

LESSONS IN LEADERSHIP

The Education of Andy Grove

A Harvard historian explains how Intel's legendary chief became the best model we have for leading a business in the 21st century.

By [Richard S. Tedlow](#)

In 1991, an instructor at Stanford's Graduate School of Business presented his class with a case study. It went like this: A CEO was scheduled to address a major industry gathering, and he could give one of three speeches. The first would publicly commit his company to incorporating a sexy, sophisticated new technology in its products. The second speech would reaffirm the company's commitment to developing its existing technology. The third speech would do neither, leaving the decision to "the market." The stakes were enormous: A wrong decision could well ruin the business. What should the CEO do? The question was more than academic, because the CEO described in the case was also the man at the front of the classroom. Dr. Andrew S. Grove, like professor Indiana Jones, was better known for his exploits as "Andy," the famous leader of [Intel Corp.](#) But unlike Indy, Grove wasn't simply biding time here between adventures. His question was meant not just to challenge students' thinking but to advance his own. That big speech was three weeks away, and Grove had yet to make up his mind. He didn't know the answer.

It's not common for any CEO to stand before an audience and say, "I don't know what to do. What do you think?" It's even less common for that CEO to listen to the responses and take them seriously. But Grove, 69, has never lost track of the truth: that Intel has always been one wrong answer away from disaster—and that a closed mind is a trap door to the abyss.

Grove and Intel are now embedded so deeply Inside our minds, our computers, and our culture—the man has been on *77* magazine covers, by one count—that with hindsight, their success seems foreordained. But the opposite is the case: By all odds, Intel should have failed. It should have been destroyed by the same brutal international competition that has killed apparel companies, tire companies, and television companies, or fallen into obscurity like Zilog and other successful chipmakers. Intel, too, should have stumbled on the terrifying treadmill of Moore's Law, which requires betting billions upon billions of dollars on ever more costly factories to make chips you're still developing for customers who've yet to demand them. It should have been eclipsed by an upstart competitor with a better mousetrap. Intel's success should never have happened—it was an anomaly, an outlier, a freak.

That's why Grove had chosen himself as the day's case study in the class he was teaching with professor Robert Burgelman, his longtime collaborator and the author of *Strategy Is Destiny*. In business you often don't see the cliff until you've already walked over it. Visibility on the ground is bad, and the roadmap—well, that can't be trusted either. To spot the next cliff, Andy Grove was willing to let go of his instincts—since they could be wrong—and view himself as a student might: from outside, peering down with the wide-

angle, disinterested perspective of the observer. Did the man below seem aware of his surroundings? Was he choosing the correct path? Was there a 1,000-foot drop ahead?

Normally, our society observes a division of labor. Musicians don't critique, and critics don't compose. Quarterbacks decide on Sunday, and fans deride on Monday. It is the singular ability to inhabit both roles at once—subject and object, actor and audience, master and student—that sets Grove apart. And it's why, for everything that has been written by and about him, we have yet to appreciate his biggest legacy. Andy Grove is America's greatest student and teacher of business.

By analyzing the decisions he made on the road to becoming a great leader, you can learn to hone your own leadership skills. Because there's no gain in being able to recruit great employees, handle a board, dazzle Wall Street, or rally your cavalry for a glorious charge at dawn's early light if you haven't figured out which way to point the horses.

Grove's output as a teacher of management has been prodigious. He has taught from the lectern, in the op-ed pages, in his famous (sometimes feared) one-on-one sessions, and with his books, including 1983's *High Output Management* and 1996's *Only the Paranoid Survive*, whose title entered the lexicon along with its phrase "strategic inflection point," which Grove defines as "a time in the life of a business when its fundamentals are about to change." His teaching would have been an impressive career in itself. Yet it is one thing to search for truth in the ivory tower and quite another to take those lessons, however wrenching, and apply them to a living, breathing business like Intel. Grove's most powerful lessons have been in the doing.

What can others learn from Grove's odyssey? As we face a future where change is not only constant but accelerating, reality will transform itself more swiftly than most humans—or most companies—are hard-wired to handle. Even startups that overturn one reality are easily overturned by the next big change. Grove has escaped natural selection by doing the evolving himself. Forcibly adapting himself to a succession of new realities, he has left a trail of discarded assumptions in his wake. When reality has changed, he has found the will to let go and embrace the new.

It's a performance as remarkable as his life story. There will not be another CEO who survived both the Nazis and the communists before becoming a naturalized capitalist. And yet Grove is the best model we've got for doing business in the 21st century. If you hope to thrive in an environment of rapid change, it is this outlier—his strengths forged in a distant and vanished world—that you should follow. Begin your lesson in leadership the same way Andy Grove attacks a problem: by setting aside everything you know.

As a historian whose subjects have been, until now, no longer living, I found it a jolt to face a very alive Andy Grove. When he gets to a particularly intense point in a conversation, Grove leans forward and fixes you directly with his eyes, which are a startling blue. "That is not the right question," he will say, briefly taking over the duties of the interviewer. It's not personal. It's about an invisible third party: the truth. The truth is so precious and so hard to coax into view—surrounded by its bodyguard of politics and

half-truths—that there is simply no time for fuzzy thinking. There are moments when you can almost experience firsthand the flow of self that went into Intel. And Grove's state-of-the-art memory can transport you from the deck of his home—where a commanding view of Silicon Valley spreads out at his feet—to vivid places in time. Like the day not long after the Stanford case study when Intel executives Craig Kinnie and Dennis Carter arrived in his cubicle to confront him.

In the run-up to the speech about technology choices, Grove had uncharacteristically wavered. He'd told Stanford's Burgelman that he was inclined to stick with Intel's mainstay chip technology known as CISC (for complex instruction set computing—don't ask). But when Intel published its annual report, the cover included a new, fashion-forward RISC chip (for reduced instruction set computing). Engineers across the industry were enamored of RISC because of its elegance: It required fewer transistors to accomplish most computing tasks. Grove had even appeared in an Intel rap video to promote RISC.

But Kinnie and Carter had trained at the Grove school of management—Grove's MO as a leader has always been to depend on "helpful Cassandras" to make sure that he doesn't win an argument he ought to lose. The two were blunt. "Andy, you can't do this," Carter said. Abandoning CISC for RISC, they argued, would truncate one of the most profitable franchises in business history for ... what? Leveling the playing field for Intel's competition? When the discussion ended, Kinnie and Carter had achieved a feat of monumental difficulty. They'd won an argument with Andy Grove.

Grove has been grateful to them ever since. He looks back at this episode with anger—at himself. "We almost wrecked the company," he told me. "We had established our technology as the industry standard. This franchise was worth millions, billions. We ... I ... almost walked away from it because the elegance of a new product seduced me into taking my eye off the market." The sun is shining, the view is stunning, and Andy Grove is berating himself for a mistake he didn't make a decade and a half ago. It's a measure of the demanding life he has lived—a life that, at critical junctures, has hung on Grove's ability to transform himself, to move from role to role as the moment required.

The Early Adapter

To be born a Hungarian Jew in 1936 was to be born on the wrong side of history. Grove was forced to adapt to a succession of threatening realities from the very beginning.

Transformations were the story of Grove's young life. When the Nazis invaded Hungary in 1944, his mother changed his name from Andras Grof to the Slavic Andras Malesevic. When the communists arrived the following year, he once again became Andras Grof. As a young man, he switched from journalism to chemistry after publishers started rejecting his articles for political reasons.

Communism nauseated him. One of his most vivid recollections is the May Day parade of 1950. Cheering was broadcast from loudspeakers around Budapest. But when Andy

and his schoolmates arrived at Heroes' Square, they discovered there was no crowd at all: The cheering was recorded. Six years later, when the Hungarian Revolution caused the border with Austria to be open for a brief period, Grove faced an immediate and unanticipated decision. He had never been outside Hungary. An only child, he would be leaving parents he might never see again. He had little idea of what he'd be running to. If ever there was a plunge into the unknown, that was it.

He arrived in the U.S. on Jan. 7, 1957—the same day that *Time's* "Man of the Year" issue featured THE HUNGARIAN FREEDOM FIGHTER on its cover. Soon he would change his name for a third and final time. At the City College of New York, where he enrolled, Andras Istvan Grof was struck from the transcript and above it was written Andrew Stephen Grove. He had left behind his home, and he needed a name people could pronounce.

The Self-Made Manager

By the late 1960s Grove had earned a Ph.D. in chemical engineering at the University of California at Berkeley and joined Fairchild Semiconductor, birthplace of the integrated circuit. When colleagues Robert Noyce and Gordon Moore quit to start Intel, Grove declared he was coming too. In 1968 they put their 32-year-old protégé in charge of operations. That forced Grove into an unfamiliar role: having to lead people.

Quite suddenly Grove found himself on the shop floor of a manufacturing startup. There the human dynamics proved far more complex than the fluid dynamics he'd studied at Berkeley. The job, he quickly recognized, required something he knew nothing about: It required management. What was that, anyway? Grove decided he had to figure it out.

On July 4, 1969, he opened a school notebook and pasted in a clipping from a story in *Time* magazine about movie directors. "Vision to Inspire," it read. "Any director must master formidable complexity. He must be adept at sound and camera work, a soother of egos, a cajoler of the artistic talent. A great director has something more: the vision and force to make all these disparate elements fuse into an inspired whole." Above the clipping, Grove wrote with a red pen: "My job description?"

So began the self-education of Andy Grove, manager. It was a quest in which he immersed himself. His classroom would be a remarkable set of journals that he kept for years—and that have never, until now, been revealed. They're a window into the mind of an engineer grappling with the challenge of managing people. How did a company's growth rate, for instance, relate to its employees' ability to grow? In an entry from the early 1970s, Grove noted, "Three groups of people can be identified: (A) don't belong in their jobs in the first place. These are "defective choices," nothing to do with growth. (B) These are the previously discussed cases, people who can't grow with their jobs. (C) This is everybody else, including those that have demonstrated all kinds of growth capability before.

"The point is, there is a growth rate at which *everybody* fails and the whole situation results in a chaos. I feel it is my most important function (as being the highest-level manager who still has a way to judge the impending failure) to identify the maximum growth rate at which this wholesale failure phenomenon begins."

Grove succeeded where others didn't, in part, by approaching management as a discipline unto itself. There's real urgency in his efforts to school himself: He never lost his Hungarian refugee's apprehension of the risk of imminent failure.

The Change Agent

*By 1983, when Grove distilled much of his thinking in his book *High Output Management* (still a worthwhile read), he was president of a fast-growing \$1.1-billion-a-year corporation, a leading maker of memory chips, whose CEO was Gordon Moore. Could Grove and Moore save the company from an industry that was filled with ferocious competitors?*

In many ways change was in Intel's DNA. It was Moore who had famously observed that the number of transistors you could cram onto a chip tended to double every couple of years (later refined to 18 months). What Moore's Law did not and could not predict was that Japanese firms, too, might master this process and turn memory chips into a commodity. That was change of a different order, and not even Intel was prepared for it.

The company's top executives simply could not believe the growing evidence that they were being outcompeted in a market they had created. Intel was the memory company, period. Its chips were in many of the best minicomputers and also in the new breed of machine that was then taking off, the personal computer. In the early 1980s profits from other products helped to sustain the delusion that memories were a viable future.

Intel kept denying the cliff ahead until its profits went over the edge, plummeting from \$198 million in 1984 to less than \$2 million in 1985. It was in the middle of this crisis, when many managers would have obsessed about specifics, that Grove stepped outside himself. He and Moore had been agonizing over their dilemma for weeks, he recounts in *Only the Paranoid Survive*, when something happened: "I looked out the window at the Ferris wheel of the Great America amusement park revolving in the distance when I turned back to Gordon, and I asked, 'If we got kicked out and the board brought in a new CEO, what do you think he would do?' Gordon answered without hesitation, 'He would get us out of memories.' I stared at him, numb, then said, 'Why shouldn't you and I walk out the door, come back, and do it ourselves?'"

The words "I stared at him, numb" suggest that in the crucial moment, Andy ceased to be Andy. Instead he was Dr. Grove the engineer, the teacher, looking down at his own case study. And from this realm of pure reason he could see that Intel's present course had an obvious ending: disaster. It was a cognitive *tour de force*, yet within moments Andy Grove the executive returned—and was dismayed by what Andy Grove the teacher had concluded. Professors overturn ideas, but they don't upend lives. "To be completely

honest about it," Grove wrote, "as I started to discuss the possibility of getting out of the memory chip business, I had a hard time getting the words out of my mouth without equivocation." One of his managers even persuaded him "to continue R&D for a product that he and I both knew we had no plans to sell." Grove's devotion to reason did not mean that he was a machine. Far from it. What he found in the end was the will to do what was painful, the will to let go.

"Welcome to the new Intel," Grove said in a speech not long afterward, to rally the troops behind the decision to exit memories. Intel the memory company was dead, he explained, but there was another product on which it could stake its future: the microprocessor. Invented at Intel in 1971, it had spent the 1970s timing traffic lights and helping bacon packers slice their bacon into even strips. Not all that exciting. But once IBM chose Intel's microprocessor to be the chip at the heart of its PCs, demand began to explode. Even so, the shift from memory chips was brutally hard—in 1986, Intel fired some 8,000 people and lost more than \$180 million on \$1.3 billion in sales—the only loss the company has ever posted since its early days as a startup.

The Reality Shifter

Grove and Moore had no way of knowing that Intel was on the verge of a remarkable ten-year run. They did know they were betting the company—and that to make the shift they had to risk angering IBM. The \$60-billion-a-year giant was not only Intel's biggest customer but also its biggest shareholder—it had bought a large stake in the company to shore up its shaky supplier.

Intel did not set out to dominate the computer industry any more than humans set out to dominate the planet. In both cases the main concern was survival. Humans were so vulnerable to being eaten by larger, faster creatures that their only hope of survival was to control their environment. The "new Intel," too, was subject to forces beyond its control. Grove would later use a graphic that depicted Intel as a castle with the 386 chip in the center. The castle was under siege by rival chipmakers [Sun Microsystems](#), [Harris](#), [Motorola](#), and NEC, not to mention RISC. But in the mid-1980s, before the graphic was ever made, Intel faced a more basic challenge: It was not so much a kingdom as a vassal state. Its dominant customer, IBM, had long insisted that Intel license its microprocessor designs to other chipmakers so that Big Blue could always be certain of a ready supply of chips at a pleasant price.

Grove decided that had to change. "Finally, we had a real winner of a device," Grove says of the 386 chip. But if Intel wanted a more secure future, "we not only had to win; we had to win our way." The 386 marked a genuine milestone of computer engineering. As [Microsoft](#) and other software developers figured out how to make full use of the new chip, Grove knew, the PC market would probably grow even hotter. Yet as long as Intel had to share its designs with other chipmakers, it would always face the anonymous and uncertain life of a parts supplier, subject to the whim of a customer 60 times its size.

To become its own kingdom, Grove realized, Intel had to make itself effectively the sole source of microprocessors. Getting IBM to buy the idea posed a challenge—he had no way of knowing how his giant partner would react—but he knew the status quo did not give Intel the freedom it needed to grow. So Intel moved unilaterally: In 1985, when it launched the 386, it declared the technology would not be licensed to other producers. IBM at first did not build 386s into its machines. But as archrival Compaq picked up the chip, IBM came around, cutting a deal with Intel to make some of the 386s it expected to use in its own chip factories. The gamble had paid off. "To insist on our way meant we might lose," Grove says. "But to me, that is better than losing by compromising your advantages away."

The Fallible Human

During Grove's 11-year tenure as CEO, Intel grew at a compound annual growth rate of nearly 30%. Together with Microsoft, Intel supplanted IBM as the dominant standard in computing. In 1992, Intel's profits topped \$1 billion for the first time—on \$5.8 billion of sales. What made such extraordinary growth possible under Grove's leadership was his continuing ability to adapt to shifting realities—but even Mr. Strategic Inflection Point could stumble.

The 386 caught on, and sure enough, Microsoft used it to transform computing—its smash-hit Windows 3.0 operating system, which debuted in 1990, was designed to work on 386-based machines. Grove's breakthrough about changing the rules of the game opened the door to an epiphany about branding and marketing. In 1990 marketing chief Dennis Carter—the same Dennis Carter who had badgered Grove on RISC—came to him with a scheme to launch a large-scale consumer marketing campaign around the slogan "Intel Inside." It is hard to recapture how foreign the concept of branding was at an engineering company like Intel. According to Carter, when he pitched the idea to a roomful of Intel senior executives, "most of them thought it was nuts. But not Andy. He said, 'It's brilliant. Go make it happen.'" Improbably, it turned an internal component into one of the most recognized brands in the world. Grove so loved the idea of marketing to consumers that he selected the name Pentium himself.

There's a rate of growth, though, at which *everybody* fails, including Andy Grove. His biggest tumble from the learning curve began in 1994. That fall Thomas Nicely, a mathematician at Lynchburg College in Virginia, spotted "inconsistencies" in the way Intel's latest Pentium chip performed a rare, complex scientific calculation.

Intel engineers knew about the bug but deemed it too insignificant to report. By their calculations, a spreadsheet user would encounter it once every 27,000 years of spreadsheet use. But when Nicely's findings were posted on an Internet newsgroup, the discussion became a tempest, then burst into public view. Soon IBM announced it was suspending shipments of its Pentium-based computers.

It was a moment when Grove should have switched into observer mode and asked, "What has changed here?" Instead, he kept thinking like an engineer and waded into the online

mob himself, as though it were purely a technical debate. The uproar grew, though, until Grove was forced to adopt a no-questions-asked replacement policy and to apologize to customers. The apology was not very gracious. "What we view as a minor technical problem has taken on a life of its own," he declared. "We apologize. We were motivated by a belief that replacement is simply unnecessary for most people. We still feel that way." In effect he was telling consumers that they wanted something they did not need, but Intel had decided to indulge their irrationality.

A customer replied on the Internet with a poem:

*When in the future we wish to deride
A CEO whose disastrous pride
Causes spokesmen to lie
and sales streams to dry
We'll say he's got Intel Inside™.*

For a man who strives to grasp objective reality, Grove had missed a fundamental shift in the nature of his business. Intel had become a marketing company. And while a chip is built in a factory, a brand is co-created with the customer. This required a rethinking of the meaning of "objectivity." In branding, a customer's subjective reality, even if confused, becomes your objective reality. The learning experience was more expensive than most: The Pentium recall required a \$475 million writedown that marred Intel's year.

The Data-Driven Patient

A few months later Grove faced crisis again: He was diagnosed with prostate cancer. In the intense period that followed, he remained on the job for all but two-and-a-half days. He handled the decision about his treatment the same way he handled decision-making at Intel: as if life depended on it.

Grove had never been one to rely on others' interpretations of reality. Hungary, in this regard, served as How-Not-To-Do-It University. Reality there was shaped by one's position in the system. At Intel he fostered a culture in which "knowledge power" would trump "position power." Anyone could challenge anyone else's idea, so long as it was about the idea and not the person—and so long as you were ready for the demand "Prove it." That required data. Without data, an idea was only a story—a representation of reality and thus subject to distortion. Hungary had been a grotesque funhouse mirror. The slim man looked fat, and the fat man slim. But when he was diagnosed with prostate cancer in 1995, Grove found himself in the position of most patients: frightened, disoriented, and entirely reliant on the advice of doctors. Their advice was straightforward: Surgery was the best option, and that was pretty much all there was to it.

Was it, though? It took very little to discover that there was much, much more to it. There were alternatives to surgery. No surgeon advised him to take them seriously. But the expert opinions, Grove soon determined, were just that—opinions, based on little if any hard data. Data did exist. What Grove found most shocking is that no one had done the hard work of pulling it together. Plainly, Grove would have to do it himself.

The patient, in effect, became his own doctor. It was a massive research undertaking whose details Grove chronicled in a 1996 story for Fortune. One is left with the image of Grove, awake late at night, plotting and cross-plotting the data in his own methodically constructed charts. What did the data tell him? That he would be better off with an alternative procedure known as radiation seeding. That was the treatment he selected.

What Grove found most appalling, in the end, was the utter fixity of belief among doctors who failed to separate knowledge from conventional wisdom. Even the doctor who carried out Grove's procedure was captive to it. "If you had what I have, what would you do?" Grove asked him at one point. The doctor said he'd probably have surgery. Confounded, Grove later asked why. The doctor thought about it. "You know," Grove remembers him saying, "all through medical training, they drummed into us that the gold standard

"Let's Think for Ourselves"

Grove stepped down as CEO in spring 1998 to become Intel's chairman. The betting at Intel was that he'd never really let go of the reins, but Andy surprised everyone. He dug into his new assignment as he has every other—setting out to examine and improve the way the board governed Intel and thereby to set an example for corporate boards everywhere (see "Inside Andy Grove's Latest Crusade" on fortune.com).

Last May, when Paul Otellini succeeded Craig Barrett as CEO, Grove officially became "senior advisor" to the company. The title didn't matter. Grove was still teaching.

On a Monday last month, Grove stood before 400 or so Intel employees, the advance troops of the company's health-care initiative. (Intel wants to make its chips the basic building blocks of 21st-century health-care and medical technology.)

Many had never seen Grove in person before, and he got a standing ovation before he said a word. His speech was a strong statement about strategy. Understanding comes from action. So "be quick and dirty," he said. "Engage and then plan. And get it better. Revolutions in our industry in our lifetime have taken place using exactly this formula. The best example is the IBM PC"—created on the fly by a team in Boca Raton.

Then he took questions. A European software engineer stood up with microphone in hand. He asked about handling health-care information. "How can we address the problem of privacy protection and data protection?"

"Stay with me for a minute," Grove said quickly. "Can I ask you a question? Why do you care?"

"Because health-care information might find its way to insurance companies and might result in higher insurance rates," the engineer replied.

"Explain to me why," said Grove, almost before the engineer could finish speaking.

"Many people have said it would be a bad thing if insurers knew all about the health history of everyone in the population," he replied.

Intel's senior advisor sized up the engineer's comments this way: "I think we have a tendency toward adding imaginary complexities to a problem which is already unimaginably complicated." He added, "Let's think for ourselves. Let's not repeat mindlessly ... excuse me, automatically ... suppositions that are true merely because somebody else says they are."

Did the engineer care about having been cross-examined and momentarily called mindless in the presence of 400 co-workers by his legendarily blunt leader? He smiled at Grove's choice of words. "Go ahead," he told Grove. "I was prepared."

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