Monkey Feel, Monkey Do (And Vice Versa)

Star Trek's Big Lie

Emotion. The muse of the volatile and irrational. The enemy of reason. The Yin to Logic's Yang. *Or so our culture says.* To wit, this dichotomy is a primary theme of possibly the greatest (& most ponderous) cultural artifact of our era, the *Shakespeare* of the late 20th century: Gene Roddenberry's *Star Trek* (in all its incarnations). Vulcans, androids, cyborgs, holograms—each is a science-fictionalized projection of a core modern human belief: that submitting fully to logic is synonymous with abandoning emotion, and vice versa. I'm here to tell you: *they've got it all wrong*.

In many ways, emotion is *pure* logic. Or, more accurately, it's pure logic cut with a dose of gambling. But to understand why that's true, we need to begin with the original purpose of emotions. In the simplest terms, mammalian brains first used emotions to tag basic pattern data (essentially, things & events) as helpful or harmful. Over time, evolving neural structures have allowed our feelings to reflect more complex judgements, but at their core they're all still designed to trigger the same binary response: inhibit or encourage an action/behavior. *Ouch! That red glowing stuff is hot. Mmmm! This stuff I'm eating is yummy.*

Pain. Pleasure. The ancestral root & ultimate result of all feelings. Forget the false *Star Trek* dichotomy of logic & emotion—whose purposes are nearly identical—the real Yin & Yang of our minds is Pain & Pleasure. Without them, the human brain would almost be *incapable* of exercising logic. Think of it this way: when we say we want to make a decision *logically*, we're essentially saying that we want to make that decision strictly by weighing our choices' *most-believable cost/benefit ratios*. More conversationally: logic

is all about reducing decisions to *the cold, hard facts of the matter.* But in our brain's predictive and decision-making equations (those interweaving narratives in our mind) our emotions *are* the cold, hard facts—the fixed values that our brain uses to calculate each choice's most-believable (*highest validity*) cost/benefit (*pain/pleasure*) ratio.

The Logic of Emotions

Imagine that we accidentally dropped that aforementioned *yummy stuff* into that *hot red glowing stuff*—our brain has a choice to make: *do we tell this clumsy idiot to reach into the fire for his last piece of newly-discovered yummy or do we make him cry over its loss?* To make this choice the brain likely (via internal dialogue) quickly tells itself at least two stories (unless it has a closely-related & well-remembered previous experience to call upon for a more reflexive response). Each story is one of those predictive, decision-making (and *emotional*) equations that our mind is perpetually calculating. The narratives might go something like this (although in any specific case, obviously, the actual "heard" syntax might be far more simple or detailed):

1 - *Idiot reaches into fire, burns hand briefly but harmlessly (small value loss), retrieves yummy & consumes (medium value gain), and feels pleasure. (Narrative pattern is tagged with this pleasure—whose future purpose is to encourage reaching into small fires for medium value assets.)*

2 - *Idiot watches yummy burn (medium value loss) and cries, feels pain. (Pattern tagged with pain—unlike story #1, this event is probably not categorized as its own narrative. Instead, it's seen as the final plot twist in the story "being careless while eating something excitedly over a fire" and thus, this pain's future purpose is to inhibit such situational carelessness. Additionally, I believe that the "lightly experienced" emotion generated simply by running this predictive scenario in your mind after dropping the yummy encodes the actual memory data with enough pain to mildly discourage future situational carelessness, even if you choose to retrieve the yummy and never experience the pain of actual loss).*

After quickly comparing these two predictive narratives, the brain is most likely to lead the idiot to retrieve the yummy and achieve pleasure. In order to foresee that pleasure, the brain needed to calculate the net result of the predicted value loss & predicted value gain. These *values* are partly derived by the intensity & type of *emotion* (pain or pleasure) experienced when the data was first tagged *Ouch!* or *Mmmm!* Thus, the "emotional equation" of story #1 is something like: burn pain (-1 value, partly derived from *Ouch!*) + yummy consumption pleasure (+3 value, partly derived from *Mmmm!*) = net pleasure (+2 value).

Note, however, that I said these values are only *partly* derived by the strength of the

original pleasure/pain tag. That's because this value is actually likely the result of a "sub-calculation" that combines *three* basic judgements of a narrative event or element: importance, relevance, and novelty. *(In Essay #5, we'll discuss more about how the brain makes these "Narrative Prioritizor Test" judgements & how they impact decision-making.)* In story #1 the *importance* of consuming the yummy is determined by that original pain/pleasure tag (really tasty & satisfying *Mmmm!* signals greater gain and equals higher importance).

The *relevance* is determined by the fact that it is the idiot's yummy, therefore highly relevant. If he intended to share the yummy with, say, a random wanderer who just dropped by, the gain is essentially half as relevant (but if the sharer is, instead, part of his family, the gain might still retain high relevance).

The *novelty* is determined by several things here: it was the idiot's last piece, it was the first time he'd ever found this yummy, and he does not believe these specific yummies are in local abundance. This all gives it high novelty, further increasing the yummy consumption's total pleasure value.

This sub-calculation not only determines the full value of that specific narrative event (idiot consumes yummy=+3 value) but ultimately helps determine the value/intensity of the net pleasure generated (both predicted and actual) as a result of the full narrative (idiot reaches into fire, burns hand, retrieves yummy & consumes=+2 pleasure). And the brilliant Daniel Kahneman's & Amos Tversky's Nobel Prize-winning *Prospect Theory* has shown that our brain is calculating these exact kinds of complex, predictive, *contextually-defined* gain & loss computations (much more complex than this one) when making those decisions that our consciousness governs. [1, 2]

Although Kahneman was awarded the Nobel in Economics, Prospect Theory's insights actually apply to how humans judge risks & rewards in all kinds of decisions, not just financial ones. And in the view of *our* theory, it's clear that the human brain's emotionally-based value gain/loss judgement mechanisms don't distinguish between "monetary" gains/losses and gains/losses of all other kinds of resources (time, effort, non-monetary assets, social capital, personal support, affection, etc. *ad infinatum*).

Our brain's emotional & decision-making calculations ultimately *don't care* what the actual *substance* of the gain or loss is. Either it did/could *help us* or it did/could *harm us*— and the contextually-determined degree to which we judge it did/could *help/harm* is the data that our

brain uses to judge how much value (of any kind) has been (or will be) gained or lost. (At the root of these value judgements is that just-mentioned *importance/relevance/novelty* "Narrative Prioritizor Test.") Thus, when Prospect Theory demonstrates how humans "feel" about & calculate those risk/reward decisions based on contextual (narrative) gain/loss predictions, the theory is demonstrating how humans calculate *all* feelings & decisions about contextual gain/loss predictions & events: aka, *emotions*.

In Narrative Complexity's model, this gain- & loss-based "emotional analysis" of narratives occurs near the tail end of our cognitive loop. We'll discuss cognition & emotions' role in decision-making in Essays 4 & 5, but in our model, this (highly-diversified) emotional analysis occurs just after a language-based narrative parcel has been neurally constructed (& *prior* to that parcel entering our conscious awareness). The results of this analysis (which involves myriad brain areas, i.e., the anterior cingulate cortex, orbitofrontal cortex, insula, amygdala) are routed to our decision-making *Dorsolateral* PFC (to help determine the activation/inhibition of actions) and to the appropriate emotional-response areas (i.e., the hypothalamus), which aid in producing emotionally-based bodily responses and "feeling-producing" neurotransmitter/hormone output. (The general principles of our model of emotional mechanics & emotion's role in decision-making is strongly supported by Oxford neuroscientist Edmund Rolls' recent groundbreaking work, *Emotions and Decision-Making Explained* [3].)

In addition, according to our theory, these narratively-produced emotions are ultimately routed to our somatosensory cortex, which helps us to actually *perceive* our emotions. The somatosensory cortex is involved in processing tactile sensations (including physical pain) and mapping those sensations to specific locations in our body. For example, the insula receives tactile information such as physical pain (from the nervous system via the thalamus) and likely uses its connections to the secondary somatosensory cortex to send those insula-processed pain (or pleasure) judgements to that somatosensory system for mapping to a specific part of our body (the insula also sends instructions to the hypothalamus to help produce those neurotransmitter/hormone-fueled responses). Similarly, we hypothesize that the insula also receives narratively-produced syntactic & semantic data (which contains the content required for those "emotional equations") and routes its emotional analysis of that data to our somatosensory cortex, allowing us to physically feel & perceive the emotion.

Of course, emotional pain & pleasure don't directly correlate to specific body parts. Nonetheless, because this somatosensory route is essentially the

only way that our brain can physically map & perceive "feeling" an emotion, those narratively-produced feelings still seem to be experienced in (sometimes vaguely-defined) areas of our body. And I believe that the bodily area in which we feel an emotion generally correlates to the part of the body associated with the primitive, root "proto-emotion" from which that emotion evolved.

We'll discuss these proto-emotions in great detail near the end of this essay, but the simplest example is the proto-emotion that we hypothesize is the root of all basic pain/pleasure: *hunger/satiation*. Hunger/satiation is obviously a sensation felt in (& cognitively mapped to) our stomach—thus its evolutionary-descendent, emotional pain & pleasure, is often also felt in (& cognitively mapped to) our stomach. In the view of our theory, this mechanic is a key element of how we experience the many-varied emotional states that can be produced by our consciousness-sustaining internal narratives (additionally, I believe that we can *learn*—via experience & study—to associate different body parts with different emotions, which can also impact how we cognitively map & perceive these feelings).

Ultimately, all of this means that emotions are *not* some separate neural mechanism that is *competing* with our more "rational" cognitive processes (that *competition* is actually provided by our more primal *urges*, aka, those aforementioned *proto-emotions* that we'll discuss more later).

Rather, narratively-based emotions are an integral & incredibly *useful* (in very practical terms) element of human cognition & decision-making. So, take *that* logic, you *need* emotions—without those little fellas, you ain't nothin'. (You can examine a visual depiction of the above-described cognitive loop by exploring our *Rudimentary Map of Human Consciousness*.)

Mitigating Factors & Complex Emotions

Of course, our endangered-yummy scenario only depicts the most basic of emotions: pain & pleasure. This is mostly because I conveniently kept our scenario free of any real *mitigating factors*. In other words, our scenario involved very simple causal elements (our own accidental carelessness led to a potential loss, quick action resulted in a gain) and highly predictable results (fire will burn me briefly & harmlessly, eating the yummy will give me pleasure).

But life is usually *full* of mitigating factors. *I was going to give half to my starving child. I already lost one hand in a fire. I think I saw the wanderer poop in the campfire earlier.* These mitigating factors can makes us feel *all sorts* of things. (These kinds of context-based emotional mechanics are at the foundation of the currently most-accepted approach to emotions: *appraisal theory*, which provides the basis for emotional models by leading theorists like the late Richard Lazarus & Robert Plutchik. [4, 5])

In essence, each mitigating factor becomes an additional variable in the overall narrative's emotional equation. And these variables—which lead to more complex emotions—are primarily the results of three basic types of narrative judgements: judgements that measure the *validity* (reliability and/or likelihood) of a value loss/gain prediction, *potential* loss/gain, and judgements that measure *other individuals' roles* in a value loss/gain. Which is a mouthful. So before you go back to reread that, let's move quickly to an example...

Since we're going to further torture our poor idiot, let's at least give him a name; we'll call him Rodney (since that's what the R. in R. Salvador stands for, no sense in offending other name-holders). In our new endangered-yummy example, let's say Rodney was joined by the wanderer before dropping his yummy into the fire. In addition (because I can't help myself) *Rodney thinks he saw the wanderer poop in the campfire earlier.* Thus, a mitigating factor has just been added to his "reach into the fire" narrative. In essence, the *validity* (or likelihood) of our story #1's happy ending has been been undercut by the possibility that the yummy has been contaminated by poop. (For the sake of simplicity here, we'll ignore extra narrative branches that might involve Rodney trying to ascertain more clearly whether or not there is actually poop in the fire, and assume he only has his brief distant view of a squatting wanderer as proof. Adding these branches would make the equation more complex, but not illustrate any additional mechanics.)

When compared against the happy-ending narrative, this new poopy-yummy narrative branch seems equally possible. Rodney *wants* the gain of recovering his yummy, but no longer has full confidence in his happy-ending narrative. The result is a different kind of pain-related emotion: *anxiety*. This anxiety is a negative validity judgement. It says *this thing we're about to do or thinking about likely doing because it has a big potential gain, we now doubt to some degree the validity (or likelihood) of that prediction being correct.* And this emotion has a purpose: it wants us to hesitate. It wants to give our brain a few more moments to run new prediction subroutines and determine more possible solutions. It wants a little more time to work its looping thought-iteration magic in hopes of discovering a preferred high-validity happy-ending narrative.

The specific level of anxiety is determined by the phrase we used earlier: *we now doubt to some degree*. The degree of doubt you have is equivalent to the level of anxiety produced—high doubt (low validity/likelihood) means high anxiety (more intense anxiety-related pain). And although anxiety is the product of a more complex judgement, its ultimate result is

still to contribute to that core binary emotional response: inhibit or encourage. *Because Rodney was worried that his yummy might be poopy, he felt nervous and hesitated before reaching into the fire.*

The Fear of Losing Yummy

The thing about complex emotions is that they are...*complex*. And in the case of anxiety, it's usually accompanied by another pain-related emotion—one that contributes to the ultimate level of inhibition or hesitation generated when you're worried that your yummy might be poopy. That emotion: *fear*. Although it involves prediction, fear (unlike anxiety) isn't primarily about validity, it's about value—specifically, a value loss. More specifically, it's about a *potential* value loss.

When your brain begins to have anxiety about a desired prediction failing, it's interested in what that failure is going to cost. *If I retrieve a poopy yummy, what's the loss?* (And when your brain is feeling predictive *confidence* about a desired gain, it's interested in how *excited* you should be about that upcoming potential gain.) In Rodney's case, he's calculating a few potential loss scenarios. If he doesn't reach in, he loses the yummy. If he reaches in and the yummy is poopy, he loses the yummy, suffers a small burn, and risks a poop-contaminated hand. If he reaches in and the yummy is okay, he only suffers a small burn. In reality, he only has two choices: reach in or don't. Both predictive narratives produce some fear over potential losses, but because one of the choices (reaching) offers a 50/50 big loss potential and the other (not reaching) a 100% big loss potential, the latter choice produces more fear.

This fear of the 100% loss pushes Rodney toward reaching in (he is *afraid* not to, thus inhibiting any attempt to *resist* reaching). And yet, as he reaches, the anxiety from the uncertainty over the yummy's cleanliness still makes him hesitate momentarily, and possibly experience with it a little more fear over the 50/50 potential loss posed by possible poopiness. These emotions serve the same purpose: to slow Rodney down, just a little, just in case that time can provide him with a unique and preferable solution. But the clock is always ticking. And possibilities like the yummy getting burnt and the wanderer snagging it for himself place a deadline on our calculations. In this case—if he really desires that yummy—even after the fear- & anxiety-produced hesitation, when that deadline comes, Rodney's brain is likely to roll the dice and gamble that it's better to reach than not to reach, poop be damned.

And this is what I meant when I said that emotions are pure logic cut with a dose of gambling. We set up a narrative's emotional equations, add all of the mitigating factors, fill in all of the value-

and validity-based variables (determined by previous emotional tags, narrative judgements, and prediction pattern comparison), and then create a final emotional mix intended to guide us toward taking a chance on the choice that seems most likely to achieve the largest gain and/or avoid the largest loss. In Rodney's case, in addition to seeking the largest gain, he's also risking the largest loss: a poopy yummy, plus a little burnt skin & maybe even a poop-contaminated hand. Pure logic with a dose of gambling.

And there's a reason that different emotions are used to measure *potential loss/gain* & *prediction validity* judgements: the combination helps to calibrate our overall inhibit/encourage behavioral response appropriately according to the specific situation. Therefore, if we have high doubt (a low validity judgement) but the potential loss is very small and the action still provides the possibility for a desired gain, the small potential loss lessens the overall anxiety/fear-produced inhibition—making us more likely to take that doubted action.

This is the basic emotional equation that's at work when we do something like spend $2 on a carnival game that we know is rigged for us to lose, yet still *might* win us that cute stuffed bear (and give us that simple feeling of pleasure from having defeated the challenge). When you play the game, you probably feel a little bit of that anxiety over the unlikeliness of succeeding (weakened by the small potential loss) combined with the excitement over the unlikely-but-desired potential gain (an excitement, frankly, that often seems disproportionate to the gain of a mere *stuffed bear*, but we humans are pretty good at *overvaluing* our simple pleasures).

Conversely, even if our doubt isn't very powerful (in cases like a "medium" a validity judgement) but the potential loss is very high, our overall anxiety/fear-produced inhibition is still likely to be fairly significant. In other words, we're *pretty sure* this is going to work out, but the potential loss might be so great that *pretty sure* just isn't good enough. This means we're more likely to hesitate before this action—in the hopes of coming up with something more certain than *pretty sure*. In all of these kinds of situations, our brains are combining the differently-measured emotions of *anxiety/confidence* & *fear/excitement* to properly calibrate our behavioral response using situation-specific calculations that separately account for likelihood & potential loss/gain.

These categories of predictive emotional judgements are central to Kahneman's *Prospect Theory* equations, which show how human brains make these types of decisions by calculating value and probability of predicted results. Kahneman's "value" is our theory's *gains & losses (*measured according to

importance, *relevance* & *novelty*) and his "probability" is equal to our theory's *validity*, which we actually view as a combination of the *likelihood* of a prediction & *reliability* of prediction data. This *reliability* judgement might be thought of as how much we *trust* the predictive data and/or its source, which can be impacted by factors like sharing a source's beliefs or having a close bond with the source (both discussed later).

But wait...there's more! Complex emotions are not only complex, they're everywhere. And there are still a few emotional complexities to iron out in our *Rodney drops a yummy into a possibly poopy fire* scenario. Earlier, I'd said that there were primarily three basic types of narrative judgements that lead to complex emotions: those that measure prediction validity (anxiety/confidence), those that measure potential loss/gain (fear/excitement) and those that measure *other individuals' roles in a value loss/gain*. My shorthand for these types of individuals: Agents of Value (gain or loss). A teacher, who can potentially confer knowledge value, might be seen as an Agent of Gain. A thief, who can potentially cause you asset damage, might be seen as an Agent of Loss.

We can also make more subtle—and in many ways more unconscious—judgements that lead us to view others as Agents of Gain or Loss: similarities or differences in visual appearance, common or conflicting social/cultural identity, even synchronous or asynchronous physical movements can impact these judgements of other individuals (as demonstrated in research by Northeastern University Professor of Psychology, David DeSteno [6]). These less narrative & more *reflexive* Agent of Gain/Loss judgements are likely tied to mammals' most primitive, least cognitively-based judgements of fellow species-members.

Returning to our contextually/narratively-based emotions: when we perceive someone as a *known* Agent of Gain or Loss (based on a specific experienced or studied act/behavior) or a *potential* Agent of Gain or Loss (based on patterns predicting future acts/behavior) we have different specific feelings toward them. In response to a known Agent of Gain, we feel *gratitude*. *Rodney offered the wanderer half his yummy, and the wanderer felt a good feeling toward Rodney that he could only describe as gratitude.* This pleasure associates that Agent of Gain with memory data that has been tagged as positive.

As we've pointed out, every emotion is a Yin & Yang spectrum. And gratitude's Yang is *anger*—the response to the thief, the known Agent of Loss. *When Rodney retrieved his yummy and saw it was poopy, he felt angry toward the wanderer because he'd cost him the chance to save his yummy.*

The Power of Love & Hate

Gratitude and anger are primarily value propositions. The larger the gain or loss, the greater the gratitude or anger toward the Agent of Value. In more complicated scenarios, level of culpability and/or certainty over culpability can affect the level of emotion generated, but even in these cases, gratitude & anger are still used mainly to reflect value. If the wanderer was starving (increasing the yummy's value) he might've felt more powerful gratitude toward Rodney for sharing. If Rodney was starving, he might've punched the stranger for pooping in his fire.

In contrast to this, *potential* Agents of Gain/Loss are judged using both value *and* validity criteria, because it's about predicting the likelihood that this person will be a *future* Agent of Value. Thus, the emotions produced are slightly different. A potential Agent of Gain triggers *affection*, an emotion so powerful that at its highest level it is basically love. Potential Agents of Loss evoke *animosity*, which can grow into viciously-powerful hate.

One of the things that makes these emotions so powerful is the way they combine a value judgement with a prediction assessment. Consider that the likelihood of potential future losses caused by someone is increased by the number of actual or perceived losses caused by them in the past. So by the time we have predictive confidence in someone's potential to cause future losses, we've possibly already accumulated a good store of strongly imprinted ill-will toward them—which is only increased by the losses we predict they will cause. In this way, it seems that both animosity & affection can grow in a compound fashion.

And yet, because animosity & affection are about *potential* loss/gain, we don't need any *actual* past loss/gain experiences with an individual (or entity) to feel either of these emotions. We just need to believe the individual/entity is capable & likely to cause us future losses or gains. *After your 2-minute conversation with your daughter's arrogant, dumb & clearly-reckless brand-new boyfriend, you despise him. You can feel it in your bones, and you didn't even know he existed 3 minutes ago.* There's still a value judgement here: because the potential harm involves your daughter (very high value) the animosity is more intense than if the guy was just your neighbor's kid's friend. But that value judgement is not based on any previous losses caused by the new boyfriend, demonstrating that these emotions are about *potential* events—and that love & hate can quickly grow from nothing.

The difference between anger/gratitude (*known* Agents) & animosity/affection (*potential* Agents) becomes clearer when we realize than we can both feel gratitude

toward someone and still have continued animosity toward them. (Or feel anger, yet continued affection.) Imagine that a homeless person is handed a free meal. They feel momentary gratitude toward the *known* Agent of Gain—this occurs almost no matter who the Agent is (as long as they suspect no malicious intent in the act).

Now imagine that a homeless person has been given a free meal by a well-intended congressman who has led the charge against—and will likely continue to oppose—robust homeless services (and this is understood by the homeless person). The homeless person might still experience some momentary gratitude for the specific act, but they could maintain a general animosity toward the congressman because he is a *potential* Agent of Loss. Conversely, when your spouse crashes the car for the third time and sends your insurance skyrocketing, you may feel some very certain anger toward them in the moment, but nearly simultaneously—or close on that anger's heels—you should (hopefully) be able to look into their eyes and still feel a good measure of affection because of their future potential as a high value Agent of Gain (which is, I know, an *awfully* romantic way to view love).

And to add *even less* romance to the matter of *romance*, I'll share our theory's own special analogy for love's harrowing journey: a two-stage hormone-&-neurotransmitter-driven rocket that sends into orbit a highly-volatile satellite whose speed & trajectory are subject to near-constant (& often *orbit-dooming*) changes. Our *Stage 1 Rocket*—the Saturn V-esque monster that possesses the power to achieve escape-velocity—is that initial rush of attraction, lust (& let's be honest: *obsession*) that accompanies those earliest months.

As the fuel from this beautiful monster wanes & its engines are shed, our more modest (but vital-to-achieving-orbit) *Stage 2 Rocket*—that less-lusty-but-still-intense period of bonding & attachment —takes over propulsion. This is a period that *once upon a time* was meant to result as-soon-as-possible in child-rearing, but these days is just as likely to result in a decision to begin seeking therapy—either jointly or secretly on your own at first. ("Secretly" being an observation that's more *Woody Allen-supported* than *Daniel Kahneman-supported*.)

Once all of *that* fuel supply is spent—then, if final thrusters like *procreation & therapy* have maintained altitude, we at last reach our highly-volatile orbit whose speed & trajectory are subject to near-constant change. And on a week-to-week, month-to-month & year-to-year basis, that orbit is mostly defined by that oh-so-unromantic neural judgement: *whether or not you're able to look into their eyes and still feel a good*

measure of affection because of their future potential as a high value Agent of Gain. In addition to the effect of ongoing primal breeding cycles—*while the urges last.*

Here again—once our hearts have reached the orbit of affection or animosity—we see specific emotions that are the result of complex judgements, but whose ultimate purpose is to generate that core binary response: encourage or inhibit. Affection draws us to people who can provide us good things in the future (emotional, financial, or parenting support, motivation, knowledge, anything that an individual values) and animosity makes us wary of those who might bring us some sort of harm.

Each emotion reflects our judgement of an Agent of Value and guides our behavior toward them. And every time we gain more value from someone whom we already have great affection for, it reinforces that view of them as a future Agent of Gain, strengthening the affection. This same mechanic is at work with animosity, which is why people often despise an initially disliked President *even more* by the time he's left office. *You thought you hated him when he got elected, but after piling on four additional years of painful, highly-important, highly-relevant, anger-inducing experiences, you can barely stand the guy.*

This *known vs. potential* mechanic also helps explain the roots of the dysfunction that can result in something like an abused spouse continuing to show affection for their abuser. When our brains make predictions about what value we can potentially gain from an individual, many factors are involved. One of the most significant factors is our beliefs—which we'll explore in detail a bit later.

If (through a lifetime of dysfunctionally-arrive-at evidence) I have grown to believe that I am difficult to love, and then (through my limited options) I view this individual as one of my few opportunities to achieve that love, I may be prone to angrily submit to multiple loss-inducing events while still seemingly illogically continuing to exhibit genuine affection toward this individual. This is because I believe they are a novel potential source for something I desperately seek. (I also believe that this kind of prolonged emotional dysfunction eventually "rewires" our emotional responses in a way that we typically perceive as "abnormal" behavior like staying with an abuser.)

One other thing to keep in mind here: under more "normal" circumstances, there are essentially two ways that past experience can help you accumulate enough evidence to result in strong affection or animosity. You can have a high number of small or

medium gain experiences that cumulatively provide enough evidence for the brain to judge the individual as a strong potential Agent of Value. Or you can have a smaller number of high gain experiences that provide the necessary evidence. So, even though your neighbor does plenty of nice little things for you month after month, year after year, you still might have less total affection for them than someone whom you only interacted with a few times, but one of those times they saved your life.

The Essence of a Moment

When we mix these judgements gauging matters such as known & potential gain/loss, prediction validity, and known & potential Agents of Gain/Loss, we begin to see the complex chemistry of emotions that define each moment of experience. Consider that all of the scenarios we've dissected thus far are relatively basic narratives. In reality, our constantly-shifting attention, data-rich environment & complicated lives generate a rapid, steady stream of complex interweaving, interchanging narratives. And in any moment we might be surrounded by a diverse collection of individuals about whom we feel a variety of ways. (And, via *empathy*, we might even feel an echo of some other individual's *own* emotions. Empathy also contributes to the emotions evoked by literature & art—the subject of my Story Theory essay.)

Every day is an endless stream of encounters & narratives running the loop through our consciousness, perpetually evoking & generating their own unique emotional results. In addition, the emotional tableau of any moment is likely enhanced by non-narrative emotions that are caused by quick-hit, environmentally-triggered memory pings that evoke associated feelings. *You see a blue uniball pen leaking ink from the cap; it's exactly like the leaking pen your girlfriend handed you after she dumped you.* Here—because the emotions have been encoded into the memory data that has been pinged—the sight of the pen briefly triggers an echo of the pain from that first pen moment.

There are also purely physically-evoked feelings—produced artificially via drugs, or purposefully through injury, activity (like sex & exercise) & urges (like hunger), or mistakenly due to brain or nerve disfunction, etc. Another source of these more reflexive, non-narrative emotions are the primal, pre-programmed genetic responses to specific environmental stimuli: fear caused by the sight of creepy-crawlies, disgust evoked by the taste of rotten food or foul scents, attraction to symmetry in patterns & faces, etc. We also *feel* (although not in an emotional sense) all of those tactile & physical sensations (*smooth or hot*—even sensations like *speed &*

force) which can be perceived specifically or peripherally depending on our attention. Like memory-triggered emotions, these reflexive emotions & physical sensations can all make a similar kind of non-narrative contribution to the *feeling* of a moment. (And although the feelings & thoughts they generate are used in narrative emotional equations—contributing to choices like drug-seeking behavior or Rodney's decision to risk a small burn—they are not essentially a *product* of our consciousness' narrative mechanisms, so we won't discuss them in detail here.)

This wash of widely-varied emotions—each felt in differing intensity, and each derived from different past, present or potential sources—this tableau (combined with those other more reflexive sources) is the essential *feeling* of any given moment of existence. While our consciousness is drawing our attention to data in our environment (& ourselves) and running related internal dialogue narratives, these combined mechanics are also helping to generate the accompanying emotions, feelings & sensations of the moment, which contribute to the overall purpose of our consciousness: to predict results and make decisions, lots of them, every second of every day.

This mix of feelings composing the experience of a moment is roughly equivalent to what philosophers have long referred to as *qualia*—a word that seems to exist only because we had no more precise terminology. But now we have more precise terminology, so let us never speak of that oft-debated, oft-misrepresented term *qualia* ever again!

...Or we'll never speak of it again *after a few more paragraphs*. Before ditching the term entirely, we *should* probably specifically address one very common misperception (or misrepresentation) of "qualia"—one that many over-thinking philosophy-types like to use to prop the door open for the possibility of some *ineffable*, *non-physically-based* quality of mind. This misperception is that there is, for example, some intrinsic & specific qualia-like "sensation" that partially defines (or is the foundation of) our *experience* of something like seeing the color red. This *floaty mind argument* (which is my view of it, not how they describe it) claims that this "sensation of red" is a type of qualia that cannot "merely" be ascribed to the physical processes within our brain —which is, of course, *nonsense*.

The "color red" is specific visual data that we have been taught to linguistically define as the word "red"—a linguistic tag that our culture has kept powerfully consistent for many millennia. For any individual, this word & its associated visual data appear (separately or together) within innumerable

personal & emotionally-impactful experiences, and play widely-varying roles in those experiences. In addition, we have been culturally taught to associate that word & visual data with specific ideas & actions (i.e., *red means stop*).

Thus, if you are shown a big red wall & asked how the color makes you *feel*, your response will ultimately describe some emergent combination of the result of all those other (differently-weighted & emotionally-varied) previous associations. There is no innate *sensation* or *feeling* of red that we either all share or that is individually intrinsically & consistently the "sensation of red" to us. (In other words, you likely don't share the exact same *feeling* of red with another version of yourself from a much different period in your life.)

The *sensation* or *feeling* of perceiving or imagining any particular color or object or memory or idea—the feeling of *anything & everything*—is a result of all those types of in-the-moment emotions & memory-associated emotions (& physical sensations) that we're discussing here. Feelings that are (or were) attached to current & previously-stored versions of our sensory or linguistic data via experience.

When we consider the likely complexity of the "emotional fingerprint" created by any moment's mix of varying emotions at varying intensities, we can see why our experiences and memories are capable of evoking such "moment-specific" feelings—which can be both very intense, and in a way indescribable. How *could* we truly describe the mix of feelings that composes a moment? Usually, we pick out the most prominent note among the cacophony of emotions and define the moment that way, reducing it to one of the more basic tags. *I was so...happy. It felt, I don't know, just... depressing. All I can tell you is...I was scared.*

If we were being accurate, we might say something more like: *Well, I was mildly nervous about the upcoming interview, but fairly confident and excited about my date afterward, very annoyed by the gnats in my face, a little scared when I saw that guy who I thought was Joe, and thrilled that the check I was opening was twice what I was expecting!* And keep in mind: that description only included the net emotional results of the different narrative threads mentioned. To arrive at those results, our brain had to provide that other set of sub-calculated emotional values & judgements to be plugged into the main emotional equation (like deriving slight "pattern-pleasure" from the cloud of gnats' visual presentation despite an overall judgement of them as annoying).

In light of all this, it's not hard to believe that the feeling of each moment—its

emotional essence—is like those mythical no-two-are-ever-alike snowflakes. It's the most torturous quality of nostalgia: that we seek to recreate the emotional essence of a moment or experience, but in reality, that is nearly impossible.

The Spectrum: Perform or Survive

One of the *coolest* things about the human brain is its capacity to achieve this kind of extraordinary emotional complexity through a system that is, in its own way, extraordinary in its simplicity, its *elegance*. And emotion's ability to create this complexity out of simplicity is akin to the way a wide array of colors can be achieved through different combinations of the 3 primary colors in varying intensity. But instead of having merely 3 colors, Narrative Complexity hypothesizes that our brain's emotional palette has at least 26 "primary colors" at its disposal (13 Yin & Yang pairings)—all of which can be mixed in at anywhere from 1% to 100% intensity.

Now, I know that since I just offered up the number 26, you want to know what they all are—and I promise we'll get to that, but before we do, let's lay out a few more things about our *magical 26*. First, this encourage/inhibit instruction does more than simply tell us to act or not act, it seems to calibrate an entire set of responses—both physical and mental—that better prepare us to confront whatever challenge we face. Before (or as) our brain urges us toward an *action*, it seeks to calibrate our *behavior* prior to that action in a way that gives us the best chance to achieve a desired result.

Therefore, when our brain is flooded with pleasure-based (encouraging) or pain-based (inhibiting) emotions, the emotions are *preparing us to act* in addition to helping us *choose* to act (or not act). Some of these reflexively-triggered "behavioral preparations" or responses specifically differ in response to different emotional combinations (i.e., the reflexive facial expressions & bodily responses that accompany our various emotions). However, according to our theory, there is also a dichotomized set of more neurally-generalized & emotionally-universal brain states that are triggered depending upon which side of the pleasure/pain (positive/negative) spectrum the emotion falls.

In the case of pleasure or encouragement, the positive emotions help to create a "performance mode" in our minds and bodies. This might also be thought of as an "open" state in which we are free to act with more fluidity and greater resource-focus on the task at hand. Basically, the brain is saying *we can be in performance mode here, which requires a devotion of our primary physical & mental resources to this task*. The brain arrives at this decision through emotional equations that determine: 1) this task is worth it, and 2) we can safely devote our resources to this task without exposing

ourselves to unnecessary risk by temporarily ignoring other needs (*aka, non-mission-critical neural resource-requests*). We're also prone to devote these resources even if it isn't actually safe, but the action is of such high priority that we're willing to take that risk—which we've probably convinced ourselves is avoidable.

The opposite occurs when our brain is flooded with inhibiting emotions. As opposed to performance mode, our brain and body go into "survival mode." This kind of behavior is reflected in the hesitation caused by fear and anxiety. Instead of creating an "open" (higher performance/ higher risk) state, the negative emotions create a "guarded" state that sacrifices fluidity & goal-focused resource-devotion in favor of caution, protection & more diffuse resource-devotion. Via resource-use that's spread more diffusely to all of our internal & external sensory mechanisms, we are hyper-aware of & ready-to-defend against *any* possibly danger-predicting data in our environment or ourselves *in addition* to focusing some of those resources on the perceived potential loss.

To best understand this dichotomy, it is most useful to examine it at its extremes. Ultimate performance mode is reflected by athletes who are "in the zone" and perform with such fluid physical & decision-making precision that it seems almost inhuman. In this case, all of the positive emotions—pleasure from the accumulating success, growing confidence from their belief in their skills to achieve their goals, pride from the social status gained by their performance —this flood of positivity merges with their actual skill & ability to create a nearly-ideal performance state in which everything else drops away from their consciousness and all resources are freely devoted to their athletic task. They have become the perfect machine for this particular moment.

And when we are in these "hyper-positive" neural states, the way in which these more-focused neural resources are used is likely dependent upon the momentary requirements of the specific task & where we are devoting most of our attention in that moment. Thus, when a musician enters this kind of brain mode while performing, it's likely that their resource-focus will mostly be devoted to their auditory systems —creating a heightened, more vivid & detailed auditory experience, which aids in their musical performance (and depending on the instrument, there might also be heightened tactile or physical responses).

Later, such a musician might be able to describe the performance in extraordinary detail—while having little memory of specific visual data, like the actions of the crowd. Except, for example, in those moments *after* they complete a song or performance and their brain (still in its

hyper-positive state) turns its attention toward the cheering crowd. Now that those extra-focused resources are no longer needed by the auditory & physical systems, they can be used for the primary task in this moment: looking over the crowd. This helps to create a momentarily extra-vivid & detailed visual experience as they take in the full sweep of their adoring throngs.

This kind of shift-in-focus/shift-in-resource-devotion is also reflected in the way many athletes describe those in-the-zone experiences. For example, when standing at the plate before a big moment, baseball players often describe the vividness of the crowd & the sea of flashing bulbs. But once the pitcher winds up, that same player often describes losing all sense of the crowd. With their extra-focused resources now devoted to hitting, the sight of the rapidly-oncoming ball fills their visual field with extraordinary detail—as is frequently stated: *they can see the seams on the baseball.*

At the other end of this spectrum is paralyzing fear—those moments in which all choices seemingly lead to great loss or harm, making you so afraid that you are literally frozen, unable to act at all. And in your frozen state you feel almost *animalistic*: nearly wordless, cowering, trembling, eyes darting frantically between each rustle of sight & sound, ready to protect ourselves, to lash out violently if provoked. In these cases, your brain isn't interested in what your consciousness might want to focus its resources on—you cannot afford to leave any aspect of this moment fully-unattended. And your brain doesn't *want* you to fully-focus on any specific task right now—it's trying to *inhibit* your actions until it knows it's safe to "un-guard" itself. This is an extreme response to the same impulse that made Rodney hesitate before reaching into the fire for his possibly-poopy yummy.

In these fearful or guarded neural states, we naturally still retain some primary focus on the identified threat or loss but—because the diffuse resource-distribution limits resource-use by any specific system—that focus (i.e., visual resources devoted to a threat) is likely much more narrow than the rich, broad focus experienced in positive neural states. Thus (returning again to those oncoming baseballs) when a timid Little Leaguer returns to the plate—after being hit by a pitch his first time at bat—and fearfully stares down yet *another* baseball speeding toward his helmet, he will very likely have a strong-but-narrow visual focus on the incoming projectile. Nonetheless, in its resource-deprived state this visual focus *does not* result in any capacity to *see the seams on the baseball* before it nearly beans him (we'll be kind & assume he learned from his first experience & ducked out of the way this time).

Ultimately, when we experience something like paralyzing fear or anxiety, your brain is begging you to wait until you can find some solution that doesn't involve a major loss. *Don't move. At all. And keep an eye on that, but stay alert! If you notice* anything—*protect yourself! Let's see if we can figure something out before you do this thing that is very likely to end very badly.*

Performance & Survival. Open & Guarded. Encourage & Inhibit. Pleasure & Pain. Yin & Yang. This is the spectrum upon which all emotions are measured & expressed. In the end, we're simple creatures—it just takes a whole lot of calculating to get there.

The Purposes: Imprint & Signal

Yes, I know, *what about the magical 26?* Getting closer...*promise*. But there's a distinction within our emotions—one we've already acknowledged—that I want to bring to the forefront before revealing the 26. It's the distinction between our emotions' two basic purposes: *imprinting* & *signaling*.

"Imprinting" is the encoding of data with a particular positive or negative value at the time of incident ("*Ouch! That red glowing stuff is hot"* or "*Mmm! This stuff I'm eating is yummy")*. As we'll discuss in Essay #4, this emotional imprinting also plays a key role in how weakly or powerfully an experience is *remembered*. The greater the *intensity* of the pleasure- or pain-based emotion (likely determined primarily by the overall gain/loss value of the event) the more strongly the event is imprinted into your memory.

Our theory also hypothesizes that our imprinting or "tagging" process works slightly differently when we make judgements about other entities (individuals, groups). In this process, emotions can both help encode the entity itself with a value, and help create/strengthen a connection between the entity and other data that has been encoded with a value (i.e., a gain/loss event). This is the mechanic that allows us to associate anger-generated, negative-value data with someone whom we actually have affection for—*without* changing our overall perception of them as an Agent of Gain. (In Essay #4, we'll discuss more deeply how this process is managed.)

Our emotions' other purpose is "signaling" or prompting, which is the primary emotional mechanic we have been discussing thus far—guiding our actions & behavior toward a desirable result. Although most of the signaling examples I've provided have been fairly straight-forward (i.e., *fear* signals behavior that helps mitigate a potential loss), our full matrix of emotions will also detail some of the more complex behaviors that our emotions can signal. These are the most sophisticated of our primary emotional pairs (and might be the most recent to evolve, which we'll discuss more later).

Some emotions are likely more heavily-weighted toward either imprinting or signaling, depending upon the kind of judgment they are designed to make. For example, pain—which is the result of an *actual* loss, and therefore a reliable indicator that this action will also be harmful in the future—is likely a stronger *imprinter* than fear. This is because fear is triggered by a *potential* loss, and is thus more-likely geared toward *signaling* (prompting) behavior & actions that help us to avoid or mitigate the *not-yet-happened* loss. In fact, if your fear is effective-enough in helping you to actually find a way to avoid that loss, then your brain would probably find it more beneficial to imprint the experience more *positively* than negatively.

Thus, it would make sense that fear's imprinting power be weak enough to be *out-imprinted* by emotions that actually judge whether the experience was ultimately positive or negative. Similarly, it's likely that emotions reflecting *actual* prediction success or failure—affirmation & surprise —are stronger imprinters than primarily *signaling* emotions that reflect *potential* prediction success or failure—confidence & anxiety.

There is also another kind of "signaling" purpose that our emotions serve—a kind of signaling that we noted when describing those more specific reflexive physical responses generated by different emotions: facial expressions. The widely-varied facial expressions (& accompanying "body language") generated by different emotions play a key role in *expressing* or *communicating* how we feel—both to other people and to *ourselves*. (And although the basic templates for pain-based & pleasure-based facial expressions are likely inborn—aiding infants & toddlers in their early attempts to express & to comprehend expression—recent research has shown that our emotion-based facial responses are also deeply influenced by learned cultural cues.)

In the case of *ourselves*, there is a kind of internal "feedback loop" that can result from reflexive physical emotional responses like smiling when experiencing some gain or positive result: the physical act of smiling seems to enhance (or help to perpetuate) those positive feelings that triggered the smile. This kind of feedback loop likely helps us to sustain those "preparatory" emotional states (and thus sustain the situationally-advantageous neural-state) that precede actual decisions & actions *without* having to continually cognitively *re-assess* the situation in order to help continually "re-trigger" that situationally-advantageous neural-state.

In the case of expressing these emotions to other people, there are obviously myriad powerful communicative & social advantages provided by the capacity to visually demonstrate & identify various emotional states. From a cooperative & knowledge-sharing perspective,

instantaneously perceiving a companion's expressed emotional response to stimuli that is novel to you—but familiar to them—is an almost-magical & wordless way by which that companion can communicate (& allow you to make personal use of) data derived from their own experience. This ability also allows you to wordlessly (& sometimes distantly) detect things like whether or not that companion is expressing their dire need of your help.

From an adversarial social perspective, instantaneously perceiving, for example, a possible enemy's expressed emotional response to *you* can obviously be extremely useful in helping you to quickly take any survival-aiding actions before that survival is actually in jeopardy. Indeed, visually expressing or assessing everything from fear to confidence to guilt can aid in effectively choosing how to manipulate or respond to social conflicts.

Despite their varied purposes & applications, all of these imprinting & signaling mechanisms play a vital role in calculating & enacting the results of our brain's emotional equations. Imprinting allows memory-based data to have actual values when plugged into those equations, and signaling ensures that the results of the equations guide our behavior, actions & neural/physical states in useful or advantageous ways based on the known data. (Narrative Complexity's layered, multifaceted view of our emotions' myriad & interconnected functions reflects the kind of non-exclusive & integrated approach to emotional function suggested in the 2013 paper by Farb, Chapman & Anderson, *Emotion: Form Follows Function.*[7])

Part of what makes this system plausible is the fact that all decisions & emotions are data-based. Not only data-based, but data-based in a way that is ultimately binary, which is the way our brain primarily functions. In the end, everything in the brain essentially comes down to an unimaginably vast array of on/off switches. Emotions make maximum use of those switches. *Complexity from elegance.* If you could use only three words to describe how the human brain functions, those would be the three words.

The Secrets of Beliefs

So, yes, we've *almost* arrived at that part. The part where we reveal *The Mothership of Emotions*. But there's just *one little concept* that I need to slip into your brain before we visit *The Mothership*. Actually, it's a pretty big concept, one that might be the most powerful force in shaping our most important decisions: *beliefs*.

There are special emotional pairs that are specifically designed to use our beliefs to generate feelings. And these beliefs provide the foundation for a vast number of the decisions we make. *You believe in God. You believe in the principles of conservatism or liberalism. You believe that love is always good*

and violence is always bad. You believe violence is a necessary evil. If you were to catalog them, your list of personal beliefs might seem nearly endless. Yet, the list would still have an hierarchy. And if a decision pits two opposing beliefs against each other, the stronger belief is very likely to win out. So what does that mean, for a belief to be *stronger* than another? To answer that question, we first need to answer a more fundamental one: *what is a belief?*

In the view of Narrative Complexity, a belief is, in essence, a high-value, high-validity prediction trope. It expresses a basic (although often complexly arrived at or applied), important, broadly-applicable and over-arching prediction that has achieved very high validity through the accumulated experience or study of actual or perceived-to-be-true events. *I believe forgiveness is always better than revenge.* Or more purely: *I believe in forgiveness.* Translated: in any choice that can be reduced to an act of forgiveness or revenge, choosing forgiveness is highly-likely to achieve a more desirable ultimate result.

The higher a belief's related value (i.e., *your soul's eternal survival = extremely high value*) and the higher its validity (*being taught something from the moment your memory began, by people you implicitly trust = very high validity*) the higher a belief rises in the hierarchy (*Above all else, I believe in God*).

These top-level tropes are decision-making gladiators—taking on all contradictory ideas or choices and slaying them with the power of their "truth." Who are these gladiators really? Purely-reduced & powerful prediction models that represent something we assess to be both a highly-valid prediction in almost all circumstances & settings, and a prediction that relates to many high-value goals.

Cheating is bad. All success requires hard work. These are superseding predictors, the express lane of decision-making, because if can we find a way to apply this predictive pattern—even without examining related data in detail—we think there is a strong likelihood of goal-success. Which does not make a belief true, it just means you "successfully" applied it or "know" it has been successfully applied enough from your perceived personal experience or your study of "reliable" sources to make it rise to the level of a belief.

And this mechanic reveals the source of many seemingly illogical behaviors and beliefs, which are actually based on very logical choices by our brain—unfortunately, in these cases, our brain has arrived at this logic through bad data or data that has been misinterpreted (often through the application of other powerful, but false beliefs).

For example, long-ago seafarers behaved in all kinds of illogical ways because they believed sailing too far would send them off the edge of the world. This belief was founded on the superseding belief that the world was flat. *This* belief was arrived at through a lifetime of misinterpreted evidence (it *looks* flat, *all the time*) and bad data sources (*everybody* says it's flat). It was almost impossible for those sailors to imagine that the sea wasn't a purely flat and likely finite entity, because they had no "valid" pattern evidence to build a different belief on.

Thus, we have *confirmation bias*—because when we judge contradictory data for validity we often can't even imagine it as true, which makes us more likely to seek out & choose to trust data that reinforces what we already believe.

[Dude from the future speaking to the long-ago seafarer.]

Dude: *Look, trust me, the world is round. That's why you can't see forever along its surface, because the surface is curved!*

Seafarer: *Right. I can't see forever because it's too far away. And on the other side of this "round" world, I suppose they're upside down and still sticking to the ground? Don't think so.*

Dude: *Gravity man. Heavier objects attract smaller, and the earth is huge!*

You can see this conversation isn't going anywhere. To the long-ago seafarer's brain, what the Dude is saying is inherently *not true* and thus, nearly impossible to tag as valid. This also makes it nearly impossible for the Dude's true, but unconvincing evidence to change the ancient mariner's belief. One way to avoid this trap is to make *"Doubting your instinct to believe in something"* one of your highest level beliefs, which is a way to "short circuit" confirmation bias. This belief does that by making doubt supersede certainty, which provides your brain with a logical, high-validity reason to give contradictory data a second look. And this allows your brain to accept this data as valid *despite* the fact that it contradicts what you "know" to be true.

It's an awfully tricky trick—which is why most of us are total suckers for confirmation bias. But the use of this trick is why the scientific method, over time, has been able to initiate major changes in human beliefs: because it is built on *skepticism*—that belief that doubt supersedes certainty. This has helped science-based endeavors to accumulate enough valid evidence and repeatedly produce enough confirming data to slowly change many of our beliefs.

Despite all this, to our brain, confirmation bias is not a flaw. Most humans do not have the luxury of being able to treat all evidence as possibly equal without further, detailed

examination. It's much more efficient to build beliefs on accumulated past evidence and trust those assessments, otherwise we might be frozen by the possibilities of what might be the *real* best decision. In fact, using the evidence that we've already gathered is essentially the *only* way we can create our beliefs. Our whole system of consciousness is founded on trusting our original value tags & validity judgements and building upon those. Yes, this means that humanity can get mired in ultimately false beliefs for a long time, but in a way many of these beliefs are *functionally* true. This means that the application of these beliefs still works within the framework of what is *actually* true well-enough to aid in our survival.

In other words, yes, there were great benefits to be had by understanding that the world is, indeed, round. But the belief that it was flat still embodied enough *actual* truths about the world to make it functional. *If we move consistently in one direction, we will arrive at a different place. When we encounter a valley or mountain, it will not continue in perpetual incline or decline, but be surmountable at some point, etc.* These might seem to be uselessly obvious premises to us, but to ancient man these truths were *functionally* more important than the belief that the earth is round, and therefore highly-useful despite contributing to a false belief.

And this appearance of functional truths within an ultimately false belief is not an accident. This occurs exactly *because* our brain is using that time-tested experiential-data-based method to build the belief. *Some* of that belief-building data has been interpreted in valid ways, and is therefore specifically useful even though we've gotten the big picture wrong (which leads to other problems, but nobody's perfect). Thus, confirmation bias has survived, because even though it can divert us to the wrong track, that track can still get us to where we need to go at that moment.

Which is all good & well, but what exactly do these beliefs have to do with emotion? Suffice to say: our brains *do not* like it when we let the lure of big pleasure or big gains usurp the supremacy of our beloved beliefs in the decision-making process. *Sure, this seems awesome right now man, but think BIG PICTURE. All the good you can get from this ain't gonna make up for all the bad that's likely right on its heels.* Remember: every time your brain is making you feel terrible, it's just looking out for you. Your brain really *is* in your corner, even when it feels like it isn't.

The Mothership of Emotions

Okay, no more stalling. Following is our Emotion Matrix containing the magical 26 —the 13 base pairs of Yins & Yangs. You are now invited to board: *The Mothership…*

The Mothership of Emotions [Matrix of Primary/Complex Human Emotions]

The Spectrum —>	***Performance (Open)***	***Survival (Guarded)***	
Narrative Triggers	**Emotional Pairs**		**Primary Purposes**
Known Value Gain/Loss	Pleasure	Pain	• Encode data as helpful *or* harmful • Signal behavior that perpetuates gain *or* stops loss
Potential Value Gain/Loss	Excitement	Fear	• Encode data as helpful *or* harmful • Signal behavior that helps ensure gain *or* mitigate loss
Global Value (Known & Potential) Gains/Losses	Happiness	Sadness	• Signal behavior that prepares us to: - expend/risk resources in times of perceived abundance, *or* - conserve/protect resources in times of perceived scarcity
Known Prediction Success/Failure	Affirmation	Surprise	• Encode prediction data as reliable *or* unreliable • Signal behavior continuance *or* cessation
Potential Prediction Success/Failure	Confidence	Anxiety	• Signal behavior that helps ensure prediction success *or* mitigate prediction failure
Known Agent of Gain/Loss	Gratitude	Anger	• Signal behavior toward entity that either: - reflects openness and strengthens bond, *or* - protects against and seeks "restitution" for loss • Associate entity with gain *or* loss data
Potential Agent of Gain/Loss	Affection	Animosity	• Signal behavior toward entity that either: - reflects openness and strengthens bond, *or* - protects against and seeks "restitution" for any previous outstanding losses • Encode entity as helpful *or* harmful

The Mothership of Emotions [Matrix of Primary/Complex Human Emotions]

The Spectrum —>	***Performance (Open)***	***Survival (Guarded)***	
Narrative Triggers	**Emotional Pairs**		**Primary Purposes**
Known Need of Agent of Gain/Loss	Generousness	Selfishness	• Encourage specific act of aiding/sharing with Agent of Gain *or* inhibit specific act of aiding/ sharing with Agent of Loss
Potential Need of Agent of Gain/Loss	Magnanimity	Greed	• Encourage behavior that prepares us to aid/share with Agent of Gain *or* to protect resources from Agent of Loss
Known* or *Potential Social Status Gain/Loss	Pride (In Self)	Embarrassment	• Encode data as "socially" helpful *or* harmful (in terms of prestige in specific community) • Signal behavior that perpetuates gain *or* stops loss
Known Belief Compliance/ Violation (by Other Entity)	Pride (In Other) *[Root of Covetousness]*	Disgust *[Root of Jealousy]*	• Associate entity with "model" *or* "avoid" behavioral data • Signal supportive *or* antagonistic behavior toward entity
Potential Belief Compliance/Violation (by Other Entity)	Admiration *[Root of Envy]*	Disdain *[Root of Resentment]*	• Encode entity as "model" *or* "avoid" • Signal supportive *or* antagonistic behavior toward entity
Known* or *Potential Belief Compliance/Violation (by Self)	Satisfaction	Guilt	• Encourage belief-compliant behavior *or* inhibit belief-violating behavior

[I chose not to include *Engagement/Boredom* because they seem to be a general mental response to the *presence* (engagement) or *absence* (boredom) of useful or novel data in our environment or within whatever we are specifically evaluating. Instead of producing actual pain or pleasure on their own, these "mental states" seem to reflect whether or not there is any possible emotion-producing data present. Thus, *engagement* opens the door to all emotions (which are actually what produce the pain & pleasure, and *keep us* engaged) and *boredom* leads to almost no emotion, a state which makes us want to move on and find something to feel.]

The Mothership's Alien Language

I know, *I know*—you have questions. And complaints. Before you toured *The Mothership*, you were thrilled it had finally arrived (anticipating that value gain). But now that you're aboard, you might be perturbed. *Where is my favorite emotion?! How can you claim this is complete? Magnanimity!? Affirmation?? What the hell!?*

I understand. And don't worry, your favorite emotions haven't gone anywhere. Think of it this way: you're looking at red, blue & yellow, and begging to know why *fuchsia* isn't there. *It's in there.* But we need to work a little alchemy in order to show it to you. And there's something else: *what exactly does fuchsia mean to you?* Sure, we can all eventually agree on what's generally red, blue & yellow—even green, purple & orange. But when we start to get into those *subtle shades* of color & emotion, we also get into that *malleable words* area. Here we begin to see some of the drawbacks of a language that allows for imprecision—a system in which certain words represent less frequently encountered ideas, and are therefore more reliant on specific personal experience for description, as opposed to more cumulatively developed & more culturally reinforced fundamental ideas (fuchsia vs. red).

Nonetheless, before there's a mutiny, let's work a little alchemy and try to make some fuchsia. *Disappointment*. Here we have a combination of surprise (*we thought we were going to ace that test*) and the simple pain of loss (*our failure cost us an "A" in the course*). Conversely, the surprise of an unexpected "A" (prediction failure + value gain) instead creates a feeling we might describe as *delight* (which helps give a positive tag to a gain event that otherwise might've been seen merely as a prediction failure).

But let's return to the disappointed student (because he's more fun to mess with). The student's disappointment might be augmented by other factors. *I should've studied harder* produces *guilt* (he violated his belief: *Success requires hard work*). And when he imagines telling his parents, he begins to experience the inevitable *embarrassment* from public failure (loss of social status). *And* because of his strong affection for his parents (which makes him want, among other things, to be admired by them) this failure registers as an even higher value loss, amping up the pain of his embarrassment & guilt to the level of *shame*.

Now imagine that in the back of that student's mind, he suddenly realizes that this failure might have the eventual bonus of lowering his parents' expectations, allowing him to imagine future gains in affection achieved at a lower cost (less studying & other success-related effort). Here his brain pumps out a bit of *excitement* over these potential future gains. In reality,

the shame of the moment is probably powerful enough to quell any real feeling of excitement, but its small pleasure still registers—most likely in a way that he perceives as "momentary relief."

When the student saw the unexpected "F" on his test, and realized he'd just lost his "A" in the course, and thought about telling his parents, he was filled with disappointment & shame. Then, for a moment, he imagined a new future in which his parents stopped expecting so much, and felt a small respite from the pain.

Of course, that still might not be *exactly* your description of fuchsia, but we can probably at least agree on which paint matches the curtains now. Keep in mind: it's not so much about the words as it is the judgements they represent, and then tying those judgements to specific pain or pleasure behavioral responses—some of which are more universally recognizable than others.

The less recognizable primary emotions & their sources are, in a way, "camouflaged" because they are rarely felt in total, focused isolation. Consequently, we aren't as compelled or likely to determine their specific narrative triggers (unless, of course, you spend a lot of time in therapy). This means there are some basic emotions that we never really think to distinguish on their own. For example, let's examine that simple (& almost *overly-familiar*) feeling of *affirmation* that you get from positive feedback when playing out a successful predictive pattern. At first glimpse this seems like a pretty flimsy emotion, especially compared to its pair: *surprise*, which is easily (& often powerfully) quantifiable to all of us. But the emotional juice from affirmation is what, for example, video game designers and mystery writers are doling out along the way to get you to the ends of their creations. Every hint revealed along the story's path (confirming the narrative that we are predicting) and every glowing, animated star that pops up en route to the end of a game level (confirming your ongoing success in solving the puzzle)—all of this pleasure says to your brain: *yes, keep going, keep thinking this way.*

And if we look more closely at "unbalanced" pairs like surprise & affirmation—where one half feels more powerful & identifiable —we can see where evolution is likely at work. Surprise *needs* to be more powerful. It's often trying to stop you cold: *woah, that's not what we expected, hold up!* But its pair, affirmation, would probably prefer we stay in the flow of whatever we are (successfully) doing. It just wants to make sure we're positively noting our success along the way. (Here again, our "Guarded vs. Open" mechanic is at work.) Thus, we can see how, over time, these differently

weighted usages resulted in differently evolved characteristics within some emotional pairs. (Much research actually suggests that our brain weights almost *all* pain-based emotions more heavily than pleasure-based—something reflected in Kahneman's *Prospect Theory*, which shows that potential losses tend to carry more predictive weight than potential gains in our brain's decision-making calculations.)

We can also see this kind of evolution in *guilt* & *satisfaction* (belief violation & belief compliance). Consider that beliefs are, by definition, already associated with high value & high validity. This makes us generally more likely to comply than not to comply. Thus, *satisfaction* doesn't need to work very hard to reinforce our belief-compliant behavior—our behavior is naturally belief compliant. Satisfaction, like affirmation, is just produced to help keep us going: *excellent*, *you're doing the right thing man*, *keep it up*.

This lack of emotional juice when we act belief-compliant is likely one of the reasons why we usually want to tell other people about events such as a our own acts of kindness. Even though we feel some genuine *self-satisfaction* from, say, saving a dog who was hit by a car *(I believe in aiding all creatures in need)*, our satisfaction still might not be as strong as our desire to tell other people—which provides that juicier, more powerful social status reward of pride (something that requires an audience).

Contrary to satisfaction, *guilt* is triggered when a belief's innate power is *not* doing its job—when a belief is being undercut by something like the potential for strong pleasure or big gains (or the desire to avoid a big loss). Thus, guilt has to have some serious juice—because in many cases, it's our last line of defense against a very bad decision. This kind of role likely led our brain to accede to guilt-heavy mutations over the course of evolution.

In this way, we can see how the evolution of emotional pairs is similar to the evolution of more concrete features, like our limbs. Once upon a time, the fins & paws that became limbs were fairly balanced in composition & effect, but as the needs of each end of the mammal grew more specific, the limbs adapted differently (while still remaining fundamentally similar & clearly part of the same original mechanism).

Now, we could continue to scour the emotional spectrum in hopes of eventually hitting everyone's favorite & thus-far-unnamed emotional combo color—but, y'know, *that'd be nuts*. There are way too many hues hidden in the rainbow. However, the colors are all there to mix for yourself. And to show you just how easy (and fun)

mixing can be, we'll do *one more* combo color—my own favorite emotion, *melancholy* (the *bittersweet* kind, as opposed to a pure shade of sadness). What I believe most people are describing in these cases of melancholy: the simultaneous experience of pleasure or happiness in response to a *current* moment of value gain combined with the pain or sadness of predicting the *future* loss of the source of your current happiness. In other words, the joy of watching your toddlers play—a current value gain—can be tinged with melancholy if you start to perceive the fact that someday they will no longer be toddlers—a predicted future value loss.

While you're trying to locate your own favorite emotions, keep in mind that some of them are essentially a word that describes a primary emotion in differing intensity: powerful guilt (strong associated loss or violation of a strong belief) is often deemed *remorse*, whereas less powerful guilt might be expressed as simple *regret*. Similarly, *annoyance* is basically a description of very minor *pain* (those bugs in your face cause tiny, but frustrating losses in resources like mental focus). But we're starting to scour the rainbow again, so —*scouring officially ceased*. (You can do a little more scouring at the end of this essay, which lists & describes 14 of the more common *Very Complex Emotions*.)

Deep Inside The Mothership

Instead of exploring more emotional blends & hues, let's look more closely at a couple of the primary emotional pairs—the ones that seem to need the greatest clarification: *generousness/selfishness* & *magnanimity/greed*. The former pair is easy enough to conceive, but the latter seems almost unnecessary in light of the first. Here again, language complicates matters. In practical terms, humans haven't had much reason to distinguish something like "selfishness" from "greed"—basically, we consider those words to be synonyms. In both cases the result is the same: *we're keeping it!*

But our evaluation of another entity's need as *known* (current) or *potential* (future) is necessary to affect the proper kind of behavioral response in each case. If the *yammering homeless guy* on the corner wants money as you walk by him, your momentary *selfishness* might keep you from handing him a buck. But what if you're worried that the government is going to come around *next year* asking for a big income tax hike to help feed *those worthless indigents?* In that case (because you're a greedy jackass who sees the government & homeless people as Agents of Loss) you might actually hide your money in some offshore bank accounts—so when the Feds come asking, it's protected. *Greed rears its ugly head.*

Conversely, if your kid wants money for pizza tonight, you have to be able to distinguish that need from their need to pay for college someday, which requires an entirely different set of actions, behaviors & long-term evaluations—as opposed to one simple act of fulfillment that is primarily dependent on your current resource status.

And these emotions work much like their cousins anger/gratitude & animosity/affection: you can be motivated to feel situation-specific generousness toward an entity that you otherwise generally behave greedily toward & vice versa (i.e., you donate specific disaster relief to a nation that you otherwise support a general embargo against, or you selfishly refuse to anté up for your kid's pizza tonight because you want the cash for beer, but still magnanimously sock away money for their tuition someday). That's because, as similar as these feelings are, they are still the results of slightly different narrative judgements. And this distinction allows your decisions to take into account relevant current & predicted resource status when deciding how to most efficiently & beneficially share or protect your resources when necessary.

Which just leaves us with one more sub-system to examine aboard our Mothership: *covetousness/jealousy* & *envy/resentment*—whose roots are, respectively, *pride(in other)/disgust* & *admiration/disdain*. Since we consider their root pairs to be Complex Emotions, we might think of these other branches as *Very Complex* Emotions. Actually, *all* of our "fuchsias" (like disappointment/delight) are Very Complex Emotions. Which is to say, at first glance they appear to be complex, but primary emotions—until you look a little closer, and realize that all of their component narrative judgements and desired behavioral results can be arrived at through some combination & application of our *magical 26*.

I've specifically noted jealousy, et al, on our emotion matrix (even though they aren't a primary pair) because these are actually among the most powerfully identifiable emotions, and their pairings so mimic the other complex Yins & Yangs that they truly *look* like primary pairs. But jealousy/covetousness & resentment/envy are *very complex* because they involve: judging another entity's belief compliance (pride/disgust), *and* judging a value gain by that entity—a gain that you view somehow as a personal loss, which triggers a combo of pain, generousness/selfishness, and possibly anger or disappointment. (Keep in mind, this "personal loss" doesn't require that you ever really had a chance of having it—to our brains, it's enough to simply want it for yourself & not get it.)

My lazy co-worker (Belief alert! "Success requires hard work") just got the promotion I wanted. I'm pissed. And, frankly, I'm jealous.

Well, Anne got the promotion I wanted. But the truth is she works so hard around here, she deserves it. Still, I'm disappointed. And I really covet her new office—which is terrible, isn't it? I should be happy for her.

It's difficult to be happy for other people (especially when their gain looks like our loss) but when their gain actually reinforces our beliefs, our brain still wants to make sure we find a way to tag the experience positively (thus, covetousness). This is because those actions & behaviors have value to us as an *effective model* of how our beliefs can help us to achieve what we want.

Conversely, when someone else's delicious gain is achieved through behavior that violates of our beliefs, our brain wants to make sure that we still tag this behavior as negative, *despite* the fact that it provides a model for achieving something we might want. So even though you also want that big sailboat your neighbor owns, you don't want to be tempted to set up a Ponzi scheme like he did in order to buy the boat. (Assuming your beliefs predict that the temporary gains from such behavior will likely be followed by dire results.) Thus, jealously gives us the permission to feel negatively about his gain in order to help reinforce future belief compliance (particularly in the face of desired gains like a big sailboat).

Culturally, we tend to view jealousy and covetousness in the same negative light, but this is one of those illogical behaviors based on a learned false belief (one that had logical origins). The roots of the word "to covet" were related to inappropriate sexual desires (this is buried in the word's etymology). But long ago we discovered that the *emotion* of coveting applies to our desire for anything of value that's possessed by someone we respect—even symbolic items, like a job title—which led us to appropriately expand the word's usage. Nonetheless, its original negative association remained, creating the foundation for a false belief: *Coveting is bad.*

The "taboo" of covetousness (taught in ancient religious texts) was originally created by our culture for a good reason. It helped us to avoid a powerful, primal & non-narrative urge: *your neighbor's wife* (whom you might succumb to coveting hands-on, even if you really respect your neighbor, *and* your own wife). But, as we observed, the idea of coveting has long been applied to that whole non-sexual universe of value gains deservedly-achieved by others—gains that we are (usually) much better at controlling our desires for (or at least we're more likely to be deterred by the

penalties in place, which *your neighbor's wife* is also good at overriding). And these non-sexual gains are the ones that our brain *wants* us to covet—because it knows it can use this data to help us to achieve our own future gains via belief compliance.

When we're jealous, the "ickiness" of the feeling toward the other person comes from our disgust over the belief violation that is at the heart of their value gain. Conversely, your desire to fight your own loss pain in order to "be happy" for the coveted gains of someone you respect—that positive impulse is rooted in your pride in their belief-compliant behavior. So go ahead—*covet* all you like. It's good for you. Just keep your envious eyes (and your hungry hands) off your neighbor's wife.

A Final Filmstrip: Emotion's Evolution

Alas, the time has come to disembark *The Mothership*, and leave behind all its high-tech, evolutionarily-fancified brain mechanisms. Your own brain, I'm sure, would be happy to take a respite from all those wacky, mind-bending emotional equations. So we will. *Consider the chalkboard cleared.*

But before you go, let me pull the screen down over the board, switch off the lights, and roll out one of those old filmstrip projectors (kids, imagine an ancient PowerPoint presentation with *way better* analog-ish ambience). And don't put your head down on your desk—*you're gonna wanna see this.*

Because our speculation about emotional equations has been based on very familiar experiences & a mathematic (or at least "algebraic") *Prospect Theory-supported* approach, its conclusions are in many ways quantifiable. The speculation in our filmstrip, however, is more... *speculative.* Which is, frankly, what one would expect from a story about the evolution of emotion. Nonetheless, the tale is a compelling one. And at the very least, we know that modern human emotions had to come from *somewhere.* And that somewhere is *exactly* where our filmstrip begins...

It is 700 million years before humans ambled onto the evolutionary stage. A little roundworm with an unfortunate first name —Caenorhabditis elegans—is squiggling along in the muck. And little C. elegans has something in common with us: he likes to eat. Not only does he like to eat, he *expresses* this desire using clever devices that we also make heavy use of in the expression of our desires: *neurotransmitters*.

In particular, C. elegans is using serotonin and dopamine, which play significant roles in our own brain mechanics (they are key players in producing & manipulating our pleasure/pain responses). When Mr. Roundworm encounters positive stimuli, like food or a mate, serotonin is released—helping to enact motor scripts like bacteria ingestion. In addition, when his worminess rubs up against that yummy bacteria,

dopamine is released. The dopamine helps to inhibit the creature's locomotion motor scripts—slowing him down & allowing him to spend more time in the presence of the food. And if he's really hungry, more serotonin is released—this dose helping to inhibit his locomotion even further, ensuring he eats every last bacterial bite. [8]

I know what you're thinking: *this C. elegans guy sounds like an uncle of mine*. And, yes, from a broad universal perspective, we're not all that different from our wormy planet-mate. But 700 million years is a long time. And our use of these neurotransmitters is so much more diverse & complex than C. elegans' that it's like comparing an abacus with an iPad. Sure, they both calculate stuff with similarly clever efficiency, but an iPad can calculate *a whole lot more stuff*. And not to make C. elegans feel worse about himself, but plenty of tinier & earlier creatures were using neurotransmitters to affect behavior (even lowly paramecium use serotonin when swimming).

Nonetheless, in C. elegans scientists have found some of the specific kinds of serotonin receptors that humans use today. [9] And in his simple existence we can see the early sparks of those relationships between resources (*food*), "feeling" (*neurotransmitters*) & behavior (*stay here*) that are at the root of our own complex emotions.

As we said, 700 million years is a long time. And in the epochs between roundworms & humans, those simple neurotransmitter-fueled commands *"stay here & eat"* and *"stay here & reproduce"* evolved into more complexly regulated—but still very basic—resources, feeling & behavior relationships. (Thanks to more robust & diverse neural structures & neurotransmitter mechanisms.)

The result was likely a system of primitive *proto-emotional* pairs that initially helped vertebrates to manage: *hunger(thirst)/satiation*, *lust/repulsion* & *strength/fatigue*. Those would cover all of an early creature's basic needs (and probably composed an average evening in the cave: eat, drink, screw, sleep). *C. elegans politely raises his tail: "Hey, I basically do all of that stuff too!"* Which is true, but post-roundworm creatures began to require resource-acquisition strategies more complicated than *squirm toward that chemical marker & hope I squiggle over something to eat*. Thus, the neurotransmitter-fueled behavior signaled by proto-emotions such as hunger & lust also grew more complicated.

Now, in the blink of a celestial eye, 700 million years have passed (cue Terence Malick's *"Tree of Life"*). Here, humans have gotten the long end of the stick. Their brains are *awesome*. Those simple implements like hunger/satiation, lust/repulsion & strength/fatigue have morphed into an entire toolbox of fancy gadgets. And those gadgets have a

name: *emotions*. The same neurotransmitter-based signals that forced C. elegans to eat all his spinach are now signaling all sorts of crazy & unbelievable things. And they're doing it mile-a-minute. If a roundworm's simple signaling system woke up inside a human brain, it would feel like a previously perpetually-recluse hydrogen atom suddenly transported to the center of a blazing sun.

And yet, it was C. elegans who begat those proto-emotions—and those proto-emotions likely begat our complex (& *very* complex) emotions. Look closely at the value gain/loss judgements that are at the heart of so many primary emotional pairs. What was the original *object of value*, the one that hunger & satiation managed? *Food*. Hunger. Pain. Value loss. / Satiation. Pleasure. Value gain. *Rodney saved the yummy and felt pleasure—even before* eating *the rescued yummy*. (Interestingly, the *vast majority* of our brain's pleasure-producing serotonin comes from one location: our *stomach*—and the serotonin's commute to the brain is signaled by a specially-designated nerve that connects the two organs. Coincidence? Doubt it.)

In addition, these *other entities* we are always judging, Agents of Value—what was the original *other entity* that early animal brains were most interested in evaluating? *Our mate*. Lust. Affection. Agent of Gain. / Repulsion. Animosity. Agent of Loss. *Rodney was angry at the wanderer for causing the loss of his yummy*.

The emotional "bonding" that is triggered by Agent of Gain judgements (which are involved in many emotions beyond affection—like generosity & magnanimity) is likely aided by the specific use of the hormone/neuromodulator *oxytocin*. Research has shown that this neuromodulator is involved in many "empathetic" (aiding/sharing)[10] or affectionate behaviors (it's sometimes called the "love hormone").[11] And the use of oxytocin by our modern Agent of Gain emotions (to aid in bonding with those dynamically-determined Agents) probably has its roots in that more reflexive proto-emotion *lust*.

As in humans, oxytocin appears to be used by earlier mammals to aid in bonding with mates & offspring, thus its expanded (but similar) use in our modern *Agent-of-Gain-related* emotions seems likely. (And this kind of bonding works in combination with belief-based mechanics like *admiration*—and other predictive patterns/assumptions drawn from accumulated or high-impact experiences—in helping to cognitively define individuals & entities as reliable or "trustworthy.")

Decision-making about all of these resource gains & other entities began getting more complicated when —in the middle of that

700 million year blink—advancing creatures got a cool new (but still primal) neurotransmitter-fueled prediction tool & signaling gadget: *fight or flight*. This little device provided a super-useful survival skill: a method for choosing the most appropriate response to immediate danger. *I can take him! Let's do this!* or *No way, man! Run!* Whaddaya know...*a validity judgement —assessing which one of two predictions is more likely to either achieve a gain or avoid a loss*. Fight. Confidence. Prediction success. / Flight. Anxiety. Prediction failure. *Rodney hesitated before reaching into the fire for his possibly-poopy yummy.*

Keep in mind, exercising *fight or flight* is not the same as identifying a possibly-edible fruit and feeling compelled to eat it. That's simple value gain recognition & signaling. You know *exactly* what to do: eat the fruit. But fight/flight is likely tied to our ancestral validity systems because it involved assessing two possibilities that might be best. *If I fight, I might win & live. If I run, I might get away & live.* You *don't* know exactly what to do, you're weighing your choices—*measuring the validity or likelihood of each prediction.*

Another primitive feeling—one that also seems to be tethered to a modern emotional mechanism—emerged during the heart of that 700 million year blink: strength/fatigue. Is this category a little too imprecise? Probably—inasmuch as it doesn't distinguish between an overall state of fitness & simply feeling rested/unrested. But at its core, strength/fatigue represents a more fundamental, action-specific judgement: *am I able to keep going or must I stop?* This judgement is most vital at times when a creature's survival depends on its ability to squeeze every last bit of life-saving action out of whatever physical resources remain—which can be hindered by things like pain & fatigue (feelings creatures typically experience in these survival-challenged moments).

Once again, nervous systems around the globe went back to that oh-so-reliable tool for a little help in these situations: neurotransmitters. Vertebrates got a gift—*endorphins*, which are released during moments of pain, excitement, exercise & fatigue (and others, like orgasm, but let's stay focused). These endorphins are known to inhibit pain, create feelings associated with pleasure, and to be released in moments when we're trying to squeeze the most out of our resources (injury, exhaustion, sex).

Thus, it seems likely that—as the modern human brain emerged—mechanisms rooted in that primitive strength/fatigue feeling & involving endorphins evolved into what we think of as *willpower:* the attempt to "consciously" bolster one of those

aforementioned struggling or difficult (or *extra-resource-requiring*) efforts. Science has, indeed, shown that these endorphins can play a key role when we experience both very open & very guarded states [12] (highly-excited & highly-fearful) generated by our primary (*narratively-based*) emotional pairs —making us more capable of taking effective action in each state. And the roots of this kind of willpower mechanism were probably heavily-intertwined with that validity-based proto-emotion we just described: fight/flight.

To understand why, first consider that the validity judgements necessary to take the most-beneficial dynamic & contextually-based action appear to have actually *preceded* the development of true fight/flight (even though we shamelessly gave fight/flight all the credit on the previous page). This validity-based precursor to fight/flight is something we might think of as a *fight/cower* response.

An example of this in early reptiles: *turtles.* (Humans, of course, didn't evolve from turtles, but reptiles & mammals both emerged from the earliest amniotes. Thus, those first versions of reptile brains likely shared many fundamental mechanisms with those first versions of mammalian brains—and similar basic fight/flight responses are demonstrated by both reptiles & mammals.) When certain land turtles dynamically *choose* to respond to a unique new potential threat by either biting or retracting their heads [13] (some are not capable of both) they are making one of those contextual *this-or-that* validity judgements that's the basis of fight/flight.

But, as described, turtles don't typically *flee* —instead, they essentially *cower.* If we consider that, according to our theory, all emotions (proto & modern) are part of an encourage/inhibit pairing, then fight's *encourage* response would naturally be countered by a pure *inhibit* response. This is what cowering represents: *inaction & guarding behavior* in response to a perceived threat instead of active & open behavior (biting).

In order for this creature to overcome its inhibitory cowering response and actually *flee,* they would likely need to begin getting injured while cowering & suffer pain. This is because, among these earlier vertebrates, pain or fatigue were required to generate an endorphin response, which is what ultimately helps them to neurally overcome the inhibitory cowering and actually engage in some life-saving fleeing.

One of the interesting things about fight/flight is that it contradicts that seemingly fundamental action/inaction pairing of emotional responses—fight/flight is actually *action/action*. How did advancing

vertebrate brains likely achieve this paradoxical pairing? *Endorphins*. Evolution seems to have sorted out the fact that—if you've already determined a threat is *un-fightable*—it's often better to engage in any necessary fleeing *before* you begin to get that endorphin rush from being pummeled while cowering (especially if you're a *post-turtle* vertebrate whose *cowering effectiveness* isn't enhanced by a shell). Thus, in the development of fight/flight, the brain likely began to repurpose those original endorphin-based strength/fatigue mechanisms & use those neurotransmitters to help counteract that *initial* inhibition response generated by fight/cower.

Basically, this means that creatures with more evolved fight/flight responses would've been the first to generate endorphins based on cognitive analysis of externally-perceived threats (those *this-or-that* validity judgements) as opposed to producing endorphins purely based on internally-detected pain or fatigue stimulus. (This kind of development seems to be one of the primary drivers of evolutionary advancement in vertebrate cognition: the growing integration of neural systems that were originally solely devoted to either external or internal sensory input.)

The neurotransmitter/hormone most-commonly associated with fight/flight is epinephrine (aka *adrenaline*, like our body's version of speed) which is typically released in heavy doses when stressed or otherwise physically-aroused by a situation. But epinephrine doesn't appear to help us to *choose* to act or overcome some inhibitory behavior. Rather, it seems to be released once we've *already chosen* to act or simply upon *encountering* the stressful stimuli—essentially temporarily juicing our whole system, allowing us to perform *whatever* act with greater efficiency, robustness, stamina or effectiveness.

Endorphins, on the other hand, were first designed to be pain-blockers (like our brain's version of opiates) and thus naturally work in *direct opposition* to inhibitory instructions and primal urges. Endorphins aren't just there to provide pleasure that enhances performance, but pleasure that also specifically helps overcome inhibitory or contradicting instructions. Thus, fight/cower likely generates only epinephrine in the creature (making it more effective in fighting or cowering, but still unable to flee) while the more-developed fight/flight response generates both epinephrine *and* endorphins. Similarly, endorphins likely play a key role in some of our "guarded" emotions that can require urgent action, like *anger* (which is probably why it can actually *feel good* to be angry sometimes).

These are the reasons why it's more probable that endorphins and *not*

epinephrine are the foundation of our actual *willpower* mechanisms. (In fact, because it's juicing *everything* in the brain, epinephrine can sometimes make it *more* difficult for an urge to be controlled by our endorphin-based willpower.)

Why did the involvement of strength/fatigue's endorphins with fight/flight's validity judgements end up being so great for humans? Because this evolutionary development connected the release of endorphins to those early cognitive systems that would eventually generate validity-tested, emotion-producing, decision-making narratives. This is how it likely became the root of *willpower*—that attempt to "consciously" bolster a struggling or difficult effort. Once these systems—urge-overcoming endorphin-production & action-enhancing narrative motivations—were tied together, human brains could use these unique neurotransmitters to aid in choosing high-priority & sophisticatedly-arrived-at narrative options over powerful primal or emotional urges.

Unfortunately, endorphins are a fairly new discovery (only dating back to the 1970s) and there is not a wealth of broad research on their effects in different neural circumstances. But there is a small amount of endorphin research that provides an interesting window into their willpower connection: research on endorphins & *sleep*. In one study, it was shown that disrupting endorphin input within the human brain while sleeping had no impact on the sleeping brain; it remained asleep & unperturbed [14]—suggesting that endorphins have no role in the sleeping brain.

In addition, a study on cats showed that the introduction of endorphins to the brain during sleep both inhibited lighter sleeping & entirely prevented deep REM sleep [15]—also suggesting that it is unlikely that mammalian brains are using endorphins while sleeping. Thus, those moments immediately after awakening or moments of semi-sleep (like sleep-walking) are likely brief windows into how our brains might behave *without* the benefit of narrative-action-enhancing, urge-inhibiting endorphins.

As someone with a lifetime of sleep issues (sleep-walking, difficulty sleeping long stretches, etc.) I happen to have a good deal of experience facing the world in either semi-sleeping or barely-awake states—in fact, as I've aged my sleepwalking has been replaced by the odd & disconcerting habit of sleep-*eating*. My experiences in both of these (likely endorphin-deficient) states are fairly common, and one thing seems to be particularly true about all of these experiences: I exhibit a significant decline in my ability to express *willpower* over my urges (like eating half the box of cookies or flying off the handle at the slightest irritation, even though deep in my brain I can hear myself clearly saying *don't eat that* or *calm down*).

This willpower deficiency while barely-awake, as mentioned, is not uncommon. My guess is that many readers of this essay have had similar experiences. And although some of the other primary neurotransmitters like serotonin & dopamine are typically less in evidence during sleep, they are still used in some small fashion or another during the whole process of sleeping and awakening, and their presence in the brain does not actually appear to inhibit sleep in the way endorphins do. Thus, endorphins appear to be one of the only primary neurotransmitters that's entirely absent during these episodes of sleep-induced willpower deficiency, also supporting its candidacy as willpower's main neural advocate.

Whenever a narratively-based cognitive desire (don't eat those cookies, don't get mad about that, *control yourself*) is powerfully contradicted by one of those strong emotional or urge-based impulses, endorphins are released and enlisted in aiding the "preferred" narrative desire. The higher the value you can generate for the preferred choice via your story, the stronger the production of endorphins in support of that narratively-reasoned option.

This is why when guys like Aron Ralston (the dude who was wedged in a rocky crevice & saved his life by cutting off his own arm) finally muster up the willpower to slice away, they do so by thinking of all the people they love and want to return to, convince themselves that they will die otherwise and thus must act to see them again. Ralston even thought about people that didn't *exist* yet—namely, imagining his someday child, who might not *ever* exist if he didn't survive. These are powerful & convincing stories—the kind that help maximize endorphin production & win the battle over the very strong primal urge *not* to cut off your own arm.

Another thing about Ralston, whose endorphin system and story were so amazing that he could cut off his own arm: he was one of those *thrill junkies*. In other words, he seemed to get extra-special and addictive pleasure from the endorphin-enhanced joys of risk-taking behavior and physical exertion. This is evidence that he likely possesses naturally-strong endorphin production or benefit, which is partly what saved his life —that and the aforementioned powerful, convincing & endorphin-maximizing *story* that aided him in winning the battle against *not wanting to cut off one's own arm*.

Which is not to say that *all* individuals with strong natural willpower mechanisms exhibit a *thrill-desire*—many other factors are also at play here, such as our ability to create & maintain those powerful narratives/reasoning that help *trigger* the endorphins. In fact, from our theory's perspective, many of the decision-making conflicts that are considered to be mitigated primarily by "willpower" (such as resisting the urge to cheat on a test) are actually a result of our belief systems working in

powerful *combination* with mechanisms like our endorphin-based willpower (a matter that will be explored in Essays 4 & 5).

Ultimately, the particular willpower device that we're identifying here can be described in very specific terms: "willpower" is a neural mechanic that (with the aid of endorphins) encourages humans to *consciously choose to endure* (& helps them to tolerate) predicted & ongoing pain/loss in the service of achieving a longer-term personal or broader societal (& often belief-based) gain. This neural mechanic is cognitively triggered when there is a *strong conflict* between a powerful narratively- or belief-based (consciously-considered) goal and a powerful pain-based/loss-avoidance urge or emotion—like hunger, fear, anxiety or anger. (For example, when the goal of saving your life by cutting off your arm *strongly conflicts* with that fear- & pain-based urge to *not* cut off your arm.)

Keep in mind: even when we use willpower to refuse an easily-available gain like secretly downing an extra piece of cake or swiping an unseen $100 from the register (*or having sex with someone other than your spouse*) that willpower mechanic is still essentially helping us to overcome (& tolerate) the predicted (& ongoing) pain of *not* eating the delicious cake or *not* becoming $100 bucks richer (*or that devilish pain of* not *having sex with someone other than your spouse*).

Additionally, as we noted, the *effectiveness* of this mechanic in helping to achieve or choose the narratively- or belief-based goal is primarily determined by a combination of the strength of the emotional response generated by the narrative and an individual's capacity for endorphin production & benefit. This effectiveness can also be *hindered* by the kind of mental fatigue (aka, diminishing brain resources) that can result from being over-worked, under-rested or stressed-out—which likely makes it harder to maintain the cognitive focus necessary for effective (& willpower-inducing) narrative reasoning. (This mental-fatigue-based willpower hindrance does not, however, *totally disable* our human willpower mechanisms in the way that those *endorphin-deficient* sleeping or semi-sleeping states seem to.)

By viewing willpower in these terms, its connection to that endorphin-based *strength/fatigue* proto-emotion becomes even more clear. When those early creatures attempted to muster their quickly-waning resources in order to take that next *survival-aiding* step away from danger despite extreme fatigue or serious injury—which trigger endorphins—what those creatures were really doing was choosing to endure (& being aided in tolerating) the *pain* that was an inevitable consequence of taking that *oh-so-difficult-but-survival-aiding* next step away from the danger. That *pain* is telling the creature: *Don't move, we're injured!* or *Don't*

move, we're almost out of resources! But the endorphin-based (& primitively cognitive) response is saying: *We'll worry about that later, because if we don't move RIGHT NOW there probably WON'T BE any "later."*

And so, based on all of this, we can imagine how a complex, endorphin-based willpower system evolved from our ancient strength/fatigue mechanism—via millions of years of interactions with those fellow primitive mechanisms: hunger/satiation, lust/repulsion, and most-importantly, fight/flight. *Rodney was so angry with the wanderer that he nearly slugged him—he really wanted to, but knew it was a bad idea. Resisting the urge took all the willpower he could muster.*

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The next likely leap in vertebrates' emotional evolution reveals a truth that even Darwin had a hard time reconciling: everything isn't *always* & *entirely* about us, the individual. In some cases, it turned out that aiding one's own survival meant aiding *the group's* survival. And aiding the group often meant one specific kind of behavior: sharing resources. (It also meant helping out fellow group members in a bind—i.e., helping free a trapped species-mate, which is ultimately a *sharing* or *donating* of personal resources like time, energy & risk-exposure; we're *literally* giving something of ourselves.)

This gearing of individual action toward benefitting a larger group by encouraging cooperative behavior (essentially, aiding & sharing behavior) was the beginning of social structures. (Keep in mind that in these social structures, individual actions that benefit the group also provide ultimate benefits for that *individual*, whose own survival is supported by the group.) And recently, researcher Alison Davis Rabosky discovered a rare group of desert-dwelling lizards who present the earliest evolutionary evidence of kin-based social behavior.[16, 17] These lizards work cooperatively to build the tunnel structures in which they live (for multiple generations) & share resources, and this openly cooperative behavior is built around kin-based social structures. In other words, these lizards appear to be among the first to share with other genetically "pre-defined" (by kin) Agents of Gain within their species.

In early mammals, there is actually evidence that this aid/share proto-emotion or instinct was applied species-wide. (To be more accurate & less positively-biased, this proto-emotion is better described via its root encourage/inhibit pair: Share/Hoard.) Peggy Mason at the University of Chicago demonstrated that rats will help free a trapped (& unrelated) rat, and also share the yummy chocolate chips that both rats have access to (they will even free the trapped rat first, despite having open access to the

yummy chocolate chips).[18] Other recent research in rats has shown that they appear to use mirror neurons to empathically reflect/experience stress & pain observed in other rats.[19] Thus, it seems likely that the mirror-neuron-perceived distress in other trapped (or otherwise stressed) rats helps to trigger sharing's resource-donating twin: "aiding" behavior (a string of dynamic responses that continue to be tested & revised until no stress is empathically perceived in the other rat). All of this essentially represents indiscriminate "altruistic" behavior in which donating resources to any fellow species-member represents an overall survival benefit.

In later mammals (like pack animals & primates), this aid/share instinct mostly grew more discriminatory again—applied only to kin (like those lizards) or other members of tightly-knit social groups, thus allowing more intra-species competition for resources. With the exception of bonobos, who—as proven by Brian Hare at Duke—actually *prefer* to share with *strangers*.[20] It seems that ever-social bonobos value expanding their social circle above all else.

Hare's most recent (& brilliant) bonobo experiments also demonstrated something else very revealing: the sharing-inclined bonobos would *not* share with the stranger if an *actual* food loss wasn't *counterbalanced* by the gain of *actual* social contact.[21] I believe this loss/gain "counterbalancing" is still an essential element in modern human sharing; no matter how powerfully our relationships or beliefs may compel us to share, there is almost always some "maximized" level of loss that will inhibit that powerful urge to share or aid. (The *most-maximized* level of loss is, of course, losing *our lives*—which we're typically only willing to donate in the service of our most dear causes or in aiding our most profoundly-bonded Agents of Gain.)

Even though this kind of kin- or pack-based (or stranger-based) sharing was a more discriminatory application of this proto-emotion in mammals, it was still applied primarily according to genetically "pre-defined" Agent of Gain criteria. And sharing stayed that way (pre-defined) for a long time—until hominids (or likely until some of their closest primate relatives). Thanks to those newly-evolved, awesomely-modular & flexible neural systems, humans added a new trick to our judgements of other individuals/entities: that dynamic tagging of Agents of Gain or Loss (the descendant of Lust/Repulsion).

In other words, no matter *who* you are, if you help me or hurt me I'm going to *remember* that and tag you as a helpful or harmful entity for future reference. This individualistic, dynamic tagging of Agents of Gain also meant that our aiding/sharing

behavior could be applied in a newly dynamic way—allowing humans to feel those modern emotions like *generosity* or *selfishness* toward entities that we have specifically categorized as helpful or harmful. Share. Generosity. Donate resources. | Hoard. Selfishness. Protect resources. *The wanderer promised to help Rodney hunt in the morning, and the offer made Rodney feel better about sharing his yummy with the wanderer.*

(Earlier mammals—like dogs—can also remember entity-related gain events that can *ultimately* affect future sharing behavior with that entity & help them make emotional judgements like anger & affection. But I believe those initial gain-providing interactions can actually allow that entity to obtain “pack member” status. And that pack status is still the “pre-defined” neural judgement that determines specific sharing behavior, which is a neural judgement that’s different from anger & affection.)

It's important to understand, however, that a human’s decision to *share* or *hoard* isn't all about our dynamic Agent of Gain/Loss tagging—because humans have those other powerful behavioral calibrators: *beliefs*. In other words, we can have very specific & hierarchically-organized learned beliefs regarding sharing and apply those in combination with our more primal (but sophisticatedly-dynamic) Agent of Gain or Loss judgements when making decisions about sharing resources or providing aid.

Ironically, from Narrative Complexity's perspective, our human empathy mechanisms (which I do not believe are actually much different from the empathy mechanisms of other primates) only play a tertiary role in human aiding/sharing behavior—behind the roles of those beliefs & Agent of Gain/Loss mechanisms. Consider that "empathy" is ultimately the result of mirror neuron-based systems that reflect visually-perceived "other entity" physical movement & facial expressions from our parietal lobe to our pre-motor & somatosensory cortexes—which allows us to internally experience & interpret those "other entity" physical movements & feelings.

Thus, this empathy mechanic really only provides humans with the *capacity to better judge* (& feel for ourselves) how others are feeling, but empathy does not actually have much impact on how we choose to *respond* to that experience or judgement of their feelings. Our actual response to empathically-based emotions & judgements is mostly determined by cognitive mechanisms like those Agent of Gain/Loss mechanics & belief systems.

Someone says something mean to you. You respond by saying something even meaner & it almost makes them cry. You visually & empathically

—via mirror neurons—identify their sadness & reflexively, to some degree, feel their sadness. Do you apologize or walk away satisfied?

In both cases, you *empathically* perceived their pain—and this empathic perception might automatically trigger at least an *echo* of that primal "aiding" urge—but ultimately, your full behavioral *response* to that perception (& that echo) depends upon your beliefs about concepts like forgiveness, and judgements like whether or not you perceive them as a potential Agent of Loss or Gain.

Returning to the trail of emotion's evolution, although our earliest social mammalian ancestors did not possess this ability to respond to other group members in such diverse & complicated ways, their primitive-but-ever-advancing social structures did more than just foster basic aiding & sharing. These social structures also helped give value to a new commodity that those animal packs & communal groups allowed: *social status* (the acquisition of which provided myriad survival & reproductive advantages). And wherever there's value to be gained or lost (social or otherwise) emotions are bound to be found. Thus, mammalian brains developed a new proto-emotional mechanism that aided in managing & responding to the gains & losses of this new, valuable *social status* commodity.

In the view of Narrative Complexity, advancing mammals who arranged themselves into more complex (non-purely-kin-based) social groups—i.e., pack animals like wolves—likely used this "social status" behavioral/emotional mechanism to accomplish two tasks that are crucial to forming complex social groups: 1) helping to determine "in-group" & "out-group" judgements of individuals, 2) helping to determine an hierarchical order within the group (aka, determine leaders & followers). And, according to our theory, the proto-emotion that played the key role in those tasks was likely a primitive version of our purely-socially-based modern emotion: *Pride/Embarrassment* (an emotion that, as we noted earlier, *requires* an actual audience—or, at the very least, an *imagined* one). Viewed in its proto-form, we might think of this emotional pair as *Inclusion/Ostracization.*

Whenever a potential or current member of a social group (like a pack of wolves) engages in behavior that harms the group or its pursuit of a goal (*like hoarding food or screwing up your role in a group hunt & allowing the escape of soon-to-be-food*) the social group—usually following the example of the leader—will likely engage in some kind of "disciplinary behavior" toward the offending screw-up. This "disciplinary behavior" is essentially a form of "shaming." And the result of this shaming is that the offender "feels" (at least temporary) *ostracization* from that group.

The behavior that's triggered by this proto-emotion (behavior that's demonstrated, for example, when you scold your otherwise-beloved dog for pooping on the carpet) essentially leads the offending individual to "self-ostracize" or engage in behavior that distances themselves (physically and/or socially) from that group.

Conversely, when a potential or current group member engages in behavior that specifically aids the group or its pursuit of a goal (*like impressively taking down the big & elusive target of a group hunt or wisely leading a group of foragers to the perfect location for abundant foraging*) that individual is likely to receive a positive response from other group members (essentially a form of "praise" combined with primitive expressions of gratitude). The result of this positive social response is that the individual experiences a powerful "feeling" of *inclusion* within that group. And the behavior that is triggered by this proto-emotion (which can be observed when you effusively praise your dog for a job well done) is something that we might think of as a desire or willingness to "take center stage" (at least temporarily or maybe even *momentarily*).

This kind of primitively prideful behavior essentially signals a stronger engagement with or commitment to the group, which demonstrates to others that individual's capacity to be part of (or take on a greater role within) the group. This *inclusion-spurred* behavior can also trigger within that individual a *desire* to take on a greater role within that group (something that might ultimately lead a powerfully-prideful underling to challenge the reigning *alpha* for group dominance).

The evolutionary-fitness value of this emotional mechanic is that it both helps to sort out the most group-benefitting individuals from the least group-benefitting individuals, and it helps to determine an hierarchy within that group, which is crucial to highly-cooperative behavior like pack-based hunting or group foraging (cooperative behavior that typically requires both a strong, proven, highly-skilled leader and competent, willing & well-disciplined followers). Despite the obvious evolutionary necessity for this distinct proto-emotion's existence in advancing social mammals, it expresses such a fundamental judgement about how we view ourselves (*part of* or *not part of*) that we barely think of this primitive pair as a true set of "feelings" by themselves.

And, in fact, I believe that our difficulty in identifying *Inclusion/Ostracization* as a distinct & separate proto-emotion that can be clearly differentiated from the experience of *Pride/Embarrassment* is because this feeling has actually *barely evolved* from its primitive form into a distinctly modern one. Why have these

particular emotional offspring stayed so uniquely close to their parents? According to our hypothesis, it's because a more complex, capable & modern emotional/social tool took on many of the tasks that Pride/Embarrassment (& its proto parents) originally handled: those ultra-useful & highly-flexible human belief systems.

We'll detail the evolution of our belief systems in a moment (& explain exactly how intricately Pride/Embarrassment are tied to that evolution) but we've already discussed the powerful role that belief-based emotions like admiration/resentment can play in making decisions about following or not following the lead of someone else. Additionally, in modern social groups an individual's in-group or out-group status is powerfully impacted by whether or not that individual has demonstrated or expressed that they share the group's most important & sacred beliefs.

Because our brain's belief systems are so complex & highly-evolved, they are ultimately much more effective & nuanced arbitrators of social groups & group hierarchies than those much simpler Pride/Embarrassment mechanics. In addition, Pride/Embarrassment can be overly-prone to undesirable results like simply allowing the biggest bully—aka, a disproportionately prideful & shaming-prone individual—to take over a group without necessarily demonstrating all of the skills best-suited for leading the group (fueling the political ascendence of rage-filled despots like Adolf Hitler and narcissistic fools like Donald Trump). Thus—having ceded the task of handling the more diverse & robust management of social groups to our beliefs—that nearly-proto-emotion Pride/Embarrassment was never evolutionarily driven to morph into something more distinctly complex. It's like the *Peter Pan* of modern emotions: *it just never really grew up*.

All of which means that—although there's still a distinct parental relationship between the proto & modern versions—the evolved pairings of Inclusion-Pride *(Gain of Social Status)* | Ostracization-Embarrassment *(Loss of Social Status)* still remain uniquely sibling-like (members of nearly the same "emotional generation"). *When Rodney explained to the wanderer that he was the first person in his tribe to discover this unique yummy—and then observed how much this impressed his new companion—Rodney's heart swelled with pride.*

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Those frequently-aforementioned belief systems finally bring us to what might be the most crucial & pivotal development in the evolution of emotion, one that likely occurred alongside the emergence of social structures in the heart of that 700 million year blink: disease avoidance behavior—

essentially, primitive *disgust*. Early disease avoidance appears to be based on identifying a specific subset of olfactory data within a larger scent pattern. For example, rats could detect & identify a subset of disease-indicating olfactory data within the larger scent pattern of another rat, which triggered survival-aiding *avoidance behavior*.

(The unique neural mechanics & roots of primitive disgust are well-explored by Hanah Chapman & Adam Anderson in their 2012 paper "Understanding Disgust." Additionally, as their paper notes, humans' & other animals' *distaste* response—primarily spurred by specific stimuli like bitterness, and intended to identify toxicity as opposed to a possible disease-source—is much more primitive & less sophisticated than disgust. [22])

In the view of Narrative Complexity, this neural mechanic—applying a specific, but broadly-applicable subset of data to larger data patterns in order to determine avoidance behavior—is what unites *all* forms of disgust. This mechanic is demonstrated by advancing mammals' capacity to specifically judge, for example, disgust-producing (& possibly-illness-causing) *rottenness* across a wide variety of unlike fruits & meats.

As mammals evolved, different species developed different levels of disease avoidance behavior—likely based on the species' specific natural disease-resistance. (Thus, species with greater natural disease-resistance, like dogs, would require less powerful & broadly-applied primitive disgust responses.) Hominids not only inherited this olfactory-based, disease-avoiding disgust, but they also seemed to possess a particularly powerful version of it—demonstrated in our strong, primal aversion to the scents & tastes of harmful resources like rotten food or feces (stimuli that don't seem to particularly bother the olfactory systems of mammals like those aforementioned dogs).

And since we've mentioned dogs, it seems fair to note the unique disgust response displayed by their cultural counterparts: *cats*. Felines appear to express this avoidance behavior by reflexively attempting to *bury* or *conceal* the offending material (and they even seem to reflexively seek out a burying-favorable location—a pile of sandy dirt or a litterbox—when depositing their own offending material). Disgust's cross-applied-data-subset mechanic is evident in this behavior too: cats will reflexively display this *paw-reach-&-pull* burying action when encountering a range of different kinds of novel (but powerfully-scented) stimuli. I've seen cats do this in response to items as diverse as ashtrays & coffee puddles—despite the fact that these items' overall, complicated scents are much different from each other & from feces.

For early humans, these flexibly-applicable primitive disgust mechanics were so useful that they eventually made a spectacular & crucial leap: from the olfactory systems to our visual & cognitive systems. What spurred this leap? Narrative Complexity hypothesizes that the key event occurred long after hominid brains had already left all others in the dust, when our human ancestors finally did the deed: *making fire*. This discovery now allowed them to cook their food, which ultimately forced our ancestors to develop & nurture an unprecedented ability: eschewing the primal, *hardwired* desire to eat raw meat in favor of exercising the *learned* behavior to wait & eat the meat *after* it's been cooked (and eating the cooked meat offered a plethora of advantages in areas like digestive efficiency, food storage & general health—i.e., *avoiding* food-borne *disease*).

In his 1999 paper "The Raw and the Stolen," Harvard anthropologist Richard Wrangham hypothesizes that the advent of cooking by early Homo erectus populations played a significant role in the evolution of human social systems. [23] Wrangham theorizes that, initially, cooking was primarily used to take greater advantage of underground storage organs (essentially, root vegetables) during periods of food scarcity. He also hypothesizes that the cooking of meat didn't emerge until *after* the cooking of these root vegetables had already made a significant impact on our evolving human social systems. (Although the earliest environmental evidence of cooking with fire—i.e., hearth-like structures in human-inhabited caves—only dates back to around 1 million years ago [24], Wrangham believes that evidence derived from the Homo erectus fossil record suggests that the cooking of underground storage organs might've actually begun around 1.9 million years ago.)

In the view of Narrative Complexity, despite the powerful impact that cooking root vegetables had on the evolution of human *social* systems, this behavior would not have impacted the evolution of human *cognitive* systems in the same dramatic way that cooking meat would have. Essentially, from our theory's perspective, developing & nurturing a preference for those cooked underground storage organs over the raw versions of the same resources presented less of a *cognitive emotional challenge* than developing a preference for cooked meat vs. raw. This is because the cooking of underground storage organs likely made these less desirable (but in times of scarcity, *necessary*) food resources generally more desirable & palatable (i.e., making their consumption much easier & significantly more pleasurable). In other words—when they were initially presented with the choice between immediately consuming raw storage organs and waiting to consume the new & improved cooked versions during periods of food scarcity—our human

ancestors' brains did not have to work very hard to convince themselves (& their communal cohorts) that waiting to eat the cooked version was (for a variety of reasons) highly preferable.

In contrast, raw meat was a food resource that was commonly sought out & consumed by our human ancestors—even during periods of resource abundance. Simply put (although, as Wrangham suggests, those early humans probably didn't consume *large quantities* of raw meat) our ancestors actually *liked* eating raw meat, and chose to do so even when raw meat was not a *last-resort* food resource. Thus, unlike those raw underground storage organs—which were probably viewed as an *eat-it-or-die* food resource—raw meat was a food option that early hominids & their primate ancestors had instinctively *enjoyed & desired* for millions of years whenever the option presented itself.

How does all of this relate to those primitive mammalian disgust mechanisms making that spectacular leap from the olfactory systems to our visual & cognitive systems? Well, for starters, it helps to explain why developing a strong *preference* for cooked meat over raw meat would've required more complicated cognitive gymnastics (like those employed by disgust) than simply choosing to eat (& prefer) cooked underground storage organs instead of the raw versions. (And—as we'll discuss in detail on the next page—evidence of our modern disgust mechanisms' strong ties to meat-eating can be found in modern Homo sapiens innate *disgust* toward most raw meat, which is *not* something that most humans tend to display in response to those raw underground storage organs.)

Thus, when our human ancestors initially began to choose to consume cooked meat over raw, they likely needed to employ some of their more advanced cognitive powers—like their advanced version of *willpower*. In choosing to wait for cooked meat instead of simply eating the perfectly yummy & desirable raw meat, those early humans were demonstrating the ability to exercise their willpower in the service of a *learned & predicted long-term gain* (not just an in-the-moment, inhibition-overcoming, *get-up-&-run!* self-willed impulse). In addition—because these human ancestors did not yet possess those behavior-calibrating & socially-nurtured belief systems that ultimately emerged from this behavior—the emotional mechanic that these early groups of humans likely used to help socially reinforce the advantageous, new *don't-eat-that-raw-yummy-wait-for-the-cooked* behavior was our original emotional-social tool: Pride/Embarrassment, which enabled the effective *shaming* of non-conformers.

This suddenly-useful ability to develop a preference for cooked over raw meat was so advantageous that it quickly (in evolutionary terms) began to evolve into a hardwired, primal *avoidance* or *rejection of (disgust toward)* that raw meat. And the very close association between that socially-enforced *embarrassment* of eating raw meat & hominids' subsequently-evolving, hardwired, primitive *disgust* toward the raw meat likely accounts for the strong *overlap* between the emotional experiences of *socially-based* Pride/Embarrassment *(in self)*, and primitive disgust's modern *belief-based* descendants: Satisfaction/Guilt (*in self)* & Pride/Disgust *(in other)*.

But there was something even more unique about humans' newly-evolved & hardwired *disgust* toward raw meat: this avoidance behavior was based on detecting & identifying a subset of *visual* data, *not* olfactory data. (Two systems that are—as we'll discuss in the next essay—uniquely isolated within vertebrate brains.)

Consider this: we are often repulsed by the *sight* of particularly bloody or "gory" raw meat, but there is nothing about the *scent* of raw meat that causes a similar repulsion (that's how we can tell by *smell* if raw meat is rotten, because we aren't actually repulsed by the *scent* of raw meat unless it's gone bad). In other words, the thalamocortical loop that is at the heart of our consciousness (& whose cortex-based cognitive systems were originally rooted in ever-growing visual systems) now had use of this *data subset/behavior avoidance* technique: disgust. Consider that no other (or *non-cooking*) species seems to be *disgusted* by the *sight* or "thought" (essentially, the thalamocortical *perception*) of anything in particular. Even our near & dear primate relative, a Chimpanzee, nonchalantly *handles* their feces, even though the scent would likely prevent them from eating it. And it's quite clear that no animal other than humans is disgusted by the sights or textures of raw meat. Indeed, this visually-based application of a disgust response appears to be uniquely human.

Once this mechanic joined humans' thalamocortical cognitive toolbox, it began to do some truly amazing things. How? Let's look one more time at what this unique tool, disgust, really does: it uses a broadly-applicable, but rigidly-defined subset of data to evaluate a wide range of resources and determine which ones to accept or avoid/reject—an ability that was neurally-expanded via our learned capacity to resist a primally-motivated short-term gain (raw meat) in exchange for a longer-term gain (cooked meat).

Doesn't all of that sound an awful lot like *beliefs?* And what's that feeling we have toward someone who has violated one of our beliefs? The same as raw & bloody or rotten meat: *disgust*.[25] Avoidance. Disgust.

Belief violation. / Acceptance. Admiration. Belief compliance. *When Rodney* saw *that the yummy was poopy, he winced—and when he* smelled *the poop, he gagged. Then Rodney looked at the wanderer and shook his head, disgusted by the other man's* violation of a solemn truth*: Don't shit where you eat.*

~

How amazing was this meat-cooking behavior—behavior that allowed the extraordinary evolutionary emergence of beliefs? Consider this: those early humans' closest ancestors had likely been eating raw meat for at least a few *million* years before the advent of cooking. This means that those first instances & traditions of consuming (& encouraging the consumption of) cooked meat would have gone against millions of years of *hardwired* urges & desires.

As simple as it seems to us now, this ability to *significantly* self-delay gratification was a profound leap of logic—a kind that no other earthbound creatures had truly made, a leap that I believe marks the real beginnings of humanity as we know it. I've described this self-delayed gratification as *significant* because: a) fire-building & cooking involved the expenditure of additional resources—time, effort & actual physical resources—at a moment that likely often occurred not long after expending significant resources to *acquire* (hunt & butcher) the meat, and b) for most of those early humans that hard-earned raw meat was *already* perfectly yummy & desirable *exactly the way it was.*

This, of course, begs the question: why would any of those early humans even bother to *try* cooking their meat in the first place? One not-so-far-fetched scenario: some winter-starved early human possesses or discovers a frozen carcass that is "accidentally" cooked in efforts to merely thaw—leading to further meat-cooking experimentation & demonstration of additional benefits. However meat-cooking began, the ability to broadly spread & maintain the practice still required overcoming some powerful cognitive and behavioral obstacles. And these factors help to distinguish our earliest ancestors' meat-cooking behavior from the behavior demonstrated in a very recent experiment that showed chimpanzees were willing to exchange a raw slice of sweet potato for a yummier cooked slice by placing the raw item into a simple device that produced a cooked slice after being shaken briefly—a process designed to mimic basic cooking. [26]

(Some might also point to behavior like *seed-caching* in birds as examples of non-human self-delayed gratification, but in these cases there is no current impulse to overcome, and therefore no gratification being delayed. When the bird caches the

seeds, it's likely not very hungry *at that moment*. Thus, the cached resource is viewed as an excess—not as a very currently-desirable item whose value increases if the entity expends resources in order to help "improve" the item while self-delaying that current desire.)

And the powerful belief systems that ultimately emerged from this capacity to *significantly self-delay gratification* played an important role in our species' survival during a critical period of evolution. As the modern human came onto the scene 200,000–100,000 years ago, climate was fluctuating frequently & dramatically. In the regions of Africa where those modern humans lived, this climate instability resulted in environments that switched between lush & arid in mere thousands of years. These evolutionary pressures likely favored the selection & survival of human populations with the strongest ability to understand & dynamically adapt to the ever-changing environment by generationally passing-on these populations' ever-adapting knowledge & practices. Such abilities were based in their brains' complexly-modular, problem-solving, language-based capacities, which also allowed for the evolution of beliefs both within those brains *and* within the now-continuous, ever-sophisticating & emerging *cultures*.

And the human brains & cultures that demonstrated the strongest ability to learn & apply these newly-evolving belief systems would've been inherently better at dynamically adapting to the maddeningly-metamorphosing African landscape (we'll give an example of why in a moment). This process of Darwinian selection favoring the "believers" was likely accelerated significantly during the middle of this 100,000 year window via an event referred to as a "bottleneck" in human evolution. This bottleneck was a short period in which severe, sudden cooling of the planet reduced the human population to near extinction.

The plummeting population led to significant reduction in genetic diversity in our species—and recent analysis of the human genome has shown that *everyone alive today* is a descendant of that small pool of humans that stubbornly (& *ingeniously*) persisted along the South African coast during this bottleneck. One of the most provocative & compelling scenarios depicting this crucial moment in evolution is presented by paleoanthropologist Curtis Marean in his 2010 paper about the coastal adaptations that emerged in this tiny group of remaining humans. [27]

Marean hypothesizes that this prehistoric coastal community consisted of possibly only 600 people, and that the keys to their survival were abilities such as the sophisticated use of fire in tool-building, and exploiting the sea & other coastal

resources for their primary survival needs. (Including behavior like *harvesting shellfish*, which was only efficient at the lowest tides—unless modern humans have since lost those coastal humans' ability to *breath underwater*.) The tool-building & creative problem-solving skills were probably well-enabled by those modular cognitive systems. But some of the other adaptations—such as planning (& relying on) that harvesting of shellfish during low tides—are the kinds of learned behaviors whose powerful predictions would have required that newly-developed & very specific cognitive tool: a belief system. (In Essay #4, we'll explore in detail just how *uniquely* specific this cognitive system is.)

Consider that understanding tide cycles & correlating the movement of the moon to the harvesting of food is not the same as understanding how to build a tool or a fire, which involve direct causal relationships in their construction. These humans could not have understood *how* the moon makes the water move in the same way that they would've understood that striking two stones made a spark that ignited dry grasses—they could only observe and then come to *believe* that there was a correlation between the water & the moon. In addition, this period provides the earliest evidence of humans using red ocher (our inaugural art supply) in symbolic & ceremonial ways—which is more proof of a sophisticated belief system being present in these humans' brains.

How exactly does this kind of belief (*whenever the moon has this appearance/position, the water will be very, very low the next morning*) correlate to that original *data subset/behavior avoidance* technique that it evolved from? The "data subset" here is *the unique appearance/position of the moon that "causes" the water to be very, very low*—a data subset that is compared to the larger data set represented by the moon's & tide's "overall behavioral pattern" (their full yearly, lunar & daily cycles).

Even if these humans were making this prediction purely according to tide patterns instead of using the moon, this would still be a version of comparing a data subset (low tide periods) to a larger data set (the full tidal cycle). Although, because tides vary in a yearly & lunar pattern in addition to their daily patterns, it was likely actually easier & more reliable to recognize the *lowest-tides pattern subset* by using the moon than it would've been via the tracking of water level patterns alone.

Either way, if these humans *weren't* using *some* form of a belief to guide this behavior, then they would've simply been harvesting shellfish essentially randomly: whenever they noticed that the tides were low enough. This obviously wouldn't be a very reliable

method for managing vital resource acquisition, and it doesn't seem to represent the kind of *advantageous* behavior that would be such a great way to survive *the world's greatest winnowing of humans*.

The *emotional* role of a belief like "*whenever the moon looks like this, the water will be very, very low*" is exhibited during actual *behavior* when, for example, more-basic urges or desires come into conflict with that belief in choosing an action. Let's imagine, say, that on the morning of the lowest negative tide (which provides that lunar cycle's only opportunity to harvest the least-accessible & survival-aiding mollusks) our coastal human is very, very tired, and thus chooses to sleep late instead of harvesting mollusks at dawn.

When he puts his head back down on his grass mat & chooses to forego foraging, he might use as his lame excuse something like "I will collect shellfish later." And as he says this to himself, our coastal human likely feels a pang of *guilt*: "I cannot collect shellfish later, I should wake up now." (And this guilt is essentially being *disgusted* by one's own behavior.) Unfortunately for his *now-less-likely-to-be-reproduced* genes, this pang loses out to the pang of his comfy grass mat. This *guilt* is produced by violating his strong belief that "*whenever the moon looks like this, the water will be very, very low the next morning.*" (And he saw the moon look *exactly* that way last night.) In other words, he is making a choice that his brain *believes* will likely lead to an ultimately undesirable result (based on a highly valid & valuable prediction trope built from experience & study).

Our coastal human would therefore likely feel this guilt even if he was only harvesting the food *for himself*—eliminating other possible guilt sources, like failing to contribute to his social group or to fulfill a commitment to others. Consider that even if we are the only ones who will likely suffer the possibly negative consequences of our actions, we're still likely to feel at least *a little* guilt or inner-conflict if those actions represent the violation of a strongly-held belief.

The obvious evolutionary advantage of strong *belief-based emotions* in situations like our coastal human's *inner conflict* is that the most-likely-to-survive brains are those that feel enough *guilt* (& exhibit enough *willpower*, whose *endorphins* are unfortunately in short supply during this sleepy inner-conflict) to actually *get up & forage* instead of succumbing to the primal urge for more sleep (which is, again, a lot like waiting to eat a cooked steak instead of succumbing to the primal urge to eat the yummy bloody steak).

Exploring Marean's coastal scenario shows why human populations with the most

evolved cognitive belief systems would've likely owned a key advantage in surviving this bottleneck, and it provides the perfect avenue for this essential human trait to emerge as one of the most powerful & fundamental aspects of modern humanity —because all subsequent human evolution sprang from this harshly-selected tiny population of our best "believers."

Making efficient, reliable predictions about our world based on learned (but not entirely *provable*) correlations between events that often have mysterious, but observable relationships—and the development of a specific cognitive system devoted to this mechanism—is at the root of what separates us from all other animals. Consider that *many* other creatures—birds, aquatic mammals like dolphins & whales, elephants, other primates—have the modular neural capacity for language, and can display the profound behaviors, emotions & even the learned, generationally-fluid *traditions* that can result from such a proto-linguistic capacity (however rudimentary). But they do not have *beliefs*. And I propose that it is our beliefs, and the emotions that they engender, that truly make us *human*.

~

Interestingly, *all* of these aforementioned primitive emotional mechanisms are *still* a part of our emotional kingdom; these original systems remain almost fully intact. In fact, they are still the *rulers* of that kingdom. These proto-emotions (which we now think of as essentially *urges*) are often the last obstacle that any narratively-based decision must confront before action is taken. And the highest level of any urge will almost always supersede *any* narrative desire.

If you are at any of the urge extremes—starving/parched, in the throes of lust, completely exhausted, repulsed by rottenness or in the grip of fight/flight—those primal desires will very likely be prioritized over your narrative goal (unless you've developed—or were born with—a *wicked* willpower mechanism). This dominance of our ancestral urges over their modern offspring offers unexpected proof of an age-old truism: *we'll always be your parents & we'll always know what's best for you.*

Emotion, Meet Modularity

How, then, did we develop our modern, complex emotions from these primitive proto-emotional pairs? Well, that requires some speculation *about* the speculation, but since we're already deep in our "what-if" rabbit hole, let's keep digging...

Our filmstrip slips into one last flashback from that 700 million year blink: the long stretch when early mammal brains were morphing into the human one. This is likely the time when all of those uniquely modular neural structures (discussed in the previous essay) began to evolve. And it was this modularization of basic data & larger

"ideas" that lit the fuse that led to our emotional explosion.

Think of it this way—those early mammals were actually pretty smart critters. They could *remember* stuff and make use of it later. *Check out that tiny-brained mouse memorizing the fancy maze that leads to the yummy*. And evolving emotions played a big part in this memory device. The *pleasure* of the yummy helps encode the *pattern* of the maze into the mouse's memory. But those mice-like early mammal minds had a flaw: non-modular data structures—a result of their neural limitations. In the mouse's brain, that memory of the maze isn't a long sequence of linked-but-independently-associative turns, it's one big pattern.

This is why, when Mr. Mouse encounters a similar-but-different maze—i.e., the same exact first half, but different thereafter—the mouse will not likely recognize that the mazes are *partly* the same. He'll either ultimately think of them as entirely different mazes, or exactly the same one (possibly leaving the mouse continually baffled whenever he reaches the different second half—at least until he finally starts thinking of it as *an entirely different maze*).

This means that those pain/pleasure mechanics are still pretty broad in their application—always associating themselves with large, highly-detailed data patterns. But as mammals' neural structures evolved and data became more modular, emotions were able to associate with those modular & more specific pieces of data. These newly diversified associations between feelings & data likely helped emotions to differentiate in purpose & application as they grew more interwoven with specific kinds of data modules. (And as mammals began to employ evermore complex proto-emotions, those emotions' use in encoding specific data with specific "values" might've actually served to *aid* the emergence & evolution of those increasingly-modularized mammalian cognitive systems.)

Thus, using these evolved modular systems, a dog can learn to *symbolically* associate the first step in a sequence with the *actual* pleasure derived from the last step. *Pavlov's dog*: ring the bell and the dog salivates excitedly in anticipation of the predicted food pleasure, *not because he wants to eat the bell*. (For the mouse, seeing & recognizing the entrance to the *previously-cheese-producing* maze makes him interested & engaged, but it likely doesn't give him *pleasure*—the actual pleasure is still reserved for successful navigation & yummy consumption.) Therefore, in those more-evolved mammals like dogs, anticipatory emotions are now possible: fear, excitement, confidence, anxiety. And these symbolic inanimate objects likely also allow for symbolic *entities*: Agents of Value. *Viola!* Anger, gratitude, affection & animosity join the kingdom.

(And based upon my distinct childhood memories of our beloved family guinea pig, *Cupid*—who consistently demonstrated a *Pavlovian &* excited squeal merely upon *hearing* the plastic-crackling of the bag that contained her cherished parsley—it seems that the first examples of this emerging capacity for emotional/neural modularity & rudimentary *symbolism* appeared rather early in mammalian evolution.)

By the time humans arrive in our story, this modularity has gone gonzo. We can do all of this symbolic, predictive & other entity stuff *way*, *way* better. A massive cerebral cortex allows far more data to be stored for reference, comparison & analysis. Advanced neurons with more connections & more sophisticated associative powers enable data tagging & comparisons to be done with greater precision, and allow our predictions to become vastly more complicated. Emerging research suggests that these modern pattern & prediction mechanisms even involve our cerebellum (which brains originally employed purely to control motor function).

And our dizzyingly complex use of those age-old neurotransmitters—combined with immaculately-tuned areas like our insula, amygdala, orbitofrontal & anterior cingulate cortexes—allow for complex new ways to use those pain & pleasure responses. Guilt, satisfaction, envy, admiration, greed, jealousy, melancholy, all the blends & hues —all are now possible. In addition, those long-evolving *mirror neurons* allow *empathy* to help our minds incorporate emotional data that is physically-expressed by others.

The Mothership has arrived. And she has a passenger: consciousness. Which probably means that Descartes' elegant definition of "being" (after all these centuries) is in need one small edit: I think *and feel*, therefore I am. It's a little less succinct, but maybe a little more true—after all, without *love*, what are we?

A Ghost in the Machine

And so, our filmstrip fades to black, the music swells and...wait a minute—what's that? You *feel* something? You mean the *music* made you *feel something?* Almost forgot about that—music. Pretty cool stuff. And maybe the *coolest* thing about music: we're born with it.

Before you worry that we've suddenly gone wildly off track, *don't*—this is the perfect place to conclude our epidemiological examination of emotions. That's because (and although it's silly, I'll remind you again —we're *speculating* here) music seems to have a very special role in the blueprint of our emotional kingdom. It seems to be a kind of *pattern primer*. Remember that exciting part of the movie *"Contact"* when the crazy-brilliant, recluse mogul sends Jodie Foster the *primer* (a mathematic key or decoder) that allows her to interpret &

implement the hopelessly-complicated alien blueprint? In our filmstrip, the human brain's myriad narrative-building, emotion-generating mechanisms are the blueprint—and music is a pattern primer that helps us to interpret & use it.

Music has two vital qualities. One: it is a data pattern that simultaneously accounts for defined "vertical" or parallel relationships between its elements (chords) and defined "linear" or sequential relationships between its elements (melody). Two: the various pattern combinations resulting from these vertical & linear data relationships produce *emotions*. In other words: linear narratives (melody) whose multiple layers can be woven together (chords) to produce emotions.

Thus, music looks like a genetically pre-programmed way for our brain to show itself how to use its "blank slate" narrative & emotional mechanisms (whose pattern-analysis & predictions require *recorded data* to really get rolling). Music is a primer for the blueprint associating patterns with emotions—which is the first thing that our vast, initially-empty data-banks needs to learn in order to begin filling it with that crucial recorded data & learned rules.

One of the main ways in which this musical primer helps to build our systems of cognition is likely through the application & interpretation of *inflection* in spoken language (a matter explored in Essay #4). Inflection (which is essentially founded upon those inborn musical rules) allows infants & toddlers to associate emotional values with verbal utterances *before* they've developed a true capacity for language—thus helping to construct that initial basic syntactic framework necessary for developing the complex (& primarily *learned)* linguistic & cognitive processes that sustain human consciousness.

Music is a ghost in the machine. Because our DNA can't pass along the actual data that human brains use to create all that magic, it instead sneaks into the operating system all the pre-programmed emotional responses to the patterns of music. And this pattern primer likely helps our developing brains to make those all-important associations between the mechanisms that analyze complex patterns & predictions (narratives) and those mechanisms that produce behavior-guiding emotions.

From this perspective, it appears that the tools of music might actually help to "jumpstart" (or at least "lubricate") the observe-analyze-respond loop that is the engine of our consciousness. Music, however, obviously isn't the only primer available to us (deaf humans' brains seem to get started up just fine without it). Conveniently, DNA is a pretty spectacular

courier of information. It's easy to imagine lots of visual, tactile, olfactory, etc. pattern primers (i.e., those specific emotionally-correlated *facial expressions*) being packaged in our genes in order to help young minds usefully associate emotion with experience —ensuring plenty of redundancy for a resource of vital importance.

Nonetheless—whether or not it's merely a blind spot darkened by a false belief—music *seems* to be uniquely capable in its role as our gateway drug to the addictive & ceaseless pleasures (& pains) that come from associating patterns with emotion. Which is why it feels so...*lifelike*. Why it's so extraordinarily powerful in imprinting a specific moment with its specific feelings—which can still be distinctly reproduced when the music is heard again, even a lifetime later. Music doesn't just know *how to work* the system, it helped *build* the system.

That's also likely why music feels so fundamentally *symbolic* to us, why it so often seems to express how we feel better than we can actually express with words. Words are *almost* perfect. Music is *sublime*. And of course it is. It's some of the most-ancient, most-eloquent code in the universe —light years before the code of words.

And when these different emotion-producing tools—the words & syntax of our internal narratives and the patterns of music—are working synchronously *together*, some magical moments can occur. This is likely why we tend to seek out music that's *mood-appropriate*. From experience, it seems quite clear that there is a uniquely *interactive & amplified* emotional effect when we listen to music whose emotional equations/patterns match the emotional equations/patterns of our internal narratives (basically, when we listen to music that "expresses" how we feel about or *want to* feel about our lives at that moment).

Words are, indeed, more versatile & programmable—wizards of the high-speed modern, modular brain. But just as modern emotion's ancestors (urges) still speak to us most clearly, music knows us in a way that words do not. When our minds, at last, are nearly-gone of all those magnificent associations & cross-associations of data devoured in our lifetime—one set of associations typically remains beyond all others: the musical ones. Thought leaves us, but song often stays—nearly to the end.

And if you believed that all of this complex neural magnificence was bestowed upon us by some vast & unknowable intelligence—as you might suspect, *I do not*—but if you did, then you might assume this *musical persistence* was its parting gift to our consciousness. That before our consciousness goes, before it fails—as it must—it still

retains something ancient & sublime, something that might allow us to remain in some way *human* until the end. For music mimics human life at its most fundamental: the association of data, *experience*, with emotion.

Yes, in the end, we are merely the *courier* of a *smaller courier* (that brilliant DNA). But what gives our experience—our journey delivering this valuable parcel to the next generation—what gives that journey any meaning to us at all is the emotion we feel along the way. Does it matter that the ultimate purpose of these emotions is simply to make us a better courier, and *not* actually to imbue our journey with meaning? I don't know. *Does it?* Does it matter to *you?* Now that you are contemplating these possible truths—do you love your mother less? Is there no more anger when you think of that President whom you hate? Is there nothing you desire any longer? Emotions *are* confirmation bias: they matter to us because they *feel* like they do. Thus, the gains & losses, Agents of Value, and validity that our emotions paint our world with—and the beliefs they reinforce—they all matter too, *because it feels like they do*.

And so it is. We are a paradox of emotion—feeling like our lives matter because we feel like our lives matter. Well then, fuck it: *feel*. And let the *logic* of your *emotions* lead you. Let them make you believe that everything in this life that you *feel* like you believe actually *matters*. Find the love. Go after happiness. Why not? If you're stuck inside of a finite and ultimately inescapable & indecipherable illusion, only a fool would hope that illusion becomes a nightmare.

We're here, my fellow humans. *We're in it*. And we're only in it once. We might as well dream the dream.

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Very Complex Emotions (Mixes of Primary/Complex Emotions)

Disappointment / **Delight**
[*Surprise* + *Pain*] / [*Surprise* + *Pleasure*]

Frustration / **Amazement**
[*Surprise* + *Pain* + *Anger*] / [*Surprise* + *Pleasure* + *Gratitude*]

Horror / **Awe**
[*Surprise* + *Disgust/Disdain*] / [*Surprise* + *Pride/Admiration*]

Despair / **Hope**
[*Confidence* + *Fear* + *Guilt*] / [*Confidence* + *Excitement* + *Satisfaction*]

Melancholy / **Joy**
[*Pleasure* + *Sadness*] / [*Pleasure* + *Happiness*]

Jealousy / **Covetousness**
[*Disgust*-With Other Entity+ *Pain* (Gain: Other Entity; Loss: Self)] /
[*Pride*-In Other Entity+ *Pain* (Gain: Other Entity; Loss: Self)]

Resentment / **Envy**
[*Disdain*-For Other Entity+ *Pain* (Gain: Other Entity; Loss: Self)] /
[*Admiration*-Of Other Entity+ *Pain* (Gain: Other Entity; Loss: Self)]

* This list does not represent a *complete* accounting of all the various mixes of Primary/Complex Emotions. There are ultimately a *wide array of different emotional states* that can result from various combinations of & intensity levels within our Primary Emotions.

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