PART ONE. THE DAY

1.

THE HIDDEN PATTERN OF EVERYDAY LIFE

What men daily do, not knowing what they do!

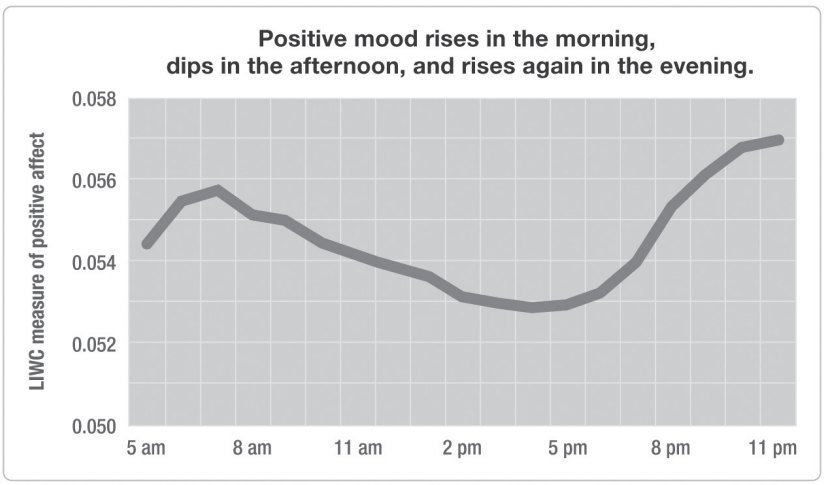
—WILLIAM SHAKESPEARE,
Much Ado About Nothing

If you want to measure the world's emotional state, to find a mood ring large enough to encircle the globe, you could do worse than Twitter. Nearly one billion human beings have accounts, and they post roughly 6,000 tweets every second.[1] The sheer volume of these minimessages—what people say and how they say it—has produced an ocean of data that social scientists can swim through to understand human behavior.

A few years ago, two Cornell University sociologists, Michael Macy and Scott Golder, studied more than 500 million tweets that 2.4 million users in eighty-four countries posted over a two-year period. They hoped to use this trove to measure people's emotions—in particular, how "positive affect" (emotions such as enthusiasm, confidence, and alertness) and "negative affect" (emotions such as anger, lethargy, and guilt) varied over time. The researchers didn't read those half a billion tweets one by one, of course. Instead, they fed the posts into a powerful and widely used computerized text-

analysis program called LIWC (Linguistic Inquiry and Word Count) that evaluated each word for the emotion it conveyed.

What Macy and Golder found, and published in the eminent journal *Science*, was a remarkably consistent pattern across people's waking hours. Positive affect—language revealing that tweeters felt active, engaged, and hopeful—generally rose in the morning, plummeted in the afternoon, and climbed back up again in the early evening. Whether a tweeter was North American or Asian, Muslim or atheist, black or white or brown, didn't matter. "The temporal affective pattern is similarly shaped across disparate cultures and geographic locations," they write. Nor did it matter whether people were tweeting on a Monday or a Thursday. Each weekday was basically the same. Weekend results differed slightly. Positive affect was generally a bit higher on Saturdays and Sundays—and the morning peak began about two hours later than on weekdays—but the overall shape stayed the same.[2] Whether measured in a large, diverse country like the United States or a smaller, more homogenous country like the United Arab Emirates, the daily pattern remained weirdly similar. It looked like this:



Across continents and time zones, as predictable as the ocean tides, was the same daily oscillation—a peak, a trough, and a rebound. Beneath the surface of our everyday life is a hidden pattern: crucial, unexpected, and revealing.

Understanding this pattern—where it comes from and what it means—begins with a potted plant, a *Mimosa pudica*, to be exact, that perched on the windowsill of an office in eighteenth-century France. Both the office and the plant belonged to Jean-Jacques d'Ortous de Mairan, a prominent astronomer of his time. Early one summer evening in 1729, de Mairan sat at his desk doing what both eighteenth-century French astronomers and twenty-first-century American writers do when they have serious work to complete: He was staring out the window. As twilight approached, de Mairan noticed that the leaves of the plant sitting on his windowsill had closed up. Earlier in the day, when sunlight streamed through the window, the leaves were spread open. This pattern—leaves unfurled during the sunny morning and furled as darkness loomed—spurred questions. How did the plant sense its surroundings? And what would happen if that pattern of light and dark was disrupted?

So in what would become an act of historically productive procrastination, de Mairan removed the plant from the windowsill, stuck it in a cabinet, and shut the door to seal off light. The following morning, he opened the cabinet to check on the plant and—*mon Dieu!*—the leaves had unfurled despite being in complete darkness. He continued his investigation for a few more weeks, draping black curtains over his windows to prevent even a sliver of light from penetrating the office. The pattern remained. The *Mimosa pudica*'s leaves opened in the morning, closed in the evening. The plant wasn't reacting to external light. It was abiding by its own internal clock.[3]

Since de Mairan's discovery nearly three centuries ago, scientists have established that nearly all living things—from single-cell organisms that lurk in ponds to multicellular organisms that drive minivans—have biological clocks. These internal timekeepers play an essential role in proper functioning. They govern a collection of what are called circadian rhythms (from the Latin *circa* [around] and *diem* [day]) that set the daily backbeat of every creature's life. (Indeed, from de Mairan's potted plant eventually bloomed an entirely new science of biological rhythms known as chronobiology.)

For you and me, the biological Big Ben is the suprachiasmatic nucleus, or SCN, a cluster of some 20,000 cells the size of a grain of rice in the hypothalamus, which sits in the lower center of the brain. The SCN controls the rise and fall of our body temperature, regulates our hormones, and helps us fall asleep at night and awaken in the morning. The SCN's daily timer runs a bit longer than it takes for the Earth to make one full rotation—about twenty-four hours and eleven minutes.[4] So our built-in clock uses social cues (office schedules and bus timetables) and environmental signals (sunrise and sunset) to make small adjustments that bring the internal and external cycles more or less in synch, a process called "entrainment."

The result is that, like the plant on de Mairan's windowsill, human beings metaphorically "open" and "close" at regular times during each day. The patterns aren't identical for every person—just as my blood pressure and pulse aren't exactly the same as yours or even the same as mine were twenty years ago or will be twenty years hence. But the broad contours are strikingly similar. And where they're not, they differ in predictable ways.

Chronobiologists and other researchers began by examining physiological functions such as melatonin production and metabolic response, but the work has now widened to include emotions and behavior. Their research is unlocking some surprising time-based

patterns in how we feel and how we perform—which, in turn, yields guidance on how we can configure our own daily lives.

MOOD SWINGS AND STOCK SWINGS

For all their volume, hundreds of millions of tweets cannot provide a perfect window into our daily souls. While other studies using Twitter to measure mood have found much the same patterns that Macy and Golder discovered, both the medium and the methodology have limits.[5] People often use social media to present an ideal face to the world that might mask their true, and perhaps less ideal, emotions. In addition, the industrial-strength analytic tools necessary to interpret so much data can't always detect irony, sarcasm, and other subtle human tricks.

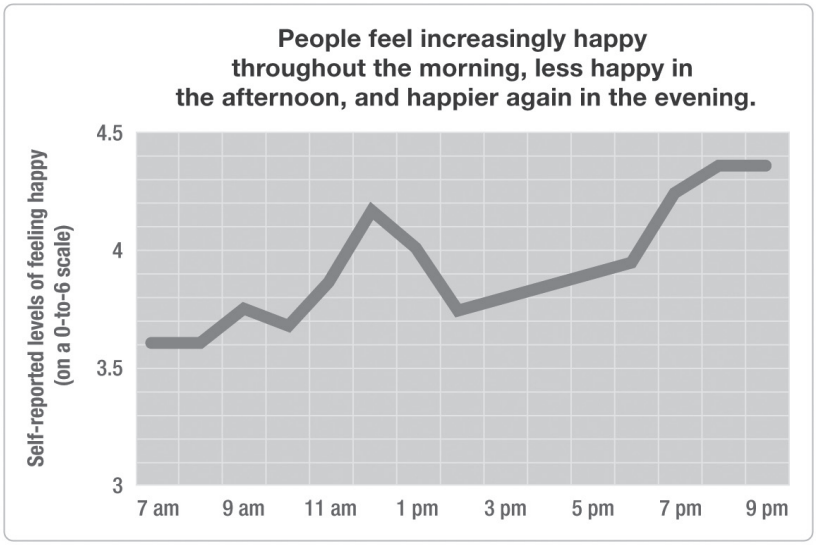
Fortunately, behavioral scientists have other methods to understand what we are thinking and feeling, and one is especially good for charting hour-to-hour changes in how we feel. It's called the Day Reconstruction Method (DRM), the creation of a quintet of researchers that included Daniel Kahneman, winner of the Nobel Prize in Economics, and Alan Krueger, who served as chairman of the White House Council of Economic Advisers under Barack Obama. With the DRM, participants reconstruct the previous day—chronicling everything they did and how they felt while doing it. DRM research, for instance, has shown that during any given day people typically are least happy while commuting and most happy while canoodling.[6]

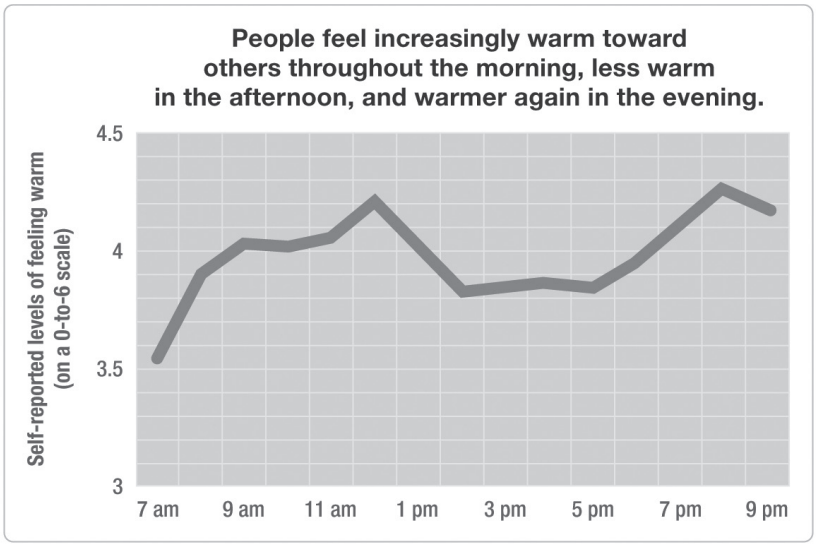
In 2006, Kahneman, Krueger, and crew enlisted the DRM to measure "a quality of affect that is often overlooked: its rhythmicity over the course of a day." They asked more than nine hundred American women—a mix of races, ages, household incomes, and education

levels—to think about the previous "day as a continuous series of scenes or episodes in a film," each one lasting between about fifteen minutes and two hours. The women then described what they were doing during each episode and chose from a list of twelve adjectives (happy, frustrated, enjoying myself, annoyed, and so on) to characterize their emotions during that time.

When the researchers crunched the numbers, they found a "consistent and strong bimodal pattern"—twin peaks—during the day. The women's positive affect climbed in the morning hours until it reached an "optimal emotional point" around midday. Then their good mood quickly plummeted and stayed low throughout the afternoon only to rise again in the early evening.[7]

Here, for example, are charts for three positive emotions—happy, warm, and enjoying myself. (The vertical axis represents the participants' measure of their mood, with higher numbers being more positive and lower numbers less positive. The horizontal axis shows the time of day, from 7 a.m. to 9 p.m.)

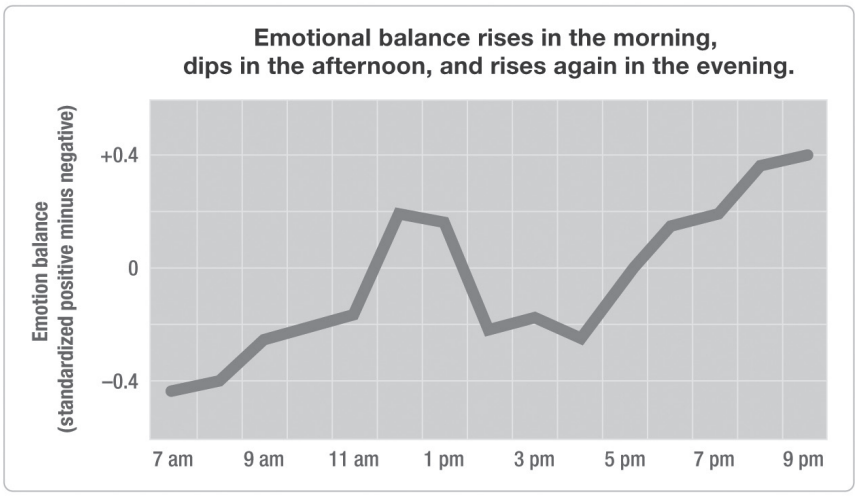




The three charts are obviously not identical, but they all share the same essential shape. What's more, that shape—and the cycle of the day it represents—looks a lot like the one on page 10. An early spike, a big drop, and a subsequent recovery.

On a matter as elusive as human emotion, no study or methodology is definitive. This DRM looked only at women. In addition, *what* and *when* can be difficult to untangle. One reason "enjoying myself" is high at noon and low at 5 p.m. is that we tend to dig socializing (which people do around lunchtime) and detest battling traffic (which people often do in the early evening). Yet the pattern is so regular, and has been replicated so many times, that it's difficult to ignore.

So far I've described only what DRM researchers found about positive affect. The ups and downs of *negative* emotions—feeling frustrated, worried, or hassled—were not as pronounced, but they typically showed a reverse pattern, rising in the afternoon and sinking as the day drew to a close. But when the researchers combined the two emotions, the effect was especially stark. The following graph depicts what you might think of as "net good mood." It takes the hourly ratings for happiness and subtracts the ratings for frustration.



Once again, a peak, a trough, and a rebound.

Moods are an internal state, but they have an external impact. Try as we might to conceal our emotions, they inevitably leak—and that shapes how others respond to our words and actions.

Which leads us inexorably to canned soup.

If you've ever prepared a bowl of cream of tomato soup for lunch, Doug Conant might be the reason why. From 2001 to 2011, Conant was the CEO of Campbell Soup Company, the iconic brand with those iconic cans. During his tenure, Conant helped to revitalize the company and return it to steady growth. Like all CEOs, Conant juggled multiple duties. But one he handled with particular calm and aplomb is the rite of corporate life known as the quarterly earnings call.

Every three months, Conant and two or three lieutenants (usually the company's chief financial officer, controller, and head of investor relations) would walk into a boardroom in Campbell's Camden, New Jersey, headquarters. Each person would take a seat along one of the sides of a long rectangular table. At the center of the table sat a speakerphone, the staging ground for a one-hour conference call. At the other end of the speakerphone were one hundred or so investors, journalists, and, most important, stock analysts, whose job is to assess a company's strengths and weaknesses. In the first half hour, Conant would report on Campbell's revenue, expenses, and earnings the previous quarter. In the second half hour, the executives would answer questions posed by analysts, who would probe for clues about the company's performance.

At Campbell Soup and all public companies, the stakes are high for earnings calls. How analysts react—did the CEO's comments leave them bullish or bearish about the company's prospects?—can send a stock soaring or sinking. "You have to thread the needle," Conant told me. "You have to be responsible and unbiased, and report the facts. But you also have a chance to champion the company

and set the record straight." Conant says his goal was always to "take uncertainty out of an uncertain marketplace. For me, these calls introduced a sense of rhythmic certainty into my relationships with investors."

CEOs are human beings, of course, and therefore presumably subject to the same daily changes in mood as the rest of us. But CEOs are also a stalwart lot. They're tough-minded and strategic. They know that millions of dollars ride on every syllable they utter in these calls, so they arrive at these encounters poised and prepared. Surely it couldn't make any difference—to the CEO's performance or the company's fortunes—*when* these calls occur?

Three American business school professors decided to find out. In a first-of-its-kind study, they analyzed more than 26,000 earnings calls from more than 2,100 public companies over six and a half years using linguistic algorithms similar to the ones employed in the Twitter study. They examined whether the time of day influenced the emotional tenor of these critical conversations—and, as a consequence, perhaps even the price of the company's stock.

Calls held first thing in the morning turned out to be reasonably upbeat and positive. But as the day progressed, the "tone grew more negative and less resolute." Around lunchtime, mood rebounded slightly, probably because call participants recharged their mental and emotional batteries, the professors conjectured. But in the afternoon, negativity deepened again, with mood recovering only after the market's closing bell. Moreover, this pattern held "even after controlling for factors such as industry norms, financial distress, growth opportunities, and the news that companies were reporting."[8] In other words, even when the researchers factored in economic news (a slowdown in China that hindered a company's exports) or firm fundamentals (a company that reported abysmal quarterly earnings), afternoon calls "were more negative, irritable, and combative" than morning calls.[9]

Perhaps more important, especially for investors, the time of the call and the subsequent mood it engendered influenced companies' stock prices. Shares declined in response to negative tone—again, even after adjusting for actual good news or bad news—"leading to temporary stock mispricing for firms hosting earnings calls later in the day."

While the share prices eventually righted themselves, these results are remarkable. As the researchers note, "call participants represent the near embodiment of the idealized *homo economicus*." Both the analysts and the executives know the stakes. It's not merely the people on the call who are listening. It's the entire market. The wrong word, a clumsy answer, or an unconvincing response can send a stock's price spiraling downward, imperiling the company's prospects and the executives' paychecks. These hardheaded businesspeople have every incentive to act rationally, and I'm sure they believe they do. But economic rationality is no match for a biological clock forged during a few million years of evolution. Even "sophisticated economic agents acting in real and highly incentivized settings are influenced by diurnal rhythms in the performance of their professional duties."[10]

These findings have wide implications, say the researchers. The results "are indicative of a much more pervasive phenomenon of diurnal rhythms influencing corporate communications, decision-making and performance across all employee ranks and business enterprises throughout the economy." So stark were the results that the authors do something rare in academic papers: They offer specific, practical advice.

"[A]n important takeaway from our study for corporate executives is that communications with investors, and probably other critical managerial decisions and negotiations, should be conducted earlier in the day."[11]

Should the rest of us heed this counsel? (Campbell, as it happens, typically held its earnings calls in the morning.) Our moods cycle in

a regular pattern—and, almost invisibly, that affects how corporate executives do their job. So should those of us who haven't ascended to the C-suite also frontload our days and tackle our important work in the morning?

The answer is yes. And no.

VIGILANCE, INHIBITION, AND THE DAILY SECRET TO HIGH PERFORMANCE

Meet Linda. She's thirty-one years old, single, outspoken, and very bright. In college, Linda majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and participated in antinuclear demonstrations.

Before I tell you more about Linda, let me ask you a question about her. Which is more likely?

a. Linda is a bank teller.
b. Linda is a bank teller and is active in the feminist movement.

Faced with this question, most people answer (b). It makes intuitive sense, right? A justice-seeking, antinuke philosophy major? That sure sounds like someone who would be an active feminist. But (a) is—and must be—the correct response. The answer isn't a matter of fact. Linda isn't real. Nor is it a matter of opinion. It's entirely a matter of logic. Bank tellers who are also feminists—just like bank tellers who yodel or despise cilantro—are *a subset* of all bank tellers, and subsets can never be larger than the full set they're a part of.* In 1983

* We can also explain this with some simple math. Suppose there's a 2 percent chance (.02) that Linda is a bank teller. If there's even a whopping 99 percent chance (.99) that she's a feminist, the probability of her being both a bank teller and a feminist is .0198 (.02 x .99)—which is less than 2 percent.

Daniel Kahneman, he of Nobel Prize and DRM fame, and his late collaborator, Amos Tversky, introduced the Linda problem to illustrate what's called the "conjunction fallacy," one of the many ways our reasoning goes awry.[12]

When researchers have posed the Linda problem at different times of day—for instance, at 9 a.m. and 8 p.m. in one well-known experiment—timing often predicted whether participants arrived at the correct answer or slipped on a cognitive banana peel. People were much more likely to get it right earlier in the day than later. There was one intriguing and important exception to the findings (which I'll discuss soon). But as with executives on earnings calls, performance was generally strong in the beginning of the day, then worsened as the hours ticked by.[13]

The same pattern held for stereotypes. Researchers asked other participants to assess the guilt of a fictitious criminal defendant. All the "jurors" read the same set of facts. But for half of them, the defendant's name was Robert Garner, and for the other half, it was Roberto Garcia. When people made their decisions in the morning, there was no difference in guilty verdicts between the two defendants. However, when they rendered their verdicts later in the day, they were much more likely to believe that Garcia was guilty and Garner was innocent. For this group of participants, mental keenness, as shown by rationally evaluating evidence, was greater early in the day. And mental squishiness, as evidenced by resorting to stereotypes, increased as the day wore on.[14]

Scientists began measuring the effect of time of day on brainpower more than a century ago, when pioneering German psychologist Hermann Ebbinghaus conducted experiments showing that people learned and remembered strings of nonsense syllables more effectively in the morning than at night. Since then, researchers have continued that investigation for a range of mental pursuits—and they've drawn three key conclusions.

First, our cognitive abilities do not remain static over the course of a day. During the sixteen or so hours we're awake, they change—often in a regular, foreseeable manner. We are smarter, faster, dimmer, slower, more creative, and less creative in some parts of the day than others.

Second, these daily fluctuations are more extreme than we realize. "[T]he performance change between the daily high point and the daily low point can be equivalent to the effect on performance of drinking the legal limit of alcohol," according to Russell Foster, a neuroscientist and chronobiologist at the University of Oxford.[15] Other research has shown that time-of-day effects can explain 20 percent of the variance in human performance on cognitive undertakings.[16]

Third, how we do depends on what we're doing. "Perhaps the main conclusion to be drawn from studies on the effects of time of day on performance," says British psychologist Simon Folkard, "is that the best time to perform a particular task depends on the nature of that task."

The Linda problem is an analytic task. It's tricky, to be sure. But it doesn't require any special creativity or acumen. It has a single correct answer—and you can reach it via logic. Ample evidence has shown that adults perform best on this sort of thinking during the mornings. When we wake up, our body temperature slowly rises. That rising temperature gradually boosts our energy level and alertness—and that, in turn, enhances our executive functioning, our ability to concentrate, and our powers of deduction. For most of us, those sharp-minded analytic capacities peak in the late morning or around noon.[17]

One reason is that early in the day our minds are more vigilant. In the Linda problem, the politically tinged material about Linda's college experiences is a distraction. It has no relevance in resolving the question itself. When our minds are in vigilant mode, as they

tend to be in the mornings, we can keep such distractions outside our cerebral gates.

But vigilance has its limits. After standing watch hour after hour without a break, our mental guards grow tired. They sneak out back for a smoke or a pee break. And when they're gone, interlopers—sloppy logic, dangerous stereotypes, irrelevant information—slip by. Alertness and energy levels, which climb in the morning and reach their apex around noon, tend to plummet during the afternoons.[18] And with that drop comes a corresponding fall in our ability to remain focused and constrain our inhibitions. Our powers of analysis, like leaves on certain plants, close up.

The effects can be significant but are often beneath our comprehension. For instance, students in Denmark, like students everywhere, endure a battery of yearly standardized tests to measure what they're learning and how schools are performing. Danish children take these tests on computers. But because every school has fewer personal computers than students, pupils can't all take the test at the same time. Consequently, the timing of the test depends on the vagaries of class schedules and the availability of desktop machines. Some students take these tests in the morning, others later in the day.

When Harvard's Francesca Gino and two Danish researchers looked at four years of test results for two million Danish schoolchildren and matched the scores to the time of day the students took the test, they found an interesting, if disturbing, correlation. Students scored higher in the mornings than in the afternoons. Indeed, for every hour later in the day the tests were administered, scores fell a little more. The effects of later-in-the-day testing were similar to having parents with slightly lower incomes or less education—or missing two weeks of a school year.[19] Timing wasn't everything. But it was a big thing.

The same appears to be true in the United States. Nolan Pope, an economist at the University of Chicago, looked at standardized test scores and classroom grades for nearly two million students in Los Angeles. Regardless of what time school actually started, "having math in the first two periods of the school day instead of the last two periods increases the math GPA of students" as well as their scores on California's statewide tests. While Pope says it isn't clear exactly why this is happening, "the results tend to show that students are more productive earlier in the school day, especially in math" and that schools could boost learning "with a simple rearrangement of when tasks are performed."[20]

But before you go rearranging your own work schedules to cram all the important stuff before lunchtime, beware. All brainwork is not the same. To illustrate that, here's another pop quiz.

Ernesto is a dealer in antique coins. One day someone brings him a beautiful bronze coin. The coin has an emperor's head on one side and the date 544 BC stamped on the other. Ernesto examines the coin—but instead of buying it, he calls the police. Why?

This is what social scientists call an "insight problem." Reasoning in a methodical, algorithmic way won't yield a correct answer. With insight problems, people typically begin with that systematic, step-by-step approach. But they eventually hit a wall. Some throw up their hands and quit, convinced they can neither scale the wall nor bust through it. But others, stymied and frustrated, eventually experience what's called a "flash of illuminance"—*aha!*—that helps them see the facts in a fresh light. They recategorize the problem and quickly discover the solution.

(Still baffled by the coin puzzle? The answer will make you slap your head. The date on the coin is 544 BC, or 544 years before Christ. That designation couldn't have been used then because Christ hadn't

been born—and, of course, nobody knew that he would be born half a millennium later. The coin is obviously a fraud.)

Two American psychologists, Mareike Wieth and Rose Zacks, presented this and other insight problems to a group of people who said they did their best thinking in the morning. The researchers tested half the group between 8:30 a.m. and 9:30 a.m. and the other half between 4:30 p.m. and 5:30 p.m. These morning thinkers were more likely to figure out the coin problem . . . in the afternoon. "Participants who solved insight problems during their non-optimal time of day . . . were more successful than participants at their optimal time of day," Wieth and Zacks found.[21]

What's going on?

The answer goes back to those sentries guarding our cognitive castle. For most of us, mornings are when those guards are on alert, ready to repel any invaders. Such vigilance—often called "inhibitory control"—helps our brains to solve analytic problems by keeping out distractions.[22] But insight problems are different. They require *less* vigilance and *fewer* inhibitions. That "flash of illuminance" is more likely to occur when the guards are gone. At those looser moments, a few distractions can help us spot connections we might have missed when our filters were tighter. For analytic problems, lack of inhibitory control is a bug. For insight problems, it's a feature.

Some have called this phenomenon the "inspiration paradox"—the idea that "innovation and creativity are greatest when we are not at our best, at least with respect to our circadian rhythms."[23] And just as the studies of school performance in Denmark and Los Angeles suggest that students would fare better taking analytic subjects such as math in the morning, Wieth and Zacks say their work "suggests that students designing their class schedules might perform best in classes such as art and creative writing during their non-optimal compared to optimal time of day."[24]

In short, our moods and performance oscillate during the day. For

most of us, mood follows a common pattern: a peak, a trough, and a rebound. And that helps shape a dual pattern of performance. In the mornings, during the peak, most of us excel at Linda problems—analytic work that requires sharpness, vigilance, and focus. Later in the day, during the recovery, most of us do better on coin problems—insight work that requires less inhibition and resolve. (Midday troughs are good for very little, as I'll explain in the next chapter.) We are like mobile versions of de Mairan's plant. Our capacities open and close according to a clock we don't control.

But you might have detected a slight hedge in my conclusion. Notice I said "most of us." There is an exception to the broad pattern, especially in performance, and it's an important one.

Imagine yourself standing alongside three people you know. One of you four is probably a different kind of organism with a different kind of clock.

LARKS, OWLS, AND THIRD BIRDS

In the hours before dawn one day in 1879, Thomas Alva Edison sat in his laboratory in Menlo Park, New Jersey, pondering a problem. He had figured out the basic principles of an electric lightbulb, but he still hadn't found a substance that worked as a low-cost, long-lasting filament. Alone in the lab (his more sensible colleagues were home asleep), he absentmindedly picked up a pinch of a sooty, carbon-based substance known as lampblack that had been left out for another experiment, and he began rolling it between his thumb and forefinger—the nineteenth-century equivalent of squeezing a stress ball or trying to one-hop paper clips into a bowl.

Then Edison had—sorry to do this, folks—a lightbulb moment.

The thin thread of carbon that was emerging from his mindless finger rolling might work as a filament. He tested it. It burned

bright and long, solving the problem. And now I'm writing this sentence, and perhaps you're reading it, in a room that might be dark but for the illumination of Edison's invention.

Thomas Edison was a night owl who enabled other night owls. "He was more likely to be found hard at it in his laboratory at midnight than at midday," one early biographer wrote.[25]

Human beings don't all experience a day in precisely the same way. Each of us has a "chronotype"—a personal pattern of circadian rhythms that influences our physiology and psychology. The Edisons among us are late chronotypes. They wake long after sunrise, detest mornings, and don't begin peaking until late afternoon or early evening. Others of us are early chronotypes. They rise easily and feel energized during the day but wear out by evening. Some of us are owls; others of us are larks.

You might have heard the larks and owls terminology before. It offers a convenient shorthand for describing chronotypes, two simple avian categories into which we can group the personalities and proclivities of our featherless species. But the reality of chronotypes, as is often the case with reality, is more nuanced.

The first systematic effort to measure differences in humans' internal clocks came in 1976 when two scientists, one Swedish, the other British, published a nineteen-question chronotype assessment. Several years later, two chronobiologists, American Martha Merrow and German Till Roenneberg, developed what became an even more widely used assessment, the Munich Chronotype Questionnaire (MCTQ), which distinguishes between people's sleep patterns on "work days" (when we usually must be awake by a certain hour) and "free days" (when we can awaken when we choose). People respond to questions and then receive a numerical score. For example, when I took the MCTQ, I landed in the most common category—a "slightly early type."

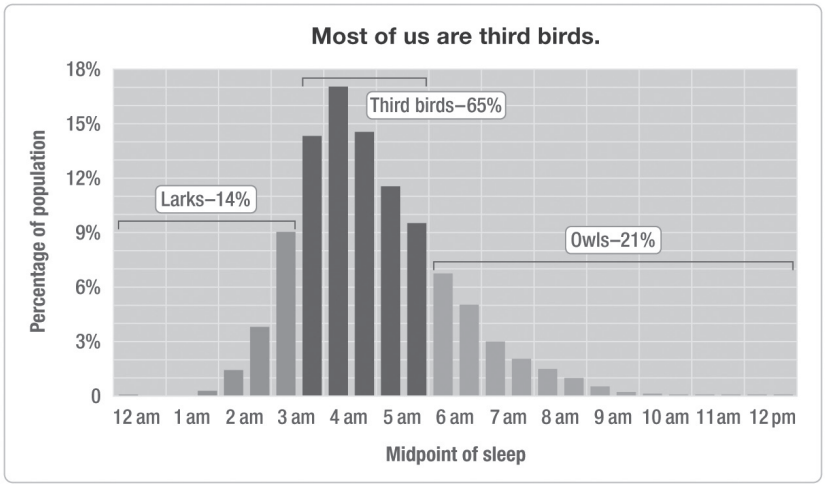
However, Roenneberg, the world's best-known chronobiologist,

has offered an even easier way to determine one's chronotype. In fact, you can do it right now.

Please think about your behavior during "free days"—days when you're not required to awaken at a specific time. Now answer these three questions:

1. What time do you usually go to sleep?
2. What time do you usually wake up?
3. What is the middle of those two times—that is, what is your midpoint of sleep? (For instance, if you typically fall asleep around 11:30 p.m. and wake up at 7:30 a.m., your midpoint is 3:30 a.m.)

Now find your position on the following chart, which I've repurposed from Roenneberg's research.



Chances are, you were neither a complete lark nor an utter owl, but somewhere in the middle—what I call a "third bird."* Roenne-

* Here's an even simpler method. What time do you wake up on weekends (or free days)? If it's the same as weekdays, you're probably a lark. If it's a little later, you're probably a third bird. If it's much later—ninety minutes or more—you're probably an owl.

berg and others have found that "[s]leep and wake times show a near-Gaussian (normal) distribution in a given population."[26] That is, if you plot people's chronotypes on a graph, the result looks like a bell curve. The one difference, as you can see from the chart, is that extreme owls outnumber extreme larks; owls have, statistically if not physiologically, a longer tail. But most people are neither larks nor owls. According to research over several decades and across different continents, between about 60 percent and 80 percent of us are third birds.[27] "It's like feet," Roenneberg says. "Some people are born with big feet and some with small feet, but most people are somewhere in the middle."[28]

Chronotypes are like feet in another way, too. There's not much we can do about their size or shape. Genetics explains at least half the variability in chronotype, suggesting that larks and owls are born, not made.[29] In fact, the when of one's birth plays a surprisingly powerful role. People born in the fall and winter are more likely to be larks; people born in the spring and summer are more likely to be owls.[30]

After genetics, the most important factor in one's chronotype is age. As parents know and lament, young children are generally larks. They wake up early, buzz around throughout the day, but don't last very long beyond the early evening. Around puberty, those larks begin morphing into owls. They wake up later—at least on free days—gain energy during the late afternoon and evening, and fall asleep well after their parents. By some estimates, teenagers' midpoint of sleep is 6 a.m. or even 7 a.m., not exactly in synch with most high school start times. They reach their peak owliness around age twenty, then slowly return to larkiness over the rest of their lives.[31] The chronotypes of men and women also differ, especially in the first halves of their lives. Men tend toward eveningness, women toward morningness. However, those sex differences begin to disappear around the age of fifty. And as Roenneberg notes, "People over 60 years of

age, on average, become even earlier chronotypes than they were as children."[32]

In brief, high school– and college-aged people are disproportionately owls, just as people over sixty and under twelve are disproportionately larks. Men are generally owlier than women. Yet, regardless of age or gender, most people are neither strong larks nor strong owls but are middle-of-the-nest third birds. Still, around 20 to 25 percent of the population are solid evening types—and they display both a personality and a set of behaviors that we must reckon with to understand the hidden pattern of a day.

Let's begin with personality, including what social scientists call the "Big Five" traits—openness, conscientiousness, extraversion, agreeableness, and neuroticism. Much of the research shows morning people to be pleasant, productive folks—"introverted, conscientious, agreeable, persistent, and emotionally stable" women and men who take initiative, suppress ugly impulses, and plan for the future.[33] Morning types also tend to be high in positive affect—that is, many are as happy as larks.[34]

Owls, meanwhile, display some darker tendencies. They're more open and extroverted than larks. But they're also more neurotic—and are often impulsive, sensation-seeking, live-for-the-moment hedonists.[35] They're more likely than larks to use nicotine, alcohol, and caffeine—not to mention marijuana, ecstasy, and cocaine.[36] They're also more prone to addiction, eating disorders, diabetes, depression, and infidelity.[37] No wonder they don't show their faces during the day. And no wonder bosses consider employees who come in early as dedicated and competent and give late starters lower performance ratings.[38] Benjamin Franklin had it right: Early to bed and early to rise makes a person healthy, wealthy, and wise.

Well, not exactly. When scholars have tested Franklin's "gnomic wisdom," they found no "justification for early risers to affect moral

superiority."[39] Those nefarious owls actually tend to display greater creativity, show superior working memory, and post higher scores on intelligence tests such as the GMAT.[40] They even have a better sense of humor.[41]

The problem is that our corporate, government, and education cultures are configured for the 75 or 80 percent of people who are larks or third birds. Owls are like left-handers in a right-handed world—forced to use scissors and writing desks and catcher's mitts designed for others. How they respond is the final piece of the puzzle in divining the rhythms of the day.

SYNCHRONY AND THE THREE-STAGE DAY

Let's return to the Linda problem. Basic logic holds that Linda is less likely to be *both* a bank teller *and* a feminist than she is to be only a bank teller. Most people solve Linda problems more readily at 8 a.m. than at 8 p.m. But some people showed the *reverse* tendency. They were more likely to avoid the conjunction fallacy and produce the correct answer at 8 p.m. than at 8 a.m. Who were these oddballs? Owls—people with evening chronotypes. It was the same when owls served as jurors in that mock trial. While morning and intermediate types resorted to stereotypes—declaring Garcia guilty and Garner innocent using identical facts—*later* in the day, owls displayed the opposite tendency. They resorted to stereotypes *early* in the day but became more vigilant, fair, and logical as the hours passed.[42]

The ability to solve insight problems, like figuring out that a coin dated 544 BC must be fraudulent, also came with an exception. Larks and third birds had their flashes of illuminance later in the day, during their less optimal recovery stage when their inhibitions

had fallen. But Edison-like owls spotted the fraud more readily in the early mornings, *their* less optimal time.[43]

What ultimately matters, then, is that type, task, and time align—what social scientists call "the synchrony effect."[44] For instance, even though it's obviously more dangerous to drive at night, owls actually drive worse early in the day because mornings are out of synch with their natural cycle of vigilance and alertness.[45] Younger people typically have keener memories than older folks. But many of these age-based cognitive differences weaken, and sometimes disappear, when synchrony is taken into account. In fact, some research has shown that for memory tasks older adults use the same regions of the brain as younger adults do when operating in the morning but different (and less effective) regions later in the day.[46]

Synchrony even affects our ethical behavior. In 2014 two scholars identified what they dubbed the "morning morality effect," which showed that people are less likely to lie and cheat on tasks in the morning than they are later in the day. But subsequent research found that one explanation for the effect is simply that most people are morning or intermediate chronotypes. Factor in owliness and the effect is more nuanced. Yes, early risers display the morning morality effect. But night owls are more ethical at night than in the morning. "[T]he fit between a person's chronotype and the time of day offers a more complete predictor of that person's ethicality than does time of day alone," these scholars write.[47]

In short, all of us experience the day in three stages—a peak, a trough, and a rebound. And about three-quarters of us (larks and third birds) experience it in that order. But about one in four people, those whose genes or age make them night owls, experience the day in something closer to the reverse order—recovery, trough, peak.

To probe this idea, I asked my colleague, researcher Cameron French, to analyze the daily rhythms of a collection of artists, writers,

and inventors. His source material was a remarkable book, edited by Mason Currey, titled *Daily Rituals: How Artists Work* that chronicles the everyday patterns of work and rest of 161 creators, from Jane Austen to Jackson Pollock to Anthony Trollope to Toni Morrison. French read their daily work schedules and coded each element as either heads-down work, no work at all, or less intense work—something close to the pattern of peak, trough, and recovery.

For instance, composer Pyotr Ilich Tchaikovsky would typically awaken between 7 a.m. and 8 a.m., and then read, drink tea, and take a walk. At 9:30, he went to his piano to compose for a few hours. Then he broke for lunch and another stroll during the afternoon. (He believed walks, sometimes two hours long, were essential for creativity.) At 5 p.m., he settled back in for a few more hours of work before eating supper at 8 p.m. One hundred fifty years later, writer Joyce Carol Oates operates on a similar rhythm. She "generally writes from 8:00 or 8:30 in the morning until about 1:00 p.m. Then she eats lunch and allows herself an afternoon break before resuming work from 4:00 p.m. until dinner around 7:00."[48] Both Tchaikovsky and Oates are peak-trough-rebound kinds of people.

Other creators marched to a different diurnal drummer. Novelist Gustave Flaubert, who lived much of his adult life in his mother's house, would typically not awaken until 10 a.m., after which he'd spend an hour bathing, primping, and puffing his pipe. Around 11, "he would join the family in the dining room for a late-morning meal that served as both his breakfast and lunch." He would then tutor his niece for a while and devote most of the afternoon to resting and reading. At 7 p.m. he would have dinner, and afterward, "he sat and talked with his mother" until she went to bed around 9 p.m. And then he did his writing. Night owl Flaubert's day moved in an opposite direction—from recovery to trough to peak.[49]

After coding these creators' daily schedules and tabulating who

did what when, French found what we now realize is a predictable distribution. About 62 percent of the creators followed the peak-trough-recovery pattern, where serious heads-down work happened in the morning followed by not much work at all, and then a shorter burst of less taxing work. About 20 percent of the sample displayed the reverse pattern—recovering in the mornings and getting down to business much later in the day à la Flaubert. And about 18 percent were more idiosyncratic or lacked sufficient data and therefore displayed neither pattern. Separate out that third group and the chronotype ratio holds. For every three peak-trough-rebound patterns, there is one rebound-trough-peak pattern.

So what does this mean for you?

At the end of this chapter is the first of six Time Hacker's Handbooks, which offer tactics, habits, and routines for applying the science of timing to your daily life. But the essence is straightforward. Figure out your type, understand your task, and then select the appropriate time. Is your own hidden daily pattern peak-trough-rebound? Or is it rebound-trough-peak? Then look for synchrony. If you have even modest control over your schedule, try to nudge your most important work, which usually requires vigilance and clear thinking, into the peak and push your second-most important work, or tasks that benefit from disinhibition, into the rebound period. Whatever you do, do not let mundane tasks creep into your peak period.

If you're a boss, understand these two patterns and allow people to protect their peak. For example, Till Roenneberg conducted experiments at a German auto plant and steel factory in which he rearranged work schedules to match people's chronotypes to their work schedules. The results: greater productivity, reduced stress, and higher job satisfaction.[50] If you're an educator, know that all times are not created equal: Think hard about which classes and types of

work you schedule in the morning and which you schedule later in the day.

Equally important, no matter whether you spend your days making cars or teaching children, beware of that middle period. The trough, as we're about to learn, is more dangerous than most of us realize.