

## INTRODUCTION

Procter and Gamble had a problem: it needed a new floor cleaner. In the 1980s, the company had pioneered one lucrative consumer product after another, from pull-up diapers to anti-dandruff shampoo. It had developed color-safe detergent and designed a quilted paper towel that could absorb 85 percent more liquid than other paper towels. These innovations weren't lucky accidents: Procter and Gamble was deeply invested in research and development. At the time, the corporation had more scientists on staff than any other company in the world, more PhDs than the faculties of MIT, UC-Berkeley, and Harvard *combined*.

And yet, despite the best efforts of the chemists in the household-cleaning division, there were no new floor products in the pipeline. The company was still selling the same lemon-scented detergents and cloth mops; consumers were still sweeping up their kitchens using wooden brooms and metal dustpans. The reason for this creative failure was simple: it was extremely difficult to make a stronger floor cleaner that didn't also damage the floor. Although Procter and Gamble had invested millions of dollars in

a new generation of soaps, these products tended to fail during the rigorous testing phase, as they peeled off wood varnishes and irritated delicate skin. The chemists assumed that they had exhausted the chemical possibilities.

That's when Procter and Gamble decided to try a new approach. The company outsourced its innovation needs to Continuum, a design firm with offices in Boston and Los Angeles. "I think P and G came to us because their scientists were telling them to give up," says Harry West, a leader on the soap team and now Continuum's CEO. "So they told us to think crazy, to try to come up with something that all those chemists couldn't."

But the Continuum designers didn't begin with molecules. They didn't spend time in the lab worrying about the chemistry of soap. Instead, they visited people's homes and watched dozens of them engage in the tedious ritual of floor cleaning. The designers took detailed notes on the vacuuming of carpets and the sweeping of kitchens. When the notes weren't enough, they set up video cameras in living rooms. "This is about the most boring footage you can imagine," West says. "It's movies of mopping, for God's sake. And we had to watch hundreds of hours of it." The videotapes may have been tedious, but they were also essential, since West and his team were trying to observe the act of floor cleaning without any preconceptions. "I wanted to forget everything I knew about mops and soaps and brooms," he says. "I wanted to look at the problem as if I'd just stepped off a spaceship from Mars."

After several months of observation—West refers to this as the anthropologist phase—the team members had their first insight. It came as they watched a woman clean her mop in the bathtub. "You've got this unwieldy pole," West says. "And you are splashing around this filthy water trying to get the dirt out of a

mop head that's been expressly designed to *attract* dirt. It's an extraordinarily unpleasant activity." In fact, when the Continuum team analyzed the videotapes, they found that people spent more time cleaning their mops than they did cleaning the floors; the tool made the task more difficult. "Once I realized how bad mopping was, I became quite passionate about floor cleaning," West says. "I became convinced that the world didn't need an improved version of the mop. Instead, it needed a total *replacement* for the mop. It's a hopeless piece of technology."

Unfortunately, the Continuum designers couldn't think of a better cleaning method. It seemed like an impossible challenge. Perhaps floor cleaning was destined to be an inefficient chore.

In desperation, the team returned to making house visits, hoping for some errant inspiration. One day, the designers were watching an elderly woman sweep some coffee grounds off the kitchen floor. She got out her hand broom and carefully brushed the grounds into a dustpan. But then something interesting happened. After the woman was done sweeping, she wet a paper towel and wiped it over the linoleum, picking up the last bits of spilled coffee. Although everyone on the Continuum team had done the same thing countless times before, this particular piece of dirty paper led to a revelation.

What the designers saw in that paper towel was the possibility of a disposable cleaning surface. "All of a sudden, we realized what needed to be done," says Don Buchner, a Continuum vice president. "We needed to invent a spot cleaner that people could just throw away. No more cleaning mop heads, no more bending over in the bathtub, no more buckets of dirty water. *That* was our big idea." A few weeks later, this epiphany gave rise to their first floor-cleaning prototype. It was a simple thing, just a slender plastic stick connected to a flat rectangle of Velcro to which dispos-

able pieces of electrostatic tissue were attached. A spray mechanism was built into the device, allowing people to wet the floor with a mild soap before they applied the wipes. (The soap was mostly unnecessary, but it smelled nice.) “You know an idea has promise when it seems obvious in retrospect,” West says. “Why splash around dirty water when you can just wipe up the dirt? And why would you bother to clean this surface? Why not just throw it away, like a used paper towel?”

Procter and Gamble, however, wasn't thrilled with the concept. The company had developed a billion-dollar market selling consumers the latest mops and soaps. They didn't want to replace that business with an untested cleaning product. The first focus groups only reinforced the skepticism. When Procter and Gamble presented consumers with a sketch of the new cleaning device, the vast majority of people rejected the concept. They didn't want to throw out their mops or have to rely on a tool that was little more than a tissue on a stick. They didn't like the idea of disposable wipes, and they didn't understand how all that dirt would get onto the moistened piece of paper. And so the idea was shelved; Procter and Gamble wasn't going to risk market share on a radical new device that nobody wanted.

But the designers at Continuum refused to give up—they were convinced they'd discovered the mop of the future. After a year of pleading, they persuaded Procter and Gamble to let them show their prototype to a focus group. Instead of just reading a description of the product, consumers could now play with an “experiential model” clad in roughly cut plastic. The prototype made all the difference: people were now enthralled by the cleaning tool, which they tested out on actual floors. In fact, the product scored higher in focus-group sessions than any other cleaning device Procter and Gamble had ever tested. “It was off the

charts,” Buchner says. “The same people who hated the idea when it was just an idea now wanted to take the thing home with them.” Furthermore, tests by Procter and Gamble demonstrated that the new product cleaned the floor far better than sponge mops, string mops, or any other kinds of mops. According to the corporate scientists, the “tissue on a stick” was one of the most effective floor cleaners ever invented.

In 1997, nearly three years after West and his designers began making their videotapes, Procter and Gamble officially submitted an application for a U.S. patent. In the early spring of 1999, the new cleaning tool was introduced in supermarkets across the country. The product was an instant success: by the end of the year, it had generated more than \$500 million in sales. Numerous imitators and spinoffs have since been introduced, but the original device continues to dominate the post-mop market, taking up an ever greater share of the supermarket aisle. Its name is the Swiffer.

The invention of the Swiffer is a tale of creativity. It's the story of a few engineers coming up with an entirely new cleaning tool while watching someone sweep up some coffee grounds. In that flash of thought, Harry West and his team managed to think differently about something we all do every day. They were able to see the world as it was—a frustrating place filled with tedious chores—and then envision the world as it might be if only there were a better mop. That insight changed floor cleaning forever.

This book is about how such moments happen. It is about our most important mental talent: the ability to imagine what has never existed. We take this talent for granted, but our lives are defined by it. There is the pop song on the radio and the gadget in your pocket, the art on the wall and the air conditioner in the win-

dow. There is the medicine in the bathroom and the chair you are sitting in and this book in your hand.

And yet, although we are always surrounded by our creations, there is something profoundly mysterious about the creative process. For instance, why did Harry West come up with the Swiffer concept after watching that woman wipe the floor with the paper towel? After all, he'd done it himself on numerous occasions. "I can't begin to explain why the idea arrived then," he says. "I was too grateful to ask too many questions." The sheer secrecy of creativity—the difficulty in understanding how it happens, even when it happens to us—means that we often associate breakthroughs with an external force. In fact, until the Enlightenment, the imagination was entirely synonymous with higher powers: being creative meant channeling the muses, giving voice to the ingenious gods. (*Inspiration*, after all, literally means "breathed upon.") Because people couldn't understand creativity, they assumed that their best ideas came from somewhere else. The imagination was outsourced.

The deep mysteriousness of creativity also intimidated scientists. It's one thing to study nerve-reaction times or the mechanics of sight. But how does one measure the imagination? The daunting nature of the subject led researchers to mostly neglect it; a recent survey of psychology papers published between 1950 and 2000 revealed that less than 1 percent of them investigated aspects of the creative process. Even the evolution of this human talent was confounding. Most cognitive skills have elaborate biological histories, so their evolution can be traced over time. But not creativity—the human imagination has no clear precursors. There is no ingenuity module that got enlarged in the human cortex, or even a proto-creative impulse evident in other primates. Monkeys don't paint; chimps don't write poems; and it's the rare

animal (like the New Caledonian crow) that exhibits rudimentary signs of problem solving. The birth of creativity, in other words, arrived like any insight: out of nowhere.

This doesn't mean, however, that the imagination can't be rigorously studied. Until we understand the set of mental events that give rise to new thoughts, we will never understand what makes us so special. That's why this book begins by returning us to the material source of the imagination: the three pounds of flesh inside the skull. William James described the creative process as a "seething cauldron of ideas, where everything is fizzling and bobbing about in a state of bewildering activity." For the first time, we can see the cauldron itself, that massive network of electrical cells that allow individuals to form new connections between old ideas. We can take snapshots of thoughts in brain scanners and measure the excitement of neurons as they get closer to a solution. The imagination can seem like a magic trick of matter—new ideas emerging from thin air—but we are beginning to understand how the trick works.

The first thing this new perspective makes clear is that the standard definition of *creativity* is completely wrong. Ever since the ancient Greeks, people have assumed that the imagination is separate from other kinds of cognition. But the latest science suggests that this assumption is false. Instead, *creativity* is a catchall term for a variety of distinct thought processes. (The brain is the ultimate category buster.) Just consider the profusion of creative methods that led to the invention of the Swiffer. First, there was the anthropologist phase, those nine months of careful observation and tedious videotaping. Although this phase didn't generate any new ideas—the point was to clear the mind of old ones—it played an essential role in the creative process, allowing the team to better understand the problem. And then, when West watched

the woman sweep up the coffee grounds, there was the classic moment of insight, a breakthrough appearing in a fraction of a second. But that epiphany wasn't the end of the process. The engineers and designers still had to spend years fine-tuning the design, perfecting the spray nozzle and the electrostatic wipes. "The concept is only the start of the process," West says. "The hardest work always comes after, when you're trying to make the idea real."

The point is that the Swiffer creative process involved multiple forms of creativity. This is where the tools of modern science prove essential, since they allow us to see how these various forms depend on different kinds of brain activity. The imagination is transformed from something metaphysical—a property of the gods—into a particular twitch of cortex. Furthermore, this new knowledge is useful: because we finally understand what creativity is, we can begin to construct a taxonomy of it, outlining the conditions under which each particular mental strategy is ideal. Some acts of imagination are best done in a crowded café sipping espresso, and some are helped by a cold beer on the couch. Sometimes we need to let go and improvise on our own, and sometimes we need the wisdom of others. Once we know how creativity works, we can make it work for us.

But just because we've begun to decipher the anatomy of the imagination doesn't mean we've unlocked its secret. In fact, this is what makes the subject of creativity so interesting: it requires a description from multiple perspectives. The individual brain, after all, is always situated in a context and a culture, so we need to blend psychology and sociology, merging together the outside world and the inside of the mind. This is why, although *Imagine* begins with the fluttering of neurons, it will also explore the influence of the surrounding environment on creativity. Why are some

cities such centers of innovation? What kind of classroom techniques increase the creativity of children? Is the Internet making us more or less imaginative? We'll look at evidence showing that seemingly irrelevant factors—such as the color of paint on the wall or the location of a restroom—can have a dramatic impact on creative production.

Furthermore, because the act of invention is often a collaborative process—we are inspired by other people—it's essential that we learn to collaborate in the right way. The first half of this book focuses on individual creativity, while the second half shows what happens when people come together, interacting in office hallways and city streets. Thanks to some fascinating new research, such as an analysis of the partnerships behind thousands of Broadway musicals, we can begin to understand why some teams and companies are so much more creative than others. Their success is not an accident.

For most of human history, people have believed that the imagination is inherently inscrutable, an impenetrable biological gift. As a result, we cling to a series of false myths about what creativity is and where it comes from. These myths don't just mislead—they also interfere with the imagination. In addition to looking at elegant experiments and scientific studies, we'll examine creativity as it is experienced in the real world. We'll learn about Bob Dylan's writing method and the drug habits of poets. We'll spend time with a bartender who thinks like a chemist, and an autistic surfer who invented a new surfing move. We'll look at a website that helps solve seemingly impossible problems, and we'll go behind the scenes at Pixar. We'll watch Yo-Yo Ma improvise, and we'll uncover the secrets of consistently innovative companies.

The point is to collapse the layers of description separating the

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nerve cell from the finished symphony, the cortical circuit from the successful product. Creativity shouldn't be seen as something otherworldly. It shouldn't be thought of as a process reserved for artists and inventors and other "creative types." The human mind, after all, has the creative impulse built into its operating system, hard-wired into its most essential programming code. At any given moment, the brain is automatically forming new associations, continually connecting an everyday  $x$  to an unexpected  $y$ . This book is about how that happens. It is the story of how we imagine.

