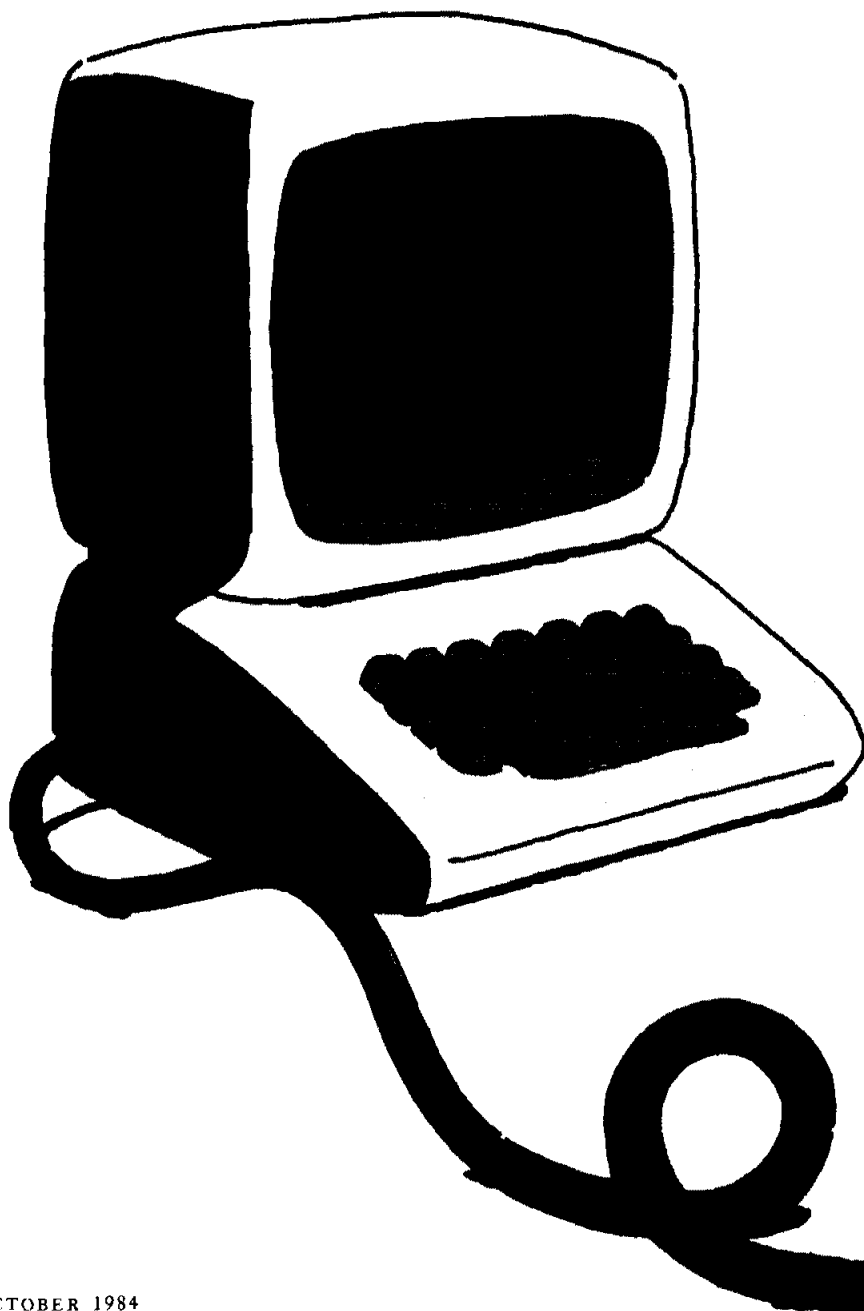

Computers may be calculating, but can they be socially responsible? Is teleconferencing oracular or vernacular? And will you find the love of your life on a silicon-chip bulletin board? Our reporter looks for the brains and comes up with the heart and the soul.



The Birth of a Network Nation

By Kevin Kelly

TAKE A FLASHLIGHT and peer into the little square hole where your telephone plugs into the wall. See those four colored wires way in the back? Those strips of copper are holding back the waters of network nation.

Define a network as at least two computers linked together, usually via telephone wires; the network nation is a web of people stretching from Bar Harbor to San Diego, from Seattle to St. Petersburg, linked electronically to one another through the medium of their computers. At this moment, in the pattern of the jiggly electrons pooled behind your telephone plug, minds meet without bodies, commute to work, and visit friends. This kaleidoscopic networking is done with dinky computers or sleek \$3,000 machines. Computer neighbors can leave notes or write stories and news to each other, which can be read on the computer screen anytime; these messages can be strictly private or made public for everyone to discuss.

Call this teleconferencing—a meeting of hearts and minds facilitated by

the twin technologies of telephone and computer. Most teleconferences are conducted through commercially run, national systems, with zingy high-tech names like CompuServe or Electronic Information Exchange System (EIES) [see box]; people plug their computers into the network for an hourly connection fee. Teleconferences can accommodate many participants at once, all busily leaving or reading messages to and from one another. Participants can, if they wish, speak to one another in "real time," as if talking face-to-face, but they rarely do—typing is too painfully slow for useful real-time conversation. Instead, messages flow back and forth at leisure, allowing for ample thought in between. Teleconferences can last days, months, or even longer: one on the EIES system, dealing with American productivity, has been going on for two years now.

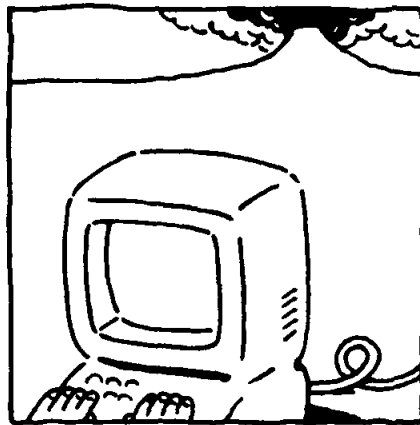
An acknowledged grand maven of computer networking is Stewart Brand, the orchestrator of the *Whole Earth Software Catalog*. As I stand by in his Sausalito, California, waterfront offices, Brand turns on his computer to enter into EIES, which he visits daily. He inserts a customized software disk that dials the correct phone number, delivers his ID and password, signs on, then automatically ducks into his favorite discussions. There are several dozen informal conferences on-going at all times. A pet passion of Brand's is the weather, in both local and global quantities. He drops into the weather discussion. No one else there right now, but four comments have been added since he last stopped in; they scroll up very quickly. Let's see: a hurricane on the loose in Japan... record snow melts in the Andes... ah, something interesting here—a volcano earlier reported to be erupting in Indonesia. Now it turns out to be merely a severe thunderstorm untypically stuck over the cone. Brand leans back and laughs in glee at this weather quirk.

Kevin Kelly, a longtime contributor to New Age Journal whose article "Blue Bikerways" appeared last April, has recently joined CoEvolution Quarterly as an editor. He is also involved in shaping an experimental, state-of-the-art computer network.

ILLUSTRATIONS: CHRIS VAN DUSEN

There are other electronic conferences he visits daily. The *Whole Earth Software Review* itself sponsors its own conference where contributors file reports from their homes across the country. The editors select and arrange, and the copy is typeset from what the authors type. Most words of the journal don't see daylight until they roll off the printing press. "I do think electricity will change magazines," Brand says. "Electronic conferencing has certainly changed my life, the way I live." Soon, it may change the way everyone lives.

Teleconferencing is not, however, the only resource in the network nation. By



The network reveals a hurricane in Japan, snow in the Andes, a volcanic eruption in Indonesia.

zipping down one silicon highway, the network traveler arrives at a homegrown electronic bulletin-board system (BBS), where messages are posted into the memory of a small computer—often sitting in someone's bedroom—passing on the latest gossip in computers, or rock music, or solar energy. BBSs differ from teleconferences in their grass-roots nature and in that, in most cases, only one participant can be connected to the system at any one time.

If you wrapped your arms around all those who are now linked to the network nation, you'd count over 1 million people. That's this year. Chris Yalonis, former director of Creative Strategies, a computer consulting firm in San Jose,

California, predicts that by the end of next year, there will be 8 million.

As it stands now, not all the forty or so major public networks such as EIES or CompuServe are interconnected, so it's possible to zigzag through the switches and reach some of the citizens of the network nation, but not each and every one. Peter Johnson-Lenz, a developer of network systems, says, "Originally, people wanted electronic networking because they thought they could instantaneously get in touch with any person they desired and win other magical qualities as well, but it's not about that."

What it *is* about is enlarging the relational skills we already have. Occasionally, it seems to be the process of this communication that has drawn us together, rather than the network's capabilities. Steve Johnson of RAIN, an organization promoting appropriate technology, tells me a story of a city neighborhood that applied for a grant under Apple Computer's Community Grant Program. "The neighborhood said, 'Let's make a network,'" he says. "'Well,' Apple said, 'in order to qualify you need some people. You need a minimum of cooperatives to apply.' So the local group went out and got together with all these other local groups that had been there all along, and they made a network."

The process usually begins through conventional channels; like-minded groups contact one another by telephone, letter, or word of mouth and agree to hand together for an electronic teleconference. Then they rent time on one of the national teleconference systems. Those having the most to gain from this network nation are special-interest and advocacy groups, the socially disadvantaged, rural citizens, and kids. Special-interest groups can use the network spaces to convene a widely scattered constituency. Advocacy groups can disseminate huge amounts of perishable information quickly and efficiently. The socially disadvantaged, a term encompassing almost anyone from the disabled to the elderly, can communicate and receive equal respect. Rural populaces become less remote. Kids thrive in the hidden electronic corners of the network nation. Networking diminishes image and lessens power and roles where image is important. Instead, it rewards ideas.

THE ORIGINS of the network nation can be traced to the early research of a computer scientist named Murray Turoff. In the 1960s Turoff experimented with techniques to pool knowledge quickly and decisively from a group of experts via the growing academic computer networks. In 1971 he had a chance to put his strategies into practice while working for Nixon's Office of Emergency Preparedness on the government's price-freeze program. When Turoff left the federal payroll in 1973, he took his vision of teleconferencing with him to the New Jersey Institute of Technology. In 1975 the thirty-nine-year-old professor went on-line with EIES—the same system Steward Brand plugged into ten years later and three thousand miles away—a true pioneer in the current crop of network brains.

Today the computers running this prestigious national network whirl quietly in the basement of a downtown Newark, New Jersey, college building, in two cabinets the size of medium refrigerators. They would both probably fit inside a clothes closet. Within their bellies live over two thousand conferences—everything from high-brow discussions of the future of telecommunications to a soap opera whose characters live in a sleepy New England town called Disbelief.

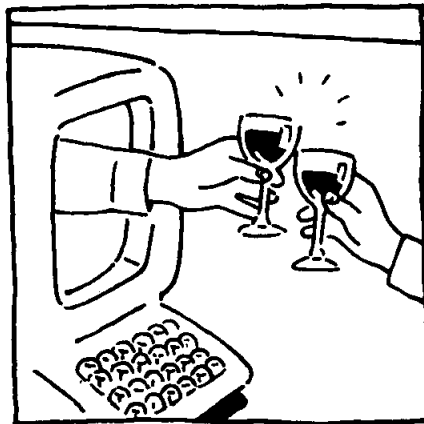
I am granted permission to visit EIES on-line for several months. I can join in from anywhere I am able to plug my computer into a telephone line. To enter, I ring a local number, type in EIES's electronic address, give my password, get a welcome, and I'm there.

Imagine entering a quiet hallway with doors on both sides, each opening into a noisy room full of voices gathered around a table or fireplace. In each room the dialogue lingers in the memory of the network; the conversation keeps going, but is also simultaneously frozen in a transcript. Whenever someone returns after an absence, the conversation can be reengaged exactly where it last left off.

I type "+ON": that lists all who are simultaneously on-line with me. Besides remembering conversations, EIES provides a way to interact one-on-one with

anyone who is sitting at his terminal at the same moment I am. There may be two or thirty. I can, if I want, link up with each or all of those names directly for real-time conversation (although for an orderly real-time conversation, of course, only one person can speak at any one time).

The thing I grow to love about EIES is that it is a place to meet, perhaps like the cafés of old Paris. It's the kind of place we haven't had in our time, the sort of spot American hars wish they were, and what churches used to be. We yearn for a common ground to rest on and to refigure the events of the day, to



EIES is a place to meet, like the cafés of old Paris. It's the kind of place we haven't had in our time.

chat, and to make fun without having to explain too much. The friends we'd like to live in our neighborhood live instead in Dallas or St. Paul or Phoenix. But on the networks, we all meet in green computer light no matter where we are. Every evening I can log into the electronic cafés of EIES and spend an hour with friends, trading news, listening, and laughing.

The laughter is what surprises me most. I often find myself in my room at night, reclining back in my chair, reading communiqués as they scroll by on the green monitor, and laughing deep belly laughs at the wry humor. I rarely do that reading. I'm more surprised to hear other teleconferrees confess the same. I e-mail (electronic-mail) a question to Turoff. What does this uncom-

mon laughter mean? I figure he should know since he spends eight to ten hours a day hooked up to his own creation. "It's about letting down face," he says. "We did some experiments with one-way mirrors and found that when people are on-line, they let down their face, that is, they drop their guard more than usual. It's a telephenomenon."

"There is a certain sense of immediacy in communicating with people electronically," says another longtime networker, Trudy Johnson-Lenz. "Somehow, even though you are not at the terminal, they are always there, and you are always there. There are traces of you." Other advantages abound: Pushy people are ignored. Without a physical presence, they're easy not to respond to, easy to shut off. Rank is gone: There is no way to indicate status on a screen, except by writing well, which is honored. One alert networker notes that he's never seen an elected official sign on, at least under his real name. The space is too democratic. Politicians feel as if they are caught in their underwear. A top management consultant recently introduced to computer conferencing tells me, "You don't get credit for listening. There's always some VIP who can control a board meeting by sitting, mouthing his cigar in silence, and watching everyone talk, reigning with his eyes. You can't do that here."

ONE DAY an acquaintance calls and gives me a telephone number; I rev up my Apple, enter the number, and sit back while it dials. When the Apple recognizes the high screech of another computer, it makes the connection. I am now linked to a computer bulletin board, or BBS. Over two thousand of them can be found in the network nation, and new ones appear every day. A BBS is usually operated by a lone systems operator (commonly called a sysop), often a high school kid, on an inexpensive home computer—a simple Radio Shack model will do—programmed with software especially designed for receiving and posting messages. In between the computer and the phone line is a black box called a modem, providing an electronic connection between the two. Sysops advertise their special interest by leaving

messages on other BBSs across the country, pointing out the location and hours of the next link in the network nation, inviting everyone to call. These kids are weaving the web.

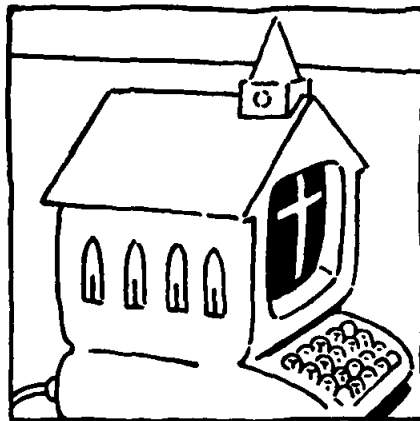
I start board-hopping across the networks by picking up suggestions from each board, grass-roots style. I connect with a board advertised as a medical clearinghouse. When I get in, it is operating but empty. There have been almost no new messages in a year! I sign off and dial over to a genealogy board. No answer. McGraw-Hill, the publisher in New York City, runs a board. There are numerous messages for a group of people who seem to know each other—"Hi, I left a message, but you didn't reply"—that kind of thing. But I do pick up a tip for a writer's BBS in Florida. I modem down South, get on the board, and head toward the message area. I manage to inspect only one message before I get caught in a loop. Without instructions I go round and round and round and have to hang up to get out. Whew! A couple of days later, I connect again and manage to make all the right moves. There's a lot going on. Message #3444, from Doug C.: "Say, got a call from Prentice-Hall. Seems they have a book they'd like written. They had an author but he/she crapped out on them and they're looking for somebody to step in and write it...Let's see, what was the editor's name?...Beth somebody..." Got to come back to that one later.

An intriguing name appears on my new BBS list: Computers for Christ, out in California. I ride the electronic highway and slip into the board. "Jesus Christ is Lord. We pray that you will read the download section with an open heart and mind." Within are serious on-line discussions, Bible tracts, and up-to-date synopses of various heretical cults, A to Z.

Bulletin boards are like horseless carriages waiting for a good name to come along and stick. They work well as electronic posting boards but are probably better as libraries of software, places to meet friends and find answers. Loitering is a problem. The sysops limit each caller's visit to a maximum of thirty minutes to an hour or so, since usually

only one person can be connected at a time, unlike EIES and other teleconferencing networks. There is one experimental multiuser bulletin board run by a student at the University of Michigan, in which five callers can be on simultaneously. I enter late one evening and find the effect disorienting. Messages are thrown at me faster than I can think. When they are perfected, multicaller boards will be the future, since most popular bulletin boards are busy round the clock.

There are national teleconferencing systems that promote this kind of electronic happening for the masses. The



Ride the electronic highway to California and slip into a gathering of Computers for Christ.

biggest of these is CompuServe—a subsidiary of H&R Block—and a Turkish bazaar of telecommunications for its subscribers—which offers CB Simulator, a program allowing up to forty people to connect their computers together.

I purchase a trial password from CompuServe and log on. From a choice of eight, I select Channel 2. Whammo! Faster than my eyeballs can read them, a barrage of one-liners rocket up the screen—a conversation bomb exploding.

The confusion gives a buzz. The skewed order the conversation arrives in disguises rationality—like a daydream—behind a careening train of free associations, a sense of being high. Logical conversation is impossible: you shoot from the hip. The chaos is even more

disturbing than it first appears because the waves of sentences break in and interrupt what I am trying to type, a sea that pushes me back two feet for every step I crawl forward.

I ask to \TALK. When answered, I am connected with a single caller, tuning out all the others. Instant privacy; it's also the reason Channel 1 has become a renowned dating place. Each night several hundred regulars cruise through CB spaces with their windows rolled down and the wind in their hair. Hey, can we \TALK?

Sexual innuendos on fast \TALK-ing CB can become quite graphic, to the point of pornography. Outside of CompuServe, local bulletin boards devoted entirely to dating—including those with a very specific sexual orientation—were some of the first ones set up. As in regular dating services, you try to describe yourself quantitatively while the on-line computer matches you up with potential mates. It gets steamy sometimes, and it's not unheard of for a computer-courted couple to marry.

The other commercial network, the Source, backed by *Reader's Digest*, offers a tamer alternative. It has its own characteristic flavor of electronic life. A network department store, it peddles e-mail, teleconferencing, and up-dated news, all available under one password. I request CHAT, the network command to link up one-to-one with anyone else on-line at the moment. I type) ON Line to get a list of ID numbers (which happen to resemble license-plate numbers—mine is BBV582) of all who are on. I CHAT one morning at the wee hour of four, after a long night of BBS hopping while the rates are low. In the early evening, two hundred or more networkers will be on the Source; now, at four in the morning, there are only fourteen. CHAT-ing is akin to dialing random phone numbers and asking to talk without the onus of impoliteness (it's too new for manners). One young girl always picks IDs coded BBBs "because they're the friendliest." I pick the first one on the list, a BBM. CHAT? Yes, his name is Bryce, from California. I ask him why he is on at this hour. "Can't sleep. Being here on the

network is almost like going out to do something. Oh, I have to leave now, OK?"

Fine for Bryce, but where else can I go at four in the morning in my sleeping Georgia town? I steer over to the electronic publishing rooms in the Source. These are publishing experiments which, if successful, earn the authors a royalty (some writers can earn as much as \$400 a month) depending on how many times a work is read. Popularized by word of mouth, one of the most highly frequented is *Sourcetek Magazine: Journeys through the Electronic Void* (a talley in the electronic magazine shows it's been read 1,679 times), managed by Sourcevoid Dave. Sourcevoid Dave introduces himself: "I am a happily married, middle-aged family man who has seen enough of Big Government, Big Wars, Big Industry, Big Political Causes—either to the left or right—to now prefer to operate a small business out of a small house, in a small neighborhood, working with small organizations, using a small computer to make it all possible."

Sourcevoid Dave also operates a small BBS called the Old Colorado City Electronic Cottage, the most original BBS now running. For several nights in a row, I try to modem into it, but crash into a busy signal. I finally stay up to three one morning and log on. The BBS is laid out as an Old West town; I enter on Main Street with stops along the way: Post Office, Roger's Bar, the Opera House, and the Cracker Barrel. You select "Meet the Mayor" to chat with Dave, if he's in town, or "Skip Town" to exit. Ducking into the Cracker Barrel, I select "A Suitable Philosophy for the Age of Information, First Canto of Date of Destiny." Then my screen goes blank.

I am sitting in a dark room before a blackened screen. Only my computer's cursor, a tiny green rectangle the size of an elf's tooth, glows in the dark. It begins to sweep across the black screen, back and forth in the even rhythm of a Japanese monk sweeping the courtyard walk. It leaves a trail of words that hang in the blackness, and with the next

Community Memory

IN THE EARLY 1980s, Lee Felsenstein entered the personal computer hall of fame by designing the Osborne I, a computer that rivaled the Apple for "user-friendliness." The Osborne Computer Corporation eventually went bankrupt, but Felsenstein's enthusiasm for computers remained undiminished. Today, he runs his own hardware design firm, Golemic, Inc., from a suite of offices in Berkeley, California.

His office is cramped, a little untidy, but somehow posh. There's an Osborne I and a Diablo High Type-I printer, a photograph of Yosemite on the wall, teak furniture, a majestic view of the University of California campus and the Cézanne-green hills of Berkeley.

As for Felsenstein, at thirty-nine he looks like a middle-aged computer engineer—brown knit pants, scruffy brown shoes, brown socks, wire-rimmed glasses, blue shirt with comb stuck in breast pocket, round face, and the obligatory digital watch. But once he gets started, Felsenstein sounds like a radical. "I don't trust the survival of humanity to the industrial structure of the world, to the marketplace," he says, launching into a polemic against centralized authority, the IBM "priesthood," and the hubris of "the artificial intelligence crowd." (Golemic does not produce robots, but the company takes its name from the medieval Jewish legend of the robotlike Golem, a silent, strong-armed protector of Jewish scholars, who ran amuck and had to be destroyed. Felsenstein reads this as a cautionary tale against the arrogance of technocrats.)

It is no small irony that Felsenstein's résumé reads like a technocrat's calling card, with the acronyms and hyphenated titles of computer hardware that he's designed. What it neglects is his street-guerrilla background: member of the Free Speech Movement; writer and temporary "military columnist" for the alterna-

tive newspaper, *The Berkeley Barb*; moderator for the agit-prop technoutopian Home Brew—Silicon Valley's first micro-computer user group, and the one that spawned Apple's Steven Jobs and Steve Wozniak; and, most important, founder of Community Memory, a decade-old project that has installed computer terminals in Berkeley neighborhoods to serve as community bulletin boards.

Currently, three terminals are in public use in the Community Memory program: one at a Hispanic community center, one at a cooperative grocery store, and one at the Whole Earth Access Store. People wander in, follow the simple instructions printed alongside the terminal, and plug into the bulletin board, reading or adding to lists of jobs, items for sale, services for rent, and so on. The service is free, but to allow the system to be self-supporting, coin boxes will eventually regulate use at five or ten cents per minute; rates will vary according to time of use and size of message posted. Felsenstein foresees sixteen to fifty terminals placed in each neighborhood to form self-sufficient networks; in time, he predicts, these networks will be linked together.

Community Memory serves as an advertisement for the sort of values Felsenstein wants new technologies to embrace. The project, he says, stresses decentralization, populist ideals, and the need for technologies that foster community. In addition, he says, the project tickles people's fancy. "Everything I have learned has pointed to a system like this as not only necessary but fun. At first, we expected we would have to defend the system against raging technophobia. But whenever people heard about it, their faces lit up. When you've got something like that happening, you know you're doing the right thing."

—TOM CHAFFIN

sweep below, it uncovers other words, with the next, more. The words are poetry, neon thoughts left by an electronic pixie. The sweeping is silent, but I imagine each word ping-pong as it is flung onto the screen. The poetry looks dumb on paper ("Experience is quite an Adventure Game...Freeware from God") but in electricity the verses skate across in dance; it's music that you see.

Then the cursor winks and stretches a poem called "A Bouquet of Ions" in a smile across the tube.

Returning to Main Street, I e-mail Sourcevoid Dave, mayor and poet, and ask for voice so I can call him by phone. We talk one night shortly afterwards for two hours.

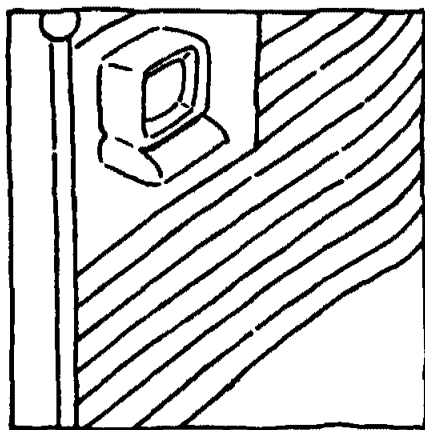
His real name is David Hughes; he's a retired West Point English teacher, and now a small-town organizer. His tools—or hoes, as he calls them—are microcomputers plugged into phone lines. With them he cultivates local politics. The BBS Hughes runs from his home in Colorado Springs gathers old-fashioned town politics in electronic space in what John Graham of *Pikes Peak Journal* calls "a New England town meeting held over an electric fence in Colorado."

In a crisp, military voice, Hughes tells how he has changed local politics: "I've used my Osborn computer to dial into the county clerk's computer and download the entire registration list of all the voters in my precinct. Now anyone can dial me and go into the world's first political precinct BBS." He approached his local branch of the Democratic party and told them he could put 100 percent of the voters in every one of the 120 precincts of the county on a public BBS for whoever wants it. Normally, his county would charge \$800 to print out the list. "This suddenly gives access to the smallest, least well-heeled campaigners," he says.

Above all, what excites him is the power electronic networks have brought to citizens confronting incumbent governments. "One of the advantages government has over the little guy is that city hall closes its doors at five o'clock, just when Joe Blow is coming home." Hughes has demonstrated with his BBSs that when you make government accessible, people will use it. People have rallied in electronic space with a phone

call at lunch, or from their living rooms after supper. Hughes created his first public agency bulletin board as a platform for complaints about a local condominium developer. Usually, at such hearings homeowners simply stand up and complain, without offering adequate documentation to substantiate their claims. But provided with the written transcript of over thirty builders' comments on the bulletin board, the building department ruled in favor of the homeowners.

Warming up, Hughes launches into an astounding story of how computer networking saved the day in his local



*A BBS can provide
instant access to
voter registration rolls
for anyone who wants them.*

community: "About a year and a half ago, the city planners of Colorado Springs made a decision to tighten the ordinance that regulates working out of the home. Their proposal would not only have made home entrepreneurship suffer, it would have flown in the face of high technology, as there are an increasing number of people using computer tools at home to earn money. I was the only person to stand up in front of the planning commission and testify against the ordinance. I argued the value of high tech, and as a consequence the planners tabled the matter for thirty days. I then brought the text of the ordinance home with me and put it on my computer bulletin board."

The reaction among Hughes's electronic neighbors was universally unfavorable. One person pointed out, via the bulletin board, that the ordinance would prohibit the sale of Amway, Mary Kay, and other products that are sold through home distributorships rather than retail shops. Hughes subsequently sent letters to the editors of the two local newspapers, announcing that anybody who had a computer or terminal could dial his bulletin board and read the ordinance for himself. Two hundred and fifty people over and above the normal number of callers dialed into the board in the next ten days.

"What I didn't anticipate was that some of the callers would be people who work in large high-tech plants, such as Digital, Rom Corporation, and Walter Drake," continues Hughes. "They not only read the ordinance, but circulated it through their plants. The next thing I knew, thousands of copies appeared throughout the city—although I never went to any meetings and never Xeroxed anything."

"In the end, the city council never knew what hit them. At the next meeting, 175 people showed up. They were anything from libertarians to longhairs. I was able to bring twenty-seven pages of printed-out comments on the ordinance from my bulletin board. Ordinarily, nobody puts out that kind of energy—no matter how concerned—because the effort to get involved with local politics is enormous. But suddenly the economy of effort that computers give you makes it possible to mobilize opinion and action. What we have here is the beginning of an electronic democracy."

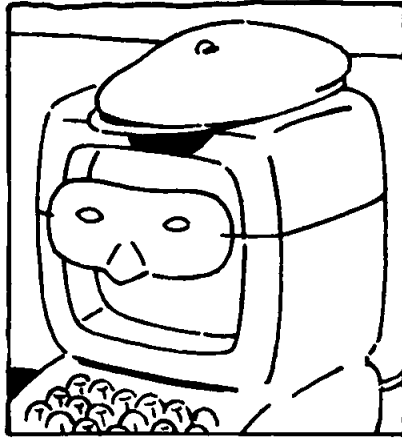
Perhaps the largest effort to inaugurate social change by electronic networking is being undertaken by the Telecommunications Cooperative Network, based in New York. TCN hosts over four hundred nonprofit organizations, including the Sierra Club, Oxfam, and the Nuclear Weapons Freeze Campaign, who have banded together to purchase networking privileges and discounts. It also distributes Interlink Press Service, a nonprofit news service specializing in news about Third World and developing nations. Bob Loeb, man-

Phone Phreaks

WHEN did computer networking begin? Its genealogy can probably be traced back to the early days of "phone phreaking." I didn't know anything about this until an eighteen-year-old phreak named Wizard called one afternoon. He and a gang of buddies have computer programs called "blue boxes" which enable them to place illegal, unmonitored calls all over the world. Blue boxes were once palm-sized metal boxes chock-full of wires and diodes; now they are software programs, lines of code that can weasel into the phone system and generate calls without bills, at least to the blue-box owners. The kids are a few of an unknown number of network outlaws who have figured out the mechanics of the telecommunications system and flaunt their knowledge by mischief, delinquency, and an increasing amount of outright crime.

The phreakers have their own electronic network to pass prized information among themselves, and since they use telephones without paying, they connect into whatever networks they want with extravagant regularity. With their help, I roam through their underground electronic network and e-mail (electronic-mail) some of the other elusive phone phreakers.

Eventually, a contact leads me to John Draper, the legendary Captain Crunch, who acquired his nickname by discovering that the little whistles in Cap'n Crunch cereal boxes had the perfect pitch for blowing you into Ma Bell's tone-activated main phone lines for free. Thirteen years ago, Captain Crunch revealed the toy whistle story to an *Esquire* reporter, telling of how he dialed into the telephone trunk-lines and blue-boxed his way through switching relays, leapfrogging with touch tones from California to Tokyo, over to India, west to Greece, all the way down to South Africa, across to South America, up to London, over to New York and finally back to "an operator in



California who rang him up on his other phone." So there he was, with a phone on each side of his head, talking to himself around the world—as he put it, "whipping my voice both ways around the world. Hello, hello, hello, one voice going east, one going west. Wow. That was a mindblower."

This was an unauthorized experiment on the organic network highway—which, in Captain Crunch's view, is the most complex system outside of the human brain. It wasn't just a bunch of phones: it was a new organism and no one—not even Bell technicians—really knew how it behaved. Long before Bell was successful in peddling teleconference to businesses, Captain Crunch and gang were blue-boxing their way into trunk lines, dialing 604 and talking to hundreds of other phreakers at once. One hacker would call Bell's main line in South Carolina every evening, keeping his line open, and wait for other phreakers to pop in. They'd all hang on to see how many they could cram in. Maybe thirty of them would be listening and gabbing on the phone at once, trying to stretch the limits of this fledgling conferencing phenomenon.

For Captain Crunch, who has spent time in jail for his experimenting, this outlaw approach is a thing of the past. He doesn't have anything to do with phreakers anymore,

though they continue to call him up. Not long ago some kids tried to connect him to a phreaker's teleconference, but he hung up.

"What did it sound like?" I ask.

"It has a very distinct sound, lots of beep tones. The kids figured out how to blue-box into video teleconferences generated by AT&T. They break into these circuits and connect up to sixty of their friends on line. They form subconferences and split off. They can pass control of the conference around like a ball. One guy starts an illegal conference, passes control to a friend on another line, drops out, starts another conference, and then hooks both of them together."

Could they keep going, connecting sixty people at a time, and not stop, say, until they hooked up a whole town? The image makes me giddy: a county-wide telephone party, the whole town squeezing into electronic space.

The more adventuresome phreakers are presently fooling around with satellites, joyriding on radio-packet networks, and beeping down all over the world: England, Australia, Africa. I have a friend who plugs computers into his radio sets. He's one of a band of creative tinkers devising cheap ways to network with radio waves. They have a bulletin board in which you ham-radio in and out, bypassing the long-distance lines and telephone charges.

According to Perry Romano, a spokesman for AT&T, that industrial giant loses \$110 million a year in such thievery and strikes back by prosecuting to the full extent of the law—up to a \$1000 fine and/or five years in prison. The lost revenue, of course, is passed on to the consumer.

"Phreaking is illegal," warns Captain Crunch. "I tell kids that if they have to play with it, they should hack on it at night when no one uses it. One kid out here got busted for it. If you get a call from phreakers," he commands me, "hang up."

—K.K.

aging director of TCN, considers his task to be to ease nonprofit organizations into the network nation—or to restrain them from making the leap if it seems unnecessary. “Technology won’t do wonder cures,” says Loeb. “We simply offer intelligent counsel when it’s hard to find.”

Third World appropriate technology has also been boosted by a network assembled to assist in areas where normal channels of communication are absent, as in the jungles of Papua New Guinea. This network, EcoNet, has already scored one unusual success. When villagers in Tonga and Costa Rica experienced a problem with crumbling cooking stoves (built from homemade cement), they hooked up with EcoNet via pan-Pacific satellite. Experts at California universities unearthed the problem: the villagers were neglecting to wash the salt out of sand they were using in the cement. “Eventually,” says Dr. Bryan Farrell, a university researcher involved in EcoNet, “we’d like villagers in Jamaica talking to villagers in Samoa about creating clean water supplies. We can’t do that yet, but we have faith that we will.”

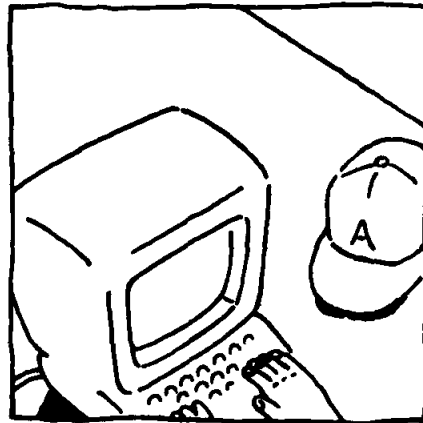
ELECTRONIC NETWORKS may seem to be a wonder cure. But they may need to be as common as TVs and telephones before they can change the culture in any deep way. And if they do reach into our everyday lives—as, for instance, the school system does—the first thing they will alter is how we learn.

Telelearning, a futuristic educational tool, evokes images of kids at home schools wired into Yale. A place in the country, an orchard out back, wood stacked up, a terminal on the kitchen table, and Johnny doing algebra problems in his baseball uniform. The family could be black or Latin, in Alabama or Alaska.

I try on the vision myself. My scene: a remodeled study in an old house in a small town in Georgia, beehives in the hackyard. My computer dials San Francisco and I log on to Telelearning, a company billed as the Electronic University, and register for a course called “College Composition.” I get a pack-

age by humdrum, post office mail: two disks and a manual. I pop one disk into the computer; after three or four minutes of introductory messages, my teacher’s portrait materializes in little dots on the screen. A caption describes her as Miriam Ylvisaker, a consultant for the Bay Area Writing Project at the University of California, Berkeley. It’s a good trick: for the rest of the course, I feel that she, not the silly computer, is talking to me.

Somewhat skeptical of the matchbook-cover image of correspondence courses, I was surprised by the tutorial’s free-wheeling approach. The first class was



Telelearning, a futuristic educational tool, evokes images of kids at home wired into Yale.

called Brainstorming. “To get some writing done, you need to get some ideas,” says Ms. Ylvisaker’s program, “and while you get ideas, you can’t be thinking if they’re any good—just write them down without stopping. Go back later to edit them, pick the best ones, and repeat the cycle.”

A series of writing exercises follow; my work is saved on a computer storage disk. When the lesson is over, the text is automatically transmitted to San Francisco via phone lines and read by Ms. Ylvisaker—“within forty-eight hours,” promises Telelearning. My second lesson begins with the comments my teacher left on the network. Ordinarily, teacher and student aren’t on-line simultaneously, nor is there a “class” going on, as I first supposed. Eventually, Tele-

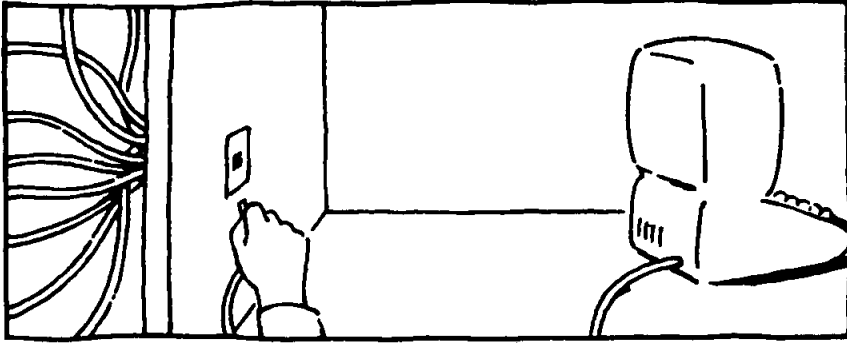
TO WRITE SOMEONE, you need a pen. To ring someone, you need a phone. And to meet someone in electronic space, you need to step into the magic rabbit hole of a computer terminal. Telecommunicating is one of the few activities in the never-never land of computers in which it doesn’t matter much what kind or brand of hardware you use. Any computer and TV monitor will do. A small box called a modem (costing \$100-300) connects your computer to the phone lines, enabling all computers to speak to each other in a near-universal code over the phones.

Logging on to most bulletin boards is free (though long-distance phone calls can be expensive), except for the dating bulletin boards and a few others which demand a membership fee for a password. The national conferencing systems (Source, CompuServe, EIES) have complex rate structures, but charge about \$6 per hour for off-peak connect time. In addition, they have steep registration fees which can sometimes be avoided by cashing in on introductory promotional deals.

In the other direction, it is very easy with nearly the same equipment to set up your own bulletin board. Just hook up any computer, modem, and monitor, and add one of the many software packages designed to program your computer to act as a bulletin board. With a particularly small computer, such as the Radio Shack 100, most people prefer to subscribe to a network such as CompuServe, which provides as one of its services a bulletin board that will handle a vast amount of mail—far more than a small personal computer.

The major on-going expense of a homegrown BBS of your own is the extra phone line needed. You could use the only one you have, and solely run the BBS at night, but unsuspecting callers would be subjected to the horrible high-pitched screech of your

How to Plug In



computer's mating call. In addition, a systems operator (sysop) must be ready to devote baby-sitting time to maintain the gadget, since none of these systems (not even the national ones) are thoroughly reliable yet.

Wherever I've been, pioneers have preceded me. I pass you on to them:

Books

● **The Network Nation**, by Starr Roxanne Hiltz and Murray Turoff (Addison-Wesley, 1978): The original birth announcement of the new era, rooted in solid scientific research, and still the best document of the implications of electronic networking.

● **The Complete Handbook of Personal Computer Communications**, by Alfred Glossbrenner (St. Martin's Press, 1983): The best how-to-do-it book for hooking up.

● **The Computer Phone Book**, by Mike Cane (New American Library, 1983): Cane has dialed up every BBS known to exist and made a directory of the good ones. A year out of date now, but no contenders in sight.

● **The Information Brokers**, by Kelly Warnken (R.R. Bowker, 1981): The complete scoop on what you need to do to make it.

Network Sources

CompuServe, 5000 Arlington Center Boulevard, Columbus OH 43220, (614) 457-8600: The largest telecon-

ferencing system to date, with the widest range of special-interest groups. No monthly charge.

Dialog, 3460 Hillview Ave., Palo Alto CA 94304, (800) 227-1927: A wholesaler of electronic data bases, accessible by individuals or libraries. Rates vary according to data base.

EcoNet, Pacific Research Unit, University of California, Santa Cruz CA 95064: An experimental electronic-mail network to aid the Third World in appropriate technology.

Electronic Information Exchange System (EIES), NJIT, 323 High St., Newark NJ 07102, (201) 596-3000. The most sophisticated telecommunications system—used by industry, government, and universities. Monthly charge, \$75.

MCI Mail, 2000 M St. NW, 3d floor, Washington DC 20036, (800) MCI-2255: Offers free accounts, free connect-time, cheap electronic-mail, and the cheapest overnight paper mail. Easy to learn.

The Source, 1616 Anderson Rd., McLean VA 22102, (800) 336-3330: A large teleconference (offering the easiest electronic-mail system) that allows any user to start his own discussion group.

Telecommunications Cooperative Network, 370 Lexington Ave., Suite 715, New York NY 10017: A cooperative of nonprofit groups to gain computing and electronic network power, which distributes Interlink Press Service, a Third World news organization.

Public Interest Organizations

Computer Professionals for Social Responsibility (CPSR), P.O. Box 717, Palo Alto CA 94301, (415) 322-3778: A nonprofit educational alliance of computer professionals dedicated to public discussion of the role of computers in society and the threat of nuclear war.

Information Technology Institute, 0245 SW Bancroft St., Portland OR 97201, (503) 221-0984: A regional (Pacific Northwest) organization studying the place of computers, telephones, and telecommunications in the nonprofit sector. ITS holds public forums on computer use, conducts classes on computer literacy and the social implications of computers, and offers a computer camp for nonprofit managers.

Public Interest Computer Association (PICA), 122 Maryland Ave NE, Washington DC 20002, (202) 544-4171: Sponsors seminars and *Nexus*, a bimonthly newsletter dealing with the use of microcomputers by public-interest nonprofit groups. *Nexus* also follows computer-related social issues such as invasion of privacy.

Volunteers in Technical Assistance (VITA), 1815 N. Lynn St., Suite 200, Arlington VA 22209, (703) 276-1800: A nonprofit, private organization providing information on how complex issues of development (such as computer technology) relate to low-income, Third World peoples. VITA publishes a newsletter focusing on the transfer of technology to developing nations and is currently working on a satellite communication project for the Third World.

Apple Computer's Community Grant Program, 20525 Mariani Ave., Cupertino CA 95014 Mail Stop 23L, (408) 973-2974: Apple Computer Corporation donates Apple 2Es to nonprofit community groups with budgets of \$500,000 or less. Application deadlines: March 15, July 15, and November 15. —K.K.

learning will sell the whole mix of off-campus courses offered by such schools as Ohio University, Central New England College, and others. Right now, you can dial up electrolectures on the rights of the injured, understanding human sexuality, the telecommunications revolution, and some other self-improvement lessons.

The inherent qualities of electronic schools and libraries—immediacy, equality, depth—seem to me to be worth pursuing. I travel, bodily, to Atlanta to attend a short training session in a classroom with real blackboards and real filing cabinets. The subject is Dialog, the world's largest electronic data bank.

I've always wanted a World Brain. The kind that lives in science-fiction books, where you can ask it any question from any terminal and it beeps out the answer. As a kid, I always wanted to ask: What do worms do in the winter? Where did the dirt in my backyard come from? Do mice dream?

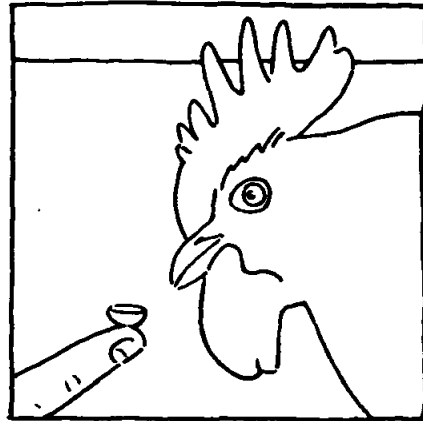
Now I'm getting my chance. I've enrolled in a two-day training workshop in how to search Dialog. What we are courting is a memory that cradles all government documents, every telephone book in the country, several million magazines, the major newspapers, the entire patent office, a backlog of scientific reports, and encyclopedias (note plural).

My instructor is Bob Donati, a small, curly-haired man gifted with a quiet manner and charged with enthusiasm. He begins by asking us to stand up and introduce ourselves. The variety of occupations is impressive. There are a couple of writers, a few scientists, an historian, an entrepreneur, and the expected group of librarians, many of them from private corporate libraries. A tall man with long hair and a handlebar mustache presents himself as an antique dealer. Apparently, there is a data bank under Dialog's umbrella that tracks art-object ownership, and he wants to gain access to it.

Getting into Dialog involves modem-ing into the networks, punching in the destination code-number, and riding up to the gate. Here ID and password are checked, and the screen goes blank except for the cursor and a "?" symbol. The computer is waiting for a question.

I'd like to tell you that you simply type in your question and—presto!—the World Brain answers, but it is far from that easy. That's why a person needs two days of training. Questions are asked in a logical code-language, which requires knowledge of the architecture of the system. Furthermore, the answer you receive is not an explanation. What you get is the summary of the article where the answer probably lies, or perhaps the article itself, or most often, a bibliography of articles to read.

We try some practice questions. Ask the World Brain for articles on recycling aluminum cans. That's easy. In twenty



Looking for an article on contact lenses for chickens? Almost immediately one scrolls on the screen.

seconds I have ten. What's covered in Bill Cosby's doctoral dissertation? Umm... A quarter of a minute later: an abstract from the University of Massachusetts (1976) on using "Fat Albert and the Cosby Kids" as a teaching aid in elementary school curriculum. How about contact lenses for chickens? I type into the World Brain: "SS contact (w) lens? and (chicken? or hen?)." Almost immediately an article from *Newsweek* scrolls on the screen.

I am in love. Or enslaved. I want to go home and leave my computer mainlined into it twenty-four hours a day, and never turn it off. I'll sell everything I have to keep it on—and I'd need to because it's a devastatingly expensive addiction. The much-desired Patent

Office files, for instance, demand \$300 an hour.

Even the least expensive data base, such as the government's educational ERIC files, are \$25 an hour on Dialog. Browsing becomes prohibitive. The only way to beat the high cost is to adopt a commando-like attack. You want to jump in, get what you need, and jump back out. For five bucks you can often find all you need if you know what you are doing.

Enter: People who know what they are doing. Librarians, the first to be trained on Dialog, discovered that businesses, lawyers, and lobbyists would pay almost anything to get information quickly. Who needs a library when you can plug into the World Brain at home? These librarians began freelancing their services as information scouts, setting up computer terminals in their homes. Thus were born the first electronic cottages.

All you need is a computer, a phone line, and experience in navigating the information sea. Enterprises contact you, and you dash through the networks gathering information and order the articles to be sent to your home. Bind them with expensive covers, ship them overnight, and charge dearly.

Electronic pioneer Elaine Kerr is one of the first to have lived out the dream of working in the electronic cottage. Over ten years ago, she plugged into the network nation and earned her way as a sort of networking consultant by adroitly introducing others to it and explaining away the dark, mysterious corners. She published some of her thoughts about working at home in the *Next Whole Earth Catalog*. "Sometimes I do miss the 'coffee breaks' that would be a part of a normal office working environment," she wrote, "because, yes, sometimes working this way is lonely. The trade-off, however, is well worth it. Here I am now, for instance, very much at home and very much working, with my newspaper on my lap for when the network is slow, the dog sleeping on the couch just a few feet away, and my son about to come home from school in an hour—to me, rather than a babysitter. This is a far saner way of living than I've ever had before."

I search the EIES network for Kerr to inquire if now, five years later, she has changed her feelings about teleworking. I find her electronic address and leave a message; she responds with a note on the network, and the next evening we meet on-line.

Has she retained the joy of nets? "I now work at home about 50 percent of my time," she answers. "I don't feel the loneliness anymore because now I'm going to meetings several days a week. I like the mix better. But I'll often put in ten hours a day on the networks. There's a rat's nest of wires all over the place. I have four terminals, two of which I don't need any longer. It very much looks like an electronic cottage."

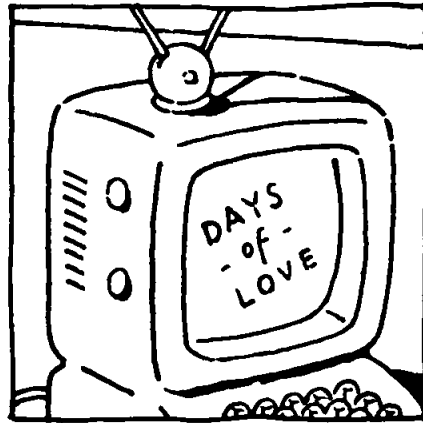
Sooner or later many travelers in the network nation turn from work to play, from the gathering and passing of data to livelier forms of exchange—telling stories, creating art. Several years ago, when my brother and I were bumming around the boondocks of India, riding trains for days at a time, we'd pass a notebook back and forth, jointly writing stories. I would write the tale for a few paragraphs, then he'd continue it, then back to me, and the story would wander, like a train untracked, all over India, all over the universe.

I am reminded of this because, at about the same time in New York, Martin Nisenholtz began a similar improvisational notebook on the networks, which attained an even keener life of its own. As part of the Alternative Media Center at New York University, Nisenholtz conceived a teleconference devoted to an on-line "soap opera" by introducing the first character (Starving Artist) and passing the cursor on to the other twelve participants scattered across the country. There was no preconceived plot, no goal, no other characters: this was a train without tracks. Each author would contribute at will by modeming into the soap opera from his home and adding his bit to the electronic transcript.

The story unfolded for twelve months, grew to about one hundred pages, and ended eerily with all the characters meeting in the underground lair of the villain—without any preagreement by the authors. After a dramatic scene the characters seemed to wander off, and the twelve creators realized the story was over.

Art Kleiner, now telecommunications master at the *Whole Earth Catalog*, was one of the authors. "As far as excitement, that was the most suspenseful time in my life. It's a very odd experience, because you are creating characters and you really, really don't know what they are going to do next. It's not like writing an ordinary novel, where you are waiting for the next image to come to you. Here, you are waiting for the image to come to someone else."

At Art's invitation, I pulse through the lines to the EIES network and slip quietly through the password gate to join a second soap opera, started last



*Using teleconferencing,
a soap opera is written
by a dozen writers
scattered across the country.*

year. There is no one else on-line when I arrive, so I snoop around the setting, the New England town of Disbelief. I check the last entry and read that a character named Fern is trying to find a place to hide in the woods. Every so often during the story, Art steps out from behind the electronic curtain and summarizes the action for the benefit of those who haven't checked in recently. His most recent synopsis includes "Ballwell's takeover of Disbelief and its renaming to Verity; Young Will's expulsion from Glitchtronics; Cherry's return to town; Old Will's assassin hiring; and a mysterious reunion between Bigfoot and the Friend of Animals."

"The weird thing about these stories," Art says, "is that some of my characters become deeply emotionally involved with other characters created by people I've never met. In one case I had no idea at all who was behind a character who pulled my character through a critical survival period, until someone accidentally spilled the beans and I learned the creator was a good friend of mine—I had no idea he was on-line." In the network nation, surprises are the order of the day.

AFTER A MONTH of scrambling about the networks, I abandon my offices for the woods to sit on a mossy stump and write about my travels across the computer byways. I have seen Timothy Leary bend down and kiss his computer terminal as if it were a poodle's nose, announcing, "I should have had one of these twenty years ago." Sourcevoid Dave has explained that "computers generate passion, either passionate dislike or passionate appreciation," and I feel that I need some passionate distance to review my journey. I want to write about the networks in the shadow of pine trees and wise oaks, in the presence of a quiet organic network where ebb and tide and spring and night are the code words. What can I say about computers while standing in the dappled sunlight of a golden spring day, and still be honest?

The truth is that telecommunicating is still slow, cumbersome, and expensive. Worse, no two systems are the same. Every bulletin board or data bank has its own idiosyncratic layout, a different protocol, a different dialect.

At the same time, it's hard to lose a grip on the computer dream: networks of small computers flashing our intelligence along the surface of the globe just as our thoughts surge along the membrane of our cerebrum. But brains we have enough of. As we forge this network nation, will it help temper our anger? Will it soften our hearts to the ignorant? Can it encourage us to forgive when forgiveness doesn't seem possible? Beyond intelligence, where will the governing soul reside?

"Wherever we take responsibility for it," suggests Marc Rotenberg of the

Public Interest Computer Association. He suggests that we have greedily possessed the power of computers and networking without addressing the attendant responsibilities. Who owns information? Is it a commonwealth? Will you need a license to prove you're capable to drive through the networks?

ONE EVENING, cruising through the networks, I am interrupted by a message from Murray Turoff. "Do you know about Attune? It's about meditation."

"You mean like prayer?"

"Yes, the same."

"I'm interested. I take prayer seriously."

"Message to 118 or 866. They'll tell you more."

I message 866; he replies, "Attune? I dunno... it's been years. You'll have to ask Peter and Trudy, 118."

I send them a request through the networks: What is it exactly?

Peter and Trudy Johnson-Lenz, the moderators of One Attunement, send an electronic note in return: "One Attunement is an on-line version of a Quaker meeting in which participants are first shown inspirations entered by others and are then given the opportunity to enter any inspiration that comes to mind, much as Quakers stand and speak when the spirit moves them. After that, there is a more mundane exchange of comments, much like talking in the foyer or on the church steps after the service."

I tell them I'm interested in visiting. They continue: "When we first created the Attune process, we thought for a long time about how people would be introduced to the space and how to create a sense of group fellowship. We decided the best way to foster a sense of community was to spread Attune by personal invitation and networking. If you would like to be invited to join, please let us know, and we will be glad to send you the invitation message."

I message an affirmative. Since the

Attune group began about four years ago, nearly one hundred people have been invited and have participated in the on-going meeting at least once. This electronic church, like other electronic meetings, creates a sense of gathering even when only one person is actually there. Any time I want to modem in, the Attune group is ready.

I receive a welcoming message and an invitation to join One Attunement that begins: "Breathing deeply, in and out, let the cares of the world fall away... As you quiet your mind and open your heart, the darkness begins to dissolve, and the light dawns. We are all homeward bound, on a journey to our eternal dwelling place... Close your eyes, pause quietly for a few moments, and be here now. (Press RETURN when you feel attuned.)"

I press RETURN.

Three quotations materialize: one from Goethe, one from Balzac, and one from Emerson. Initially, it seems odd to meet

Goethe on-line—it's the first reference to anything older than fifty years I've come across in a month of traveling the networks. In the mind of the network nation, all seems to be electronic void before a half-century ago.

Attune, I find, is a resting place, a clearing in the jungle of computers where you have a moment to honor old things, old thoughts, old souls. The electrons seem to vibrate slower here. They form little arrows that point to the rest of the world outside the network. The stillness, like in most chapels, reminds us to look inward so that, as the quotation from Goethe floating on my screen says, "each one sees what he carries in his heart."

I leave a prayer, exit from Attune, and log off for the night. As the machine sighs, gibberish scoots across my screen—the Greek-like characters that modems generate when they unhook. It's speaking in tongues. Finally, the words faint to a blank screen. ☺

