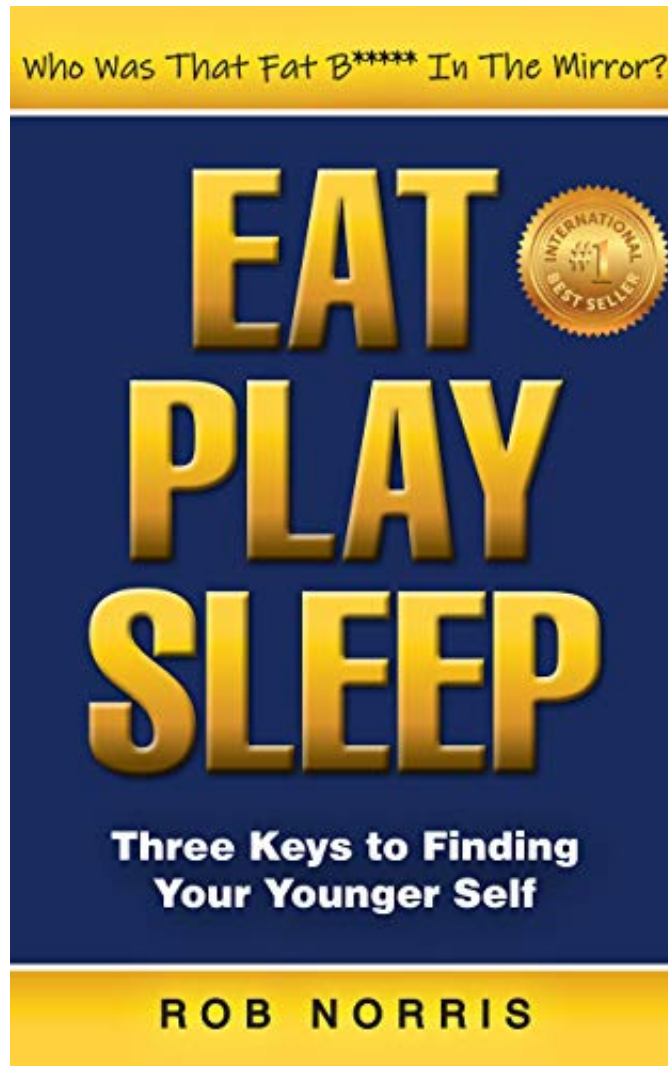


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EAT. PLAY. SLEEP.: Three Keys to Finding Your Younger Self

by
Jerry Lee



Synopsis

EAT. PLAY. SLEEP. Three Keys to Finding Your Younger Self Rob Norris had to admit it – it was time to slow down, or so he thought. It was a serendipitous encounter with a slightly far-out professor and a single idea he proposed that made Rob question his entire career as a health professional. In this book, 'Eat. Play. Sleep' he reveals how to identify and break the seemingly innocent modern habits that are making us age faster. Join Rob as he sorts through the enormous heap of health-related 'facts' flooding our screens and offers a few pearls that he had discovered. As his accomplice, you'll learn how to develop simple daily practices around nutrition, exercise, and sleep that make you feel less tired, fitter, and happier. Rob will show you... How to get more and better sleep How to tackle sleep debt and feel more rested How to identify and treat sleep apnoea How to exercise in a way that makes you feel fitter, stronger, and younger How to turn exercise into something you look forward to How to work out smarter not harder How to enjoy food to the fullest and still lose weight How to tackle food cravings and comfort eating How to maintain a healthy weight without counting calories Whether you're a seasoned health nut or just beginning to take health into your own hands, the learning tools are made easily accessible to all.

Sort review

About the Author Cheryl Kimball (Middletown, NH) has been publishing director of two book-publishing companies and started a bookstore. --This text refers to the paperback edition.

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Look inside the book

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Note from the Author This book is written by a man of more than sixty summers in the language he learnt — and mangled — at school. It may not be politically correct newspeak, but the aim is to inform, not offend. It is, however, a journey into a reality that is meant to disturb and confront the reader. The book is not written to appease. The intent is to make readers laugh, be angry, and think — then, perhaps, lead better, healthier lives.

About the Author Rob was born in Watford, Hertfordshire in the late 1950s, bestowing on him the dubious claim to being "a Northerner." After he started school, his family emigrated to

Australia, leaving behind grandparents, uncles, aunties, and cousins. Sometimes, after a beer, Rob will simultaneously claim to be a “boat person” and one of a “stolen generation.” He can stand alone at parties. Rob entered the state school system, and despite his dyslexia, he matriculated with his high school attendance certificate and tertiary entrance exam in 1975. Since the age of fifteen, Rob has had many jobs. He has been a postman, milkman, dishwasher, yardman, builders’ labourer, street-sweeper, receival point operator, grain sampler, a roadie for the New Horizon dance band, crowd control with The Wiggles — and somehow, he found time to become a dentist. After graduation and a year in public service, private practise beckoned. Rob was one of the few in his year to secure work in the private sector. It was the time of the “recession we had to have,” professional underemployment was rife. He battled on for a few years as his peers went overseas to greener pastures. He had a “road to Damascus” moment one day while waiting in the bank to deposit his months’ pay which, was less than his school-leaver assistant took home each month. Rob needed to go where there was plentiful work. He had to go to Britain, the land of milk and honey, or sweet tea and chocolate. With massive dental needs and a government willing to deal with the problem, Rob had found his niche. The plan was to go to Britain for a couple of years, then return to Australia and set himself up properly. And return he did — twenty years later. While in Britain, Rob practised family general dentistry. His special interests were using sedation and other relaxation techniques for the treatment of dental phobias, plus full-mouth reconstruction of the broken-down dentition. He was on the secret, non-existent, list of dentists who were called on to fix cases that had backfired, and he is proud to claim that the bulk of one of his letters was used as an anonymous editorial in The British Dental Journal. Returning to Australia with his lovely second wife and his three children, Rob and his family established themselves in the south-west of Western Australia. Rob sometimes reflects on the wisdom of the philosopher Tony Blackburn who once said, “Buy someone you do not like a house and marry your second wife first.” That advice would certainly have saved him a lot of heartache! After trying government employment and considering a business partnership, Rob bought a practice in the country, which is similar in feel to working in the smaller communities he had become accustomed to back in Britain. Now his children are grown up, Rob spends a lot of time in the garden trying to stay a step ahead of nature. He likes reading, hiking, watching motorsport and cricket. Occasionally, he goes carousing with old school pals and his children — leaving them to wonder when he is going to grow up. With years of experience in the health industry, Rob feels he can help guide people through the fog of conflicting information to live better, healthier lives. To that end, he wrote this book to help people enhance their well-being — or perhaps just make them laugh out loud on a crowded train.

To Fred and the boys of the Tuesday Night Club. Without your friendship, I would not be here.

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The genesis of a book is more than the work of the author alone. Many others are involved in its evolution to completion. I would like to thank my friend Pat Mesiti for

making me believe, inspiring, then motivating, me to commence this project. Then Cydney O'Sullivan who became a guide and mentor for this book. My parents, Pat and Roy, deserve special mention for teaching a dyslexic kid how to read installing a curiosity, and a love of learning from books, that lasts to this day. Thanks also to my Kerry and our children accepting the long antisocial absence of father while he slowly banged on his solitary keyboard. Without my readers; Jen, Kerry, Carole, Rebecca, Bev, Julie, Kym, Andy, Barry and Bruce, pointing out some major inconsistencies and reigning in some of the less socially acceptable digressions and phrases, the work would have been poorer. I did not always take your advice; this does not indicate it was unappreciated. I am grateful for the effort taken by my son, Ricky, in turning my smudged pen and ink drawings into the clear diagrams in the body of the text. Unless specifically given consent, many named characters in the text are compounds of more than one individual. The anecdotes are however true, with names changed to protect the innocent and the not so innocent. Thank you all. Lastly, I would like to thank my editor Andrew Fenn for his patience panel beating my manuscript into a book.

Introduction
The Three Keys to Finding Your Younger Self — Eat. Play. Sleep. If you want to slow down or even turn back your biological clock, this is the book for you. Nothing I am going to reveal is a secret. All the information here is readily available, hidden in plain sight yet concealed in a fog of misinformation, vested interests, entertainment, and misguided charity. I have been on a journey, a quest to discover what has gone wrong with our collective physical wellbeing, as humanity approaches a catastrophic health crisis. Let me share the few pearls I have discovered in the enormous dung-heap of information flooding our screens, airwaves and bookshelves. I recently attended a class reunion for those in my year at university. It has been almost 40 years since I graduated, and I have not seen many of my peers since the day I left — understandable, considering I spent twenty of the intervening years on the other side of the world and the bulk of the rest of my time in the bush. How we have all changed from the young, eager, fresh-faced graduands toasting our success at all the celebratory parties that took place in that summer of 1980. As a group, we have fared better than a random sample of individuals rapidly approaching retirement age. After all, if highly educated health professionals cannot keep their fitness up, what hope is there for those without the benefit of all that knowledge? Unlike my school class, this group had not had any deaths. Sadly, two of my colleagues were too ill to attend and are not likely to open their Christmas cards this year. A few fortunate individuals looked good, in prime health. Others, not so lucky, carry more than the average weight gain of 400 grams per year throughout adult life. I was bang on average in terms of weight gain, having put on 15 kilograms since my early twenties. At one point, I was appalled to find I had barrelled my way past 90 kilos, putting my BMI on the border of overweight and obese. Particularly galling was the fact I thought I had been looking after myself. I watched what I ate, and between walking Gina, the dog and swimming 1.6 kilometres, a mile, four times a week, I had been getting plenty of exercise. Something was not working — but a change was in the air. Not long ago, I attended a lecture as part of my continued professional development programme. The professor, a physician, spoke about the prevention of systemic disease. He maintained that there is no good reason why we cannot maintain our twenty-one-year-old bodies for life, at least until old age starts to cause tissue loss. After an initial mental kickback, I had an epiphany — he was right. It is just easier to believe in the inevitability of middle-aged spread than to do something about it. Then I had a much-needed motivational kick in the pants. I discovered my nocturnal wanderings were a result of the family disease: prostate cancer. Luckily, although malignant, it is not yet of a very aggressive form. In fact, the probability of it

killing me in the next twenty years is about one in a hundred, while the probability of me living another twenty years is about fifty-fifty. I should be more concerned about other causes of morbidity, although this unwelcome news did make me think — now I should renew my efforts to be healthier and smarter than I have been in the past. I increased my efforts to trawl through the information available to me. There are many older celebrities who keep in shape; actors, sportsmen and women, and entertainers. Mick Jagger, one of the fittest septuagenarians on the planet, spends hours in the gym each day. Then there is Prince Phillip. Throughout his career in public service, he has worn the same Saville Row suits he had made for him when he married — proof it is possible to maintain your physical condition throughout your adulthood. Now, there is a man who has been obligated to sit through innumerable turgid speeches and official banquets with little more than a couple of bottles of Speckled Hen for amusement. It is no wonder he lets his world-famous wit out of its box occasionally, enriching all our lives. For the average man, working long hours, running around after the kids, and trying to maintain his castle, this kind of time commitment to fitness is a fantasy. I have previous form when it comes to diet and exercise. A long time ago, back when it was all the rage, my then-wife and I tried the cabbage soup diet. I lost a little over three kilograms in ten days, but it was a deeply unpleasant experience. I was hungry all the time and suffered from bad headaches, irritability, and fatigue. Worse still, as my body rapidly lost weight, I began to smell strongly of ketone bodies. It was as if I had been on a permanent, all-night bender — not a good look given my occupation. When I gave up on the diet, the glycogen stores that had been depleted to keep my metabolism going rapidly replenished, so within days, I was back to normal weight. A couple of years ago, I flirted with the Atkins diet, a far more pleasant experience — I really do like bacon and cheese. I once saw a sign in a Balinese bar that made me laugh: “If pigs could fly, their wings would be delicious.” The diet involves eating more satisfying, slower to digest food. In theory, after a while, dieters reduce their calorific intake and lose some weight. However, pure gluttony stymied this attempt. After a month or more, I had barely lost a hundred grams. With a certain degree of hesitation, I would like to share what was previously the only diet that had worked for me. It is called “The Lager Diet.” My chum Rob and I worked on it one summer in London while our respective wives were in Ireland and Australia. The premise is simple: every weekday, you have a light breakfast and light lunch. Then every evening, without fail, you must drink at least three half-pints of beer and at some stage, have a kebab. At the weekend, the gloves are off — there is no restriction on the start time or the number of beers you can consume in a day. On this strict regime, there is no allowance for hangovers, but pints are permitted. The cunning part of this plan is that only one glass of beer is allowed from any pub for the duration of the diet, and you must travel to and from pub to pub on foot. In the second month, transport by bus or train is allowed, but only one way. A month in, I was fit enough to do a brisk, four-hour walk and had lost five kilos. It was a memorable use of my summer. I developed an almost encyclopaedic knowledge of over a hundred pubs within a ten-kilometre radius of my house and enjoyed many long walks along the banks of the Thames and through the Royal Parks of West London. As much fun as this exercise was, I do not advocate it. A better plan is to come up with a sustainable system that delivers the health-related outcomes you desire as part of your ongoing lifestyle. The food you eat, your weekly activity and the way you rest, and recover can all be tailored to provide a satisfactory standard of health for life without binge diets, special supplements, hours in the gym or a frantic search for the next pub before last orders at ten to eleven on a weeknight. At best, these measures temporarily slowed my body mass gain for half a year or so without affecting the long-term trend. I am reasonably active; I walk a lot, garden, ride a bike and a year ago, I took up swimming again. I eat healthily and I am active,

but my BMI has increased incrementally. Maybe that is just the way it is meant to be — although deep down, I know that cannot be true. If diet and exercise are not working, what is the answer? I am chronically tired, although I fight it as much as I can. As a student, I trained myself to sleep around six hours a night so I could complete all my work. Then, as a graduate, I continued this routine — I had five years of austerity to make up for! As I aged, I became more inclined to fall asleep in front of the television, often in front of a documentary I had been particularly looking forward to watching. That is normal, is it not? After all, I remember my father sleeping in front of *The Frost Report* and, later, *Floyd in France*. More problematic is the drowsy feeling that creeps up on long drives, that can be chased away with chocolate and caffeinated soft drink, or worse, in a truly desperate situation, those fashionable yet poisonous energy drinks. I remember from a dinner course on the treatment of sleep disorders a line about how sleep is important for metabolic and endocrine function. It was a lightbulb moment, the classic chicken-and-egg situation. A patient comes in: “Doc, I snore.” Response: “Lose ten kilos.” What if, instead of allowing yourself to go to seed, gaining weight and, consequently, snoring, you sleep poorly, your metabolism is disrupted, you gain weight and, therefore, you snore — snoring being an antisocial symptom of weight gain due to self-perpetuating poor sleep? Then and there, I resolved to sleep more. So, at the unhealthy weight of 93 kilograms, I decided to lose weight by sleeping more — a lot more — while tweaking my activity and nutrition. None of this has been difficult. In the first twelve weeks, I lost thirteen kilos, my resting pulse fell from 66 to 58 beats a minute, my systolic blood pressure dropped from 140 to 128, my BMI returned to the normal range, and I have not been in any danger of falling asleep at the wheel. Apparently, I snore less now too, even when I sleep on my back. My sights are set on being the same size I was at my graduation, and I am confident I will achieve it. Let me share how I did it, how it works, and most importantly, why it works. Diet and exercise are not the complete answer to the health catastrophe engulfing even the poorer nations of the world. Your biology demands a balance between sleep, activity, and food. This information is readily available; I have merely assembled it in one place. Let me explain.

Initially, I will explore the subject of sleep.

- Sleep basics
- Why we need sleep
- What happens in your brain when you think it is switched off?
- What your body gets up to when you are asleep
- Who needs circadian rhythms?
- Chemical imbalances in the brain
- What is “normal” sleep — and are you having it?

Evolutionary explanations

Secondly, I will discuss sleep disorders, what goes wrong when we do not get enough sleep, both in the short term and in cases of chronic sleep loss. I will spend some time on the subject of the massively under-diagnosed problem of sleep apnoea, its causes and treatments.

- Why are you so tired?
- The rest of the body — immune response, osteoporosis and cancer
- What are the most common sleep disorders?
- Insomnia and parasomnia
- Being ridden by the old hag — alien abduction
- Bruxing and clenching
- Snoring: social embarrassment or deadly disease?

Sleep apnoea — most people cannot even spell it. We will distinguish between simple snoring and sleep apnoea, learn the various treatments available for sufferers and the dangers of failing to respond to the warning signs.

The third part of our sleep journey will show how to get back to efficient, sound, healthy sleep to reset your metabolism so your biology works like it is supposed to.

- How much sleep?
- How to get enough sleep
- Good sleep hygiene
- What not to do. Do not sabotage yourself.

After our tour through the land of nod, we will turn to the second subject: activity. We will cover some basic knowledge of the workings of the heart, lungs and muscles, the activities humans have evolved to do and how this has a bearing on the activities that humans partake in today. We will also look at how to apply this knowledge to the modern world for a healthy lifestyle. Find out:

- What is fitness?
- The differences between strength, muscle mass and stamina
- The differences

between aerobic, isometric and high-intensity work• How fit do you need to be?• How long does it take to get fit?• Achieving and maintaining personal goals• Control your fitness levels in accordance with the task in hand• The terrible price of being too fitOnce we understand how to rest and be active, we will learn about the fuel we need to power these activities. Food, diet and nutrition are subject to more column inches of muddled thinking and misinformation than any scientific subject I know about.More of the world's wealth has been wasted on perverted science than any sane person would credit. Universities, companies and government research institutions do not seek wisdom for the benefit of humanity. They strive for commercial advantage, aspire to political patronage, prestige and sometimes, almost incidentally, the advancement of mankind. It is not evil — it is the way the system has evolved to manage and justify the vast costs of modern scientific endeavour.In the nineteenth century, many important discoveries were made by Gentlemen, usually doctors or the clergy, during their spare time working in their sheds. Now, research is conducted by large teams of well-trained graduates on full-time salaries at great expense. Therefore, the paymasters, shareholders or taxpayers want to see a return on their massive investment. Far too often, research is set up to prove a preconceived idea supporting a current dogma rather than a search for improved knowledge.With food, we will go back to basics. We will consider why we need to eat, what we need to eat and how we should be eating it. These are big subjects. Regarding what we need to eat, we will take a look at basic nutrition, the nutritional components of food and their various functions. We will also discuss how we have evolved to eat a vast array of different foods and collectively fooled ourselves into poor dietary habits — this is not a modern phenomenon.There are a variety of solutions for good nutrition. No special diet plan is needed, restricting you from enjoying the foods you love. There are not any banned ingredients on my list. Your nutritional choices should be reasonable, based on scientific principles, not pseudo-scientific dogma. I confess to drinking beer, enjoying pizza and eating too much chocolate at times during the period when I had my dramatic metabolic improvement. We will not be relying on superfoods or any special, factory-processed supplements for food replacement and weight loss.Weight loss seems to come as a consequence of changes in eating habits and metabolism, rather than a cause. What I will describe is a return to a more natural rhythm of eating based on the biology that has evolved with us over time, without going to the extreme of the Neanderthals' paleo diet. If you want to go paleo too, that is okay; it can fit in with the principals we advocate here. That said, humans invented civilisation so we could give up the paleo diet and brew beer, but that is an argument for another day. Put it this way — there are plenty of dumber diets out there.With an understanding of the biology of fuel consumption, we will venture into some of the nutritional solutions to our modern metabolic disorder and the reasoning behind them.You will learn:• The basics of nutrition• Why “healthy” options are not to be trusted• The perversion of the Glycaemic Index• How to read food labels• “Oils ain't just oils”• What has gone wrong and why• Truly healthy options• Seasonal food — grow your own?• Organic food — is it better for you?• Fresh food, local food — difficult dilemma• How to eat• Eat your food, do not drink it• Taking time, slow eating and social eating• Feasting, fasting and frugality• Wassail and Cheers, Alcohol: The original two-faced godNeither sleep, activity nor food alone is the answer to the health crisis. The real answer is to combine the knowledge of how these three factors interact to gain control of our metabolism and health. We will discuss ways to change our eating habits, feel less tired, be fitter and healthier and improve our lives by making considered changes in all three areas.Little did I know I was sleepwalking into poor health, along with most of my peers. When things were obviously not right, I made changes, but in the long run, most of these changes were merely a different path to the same

destination. It was not until I noticed how several crucial factors worked together that I saw significant improvement. I will tell you about the changes that helped me before I saw the light, and then I will share how I managed to escape my own downward spiral to poor health in a matter of months to feel better than I have for years. Best of all, anyone can do it. At the back of the book are what I call cheat sheets — simple, empirical instructions on how to implement the system without any of the explanation, perfect for those who do not feel they have the time to read the entire book at this time in their lives. That said, I do encourage you to read it, as there are variations of the system that allow a far more flexible approach than the cheat sheets might indicate. A well-rounded understanding will enable individuals to use the principles in the text to tailor their own personal regime for their desired result. A later chapter called The Bare Necessities provides an outline of the method and may be a good place to start for those in a hurry. Lastly, there will be a list of references and further reading that may be of interest. My sources of the information contained on these pages are varied. A few of the ideas — mainly the bad ones — are my own original thoughts. The rest have been obtained from:

- Scientific journals and magazines
- Undergraduate and postgraduate courses and lectures
- Audiobooks and lecture series
- Conversations with researchers and businessmen,
- Popular television programs
- Publications aimed at the general reader
- Newspapers and popular magazines.....

and last but by no means least, urban myths and apocryphal stories from blokes I met down the pub — which I have flagged with some kind of pub-related disclaimer, you will be relieved to know.

PART ONE Sleep to Health, Snooze and Lose the Ooze

Chapter 1 Sleep Basics If you believe the unlikely story of evolution, as I do, the following will not be unfamiliar. Chemicals organise themselves into crystals, while certain compounds attract or repel each other, forming interfaces resembling membranes. Shortly after the earth had cooled enough to gain a crust — somewhere in the primordial mud, probably around a subterranean vent — a group of self-organising chemicals formed the first life, something so unlikely, it has only happened once. For many, the occurrence of some sort of divine intervention is the only reasonable explanation. By a process of dumb luck, henceforth called “evolution,” some of these entities exploited biological niches and prospered, forming symbiotic relationships with other entities. They became bacteria, then single-celled organisms that coalesced into multicellular life. Life exploded into many different varieties, some with specialised cells designed to perform different bodily functions. Higher forms of life developed with cells devoted to sensory perception and centralised control. Animal brains and nervous systems are made of these cells. The world is a dynamic place with cycles of night and day, tides, seasons, and many less predictable challenges. Animals have brains to regulate their bodies and work with diverse, highly variable environmental inputs. However, the brain has a downside — every animal with a brain that has been studied thus far needs sleep. Sleep researcher Allan Rechtschaffen’s quote, “If sleep does not serve an absolutely vital function, then it is the biggest mistake the evolutionary process has ever made,” is mentioned in most discussions about sleep — and I see no reason to break with tradition. Everyone sleeps. It should not be too hard to define what it means to sleep: to lie down or make oneself comfortable, to switch off and rest the mind and body, to leave your cares behind, become unresponsive and recover — concepts high on most peoples’ list. I recently had a general anaesthetic, which was not at all like sleep. From my perspective, no sooner had I gone under than I awoke with no concept of the time that had flowed since. It was as if three hours had been excised from my life — along

with some tiny neoplasms and a couple of thousand dollars. I felt I had jumped forward in time to later that day. Never have I had sleep like that. Some people talk in their sleep. Others get up, walk around, feed themselves, and even drive their cars. I have had an incoherent conversation with a family member who had absolutely no recollection the following day. There are reported cases of sleeping people becoming violent and even committing murder.¹ It is highly likely the “alien abduction” phenomenon is a modern variation of “being ridden by the old hag,” a North American manifestation of the classical Incubus and Succubus myth, which may also be the cause of so many women being burned as witches atop seventeenth-century bonfires. These unfortunate individuals had a sleep disorder where their brains woke up, but their bodies remained paralysed in sleep. They were not, in fact, copulating with Satan or any of his demonic cohorts. So, sleep is a reversible, restful condition, distinct from anaesthesia or coma. While asleep, our environmental responses are lowered while greater stimuli are needed to rouse us than if we were merely at rest — quiet, but awake and vigilant. Sleep is self-regulated and will change, to some extent, dependent on the length of time and activity level between sleep episodes. Sleep plays a key role in our physiology. Species with more complex brains appear to have similar requirements for sleep. Birds and mammals have been studied the most, although we are more concerned with mammalian studies, as they are more pertinent to our own species. Psychology and medical students have been particularly helpful in sleep experiments. For invasive studies, rats, mice and cats have stepped up to the plate for the greater good — lawyers being too expensive. Much information has been gathered via non-invasive techniques such as the electroencephalograph (EEG), measuring electrical activity in various regions of the brain. Other tools measure the activity of eye muscles (EOG) or other muscle groups like those in the jaw (EMG). Magnetic imaging techniques allow for the real-time mapping of electrical impulses and oxygen usage in the brain. Non-invasive techniques have become so commonplace that most are regularly used in sleep centres to diagnose and treat people with sleep disorders. The EEG traces the brain’s electrical activity. While awake, this trace is not synchronised with many low-amplitude and high-frequency waves. When we are asleep, the pattern is slow, with longer-wavelength and higher-amplitude tracings occurring as groups of cells in various regions of the brain fire together in unison. Study of these patterns, along with traces of an individual’s heart rate, breathing, eye movement, muscle tension, blood pressure, and oxygenation reveal a lot about the type and quality of sleep they are experiencing. Sleep can be described in four stages. Hypnogram of a single sleep cycle. Before entering stage-one sleep, there is usually a drowsy period of relaxation and restfulness, during which an EEG trace will become slower, less chaotic, and more regular. Then, low-amplitude, irregular waves known as alpha waves start to predominate, indicating that stage-one sleep has arrived. Stage-one sleep only lasts a few minutes, and the subject can be easily roused. For example, if this stage is entered while you are driving your car and the passenger asks, “Are you okay?” almost without hesitation, you can say, “No worries,” then continue for a little while longer before your next flirtation with oblivion. Sometimes, in the transition between stage-one and stage-two sleep, one might bang the jaws shut or shudder awake, then enter the sleep cycle again. The second stage of sleep is “light sleep.” The EEG trace slows, but the amplitude increases, while eye movements slow, almost to a complete stop. People spend more time in stage-two sleep than any other stage. During this period, we can be woken up easily. While driving, a horn or the sound of rumble strips being crossed should wake you up. Your partner saying, “You are not listening to me, are you?” also has a fair chance of bringing you back and — this one applies only to women — the sound of your baby crying will not only wake you up but can also precipitate lactation, while the guilty party sleeps on without a care in the world. To

be fair, men are more likely to be woken up by the sound of footsteps or someone moving about outside than their better halves. After half an hour or so, stage-three sleep is entered, otherwise known as “deep sleep.” EEG waves are slow-frequency with high-amplitude delta waves. A lot of brain cells are firing off together like a Mexican wave in the arena of your skull. While asleep, no one has ever survived driving a car long enough to enter this stage of sleep. However, a pilot friend assures me that, on occasion, long-haul aircraft pilots have, as have oil tanker skippers — sometimes costing their employers millions in compensation payouts. Muscle tone is maintained in stage three. The eyes roll, and some dreaming occurs. You may wake up with the solution to a problem that has been bothering you or the name of the lead actor in that film you were trying to describe to your pals, unless you are of the generation where memory is considered an unnecessary chore, due to the storage capacity and total recall of the cloud — therefore, you never wake up shouting, “Conrad Veidt!” “Rutger Hauer!” or worse, “Debbie!” Mostly good things happen in this stage of sleep, including chemical rebalance, tissue repair, and deep thought organisation. Stage-three sleep takes priority during the night. In this deepest stage of sleep, it is difficult to wake up and most difficult to be woken up. If woken up during stage-three sleep, you may need a few minutes to become completely compos mentis. If your alarm goes off during this stage, you are more likely to roll over and ignore it or even be unaware of it altogether. There are researchers who describe the deepest part of stage-three sleep as “stage four.” By the latter part of this stage, the EEG trace detects none but the lowest-frequency, highest-amplitude delta waves. Some accept the descent to this deepest part of stage-three sleep as its very own stage, distinct from the dramatic final stage still to follow. The last phase is a rollercoaster ride, featuring a rapid transition back through stage-two and stage-one sleep before the final stage is entered. During rapid eye movement sleep (REM), brain traces resemble those of someone who is awake. The eyes dart around, and muscle tone decreases, while heart rate and breathing become less regular. Subjects woken up during this stage report vivid dreams, sometimes with bizarre content. It is also during this stage that nightmares occur. As REM sleep ends, there is often a brief awakening before a new sleep cycle begins. Remarkably, human sleep cycles are of consistent length, not only for individuals but also for our species as a whole: around ninety minutes, give or take. Most of us have several sleep cycles per night. Their length may be uniform, but the content changes throughout the night. Stage one and two take a little over half an hour, while REM sleep and stage three take the rest. In early sleep cycles, stage three takes the bulk of the remainder, with REM getting as little as ten to fifteen minutes. By the fourth cycle, REM may be over three-quarters of an hour, taking the spare time from stage three. The length of sleep cycles stays the same as we age, but the need for sleep decreases and sleep becomes more fragmented. Therefore, an elderly individual will often need less sleep than they did during the summer of their lives. The sleep stages also become less distinct, with elements of dissimilar stages bleeding into each other, although the overall structure remains the same. Hypnogram of a night of five sleep cycles. For optimum health, we need an average of five sleep cycles a night. Some function well on four, while others need six. Medical statistics show increased morbidity in individuals who consistently get less than six hours (four cycles) or more than nine hours (six cycles) sleep per day. Please be aware, this is time actually asleep, not in bed going to sleep. Sleep debt is a major health problem in modern society, one that we will address later in this discussion. Chronic sleep deprivation will catch up with all of us in the end, and the ferryman will be paid. It is not dedication or willpower that enables us to remain conscious for too many hours a day — it is ignorance and foolishness. Captains of industry and politicians often boast of their commitment to their vocation by indicating how little time they waste on

sleep; a flawed strategy. After as little as twenty hours of being awake, your coordination and reaction time is akin to being over the legal limit of alcohol consumption to drive. How would you feel about being governed by a bunch of alcoholics? Churchill aside, no thank you. There are a few exceptional individuals who need less than four sleep cycles a night. Margaret Thatcher tried to be one, but her life was ended by Alzheimer's disease and strokes — both conditions known to be exacerbated by a chronic lack of sleep. The Duke of Wellington, Arthur Wellesley, certainly was one, sleeping four-and-a-half hours a night throughout his career as General and then Prime Minister. Wellingtons' great adversary, Napoleon, also slept little at night. He was a sick, burnt-out man by his mid-forties. The emperor was notoriously prone to falling asleep during the day, not least in the middle of the afternoon on June 18th, 1815, leaving Ney, his impulsive, red-headed second-in-command, to squander the French cavalry at Waterloo while his master had a nice kip by a windmill. Or was that just Rod Steiger?

3 Circadian rhythms are daily cycles in your physiology, coordinating with the rhythms of the day. A day's circadian rhythm. Since life first began on earth, it has evolved with the daily cycles of light, dark, warmth, and cooling. A circadian rhythm exists. Blood pressure, body temperature, coordination, muscle strength, reaction time, mental alertness, emotional state, and hunger are just some of the functions that change during the day. Sleep debt builds up throughout wakefulness to be discharged at night or, for some, partially in an afternoon nap or siesta. Biologically, the time for the big sleep is at night, but there is a low point in the afternoon that some cultures embrace, particularly if the ambient temperature is high. Interestingly, the time drivers most often fall asleep at the wheel is 4 am, while the second most common is 4 pm — the afternoon low point of alertness in the circadian rhythm. Circadian rhythms are not as consistent as sleep cycles. They are about twenty-four hours but do vary from individual to individual, constantly resetting with the rising and setting of the sun. When deprived of sunlight for lengthy periods, the body clock ticks along at its own intrinsic rate, gaining or losing time on an individual basis until it is reset by exposure to natural light. This is important for shift workers, people who live near the poles, those who have little exposure to daylight, and, in the future, space travellers when they "boldly go where no man has gone before."

Humans have been on earth for most of the past two million years, and for the bulk of the 200,000 years Homo sapiens have existed, they have lived in small bands of closely related individuals. Fire was tamed about half a million years ago. It transformed our nights, providing warmth, protection, and a focus to the tribal nights. It was useful for different members of a group to have different sleeping patterns — some going to sleep early, some late, and some having fragmented sleep with a lengthy period of wakefulness in the middle of the night. A species with no fearsome, natural defences is at an advantage if some members of the group remain awake and vigilant throughout the night, gathered around and focused on keeping the fire going. Fireside tales may have played a pivotal part in the development of culture, language, and intelligence. Later, once man became civilised with the invention of farming and the construction of more permanent dwellings — sometimes with a ring of defences against two or four-legged predators — the pattern of sleep was very similar for all but the wealthy or desperate. At night, even in a city of our fellows, the safest place to be after dark was in a home, around a hearth. Effective public street lighting became viable in the late nineteenth century and more widespread with the invention of electric lights. Working on a history project many years ago, I conducted research on the living conditions of Kulaks in Czarist Russia prior to the 1905 revolution — think Fiddler on the Roof. This minor land-owning peasantry was actually doing it tough, even before Uncle Joe stepped in. The typical family generated a surplus that helped feed the workers in the cities and earn some cash to buy themselves

luxuries. Most families spent around two-thirds of their disposable income on kerosene to burn in their hurricane lamp — presumably to see how much vodka was left in the bottle. Think about that the next time you hear someone having a whinge about their internet download speed when they want to stay up past midnight to binge-watch the latest blockbuster mini-series. Even in Czarist Russia, technology was being used to overturn the natural rhythms of the day. Now, with our technology, we can turn night into day and run our institutions around the clock, detaching ourselves from the circadian cycles that have acted as life's daily rhythm since the day it began here on earth three-and-a-half billion years ago. However, there has been a heavy toll to pay for a lack of sleep and unnatural sleeping patterns in terms of our mental wellbeing, physical health, and safety. Accidents that occur primarily as a result of a sleep deficit rival alcohol in number and severity but attract far less official scrutiny.

Night time melatonin production Melatonin is a powerful sleep hormone produced after the sun goes down — or at least it used to be. Now, with artificial, electric light, we trick our bodies into delaying the production of melatonin, messing up our natural sleep pattern. Think of how we used to sleep; as the sun went down, some individuals produced melatonin very quickly and went to sleep early. It might have taken some time, but as the rest became sleepy, they drifted off. A few stayed up, had a late night, and produced their melatonin after dark, over the course of a few hours. These are the people we call “night owls,” our pals who do not want to leave the party until the sun is coming up. Most likely, those who went off to sleep early were the ones to rise first. These are the “larks.” Today, larks are our neighbours who mow their lawns at 7 am on a weekend, chums who send you frivolous text messages at 5 o'clock in the morning or — like me in the summer of my youth — turn up on your doorstep at 6:30 am, Coolite⁴ under arm declaring, “Surf's up.”

So, why do we need to sleep? Seemingly, Allan Rechtschaffen is right in saying it's a poor evolutionary strategy. Experts once theorised that we need sleep for energy conservation, but given the body uses only fifteen per cent less energy while we are asleep as opposed to simply resting, this is highly unlikely. In evolutionary terms, the dangers posed by the loss of vigilance must outweigh the potential energy savings. Hibernation is a different story, but humans do not hibernate. The hypothesis that sleep is a universal ruse to avoid predation is so ludicrous, the idea may have originated in a Victorian opium den. Why do predators tend to sleep longer than prey animals? And since when has playing dead been better than running away, fast? Any animal whose species' survival was dependant on lying down and being very still without camouflage as a response to imminent predation has long since become extinct. Rest and sleep allow the brain and body time to recover and repair from the day's toil. The extent of this is reflected in what goes wrong if a sufficient amount of sleep is not achieved and the conditions that occur in individuals with a sleep deficit. Avoiding the thorny questions properly addressed by philosophy and theology, let us assume the brain is just another organ like your heart or spleen. It controls your bodily functions and, in its executive role, generates your personality and thoughts. If you think you have a soul and, therefore, exist to be more than electrically excited meat until such time as you become organic waste, good for you. French philosopher Descartes said the soul is based in the head. For the sake of all those cryogenically frozen heads — mostly American — one can only hope he was right. For most, the study of neuroanatomy is a sure-fire cure for insomnia, second only to biochemistry. Let us keep it to a minimum or try to avoid it altogether. The older, more ancient parts of our brain control the vital functions of bodily regulation and maintenance. They are less affected by sleep than the newer areas that allow conscious control, as well as our thought and reasoning processes. Because so much information flows into your brain, systems are needed to homeostatically regulate bodily functions. Very little progress would be made in any field of

endeavour if we all had to spend time thinking about when to breathe in and out. Incidentally, this can happen in patients with terminal kidney failure. It is a miserable thing to watch, never mind be compelled to do. The conscious mind is better utilised thinking about how to find food, what type of food is needed, how to co-operate and mate with others — preferably of the opposite sex so as to pass on our genes to a new generation — and the meaning of life. Memories are generated, and the information is consolidated and tucked away somewhere for reference and recall at some point in the future. The brain is made up of two main types of cells. Neurons, the nerve cells, have a body with many long, projecting arms called dendrites and axons, connecting to other neurons in a vast network of interconnecting fibres — a web more complex than a whole continent of electrical wiring which, much like our power grid, works on electricity. Chemical waves pass signals along the dendrites and axons to and from synapses, the connections between the cells. Synapses have spaces where signals are passed from one cell to another. Transmitter chemicals flood the space between cells, and when enough concentration of transmitter chemical fills the space, a new signal is generated in the target neuron. The signal progresses down the target dendrite and along the neuron's axon as an electrochemical wave of ionic disruption to the next target cell or cells. Recently, it has been discovered that these brain cells can reproduce, and the interconnections between them can increase or decrease, probably as part of the basic mechanics of thought, memory, and learning. Just over half of the cells in the brain are glial cells. Several types of cells make up this group, formerly thought to act only as a type of glue, holding neurons in place. Now, we know these cells possess other vital functions. Not only do they form a scaffold for the brain, but they also play a significant role in maintaining optimum nutrient and oxygenation levels for the efficient function of neurons. Fats in the glial cells insulate the discharging axons and dendrites while wandering glial cells have an immune function that destroys pathogens. Brain cells are the show-ponies of the human body. Other tissues can burn carbohydrates, fats, proteins, and the often-unmentioned alcohol. The brain may only represent two per cent of our body mass, but it requires around twenty per cent of the blood output of the heart. However, brain neurones can only use glucose for energy. The brain stores a limited amount of energy in its glial cells — in long chains of glucose molecules called glycogen — to respond to a local increase in activity, topping up glucose supplied by increased blood flow. During wakefulness, as the chemical balance of the brain is disturbed, a sleep debt builds up in the form of increased levels of undesirable chemicals, which need to be eliminated, replaced, and rebalanced during sleep. During sleep, the glial cells shrink in volume, allowing a tidal flow of fluids to flush away harmful chemicals and replenish the required stores. The flow of fluids in the brain during sleep is many times that of the awake brain — especially in mice. Now we know that brain cells can reproduce and form new networks as we age. This process is much faster during sleep. Glial cells have been shown to grow twice as fast during sleep compared to wakefulness, and sleep is essential for the growth and maturity of neurons. In subjects with sleep debt, neurons may not grow at all. Furthermore, newly generated cells fail to mature and will die if the subject does not get sufficient sleep. It takes about a month for a crop of neurones to mature and find their niche in the neural net. If they do not find a place, they die off. If they fail to mature, they are not available to form new memories or repair damaged tissues. Ultimately, as the neurons are dead and gone, we cannot catch up on our sleep. The multiplication and growth of neurons, along with the changes in their connections to one another's dendrites and axons, is the physical mechanism of establishing memories. Studies have repeatedly shown poor sleep results in poor memory formation, learning of abstract concepts, and motor tasks. In contrast, the best way to minimise the onset of Alzheimer's

disease as we age is probably to maximise the production of new brain tissue by continuing to learn new physical activities and broaden our minds intellectually — all the while, getting a good night's sleep. As I write this, an article has appeared as headline news in *The International Express* titled "How to Keep Your Brain Sharp: Life's Simple Seven Program," drawn up by the world's leading doctors, with a view to keeping killer conditions like strokes and heart disease at bay by maintaining a healthy, active brain. The advice is the same as "Life's Simple 7," as recommended by The American Heart Association for heart health. It is all good advice: control your blood pressure and cholesterol, maintain normal blood sugar, be physically active, eat a healthy diet, lose extra weight, and stop smoking. Given the information I have briefly outlined so far, it is hard to fathom why there is no mention of getting adequate sleep. Perhaps their marketing guru, a pimply adolescent with a marketing degree from a recently promoted, new-age "university," has persuaded the committee that ideas must be presented in odd-numbered lists for maximum impact. Thinking about it, how many famous lists of eight can you recall? Seven is no problem: The Seven Wonders of the World, the Seventh Seal, the Seven Sacraments, the Seven Pillars of Wisdom, Seven Samurai, the Seven Deadly Sins, the Seven Kingdoms (the Heptarchy, not *Game of Thrones*), The Magnificent Seven, and Snow White and the Seven Dwarves. In contrast, I have only come up with The Eight Beatitudes — and I can only think of, "Blessed are the cheesemakers."⁵ Now we have dipped our toe in the pool of sleep knowledge, we can revisit the sleep cycle and examine what is happening during its various stages. During stage one, the mind is shutting down for the business of sleep. Stage two, being light sleep, is entered first. In this stage, short-term memories are sorted and rearranged. We have limited capacity in our short-term memory, something we have known for some time. It is one of the reasons educators allow young children a nap in schools, so they wake refreshed and capable to take on more knowledge. The same applies to the adult brain, a fact lost on adult educators, who seem to think two hours-plus is a reasonable length for detailed subjects. It is not. By the second hour of one of these marathon addresses, science tells us that I am not the only one being kept from falling off my chair asleep by the painful signalling of my bladder, rather than the scintillating revelations of the lecture content. Our heads — if not our bladders — are already full. Short naps of less than half an hour allow the brain to sort through and refresh its short-term memory, increasing learning and brain function. The message is finally getting through to some progressive institutions, who encourage short periods of sleep during the working day. If we sleep for long enough to enter stage-three sleep before waking up, we are unlikely to feel refreshed. In this stage, long-term memories are being formed, reorganised, and referenced. It is why Rutger Hauer may spring to mind as the brain trawls through unconscious thoughts. Dreams do happen during this stage, but they tend to be of the type where life's problems are worked out. It is best not to set an alarm to wake up during this phase of sleep. Anyone waking up feeling groggy and washed out has most likely woken from stage-three sleep. As stage-three sleep and REM sleep have variable time lengths, and REM follows stage three, it is difficult to isolate, and study REM. Subjects woken during this last stage of sleep report vivid, sometimes violent or distressing dreams. Many sleep disorders are associated with disturbances of REM sleep. We currently think that, during this phase, our mind deals with emotional upheaval, quantifying and rationalising our response and damping down horrors, enabling us to progress with life. It is often not good to be awoken during this emotional rollercoaster. If we have time for a long nap or siesta, it is best to schedule a whole sleep cycle. Prepare to sleep for either the full ninety minutes or only thirty if you want to awake refreshed, not befuddled. When I nap, I set my alarm for just under two hours' time, so I am assured of a full sleep cycle and do not get woken up in

REM or deep, stage-three sleep. Almost without fail, I wake up before the alarm sounds at the end of a sleep cycle. In summary, for the brain, sleep is essential for learning, growth, and waste removal, but what about the rest of the body? My mother used to say, "You need to get enough sleep, or you will get sick and it will stunt your growth." Although much of her medical advice was, at best, of dubious credibility, in this instance, there is more than a grain of truth to it. The best way to illustrate how sleep is good for your body is to see what happens when we do not get enough — our next subject.

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