents. Sure, we sometimes add JPEG images and other simple illustrations, and in the sciences, pre-prints rush around the world long before the articles appear in print journals, but merely putting scholarly discourse into HTML and PDF formats has not changed scholarship in any significant manner. The nature of argument has remained remarkably resistant to innovation in rhetoric or form in every field of scholarly endeavor.

We all know about the remarkable changes in distance education over the last decade, about the invention of virtual universities and online courses. Those enterprises, profit or nonprofit, show every sign of growing exponentially as demographic patterns and availability encourage more investment. But the places that have been the heart of higher education—residential colleges and universities—have remained relatively immune. Just as IT has transformed the context of teaching and scholarship without transforming either teaching or scholarship itself, so has IT transformed higher education without transforming the places that set the standards for education. Online colleges and universities still teach what is learned in the research labs and libraries of residential colleges and universities. Although demographic, technological, and economic changes are opening doors to many people who cannot attend residential schools—a fact that we all applaud—those residential schools aren’t going away. Indeed, they are more important than ever. We have not discovered, and are not likely to discover, a better way to foster and convey most forms of knowledge than the learning communities that created all the key technologies we are talking about today. And yet those places resist, even if passively, the same tools that are transforming distance education.

So we observe two parallel ironies in the IT transformation: (1) teaching and scholarship, the things we’ve created colleges and universities for, have been the institutional aspects least touched by the new technologies, and (2) residential colleges and universities, the places that stand at the heart of our educational system, have been the higher education institutions least transformed by IT. And there is a third, corresponding irony: in most fields—particularly in the humanities, social sciences, and the arts—the more elite the scholar and the institution in which she or he works, the less likely the scholar is to take advantage of the major technological and social change of our time. In other words, the greater the potential resources at their command, the less interest many faculty seem to express in integrating new technologies into their teaching and scholarship.

Though this may be an irony, it is not really a puzzle: people at the top have fewer incentives to innovate. They have flourished in the world of paper and talk and, not surprisingly, see little reason to introduce the network and the screen into their teaching and scholarship. And they see little reason to hire or promote others who do use the technology. Deans and provosts take their cues from leading faculty, and so they do not push IT as they might—and, in fact, as they did five years ago. Thus we’re witnessing a strange IT revolution in higher education. Institutions that lead in every other facet of
higher education are not leading in this transformation. It could be argued that they are even less likely to lead in the near future, if things continue as they are.

The pressure for innovation has cooled from the superheated environment of five years ago. The title of a recent attention-getting article in Harvard Business Review puts it bluntly: “IT Doesn't Matter.” Though the article by Nicholas G. Carr is not addressed to education leaders, the title is a direct challenge to the motto on the cover of EDUCAUSE Review: “Why IT Matters to Higher Education.” The article's point is simple: “You only gain an edge over rivals by having or doing something that they can't have or do. By now, the core functions of IT—data storage, data processing, and data transport—have become available and affordable to all. Their very power and presence have begun to transform them from potentially strategic resources into commodity factors of production.” The article's advice to companies, therefore, is to spend as little on IT as possible. Its three easy rules must surely cause the blood to run cold in the veins of IT corporation executives: “Spend less. Follow, don't lead. Focus on vulnerabilities, not opportunities.” IT has become infrastructure—essential but invisible, a poor focus for creative energies.

The article is being widely debated and discussed, its more sweeping conclusions challenged. Yet we can certainly see the general patterns in colleges and universities today. The trends are toward turning IT into a commodity—with uniformity, interchangeability, cheapness, and virtual invisibility as the highest goals.

The accomplishments of colleges and universities, like their technology, have tended to become invisible because they have been so successful. If you had told people ten years ago that card catalogs would virtually disappear over the next decade, to be replaced by the systems we now enjoy for the management of all forms of information, they would not have believed you. The real heroes of the digital revolution in higher education are librarians; they are the people who have seen the farthest, done the most, accepted the hardest challenges, and demonstrated most clearly the benefits of digital information. In the process, they have turned their own field upside down and have revolutionized their own professional training. It is a testimony to their success that we take their achievement for granted.

Similarly, much of the technological infrastructure of colleges and universities has been transformed in a remarkably brief period. Our own institution—the
University of Virginia (UVa)—is a good example. The university has devised several strategies and tools to take advantage of the infrastructure that has developed and matured over the last ten years or so. Partnerships between UVa academic and administrative units have transformed the educational infrastructure in many ways, pooling resources and breaking down traditional barriers. One of the most successful technology transformations at UVa has been the Instructional Toolkit (http://toolkit.itc.virginia.edu), a Web-based suite of easy-to-use tools that permit any faculty member, even those with minimal computer skills, to create and populate a course Web site. The Toolkit allows instructors to post a syllabus, store materials online, view up-to-date class rosters (including pictures of each student), maintain a course grade-book, send e-mail to the class, and perform many other course-related functions. It is used for approximately 90 percent of the courses taught at UVa, where faculty and students now take the Toolkit for granted as an essential course tool.

UVa also manages and supports a group of 207 students, staff, and faculty—designated as Local Support Partners (LSPs)—who each bear specific support responsibilities for an academic department or administrative unit at the university (http://www.itc.virginia.edu/dcs/lsp/prog_desc.html). The LSPs are well-known by the faculty and staff they support, they understand the discipline, and they provide a friendly face whenever a computer needs maintenance or whenever any other technology-related problem occurs. This highly successful program has been warmly received by the university community since its inception ten years ago. LSPs meet together several times a year for conferences, where they receive valuable training and exposure to new developments in technology at UVa.

In the past year, using a database program that permits highly secure storage and retrieval of imaged documents, the College and Graduate School of Arts and Sciences has converted all faculty paper records (more than 600 files) and most of the undergraduate student records (12,000 files) to electronic, imaged documents. Academic deans and their staff can retrieve and consult these documents in seconds, without relying on bulky, insecure paper documents. UVa is now considering the purchase of a site license that would make this document-imaging software available for hundreds of uses in all academic and administrative units.

Advising undergraduate students is one of the most important services faculty can provide to the university, and yet it is one of the most difficult to do well. The College and Graduate School of Arts and Sciences has revolutionized the student-advising process with the implementation of a variety of electronic advising tools that provide both academic and personal information on students to each of the more than six hundred faculty advisors (http://web.virginia.edu/ArtsSci/Advising/Schedule/advisor_login.asp). Before these electronic enhancements, the Dean’s Office at the College of Arts and Sciences was required to mail thousands of pages of student information to faculty advisors twice a year. The complexities of this process meant that the paperwork was outdated by the time it reached the faculty advisors’ desks. With the new electronic, Web-based tools, faculty receive up-to-the-minute academic information on each student advisee as the student arrives at the faculty member’s office for the advising meeting. Faculty are able to discuss students’ course schedules thoughtfully, and they find it easy to advise students on course selections and other academic choices.

This past April, UVa unveiled an electronic, school-wide course-evaluation system. Before this spring, the various departments of the Schools of Arts and Sciences, Engineering, Education, and Nursing had spent more than $60,000 per year to conduct student course evaluations. In the School of Arts and Sciences, course evaluations were done on a department-by-department basis, with virtually no consistency or uniformity. The new on-
line system, available through the Instructional Toolkit, will save the College of Arts and Sciences alone more than $40,000 per year.

A new online resource called OSCAR (Online guide to Scholarship, Creativity, And Research) now provides information on the research, scholarship, and creative endeavors under way at UVa (http://oscar.virginia.edu/asp/index.asp). A three-part guide for exploring the university's intellectual pursuits, OSCAR features a searchable database of UVa people, projects, and organizations. It also includes a news-publishing engine that generates stories describing, for a general audience, projects and the people conducting them. And it holds a compendium of resources for researchers, scholars, and artists who want to further their efforts.

The College of Arts and Sciences has also created a new program that offers technology support for the next wave—for those faculty who are eager to bring technology into the classroom but who lack technical expertise. The College Technology Interns Program (CTIP) partners fourth-year student interns with faculty to create technology resources and online course content in the college (http://www.people.virginia.edu/~cmg/ctip). The interns receive intensive training in Web site development, Flash animations, UNIX and Active Server Page programming, and other related skills; they then work one-on-one for two semesters with a college faculty member, not only developing technology resources for the classroom but also passing their technology skills on to the faculty member. The interns receive academic credit for this work, and the program is free to faculty and to the college.

So, interesting and important things have been done and are being done at UVa by leveraging the infrastructure. Similarly, challenging and encouraging projects have appeared at schools around the world. Just as Carr said in his *Harvard Business Review* article, IT has become a commodity, almost as invisible as the electricity on which it runs. The success of such programs has resulted in a cruel irony: when faculty look to see if a book is in the library, if a student is enrolled, or if their paycheck has been posted, few think, “Ah, I will now use technology.” They most likely do not thank their IT staffs (or deans) when this all works just as it should, even though these online services did not even exist a couple of years earlier.

And yet they do think: “I'm not sure I want to use technology in the classroom.” We all know why: many classrooms do not have permanently installed computers and projectors. Instructors face the prospect of bringing a laptop and a projector (if they can beg or borrow one) to class. And the computer and the projector are not the only problems. Most classrooms are not designed to accommodate computer projection for a class. Often, windows cannot be covered to darken the room enough to see the slides, power receptacles are too far away, there is no good place to put a projector in order to project a suitable image, and there is no screen or appropriate wall on which to project. Classroom sound systems are rarely adequate, if they exist at all. Even in classrooms in which the equipment is either reasonable or nearly so, the set-up and take-down considerations between classes take too long and are often too confusing and too time-consuming for faculty who must think of other things in addition to setting up a laptop, a projector, and a PowerPoint presentation.

Those of us who have seen what the new technologies can do have to admit that for individual teachers and scholars, the computer does not replace other work; it only adds to it. Whatever the network efficiencies we can gain in other aspects of the institutional operations, the introduction of IT into the classroom seems to soak up money and time rather than save them.

As the technical challenges of
network, memory, and software standardization lessen, the institutional challenges remain great. Faculty who have withstood all the excitement and possibility up to this point have decided that they can withstand whatever else is put before them until the end of their careers. They go to their professional scholarly meetings and attend only a few workshops and talks on the new technologies; they read the job ads and see that the jobs require exactly the same credentials as were required a quarter-century ago.

And yet their students are changing before their very eyes. A new book on the future of the public university puts it well: “The traditional classroom paradigm is . . . being challenged by digital technology, driven not so much by the faculty, who have by and large optimized their teaching effort and their time commitments to a lecture format, but by students. Members of today's digital generation of students have spent their early lives immersed in robust, visual, electronic media. . . . They approach learning as a ‘plug-and-play’ experience; they are unaccustomed and unwilling to learn sequentially—to read the manual—and, instead, are inclined to plunge in and learn through participation and experimentation.”

A study by a professor of reading states the case even more strongly: “The fact is, when kids play videogames they can experience a much more powerful form of learning than when they’re in the classroom. Learning isn’t about memorizing isolated facts. It’s about connecting and manipulating them. . . . The secret of a videogame as a teaching machine isn’t its immersive 3-D graphics, but its underlying architecture. Each level dances around the outer limits of the player's abilities, seeking at every point to be hard enough to be just doable. In cognitive science, this is referred to as the regime of competence principle, which results in a feeling of simultaneous pleasure and frustration—a sensation as familiar to gamers as sore thumbs.” Videogames are built on “the principle of expertise. They tend to encourage players to achieve total mastery of one level, only to challenge and undo that mastery in the next, forcing kids to adapt and evolve.” This sounds a lot like what graduate school does too.

We know digital learning holds great promise for making education more effective. And yet our most elite (and thus expensive) forms of education are doing an excellent job of resisting the wave of social, economic, generational, and perhaps even cognitive change that is transforming much of our world.

It is possible, of course, that this is a good thing. Some of these trends need to be resisted, and not all young people want to live in a virtual world all the time. In fact, they may see the college or university as a refuge from the media-saturated worlds in which they have grown up. During the current renovation of UVA's library, for example, students have requested a “computer-free” reading room—a place for quiet, sequential thinking. In some ways, this may be what our most prestigious schools are becoming: beautifully outfitted reading rooms built to preserve the virtues of older, linked technologies: the book and the lecture. As academicians who have spent much of our lives reading and producing books, we understand that impulse.

But of course, we don’t have to choose between the old and the new, the analog and the digital, the best of established ways and the promise of what is to come. Precisely because we live in a time when IT has become a commodity, we can get over some of the hyperbole that has been our enemy in the recent past. We no longer look for the imminent death of the book or the demise of the physical college or university. Instead, we can take advantage of the conversion of IT into infrastructure to consolidate our gains. We can adopt what is best about the new technologies, without all the heavy breathing. We can use IT to make our institutions more efficient and effective in the ways described above, ways that take advantage of standardization and ubiquity.

But we simply cannot stop there. The revolution has taken the easy ground, the

Precisely because we live in a has become a commodity, we some of the hyperbole that enemy in the
unprotected edges of the city. The citadel remains above, with the flags of the old regime flying: teaching and scholarship at leading institutions of higher education remain relatively untouched. How might we take that citadel? Not by storming it. We’ve tried that. We must take it from within.

We need to make systemic changes in everything from facilities to tenure, from our localities to our professional organizations. It could be argued that the machinery is just now adequate for the next level of integration, now that it is stable and standardized enough to make feasible what many have long dreamed of: unlocking the power that we all know lies within IT to transform teaching and scholarship in beneficial ways. We’re ready, as a result of the commodification of IT, for another burst of energy and innovation, to build on what we’ve done during the last quarter-century.

We now need to invest in people and content in the same ways that we’ve invested in hardware and lowest-common-denominator instructional software. We need to encourage the key people in our institutions—the best teachers and scholars—to build what they want and need. We’ve built around the content of teaching and scholarship; now we need to build within teaching and scholarship.

UVA has been working on such an effort for about a decade. In the early 1990s, with support from IBM, the university created the Institute for Advanced Technology in the Humanities (IATH). The basic principle behind IATH is simple: match motivated humanists with broad-minded computer scientists to create new tools for understanding the record of the human experience. Dozens of scholars and partners in digital media have worked together in fields ranging from ancient history to modern literature, from architecture to anthropology. As diverse as the projects have been, they all share the goal of creating new tools, new possibilities, and new audiences in new media.

One of the two founding projects of IATH is Valley of the Shadow: Two Communities in the American Civil War (http://valleyvdh.virginia.edu/). The idea for the project was straightforward: put every piece of information about every person in a Northern community and a Southern community in the era of the Civil War in a digital context so that students and scholars would have an unprecedented command over those millions of pieces of evidence. With these tools, people would be able to understand the immense complexity of historical change. The project was conceived before the World Wide Web appeared—it was designed to be disseminated on tape or disc—but having

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been built in SGML, it was able to move quickly to the Web and HTML.

In the years since Valley of the Shadow first appeared online in 1994, the project has won many prizes, has been featured in Wired and the New York Times, and is now the Civil War site most linked to by other sites and is thus often top-ranked in Google searches for “Civil War history.” Students at every level—from middle school to graduate school—work on the Valley project, producing papers and projects adapted to the particular course in which they are studying. Just as important, many people who are not in any kind of school also turn to the project to satisfy their curiosity about the Civil War and about history in general. A single tool serves many users. Though much time and considerable resources were required to build the site, it leverages the worldwide infrastructure of the Web to make the most of that investment in an extremely efficient way.

The success of the Valley project is surprising. It follows an idiosyncratic way of approaching a familiar historical event. Rather than gathering the information that people might think they need to understand the Civil War—biographies of generals and presidents, say, or editorials from leading newspapers—it gathers mundane information about anonymous people in obscure places. The material it presents is common and, in isolation from other material, not particularly meaningful. Put in context, however, newspaper articles take on drama and power; personal letters and diaries evoke tears and laughter; even census entries and military records can bring chills.

The power and the appeal of the Valley project derive from the tools it uses. Although those tools have been continually updated, they are not exotic: databases, XML-tagged text, and a single Flash animation. Standard though they may be, these tools provide unprecedented control over a large historical record. They change, as a result, what that historical record conveys, and they change what “history” means to the millions of people who have visited the Valley. The Valley project takes advantage of some of the appeal of video games. As in a video game, the user must work through various levels of information to make paths, to find patterns, to discover promising techniques. No one is shooting at the user while he or she is making these decisions, but a user cannot make progress in the Valley archive, or gain adequate information to assemble satisfying statements, without utilizing something of the exploration, trial-and-error, and serendipity process that one finds in video games.

Because the Valley project was conceived by a historian and built by several generations of talented younger historians who have learned to think digitally, it is firmly rooted in the discipline in which it is used. Only a historian interested in social, political, economic, and cultural history would have devised such a strange tool, so far removed from the commercial reference tools, document collections, and games about the Civil War. Only a historian would have access to the conferences and other speaking engagements to spread the word about the project. Only a historian would give the project enough credibility to get it reviewed in the leading journals of the field and used in graduate seminars.

The Virginia Center for Digital History (http://www.vcdh.virginia.edu/), headed by William G. Thomas III, has given the Valley project an ex post facto legitimacy by creating a series of elegant, sophisticated, and diverse projects, each with its own funding, that demonstrate the many ways the complicated past can be explored through digital media. Each project deploys new tools, perspectives, and methods, proving the sustainability of digital history and taking us beyond the particular techniques of the Valley of the Shadow.

As fortunate as the history of the Valley project has been, however, it has by no means established digital media as an entirely legitimate form of scholarship. The project, after all, makes no scholarly argument of its own; it puts forward no thesis to be tested. It does not provide a narrative of events against which students can test their own interpretations, and it does not engage the immense scholarly literature on the Civil War.

As a result, the team behind the Valley project decided to try to close the circle. Commissioned by the American Historical Review, the leading journal in the discipline in the United States, Will Thomas and Ed Ayers undertook to make an argument—along the lines of traditional historical scholarship—based on the Valley project. They decided to return to the long-glimmering hope that hypertext might permit new kinds of exposition and analysis, using the possibilities for more flexible linking afforded by XML as
As attractive as distance learning may be, the fact remains that residential contexts offer the possibility of a far richer digital environment than do remote sites.
into our proven techniques of teaching and scholarship as well as research. Skilled professionals, working together, can leverage large investments in infrastructure into tools that benefit every member of the academic community. That way seems clear and promising.

Yet larger challenges remain. No group has taken responsibility for fostering the creation of content. At various points, leading professional, corporate, and philanthropic organizations have stepped up to partner with teachers and scholars. UVA has benefited greatly, for example, from the National Endowment for the Humanities, the Andrew W. Mellon Foundation, the Getty Foundation, IBM, and other allies, but there is still a disappointing lack of support for digital materials for teaching and scholarship. In general, reference materials, textbook ancillaries, and teaching modules are being produced in a sort of desktop-publishing model by individual faculty, but no group is working with faculty and academic leaders to create content that faculty will respect as real aids in teaching and scholarship.

Over the last decade, as a result, American higher education has created a doughnut IT infrastructure: all periphery and no center. We have invested in the machinery but not in the teachers and the scholars to make that machinery worthwhile in the classroom and in scholarship. The massive investment in networks and computers will not pay off until we fill in the hole, until we work together to create content.

As attractive as distance learning may be, the fact remains that residential contexts offer the possibility of a far richer digital environment than do remote sites. Just as residential institutions of higher education have led the way before, they can lead the way again. They will remain the centers of production of knowledge, the producers of the ideas and methods that are taught online, and we should make them the crucible of innovation in the new technologies. We can democratize higher education only if we use our colleges and universities to build the ideal institutional environment to help lead the revolution from within, working with faculty to create the tools that people will actually use, establishing new standards for enhanced teaching and scholarship, and creating a living, ongoing alliance. Now would be a great time to start—just when it seems that IT doesn’t matter.

Notes
2. For examples of these projects at UVA, see <http://artsandsciences.virginia.edu/tech/initiatives.php>.