the Web technology put in the general public domain, with no strings attached.

On April 30 Robert and I received a declaration, with a CERN stamp, signed by one of the directors, saying that CERN agreed to allow anybody to use the Web protocol and code free of charge, to create a server or a browser, to give it away or sell it, without any royalty or other constraint. Whew!

CHAPTER 7

Changes

My experience at NCSA, and the near disaster over licensing, made me more convinced than ever that some kind of body was needed to oversee the Web's development. The Web's fast growth added to my feeling. The Web was starting to change phase. Some people were still sending me e-mail about putting up new servers. But others were not; they just started them. CERN and I were beginning to blend into the background hum. Web activity was increasing at a relentlessly steady, exponential rate. It being mid-summer, I once again graphed the number of people who were accessing the CERN server, *info.cern.ch*. It was now taking ten thousand hits a day. The rate was incredible, still doubling every three or four months, growing by a factor of ten every year, from one hundred hits a day in the summer of 1991, to one thousand in the summer of 1992, to ten thousand in the summer of 1993.

I no longer had to push the bobsled. It was time to jump in and steer.

I did not want to form a standards body per se, but some kind of organization that could help developers of servers and browsers reach consensus on how the Web should operate. With Mosaic picking up the ball and running single-handedly for the goal line, and more and more gopher users considering the Web, evidence was mounting that "the Web" could splinter into various factions—some commercial, some academic; some free, some not. This would defeat the very purpose of the Web: to be a single, universal, accessible hypertext medium for sharing information.

I talked to people at CERN about starting some kind of consortium. I also swapped e-mails with Michael Dertouzos at MIT's Laboratory for Computer Science. Michael seemed very receptive to the idea. A frequent visitor to Europe and his native Greece, he arranged to meet me in Zurich on February 1, 1994.

I took the train from Geneva to Zurich not knowing quite what Michael wanted, nor what I did. We met at a pleasant café in the old town, and over some characteristic Zurich-style veal and *Rösti*, we ended up sketching plans for the top levels of a consortium. We both returned to our homes to mull over our ideas.

It seemed more than a bit serendipitous that the first WWW Wizards Workshop was scheduled to be held only a month or so later . . . in Cambridge, Massachusetts, just a few blocks from MIT. It had been set up by Dale Dougherty of O'Reilly Associates, who again quietly managed to gather the flock.

O'Reilly had just published Ed Krol's book *Whole Earth Internet Catalog*, which was really the first book that made all this Internet stuff accessible to the public. When I had proofread it, on the train in Chicago going to meet Tom Bruce, the World Wide Web occupied just one chapter; the rest was about how to use all the various Internet protocols such as FTP and telnet and so on. But the traffic on the Web was increasing fast, and NCSA had just released working versions of the Mosaic browser for Unix, Windows, and the Mac. Dale was wondering himself where the Web was going, and felt he could find out, and perhaps also help people make it go somewhat sensibly, by getting everyone together.

About twenty-five of the early Web developers gathered at O'Reilly's offices in Cambridge. There was Lou Montulli, who had adapted Lynx for the Web, and his boss; a group from NCSA including Eric Bina, Marc Andreessen, Chris Wilson, who was porting Mosaic to the PC, and Alex Totic, who was porting it to the Mac; Tom Bruce, author of Cello; Steve Putz from Xerox PARC, of map server fame; Pei Wei, author of Viola; and others. The focus of the meeting was on defining the most important things to do next for the Web development community. In his friendly, encouraging way, Dale got us all talking. I brought up the general idea for a Web consortium. We discussed what it could be like, whether it should be a consortium or an organization or a club. At one point I put the words *Club Web* up on the whiteboard. . . . Well, it was an option. I led a brainstorming session to list the needs for the next few months, covering the walls on all sides with ideas grouped to make some kind of sense.

The event was quite a bonding occasion for some members of the community. Even for hard-core devotees of the Internet it's fun to meet face-to-face someone you have communicated with only by e-mail. During the meeting several people commented on how surprised they were that Marc, who had been so vocal on the Internet, was so quiet in person. A few of us were taking photos, and Marc was the only one who basically refused to be photographed. I managed to sneak a picture of him with a telephoto lens, but for all his physical size and lack of hesitation to come out blaring on the www-talk newsgroup, he and the others from NCSA were remarkably self-conscious and quiet.

I returned to CERN with a clearer vision that a consortium was needed. Then one day the phone in my office rang. It was reception saying there were four people from Digital Equipment Corporation to see me. Now, CERN was not a place where people

just turned up at reception. It is international, it's huge, people have to come from a long way, they need an escort to find their way around. But suddenly this group of people in suits was here. I quickly commandeered an available conference room. There were three men and one woman: Alan Kotok, the senior consultant; Steve Fink, a marketing man; Brian Reed, DEC's Internet guru at the time; and Gail Grant, from the company's Silicon Valley operations.

Alan had been pushing DEC in the direction of the Web ever since he had been shown a Web browser, and management had asked Steve to put together a team to assess the future of the Internet for DEC. Steve explained that they would be largely redesigning DEC as a result of the Web. While they saw this as a huge opportunity, they were concerned about where the Web was headed, worried that the Web was perhaps defined by nothing more than specifications stored on some disk sitting around somewhere at CERN. They wanted to know what CERN's attitude was about the future path of the Web, and whether they could rest assured that it would remain stable yet evolve.

I asked them what their requirements were, what they felt was important. They felt strongly that there should be a neutral body acting as convener. They were not interested in taking over the Web, or having some proprietary control of it. But they really wanted a body of oversight to which they could become attached. They wondered if CERN would do this.

For me this was a listening meeting. It was important input into the decision about what to do next. I told them I had talked with MIT about perhaps running a group. It might be modeled after the X Consortium, which MIT had organized to take Bob Scheifler's X Window system from his initial design to a platform used by almost all Unix workstations. It seemed to strike them as an exceptional idea.

. . .

By October there were more than two hundred known HTTP servers, and certainly a lot more hidden ones. The European Commission, the Fraunhofer Gesellschaft, and CERN started the first Web-based project of the European Union, called Webcore, for disseminating technological information throughout the former Soviet bloc countries in Europe. Then in December the media became aware, with articles in major publications about the Web and Mosaic, and everything was being run together.

Meanwhile, the community of developers was growing. It would be obviously exciting to hold a World Wide Web conference to bring them together on a larger scale than the Wizards Workshop had done. I had already talked to Robert about it, and now the need was more pressing. He got the go-ahead from CERN management to organize the first International WWW Conference and hold it at CERN. Robert was excited and checked the schedule of availability for the auditorium and three meeting rooms. There were only two dates open within the next several months. He booked one of them immediately. He came back and said, "You don't have to do anything. I'll do everything. But this is the date it has to be held."

I said, "Well, Robert, that's fine, except that it's the date that my wife and I are expecting our second child." He realized there were things that could be moved and things that couldn't be. He sighed and went back to see if the other date was still available. It was, but the date, at the end of May, was earlier than the first one, and it left us with short notice to get it all together.

Robert went about quickly coordinating all the bits and pieces needed for a conference, including speakers. One of the first people he called was Joseph Hardin at NCSA. But Hardin's response to Robert was: "Oh, well, we were thinking of holding a conference, and May is basically when we were going to do it, in Chicago. Would you mind canceling your conference so we can go ahead with ours?"

Robert debated with himself for only a moment. There was honor and pride at stake here, but also the future direction of the Web. The conference was the way to tell everyone that no one should control it, and that a consortium could help parties agree on how to work together while also actually withstanding any effort by any institution or company to "control" things. Feeling that perhaps NCSA was again trying to beat us to the punch, Robert told Hardin, "Well, if you had planned your conference so long ago then you certainly would have told us about it by now. So, sorry, we intend to go forward with ours." He pointed out that we had already booked the space and had passed the point of no return. NCSA decided to hold a second WWW conference in Chicago in November.

As 1994 unfolded, more signs emerged that the general public was beginning to embrace the Web. Merit Inc., which ran the Internet backbone for the National Science Foundation, measured the relative use of different protocols over the Internet. In March 1993, Web connections had accounted for 0.1 percent of Internet traffic. This had risen to 1 percent by September, and 2.5 percent by December. Such growth was unprecedented in Internet circles.

In January, O'Reilly had announced a product dubbed "Internet in a Box," which would bring the Internet and Web into homes. It was already possible for anyone to download, free, all the browsers, TCP/IP, and software needed to get on the Internet and Web, but a user had to know a lot about how to configure them and make them work together, which was complicated. Neither the Internet nor the Web had initially been set up for home or individual business use; they were meant for universities, researchers, and larger organizations. O'Reilly's product put it all together. All a user had to do was install it on his computer, and pay phone charges for his connection to the Internet.

Soon thereafter, however, many Internet service providers started to spring up—local companies that would give access to

the Internet via a local telephone call. They provided all the software a subscriber required. This made Internet in a Box unneeded. And it was a strong indicator of the rapid commercialization of "the Net."

A short month later Navisoft Inc. released a browser/editor for the PC and the Mac, which was remarkably reminiscent of my original World Wide Web client. Navipress, as it was called, allowed a person to browse documents and edit them at the same time. There was no need to download something explicitly, edit it with a different mode, then upload it again—finally, a browser that also functioned as an editor. I was very glad to hear of it. Usually when we had talked about the principles of the Web, most people just didn't get it. But Dave Long and the people at Navisoft had gotten it, miraculously, just by reading everything we had written on info.cern.ch and by following the discussions of the Web community. Navipress was a true browser and editor, which produced clean HTML.

I talked again with Michael Dertouzos about forming a consortium. In February he invited me to MIT's LCS to see if we could work out details we'd both be happy with. He took me to lunch at the Hyatt, which I understood was his usual place for serious discussion. The doorman knew him so well he had a cordoned-off space waiting for Michael's BMW at any time. Michael had helped put together other high-level organizations that included academic, industry, and government people, and was assuming that a similar model would hold for a Web consortium. But when he asked me where I wanted such an organization to reside, I hesitantly mentioned I didn't want it to be based just at MIT. I wanted it to be international. I didn't want to defect from Europe to the States. I thought there should be a base in Europe and a base in the States.

To my delight, this made perfect sense to Michael. He was happy to have LCS be part of what he called a two-legged beast. Of Greek descent, Michael had made many transatlantic connections

over the years, and had always been interested in fostering joint efforts between the Old World and the New. I had hit not a snag, but one of Michael's hot buttons. We returned to LCS with joint enthusiasm and warmth.

Michael later introduced me to his associate director, Al Vezza, who had helped Bob Scheifler set up the X Consortium and run it from LCS for years. Al took me into his office and asked me blunt questions about the business end of a consortium, questions to which I had no answers, questions about the organization structure and the business model. Fortunately, Al had answers. He had set up these kinds of things for the X Consortium, and was happy to do the same again. The X Consortium plan had been so well defined that Al ended up convincing me to follow a similar model. CERN clearly had first option to be the European host. Michael, Al, and I had pretty much assumed that CERN would sign on. I returned to Geneva and began a series of talks about CERN assuming this new role.

As the talks ensued, Marc Andreessen, who had left NCSA to join Enterprise Integration Technology (EIT), had met businessman Jim Clark. Together they founded Mosaic Communications Corp. The two rapidly hired Lou Montulli of Lynx fame, hired away the core Mosaic development team from NCSA, and set out to commercialize their browser. They'd soon relocate to Mountain View, California, and in April 1994 would rename themselves Netscape.

Despite the news articles hailing it as the first step of an Internet revolution, Netscape's start was very natural. The Mosaic team, unlike any of the other browser teams, had always operated much more like a product development team than a research team. They were much more aware of Mosaic's branding, of customer relations, marketing, and delivery. NCSA deliberately adapted Mosaic for multiple platforms so it would reach a large audience. Unlike CERN, NCSA never doubted for a moment that creating commercial products was an appropriate

activity. Leveraging Marc's skills, NCSA pushed Mosaic hard, from being a great idea seen in Viola to a must-have product that was going to be on every desktop. Andreessen and Clark set out aggressively to conquer the entire market. To do so they used an unprecedented marketing policy: They released their product for free, so it would be picked up widely and quickly; all someone had to do was download it from the Internet. They also seemed to follow the unprecedented financial policy of not having a business plan at first: they decided not to bother to figure out what the plan would be until the product was world famous and omnipotent.

The arrival of Web software and services as a commercial product was a very important step for the Web. Many people would not really want to use the Web unless they could be sure they could buy the products they needed from a company with all the usual divisions, including customer support. Robert and I had spent so much time trying to persuade companies to take on the Web as a product. At last, it had happened.

People began to ask me whether I was planning to start a company. Behind that question, maybe they were wondering if I felt the rug had been swept out from beneath my feet by Marc Andreessen and Jim Clark. Of course, I had several options apart from starting a consortium. I had actually thought about starting a company with the working name Websoft, to do much the same as Netscape. (The name was later taken by a real company.) But at this point, starting a company was by no means a guarantee of future riches. It was a financial risk like any startup, and a considerable one in this case, since there was not even a clear market yet.

Furthermore, my primary mission was to make sure that the Web I had created continued to evolve. There were still many things that could have gone wrong. It could have faded away, been replaced by a different system, have fragmented, or changed its nature so that it ceased to exist as a universal

medium. I remembered what Phil Gross, chairman of the IETF, had once said about gopher when it was still rising in popularity: "Things can get picked up quickly on the Internet, but they can be dropped quickly, too." My motivation was to make sure that the Web became what I'd originally intended it to be—a universal medium for sharing information. Starting a company would not have done much to further this goal, and it would have risked the prompting of competition, which could have turned the Web into a bunch of proprietary products. Theoretically, it would have been possible to have licensed the technology out, but the swift demise of gopher reasoned against that.

I also realized that by following the consortium route I could keep a neutral viewpoint, affording me a much clearer picture of the very dramatic, evolving scene than a corporate position would allow. I wanted to see the Web proliferate, not sink my life's hours into worrying over a product release. While leading a consortium would limit my public opinions due to confidentiality and the requirement of having to be neutral, I'd be free to really think about what was best for the world, as opposed to what would be best for one commercial interest. I'd also be free to wield a persuasive influence over the Web's future technical directions.

I suppose I could, as an alternative, have pursued an academic career, gone to a university somewhere as an assistant professor. But I'd never taken a Ph.D., and so even at CERN, the grade I had on entry, and the grade I was stuck with throughout my career, was one notch down. I would have had to spend a good amount of time getting a Ph.D., which would have been in a relatively narrow area. I certainly didn't have the time. And narrowing my view would have meant jumping off the bobsled I had managed to push into motion.

A more tempting option was to join the research group of a large benevolent company, which would have allowed me to pursue research that was interesting to me, but also participate in

the industry movement to get Web products into the marketplace and into people's real lives. I did talk to several companies and visited a few labs to evaluate this possibility, but there didn't seem to be a good match.

Starting a consortium, therefore, represented the best way for me to see the full span of the Web community as it spread into more and more areas. My decision not to turn the Web into my own commercial venture was not any great act of altruism or disdain for money, of which I would later be accused.

While the press was making a big deal about Mosaic Communications, the first World Wide Web conference was now fast approaching. Robert turned his full attention to pulling off an auspicious event.

The conference began at CERN on May 25, and would last three days. It was a tremendous gathering. The auditorium held perhaps three hundred people. We limited registration to three hundred, but ended up with three hundred fifty after admitting members of the press, and others who just appeared—testimony to how the Web had grown.

The student volunteers, whom Robert had rounded up to help run the conference, were manning the registration area. Robert and I, of course, were running around trying to get the last-minute things together. But when I went to go into the conference area, I was very effectively bounced by the students, because the conference wasn't open yet. It took me a long time to get across to them the fact that I was actually involved with the organization that was holding the conference.

As he had promised, Robert had set everything up, and except for the last-minute rushing, I didn't have to do anything but attend and speak. The environment in the meeting rooms was exciting yet close. There were people from all walks of life brought together by their enthusiasm for the Web. Talks given in the small auditorium were packed. Because it was the first such

conference, many people who had been interacting only by e-mail were meeting each other face-to-face for the first time. And for the first time people who were developing the Web were brought together with all sorts of people who were using it in all sorts of ways. The connections were electric. For example, there was Børre Ludvigsen, who had a home server that allowed people to visit his house, look at a cutaway model of it, see where the computers were in it, and browse his bookshelves. He had put his server on a special phone line provided by the Norwegian phone company as part of an experiment. He was talking with people who actually thought they could adapt his approach for health-care applications. The excitement, congeniality, and grass-roots fervor for furthering the Web inspired the reporters there, overdoing it a little, to dub the meeting the "Woodstock of the Web."

In the span of one session in one of the meeting rooms, the agenda was laid down for HTML for the next few years—how to incorporate tables, math, and the handling of graphics and photographic images. Although anything on an Internet FTP server was available on the Web, HTTP had completely taken off as a more efficient alternative, but it needed a lot more optimization to keep up with ever-increasing demands to frequently fetch Web pages from a server in rapid succession, and pick up all the graphics embedded in a page. In a birds-of-a-feathter session, Dave Raggett proposed a "Virtual Reality Markup Language," an idea Mark Pesce picked up and ran with to start the whole community doing 3D on the Web and to define VRML.

The only time I felt a bit uneasy was when I gave the closing speech. I talked about several technical points, which was fine. I announced the upcoming consortium, which was fine. But then I finished by pointing out that, like scientists, people in the Web development community had to be ethically and morally aware of what they were doing. I thought this might be construed as a bit out of line by the geek side, but the people present were the

ones now creating the Web, and therefore were the only ones who could be sure that what the systems produced would be appropriate to a reasonable and fair society. Despite my trepidation, I was warmly received, and I felt very happy about having made the point. The conference marked the first time that the people who were changing the world with the Web had gotten together to set a direction about accountability and responsibility, and how we were actually going to use the new medium. It was an important direction to set at this juncture.

I went home feeling very pleased. Exciting though all this was, in my personal life it was dwarfed by the arrival of our second child in June. Family life continued and for a while it seemed MIT had stalled in preparations for the WWW Consortium. Then Al Vezza began calling me at home in the evening to discuss details. The conversations seemed even more odd because of the cultural disconnect. Our little prefab house was in a small French village a few miles from the border with Switzerland. The view from our front yard stretched straight across Geneva to Mont Blanc. From the backyard, where we often ate dinner, was a view of the Jura mountains, cows grazing on the few intervening fields. Given the time difference with Massachusetts, that's often where I was when Al called. I would be wearing shorts, sitting out in the sunshine. Al, who was certainly wearing a gray suit, would be seated in an air-conditioned concrete office building in Cambridge. It was sometimes hard to connect across this gulf.

One evening in early July our phone rang. It was Al, and he was serious. He wanted to know if there was a way he could fax me right then and there. He said he had just gotten the go-ahead from MIT to form the consortium. LCS was prepared to hire me as a full-time staff member. He had a letter to that effect, and wanted to know when I would start.

It was just ten days before we were due to leave on our vacation. We had not specifically planned any dates after that, since

the process of getting the details right at MIT seemed at times to have no end in sight. As it appeared that MIT had now gotten its ducks in a row, however, there was no reason to wait. September 1 seemed like a good starting date. It would be only ten days after we'd come back from vacation, but we wanted to start in the States at the beginning of the school year.

Al's next call was on July 14, Bastille Day. As usual, our village was celebrating with fireworks, lit from a field just across the road from our house. I found that I could not be totally serious with Al, and wondered if he would understand. There we were, watching the fireworks over our little town in the French countryside, across the lake from the Alps. The conversation was almost inaudible with the explosions.

My wife and I were packing our bags for vacation. Although we assumed we could come back to sort out our affairs, we decided that if there was a question about whether to bring something or not, we should bring it. And so we left, with a young daughter, an infant son, and a cavalcade of friends going down to the airport with sixteen cases and boxes. My family never came back. I returned for ten days to sell, with the help of friends, the cars and the house.

Meanwhile, encouraged by George Metakides in Brussels, MIT and CERN inked an agreement to start the World Wide Web Consortium. It was announced in Boston by Martin Bangemann, one of the European Commission's commissioners, who was charged with developing the EC's plan for a Global Information Society. There was a press release. The Associated Press ran a story about it. Reports followed in the *Wall Street Journal*, the *Boston Globe*, and other major papers. Mike Sendal and Robert Cailliau had been joined by François Fluckiger, who was to lead the consortium team at CERN. It still wasn't clear how the consortium would fit in there, since this was new. It was clear that MIT was very much in control, moving faster, with more experience and relevant contacts. Some people in Europe expressed

concern that Web technology would move west, leaving Europe behind. I knew I had to move to the center of gravity of the Internet, which was the United States. The American government could congratulate itself on successful research funding that led to the Internet, and Europe could congratulate itself on taxpayer money well spent on CERN.

I left Geneva, off to MIT. Off to America. Off to the World Wide Web Consortium. And off to a new role as facilitator of the Web's evolution.