

Review: Matthew Walker: *Why We Sleep: The New Science of Sleep and Dreams*, Robinson, London, UK, 2017

Pages: 360

Dream of More Sleep

Fascinating and highly applicable information on what is as critical to life as water.

The author strikes a great balance between basic sleep biology with citing various studies, and practical applications for health, memory retention, physical performance, and longevity.

The bad news in such a busy world is there doesn't seem to be any shortcuts in the area of sleep (including sleeping pills); all are illusory and counter productive. The most shocking sleep-deprivation facts are heightened risks of drowsy driving, and severe diseases such as diabetes, cancer, and heart attack. Parts of the brain also atrophy!

An optimistic view would be increasing sleep raises wakeful efficiency and performance to more than offset any 'lost' time.

However, Matthew has sadly deceived himself that life has evolved and so without a Creator there is frequent ad hoc and counter intuitive story telling. Examples are legion:

-“There *ought* to have been a strong evolutionary pressure to *prevent* the emergence of sleep”. [p. 6.]

-Mother Nature “programs” variability across people [p. 22]

-Without a Creator, he understandably struggles to reason which came first, sleep or wakefulness. [p. 57]

-Sleep violates placement in any evolutionary phylogenetic category. [p. 58]

-“Sleep was likely shaped by numerous forces along the evolutionary path.” [p. 59]

-All mammals have REM sleep, except killer whales and dolphins since it causes paralysis and thus drowning [however, these ‘devolved’ from land animals which had REM sleep, so how did they survive for millions of years to devolve?].

-REM sleep may have evolved twice; in birds and mammals. [p. 62]

-“To understand how and why our sleep is so different is to understand the evolution of ape to man, from tree to ground.” [p. 72]

-“ ‘Evolution’ saw sleep shorten but become more intense.” [p. 73]

-“Our biased sensitivity to cool blue light is a vestigial carryover from our marine forebears.” [p. 270]

-“Evolution spent 3,400,000 years perfecting [sleep]”. [p. 340]

-He offhandedly equates the brain with the mind [p. 200], disproven by cases of hydrocephaly and split brain surgery in which consciousness is unaffected. The mountain of NDE literature showing mind activity sans brain function is also ignored.

The above fit into error categories: ignoring obvious signs of intelligent design; giving blind evolution foresight; relying on deep time magic; and fantastic convergent evolution ideas.

Stripping away the evolutionary dogma, the book remains a highly useful guide to take charge of your sleep, and therefore improve your health.

I) To Sleep (pp. 3-12)

Accidents by drowsy driving exceed alcohol and tobacco combined.

II) Caffeine, Jet Lag, and Melatonin (pp. 13-37)

The human circadian rhythm peaks early afternoon.

Mimosa pudica leaves trace the sun's arch across the day, which Jean de Mairan showed occurred even when the plant was placed in the dark all day!

An adult's average endogenous circadian clock is 24 hours and 15min. Sunlight exposure sporadically resets this.

Blind people don't lose all their circadian rhythm (CR).

Signals used by the brain for timekeeping are called "zeitgebers".

The suprachiasmatic nucleus of 20,000 neurons is in the middle of the brain. It 'samples' light passing along the optic nerve.

The CR's nadir is two hours after sleep onset.

40% are 'morning types' who prefer waking up at dawn; 30% 'evening' who wake up late morning or even afternoon.

The prefrontal cortex controls high-level thought and logical reasoning. When a night owl is forced to wake early, it remains in a disabled "offline" state.

Night owls don't sleep to one or two a.m.

Melatonin regulates the *timing* of sleep, but is not a sleeping aid in and of itself. Once sleep is underway, melatonin slowly decreases, and with dawn, a 'break pedal' is applied to the pineal gland.

For each day in a new timezone, the suprachiasmatic nucleus can only readjust one hour.

Cabin crew have shrunken learning and memory parts of the brains, also higher cancer and Type II diabetes rates.

Adenosine builds up continuously while awake, but it can be artificially muted by caffeine since it latches onto its receptors.

Caffeine peaks thirty minutes after oral administration, and has a half-life of five to even hours.

De-caffeinated does not mean *non-caffeinated*.

The liver removes caffeine mostly by enzyme cytochrome P450 IA2. Staying awake by taking caffeine will eventually cause a “caffeine crash” once the liver processes it.

Spiders given drugs have various odd webs including caffeine; LSD; and speed.

“There ought to have been a strong evolutionary pressure to *prevent* the emergence of sleep”. [p. 6.]

III) Defining and Generating Sleep (pp. 38-55)

The thalamus is just smaller than a lemon and is the sensory gate of the brain.

Time dilation in dreams is usually elongated, a chronometric void. This is likely since during Rapid Eye Movement [REM] sleep, memories are replayed more slowly.

Electrodes are used to detect brainwave activity, eye movement, and muscle activity. Collectively, these are a polysomnography (PSG), created by Eugene Aserinsky in 1952.

NREM and REM cycle every ninety minutes.

A hypnogram is a sleep graph.

IV) Ape Beds, Dinosaurs, and Napping With Half a Brain (pp. 56-77)

Proof of insect sleep is impossible, so it is inferred from behaviour such as immobility and reduced responsiveness.

Sleep violates placement in any evolutionary phylogenetic category. [p. 58]

“Sleep was likely shaped by numerous forces along the evolutionary path.” [p. 59].

All mammals have REM sleep, except killer whales and dolphins (these sleep half a brain at a time!) since it causes paralysis and thus drowning [however, these ‘devolved’ from land animals which had REM sleep, so how did they survive for millions of years to devolve?].

REM sleep may have evolved twice; in birds and mammals. [p. 62]

Humans always sleep with both brain halves.

Starvation supersedes sleep, meaning fasting lowers it.

The white-crowned sparrow is resilient to total sleep deprivation, and is studied by the U.S. government to develop soldiers requiring less sleep.

Biphasic sleep involves normal monophasic of about seven hours, with a half our siesta.

A “post-prandial alertness dip” is the source of afternoon drowsiness.

Greek cities open 0900-1300 and 1700-2100.

Abandoning the siesta is said to cause a 37% increased risk of heart disease.

“To understand how and why our sleep is so different is to understand the evolution of ape to man, from tree to ground.” [p. 72]

REM sleep paralyses all voluntary movement.

“ ‘Evolution’ saw sleep shorten but become more intense ... Mother Nature’s brilliance [!].” [p. 73]

Emotional quotient is associated with REM sleep.

V) Changes in Sleep Across the Life Span (pp. 78-103)

A baby in the womb spends most of its time in a sleep-like state (~22 hours per day), but its REM sleep doesn’t paralyse leading to frenetic body movement. In the final week before birth, REM sleep reaches a lifetime high of twelve hours.

Depriving rat pups of REM sleep stalled construction of the cerebral cortex.

An infant brain without sleep will ever be underdeveloped.

Infants of alcohol-drinking mothers have a 200% reduction of brain activity.

Breath rates drop from 381 per hour to just 4 for a fetus exposed to alcohol.

Alcohol is absorbed into mother's milk.

After a feeding, newborns usually transition into REM sleep.

Alcohol also increases the risk of SIDS 7X for mothers who practice co-sleeping.

The suprachiasmatic nucleus only develops by four months. At one year it is somewhat mature and baby sleeps at night. By four, the child only needs a single daytime nap.

Children should always be put to bed when drowsy, not when already asleep.

At 5, the NREM/REM split is 70/30, decreasing to 80/20 by the late teens.

Changes in deep NREM sleep precede cognitive brain milestones by several weeks. Changes begin at the back of the brain and progress forward, terminating in the frontal lobe by adolescence.

Teens have a forward-shifted circadian rhythm.

Aging reduces sleep quality, quantity, efficiency and timing orderliness. It also shifts the circadian rhythm back to earlier bedtimes via earlier melatonin release.

Deep NREM already declines by the early thirties.

Teens have a 95% sleep efficiency; an 80-year old only 70%.

Sleep efficiency and mortality, depression, and cognitive function are all positively correlated.

A practical consequence of poor efficiency is nighttime injury risk.

Evening dozing harms sleep efficiency.

VI) Your Mother and Shakespeare Know: The Benefits of Sleep for the Brain (pp. 107-132)

A ninety-minute Siesta may improve learning by 20%.

Current loops between the hippocampus and larger cortex every 100-200 milliseconds during NREM sleep (“sleep spindle” waves); shifting memory from short to long-term.

60-80 year olds suffer a 40% sleep spindle deficit.

Inemuri is the Japanese culture of “sleeping while present”).

Stimulating brainwaves can boost NREM memory storage (“transcranial direct current brain stimulation” [tDCS]).

Physical performance can only be optimum after a night of good rest, since sleep helps the brain automate movement. There is also a positive correlation between sleep loss and sports injury.

VII) Too Extreme for the Guinness Book of World Records: Sleep Deprivation and the Brain (pp. 133-163)

Concentration suffers even under the smallest amount of sleep deprivation, which is why drowsy driving is so dangerous.

One night of deprivation causes a 400% increase in concentration loss; three nights’ is catastrophic.

One night equates to four hours’ sleep for six nights in a row, or ten days at six hours per night.

Chronic sleep restriction leads to low-level exhaustion.

Car crash risk increases 3X with just five hours' sleep.

The combination of sleep loss and alcohol is *multiplicative*.

50% of U.S. truck drivers are obese.

A fatal truck accident kills ~4.5 other people.

68% of plane crashes occur at journey end.

Sleep loss is associated with suicidal ideation.

Margaret Thatcher and Ronald Reagan were proud for only sleeping 4-5 hours per night. Donald Trump sleeps only a few.

VII) Cancer, Heart Attacks, and a Shorter Life: Sleep Deprivation and the Body (pp. 164-189)

A Japanese study of 4,000 showed a 4-5X increased heart attack risk for sleeping under six hours.

Less sleep increases hypertension risk and cortisol, and reduces growth hormone which weakens the endothelium.

Moving clocks backwards for daylight saving causes a heart attack spike the next day, and vice versa.

Daily sleep under six hours increase appetite and Type II diabetes risk, where cells block glucose intake causing dangerous blood sugar levels (hyperglycemia).

The average diabetic costs \$85k p.a. to treat, and lifespan is cut short ten years.

The appetite reduction mechanism is caused by a reduction in leptin, which signals satiety, and an increase in ghrelin, which increases hunger. Additional antagonists are endocannabinoids, which are increased ("having the munchies"), and loss of impulse-control (choice of high sugar/high fat foods).

Sleep improves the microbiome.

Weight loss under deprivation targets lean muscles mass rather than fat cells.

Sleep apnea lowers testosterone and sperm count (by 29%, with more deformities).

Contrary to popular belief, sleep deprivation doesn't reduce calorie requirements.

Sickness over a week was 50% for those sleeping under five hours, but only 18% for those getting seven.

Less than four hours sleep for only a night cut circulating natural killer cells by 70%. Macrophage 1 cells fall, but dangerous Macrophage 2 ones rise.

Less than six hours sleep increases cancer risk by 40% versus seven hours.

Some cancer cells hijack inflammatory factors in angiogenesis.

Sleep-deprived mice had a 2X cancer speed and size increase.

The WHO lists night work as a probable carcinogen (2A).

Lack of sleep also drops HDL.

IX) Routinely Psychotic: REM-Sleep Dreamings (pp. 190-205)

REM sleep is characterised by hallucination, delusion, disorientation, and amnesia.

Brain MRI machines were invented in the early 2000s. Certain parts light up during REM sleep: the visuospatial at the back; the motor cortex; hippocampus; amygdala; cingulate cortex [this helps process emotion].

Lucid dreaming is remembering how and what was dreamt.

Matthew ignorantly equates the brain with the mind, disproven by cases of hydrocephaly and split brain surgery in which consciousness itself is unaffected [p. 200]. He also ignores, or is ignorant of, the mountain of NDE literature showing mind activity sans brain function.

33-55% of emotional issues resurface in dreams at night.

X) Dreaming as Overnight Therapy (pp. 206-218)

Noradrenaline (the brain's adrenaline) stops during REM sleep.

XI) Dream Creativity and Dream Control (pp. 219-234)

John Steinbeck: "A problem difficult at night is resolved in the morning after the committee of sleep has worked on it."

XII) Things That Go Bump in the Night (pp. 235-264)

Somnambulism are sleep walking-related disorders.

Paradoxical insomnia is the illusion of having had poor sleep.

Narcolepsy symptoms are: daytime sleepiness; sleep paralysis; cataplexy [sudden loss of strength].

The neuropeptide orexin controls the sleep-wake hypothalamus switch. Narcoleptics have a 90% reduction in orexin production.

The prion gene PrNP causes fatal familial insomnia which is 100% fatal within ten months. Sufferers have a destroyed thalamus. It is in the same prion family which causes Creutzfeldt-Jakob disease.

Jiang Xiaoshan went eleven days without sleep to watch Euro 2012 and died on day twelve.

Rats dies fifteen days on average without sleep.

There is no known harmful biological mechanism for sleep causing harm.

XIII) iPads, Factory Whistles, and Nightcaps: What's Stopping You From Sleeping? (pp. 265-281)

Artificial evening light fools the suprachiasmatic nucleus that the sun hasn't set and melatonin is stopped.

Even 8-10 lux affects melatonin release (bedside lamps range from 20-80).

Evening blue LED light has a 2X impact of nighttime melatonin suppression.

“Our biased sensitivity to cool blue light is a vestigial carryover from our marine forebears.” [p. 270]

Sedation is *not* sleep, rather, a light anaesthesia.

Alcohol-induced sleep is non-restorative and suppresses REM via aldehyde metabolite.

Alcoholics suffer a “backlog” of REM sleep which surfaces as the daytime psychosis *delirium tremens*.

A control study group remembered all material after a week, with alcohol on the first night half was forgotten, and those with alcohol on the third night had a 40% memory reduction. The lesson is memories remain vulnerable for three days post learning.

Alcohol takes hours to breakdown, releasing during sleep.

The extremities release heat prior to sleep onset to reduce core body temperature (selective warming of these causes a 20% faster sleep onset).

Alarm snoozes cause repeated system shocks for little benefit.

XIV) Hurting and Helping Your Sleep: Pills vs. Therapy (pp. 282-295)

10M Americans use some kind of sleeping aid, such as diazepam.

Sleeping pills are addictive, and are no different from placebos.

Ambien-induced sleep caused a 50% weakening of brain-cell connections, making it a memory eraser.

The pills increase cancer risk.

CBT-I is cognitive behavioural therapy for insomnia.

High-carbohydrate low -fat foods decrease deep NREM, but increase REM.

XV) Sleep and Society: What Medicine and Education Are Doing Wrong: What Google and NASA Are Doing Right (pp. 296-323)

A century ago, 2% sleep under six hours; today it is 30%.

Sleep deprivation costs \$2,000 per employee p.a. in lost productivity.

The sleep-deprived choose to work on less demanding tasks.

Sleep deprivation is a highly destructive torture method.

Amphetamine and methylphenidate are powerful sleep stoppers.

Surgery pioneer William Halsted was a cocaine addict. His residency program involved working days on end.

Residents working thirty hours straight commit 36% more serious medical errors and make 460% more diagnostic mistakes. A maximum twelve hours on-off is recommended.

XVI) A New Vision for Sleep in the Twenty-First Century (pp. 324-339)

Chronic lack of sleep is slow 'self-euthanasia'.

50-80% of ER calls are unnecessary.

Pain sensitisation increases 42% under sleep deprivation.

Conclusion: To Sleep or Not to Sleep (pp. 340-341)

“Evolution spent 3,400,000 years perfecting [sleep]”. [p. 340]

Appendix: Twelve Tips for Healthy Sleep (pp. 342-343)

Avoid large meals late at night!