Day2

The Chapters Ahead

Chapter 1 describes the distinct feeling of each happy chemical. We'll see how dopamine, endorphin, oxytocin, and serotonin evolved to reward specific survival behaviors. And we'll see how rewards create expectations about future rewards.

Chapter 2 explores unhappy chemicals. They get our attention when we face threats. Unhappiness will always be with us because a big-brained social animal can always find potential threats to its prospects. The chapter presents an array of threats that alarm your limbic system without your intellect knowing why.

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1

Meet Your Happy Chemicals

Your feelings are unique, but the molecules that cause your feelings are the same as everyone else's.

Your life experience is unique, but it overlaps with others because each brain focuses on its own survival.

You may not think you're focused on your own survival. Your aim is loftier when you talk to yourself in words. But your happy chemicals respond to improvements in your survival prospects, however you've learned to define them.

Meet Your Dopamine

what?
a case in point

A marathon runner gets a surge of dopamine when he sees the finish line. A football player is fueled by dopamine as he scores and does a victory dance. "I did it!" the brain tells the body. It feels so good that the brain looks for ways to trigger the feeling again.

Of course, dopamine didn't evolve for crossing arbitrary lines on the ground. It evolved to release energy when you're about to meet a survival need. If an ape climbs a high tree for a delicious mango, dopamine spurts as he nears the reward. That tells his body to release the reserve tank of energy, which helps him do what it takes to meet his needs. He doesn't say "I did it!" in words, but neurochemicals create that feeling without need for words.

When that ape was young, a bite of mango triggered his dopamine because it's full of survival-enhancing sugar. That paved a circuit which now spurts dopamine as soon as he sees a way to get another mango.

Dopamine helped our ancestors survive by managing their energy. They foraged for food by walking slowly until they saw something that looked promising. That triggered dopamine, and they surged ahead. The mammal brain scans constantly for potential rewards, and dopamine is the signal that it has found some.

Our distant ancestors didn't know where their next meal was coming from. Humans foraged constantly before they learned to store food. They survived by scanning for evidence of food and releasing their energy when something looked promising. Evidence of a reward triggers dopamine, which motivates your body to invest its energy. Even if you are not foraging in the wilderness, you are constantly deciding when it's worth making an effort and when it's better to conserve your effort. Your dopamine circuits guide that decision.

You built those circuits from past dopamine experiences. Imagine a child foraging with his mother. The child sees her get excited when they find a delicious berry patch. Before the child ever tastes a berry, his mother's excitement activates his mirror neurons and he starts triggering dopamine. Then he tastes the berry. Such intense sweetness and flavor are rare in the state of nature, so his neurochemicals tell him "Wow! This meets your needs. Get more of it!" The dopamine surge connects all the neurons active in his brain at that moment. Those connections enable the child to find berries in the future.

The happy chemical does double duty. It creates a good feeling by unleashing energy, and it stores information that can lead you to the good feeling again. Without effort or intent, dopamine surges build a neural template that responds when you see signs of a reward you've already experienced.

Humans are not born with circuits for finding food the way most animals are. We must build these from experience. Today, we learn to forage for career opportunities, and then we might forage in a cookbook or on the Food Network. But before there were words or maps, people found food because dopamine connected neurons. When something felt good, that feeling wired you to recognize the signs when you seek more of it. Dopamine supplies the road map and the motivation to travel it.

When you taste a berry, you may not get that "Wow!" because the taste is no longer rare. Your brain saves your energy for rewards that are scarce in your life experience. When the first cherries of the season appear, I get a rush of excitement just from looking at them. But my excitement doesn't last. I can't be happy all the time by looking at cherries. My dopamine responds to things more relevant to my survival instead of wasting my energy on things that are easily available.

Social rewards can't be mass produced like sugar and berry flavoring. When you seek and find social rewards, dopamine releases energy. People invest years of effort trying to become a heart surgeon or a rock star because each step along the way triggers dopamine. Even if your goal is committing the perfect crime or living on the beach, your brain releases dopamine as you seek and find markers along the way. Which social rewards trigger your dopamine depends on the experiences that built your circuits.

Every squirt of dopamine ends, alas, and you only get more when your brain sees another chance to approach a reward.

The fleetingness of dopamine was illuminated by a recent monkey study. The animals were trained to do a task and get rewarded with spinach. After a few days, they were rewarded with squirts of juice instead of spinach. The monkeys' dopamine soared. That seared the information: "This reeeally meets your needs" into their neurons.

The experimenters continued giving the monkeys juice, and in a few days something curious happened. No dopamine spike. The monkeys' brains stopped reacting to rewards that just came on its own. In human terms, they took it for granted.

When there's no new information, there's no need for dopamine. When you need to record new survival rewards or new ways of getting them, your dopamine is there.

This experiment has a dramatic finale. The experimenters switched back to spinach, and the monkeys reacted with fits of rage. They screamed and threw the spinach back at the researchers. They had learned to expect juice, and even though it no longer made them happy, losing it made them mad.

Such research improves our understanding of dopamine significantly. For most of human history, people functioned without scientific knowledge of their neurochemistry. Then in the 1950s, an electrode was inserted into a rat's brain in a spot later held to be its dopamine or reward center. The rat could press a lever that activated the electrode. He seized the day, pushing the lever constantly until he dropped dead. He would not stop for food or water or attractive mates. At the time, scientists speculated that the electrode was in his "pleasure center." But why would a brain define pleasure in a way that motivated it to die rather than eat, drink or mate? Many decades of research later, we realize that it's the *expectation* of reward that triggers dopamine. The unfortunate rat kept expecting to get food from the lever because it triggered so much more dopamine than food itself.

Cocaine stimulates more dopamine than normal life. It gives you the thrill of finding berries or finishing a marathon without leaving the couch. You get the excitement of accomplishment without having to accomplish anything.

Mothers have been seen lifting cars when their child is pinned underneath. A huge potential reward triggers a huge surge of dopamine. Saving your child's life is the biggest reward there is from the perspective of your genes. A mother is not consciously thinking of her genes when she risks her life to save her child. She's not thinking at all. Such mothers report they had no idea what they were doing. The verbal part of the brain is not needed for a dopamine circuit to unleash the energy needed to do the job.

The link between dopamine and survival is not always obvious. For example, computer games stimulate dopamine, though they don't meet real needs. Computer games reward you with points that your mind may link to social rewards. You get the points by activating the seek-and-find mechanism that evolved for foraging. Dopamine surges each time you get the reward you seek. If a computer game gave you a good feeling at a time when you were feeling bad, your brain learns that it's a way to make bad feelings go away. Gaming eliminates survival threats, from the mammal brain's perspective. The next time you feel bad, scoring points on a computer game is one way your brain knows to feel good.

Dopamine experiences	
List examples of the joy of seeking and finding: at work, at play, in yourself and others.	

well-fed

Your ancestors never stopped seeking. When their bellies were full, they looked for ways to make better arrows and better shelters. They searched for days to find the right materials. It felt good because they anticipated rewards. When they found what they sought it felt good for a moment, and then they went back to seeking. The urge for more did not start with "our society." Life experience teaches you which ways of investing your effort are likely to be rewarded, whether a material reward, a social reward, or the relief of a bad feeling.

If you are studying for a math test, you are fueled by dopamine. You may or may not consider it a "good feeling." But something in your life experience has connected math skills to other rewards. It could be material rewards, or social rewards, or just the good feeling of getting the right answer. Solving math problems is a seek-and-find activity, even though it's different from foraging. When you find that your answer is correct, you get that "I did it!" feeling, which erases any bad cortisol feelings for that moment. And if your answer is wrong, you may seek the right answer again because you still expect the reward.

Sometimes the reward you expect is another neurochemical. For example, if you expect a hug after washing the dishes, dopamine motivates you to do what it takes to get that oxytocin. If you expect a promotion after working overtime, dopamine keeps you going in expectation of the serotonin.

An athlete spends long hours training in expectation of future rewards. Each small step toward the reward triggers a small amount of dopamine. Scoring points or winning a medal triggers a big burst of dopamine. But trophies and medals are not the reward itself. They are simply evidence that the reward is approaching. An athlete expects more survival-relevant rewards, be it material rewards, or social rewards, or internal rewards, depending on the circuits that athlete has built. Dopamine tells you when to expect a reward, and you invest effort in anticipation of it. The bigger the reward and the closer you get to it, the more of that great dopamine feeling your brain releases.

Meet Your Endorphin

"Euphoria" is the word often used to describe the endorphin feeling. But this neurochemical did not evolve for good times. Physical pain is what triggers endorphin. You may have experienced this if you took a bad fall and got up thinking you were fine, only to find yourself in pain a little later.

Endorphin masks pain for a short time, which promotes survival by giving an injured mammal a chance to reach safety. If your ancestor broke his leg while hunting, or got worn down by hunger and thirst, the oblivion of endorphin helped him keep doing what it took to save himself.

"Runners high" is the well-known endorphin experience. But a regular daily run does not make you "high." You have to push beyond your capacity to the point of distressing your body to get that good feeling. This is not necessarily a good way to promote survival. Endorphin did not evolve to motivate you to inflict pain on yourself. It evolved to help you escape pain.

Perhaps you've seen a zebra wriggle out of the jaws of a lion on a wildlife documentary. You see the zebra run for its life with its flesh ripped open by the lion's teeth. Endorphin masks the pain for a few moments, which helps the zebra escape. If it fails to escape and ends up in the lion's jaw, it will die in an endorphin haze. Nature's euthanasia is nice to know about while you watch disturbing footage of predator devouring prey. Endorphin was not meant for partying but for momentary respite in the brutal struggle for life.

The respite is brief because pain has survival value. Pain is your body's signal that something is urgently wrong. If you ignored pain all the time, you would touch hot stoves and walk on broken legs. You would not make good survival choices if you were always high on endorphin. Masking pain promotes survival in narrow circumstances, but we evolved to notice distress signals, not to mask them with oblivion.

Endorphin is called the body's "natural morphine." The truth is the opposite: morphine is artificial endorphin. Opium derivatives, like heroin, make you high because they fit into the body's natural endorphin receptors.

Laughing triggers a bit of endorphin, and so does crying. The internal convulsions of laughing and crying cause physical distress. The distress is very brief so the burst of endorphin is too. This road to euphoria is limited. Fake laughs don't trigger the internal convulsions, and real laughs only last for seconds. Real cries are painful, and fake cries don't trigger the necessary bodily distress, despite the psychic distress.

Endorphin experiences

List examples of a good feeling that masks physical pain, in yourself and others.	

Endorphin is different from adrenaline. Skydiving and bungee jumping trigger an "adrenaline high," because you anticipate pain. Adrenaline releases the energy you need to handle an emergency. The "adrenaline junkie" is not seeking pain– he seeks to avoid pain. The brain anticipates pain when it sees the ground rushing at you, so it releases a lot of adrenaline. When you're on a roller coaster in an amusement park, you tell yourself the threat isn't real. But your brain evolved in a world of real threats, not self-imposed, artificially concocted threats. When it sees lots of threat signals, it releases the adrenaline.

This book does not cover adrenaline because it does not cause happiness. It causes a state of arousal, as if your body is stepping on the gas. Some people get to like that feeling, but it is not a "good for you" signal from your mammal brain's perspective. It is simply a signal that something is extremely relevant to your survival, either good or bad. For example, if you are about to accept the Nobel Prize from the King of Sweden, a spurt of adrenaline tells you that the moment is important. The same spurt would alert you if your parachute didn't open. Adrenaline amplifies the positive or negative message conveyed by the other neurochemicals. It prepares you for immediate action, but it doesn't tell you whether that action should be going toward or running away.

Social pain does not trigger endorphin the way physical pain does, except for a brief laugh or cry. A broken heart doesn't trigger endorphin the way a broken bone does. In the past, daily life held so much physical pain that social pain was secondary. Today, we spend less time suffering the pain of physical labor, predator attack, or deteriorating disease. Our attention is free to focus on the pain of disappointed social expectations. This leaves us feeling that life is more painful even though it's less painful than in the past.

Meet Your Oxytocin

When you have a good feeling about someone, oxytocin causes it. When you feel you can trust a person, or you enjoy their trust in you, oxytocin is flowing. The feeling of belonging, and of safety in numbers, is oxytocin too.

Social trust improves survival prospects, and it feels good. The brain motivates you to build social bonds by rewarding them with a good feeling, and thus promotes survival.

Feeding a horse is a very simple example of the oxytocin feeling. When I walk toward a horse with food in my hand, I am not sure I want to put my fingers near those huge teeth. The horse is not sure he wants a stranger in his face. We check each other out slowly. Each brain is scanning for evidence that it's safe to trust. When both of us are satisfied that the other doesn't pose an immediate threat, we relax, and it feels good. That's the release of oxytocin.

Trust helps a horse survive in a crucial way. By trusting its herd-mates, a horse gets an extended alarm system. Each horse shares the burden of staying alert for predators. The horse that trusts his fellow horse is more likely to survive.

Mammals live in herds and packs and troops because there's safety in numbers. A mammal doesn't consciously decide whether to stick with the herd or strike out on his own when he wakes up each morning. Instead, his brain produces a good feeling near the group, and a bad feeling when separated. Cortisol surges when a herd animal can't see at least one of his group, and oxytocin surges when he's reunited with them.

Mammals leave the group when it promotes reproduction. Young mammals typically transfer to a new troop at puberty to improve mating opportunities.[1] A mother mammal risks leaving the group to search for a lost child and to give birth. Reproductive behaviors trigger even more oxytocin that mere companionship, which motivates a mammal to leave the group when it's good for his or her genes.

When a female gives birth, her oxytocin surges. This facilitates labor and lactation, and motivates her to guard the newborn constantly. Oxytocin also spikes in the newborn's brain, so a young mammal clings to its mother long before it comprehends the danger of leaving her. Attachment to the mother is the build-up of oxytocin circuits, and over time this attachment transfers to a herd or pack or troop.

Touch triggers oxytocin. Primates are often seen grooming each other, running their fingers through a troop-mate's fur to remove debris. The sensation feels good to both the giver and the receiver thanks to oxytocin. Primates invest lots of time grooming each other, and it appears to establish social alliances. When there's a conflict within a primate troop, monkeys and apes rush to the aid of the individuals they groom with. Researchers find that monkeys and apes with more social alliances get better mating opportunities and have more surviving offspring. The good feeling of oxytocin motivates social grooming and that promotes survival.

The down side of herd behavior is obvious to humans. We worry about jumping over cliffs when the other lemmings jump. We worry about group-think and gangs and co-dependence. Before you dismiss the herd impulse, it's important to understand its value in nature. A solitary mammal is quickly eaten by a predator. It's hard to stay alert for predators all the time. Sticking with a herd distributes the burden of vigilance among many eyes and ears. To us, it seems foolish to run as soon as a herd-mate runs. But the mammal who refuses to run until he sees the lion for himself is less likely to survive. Brains that refused to trust got weeded out of the gene pool, and natural selection produced a brain that is able to trust its mates.

Reptiles, by contrast, stay alone in their vigilance. A reptile has no warm and fuzzy feelings toward other reptiles. Lizards don't trust other lizards. They have a chemical equivalent of oxytocin, but they only release it during mating and childbirth. Mammals release oxytocin (and variants that differ by an atom or two) more often, and we have lots of oxytocin receptors. Each release of oxytocin links all the neurons firing at the time. We associate the good feeling with those around us, and thus attachment builds.

Attachments make mammals what they are. We care for our young, which make it possible for our young to be born without survival skills. We learn from experience instead of being born pre-programmed. Reptiles, by contrast, strike out on their own the moment they're born. Instead of relying on parental care, a young lizard starts running the instant he hatches from his shell. If he doesn't run fast enough, a parent eats him—the better to recycle the energy into another sibling instead of letting a predator get it. Fish don't even wait for their eggs to hatch. They swim off the moment their eggs are fertilized, to pursue other interests. Plants send their seed into the wind and never find out whether it grows into mighty oaks.

Plants and fish and reptiles survive because they are born with hard-wired survival knowledge. Mammals are born fragile and stupid, but they learn from experience while under the protection of their elders. Instead of being born with a brain that develops in the safety of the uterus or egg, our brains develop by interacting with the world around us. This wires us to survive in the world we actually live in rather than the world of our ancestors.

The smaller an animal's brain, the more it survives on pre-wired knowledge. The bigger an animal's brain, the more it incorporates life experience into its survival strategy. A pre-wired brain is good at surviving in a specific ecological niche, and dies quickly outside that niche. A big brain is born ready to make connections rather than with the connections themselves.

The larger a creature's brain, the longer it remains fragile after birth, because it takes time to fill a brain with a network of connections. This creates a survival challenge because fragile newborns are easily eaten by predators. In older species, females gave birth to hundreds or thousands of offspring in order for a few to survive. But that makes it impossible to invest in each one. Mammals developed a very different strategy. We have very few children and do our darnedest to keep every single one alive.

This is a risky reproductive strategy. The more you invest in each child, the more you lose if it dies. Attachment is what makes this strategy possible. Mammalian mothers guard each newborn constantly, and herds help them protect the young from predators. When a mama mammal loses a child, she loses a big chunk of her lifetime reproductive capacity, but oxytocin keeps motivating attachment.

Not long ago, most humans spent their lives in the network of attachments they were born into. Now, many people disparage attachments. Without them, however, we feel like something is wrong. We don't know what it is, but we long for the place where "everybody knows your name." Or the concert and sports arena where thousands of people share your ups and downs from moment to moment. Or the political group that shares your anger. Or the online forum that welcomes your comments. These things feel good because social trust stimulates oxytocin. Of course, they are only brief moments of trust– small squirts of oxytocin that will soon pass. That's why the brain is always looking for a chance to get more of that oxytocin feeling.

Oxytocin experiences	
List examples of a good feeling triggered by social trust, in yourself and others.	

While trust feels good, betrayed trust feels awful. The bad feeling of disappointed trust motivates mammals to decide carefully when to trust and when to withhold trust. Big-brained primates are choosy about their friends. Instead of all-or-nothing attachment to a group, monkeys and apes have enough neurons to form individualized attachments with troop mates. They might make an oxytocin link with one social interaction and a cortisol link with the next. Over time, you “know who your friends are” because your neurochemicals react to individuals as “good for your survival” or “bad for your survival.”

When you spend time with people, you can’t help noticing that social alliances are constantly being negotiated. You may find it annoying when other people do it. But when you do it, you feel like you’re just trying to survive. Social alliances transform a bad, threatened feeling into a good, safe feeling, thanks to oxytocin.

Monogamy is rare in the mammal world, except in animals known to have a high level of oxytocin (or its chemical equivalents). Monogamy is common among birds, who also engage in parental care and produce an oxytocin-equivalent. Most mammals form long-term bonds with foraging partners rather than sex partners. This promotes survival. You might have mixed feelings about the people you eat and work with. You might not trust them all the time and even wonder why you put up with them at all. But when you leave them, your oxytocin falls and your mammal brain tells you that something is wrong.

Meet Your Serotonin

Getting respect feels good because it triggers serotonin. The good feeling motivates you to seek more respect, and that promotes survival. You may say you don't care about getting respect, but you can easily see this dynamic in others. In the animal world, getting respect clearly promotes an individual's DNA. They're not thinking about genes, of course. Mammals seek social dominance because serotonin makes it feel good.

In one study, an alpha vervet monkey was placed behind a one-way mirror to deprive him of the respect he usually got from his troop-mates. The mirror was placed so that the alpha could see his troop-mates, but they couldn't see him. He made the dominance gestures typical of his species, but his subordinates did not respond with submission gestures. The alpha got agitated and his serotonin level fell. Each day the experiment continued, his serotonin kept dropping and his agitation grew. He needed their submission to keep up his serotonin.

All living creatures have serotonin, even amoeba. One-celled animals use it in a way that's curiously relevant to us. We humans have more serotonin in our digestive system than we have in our brains. An amoeba is too small for a separate digestive system and nervous system, but it uses serotonin in a way that helps us understand its dual purpose. Serotonin signals the amoeba's body to move toward food, and prepare to receive food. The mechanism is astonishingly simple. An amoeba constantly forages and scans for danger by letting tiny amounts of water pass through its cell membrane. If the water sample shows a high concentration of foreign material, the amoeba interprets that as danger and it wiggles away. If the sample contains a low level of foreign material, the amoeba perceives a feeding opportunity and releases serotonin. The neurochemical causes its digestive juices to flow and its tail to forge a course straight ahead. Serotonin is the amoeba's response to the perception that it's safe to feed.

In mammals, serotonin is the good feeling of having secure access to food or other resources. In a mammalian herd or pack or troop, food and mating opportunities are typically dominated by stronger individuals. This may seem to conflict with one's pristine view of nature. But close observation of countless species shows that each has its way of competing for resources. When animals cooperate it makes headlines, but much of the time animals are having food fights, battling over mating opportunities, and doing everything and anything to get their kids ahead. Humans strive to curb these impulses, but we've inherited a brain that rewards social dominance with serotonin.

Imagine a piglet born in a litter of sixteen to a mother who has twelve teats. Each piglet struggles for nourishment from the moment of birth. Complex decisions are required. The more a piglet struggles, the more energy it consumes. But without struggle, it starves to death. Serotonin mediates these decisions. Each time a piglet dominates another, it gets a squirt of serotonin. That feels good, which motivates it to dominate again. The more nourishment it gets, the more its dominance-seeking efforts are likely to succeed. If it fails to dominate, its serotonin falls. That also promotes survival by reducing its motivation to dominate, so it spends less energy and survives on the food it has. The ups and the downs of serotonin both promote survival, by balancing energy expenditure with food intake.

If the piglet got seriously malnourished, its cortisol would spike. That would promote survival by triggering aggression. Aggression is different from social dominance because cortisol feels bad while serotonin feels good. Social dominance is the calm, secure feeling that your needs will be met.

When a piglet has enough energy, it strives to dominate a teat. If it succeeds, it starts striving for a better teat– one that's closer to the mother's heart. What makes the top teats better than the hind teats is still being debated by researchers, but farmers have known for centuries that piglets struggle mightily to get a better one.

Mother Pig does not intervene in this conflict. The siblings sort it out for themselves in a few days. Each piglet learns from experience. It builds expectations about which behaviors are likely to bring pain and which are likely to get rewarded. When a piglet sees a safe chance to forge ahead and meet its needs, its serotonin flows.

Nice people don't talk about the competition for resources in nature. In polite society, it's forbidden to acknowledge that social dominance feels good. But everyone has a brain that longs for the good feeling of serotonin. Everyone can see this motivation in others. The point is not that you should push your way to the best teat. The point is that your brain constantly monitors your access to the resources you need to survive.

When the access seems secure, you feel good. And then you look for ways to make things more secure.

You may get annoyed when you see others trying to secure their position. But when you do it, you think, "I'm just trying to survive."

Securing resources is complicated when you live in a group. A solitary reptile doesn't worry about what others will do when it finds a piece of food. It just lunges. But if group-living mammals all lunged at a bit of food, some of them would get hurt. The smaller, weaker ones would get hurt. Avoiding injury promotes survival more than any one bit of food. So each brain monitors those around it and decides whether it's stronger or weaker before it acts on the impulse to eat. When it's weaker, it restrains itself until the other has eaten. When a mammal sees that it's stronger, its serotonin surges and it lunges at the food. It has to eat when it can in order to survive. [2]

Studies "proving" that animals are altruistic often make the news. There's a big demand for evidence that nature is good, and researchers create a supply that meets the demand. In the name of science, hundreds of trials are done, and only the instances that can be construed as altruism are reported. Often, they emerge from artificial situations concocted in a laboratory. When adult animals snatch food from the mouths of juveniles in their daily routine, you don't hear about it in the news.

Young mammals quickly learn to avoid injury by submitting to stronger individuals. Being dominated hurts, and the cortisol it triggers wires a youth to avoid conflict. That may look like "cooperation" to the casual observer, but the animal still wants its chance to eat and reproduce. So it seizes opportunities where it's likely to win without getting injured. I am not saying we should dominate the weak. I am saying each brain is focused on meeting its needs.

Animals can't save money for a rainy day. The only way they can put something aside for the future is to invest today's extra energy into social power that can help them survive tomorrow. That's why each mammalian herd or pack or troop has its status hierarchy. The organization is not conscious, of course. Each individual simply remembers whom they fear and whom they trust, and a hierarchy emerges organically. Cortisol motivates each individual to hunch down in self-defense in the face of a stronger group-mate. And serotonin motivates it to relax and swell its chest swell with pride (or air, depending on how you look at it) when it is strong enough to get respect and meet its needs.

A cow who pushes her way to the center of the herd is safer from predators than a cow near the outer edge. The pushy cow improves her chances of living to reproduce and keeping her young alive. Bulls typically avoid the herd until mating time, when they ferociously battle other males for admission. The most dominant bull pushes his way to the center of the herd, where he meets and inseminates the most dominant cows. In each species, social dominance promotes reproductive success in one way or another. I am not advocating such behavior, but recognizing the effort it takes for humans to restrain these urges.

In the animal world, higher-status males generally get more mating opportunity. Higher-status females tend to be more fertile and their young have higher survival rates. Social dominance brought reproductive success, so brains that seek social dominance were naturally selected for.

Humans learn to restrain the dominance urge because that promotes social trust (oxytocin). Your brain is always trying ways to get more serotonin without losing oxytocin or increasing cortisol. For example, if your comment in a meeting gets respect, that feels good. But if you try to dominate the meeting, unfortunate side effects may catch up with you. Each time you get respect, your brain makes links that help you figure out how to get more. Each time you lose respect, your brain makes links that help you avoid losing it in the future.

Life experience wires each brain to perceive respect in its own way. If you set your sights on being master of the universe, you may end up feeling disrespected much of the time. Your life may be fine in objective terms, but if you expect continual admiration from others, you may experience a lot of disappointment. Another person might learn to feel satisfied with the respect they are getting from their world, and thus enjoy the calm, secure feeling of serotonin.

Serotonin experiences	
Examples of social respect triggering good feelings, at work, at play, in self and others.	

Social dominance is different from socio-economic status. A person whose's #3 on the world billionaire list might feel like his survival is threatened when he falls to #4. By contrast, a person with little socio-economic status could harshly dominate those around him and feel good about it. Many social dominance strategies are unrelated to formal wealth and status. Appearance is a good example. One person may feel respected for their appearance, while another feels disrespected, even if the two people look the same. Our neurochemicals depend on the expectation circuits we've built.

Anti-depressants, like *Prozac*, are known for raising serotonin levels in the brain. The function of serotonin was not understood when anti-depressants were introduced to the public, in the same way that aspirin was used long before anyone knew how it worked. Now, animal studies offer insight into our neurochemical ups and downs. But these insights are unsettling. The dominance-seeking urges of mammals are not a simple antidote to depression. They are only a window into the value of circuits that trigger self-respect.

Each of the happy chemicals turns on for a specific, survival-relevant reason. Then it turns off so it's ready to react to the next survival opportunity that comes your way. When a happy-chemical spurt ends, unhappy chemicals get your attention. We strive to eliminate unhappy chemicals or at least mask them with happy chemicals. But unhappy chemicals are here to stay. The following chapter explains why.

2

Good Reasons to Be Unhappy

Unhappy Chemicals Are Nature's Security Alarm

When you see a lizard basking in the sun, it looks like the picture of happiness. But that lizard is just trying to avoid death. Cold-blooded reptiles must sun themselves often or they die of hypothermia. But when a lizard goes out in the sun, he risks being eaten alive by a predator. So he shuttles constantly between the lethal threats of sun and shade.

And his brain is perfectly adapted for the job. It releases cortisol when his temperature is dangerously low, which motivates him to go out sunning. But as soon as his body reaches a safe temperature, he runs back to the good feeling of a safe hiding spot. While he's exposed and vulnerable, his brain constantly scans for predators, ready to run at the slightest whiff. He is not having fun yet. But he survives, because his brain is skilled at weighing one threat against another.

You have the brain of a reptile at the base of your limbic system. Mammals built on top of reptilian brain structures rather than starting from scratch. The systems we added release happy chemicals to mediate social life. But we still use the reptile brain for the jobs it is good at, like alerting the body to potential harm. Nature adapts old parts rather than starting over.

Your brain stem and cerebellum are eerily similar to a reptile's brain.[1] You are good at avoiding survival threats because your brain releases cortisol when something looks bad. Of course, you can make fine judgments about potential threats because your cortex brings its huge information-processing capacity to the job. But your cortex cannot make judgments without your neurochemicals. It sees the world as a mass of detail until neurochemicals mark things as good for you or bad for you. Your cortex is always working together with your older brain systems. You need your reptile brain to avoid harm.

Cortisol is the brain's emergency broadcast system. Corticoid hormones are produced by reptiles, amphibians, fish and even worms, when they encounter survival threats. It makes them feel bad, and motivates them to "do something, now."

Cortisol is what humans call "pain." Pain gets your attention. It feels bad because that succeeds at getting your attention. Once you experience pain, you don't want to experience it again. Your brain strives to avoid pain by storing details of the experience, so you know what to look out for in the future. When you see things associated with past pain, your cortisol is triggered and you get ready to do what it takes to avoid more pain.

A big burst of cortisol is what we call "fear." Small drips of cortisol are "anxiety" or "stress." These bad feelings tell you you're in immediate danger of pain, and your cortex tries to figure out what the danger is. Your reptile brain can't say why it released the cortisol. It just responds when electricity flows down a pathway you connected in the past. You built those pathways from real experience, so the danger feels real to you. You want to avoid stress, but you want to avoid harm even more.

Bad feelings are often caused by real threats, so avoiding bad feelings promotes survival. Cortisol does its job by motivating us to do what it takes to eliminate bad feelings. We dream of a life with no bad feelings, and a world in which everything that makes us feel bad is gone. But our brains will keep releasing cortisol. We need it to avoid real risks as much as we need happy chemicals to steer us toward rewards. Sometimes we may seem over-react to threats, and other times we may mask threats with happy chemicals. Survival threats are not perfectly predictable, so we need both our neurochemical warning system and our information-processing cortex.

Valuing Unhappiness ?

When a cautious reptile brain is hooked up to a dominance-seeking mammal brain and a pattern-seeking human cortex, it's not surprising that alarm signals are triggered a lot. If you expect to eliminate unhappy chemicals from your life, you are likely to be disappointed. You are better off accepting the part that unhappy chemicals play in human life. Cortisol is not just the cause of unnecessary pain. Much of the time, it succeeds at preventing pain.

For example, lizards run from me the moment I walk out my door. Most of the time they are running for nothing because I would never step on a lizard. But who knows how many lizards have saved their lives from my accidental footsteps. Reptiles protect themselves from the faintest danger signal without faulting themselves for it. False positives are part of the reptilian survival system.

Humans hate false positives. We expect to duck every bullet, but we hate to duck when there is no bullet. We expect our alarm system to call the shots perfectly every time. I think about this when I watch the meerkats at the zoo. They run for cover whenever a plane flies overhead. Their fear seems misguided since the plane is not an eagle who could eat them. But meerkats did not evolve to live in zoos near airports. They evolved in places where birds of prey could grab them in an instant. They survived because of their alertness for a particular pattern of cues. I am not saying we should fear everything our ancestors feared. I am simply appreciating the meerkats' self-acceptance. They don't castigate themselves for their timidity after the plane passes. They don't berate each other for bad calls. They just go back to what they were doing before the plane passed: scanning for threats and opportunities.[2]

docent

We humans also use excess caution to avoid harm. For example, I wash my hands before every meal even though no deadly bacteria are there most of the time. I look in my rearview mirror whenever I change lanes even though no car is there much of the time. You might wear seat-belts your whole life without ever being in an accident. Anticipating potential threats helps us prevent unhappiness in the long run.

But if I wanted to protect myself from every possible danger signal, I could end up with endless hand-washing, mirror-checking habits. Sometimes it's better to approach threats and gather information about them instead of avoid them automatically. Cortisol helps you do that. It alerts you

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to new risks, which frees you to try new things and still notice when you've gone too far.

Accepting bad feelings sounds harsh, but the alternative is worse. You end up unhappy about being unhappy if you don't accept your own warning system. It's a vicious cycle of unhappy chemicals. The alternative is to accept your brain's reaction to anything similar to past threats. Some of those threats will be real and some won't, and you can't always predict correctly.

My security alarm	
Unhappiness I avoid with habits	
Unhappiness I accept as it comes	

When I wish my cortisol would stop, I think about feral pigs. These are pigs who have escaped from farms and returned to the wild. They start developing the features of wild boars once they start meeting their own survival needs. Their snouts grow long when they use those snouts to root for food. Their fur grows long when they need it for shelter from the cold. I am not saying we should act like wild boars. I am saying our efforts to meet our needs make us who we are. A farm pig has the potential to be a boar, but doesn't express the traits when its needs are met by a farmer. A domesticated pig has traits of a juvenile wild boar because it hasn't faced the survival challenges that develop mature traits. Survival challenges are not evidence that something has gone wrong with the world. They're evidence that you are a free adult rather than a farm animal.

Do Something, Or Else

Cortisol does its job by making you feel like you will die if you don't act instantly. Of course, you know you won't actually die if you fail to get that hoped-for promotion, or if someone pulls your hair on the playground. You know you won't die if there's a long line at the post office and you end up getting a parking ticket. But your neurochemicals evolved for life-or-death challenges, so when they start flowing, you feel like catastrophe is around the corner if you don't "do something" immediately.

Sometimes you can't see a way to "do something." Modern life is not the cause of this problem. Our ancestors faced threats with no instant fix, too. When they escaped lions at the water hole, they had to face the water hole the next day. If you had lived in the past, sores would have irritated your skin, and vermin would have infested your home, your food, and your drinking water. You would have watched siblings die, and neighbors invade, rape and pillage. You would not have been free to choose your own sex partners. You would have lived with a lot of unhappy chemicals. And you would have kept looking for ways to "do something" to feel better.

Why do so many people believe their lives are harder than life in other times and places? Because neurochemicals get your attention more than facts. If you are worried about taking the SATs or looking fat, cortisol tells you that something is urgently wrong. You might have faced bigger threats elsewhere, but such threats feel less real to your brain. Other lives may seem like paradise because they don't have SATs or diets–the threats you wired yourself to respond to. You may think animals are happy because they don't have your problems, even though they go hungry for days and have food and mates grabbed from them by stronger individuals. Consciously, you know that looking fat is not as bad as famine and plague. You know that an irritable boss is not as bad as invasion and rape by a neighboring tribe. But if you never actually felt the threat of plague or invasion, it doesn't sound as bad as your moody boss or your weight gain.

We don't realize the extent to which our perceptions of danger are wired from past experience. These circuits are quirky because experience is never a random sample of the world at large. A great example is the story of a girl who panicked when she heard laughter. The girl had been in a car accident and awoke from a coma to learn that some of her friends had died. She did not remember the accident, but she began having panic attacks at the sound of laughter. A therapist helped her remember that she was laughing and partying in the back of the car at the moment of impact. Her reptile brain connected the pain of the accident to the sound that went with it. Of course the girl knows in her cortex that laughter doesn't cause car crashes. But large amounts of pain create large cortisol circuits without the cortex getting involved. Now, when her brain hears laughter, it sounds the alarm in attempt to avoid a painful car crash. The alarm tells her she must do something urgently, but the message doesn't make sense so she doesn't know what to do.

The reptile brain's quirky way of interpreting danger makes sense when you look at it from a lizard's perspective. Imagine a lizard being seized by an eagle. Claws dig into his sides, triggering cortisol and fusing all the neurons active at that moment. If the lizard manages to free himself and survive, he will have neural pathways that efficiently release cortisol when they perceive the sights, sounds and smells that were active when the pain was experienced. That includes everything the reptile experienced a moment *before* the pain, because those neurons are still electrically active. The lizard links danger to the smell of the eagle as it swooped in, and the sudden darkness caused by the eagle blocking out the sun. In the future, the lizard will run faster when he detects that smell and that shadow. And he will survive.

From a survival perspective, the inputs you experience just before a moment of pain are the essential information. They enable you to recognize advance warning signals and thus avoid harm. The brain stores such information without conscious effort or intent because sensory inputs remain electrically active for a moment before they extinguish. This "buffer memory" allows pain circuits to include the events that preceded the pain. It allows creatures to detect probable threats without need for rational analysis. Cortisol builds circuits that motivate a reptile to avoid death without actually "knowing" what death is or what an eagle is. Our brains do the same. We get wired for advance warning signs of the dangers we actually experienced. When big cortisol spurts cause big warning circuits, we label it "post-traumatic stress." But smaller cortisol spurts are always building smaller warning circuits that we're less aware of.

Sometimes our warning circuits don't make useful predictions. It would be nice if we could delete them, but there's a good survival reason why we can't. Imagine your ancestor watching someone die from eating a poison berry. His cortisol would surge and he would remember what that berry looked like forever. If he was hungry decades later and could find nothing to eat but that berry, the enduring cortisol circuit would help him resist. Your ancestor survived because he honored his neurochemical impulses.

Today, we like to challenge old fears. You might like to imagine your ancestor courageously eating that berry and proving that it was harmless all along. But in practice, someone who ignored warning signals as soon as he got hungry would have died and his genes would have disappeared. Our genes come from people who held onto their experiential learning. Once you experience a pain yourself, your brain does not let go of that information.

This mechanism may seem flawed, but learning from experience is much more efficient than being hard-wired for dangers at birth. Instead of being born to fear things that threatened our ancestors, each generation of humans is able to learn about danger from its own cortisol experiences. To some extent, we learn about danger from our elders. But each generation builds its own fears and tends to sneer at the fears of its elders.

I learned this in a painful way. My mother once told me she couldn't sleep all night because she worried that she forgot to put the milk back in the refrigerator and feared it would spoil on the counter overnight. I sneered at her anxiety. But after she died, I realized that when she was a child, she would have gone hungry if she left the milk out. Her three sisters would have gone hungry too, because she was responsible for feeding them when she was only a child herself. Real pain built connections in her brain that were always there.

Danger circuits I've built	
The ones that serve me well	
The ones I would love to delete	

I wish I had understood this when she was alive. The best I can do is celebrate my brain's ability to learn from my own experience. I didn't have to learn everything from scratch. My cortisol was triggered when I saw the fear of others, thanks to my mirror neurons. That saved me from having to learn by playing in traffic and eating poison berries. But each baby born into the world gets to build her own threat detector.

The human brain generalizes from past dangers. Sometimes we over-react, but we'd be worse off if we didn't generalize. If a jellyfish touched a hot stove, only the tentacle that got burned would learn from the experience. Jellyfish don't have a central nervous system, so one hand literally doesn't know what the other hand is doing. Your brain is a big central clearing house that generalizes from past pain to potential future pain. We anticipate threats so efficiently that we start worrying today about statistical projections of harm to one person per ten million twenty years from now. We feel anxiety when the boss lifts one eyebrow by one millimeter. It's frustrating to be so good at anticipating harm.

Mammals developed a way to alleviate the unpleasant feeling of imminent threat. They congregate in groups. Herds make it easier to relax while remaining alert for danger. Herd behavior has a bad ring to it, but the math proves that safety in numbers promotes survival better than the every-reptile-for-himself lifestyle. Mammals have a higher life expectancy than most earlier species, and their babies have a much higher survival rate. This has tremendous consequences. Mammal mamas can have fewer offspring and invest more in each one. Maternal investment allows mammals to have brains that learn from experience instead of being born pre-programmed.

But life is not all warm and fuzzy in the mammal world. Social groups trigger bad feelings as well as good feelings. When the brain adapted to group life, a new kind of unhappiness evolved: social pain.

Social Pain and the Mammal Brain

Social pain is like physical pain because it warns you of a survival threat. In the state of nature, you need social bonds to survive, and the brain evolved to give you an emergency alert when it sees a threat to your social bonds.

Social pain is not new to the modern world. Your ancestors suffered when group-mates rejected them, or dominated them callously. Chimpanzees do too. If your life is full of real pain from hunger, violence, hard labor, and disease, social pain doesn't command your attention. But when your brain finds no immediate physical threat, it focuses on social threats. Every possible threat to your social bonds and status looms large in your mind.

The social pain you experienced in the past triggered cortisol, which connected neurons. Now your brain is skilled at seeing the advance warning signs of that particular social threat. A cortisol alert is easily released at the slightest hint of that old familiar pain.

Animals sometimes eject an individual from the group. The most common examples are deposed alphas and adolescent males. Cortisol spikes in the ostracized animal, and indeed they often perish. Animals fear exclusion so intensely that they typically do what it takes to stay with the group, even when dominated harshly.

Everyone has past experience with social pain. We are all born dependent on others for our survival. As children, we learn to seek support from others when we're threatened. But sooner or later, that support wanes. All mammals transition from dependence to self-reliance. If they didn't, the species would die out when the parents died. When a mammal loses the protection of his elders, the perceived risk triggers cortisol. That wires him to react to losing social support in the future.

You may not consciously believe you will die without support. But your limbic system releases feelings that surprise you. For example, if your work is criticized at a performance review, you know your survival is not literally threatened, but your cortisol rises. This wires you to scan for that particular threat, so you may see lots of evidence that fits.

Reptiles never worry about social exclusion. Mammals worry about it all the time. Herd animals constantly monitor the location of their group mates. Their cortisol rises when they cannot see others, and their oxytocin flows when they're surrounded by the group. The good feeling motivates them to seek safety in numbers without conscious intent. Mammals that were indifferent to the group were soon eaten by predators and got weeded out of the gene pool. The brain we've inherited was naturally selected to monitor social bonds all the time, and to feel bad at hints of threat to those bonds. Of course, you value your individuality. You don't just stick with the herd. But huge cortisol spikes seem to come from no where when you see threats to your social bonds.

The mammal brain is always monitoring what others are doing because that promotes survival. When leaving the group promotes survival even more, that's what a mammal does. Finding a lost child or improving mating prospects are the most common examples. Cortisol surges when you leave the group because the risk is real. But when your legacy is at stake, your brain motivates you to persevere despite the cortisol. You expect a big happy-chemical reward.

Social pain happens when you're inside a group as well as when you're outside, as we all know. Imagine you are a wildebeest in the vanguard of a herd looking for greener pastures. You reach a river and you stop, knowing that a crocodile will cause you pain if you jump in first. The rest of the herd stops behind you. Soon, a huge crowd builds up and you fear they will push you in. That would be more dangerous than jumping in, so you decide to take the plunge. As soon as you do, they all pile in too. Crocodiles eat the stragglers so every wildebeest is determined not to be the one left behind. What looks like herd behavior results from individual survival calculations from moment to moment. Your survival is constantly affected by the choices of those around you.

Your brain is constantly choosing between preserving social bonds and striking out on your own. Cortisol helps you decide which option best promotes your survival. You may get a bad feeling when you think of the opportunities you lose by sticking with the herd. But you also get a bad feeling when you think of being isolated. Bad feelings are the brain's way of weighing one risk against the other. We need bad feelings to interpret information, even when things are good. For example, you might be offered a great promotion in another state. You feel bad at the thought of losing the life you have now, but you feel bad about losing the career advancement. Unhappy chemicals help your brain calculate your best option.

Animals with bigger brains have more social ups and downs. Small-brained mammals tend to size up each other once, and stick with that circuit for life. Primates have enough neurons to keep updating their feelings about each other.

Primates are born with special neurons that facilitate social bonds. These *mirror neurons* activate when an individual watches the behavior of others. Scientists discovered mirror neurons by accident. They were studying the electrical activity in a monkey's brain while it grasped a peanut. When the experiment was over, a researcher picked up the peanut to put it away. To his amazement, the monkey's brain lit up with the same pattern of electricity it had when he picked up the peanut himself. Watching stimulates the same neural trails as acting.

Mirror neurons are not activated by watching random movement in others. They fire when you see others seek rewards or risk pain. Watching triggers much less electricity than doing. About 15% of the neurons are estimated to be mirror neurons in certain parts of the primate brain. But if you repeatedly watch another person, connections build and it becomes easier for you to execute the behavior yourself. This research is in its infancy, but there are indications that song birds learn their songs through mirror neurons.

Empathy comes from mirror neurons. We can literally feel other people's pain. If you repeatedly watch another person suffer, you build up your own circuit for experiencing that suffering. Even if you have a perfectly good life, those circuits make it easy for your cortisol to start flowing. The cortisol gives you the feeling that your survival is threatened, so your cortex looks for information about the threat. It will find threats, because that eases the nagging "do something" feeling. Social groups build a shared sense of threat as a result.

You can choose whether to focus your attention on these shared threat signals or not. But there's so safe choice. If you fail to empathize with shared pain, your social bonds are likely to be threatened. Your group-mates may start perceiving *you* as the threat. It's not easy being a primate.

Each brain builds expectations from the information it is fed. If you feed your brain a lot of inputs about suffering, you will build circuits good at finding more suffering. The world will look very bad to you. Your good intentions will leave you with a lot of cortisol.

Being Heard Equals Survival to the Human Brain

Exclusion makes a mammal unhappy, but inclusion does not necessarily make you happy. Once you're included, your brain wants more. It wants the attention of the group. You may be respectful of others, but part of your brain feels you will die if you do not get attention. We start out in life needing attention to survive, and cortisol wires us to fear losing it.

When you were born, your survival needs caused you pain, but you couldn't do anything about it. The resulting surge of cortisol caused you to cry, and that worked. It got your needs met. A newborn doesn't cry as a conscious act of communication. It doesn't cry because it knows what milk is. Crying is one of our few pre-wired behaviors. Soon, a baby learns to expect relief when he hears footsteps, and the expectation of attention stops the crying.

But a baby learns that attention can vanish as quickly as it came. The more a baby learns to expect support, the more he ventures out to explore the world, and thus the more threats he encounters. No amount of nurturing can protect a person from the reality of human vulnerability.

Your early vulnerability built the first circuits in your brain. Those old circuits are triggered today when your poetry is ignored by the one you love, or your views are ignored at a meeting. We don't consciously think being seen and heard is a matter of life or death. But our inevitable cortisol circuits make it feel that way.

The fragility of a newborn human is unparalleled in nature. No other creature is born so far from being able to survive on his own. A gazelle can run with the herd the day after he's born. An elephant can walk before his first meal, because that's how he gets to the nipple. A fish is an orphan from birth because his parents swim off once their eggs are fertilized. But the fish is born with fully developed survival circuits A human cannot even lift his head for weeks, and he can't provide for himself and his offspring for...decades.

We humans are born with an unfinished nervous system. Instead of developing fully *in utero,* we get born premature while our brain can still fit through the birth canal. Human brains grew bigger as our ancestors succeeded at getting more protein and fat.[3] Bigger brains led to better hunting methods, more nutrition, and even bigger brains. So our species got born at ever earlier stages of development, with lots of neurons, but fewer connections between them.

A chimpanzee is more hooked up at birth than a human, so its eyes and limbs start working quickly. A chimpanzee born prematurely looks amazingly similar to a newborn human. A full-term chimp is born with a brain already linked to his sensory organs and musculoskeletal system. Humans build these links outside the womb from direct experience. When a newborn human sees a hand flying in front of his face, he does not know he's attached to that hand, no less that he can control it. We are born helpless and we hook up our brains gradually during a long period of dependency. This gives us the advantage of adapting our nervous system to the environment we're born into, whereas animals are born adapted to one ecosystem and rarely survive outside it.

The vulnerability of a human baby is a huge survival challenge. Many babies died in the past. If they were good at getting attention, they were more likely to survive. Mothers good at interpreting their babies' signals had more surviving DNA. As a result, humans were naturally selected for the ability to communicate. When we succeed, happy chemicals flow. When we fail, cortisol flows and we look for a way to do something about it. Eventually, we develop complex communication circuits, but they rest on the core sense that you will die if you are not heard. You don't think this in words but you think it with neurochemicals.

The bad feeling of being ignored is compounded when you see others getting attention. In every troop of primates, some individuals get more attention than others. Field researchers have documented the way baboons give their attention to some troop-mates more than others. Laboratory researchers find that chimpanzees will exchange food for a chance to look at photos of the alpha chimp in their group. Your brain seeks attention as if your life depended on it because in the state of nature, it does. Cortisol flows when the expectation is disappointed.

The Unquenchable Thirst for Status

Respect makes people happy, and disrespect makes people unhappy. We tell ourselves status doesn't matter and everyone is equal, but each brain keeps track of how it stacks up against others. Expectations build from experience, making people sensitive to slights. Happy chemicals flow when our expectations are exceeded. When our expectations are disappointed, we perceive it as a threat.

Everyone wants to be special. When you see others being special, you say you want equality. When someone gets ahead of you, your cortisol starts flowing. It's easy to see this in others, especially those you dislike. It's hard to see it in yourself, but the universality of this urge is apparent when you know how animals strive to be special.

Animals one-up each other in myriad ways, and each way somehow promotes reproductive success. A simple example is the way animals make themselves look bigger by making their hair stand on end. They don't do it consciously, but when their cortisol is triggered they get goose bumps, which causes their hair follicles to tighten. That makes their hair stand out, giving adversaries the impression they are bigger than they are. Looking big promotes survival, and bad feelings make it happen.

The bigger a mammal's brain, the more effort it invests in the quest for social status. Small-brained animals like cows generally have one status ranking for life. When a cow reaches puberty or joins a new herd, she fights each other cow once.[4] If she wins, she learns that she can dominate that individual, and if she loses, she learns to submit to that individual to avoid injury. Her brain links each herd-mate to either her cortisol or her serotonin. A herd is typically dominated by an "alpha," who is the unchallenged queen for life. When she dies, the high-status cows will challenge each other for her spot. Then things go back to normal. Cows don't have enough neural plasticity to keep updating their circuits.

Primates do. Monkeys and apes tend to challenge their place in the status hierarchy. That doesn't mean they fight all the time. They avoid fighting because they can anticipate pain. Instead, they build social alliances that threaten their adversaries with pain. Primates find ways to get along because their unhappy chemicals warn them that conflict is dangerous. But the primate brain is always on the lookout for safe ways to raise its rank.

If a monkey or ape shows weakness, others are quick to notice the opportunity and challenge them. Successful challenges stimulate serotonin and create more surviving offspring with better survival prospects. Brains that seek status were thus selected for.

Animals care about the status of their mating partners. Each species has its own strategies for judging potential mates, and biologists have shown that the traits animals focus on are uncannily relevant to the survival potential of offspring. For example, peacocks with more colorful tails actually have higher resistance to deadly parasites, which gives their children a survival advantage.

Research has made it clear that each primate in a group is aware of the relative status of each troop-mate in relation to others as well as to themselves. And after an internal conflict, each primate brain rewires itself to reflect the new status hierarchy. The rewards for status are often quite small, but they get the brain's attention when it's not busy meeting a more urgent survival need. Brains good at status-seeking made more copies of themselves, and the rest is history.

You may say you don't care about status. But happy chemicals soar when you have the chance to mate with a high-status person, or the chance to raise your children's status, or any other status-booster that comes your way. Your unhappy chemicals soar when your specialness is overlooked, or, much worse, your children's specialness is overlooked. You may blame your disappointments on "our society" without recognizing its universality. If everyone in the room has eyes for the same beauty, many people will be unhappy. If everyone wants their children to go to the same few schools, lots of cortisol will flow. If everyone wants to be chief, unhappiness will reign. That does not mean everyone's survival is threatened, but each brain feels as if it is.

The urge to be special	
Disappointment of that urge in myself.	
Disappointment of that urge in others.	

Your feelings about your status are independent of your socio-economic circumstances. Imagine you're a high-priced lawyer with lots of formal status trappings. Every minute of your waking life you are kowtowing to clients and senior partners and people who can help your career. Wherever you look, you see threats that could cost you everything. You might feel worse about your status than a bus driver who rules the bus all day and then rules the roost at home. Status does not come from fixed labels and abstract words. It's the feeling you get when you interact with others. Those feelings change from moment to moment as we go through our day, but they depend heavily on the circuits you've already built.

Your brain compares itself to others even if you wish it didn't. In the state of nature, comparing yourself to others promotes survival. It protects you from getting into fights you are likely to lose. When your brain sees you are weaker than another individual, it releases cortisol to remind you of the risk. This helps you hold back, despite your urge to promote your survival interests. Unhappy chemicals help us inhibit our urge for dominance and thus get along with group mates. We need unhappy chemicals, as much as we'd rather live without them.

The Unhappiness of the Cortex

The intelligence of the human cortex adds to the unhappiness of the mammal brain. A meerkat may over-react to passing airplanes, but it

↳ why?

never imagines planes that aren't there. Humans imagine potential future risks because it helps us prevent them. The things we imagine feel as real as the external inputs triggering our senses. We humans can scare ourselves with our own neurons!

Our ability to process abstractions leads us to understand our own mortality. We don't know what will kill us but we know we will die. This is plenty of incentive to keep scanning for threats.

Our skill at predicting harm helps us prevent it. But as soon as we eliminate one threat, our brain looks for another. So even if you're a very effective survivor, your cortisol flows.

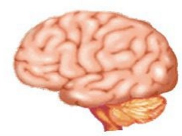
Finding threats makes you feel curiously safe. When you know a lion is near, you feel safer when you can see it. We keep seeking evidence of threats, and we get a dopamine boost when we find what we seek. You may also get a serotonin boost from the feeling of being right, and an oxytocin boost if the evidence bonds you to those with similar concerns. This is why people seem oddly pleased to find evidence of doom and gloom.

A steady stream of cortisol leaves you feeling you must "do something" immediately to avoid disaster. But nothing you do stops the cortisol because you are generating it with your own thoughts.

Thinking about the future triggers the most threatening thought of all: the fact that the world will some day go on without you. This is so upsetting that people almost prefer imaging that the world will end when they end. I noticed this at a lecture on future energy reserves. When the audience was shown a chart projecting world energy reserves a hundred years from now, everyone had to imagine a world they would not be part of. This triggers cortisol, and we look for a logical explanation. We presume the crisis is in the world because we don't know what is triggering us. A big cortex attached to a reptile brain easily concludes that the world is going to hell in a handbasket.

A human cortex is good at predicting rewards as well as pain. When anticipated rewards don't materialize, more pain is triggered. Your cortex can imagine a better world that makes you happy all the time. But reality falls short of the better world of your imagination, so reality is a continual disappointment. We create this disappointment because we have enough neurons to build a world in our heads that feels as real as the world reaching our senses. In our imagined world, social and physical pain are easily eliminated, so it's hard to understand why the world you experience fails to measure up.

A lizard never thinks something is wrong with the world. It watches its young get eaten alive without telling itself "something must be done about this." It doesn't have enough neurons to imagine the world being anything other than what it is. It doesn't expect a world in which there are no predators, so it doesn't condemn the world for falling short of its expectations. Nor does it condemn itself for failing to keep every one of its offspring alive.

The world of the cortex	
Unhappiness created by anticipating harm	
Unhappiness created by anticipating rewards	

A monkey isn't thinking something is wrong with the world when he cedes a banana to the alpha monkey. He feels bad because his unhappy chemicals are triggered, and he tries to feel good by staying alert for opportunities to get bananas. But he isn't lamenting the state of the world.

Your brain's ability to imagine good things is unlimited. As soon as you get something good, your brain imagines more good things. Your potential to be disappointed is unlimited as a result. Reality can't live up to your expectations because you keep building new expectations. So even as your expectations lead you to better things, your cortisol flows and your survival feels threatened. That bad feeling keeps motivating you to focus on the "better world" you've constructed in your mind.

Your brain would be happy if you could control everything and live forever. That doesn't happen, so unhappy chemicals are part of life.