Twitter Thread by ■■■s■ ■■■■■■

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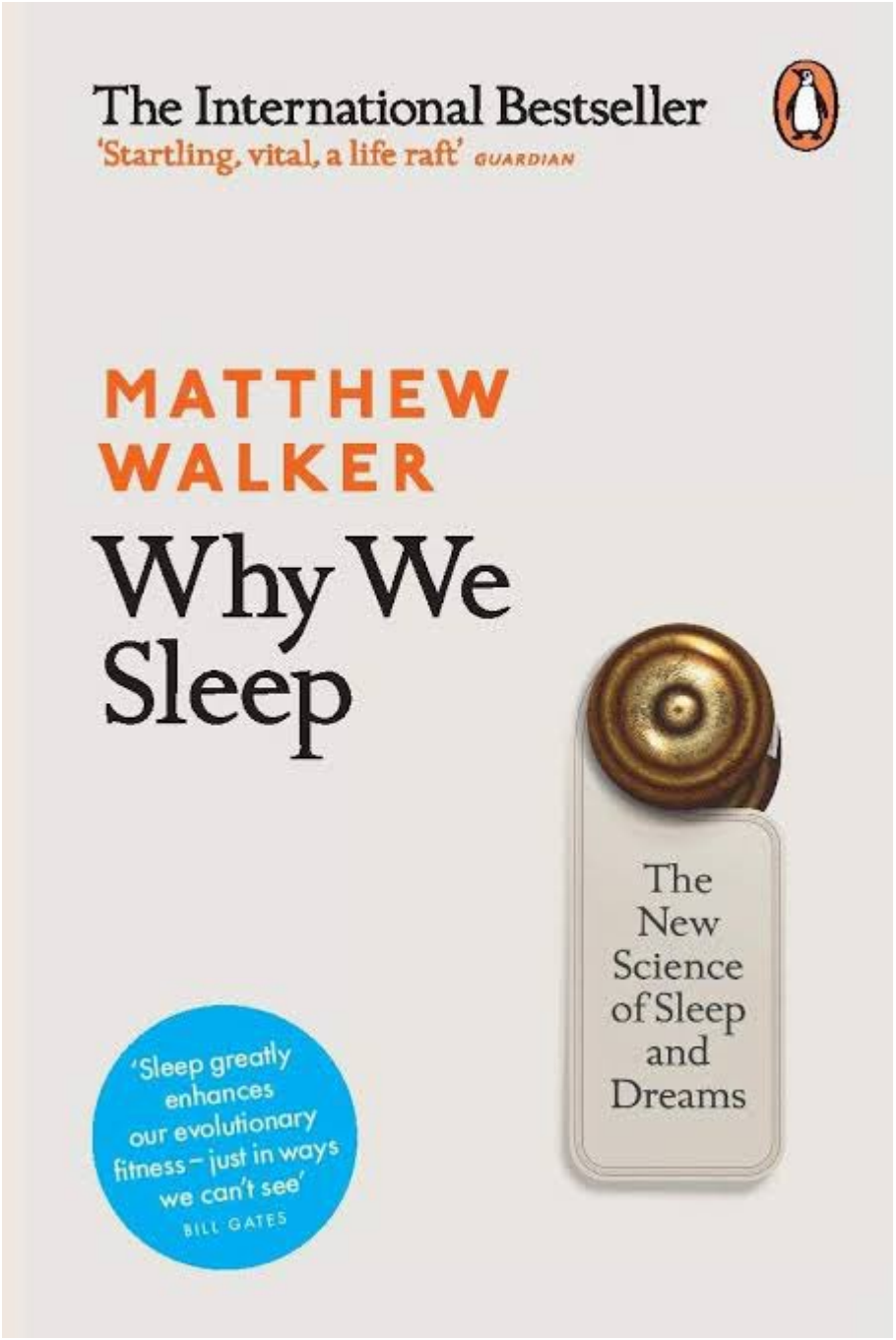
A thread on the snippets (paragraphs & quotes) from the book ‘Why We Sleep’ by Matthew Walker ■

One third of our lives, better read about it.

This thread will be updated as I read further & further.



1/ “Two-thirds of adults throughout all developed nations fail to obtain the recommended eight hours of nightly sleep.”

Imagine if you don’t have that rare ‘short sleep’ genes ■ that allows you to do will less than 5 hours of sleep ■.

2/ It’s going to get ugly.

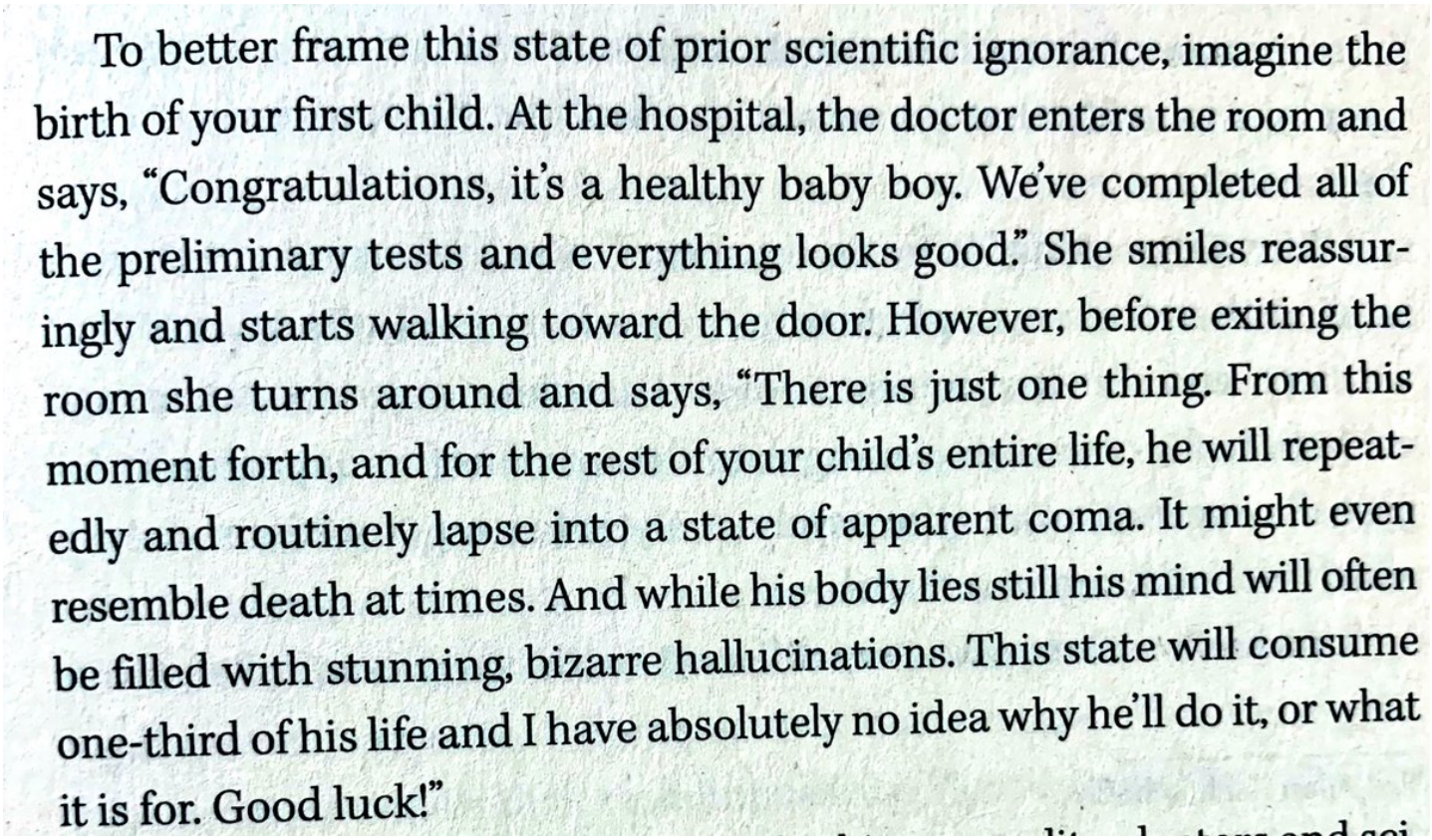
I doubt you are surprised by this fact, but you may be surprised by the consequences. Routinely sleeping less than six or seven hours a night demolishes your immune system, more than doubling your risk of cancer. Insufficient sleep is a key lifestyle factor determining whether or not you will develop Alzheimer's disease. Inadequate sleep—even moderate reductions for just one week—disrupts blood sugar levels so profoundly that you would be classified as pre-diabetic. Short sleeping increases the likelihood of your coronary arteries becoming blocked and brittle, setting you on a path toward cardiovascular disease, stroke, and congestive heart failure. Fitting Charlotte Brontë's prophetic wisdom that "a ruffled mind makes a restless pillow," sleep disruption further contributes to all major psychiatric conditions, including depression, anxiety, and suicidality.

Perhaps you have also noticed a desire to eat more when you're tired? This is no coincidence. Too little sleep swells concentrations of a hormone that makes you feel hungry while suppressing a companion hormone that otherwise signals food satisfaction. Despite

3/ Pandemic.

state of sleep neglect: human and financial alike. So much so that the World Health Organization (WHO) has now declared a sleep loss epidemic throughout industrialized nations.* It is no coincidence that countries where sleep time has declined most dramatically over the past century, such as the US, the UK, Japan, and South Korea, and several in western Europe, are also those suffering the greatest increase in rates of the aforementioned physical diseases and mental disorders.

4/ Why to learn about sleep.



To better frame this state of prior scientific ignorance, imagine the birth of your first child. At the hospital, the doctor enters the room and says, "Congratulations, it's a healthy baby boy. We've completed all of the preliminary tests and everything looks good." She smiles reassuringly and starts walking toward the door. However, before exiting the room she turns around and says, "There is just one thing. From this moment forth, and for the rest of your child's entire life, he will repeatedly and routinely lapse into a state of apparent coma. It might even resemble death at times. And while his body lies still his mind will often be filled with stunning, bizarre hallucinations. This state will consume one-third of his life and I have absolutely no idea why he'll do it, or what it is for. Good luck!"

5/ 'Are there any biological functions that do not benefit by a good night's sleep? so far, the results of thousands of studies insist that no, there aren't.'

Nature, the most magnificent architect.

6/ Morning Larks & Night Owls ■

MY RHYTHM IS NOT YOUR RHYTHM

Although every human being displays an unyielding twenty-four-hour pattern, the respective peak and trough points are strikingly different from one individual to the next. For some people, their peak of wakefulness arrives early in the day, and their sleepiness trough arrives early at night. These are "morning types," and make up about 40 percent of the populace. They prefer to wake at or around dawn, are happy to do so, and function optimally at this time of day. Others are "evening types," and account for approximately 30 percent of the population. They naturally prefer going to bed late and subsequently wake up late the following morning, or even in the afternoon. The remaining 30 percent of people lie somewhere in between morning and evening types, with a slight leaning toward eveningness, like myself.

You may colloquially know these two types of people as "morning larks" and "night owls," respectively. Unlike morning larks, night owls are frequently incapable of falling asleep early at night, no matter how hard they try. It is only in the early-morning hours that owls can drift

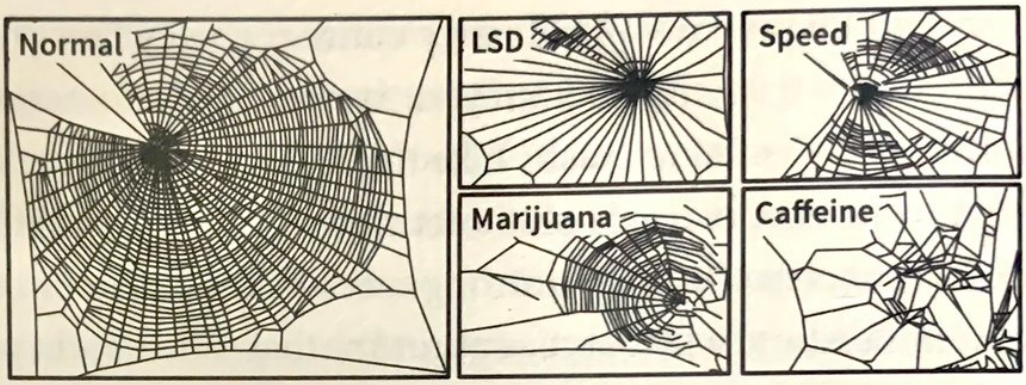
7/ The evolutionary reason for ‘6/‘

You may be wondering why Mother Nature would program this variability across people. As a social species, should we not all be synchronized and therefore awake at the same time to promote maximal human interactions? Perhaps not. As we'll discover later in this book, humans likely evolved to co-sleep as families or even whole tribes, not alone or as couples. Appreciating this evolutionary context, the benefits of such genetically programmed variation in sleep/wake timing preferences can be understood. The night owls in the group would not be going to sleep until one or two a.m., and not waking until nine or ten a.m. The morning larks, on the other hand, would have retired for the night at nine p.m. and woken at five a.m. Consequently, the group as a whole is only collectively vulnerable (i.e., every person asleep) for just four rather than eight hours, despite everyone still getting the chance for eight hours of sleep. That's potentially a 50 percent increase in survival fitness. Mother Nature would never pass on a biological trait—here, the useful variability in when individuals within a collective tribe go to sleep and wake up—that could enhance the survival safety and thus fitness of a species by this amount. And so she hasn't.

8/ The most widely used (& abused) psychoactive stimulant in the ■

To impress upon you the effects of caffeine, I footnote esoteric research conducted in the 1980s by NASA. Their scientists exposed spiders to different drugs and then observed the webs that they constructed.* Those drugs included LSD, speed (amphetamine), marijuana, and caffeine. The results, which speak for themselves, can be observed in figure 3. The researchers noted how strikingly incapable the spiders were in constructing anything resembling a normal or logical web that would be of any functional use when given caffeine, even relative to other potent drugs tested.

Figure 3: Effects of Various Drugs on Spider Web Building



It is worth pointing out that caffeine is a stimulant drug. Caffeine is also the only addictive substance that we readily give to our children and teens—the consequences of which we will return to later in the book.

9/ Are you in a state of chronic sleep deprivation?

Setting aside the extreme case of sleep deprivation, how do you know whether you're routinely getting enough sleep? While a clinical sleep assessment is needed to thoroughly address this issue, an easy rule of thumb is to answer two simple questions. First, after waking up in the morning, could you fall back asleep at ten or eleven a.m.? If the answer is "yes," you are likely not getting sufficient sleep quantity and/or quality. Second, can you function optimally without caffeine before noon? If the answer is "no," then you are most likely self-medicating your state of chronic sleep deprivation.

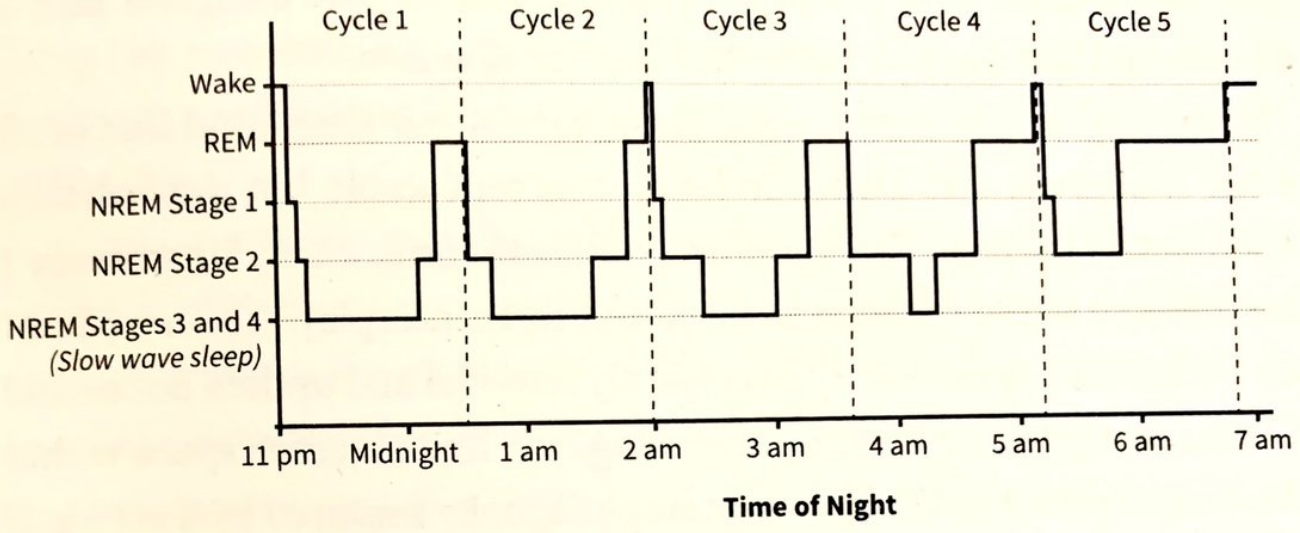
Both of these signs you should take seriously and seek to address

10/ The sleep cycle, each is 90 mins.

REM sleep aka Rapid Eye Movement sleep aka Dream sleep.

On the vertical axis are the different brain states, with Wake at the top, then REM sleep, and then the descending stages of NREM sleep, stages 1 to 4. On the horizontal axis is time of night, starting on the left at about eleven p.m. through until seven a.m. on the right. The technical name for this graphic is a hypnogram (a sleep graph).

Figure 8: The Architecture of Sleep



11/ Which came first? Sleep ■ or wakefulness ■

Many of the explanations for why we sleep circle around a common, and perhaps erroneous, idea: sleep is the state we must enter in order to fix that which has been upset by wake. But what if we turned this argument on its head? What if sleep is so useful—so physiologically beneficial to every aspect of our being—that the real question is: Why did life ever bother to wake up? Considering how biologically damaging the state of wakefulness can often be, that is the true evolutionary puzzle here, not sleep. Adopt this perspective, and we can pose a very different theory: sleep was the first state of life on this planet, and it was from sleep that wakefulness emerged. It may be a preposterous hypothesis, and one that nobody is taking seriously or exploring, but personally I do not think it to be entirely unreasonable.

12/ Which type of sleep- NREM or REM sleep is more important?

There are many ways you can define "importance" or "need," and thus numerous ways of answering the question. But perhaps the simplest recipe is to take an organism that has both sleep types, bird or mammal, and keep it awake all night and throughout the subsequent day. NREM and REM sleep are thus similarly removed, creating the conditions of equivalent hunger for each sleep stage. The question is, which type of sleep will the brain feast on when you offer it the chance to consume both during a recovery night? NREM *and* REM sleep in equal proportions? Or more of one than the other, suggesting greater importance of the sleep stage that dominates?

This experiment has now been performed many times on numerous species of birds and mammals, humans included. There are two clear outcomes. First, and of little surprise, sleep duration is far longer on the recovery night (ten or even twelve hours in humans) than during a standard night without prior deprivation (eight hours for us). Responding to the debt, we are essentially trying to "sleep it off," the technical term for which is a sleep rebound.

Second, NREM sleep rebounds harder. The brain will consume a far larger portion of deep NREM sleep than of REM sleep on the first night after total sleep deprivation, expressing a lopsided hunger. Despite both sleep types being on offer at the finger buffet of recovery sleep, the brain opts to heap much more deep NREM sleep onto its plate. In the battle of importance, NREM sleep therefore wins. Or does it?

Not quite. Should you keep recording sleep across a second, third, and even fourth recovery night, there's a reversal. Now REM sleep becomes the primary dish of choice with each returning visit to the recovery buffet table, with a side of NREM sleep added. Both sleep stages are therefore essential. We try to recover one (NREM) a little sooner than the other (REM), but make no mistake, the brain will attempt to recoup both, trying to salvage some of the losses incurred. It is important to note, however, that regardless of the amount of recovery opportunity, the brain

13/ There is a simpsons episode where dolphins ■ take over the world. Why it's possible ■

A third striking difference in sleep across the animal kingdom is the *way* in which we all do it. Here, the diversity is remarkable and, in some cases, almost impossible to believe. Take cetaceans, such as dolphins and whales, for example. Their sleep, of which there is only NREM, can be unihemispheric, meaning they will sleep with half a brain at a time! One half of the brain must always stay awake to maintain life-necessary movement in the aquatic environment. But the other half of the brain will, at times, fall into the most beautiful NREM sleep. Deep, powerful, rhythmic, and slow brainwaves will drench the entirety of one cerebral hemisphere, yet the other half of the cerebrum will be bristling with frenetic, fast brainwave activity, fully awake. This despite the fact that both hemispheres are heavily wired together with thick crisscross fibers, and sit mere millimeters apart, as in human brains.

Of course, both halves of the dolphin brain can be, and frequently are, awake at the very same time, operating in unison. But when it is time for sleep, the two sides of the brain can uncouple and operate independently, one side remaining awake while the other side snoozes away. After this one half of the brain has consumed its fill of sleep, they switch, allowing the previously vigilant half of the brain to enjoy a well-earned period of deep NREM slumber. Even with half of the brain asleep, dolphins can achieve an impressive level of movement and even some vocalized communication.

14/ How do birds sleep during transoceanic migration?

Yet the most incredible feat of deliberate sleep deprivation belongs to that of birds during transoceanic migration. During this climate-driven race across thousands of miles, entire flocks will fly for many more hours than is normal. As a result, they lose much of the stationary opportunity for plentiful sleep. But even here, the brain has found an ingenious way to obtain sleep. In-flight, migrating birds will grab remarkably brief periods of sleep lasting only seconds in duration. These ultra–power naps are just sufficient to avert the ruinous brain and body deficits that would otherwise ensue from prolonged total sleep deprivation. (If you're wondering, humans have no such similar ability.)

15/ Afternoon nap is biologically ingrained.

The practice of biphasic sleep is not cultural in origin, however. It is deeply biological. All humans, irrespective of culture or geographical location, have a genetically hardwired dip in alertness that occurs in the midafternoon hours. Observe any post-lunch meeting around a boardroom table and this fact will become evidently clear. Like puppets whose control strings were let loose, then rapidly pulled taut, heads will start dipping then quickly snap back upright. I'm sure you've experienced this blanket of drowsiness that seems to take hold of you, midafternoon, as though your brain is heading toward an unusually early bedtime.

Both you and the meeting attendees are falling prey to an evolutionarily imprinted lull in wakefulness that favors an afternoon nap, called the post-prandial alertness dip (from the Latin *prandium*, "meal"). This brief descent from high-degree wakefulness to low-level alertness reflects an innate drive to be asleep and napping in the afternoon, and not working. It appears to be a normal part of the daily rhythm of life. Should you ever have to give a presentation at work, for your own sake—and that of the conscious state of your listeners—if you can, avoid the midafternoon slot.

16/ Be kind to teenagers.

ening of the brain, but it appears to be a significant one that paves the way to mature thinking and reasoning ability. Feinberg's study reminds me of a billboard advertisement I once saw from a large insurance firm, which read: "Why do most 16-year-olds drive like they're missing part of their brain? Because they are." It takes deep sleep, and developmental time, to accomplish the neural maturation that plugs this brain "gap" within the frontal lobe. When your children finally reach their mid-twenties and your car insurance premium drops, you can thank sleep for the savings.

17/ The Trillion $ Drug.

AMAZING BREAKTHROUGH!

Scientists have discovered a revolutionary new treatment that makes you live longer. It enhances your memory and makes you more creative. It makes you look more attractive. It keeps you slim and lowers food cravings. It protects you from cancer and dementia. It wards off colds and the flu. It lowers your risk of heart attacks and stroke, not to mention diabetes. You'll even feel happier, less depressed, and less anxious. Are you interested?

While it may sound hyperbolic, nothing about this fictitious advertisement would be inaccurate. If it were for a new drug, many people would be disbelieving. Those who were convinced would pay large sums of money for even the smallest dose. Should clinical trials back up the claims, share prices of the pharmaceutical company that invented the drug would skyrocket.

Of course, the ad is not describing some miracle new tincture or a cure-all wonder drug, but rather the proven benefits of a full night of sleep. The evidence supporting these claims has been documented in more than 17,000 well-scrutinized scientific reports to date. As for the prescription cost, well, there isn't one. It's free. Yet all too often, we shun the nightly invitation to receive our full dose of this all-natural remedy—with terrible consequences.

18/ Macbeth: Act two, scene two (1611)

Shakespeare prophetically states

“Sleep that knits up the raveled sleave of care,
The death of each day’s life, sore labor’s bath,
Balm of hurt minds, great nature’s second course,
Chief nourisher in life’s feast.”

In simpler words:

Sleep that soothes away all our worries. Sleep that puts each day to rest. Sleep that relieves the weary laborer and heals hurt minds. Sleep, the main course in life's feast, and the most nourishing.

19/ Why All-nighters before exams never work.

SLEEP-THE-NIGHT-AFTER LEARNING

The second benefit of sleep for memory comes *after* learning, one that effectively clicks the "save" button on those newly created files. In doing so, sleep protects newly acquired information, affording immunity against forgetting: an operation called consolidation. That sleep sets in motion the process of memory consolidation was recognized long ago, and may be one of the oldest proposed functions of sleep. The first such claim in the written human record appears to be by the prophetic Roman rhetorician Quintilian (AD 35–100), who stated:

> It is a curious fact, of which the reason is not obvious, that the interval of a single night will greatly increase the strength of the memory. . . . Whatever the cause, things which could not be recalled on the spot are easily coordinated the next day, and time itself, which is generally accounted one of the causes of forgetfulness, actually serves to strengthen the memory.*

20/ Practice is not enough to reach perfection.

After my lecture, a distinguished-looking gentleman with a kindly affect, dressed in a tweed suit jacket with a subtle yellow-green hue that I still vividly recall to this day, approached me. It was a brief conversation, but one of the most scientifically important of my life. He thanked me for the presentation, and told me that he was a pianist. He said he was intrigued by my description of sleep as an active brain state, one in which we may review and even strengthen those things we have previously learned. Then came a comment that would leave me reeling, and trigger a major focus of my research for years to come. "As a pianist," he said, "I have an experience that seems far too frequent to be chance. I will be practicing a particular piece, even late into the evening, and I cannot seem to master it. Often, I make the same mistake at the same place in a particular movement. I go to bed frustrated. But when I wake up the next morning and sit back down at the piano, I can just play, perfectly."

"I can just play." The words reverberated in my mind as I tried to compose a response. I told the gentleman that it was a fascinating idea, and it was certainly possible that sleep assisted musicianship and led to error-free performance, but that I knew of no scientific evidence to support the claim. He smiled, seeming unfazed by the absence of empirical affirmation, thanked me again for my lecture, and walked toward the reception hall. I, on the other hand, remained in the auditorium, realizing that this gentleman had just told me something that violated the most repeated and entrusted teaching edict: practice makes perfect. Not so, it seemed. Perhaps it was practice, *with sleep*, that makes perfect?

SLEEP FOR CREATIVITY

A final benefit of sleep for memory is arguably the most remarkable of all: creativity. Sleep provides a nighttime theater in which your brain tests out and builds connections between vast stores of information. This task is accomplished using a bizarre algorithm that is biased toward seeking out the most distant, nonobvious associations, rather like a backward Google search. In ways your waking brain would never attempt, the sleeping brain fuses together disparate sets of knowledge that foster impressive problem-solving abilities. If you ponder the type of conscious experience such outlandish memory blending would produce, you may not be surprised to learn that it happens during the dreaming state—REM sleep. We will fully explore all of the advantages of REM sleep in the later chapter on dreaming. For now, I will simply tell you that such informational alchemy conjured by REM-sleep dreaming has led to some of the greatest feats of transformative thinking in the history of the human race.

22/ Guinness ■ of ■ records.

Struck by the weight of damning scientific evidence, the *Guinness Book of World Records* has stopped recognizing attempts to break the sleep deprivation world record. Recall that *Guinness* deems it acceptable for a man (Felix Baumgartner) to ascend 128,000 feet into the outer reaches of our atmosphere in a hot-air balloon wearing a spacesuit, open the door of his capsule, stand atop a ladder suspended above the planet, and then free-fall back down to Earth at a top speed of 843 mph (1,358 kmh), passing through the sound barrier while creating a sonic boom with just his body. But the risks associated with sleep deprivation are considered to be far, far higher. Unacceptably high, in fact, based on the evidence.

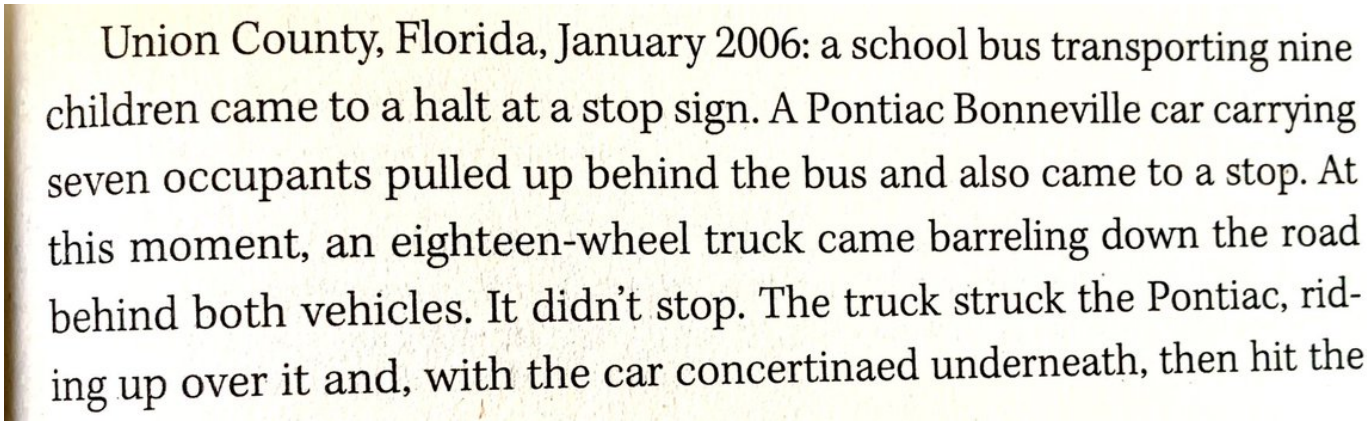
23/ YOU DO NOT KNOW HOW SLEEP-DEPRIVED YOU ARE WHEN YOU ARE SLEEP-DEPRIVED.

The third key finding, common to both of these studies, is the one I personally think is the most harmful of all. When participants were asked about their subjective sense of how impaired they were, they consistently underestimated their degree of performance disability. It was a miserable predictor of how bad their performance actually, objectively was. It is the equivalent of someone at a bar who has had far too many drinks picking up his car keys and confidently telling you, "I'm fine to drive home."

Similarly problematic is baseline resetting. With chronic sleep restriction over months or years, an individual will actually acclimate to their impaired performance, lower alertness, and reduced energy levels. That low-level exhaustion becomes their accepted norm, or baseline. Individuals fail to recognize how their perennial state of sleep deficiency has come to compromise their mental aptitude and physical vitality, including the slow accumulation of ill health. A link between the former and latter is rarely made in their mind. Based on epidemiological studies of average sleep time, millions of individuals unwittingly spend years of their life in a sub-optimal state of psychological and physiological functioning, never maximizing their potential of mind or body due to their blind persistence in sleeping too little. Sixty years of scientific research prevent me from accepting anyone who tells me that he or she can "get by on just four or five hours of sleep a night just fine."

24/ In USA, Vehicles accidents (12 lakhs per year) caused by drowsy driving exceed those caused by alcohol & drugs combined ■

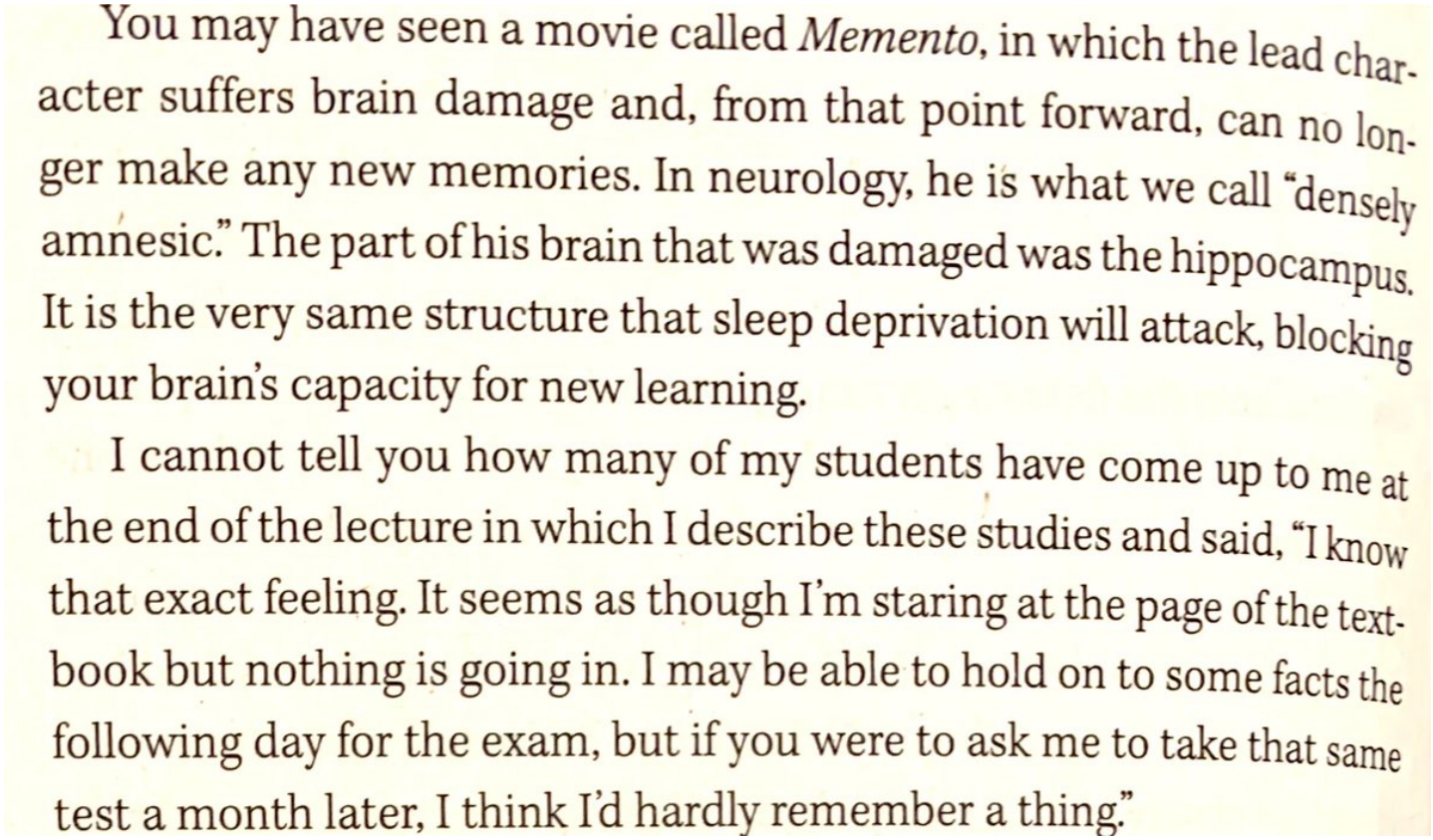
25/ A terrible story that could have been avoided



Union County, Florida, January 2006: a school bus transporting nine children came to a halt at a stop sign. A Pontiac Bonneville car carrying seven occupants pulled up behind the bus and also came to a stop. At this moment, an eighteen-wheel truck came barreling down the road behind both vehicles. It didn't stop. The truck struck the Pontiac, riding up over it and, with the car concertinaed underneath, then hit the

26/ "The recycle rate of a human being is around sixteen hours. After sixteen hours of being awake, the brain begins to fail. Humans need more than seven hours of sleep each night to maintain cognitive performance."

27/ Remember the movie 'Ghajini'



You may have seen a movie called *Memento*, in which the lead character suffers brain damage and, from that point forward, can no longer make any new memories. In neurology, he is what we call "densely amnesic." The part of his brain that was damaged was the hippocampus. It is the very same structure that sleep deprivation will attack, blocking your brain's capacity for new learning.

I cannot tell you how many of my students have come up to me at the end of the lecture in which I describe these studies and said, "I know that exact feeling. It seems as though I'm staring at the page of the textbook but nothing is going in. I may be able to hold on to some facts the following day for the exam, but if you were to ask me to take that same test a month later, I think I'd hardly remember a thing."

28/ A 5x increase in the getting of cardiac arrests.

Unhealthy sleep, unhealthy heart. Simple and true. Take the results of a 2011 study that tracked more than half a million men and women of varied ages, races, and ethnicities across eight different countries. Progressively shorter sleep was associated with a 45 percent increased risk of developing and/or dying from coronary heart disease within seven to twenty-five years from the start of the study. A similar relationship was observed in a Japanese study of over 4,000 male workers. Over a fourteen-year period, those sleeping six hours or less were 400 to 500 percent more likely to suffer one or more cardiac arrests than those sleeping more than six hours. I should note that in many of these studies, the relationship between short sleep and heart failure remains strong even after controlling for other known cardiac risk factors, such as smoking, physical activity, and body mass. A lack of sleep more than accomplishes its own, independent attack on the heart.

29/ Afraid of gaining weight? ■

From a metabolic perspective, the sleep-restricted participants had lost their hunger control. By limiting these individuals to what some in our society would think of as a "sufficient" amount of sleep (five hours a night), Van Cauter had caused a profound imbalance in the scales of hormonal food desire. By muting the chemical message that says "stop eating" (leptin), yet increasing the hormonal voice that shouts "please, keep eating" (ghrelin), your appetite remains unsatisfied when your sleep is anything less than plentiful, even after a kingly meal. As Van Cauter has elegantly described to me, a sleep-deprived body will cry famine in the midst of plenty.

But feeling hungry and actually eating more are not the same thing. Do you actually eat more when sleeping less? Does your waistline really swell as a consequence of that rise in appetite?

With another landmark study, Van Cauter proved this to be the case.

30/ ■ (this leaf, but in green)

Of relevance to this behavior is a recent discovery that sleep loss increases levels of circulating endocannabinoids, which, as you may have guessed from the name, are chemicals produced by the body that are very similar to the drug cannabis. Like marijuana use, these chemicals stimulate appetite and increase your desire to snack, otherwise known as having the munchies.

Combine this increase in endocannabinoids with alterations in leptin and ghrelin caused by sleep deprivation and you have a potent brew of chemical messages all driving you in one direction: overeating.

31/ How to loose weight effectively.

A final comment on trying to lose weight: let's say that you choose to go on a strict, low-calorie diet for two weeks in the hopes of losing fat and looking more trim and toned as a consequence. That's precisely what researchers did to a group of overweight men and women who stayed in a medical center for an entire fortnight. However, one group of individuals were given just five and a half hours' time in bed, while the other group were offered eight and a half hours' time in bed.

Although weight loss occurred under both conditions, the *type* of weight loss came from very different sources. When given just five and a half hours of sleep opportunity, more than 70 percent of the pounds lost came from lean body mass—muscle, not fat. Switch to the group offered eight and a half hours' time in bed each night and a far more desirable outcome was observed, with well over 50 percent of weight loss coming from fat while preserving muscle. When you are not getting enough sleep, the body becomes especially stingy about giving up fat. Instead, muscle mass is depleted while fat is retained. Lean and toned is unlikely to be the outcome of dieting when you are cutting sleep short. The latter is counterproductive of the former.

upon receiving such information. With a genuine lack of malice, I proceed to inform them that men who report sleeping too little—or having poor-quality sleep—have a 29 percent lower sperm count than those obtaining a full and restful night of sleep, and the sperm themselves have more deformities. I usually conclude my response with a parenthetical low blow, noting that these under-slept men also have significantly smaller testicles than well-rested counterparts.

Rare podium fracases aside, low testosterone is a clinically concerning and life-impacting matter. Males with low testosterone often feel tired and fatigued throughout the day. They find it difficult to concentrate on work tasks, as testosterone has a sharpening effect on the brain's ability to focus. And of course, they have a dulled libido, making an active, fulfilling, and healthy sex life more challenging. Indeed, the self-reported mood and vigor of the young men described in the above study progressively decreased in lockstep with their increasing state of sleep deprivation and their declining levels of testosterone. Add to this the fact that testosterone maintains bone density, and plays a causal role in building muscle mass and therefore strength, and you can begin to get a sense of why a full night of sleep—and the natural hormonal replacement therapy it provides—is so essential to this aspect of health and an active life for men of all ages.

A remarkable discovery in 2002 demonstrated that sleep profoundly impacts your response to a standard flu vaccine. In the study, healthy young adults were separated into two groups: one had their sleep restricted to four hours a night for six nights, and the other group was allowed seven and a half to eight and a half hours of time in bed each night. At the end of the six days, everyone was given a flu shot. In the days afterward, researchers took blood samples to determine how effective these individuals were in generating an antibody response, determining whether or not the vaccination was a success.

Those participants who obtained seven to nine hours' sleep in the week before getting the flu shot generated a powerful antibody reaction, reflecting a robust, healthy immune system. In contrast, those in the sleep-restricted group mustered a paltry response, producing less than 50 percent of the immune reaction their well-slept counterparts were able to mobilize. Similar consequences of too little sleep have since been reported for the hepatitis A and B vaccines.

34/ Dreaming provides closure.

Cartwright, who I contend is as much a pioneer in dream research as Sigmund Freud, decided to study the dream content of people who were showing signs of depression as a consequence of incredibly difficult emotional experiences, such as devastating breakups and bitter divorces. Right around the time of the emotional trauma, she started collecting their nightly dream reports and sifted through them, hunting for clear signs of the same emotional themes emerging in their dream lives relative to their waking lives. Cartwright then performed follow-up assessments up to one year later, determining whether the patients' depression and anxiety caused by the emotional trauma were resolved or continued to persist.

In a series of publications that I still revisit with admiration to this day, Cartwright demonstrated that it was only those patients who were expressly dreaming about the painful experiences around the time of the events who went on to gain clinical resolution from their despair, mentally recovering a year later as clinically determined by having no identifiable depression. Those who were dreaming, but not dreaming of the painful experience itself, could not get past the event, still being dragged down by a strong undercurrent of depression that remained.

35/ Creativity via dreaming.

Deep NREM sleep strengthens individual memories, as we now know. But it is REM sleep that offers the masterful and complementary benefit of fusing and blending those elemental ingredients together, in abstract and highly novel ways. During the dreaming sleep state, your brain will cogitate vast swaths of acquired knowledge,* and then extract overarching rules and commonalities—"the gist." We awake with a revised "Mind Wide Web" that is capable of divining solutions to previously impenetrable problems. In this way, REM-sleep dreaming is informational alchemy.

36/ He saw that in a dream.

Mendeleev, a Russian chemist of renowned ingenuity, had an obsession. He felt there might be an organizational logic to the known elements in the universe, euphemistically described by some as the search for God's abacus. As proof of his obsession, Mendeleev made his own set of playing cards, with each card representing one of the universal elements and its unique chemical and physical properties. He would sit in his office, at home, or on long train rides, and maniacally deal the shuffled deck down onto a table, one card at a time, trying to deduce the rule of all rules that would explain how this ecumenical jigsaw puzzle fit together. For years he pondered the riddle of nature. For years he failed.

After allegedly having not slept for three days and three nights, he'd reached a crescendo of frustration with the challenge. While the extent of sleep deprivation seems unlikely, a clear truth was Mendeleev's continued failure to crack the code. Succumbing to exhaustion, and with the elements still swirling in his mind and refusing organized logic, Mendeleev lay down to sleep. As he slept, he dreamed, and his dreaming brain accomplished what his waking brain was incapable of. The dream took hold of the swirling ingredients in his mind and, in a moment of creative brilliance, snapped them together in a divine grid, with each row (period) and each column (group) having a logical progression of atomic and orbiting electron characteristics, respectively. In Mendeleev's own words:*

> I saw in a dream a table where all the elements fell into place as required. Awakening, I immediately wrote it down on a piece of paper. Only in one place did a correction later seem necessary.

We also know of precious artistic gifts that have arisen from dreams. Consider Paul McCartney's origination of the songs "Yesterday" and "Let It Be." Both came to McCartney in his sleep. In the case of "Yesterday," McCartney recounts the following dream-inspired awakening while he was staying in a small attic room of his family's house on Wimpole Street, London, during the filming of the delightful movie *Help*:

> I woke up with a lovely tune in my head. I thought, "That's great, I wonder what that is?" There was an upright piano next to me, to the right of the bed by the window. I got out of bed, sat at the piano, found G, found F sharp minor 7th—and that leads you through then to B to E minor, and finally back to E. It all leads forward logically. I liked the melody a lot, but because I'd dreamed it, I couldn't believe I'd written it. I thought, "No, I've never written anything like this before." But I had, which was the most magic thing!

38/ Sleep on it.

Little wonder, then, that you have never been told to "stay awake on a problem." Instead, you are instructed to "sleep on it." Interestingly, this phrase, or something close to it, exists in most languages (from the French *dormir sur un problem*, to the Swahili *kulala juu ya tatizo*), indicating that the problem-solving benefit of dream sleep is universal, common across the globe.

39/ Insomnia ■

In truth, insomnia is likely to be a more widespread and serious problem than even these sizable numbers suggest. Should you relax the stringent clinical criteria and just use epidemiological data as a guide, it is probable that two out of every three people reading this book will regularly have difficulty falling or staying asleep at least one night a week, every week.

Without belaboring the point, insomnia is one of the most pressing and prevalent medical issues facing modern society, yet few speak of it this way, recognize the burden, or feel there is a need to act. That the "sleep aid" industry, encompassing prescription sleeping medications and over-the-counter sleep remedies, is worth an astonishing $30 billion a year in the US is perhaps the only statistic one needs in order to realize how truly grave the problem is. Desperate millions of us are willing to pay a lot of money for a good night's sleep.

Keep in mind that food, oxygen, and water are no different, and they, too, have a reverse-J-shape relationship with mortality risk. Eating to excess shortens life. Extreme hydration can lead to fatal increases in blood pressure associated with stroke or heart attack. Too much oxygen in the blood, known as hyperoxia, is toxic to cells, especially those of the brain.

Sleep, like food, water, and oxygen, may share this relationship with mortality risk when taken to extremes. After all, wakefulness in the correct amount is evolutionarily adaptive, as is sleep. Both sleep and wake provide synergistic and critical, though often different, survival advantages. There is an adaptive balance to be struck between wakefulness and sleep. In humans, that appears to be around sixteen hours of total wakefulness, and around eight hours of total sleep, for an average adult.

41/ Alarm Clocks ■ & Snooze buttons ■

No other species demonstrates this unnatural act of prematurely and artificially terminating sleep,* and for good reason. Compare the physiological state of the body after being rudely awakened by an alarm to that observed after naturally waking from sleep. Participants artificially wrenched from sleep will suffer a spike in blood pressure and a shock acceleration in heart rate caused by an explosive burst of activity from the fight-or-flight branch of the nervous system.†

Most of us are unaware of an even greater danger that lurks within the alarm clock: the snooze button. If alarming your heart, quite literally, were not bad enough, using the snooze feature means that you will repeatedly inflict that cardiovascular assault again and again within a short span of time. Step and repeat this at least five days a week, and you begin to understand the multiplicative abuse your heart and nervous system will suffer across a life span. Waking up at the same time of day, every day, no matter if it is the week or weekend is a good recommendation for maintaining a stable sleep schedule if you are having difficulty with sleep. Indeed, it is one of the most consistent and effective ways of helping people with insomnia get better sleep. This unavoidably means the use of an alarm clock for many individuals. If you do use an alarm clock, do away with the snooze function, and get in the habit of waking up only once to spare your heart the repeated shock.

Parenthetically,

42/ Sleeping pills aka sedatives

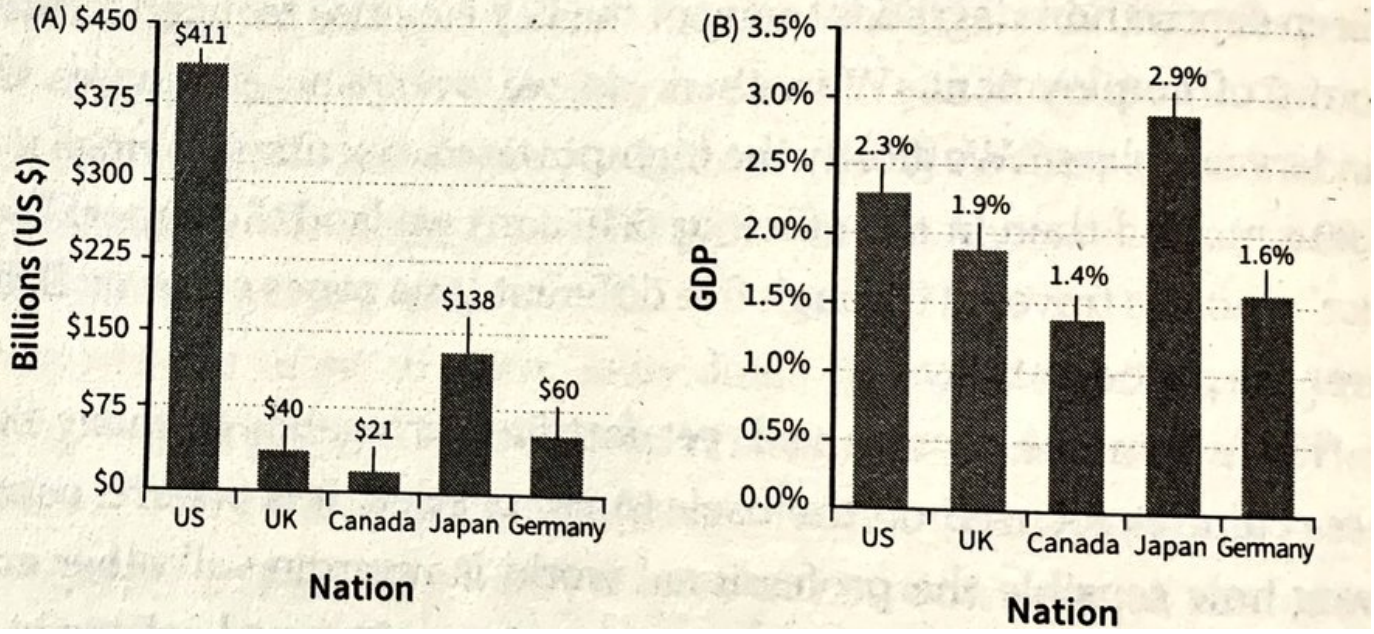
Summarizing the findings, the committee stated that sleeping pills only produced "slight improvements in subjective and polysomnographic sleep latency"—that is, the time it takes to fall asleep. The committee concluded the report by stating that the effect of current sleeping medications was "rather small and of questionable clinical importance." Even the newest sleeping pill for insomnia, called suvorexant (brand name Belsomra), has proved minimally effective, as we discussed in chapter 12. Future versions of such drugs may offer meaningful sleep improvements, but for now the scientific data on prescription sleeping pills suggests that they may not be the answer to returning sound sleep to those struggling to generate it on their own.

43/ Economic cost of insufficient sleep.

A study across four large US companies found that insufficient sleep cost almost $2,000 per employee per year in lost productivity. That amount rose to over $3,500 per employee in those suffering the most serious lack of sleep. That may sound trivial, but speak to the bean counters that monitor such things and you discover a net capital loss to these companies of $54 million annually. Ask any board of directors whether they would like to correct a single problem fleecing their company of more than $50 million a year in lost revenue and the vote will be rapid and unanimous.

An independent report by the RAND Corporation on the economic cost of insufficient sleep offers a sobering wake-up call for CFOs and CEOs.* Individuals who sleep fewer than seven hours a night on average cause a staggering fiscal cost to their country, compared to employees who sleep more than eight hours each night. Shown in figure 16A, inadequate sleep costs America and Japan $411 billion and $138 billion each year, respectively. The UK, Canada, and Germany follow.

Figure 16: Global Economic Cost of Sleep Loss



44/ The company which started the ‘sleeping at work’ culture

tions represent the "soft approach." But make no mistake: companies like Nike and Google are as shrewd as they are profitable. They embrace sleep due to its proven dollar value.

One organization above all has known about the occupational benefits of sleep longer than most. In the mid-1990s, NASA refined the science of sleeping on the job for the benefit of their astronauts. They discovered that naps as short as twenty-six minutes in length still offered a 34 percent improvement in task performance and more than a 50 percent increase in overall alertness. These results hatched the so-called NASA nap culture throughout terrestrial workers in the organization.

By any metrics we use to determine business success—profit margins, marketplace dominance/prominence, efficiency, employee creativity, or worker satisfaction and wellness—creating the necessary conditions for employees to obtain enough sleep at night, or in the workplace during the day, should be thought of as a new form of physiologically injected venture capital.

45/ Brainwashing Children 101.

SLEEP AND EDUCATION

More than 80 percent of public high schools in the United States begin before 8:15 a.m. Almost 50 percent of those start before 7:20 a.m. School buses for a 7:20 a.m. start time usually begin picking up kids at around 5:45 a.m. As a result, some children and teenagers must wake up at 5:30 a.m., 5:15 a.m., or even earlier, and do so five days out of every seven, for years on end. This is lunacy.

Could you concentrate and learn much of anything when you had woken up so early? Keep in mind that 5:15 a.m. to a teenager is not the same as 5:15 a.m. to an adult. Previously, we noted that the circadian rhythm of teenagers shifts forward dramatically by one to three hours. So really the question I should ask you, if you are an adult, is this: Could you concentrate and learn anything after having forcefully been woken up at 3:15 a.m., day after day after day? Would you be in a cheerful mood? Would you find it easy to get along with your coworkers and conduct yourself with grace, tolerance, respect, and a pleasant demeanor? Of course not. Why, then, do we ask this of the millions of teenagers and children in industrialized nations? Surely this is not an optimal design of education. Nor does it bear any resemblance to a model for nurturing good physical or mental health in our children and teenagers.

Our children didn't always go to school at this biologically unreasonable time. A century ago, schools in the US started at nine a.m. As a result, 95 percent of all children woke up without an alarm clock. Now, the inverse is true, caused by the incessant marching back of school start times—which are in direct conflict with children's evolutionarily preprogrammed need to be asleep during these precious, REM-sleep-rich morning hours.

The Stanford psychologist Dr. Lewis Terman, famous for helping construct the IQ test, dedicated his research career to the betterment of children's education. Starting in the 1920s, Terman charted all manner of factors that promoted a child's intellectual success. One such factor he discovered was sufficient sleep. Published in his seminal papers and book *Genetic Studies of Genius*, Terman found that no matter what the age, the longer a child slept, the more intellectually gifted they were. He further found that sleep time was most strongly connected to a reasonable (i.e., a later) school start time: one that was in harmony with the innate biological rhythms of these young, still-maturing brains.

47/ Read till the end ■■■■

Halsted founded the surgical training program at Johns Hopkins Hospital in Baltimore, Maryland, in May 1889. As chief of the Department of Surgery, his influence was considerable, and his beliefs about how young doctors must apply themselves to medicine, formidable. There was to be a six-year residency, quite literally. The term "residency" came from Halsted's belief that doctors must live in the hospital for much of their training, allowing them to be truly committed in their learning of surgical skills and medical knowledge. Fledgling residents had to suffer long, consecutive work shifts, day and night. To Halsted, sleep was a dispensable luxury that detracted from the ability to work and learn. Halsted's mentality was difficult to argue with, since he himself practiced what he preached, being renowned for a seemingly superhuman ability to stay awake for apparently days on end without any fatigue.

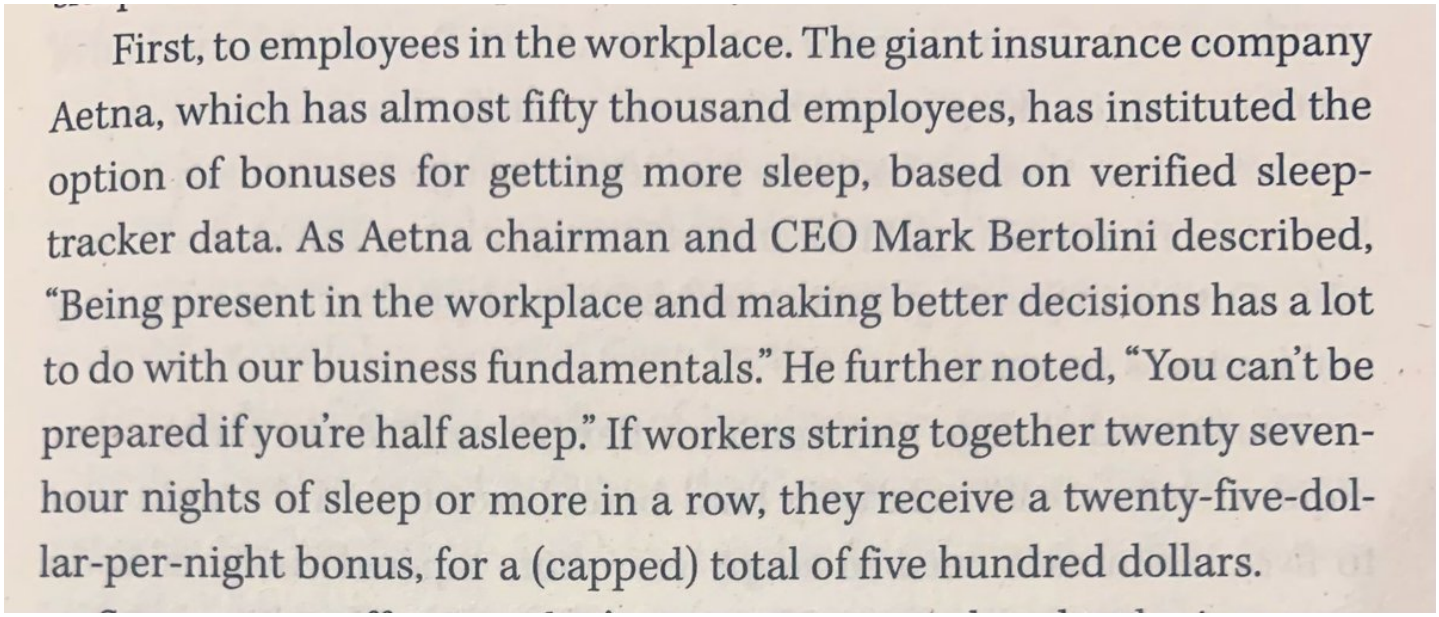
But Halsted had a dirty secret that only came to light years after his death, and helped explain both the maniacal structure of his residency program and his ability to forgo sleep. Halsted was a cocaine addict. It was a sad and apparently accidental habit, one that started years before his arrival at Johns Hopkins.

48/ ■■ looses 50 lakh lives due to medical negligence each year (sadly, has increased in COVID, anecdotally speaking)

The injurious consequences are well documented. Residents working a thirty-hour-straight shift will commit 36 percent more serious medical errors, such as prescribing the wrong dose of a drug or leaving a surgical implement inside of a patient, compared with those working sixteen hours or less. Additionally, after a thirty-hour shift without sleep, residents make a whopping 460 percent more diagnostic mistakes in the intensive care unit than when well rested after enough sleep. Throughout the course of their residency, one in five medical residents will make a sleepless-related medical error that causes significant, liable harm to a patient. One in twenty residents will kill a patient due to a lack of sleep. Since there are over 100,000 residents currently in training in US medical programs, this means that many hundreds of people—sons, daughters, husbands, wives, grandparents, brothers, sisters—are needlessly losing their lives every year because residents are not allowed to get the sleep they need. As I write this chapter, a new report has discovered that medical errors are the third-leading cause of death among Americans after heart attacks and cancer. Sleeplessness undoubtedly plays a role in those lives lost.

Young doctors themselves can become part of the mortality statistics. After a thirty-hour continuous shift, exhausted residents are 73 percent more likely to stab themselves with a hypodermic needle or cut themselves with a scalpel, risking a blood-born infectious disease, compared to their careful actions when adequately rested.

49/ Best thing I read today.



First, to employees in the workplace. The giant insurance company Aetna, which has almost fifty thousand employees, has instituted the option of bonuses for getting more sleep, based on verified sleep-tracker data. As Aetna chairman and CEO Mark Bertolini described, "Being present in the workplace and making better decisions has a lot to do with our business fundamentals." He further noted, "You can't be prepared if you're half asleep." If workers string together twenty seven-hour nights of sleep or more in a row, they receive a twenty-five-dollar-per-night bonus, for a (capped) total of five hundred dollars.

50/ Finally, Twelve tips for Healthy Sleep.

End of Thread.

*Twelve Tips for Healthy Sleep**

1. Stick to a sleep schedule. Go to bed and wake up at the same time each day. As creatures of habit, people have a hard time adjusting to changes in sleep patterns. Sleeping later on weekends won't fully make up for a lack of sleep during the week and will make it harder to wake up early on Monday morning. Set an alarm for bedtime. Often we set an alarm for when it's time to wake up but fail to do so for when it's time to go to sleep. If there is only one piece of advice you remember and take from these twelve tips, this should be it.
2. Exercise is great, but not too late in the day. Try to exercise at least thirty minutes on most days but not later than two to three hours before your bedtime.
3. Avoid caffeine and nicotine. Coffee, colas, certain teas, and chocolate contain the stimulant caffeine, and its effects can take as long as eight hours to wear off fully. Therefore, a cup of coffee in the late afternoon can make it hard for you to fall asleep at night. Nicotine is also a stimulant, often causing smokers to sleep only very lightly. In addition, smokers often wake up too early in the morning because of nicotine withdrawal.
4. Avoid alcoholic drinks before bed. Having a nightcap or alcoholic beverage before sleep may help you relax, but heavy use robs you of REM sleep, keeping you in the lighter stages of sleep. Heavy alcohol ingestion also may contribute to impairment in breathing at night. You also tend to wake up in the middle of the night when the effects of the alcohol have worn off.
5. Avoid large meals and beverages late at night. A light snack is okay, but a large meal can cause indigestion, which interferes with sleep.