nism for Gates to be exposed to the Internet side of the online service argument. Silverberg sensed that because of Gates's close relationship with Siegelman and Myhrvold, the chairman had been hearing a one-note song. Nevertheless, for Silverberg, Shumway was hardly an earthshaking occasion. He listened to the debate of online versus the Internet with interest. It was an intriguing psychological dynamic for Microsoft, but it had little impact on his thinking. His mind was made up. Shumway merely reaffirmed the need for him to keep moving down the trail he had already been blazing. As far as he was concerned, the debate could continue without him. The Windows effort could not afford to sit on its hands, waiting for an elusive consensus to emerge. By then it would be way, way too late.

So Silverberg started the Chicago team down an Internet path that was in many ways parallel to the goals of Siegelman's online effort. Chicago was firmly in the camp of supporting open Internet protocols for things like e-mail, security, and dialing up from home. Marvel was building its service from the ground floor up, on its own e-mail and publishing and dial-up protocols, with the hedge that if users wanted Internet access, they would be able to get there from Microsoft's online service.

The Siamese-twin approach had enormous inefficiencies in development and personnel overlap. It was the kind of budget drain most executives and big companies would never countenance. Choose one or the other, they would direct their managers. But Gates saw benefits to multitasking the online strategy. It gave him the chance again to play two hands at once, as Microsoft had with parallel OS/2 and Windows development. Competition was important, even if it was internal. And Gates was loath to discourage entrepreneurialism within his ranks. Creative tension was needed in an organization for it to thrive and move forward. Gates was not going to stand in the way of a process that would save Microsoft from becoming a Wang or an Apple or a Lotus or an IBM.

Gates also was caught in the bind of the Silverberg-Siegelman personality conflict. It too was nothing new in Microsoft's competitive, ego-driven culture: "It's just another thing you have to manage," Gates said later. In this case, he saw benefits to a macro, not micro, managed approach. He had given Siegelman the green light well before the Net was a factor. And at the Shumway retreat he had made it obvious that Silverberg was to integrate the Internet into Windows. Gates was like the basketball coach having two point guards play one-on-one to see who would get the starting assignment.

After the Shumway retreat, Silverberg met with Phil Barrett, a lead systems manager who had just joined the Windows 95 development effort. Silverberg asked him to look at how Internet capabilities could be woven into Chicago. Included on the list were Allard's initiatives regarding TCP/IP, ftp, telnet, WAIS, auto dialer, and other Net access features. Silverberg added another item to the laundry: browsing capability. Should we include a browser with Chicago? he asked Barrett. What would be the browser's role vis-à-vis Chicago connectivity with the Web? Should we build it ourselves, from the ground floor up? What would that take, in terms of resources and time? Would it be better to license or buy existing technology and improve on it? Silverberg did not want to rush headlong into a drain on Microsoft resources. There were lots of browsers out there, after all, and little discernible demand. There was still plenty of time, it seemed, for Microsoft to make its play in the browser sweepstakes.

Barrett hired two part-time program managers and by midsummer had a college intern on hand to help out with product management. But his primary focus was on Chicago, not the Internet. "Everyone was focused on getting Chicago out," he recalled. "Bill may have said the Internet is very, very important, but organizationally, I don't think that took right away at all." Barrett took on the assignment, but for him the Internet was not a huge action item. As for the browser, Barrett had heard nothing about integrating it into Windows at the Shumway retreat, and he felt little urgency to pursue the issue.

For Silverberg, however, browsing in Windows was a top priority. The Windows three-year plan he presented after Shumway specifically outlined "integrated Net browsing in [Windows] Explorer." He was not sure what form it would take, but browsing needed to be there. On board as well was John Ludwig. "It was clear from Shumway that we needed to Internet-enable our operating systems much, much, much more, and that a browser was the most important part of this," Ludwig later recalled, even if all the t's were not crossed or the i's dotted.

Six weeks after the retreat, Silverberg attended Windows World at Spring Comdex in Atlanta, with an eye toward finding out what Windows vendors were doing with the Internet. Sinofsky was there with a similar goal in mind. The two hooked up and strolled the floor together. In a tiny booth tucked away on a side aisle they found gold—or at least some glitter. BookLink Technologies, Inc., a small software developer based in Wilmington, Massachusetts, was showing an early iteration of Internetworks, browsing technology that integrated tightly with Windows. Silverberg and Sinofsky had learned of BookLink from Allard, who knew one of the company's principals, Bill Hawkins, through various Internet conferences. Hawkins, who

For Silverberg, long the Marvel skeptic, the problem was that the browser, and by extension the Internet, was too low a priority for Marvel. Siegelman had simply blown a huge opportunity, and now Microsoft was back to square one. Silverberg was determined to have browser technology in Chicago. It looked like his team would have to develop or obtain it themselves. John Ludwig, the networking veteran who was "blue-skying" future opportunities for Windows for Silverberg, agreed: We had better reassess where we are in the browser game, he put it to Silverberg. We need to decide whether we are serious about this stuff, in which case we had better start moving faster and more decisively. Or we need to cut bait. It was a short conversation. As far as the Internet goes, Silverberg said, we're as hardcore as Microsoft has ever been about anything. It was more than a year before Bill Gates, on December 7, 1995, would say the same thing to the world at large.

Tall, gentle-mannered, and cerebral, Ludwig brought keen analytical skills and a calm rationality to the browser project. Ludwig monitoring a project was like a submarine tracking a target. He preferred working below the surface, unnoticed, while tirelessly and unflaggingly plotting strategy, honing in on challenges and charting progress. Silverberg and Ludwig made a great alliance. Both hated ego-boosting or self-aggrandizing schemes. Both practiced a subtle form of leadership where they enabled those around them either to make the right choice or to learn from mistakes—miscues neither of them might have committed, but which were necessary as lessons learned. Both drew more satisfaction from watching those around them succeed together than from calling attention to their own contributions. From mid-1994 on Ludwig was a critical part of each significant strategic decision Microsoft made on the browser front. Yet, innumerable articles and analyses of the browser competition almost never identified him.

There was an almost audible shifting of gears going on for the Redmond gang. Through early fall of 1994, browser development had more or less meandered along as part of the Chicago effort, but not a huge part. It was not so much that the browser was considered unessential or insignificant. The Shumway retreat, and Gates's mobilization e-mail immediately following, made it clear that integrating browsing capability into the operating system was a vital goal for the company's Internet effort. But it seemed unrealistic to expect that a browser could be cobbled together in time for Chicago's release, at the time still scheduled for the upcoming fall of 1994. Integrating an entirely new dimension would mean lots more coding, debugging, testing, coding, debugging, testing—the seemingly endless programming cycle. If you altered one line of code in a program as complex as Windows, Silverberg was wont to point out, you usually stood the chance of introducing a bug or glitch that would have to be fixed, introducing the possibility of yet another bug or glitch, and so on down the line. Software development at its heart was a mind-drubbing, Sisyphian chore of debugs and fixes. Microsoft's ability to persist to the bitter end in ferreting out as many bugs as possible and in addressing user needs helped explain its successes where others had run out of ideas, steam, or initiative.

The previous spring, Barrett had been assigned to look into a browser, but with attention focused on more pressing issues in the Chicago upgrade, he had not put it on the front burner. Over the next few months he talked to a few people, looked over the field—then consisting of a wild assortment of browsers that did one or two things well but overall were slow, underfeatured, and immature—and drew up some preliminary specifications. But no team got assembled, no product description or business plan got drawn up, and no code got written. Neither did any alarm get sounded. The BookLink discussions were progressing along a normal path, after all. With most browsers available for free, there was no real commercial pressure on Microsoft. Once the Internetworks code became available, the thinking was, the browser effort would be able to ramp up production quickly.

When the BookLink deal fell through, everything changed.

As luck would have it, and Microsoft often did have luck, a coding maniac by the name of Ben Slivka had other ideas. Bearing a striking resemblance to Anthony Edwards—Dr. Mark Greene on the TV series ER—Slivka combined a studious demeanor with alacritous energy, stamina, and will. Starting the previous summer, Slivka had agitated Ludwig's next-generation Windows team to do something like Mosiac for Windows. Although it was not true that, in order to be part of Microsoft's Internet effort, your last name had to begin with "S" and feature some combination of "v," "i," "n," or "l," Slivka was a perfect fit for the company's aborning browser development. A veteran of the OS/2, DOS 5, and DOS 6 projects, Slivka had a ton of code under his belt and was known as a just-ship-it kind of guy. He liked impossible challenges, particularly if he could drag his friends into them as well.

Ludwig, looking for a programmer to start prototyping browser technology for Windows, asked Slivka onto the team. At that point, the Internet was just one aspect of the blueprint for Memphis, as the leapfrog upgrade of

Windows—the one following Chicago—was code-named. The whole idea of projecting an upgrade ahead was a new twist for the Windows team. It harkened back to Silverberg's conviction that software development had to happen in incremental iterations rather than one shot only. Besides the Internet, on the Memphis team's plate were things like wireless communications, game machines, PCs in the home, the eventual merging of Chicago with Windows NT. Permeating the effort philosophically was the Gates vision of Information At Your Fingertips, approaching its fourth anniversary. How would the Windows of three or four years hence continue the IAYF vision? Ludwig thought about the question every day.

After joining Ludwig's team in July, Slivka initially was interested in the notion of indexing all the content on the Internet. It seemed a natural extension of the IAYF metaphor. In order for the unthinkable amount of data on a vast interconnected network to be useful, it would have to be indexed in a way that gave meaningful access to users. Ironically, by that point, the summer of 1994, Slivka had not even gotten a home connection on the Net. He knew next to nothing about the Web. He hadn't seen the Allard or Sinofsky memos. He hadn't attended the Shumway retreat. Of all the eventual architects of Microsoft's Internet presence, Slivka was undoubtedly the last to the starting line. But in terms of producing actual code, Slivka was first out of the blocks.

Ludwig loved this about Slivka. Ben is not a patient fellow, Ludwig would say. When he identified something that needed to be worked on, Slivka was like a woodpecker, tapping, tapping, tapping till he got to the meat of the matter. "He'll come at you every day with ten things you ought to be doing," Ludwig put it. "Some percent you already are doing, he just didn't know about it. Some percentage are just shooting from the hip, he hasn't really thought through. But some percentage are dead on and you should listen to him. I let him have his say, and he tells me how to do my job, and then I throw away the nine things I don't want to hear about. The one thing he says that's accurate, I say, That's a good idea, I'll try to do better on that one."

First Slivka tracked down a Microsoft technician and browbeat him into providing an Internet tap to Slivka's office. As of the summer of 1994, getting an Internet line at Microsoft still was not a trivial procedure, where security concerns about the Net still kept it from being widely accessible. Once he got on the Net and downloaded Mosaic, Slivka spent twelve hours straight surfing. He would get on a home page, then click to a link, then go to another URL, then find a dozen more links. It was revelation after revelation. This was as close as Slivka had seen to an actual manifestation of IAYF in all its original intent.

After his tour of the Web, Slivka did not just feel the world had changed, he set about making sure it had—at least, his world. He started sending around e-mail, asking questions, communicating with programming teams. He asked Silverberg and Ludwig where the company was on the browser. Shouldn't we be developing something for Chicago? From the standpoint of programming, the browser did not seem to be a monumental challenge. Even if we can't get it in time for the Chicago release, Slivka told the Windows team, we ought to have it ready within a few months afterward. Directed to consult with Barrett, Slivka became even more convinced that Microsoft needed to move more quickly. What he found was pretty bare bones. Barrett had "already decided this was nuts. This is going nowhere, and I don't particularly want to be in an enormous company." To his mind, Microsoft did not get the Net and was not likely to soon. It was time to move on. By August "I'd already made a decision to leave," Barrett recalled. Knowing he was a short-timer, Barrett ignored the Internet project.

Oblivious to Barrett's disenchantment, Slivka spent little time puzzling over the situation. Microsoft would get a browser, he decided, if he had to write every last line of it himself. Slivka's first step was to take a comprehensive look at Mosaic, break it down feature by feature, figure out how the stuff worked, and where Microsoft had the opportunity to improve. What was the competition in the browser space? Who were the players? What were the feature sets? What problems do users encounter with surfing? One of Slivka's first assumptions was that browsing—at the time still being referred to as "viewing"—would supersede gopher and ftp. This despite the fact that at the time, gopher and ftp were by far more popular ways of navigating the Net than any of the browser technologies. Our focus should be on the Web, Slivka told Ludwig and Silverberg. That's where our resources should go.

Like Ludwig himself and Silverberg, Slivka was a systems guy, which meant he thought in terms of platforms. How could Microsoft use a new technology to benefit Windows users? How could the company get thousands of software developers to use Microsoft technology? That was the key question to platform guys. At the time, the Memphis team was well aware of parallel efforts to incorporate browsing into other Microsoft products. Pathe had the Internet Assistant project going for Word. Evslin headed the effort to make browsing a part of Microsoft's Exchange e-mail project. No, no, no,

the systems guys were saying. Browsing—viewing, exploring, whatever—should be a part of Windows. Not that Pathe or Evslin were misguided in wanting to make browsing a key part of their end users' experience. But writing a browser for Word, and another one for Exchange, and yet another one for Windows would waste resources and create a lot of redundant code.

On August 22, in an e-mail time-stamped 5:10 P.M., Slivka notified the Memphis planning team that he had gotten started on the user interface design for what he termed Microsoft's "WWW Explorer"—there was that word again. Slivka had cataloged the entire Mosaic user interface—at least as far as http was concerned; ftp and gopher mechanics were still awaiting assessment. To a crack systems programmer like Slivka, Mosaic was a collection of pieces, as its name implied. There was an html piece, a user interface component, a caching element—caching referring to the process where things like Web pages, or URLs, were stored on the local machine for ready reference by the browser user or the browser itself. Caching made it much easier and faster for the browser to call up previously displayed URLs. Slivka thought it was done pretty poorly on Mosaic, and it became one of the WWW Explorer team's top priorities and early triumphs. From his initial analysis, Slivka concluded that the process of Web browsing was pretty similar to network browsing and hard-disk browsing. It was all exploring, he thought at the time. Slivka started a list of what changes and improvements the Windows team could make to Mosaic, but a key design question also needed to be addressed: "At this point, I'm not sure if I want to be *TOTALLY INTEGRATED INTO THE CHICAGO EXPLORER*, or if we want a separate window for the html viewer." The reference provided another benchmark in Microsoft's plan to blend Windows with the Web. Eventually Slivka would have it both ways. The html viewer—browser—would start off as its own window but gradually, with the release of Internet Explorer 4.0 in September 1997 and Windows 98 the following June, meld with the Windows Explorer.

Slivka's persistent questioning of the browser effort got back to Silverberg. He looked into the situation, found it wanting, and told Barrett he was not happy with the progress he was making. Silverberg was a patient manager as long as progress was evident. It looked to him as if Barrett did not understand what the browser did and what Microsoft needed from the technology. Barrett was in no frame of mind for second-guessing. By the first week of October, he told his supervisors, "I'm quitting and I've got four weeks of vacation. See you later." Within days Ludwig was paying Slivka a visit. How would you like to be in charge of the browser effort? Ludwig asked. It was an entirely rhetorical question. Slivka did not even bother to ask what happened to Barrett. As it turned out, Barrett took about a month off and then joined Rob Glaser's Internet start-up, Progressive Networks, as *vice president of software development*.

It was fitting that Slivka found himself on the cusp of Microsoft's biggest paradigm shift since DOS-to-Windows. Everything in his upbringing and career path had pointed toward a day when he would tackle something worthy of his talents. Since childhood, Slivka had been self-driven toward programming achievement. One of twin boys born in 1960 in Seattle to a public librarian mother and Seattle Symphony percussionist father, Slivka grew up playing with a variety of electronics. His first-generation Russian father, Meyer, put together a Theremin, a rare electronic musical horn whose "wooo wooo" sound changed tone when one's hands passed over its surface. Meyer also built an oscilloscope and TV set from Heathkit and, in the mid-1970s, put together his own electronic music synthesizer. Assisting him, young Ben got handy with a soldering iron. It was his mother, Enid, however, who introduced Slivka to programming. In the early 1970s she took a course on programming in BASIC, and Slivka got intrigued by what you could do with computer code. He was still a little on the young side to do much on his own, but a seed had been planted. When Hewlett-Packard came out with its programmable pocket calculators, Slivka would go downtown after school, a half-hour bus trip, and program display models for an hour or two at Seattle's leading department store, Frederick & Nelson. The salespeople, amused at what a kid could do and figuring it might attract buyers, were tolerant.

Slivka learned early on the value of hard work and independent thinking. His working mother had the two boys helping out almost from the time their younger sister was born. "The poor things never knew what it was like to sit still and have someone wait on them," Enid Slivka recounted. As a result they learned to speak their minds when they wanted something, a trait heartily encouraged by their mother. Enid Slivka had read a book about the Compton family, which produced two university presidents and Nobel Prize–winning physicist Arthur Holly Compton. "The way their [Compton] children were encouraged to investigate things for themselves made quite an impression on me," she said. Ben eventually drew the admiration, not to say awe, of Microsoft coworkers for being able to repeatedly challenge a boss named Bill Gates, and take the return heat without flinching.

Slivka eventually outgrew the calculators and discovered bigger terrain. Near Green Lake in north Seattle, a treasure trove called the Retail Com-

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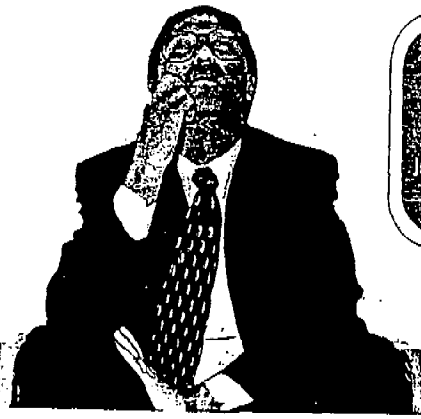

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