The Force of an Idea

Until recently, Bill Gates and Microsoft seemed unstoppable. Now it's a different story. What happened?

— John Cassady, 1998

In a way, Bill Gates's current troubles with the Justice Department grew out of an economics seminar that took place thirteen years ago, in December of 1984, at Harvard's John E Kennedy School of Government. The guest speaker was Brian Arthur, a little-known Stanford economist who was having difficulty getting his articles published in professional journals. The paper Arthur now read—"Competing Technologies and Lock-in by Historical Small Events: The Dynamics of Choice Under Increasing Returns"—drew a strong, and largely hostile, response. One Harvard economist, Richard Zeckhauser, stood up afterward and said, "If you are right, capitalism can't work." A few months later, when Arthur read the same paper to a gathering in Moscow, an equally eminent Russian economist declaimed, "Your argument cannot be true!" Such was Arthur's challenge to economic orthodoxy that it would be another five years before he succeeded in getting this paper published.

Since the Second World War, economists have spent most of their time articulating the reasons that free markets work so well, and arguing that government intervention in the economy is usually not only unnecessary but often downright harmful. Their argument, which harks back to Adam Smith, was rigorously developed in the "general equilibrium" models of the nineteen fifties and vociferously promoted by the Chicago School of the sixties and seventies, whose members included Milton Friedman, Gary Becker, and Ronald Coase, Nobel laureates all. The Chicago doctrine was translated into the policy arena by Robert Bork, whose 1978 book, "The Antitrust Paradox," became an important intellectual prop for the generation of conservative jurists who were appointed to the federal courts by Richard Nixon and Ronald Reagan.

Arthur's paper argued that the underlying assumptions of the Chicago School simply don't apply to large parts of the economy, especially the high-technology and communications industries. In these fast-growing sectors, Arthur said, there is no guarantee that the market, left to its own devices, will select the best products and maximize benefits to the consumer. Instead, he maintained, inferior products can beat out superior products merely because of happenstance—by being first to the store shelf, say—and they can remain in a dominant position for a long time. Small events, such as a misleading marketing campaign, can be magnified into big changes in sales. And some firms are likely to establish, through predatory tactics or mere luck, lucrative and lasting monopolies, which stifle the very competition that free-market advocates swear by. In those instances, government intervention may be needed to restore competition.

When I met Arthur recently, in Washington at Ralph Nader's two-day conference on Microsoft, he turned out to be a gray-haired native of Belfast who speaks softly and views the real world with a detached sense of amusement. "I was saying all this during the Cold War, so ideology got in the way," he said, smiling broadly. "I spent about ten years in the wilderness." He didn't seem bitter about this fate, which was probably inevitable, given the revolutionary nature of his theory. "It stands a great deal of standard economics on its head," he said with another smile.

Arthur eventually emerged from the wilderness. His arguments couldn't be dismissed as "informal or anecdotal" the customary derisive tags for

This article originally appeared on January 12, 1998, in *The New Yorker*.

heterodox economic ideas—because they were expressed in exactly the sort of dense mathematics favored by the editors of the *American Economic Review*. Arthur had taken degrees in electrical engineering and mathematics before turning to the dismal science, and he still refers to himself as an "applied mathematician" rather than as an economist. He is now a professor at the Sante Fe Institute, where physicists, computer scientists, and economists are applying the nascent science of complexity which examines how fairly simple dynamic systems can produce incredibly complicated outcomes—to subjects as diverse as geography, inequality, and finance.

Gradually, a number of economists began to take Arthur's conclusions seriously. Some of them—including Garth Saloner, of Stanford, Joseph Fatten, of Berkeley, and Steven Salop, of Georgetown—went on to develop game-theory models that demonstrated how powerful firms could exploit the peculiar nature of high-tech markets to the disadvantage of their opponents. Finally, even figures outside the economics profession started to take notice. "At first, people said, 'Your theory may be theoretically valid, but there's no actual evidence of it in the economy,'" Arthur recalled. "I thought about that, and said, 'No, no, no. The whole high-tech sector operates in this way.' When I started to say that, I discovered it had a lot of resonance in Silicon Valley. People I talked to there just nodded wisely, grinned, and said, 'This is how we see it, too, but we've never seen it written down and formalized.'"

One of the people who picked up on Arthur's work was Gary Reback, a Palo Alto antitrust lawyer who represents several of Microsoft's rivals. During the nineteen-eighties, Reback came to despair of the Justice Department, the Federal Trade Commission, and the courts, all of which he believed were in thrall to Chicago School economics. In 1995, Reback asked Arthur and Saloner to contribute to a white paper that he was drawing up for the Justice Department to protest Microsoft's abortive takeover bid for Intuit, a company that manufactures software for personal finance. Ever since 1981, when Microsoft provided the MS-DOS operating system for the first I.B.M. personal computer, the firm's rivals have claimed that it uses anti-competitive tactics, such as issuing restrictive contracts to its customers, announcing software products that don't yet exist, tying products to each other in such a way that customers have to buy both of them, and deliberately making its products incompatible with those of its rivals. Reback's white paper reviewed some of these charges, related them to recent academic work on the subject, and concluded with a stark warning about the future of the on-line information world: "The markets today consist almost entirely of American competitors. But without government intervention, Microsoft will in short order crush this competition."

Gates has always denied acting in a predatory manner, and during the nineteen-eighties his rivals' complaints evoked little sympathy in Washington. Finally, in 1990, the F.T.C. decided to investigate Microsoft, but three years later four F.T.C. commissioners deadlocked on whether to bring legal action. The Justice Department belatedly took up the case, and in July of 1994 Microsoft agreed to a consent decree with the government in which the firm pledged to stop charging computer manufacturers, such as Compaq and Hewlett-Packard, a license fee based on the total number of personal computers they shipped, regardless of whether those computers contained Microsoft software. (In effect, the contracts forced computer manufacturers who wanted to install non-Microsoft operating systems, such as DR-DOS or I.B.M.'s OS/2, to pay two licensing fees—one to Microsoft and one to the other company.) Microsoft didn't admit to any wrongdoing, and Gates said publicly that he regarded the consent decree as a minor setback that would have little impact on how he conducted his business. Even now, with about ninety per cent of the market for personal-computer operating systems, Microsoft denies being a

monopolist. “We have never admitted to it, nor has any court ever found that to be the case,” William Neukom, Microsoft’s top lawyer, told me. “In this industry, we do not have the sort of monopoly power where one can reduce the supply and increase the price to the point of extracting monopoly rent. It’s the reverse. People are getting better technology at lower prices.”

In October, the Justice Department asserted that Microsoft, by forcing computer manufacturers to include its Internet Explorer (a piece of software used for viewing-and retrieving information from-the World Wide Web) with every copy of its Windows 95 operating system, had violated a term of the 1994 consent decree which barred the company from tying any “other product” to the purchase of its operating system. Microsoft vigorously opposed the government’s argument, citing another clause in the consent decree that expressly allowed it to develop “integrated products,” and a bitter legal and public-relations battle ensued.

Last month, Judge Thomas Penfield Jackson, of the United States District Court in Washington, surprised many observers by issuing a preliminary injunction in the government’s favor. In ordering Microsoft to stop bundling Internet Explorer with Windows 95, the judge didn’t say the firm had violated the consent decree, the language of which he pronounced ambiguous, but he declared that Microsoft was indeed a monopolist, and suggested that its behavior may have violated the antitrust laws. “The probability that Microsoft will not only continue to reinforce its operating system monopoly by its licensing practices, but might also acquire another monopoly in the Internet browser market, is simply too great to tolerate indefinitely until the issue is finally resolved,” Judge Jackson wrote. Microsoft appealed his ruling, arguing that it was virtually impossible to remove Internet Explorer from Windows 95. The case rapidly turned into an imbroglio, with the Justice Department accusing the company of failing to obey the court’s order, Microsoft accusing the government of being “poorly informed,” and Judge Jackson using a laptop in the courtroom to demonstrate how easy it would be to remove the Internet Explorer browser from Windows 95.

The legal skirmishing is set to resume next week, but the ultimate outcome of the case probably won’t be known for several months. Judge Jackson has appointed a Harvard law professor, Lawrence Lessig, to report back to him on the technical issues involved in the dispute before he makes a final ruling, and he has also asked both sides to provide further evidence. (Microsoft is trying to get Lessig removed, claiming that he has been given too broad a mandate.) As the case proceeds, the Justice Department will be relying on just the sort of intellectual arguments that economists like Brian Arthur have been making. “In these kinds of markets, it is just not right that leaving it to the market is always going to get an efficient outcome,” Daniel Rubinfeld, a former Berkeley professor who is now the chief economist in the Department of Justice’s antitrust division, told me recently. “There is still an honest debate about exactly what role government ought to play, and people are going to differ, but there are very few economists I have talked to who would argue that leaving it to the market is always the best solution. We are just not in that world anymore.” Joel Klein, an intense, sallow fifty-one-year old Assistant Attorney General who heads the antitrust division, shares that view. Klein is a lawyer (before moving to Justice he was a deputy White House counsel), but he studied economics at Columbia, and he credits Arthur in particular with influencing his thinking on how high-technology markets operate. “In the nineteen eighties, the view was that markets worked just fine, and the government basically ought to stay out—that the cost of government intervention out weighs its benefits,” he told me. The “new synthesis,” he went on to say, is “that markets don’t always self-correct, and that surgically applied intervention aimed at protecting consumer choice and preventing the abuse of market power is desirable.”

In the Chicago world, competition doesn't need guarding by the Justice Department or anybody else. If a firm makes monopoly profits, that fact will attract new entrants into the industry and spur existing competitors to innovate. Before long, the firm's monopoly will be broken, and full-scale competition will be restored. It is an attractive vision, and one that Gates exploits in his public speeches. "In the world of technology, nobody has a guaranteed position," he said at Microsoft's annual shareholder meeting last November. "New ideas like browsers and Java operating system, or software built on artificial intelligence technology—if that's done very well and we don't do something that's even better, our leading position could be eroded quite rapidly." If the new economic theories are correct, Gates's fortune, which is made up of about thirty-seven billion dollars in Microsoft stock, is a great deal more secure than he claims. "There has already been a lot of technical innovation by other people," notes Steven Salop, the Georgetown economist, who has advised the Justice Department on the Microsoft case. "Microsoft wasn't first with the Web browser, but nothing has dislodged it." According to Salop, Microsoft is a "powerful monopoly' that is unlikely to be unseated in the near future, even by "competitors who have better products."

Microsoft's power comes from its ability to exploit what economists call "network externalities." (Arthur uses the phrase "increasing returns," but he is talking about the same thing.) In plain English, "network externalities" means that the value of a product increases along with the number of other people who are already using it. This is not generally true—few people care how many others are buying the same brand of soap or cornflakes—but it usually applies to high-tech goods, for two reasons: they have to be compatible with one another (a Betamax videocassette player is of no use these days, because it can't play VHS cassettes), and they are often linked to a network, in which case the more people there are on the network the more valuable the product becomes. (A telephone is worthless if you're the only person who owns one.) In a business with network externalities, such as the market for personal computer operating systems, firms that control the industry standards and boast a large installed base of products have an enormous advantage over their rivals. Most computer buyers know little about the operating system, which is usually pre-installed by computer manufacturers, but they care greatly about the availability of a large number of applications, such as games, word processors, and spreadsheets, to run on top of the operating system. Writing these applications is a time-consuming and costly process, so independent software developers tend to design them only for operating systems that have a large installed base. The result is a "positive feedback" process: successful operating systems tend to have more applications written for them, which further strengthens their market position. This, in turn, encourages more developers to write programs, which attracts more customers, and so on. Eventually, the entire market tips into the hands of one firm, and that company's technology "locks in."

Competitors who arrive on the scene after a market has locked in face a tough task, even if their products are good ones. Digital Research's DR-DOS, which was launched in the late eighties, was in some ways more advanced than the competing version of Microsoft's MS-DOS, but it failed to acquire a significant market share and ultimately all but disappeared. During the early nineties, I.B.M. spent about two billion dollars developing and marketing OS/2, a sophisticated rival to Windows, but it, too, flopped, despite laudatory reviews from independent experts. "There is no presumption in markets with increasing returns that superior technology wins," Garth Saloner said recently. "An inferior technology that gets in first and is supported by

network externalities may be able to hold its place even against superior technologies that come later."

Many economists point to the VHS videocassette as an example of an inferior technology that locked in and defeated a superior alternative. (VHS was in some ways technically inferior to Betamax, but VHS was able to offer a larger selection of movies.) Arthur reckons that Microsoft's operating system is another. "People often ask me to give an example of something inferior that locked in," he said. "I say, look at MS-DOS. Here is something totally crummy that locked in for ten years." Arthur's opinion of MS-DOS was shared by many computer scientists, who argued that it was a primitive and unwieldy operating system, but with the development of Windows Microsoft has greatly improved the quality of its products over the years, and few customers are complaining. At the end of 1997, it was estimated that Microsoft had a total installed base of about a hundred and fifty million personal computers.

The presence of significant network externalities creates powerful incentives for a dominant firm to try to manipulate the market. One way for it to do so is to make products incompatible, or partially incompatible, with offerings from rival venders, in which case customers will tend to stick with products that they know are fully compatible and reliable. Microsoft has been accused of adopting this tactic on numerous occasions. A few years ago, Microsoft told customers that DR-DOS would not work with Windows 3.1, which was then being tested, and those who tried got an error message on their screens. (DR-DOS designers maintained that there was no reason the two programs shouldn't work together.) More recently, Microsoft has made arrangements to sponsor sites that are inaccessible to viewers who are using a Navigator browser from Netscape.

A dominant firm can also sabotage its rivals' products by announcing that it is about to come out with a similar product, even if the actual launch date is months, or even years, away. The mere potential existence of such "vaporware," as it has come to be called, may well persuade buyers to wait for the dominant firm's offering instead of switching to another supplier, thus confirming the dominant firm's position. Garth Saloner and Joseph Farrell published a formal model in the American Economic Review several years ago showing how this could happen. "Especially when targetted against a fledgling technology, the pre-announcement may well be anticompetitive," they wrote. Many software companies make strategic use of product pre-announcements, but Microsoft is the company that is most notorious for it. During the eighties, so many of the firm's products failed to materialize on time (the original Windows was the most famous example) that Gates became known in Silicon Valley as the Viscount of Vapor. Perhaps the most important way a dominant firm can exploit its position, however, is by using its monopoly in one market to bludgeon its way into another. This is particularly significant in light of the network externalities in the computer industry, since new markets are developing there all the time. "I think that high-tech markets are a bit like the land rushes that the United States used to have in the eighteen-eighties in places like Kansas and Oklahoma," Arthur explains. "Everybody lines up behind the starting line, they race their horses and buggies, and if they win they get to stake out their hundred and sixty acres." The problems come, he added, if the victor in one race "parlays his winnings into a Toyota Landcruiser" to use in the next race, or if he "hobbles all the other horses at night." Joel Klein, at the Justice Department, uses a similar figure of speech, comparing the computer industry with a series of sprints, in which the government's role is to make sure that the contestants line up squarely on the starting line. "Our view is that a monopoly fairly acquired is not unlawful," he told me. "Our concern is with the use of monopoly

power, once acquired, to protect or extend that monopoly—in this case, the use of monopoly power in operating systems to undermine competition among browsers."

It may seem odd for the Justice Department to be so concerned about the fate of a product that is effectively given away to many consumers by both Microsoft and Netscape, but the government believes that there is a lot more at stake in the battle between Internet Explorer and Navigator than the market for Web browsers. "Microsoft's own documents show that what Bill Gates cared about from Day One was that browsers could go after the operating system," Klein told me. "We have quote after quote from their executives saying, basically, 'We are not worried simply about the browsers, we are worried about control of the desktop, and therefore we have got to win the browser war.' That's the story."

Court documents filed by the government provide support for Klein's argument. In one such document, an internal memo dated May 26, 1995, Gates wrote, "The Internet is the most important single development to come along since the IBM PC was introduced in 1981. It has enough users that it is benefitting from the positive feedback loop of the more users it gets, the more content it gets, and the more content it gets, the more users it gets." Furthermore, Gates continued, the Internet presented a major threat to Microsoft because the firm's rivals, such as Sun Microsystems and Netscape, were trying to exploit and "commoditize the underlying operating system," which is the product that Microsoft's success is based upon.

Since Gates wrote that memo, the potential threat to Microsoft has increased sharply. I.B.M. and many other companies are developing software applications, such as word processors and video games, that use Sun Microsystem's Java programming language to run on Web browsers, without any need for an underlying operating system, such as Windows 95. "Netscape/Java is using the browser to create a 'virtual operating system,'" Paul Maritz, a senior Microsoft executive, warned in another document obtained by the Justice Department. He also wondered whether Windows would become "devalued" or "eventually replaceable."

Beginning in mid-1995, Microsoft's response to this challenge was to start bundling Internet Explorer with Windows 95, so that anybody who bought a computer with a Microsoft operating system also received a Microsoft Web browser, but Judge Jackson has outlawed this tactic, at least temporarily. In stating that Microsoft's right to integrate new products into Windows "stops at least at the point at which it would violate established antitrust law," he drew attention to a series of statutes that many people in Silicon Valley had written off as outdated and ineffectual.

The antitrust laws, as their name suggests, were introduced in response to the commercial combines that dominated the markets for sugar, lumber, beer, and numerous other goods at the turn of the last century. (The most famous of the "trusts" were the Standard Oil Company, which John D. Rockefeller created in 1879, and the United States Steel Corporation, which J. P. Morgan put together in 1901 after buying out Andrew Carnegie's industrial empire.) The Sherman Act, which Congress passed in 1890, was, at first sight, a historic piece of legislation, for it proscribed any restraint of trade by an existing monopoly and any attempt to form a new monopoly. The Clayton Act, of 1914, which Congress enacted in order to outlaw a number of specific predatory tactics employed by American firms, such as price-discrimination and exclusive-dealing contracts, also seemed at the time to be a potent measure.

In practice, though, the antitrust laws have proved to be a lot more accommodating than their language implies. "The successful competitor, having been urged to compete, must not be turned upon when he wins," Judge Learned Hand wrote fifty years ago, and most courts have taken his advice, refusing to shackle, let alone dismantle, powerful corporations unless they were guilty of

blatantly anticompetitive behavior. Faced with potentially hostile judges, the executive branch has traditionally deliberated very carefully before launching a criminal antitrust action. "The Justice Department, as an institution, is extremely conservative," Philip Verveer, a former government lawyer who, during the nineteen-eighties, helped bring the case against A.T.&T., told me. "It has all manner of safeguards."

In 1994, Anne Bingaman, who headed the Justice Department's antitrust division during the first Clinton Administration, reviewed all the evidence against Microsoft and decided that she couldn't prove a broad monopolization case against it under the Sherman Act, which is what many of her staff were recommending. Instead, she settled for negotiating the consent decree that is at the center of the current legal dispute. From the moment Bingaman made that decision, it has faced heavy criticism. In early 1995, Judge Stanley Sporkin, of the United States District Court in Washington, D.C., rejected the settlement between the government and Microsoft, because it didn't address many of the charges against the firm, including its alleged use of vaporware. In a memorable ruling, Sporkin declared, "It is clear to this Court that if it signs the decree presented to it, the message will be that Microsoft is so powerful that neither the market nor the Government is capable of dealing with all of its monopolistic practices."

An appeals court subsequently overturned Sporkin's decision, on the ground that he didn't have the authority to block the settlement, but many critics still believe that the government erred in agreeing to such a limited consent decree. "Gates is like smallpox," Frederick Warren Boulton, a former chief economist in the Department of Justice's antitrust division, told me. "You have to go in there and you have to nail it. If you leave it lying around, it will just come back." Warren-Boulton, who worked for Novell, a Microsoft rival, in trying to persuade the government to sue Microsoft, compared Bingaman's decision with the Bush Administration's failure to carry on the Gulf War. "They were within two days of the capital, they could have taken Baghdad, but for some reason they decided to sit there and negotiate a consent decree. Boy, was that a mistake!" he said.

Until the Justice Department's recent action, the impact of the consent decree on Microsoft's business was minimal, just as Gates predicted. Even some senior figures at the Justice Department appear to believe that the settlement that Bingaman and her colleagues reached with Microsoft wasn't ideal. "Anytime you have a retrospective dispute, one can think of things one might have changed at the time, but I don't think it would be appropriate of me to second-guess," one official told me. "They did what they thought was right."

Like Bingaman four years ago, Joel Klein is now under pressure to bring a monopolization case against Microsoft under the Sherman Act, this time relating to the company's behavior in the market for Internet browsers. Last month, the Justice Department hired David Boles, a top antitrust litigator, as a consultant, but Klein insisted that he has not yet made a decision on whether to go ahead with the case. "It's too early to tell," he said.

Despite his ongoing tussle with Gates, Klein is keen to avoid being portrayed as a "trust-buster" in the tradition of William Howard Taft and Theodore Roosevelt. "There are some people out there who have a political view that the aggregation of economic power, in and of itself, is a bad thing. I don't think that is the role of the antitrust department," he told me. "Ours is a much more careful, market-driven approach, one that takes into account the potential competitive benefits as well as the potential competitive harms of bigness." Klein stressed that he doesn't want the Justice Department to be seen "as the regulatory bureau for the Microsoft company," and he added that the government's aim is limited and straightforward: "We are trying to have a fair fight for these new markets."

I asked Klein how it felt to be taking on the most popular businessman in the country—a man who has become an icon for the global triumph of capitalism at the end of the twentieth century.

"Microsoft has been a tremendous American success story," he replied. "I say that publicly, and I don't think there is any doubt about it. This is not about good guys and bad guys."

One of the ironies of Judge Jackson's preliminary ruling is that the much-maligned consent decree could turn out to have more bite than its critics anticipated. In delaying his ultimate decision for several months, the judge has provided time for a long-overdue discussion about what the government's role should be in an information-based economy. Until now, such a debate had been prevented by the naïve libertarian sentiments of many people in the computer world, and by a more legitimate worry that too much government intrusion could threaten the high-tech sector's remarkable record of innovation.

Predictably, perhaps, economists are divided in their views on how far the government should go. Some of them, including Steven Salop, think the forces leading toward monopolization are so strong in the computer industry that full-scale federal regulation may eventually be unavoidable. Others, including Garth Saloner and Richard Schmalensee, of M.I.T., who has acted as a consultant for Microsoft, believe that vigilant enforcement of the existing antitrust laws is the best solution available. "The notion that you ought to replace faith in the market with faith in the government—I don't think the new theories let you do that," Schmalensee said. "They offer less reason to have unqualified faith in the market, but they don't make the government's job easier."

Even Brian Arthur, whose pioneering work helped spark the revival of antitrust economics, concedes that he is of two minds about the Microsoft battle. "The wrong type of regulation could turn the high-tech sector into something like the high-tech sector in Europe or Japan, not the wild and wonderful free-for-all that it is now," he told me. "I think America has an absolutely wonderful record of innovation in high technology, and I would hate to see that hampered." Despite these fears, Arthur believes that the Justice Department did the right thing in challenging Microsoft and trying to establish the simple but important principle that companies should have equal access to new markets. "Exactly how you do that in a positive way I don't know," he said. "But it would certainly rule out what is going on now, with Microsoft saying, 'I command a user base of millions, and I'm just going to lever them over into the next market that I am taking over.' It's impossible to start everybody absolutely equal, but when things become egregious the government ought to step in."