A Social History of Bitnet and Listserv, 1985–1991

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After the engineers built the computer networks, users had to build the social networks that made them useful. Listserv, the combined mailing list and file server, was an important tool for those interested in building network-based organizations. It first appeared on Bitnet, an academic network based on IBM computers. The early versions of Listserv became operational in the mid 1980s, and its early archives show how network users learned to use the software and, perhaps more importantly, how to manage network-based organizations.

It is hard for us to remember a world without the Internet and equally hard to remember that computer networks were once the domain of a narrow spectrum of users: physicists, electrical engineers, computer scientists, and weapons engineers. Even now, it is difficult to imagine how general computer users, users with little or no technical education, first became acquainted with computer networks and how they built communities that were supported by those networks and the existing network software. Most histories of early network development focus on the evolution of hardware and software and give only scant treatment to the social development of those networks.[1]

Part of the reason for the lack of histories of early network users is the ephemeral nature of network correspondence. The notes transmitted by interactive message commands and the communications distributed by chat programs vanished before the computers that ran those programs were disconnected. The archives of early email, should any remain to this day, are stored on rapidly decaying floppy disks and other media that are sliding toward obsolescence. Only with the appearance of Listserv programs—programs that managed email lists and distributed mass mailings—do we find systematic archives of electronic mail and a coherent picture of the early general user. These record archives chronicle the development of the first network communities.

Before these first communities appeared, the social arena of computer networks was unstructured. John Perry Barlow described computer networks as the "electronic frontier." In the *Communications of the ACM*, he wrote, "Cyberspace remains a frontier region, across which roam the few aboriginal technologists and cyberpunks who can tolerate the austerity of its savage computer interfaces, incompatible communications protocols, proprietary barricades, cultural and legal ambiguities and general lack of maps or metaphors."[2]

The settling of a frontier has been a major theme in U.S. history since 1893, when historian Frederick Jackson Turner argued that the frontier experience defined U.S. culture. In his seminal description of U.S. history, he wrote: "American social development has been continually beginning over again on the frontier. This perennial rebirth, this fluidity of American life, this expansion westward with its new opportunities, its continuous touch with the simplicity of primitive society, furnishes the forces which dominated American character."[3]

While the development of network communities has much in common with the settlement of the American West, it lacks the physical hardship. While early network software was primitive and often difficult to use, it contained nothing that could be compared to the tasks of clearing forests, draining swamps, and breaking the sod. The settling of the network—the building of sophisticated communities—was largely a social activity and is perhaps best explained by the theories of sociologist Erving Goffman. Goffman studied what he termed "the presentation of self in public life," and much of the early development of the network can be appreciated in terms of increasingly sophisticated communities in which

people presented themselves.[4] The social growth of Bitnet was a continual transformation of social spaces that involved both the mastery of software communications tools and the understanding of how to direct a social organization.

Founding Bitnet: 1981–1987

Bitnet began as a social organization before it was a physical network. In March 1981, the computing center directors at a dozen East Coast universities, led by Ira Fuchs of the City University of New York, organized a technical cooperative to establish a network among universities that had computing centers with large IBM mainframes. This cooperative hoped to promote the tools of computer networking to all scholars within universities, not just computer scientists. This founding group became the Bitnet executive committee, the managerial body for the network. The group would set standards, establish policy, and, during the first years, build the network and oversee operations.[5]

Two universities represented in the executive committee, Yale University and the City University of New York, established the first Bitnet link on 5 May 1981. By year's end, 25 other computer centers had joined the network, including those at Princeton University, Columbia University, and the University of North Carolina.[6] The network was not an Arpanet-style packet-switched network, but a tree-structured store and forward network that used the IBM RSCS protocol. For its first three years, Bitnet grew slowly, adding only about 50 nodes per year. At the start of 1984, Bitnet connected 157 computers. Unlike the rapid growth of the Internet less than a decade later, the number of Bitnet users grew at a moderate pace. In January 1984, the executive committee estimated that 3,000 people used the network (or about 15 people per node).[7]

The year 1984 marks the first turning point in the history of Bitnet, a point at which it started to become a more stable and more formal organization. In that year, IBM provided the Bitnet executive committee with a grant of funds to pay for an operations center and an information center.[8] As it now had to be responsible for the IBM funds, the Bitnet executive committee organized the network into a cooperative, adopted bylaws, and established regulations for building and maintaining the network. The committee organized the members into four classes of network nodes: universities, consortia of universities, nonprofit institutions, and organizations that supported higher education. The committee also decreed that the network could carry no commercial communication and required each member of the network to provide at least two connections that new members could use.

In 1984, we also have the first records of the Bitnet social structure. In creating an organization to manage the network, the Bitnet executive committee identified three stratified classes of workers. The first class of workers was the institutional representatives to the executive committee itself. These individuals were usually the directors or senior managers of university computer centers. The second group was the individuals who maintained the network software and hardware. The executive committee required only one of these individuals per site, but many Bitnet members assigned several staff workers to this task. Finally, each member had to identify one person to help network users and to promote the network.[9]

Given the size of the Bitnet community in 1984, it seems likely that there were few users beyond the individuals in the three classes given above. The few records from that era suggest that most of the network users knew a large fraction of the network community and that correspondence between network users was informal.[10] Before progressing with the history of the network itself, it will be useful to introduce some terms from Goffman's sociological theories.

In Goffman's approach to the study of social organizations, all the world is indeed a stage and all the men and women merely players. These players have their exits and their entrances, but unlike the classical world of the theater, the players have not seven parts but two. Goffman divides the social sphere into front stages and back stages. The front stage is a formal area, where roles are well-delineated and constructed by social norms. In front stage roles, the players must follow fairly strict rules that govern what they can and cannot do.[11] By contrast, a back stage is an informal area, where people go to relax, where roles are not as well-defined, and where conduct is controlled less by hard and fast rules and more by a common commitment to certain ideals or goals.[12]

We can find a simple example of Goffman's ideas in a restaurant. A restaurant is a social space that can be divided into front and back stages. The players are the customers, the waiters, and the other staff. One of the front stages is the eating area, the place where the customers and the waiters interact. Both groups have fixed roles to play. The waiters must be friendly but keep their distance. The customers are paying guests. They can expect attentiveness from the waiting staff, but they cannot,

under normal circumstances, interfere with the operation of the restaurant. They cannot fetch their own food, bus their tables, or give orders to the cooks. (In making this statement, we are ignoring the casual restaurants in which such things are permissible.)

Within this restaurant, a back stage area might be found in a side room, where the waiters keep their street clothes and where they rest during their shifts. The only people who can gain entrance to this area are members of the waiting staff. Because all occupants of this area share common tasks and ideas, they behave in a less formal, less predictable way. Anyone who has worked in a restaurant knows that behind the scenes, the waiters complain about their boss, mock the customers, and share details of their personal lives. In the public areas of the restaurant, they would do none of these things except in the most extraordinary of circumstances. The back stage social space is not open to all, and it would rapidly revert to a front stage if it were invaded by someone who does not share the common ideals of the waiters.

Applying Goffman's ideas to the development of Bitnet in 1984, we conclude that the social structure of the network was a back stage region—an informal and loosely structured social space. To most of the individuals using the network, Bitnet was a back stage area juxtaposed against the front stage area in which they worked, usually a university computer center. In that front stage region, they had clearly defined roles and authority. They represented a computer center or some other institution and were responsible for maintaining services or answering questions. In the social space of the Bitnet, they were less certain of their position and scope.

The individuals in the third class of Bitnet workers—the user representatives who answered questions and promoted the network—were the ones most aware of the weak social structure of the network. They often had to correct individuals who were misusing the network by sending junk mail, chain letters, or merely frivolous correspondence. These user representatives were deeply committed to protecting the bandwidth of Bitnet, which was limited to 4,800 or even 2,400 baud at some points. Yet, when they confronted those who were overwhelming the network, the user representatives were often aware that the network social structure gave them an ill-defined role. Many refused to rebuke users in emails or messages but instead used the telephone or even met the offenders face to face. "A friend," wrote one Bitnet representative, "finds that a telephone call about annoying behavior works well."[13] To them, the social space of Bitnet gave them no structure from which they could exert authority.

During the period from 1984 to 1987, the period in which IBM helped fund Bitnet operations, volunteer programmers wrote programs in attempts to expand the network services and make Bitnet easier to use. These programs included file servers, name servers, mailing list servers, new chat programs, bridges to Usenet, and interfaces to Arpanet. None of the programs written during this period was particularly successful, and none did much to structure the network social space. A few programs, such as a file server at the University of Maine, were briefly prominent on the network, but none attracted large numbers of general users or did much to shape Bitnet society.[14]

The number of users continued to grow slowly, and the Bitnet representatives and technicians gradually took control of the network and their social space. In February 1985, a group of senior network operators removed a popular chat program in response to a paper, written by one of their number, showing that the program was highly wasteful of network resources.[15] A programmer at the University of Tennessee at Chattanooga quickly replaced the program with one called Relay, which used regional servers to limit network traffic.[16] After Relay became operational, some users tried to operate the old program or, worse, run chat programs of their own design, programs that were usually ill-conceived and inefficient. As these programs appeared, the network operators and user representatives found it easier to assert their authority in network communications, and they were less tolerant of those who abused network resources.[17]

The Golden Age of Growth: 1987–1989

Faced with the end of the IBM grant in January 1987, the Bitnet executive committee moved to secure the survival of the network by incorporating their organization and by raising funds through membership dues.[18] This move came at the same time that the Bitnet information center, then located at City University of New York, adopted a new combined mailing list manager and file server called Listserv.[19] These two events mark the start of the rapid growth of Bitnet and the appearance of large numbers of network-supported communities. The network expanded rapidly during this period, adding hundreds of new nodes and thousands of new users each month.[20]

During this period, Bitnet began attracting large numbers of general users, individuals not

trained in the technical subjects of network programming and management. These new users were often intrigued with the network communities Listserv supported. These users were interested in forming their own organizations, yet they built many of their first network communities directly on the social foundations laid by the Bitnet representatives and technicians. In Goffman's sense, the new users of Bitnet changed the back stage communities constructed by technically trained users into front stages for the general user.

Listserv—the software that supported the proliferation of network-based social organizations—was written by Eric Thomas, a graduate student in Paris. It relied heavily on features of IBM mainframe architecture, including IBM assembler, the Rexx language, and the VM operating system. It first appeared at several Bitnet nodes, and then the Bitnet Information Center adopted it.[21] It combined the function of earlier server programs, was fairly well-documented, and was stable enough to be installed and operated by programmers who were not intimately familiar with the details of its code. It quickly proliferated through the network. In less than three years, 46 sites had adopted Listserv, and the program was supporting the communication of over 130 different groups.[22]

Listserv proved to be the lasting legacy of Bitnet. It was more flexible than competing technologies of Usenet, and it could support a wider range of social organizations. Users did not need to have any special software, as all communication through Listserv was conducted through email. In fact, many users of Bitnet Listserv were not directly connected to Bitnet. Listserv could host an email-based open forum, host a moderated discussion group, or publish an electronic periodical. It could archive correspondence and even maintain an electronic library.

The community that built and operated Bitnet—the user representatives, programmers, and computer center managers—used Listserv to help them maintain the network and share information. They formed discussion groups to share ideas about using the network software, to discuss policy matters, to plan for the future, and to share lessons on programming for the network.[23] In the remaining archives of these groups, we can see the elements of Goffman's back stages. The members of these groups are relaxed and often rely on a common lingo or shorthand to communicate. Generally, these members share the ideal of an open network, and they are interested in preserving and extending the bandwidth of that network. However, while sharing an ideal,

these individuals often disagreed about the means of achieving their goals, and their discussions were often quite lively.

The back stage nature of these groups is best seen in the way that they handled new members, particularly the new members who were outsiders and had no interest in the goals of the group. In general, these groups treated the outsiders with deference so long as they subscribed to the group's code of behavior. Once they violated that code, the group usually moved quickly to correct, stifle, or expel the invaders.

An early Bitnet group discussing user guidelines illustrates this phenomenon. This group was surprisingly tolerant of new members who were honestly interested in the network and who were trying to understand how it operated. After the group had been operating for about a year, a librarian joined the group. His comments were few and often revealed that he knew little of network operations or of the policies of his own university's computer center. The members of the group rarely engaged him, but they also never corrected him. After he had been part of the discussion for a year, he left the group to start a discussion on subjects of interest to himself and other librarians. His experience contrasts strikingly with those of a pair of undergraduates who joined the Bitnet group during the same period. After they made a few obnoxious comments, they were quickly expelled.[24]

The experience of the user guidelines group was repeated regularly after 1987. Like the librarian, the most successful founders of new network-based communities learned from the experience of others. They joined existing groups, learned how to use Listserv, observed group interactions, and left (or were expelled) to form their own organizations.

Many attempted to establish new groups, though most of these groups proved to be transitory. Their leaders often struggled with the technical problems of managing Listserv and were unprepared to manage social problems. Over the period from 1987 to 1989, the best network-supported groups became increasingly more sophisticated, turning the back stage region of 1984 into a collection of front stages.

Transitory Groups

One of the more successful early groups was built around the network periodical *Netmonth*. It straddled both the technical and nontechnical communities, as it was a publication about Bitnet itself. However, its staff members were more concerned with using the network than they were in the details of its operation. It contained regular columns that discussed new net-

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Figure 1. *Netmonth* cover art.

work services and features that speculated on the impact of network communications. Published between 1986 and 1989, *Netmonth* did more than any other activity to promote Bitnet and teach people how to use network software. Through articles and examples, it showed people how to use network software and how to organize network communities. Its founder, a Sacred Heart College undergraduate named Chris Condon, was the individual most responsible for converting the back stage of the old Bitnet into the front stage of the new.

Like his periodical, Condon straddled two parts of Bitnet society, playing a role that Goffman identifies as "discrepant." He was a friend of several Bitnet staff members. Because Sacred Heart students used the Yale University computers, Condon knew the operators who helped to distribute Bitnet routing tables and the staff of the Bitnet information center at City University of New York. Yet he was not a computer scientist and had deep sympathies with those who were trying to use the network. When forced to display his opinions, he remained loyal to the Bitnet hierarchy and defended the policies of the Bitnet executive committee and the operators of Bitnet.[25] He praised the writer of Listserv as "Eric Thomas, savior of Bitnet bandwidth"[26] and called for policies restricting the use of Relay programs.[27]

Though Condon was accepted in Bitnet social groups, he often subtly diverged from the opinions of those who built the network. He wanted to promote Bitnet to a broad class of users at a time when many of those who operated the network were hesitant to do so. In an early issue of *Netmonth*, he promoted a group that was using Listserv to discuss science fiction, an activity that several of the network operators questioned.[28] Condon also experimented with "cover art" for his periodical, creating designs from standard characters. These designs increased the size of each *Netmonth* issue by 10 to 15 percent and added what some considered unneeded and inappropriate traffic to Bitnet.[29] (See Figure 1, Figure 2, and Figure 3.)

The social structure of the *Netmonth* community was far more sophisticated than most other network-based organizations of its time, but it was not robust enough to survive Condon's departure. Condon recruited nearly two dozen writers to his staff, among them some of the more-active network users of the time. He assembled them into an intricate organization that he advertised, along with the size of his readership, on the masthead of *Netmonth*. The subscription list of the periodical peaked at 6,000 in late 1989. Even with his staff of writers and his large subscription list, Condon remained the central figure of the group, and no one moved to take his position once he graduated from college. Trying to continue *Netmonth* while he held a full-time job, Condon was able to maintain regular publication until October 1989, when the demands of his job left him less time for an outside endeavor. Over the next two years, he was able to produce only four issues. Unable to meet the demands of producing a regular periodical, he gave up entirely.[30] When he did, his readers discovered that his editorial staff lacked the organizational cohesion to continue without him. It was unable to select a new leader and could not continue publication without Condon.[31]

Condon's *Netmonth* encouraged many individuals to establish network-based groups, but most of these organizations were highly depend-
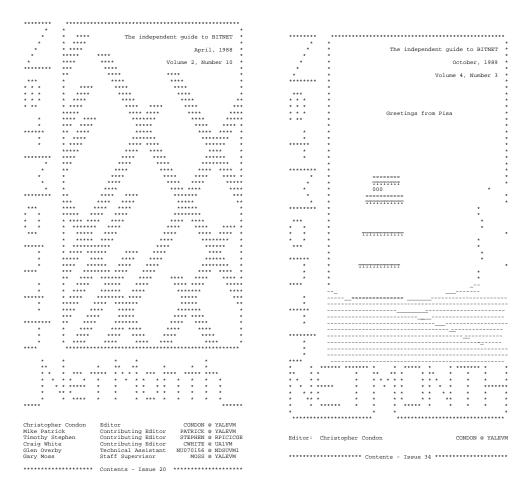
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Editor: Christopher Condon   CONDON @ YALEVM

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Figure 2. *Netmonth* cover art.

Figure 3. *Netmonth* cover art.

ent on their founder and never developed a strong organization. Few were able to solve the problem of choosing a new leader once the originator of the group departed. The work of John Harlan, a librarian from the University of Notre Dame, illustrates the problems these communities faced. Harlan was originally a member of Condon's community. He contributed a few pieces to *Netmonth* as he worked to establish his own organizations. He tried to build groups to discuss libraries, foreign languages, and international affairs. He actively promoted his groups, encouraged people to join, and worked to sustain a sense of community. His largest social group read his electronic publication, *JBOnline*, and exchanged opinions about world issues over one of several related discussion groups. *JBOnline* was an electronic digest that published stories gleaned from shortwave radio reports. Like Condon at *Netmonth*, Harlan had many readers and little assistance. For three years, he ran the service with no support from others. Though he had many enthusiastic readers, he never attempted to build an organization to institutionalize his ideas. Without others to share the burden of running the groups, he eventually ceased to publish *JBOnline*, and the community he built faded away.[32]

In addition to the problem of identifying new leaders for a community, many of the network-supported groups struggled with the problem of free speech. The tradition of free speech on the network was rooted not only in the U.S. Bill of Rights but also in the scientific tradition of the free expression and criticism of ideas. Yet, the extent to which a community can tolerate free and unrestricted speech is a troubling problem for all societies and remains an open issue in network-supported organizations. During the period of Bitnet's rapid growth, the problem was exacerbated by the lack of mature social organizations and by the need to preserve the bandwidth of the network. The discipline of learning how to balance freedom of expression with the other rights and obligations of an organization is one of the key steps in turning

an organization that is effectively a back stage space into one that is front stage.

The discipline of managing free speech is a discipline that many groups of this era failed to learn. The fate of a discussion group devoted to the politics of the Soviet Union and Eastern Europe illustrates many of the problems posed by open and free discussion. This group was part of a larger community that included the members of a half dozen discussion groups that talked about politics and culture in the waning days of the cold war. Most of these politics and culture groups were moderated by a very active network user, a graduate student at a Midwestern university who identified himself by the pseudonym Valentine Michael Smith. This student wrote extensively about the problems and issues facing Eastern Europe and the Soviet Union, and he distributed these efforts to the members of a large mailing list. Many of those who read these writings took part in the discussion groups that this student moderated.

In 1988, a conservative member of the group discussing the Soviet Union started dominating discussions and picking fights. The moderator of the group was committed to free and unhindered speech and felt that he could not, and should not, stop or even rebuke the offending party. From this position, he watched as the group slowly withered and began to disintegrate. Long-standing members grew tired of the discourse and left. The few new members who joined the group seemed to have little interest in substantive issues. Only when he began to realize that the community might vanish did the moderator contemplate confronting the person who was causing the trouble. Finally, when the group had shrunk to a small fraction of its original size, the moderator deleted the offender from the subscription list. He later described it as "the hardest decision I've had to make." The group, fatally damaged by the turmoil, continued for a few weeks before vanishing.[33] This is an extreme example of the problems inherent in a network-based organization, but illustrates the dilemma that many leaders of network-based groups faced during this period.

Permanent Organizations

Slowly, these transitory groups began giving way to more-permanent organizations. Like their predecessors, these new groups built on lessons learned from preceding groups. Perhaps the best example of a network-based group that built a successful organization is a group of students who published a daily newsletter: *China News Digest*. Like some of the other early groups, the group learned from other organiza-tions. However, this group was also disciplined by outside events.

We can trace the ancestry of *China News Digest* to a Listserv discussion group, Chinanet, that began operating at Texas A&M University in the summer of 1986. Chinanet was run by some U.S. computer scientists who were exploring the possibility of a connection between Bitnet and Asia. It was a back stage social space on the network where computer scientists with common aims could talk about their plans. Chinese students invaded the list in the late fall of 1986, a time of political turmoil in China. The founders of the discussion group tolerated the invaders for a time, but eventually decided that students should take their discussion elsewhere.[34]

In November 1987, the students on Chinanet formed a Usenet group, soc.culture.china.[35] This news group soon became a useful means of disseminating news within the Chinese student community, but it was a limited tool and gave the group no incentive to mature. As Usenet could be found on only a small fraction of computers, its news groups, including soc.culture.china, were unavailable to many students. To broaden the scope of soc.culture.china, Chinese students formed two other organizations to redistribute the news from soc.culture.china. The first was *Electronic News for Chinese Students*, a loose confederation of students that redistributed the news in an email tree.[36] The editor would prepare a digest and send the digest to a dozen distributors, each of whom kept a mailing list of different subscribers. The second method was *News Digest,* a similar group, that used the Listserv program to redistribute the soc.culture.china news.[37] *Electronic News for Chinese Students* appeared in late 1988. *News Digest* began operating in March 1989.

The events of "Democracy Spring," the Spring 1989 Beijing protests, pushed *News Digest* to the fore. The subscription list expanded quickly, and the publication acquired a skilled editor, Bo Xiong. Xiong behaved much as Condon had done with *Netmonth.* He systematized the publication, gave it a regular schedule of publication, and recruited others to help him with the work. The Tiananmen Square massacre of 4 June 1989 further galvanized the Chinese student community in the United States and caused them to form a political action group, the Independent Federation of Chinese Students and Scholars.[38] At the meeting that formed the federation, representatives of *Electronic News for Chinese Students*, *News Digest*, and a third Chinese network group agreed to form an electronic publication: *China News Digest.*[39]

China News Digest began operations in late August 1989 and achieved a limited organizational stability within six to eight weeks.[40] It had a formal editorial hierarchy and programmers to help with distribution and software support. It was an organization truly located in cyberspace, with no central office. The staff members were scattered at a dozen universities in Canada and the United States. For its first year, the electronic mailing list did not even have a permanent home, but moved from the University of Toronto to Kent State University with several stops in between.

It took nearly a year for the editors of *China News Digest* to understand the issues they faced in managing a network periodical and to learn how to handle the problems of a network social organization. At the start, they attempted to keep the periodical open to all points of view, but they soon learned that unfettered communication was not in their best interest. In the fall of 1989, they were involved in the effort to have Congress change the visa status of Chinese students. In the midst of the campaign, after the students had suffered several setbacks, one student wrote, "Some times there are things we cannot post in the Net because they will go everywhere including congressmen's office, and sometimes it is not the best way to have massive response."[41] After this crisis, the group began behaving increasingly like the staff of a conventional periodical, carefully editing their periodical and choosing the content they would publish. Within six months, it became one of the largest groups Listserv supported, with well over 10,000 subscribers.

Scholarly organizations also learned the lessons of establishing social discipline. Two small organizations, Humanist and Shaksper, illustrate the pattern. Humanist was a group devoted to discussion of the humanities. It was founded in 1987 at the University of Toronto by professor Willard McCarthy.[42] Shaksper, which was devoted to discussion of the works and times of William Shakespeare, was founded at the same school three years later and borrowed many ideas from its predecessor.[43] Both survived the departure of the original founder. Both were able to move their operations to different sites on the network. Both established resilient nonhierarchical communities by forcing potential members to make a public commitment to the group, which included posting their biographies on the Listserv.

Of the two, Humanist had the strongest connections to the earlier, less-structured back stage social spaces. It was based around a Listserv-moderated discussion group. In establishing the group, McCarthy was looking for a structure that would provide a free discussion and yet avoid the problems of many of the freewheeling network discussion groups. He moderated group discussions, gently controlling the flow of information. Yet over its first three years, he struggled with the usual complement of arguments and disruptions. As the organization grew, he learned the importance of having rules to govern the network discourse and eventually instituted the policy of posting biographies as one way of demonstrating a commitment to the group. He eventually left the group, and Humanist took a final maturing step by uniting with a small professional organization.[44]

The founders of Shaksper, using the model McCarthy developed, matured much more quickly. A few weeks after it began operation, the group was sustaining a series of interesting discussions and was attracting the attention of Shakespeare scholars and learned readers. Like Humanist, Shaksper never developed a hierarchical structure, but it had enough formal organization to allow the group to identify a new leader once the founder decided to depart.[45]

The End of a Golden Time

By the fall of 1991, Bitnet was starting to mature as a social framework. The intimate back stage region of 1986 had split and multiplied. That fall, over 200 copies of Listserv supported over 3,000 discussion groups, electronic periodicals, and other organizations.[46] Though most of the social organizations Listserv supported were still simple discussion groups, many of the new organizations were more sophisticated and were interested in a broad array of issues. Most founders of these new groups learned from their predecessors how to use the Listserv software and how to manage a social organization. Thus, we find a group of European students leaving a discussion devoted to U.S. politics to form a roundtable on European politics,[47] a subscriber to a technical group discussing the IBM PC starting a service to answer questions about computer tools for the blind,[48] and a group of Indian students copying the structure of the Chinese student news organization, *China News Digest*.

The members of these new groups considered these new communities to be front stage areas, places where ideas were presented to the public and where participants had a formal role. They were less shackled by the idea that a network-based group should be an open, unstructured back stage region and were more willing to accept a stronger social structure,

with clear leadership and rules governing membership and behavior.

The lessons about organizing network communities proved to be longer lasting than the technology of Bitnet itself. At its height of prosperity in 1989, Bitnet connected nearly 500 organizations and had over 3,000 nodes. In the early years of the 1990s, organizations began to withdraw from the Bitnet as they began to have access to TCP/IP networks and the Internet. The Bitnet executive committee was not caught unaware by the TCP/IP protocol, but it never produced a viable plan for converting TCP/IP even though the committee spent much effort discussing the future of its network. It had experimented with TCP/IP, had built gateways to the Internet, and had even used TCP/IP networks to carry some Bitnet traffic.[49]

The golden age of Bitnet ended in 1991, just as the Internet began its rapid rise to prominence. That year, Bitnet merged with a small, floundering TCP/IP network called CSnet.[50] The resulting organization, called CREN, never achieved the success of the Internet or even the relative success of the original Bitnet. CSnet, rather than expanding the network, became a financial liability. CREN found itself paying large sums to maintain CSnet service, taxing the cash surplus that it had built in the years since 1987. Members of the new organizations, most of whom were now connected to the Internet, began dropping their Bitnet memberships as they found no advantages to remaining on the old network. CREN survived the period, but it no longer held the innovative position it occupied during the second half of the 1980s.[51]

Listserv technology proved more durable than the technology of Bitnet itself. In 1991, programmers were already working on porting the software to Unix platforms, freeing it from the proprietary restraints of the IBM mainframe environment.[52] By 1994, most of the strongest network communities that had been supported on Bitnet servers had moved to new machines on the Internet. These organizations remain the legacy of Bitnet, organizations that helped turn the limited, private, back stage social regions of the network into more-sophisticated front stage regions.

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Most of the raw material for this article was gathered during the summers of 1991 and 1992. The first author attempted to gather as much archival material as possible from the 149 sites that were operating Listserv in 1989. (Listserv Groups, 13 February 1989, Listserv@

Bitnic.) Most sites strictly limited the number of bytes that could be requested each day, and many of the sites had little material that predated 1989. In all, the first author collected material from 40 sites that he believes contain most of what was still available from the 1985–1989 period. Few of these sites remain operational, and fewer still continue to hold material from this period.

Abbreviations and sources:
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EDUCOM: Educom networking, 1987–1989, NICSERVE, collected July 1991.

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19. See *Netmonth*, July 1986; Dec. 1986; Jan. 1989.

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24. See Logs for UGL-L, 1986-1988, Listserv@Bitnic.

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27. *Netmonth,* Dec. 1986.

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