The Brain-Friendly Organization:
What Leadership Needs to Know for Intelligence to Flourish

By Janet L. Crawford

INTRODUCTION

Applying neuroscience to leadership matters. Science is revolutionizing our understanding of what it is to be human. An explosion of advances in human neuroscience is giving us a window into why people behave as they do and how we can manage our environments and behaviors with others to maximize results. These new scientific findings challenge old assumptions of what it means to lead. While intelligence is our greatest strategic asset, our way of life has become profoundly out of sync with our neurology, and we largely fail to practice brain-friendly leadership principles.

Classical economics divides business assets into land, capital and labor. In today's economy, if you don't manage intelligence well, the other three are irrelevant. We are in the midst of a knowledge creation and accessibility avalanche. Content knowledge is outdated almost overnight. We pay people not for their content knowledge, but for their ability to learn, to think in novel ways, to sort through the overload of information and decipher what's relevant, and to make good decisions quickly. Work demands collaboration, so we need smart people who can smoothly coordinate action with others and build processes that take ideas to fruition. The speed of change demands flexibility and the capacity to adapt quickly to market conditions.

We can fight biology or leverage it. As we understand more about human neuroscience, true leadership may become defined as the art of creating brain-friendly organizations.

Most of our organizational practices still reflect what worked in the old economy. If our greatest asset is the collective brain power of the people who form the corporate community, then the fundamental role of great leadership is to create places of work where the greatest level of collective intelligence can emerge and flourish. If each one of your employees is not showing up to work with their full brain engaged, you are squandering your greatest asset and your only true competitive advantage.

A critical issue for leaders today is the comprehension of how profoundly our work practices have become out of sync with our biology. In many ways, technology has outstripped our ability to use it effectively. Email, IM, voice mail, and texting allow a rapidity and quantity of communication far beyond what our brains are designed to process. The amount of daily newness and the quantity information we are expected to remember is unprecedented in human history. We are bombarded by choices unimaginable a few generations ago. Our brains, designed to follow any shiny ball that enters our awareness, are on constant overload. We need tools for a level of discernment that was never before necessary.

The fallow periods of rest between harvest and planting are distant primal memories. We work across time zones and travel frequently, disrupting our natural biological rhythms. Our love affair with the machine-age metaphor has stripped us of biologically friendly practices like ritual and story-telling. We have created a dearth of social connection and of unstructured time and reflection. In doing so, we create a neural hunger that's not being fed: a hunger that leaks out in other ways, disrupting our ability to do good and fulfilling work.

Taking the implications of brain science into the workplace demonstrates how many "nice to have" leadership practices are, in fact, critically necessary. We talk of work-life balance, but have no real idea how to accomplish it. We tolerate and even encourage bullying and narcissism. We believe we can think our way out of biological overwhelm, and if we fail, it's a character issue. Even if we acknowledge brain-friendly work environments as desirable, we don't truly understand how to create them, or don't believe that they are possible and imperative to our success.

If, as leaders, we commit ourselves to the task of cultivating environments which optimize the human operating system, much of the rest will take care of itself. People will be excited and motivated. They will think clearly and efficiently. Creativity and focus will abound. Collaboration and commitment become possible. In this article, I introduce key concepts in brain science that form the basis for understanding how to create this optimal environment.

TRIUNE BRAIN

A simplified, but useful model for understanding the human brain is called the "triune" brain ("tri" meaning three and "une" meaning one). This model examines the brain by dividing it into three levels: the *neocortex* which is responsible for "higher-level" thinking, such as reasoning and future-oriented thinking; a *limbic* system, which is the emotional center of the brain; and a *reptilian brain*, which is oriented toward more base level survival.

These areas of the brain operate as an integrated system, but can at times also "parallel process." For example, our limbic interpretation of a situation may not be in agreement with the neocortical interpretation. Consider romantic attraction. Most people have experienced at least one situation where they were emotionally or physically attracted to a potential partner who they knew logically to be a poor choice.

Writings on the triune brain frequently state that these three levels developed on a strict evolutionary trajectory, with the reptilian brain being the oldest and the neocortex being most recent. There is some loose validity to this claim: humans are relatively recent players on an evolutionary timeframe and we have the largest neocortex relative to body weight. Complex emotional (limbic) interactions are a function of taking care of one's young and living in social environments, not a feature of the very first animals to emerge from the swamps. The most basic functions of the reptilian brain were necessary at the outset of the evolution of complex creatures. The story for everything in between is much murkier and doesn't follow a tidy linear path.

NEOCORTEX

The neocortex is the structure we tend to identify most with being human. When we view representations of the human brain, the neocortex is the two large folded grey lobes which dominate the picture. The left hemisphere of the neocortex is roughly responsible for logical/analytical thinking, and the right hemisphere is responsible for more "creative" non-sequential thinking. The two hemi-spheres are connected by the corpus callosum, which mediates the passage of information between them, as well as to the limbic system. The brain, when functioning well, processes information in multiple areas of the neocortex. At the same time, the limbic system evaluates how the idea, decision or situation feels. We tend to decide in favor of things that generate positive emotional response and against those that don't. The neocortex is home to the prefrontal cortex (PFC), which is critical to high functioning knowledge-based organizations. We'll examine the PFC much more closely a little later.

LIMBIC

The limbic system is shared by all mammals and is the seat of emotion and memory. Because mammalian offspring are not self-sufficient for an extended period of time after birth, they are dependent on emotional bonding with their parent for survival. As such, mammals have developed an exquisitely sensitive circuitry for detecting the emotional state of others and responding accordingly.

Humans are born with what is referred to as "open neurology." At birth, we cannot self-regulate even such fundamental bodily functions as respiration and heartbeat. Rather, we are dependent on physical contact with the nervous systems of those who care for us to regulate ourselves. In the face of danger or pain, we do not innately know how to interpret the seriousness of those signals. Our bodies mimic the reaction of those most closely bonded to us in order to learn how to respond to the world around us. It is at this early stage of development that our most sensitive emotional patterns (activation profiles) are encoded. The formation and function of these "implicit" memories is so important to our everyday behavior that we'll devote a separate section to this later. As we mature, our neurology becomes increasingly closed, or self-regulating, but it never closes completely. Those around us continue to have an influence over our bodies and moods.

We can describe the limbic brain in relation to others with three processes: resonance, regulation, and revision. Limbic *resonance* describes how we unconsciously and continuously attune emotionally to the others around us. We read facial movements and behavior and get a "feel" for the other person. When I hear clients say things like, "I just want to take emotion completely out of the picture," I chuckle (inwardly of course), because that simply isn't possible. We're not designed that way.

Limbic *regulation* refers to the human need for attachment in the development of stable neurophysiology. While this is strongest in early childhood, our physical, mental and emotional well-being always remains open to the influence of the emotional state of others. Some people can walk into a room and their presence automatically calms those around them. Others have the opposite effect. A calm limbic brain breeds calmness in those around it…a desirable characteristic in a leader.

Research has shown over and over that healthy social interaction promotes healing and extends our life span. We are designed for emotional attachment and to rely on others in a social network. Even small breaches in trust and relationship can produce profound physiological responses such as changing the areas of the brain involved in processing information and disrupting normal heart rate, blood pressure, and sleep patterns.

Limbic *revision* points to the ability of others to actually rewire our emotional circuitry. Surround yourself with emotionally healthy people and you, yourself, will become more emotionally stable over time. As your emotion circuits are exposed to healthy patterning over and over, they begin to rewire in more functional configurations. Surround yourself with stressed and reactive people, especially if you have no practices to support your prefrontal cortex, and you will also become more reactive.

An interesting facet of the limbic system is its inability to distinguish between imagination and reality. When we think about a situation, the emotional response in the brain is strikingly similar to that of the actual event occurring. When we think repetitively about an event, we warm the emotional circuits associated with that situation to such a degree that we experience being in a "mood." We then start to preferentially perceive the world through the lens of what is consistent with that emotional state, and are unable to perceive information which disconfirms it. In some situations (e.g., trauma, loss), the neocortical love for the question "what if?" can become a huge liability. We flood the brain and body over and over again with threat signals that don't, in reality, exist.

LIMBIC SYSTEM: AMYGDALA

The amygdalae (usually referred to in the lay literature in its singular form: amygdala) are a pair of almond-shaped structures in the limbic brain which form a kind of gateway to the reptilian brain. This structure determines whether your higher brain should deal with a stressor or the reptilian brain should handle it. It scans the

environment for danger and makes sure that we can respond to any perceived threat quickly. This function of the amygdala has earned it the title of "fear center" of the brain. While it is true that the structure is a central part of responding to threat, it has other functions as well.

What the amygdala recognizes as a threat is a complicated mix of preprogrammed "hard-wiring" and references to past experiences. As humans, we *instinctively* know to be afraid of certain things. We see a stick in the trail and freeze, at least until such time as the brain sorts out that it's just a stick and not a snake. Standing on the edge of a cliff makes us queasy even if our balance is good and we've got a rope to steady us. As social animals, we are preprogrammed to assess status and to respond to challenges to our status as threats. We can overcome these responses, but it takes conscious attention and a strong prefrontal cortex to retrain these reflex reactions.

A second category of threat comes from our internal library of past negative experiences. Our survival depends on avoiding situations which have been threatening in the past, so we record very sensitive memories or *neural activation profiles*. Whenever we sense something in the present with enough similarity to a past negative situation, it triggers that activation profile. At lightning speed and outside of conscious awareness, we interpret the current situation through the lens of that past experience. If asked to justify our behavior, we are likely to generate logical interpretations of the current situation to justify our response.

Have you ever noticed how several people can sit in the same meeting and have very different emotional stories about what happened? Some will view a behavior as humorous, while another will label it as obnoxious. One will see it as a legitimate professional response, while another will interpret it as a personal attack. The response of each individual in the room has more to do with his or her neural activation profiles than it does with the intent of the behavior of the observed party. This is one of the great coaching challenges: helping clients see the present situation through clear eyes, to disengage from those templates of the past and be open to fresh interpretations of the present. So activation profiles, or stored emotional memories, are a second source of amygdala "warming."

A third category is *perceived difference*. Humans have some very interesting cells located in the anterior cingulate called mirror neurons. Their job is to keep us safe by predicting the most likely next actions of those with whom we are interacting. Mirror neurons track minute details about the physiology of the other(s) and then check that state against what it would mean for *us* if we were to exhibit that behavior. What emotion would we be feeling? How would we likely respond? We run the state through our activation profiles in an attempt to discern how people in the past have acted when they exhibited this physiology. By doing so, we attribute meaning to the other's communication. We also generate what we deem to be the appropriate emotional response to the observed behavior. If we perceive a high level of "difference" in the other person, they are less predictable and therefore more dangerous.

You may have observed that people who are deeply engaged with each other in a positive way start sitting and moving alike. They may cross and uncross their legs in quick succession or reach for their coffee at the same moment. Even such unconscious actions as breathing may start to align. We sense the physiology of the other, and predict that what it would mean for us is "I need coffee." Because we've recreated their state inside us, we now actually have a desire for coffee! The process happens in a blink and voila! – both parties simultaneously reach for their mugs. At its best, this physiological mirroring creates similarity, calming the amygdala and allowing both parties to relax into their highest thinking capabilities.

Conversely, when a great deal of tension or difference is present, we sense danger and our amygdala starts to warm up. At times, the threat is real. The person with whom we're interacting actually holds mal intent toward us. We notice the tightness in their chest, how they aren't sitting like anyone else, the strident tone in their voice. These signal that an attack may be imminent, and our brains want to prepare us to act quickly in the face of that possibility.

A more insidious side of our biology, though, is that we sometimes code difference as danger when in fact, it is only difference. When we meet someone who acts or looks different from what we are accustomed to, our biology tells us to distrust them until we have more information. This is at the root of much "discriminatory" behavior. It isn't so much a character flaw or moral failing as it is our unconscious biological programming in motion. Just because it's "biology," though, doesn't let us off the hook. Mature, high-functioning adults can monitor these reactions and choose to an extent to override them. Also, the more familiarity we have with other cultures, ethnicities, social classes, etc., the less of a threat they become. They are still different, but they are no longer unfamiliar and thus unpredictable. This points to the critical importance of diversity and of having cultural experiences which take us outside our comfort zones.

When the combination of all of these threat indicators "warms" the amygdalae past a certain point, they can divert control over our behavior from the higher brain (prefrontal cortex) to the lower, or reptilian brain. When this occurs, it is referred to as an "amygdala hijack." Literally, the amygdalae have hijacked the brain's higher neural processing and rerouted it to the more primitive and instinctual circuits.

It does this by disrupting the ability of the higher brain levels to pass neural signals to the body. The left and right hemispheres, as well as the limbic system, can still "think," but they can no longer produce action. We've all experienced this: think of a time when something emotionally triggered you and you reacted in a less than mature fashion. Was there a part of you that was thinking, *at the same time you were reacting,* some version of "I know better than to respond like this!" or "This is going to be embarrassing later"? When I'm facilitating offsites or coaching executives, I frequently ask this

question. I've yet to encounter someone who doesn't have a cringe-worthy example!

REPTILIAN BRAIN

The reptilian brain mostly runs in the background, taking care of autonomic body functions such as heart rate, breathing and various hormonal functions. Its functions do not require conscious thought. Case in point: when was the last time you had to remember to make your heart beat? It is the most primitive part of our brain, but the most crucial to our survival. While we can withstand brain damage to other structures and survive, even thrive, damage to this area of the brain generally results in death.

Under the grips of an amygdale hijack, the reptilian brain can only respond in three ways: fight, flight or freeze. You can run away; you can fight; or you can shut down. This reaction makes sense when the saber tooth tiger is chasing us and we're actually under physical attack. It's not so useful, though, in everyday organizational settings.

Stage fright is a freeze reaction, as is forgetting your point when the CEO suddenly turns his attention on you and asks a question. When somebody challenges your point in a meeting and you respond with angry defensiveness, it's a fight response. The hallmark of an amygdala hijack is that you didn't experience choice about your reaction in the moment, but later on you thought to yourself, "Why did I do *that*?!" Interestingly, since the neocortical and limbic systems can still "think" but cannot produce action during a hijack, we can have the excruciatingly frustrating experience of *knowing* in the moment that what we're doing isn't mature or resourceful. But because these higher parts of the brain have become powerless, we do the knee jerk behavior anyway.

AVOIDING AMYGDALA HIJACKS

Amygdala hijacks are an unconscious process. Once we're having one, we can't stop it. The reptilian brain is in control, and it can cause us to do things we regret or are embarrassed by later. The trick is to avoid the hijack altogether by learning the early warning signals which indicate amygdala warming and to moderate life style and communication patterns that make us more susceptible to amygdala warming in the first place. You want to raise the threshold for what triggers a hijack and at the same time notice and reverse the process before it reaches that threshold.

You can train yourself to notice when an amygdala response is imminent through careful self-observation. There's a period--and it's very brief--when we're conscious that we're starting to get amped up. If you catch yourself in that fleeting moment, you may be able to divert the hijack. Because one of the natural physiological responses to stress is to hold our breath, deep breathing is extremely importance. Focused muscle relaxation is also useful. Having something you say to yourself at that moment can also help, but you must have rehearsed this response ahead of time so that it's available when you need it. Often those self-statements involve putting the situation into perspective or reminding oneself of a higher goal or purpose.

The most important thing is to manage the predisposition to having a hijack. This raises the threshold for how much perceived threat must be present before a hijack occurs. Self-care in all its forms—exercise, diet, relaxation, meditation—is key. When we look at the brains of people who are practicing these consistently, their amygdalae are much calmer than those of people who are not practicing good self-care. Brain scans of monks who have dedicated meditation practices show that they can remain calm and think clearly even under extremely stressful situations. The key is to take care of yourself so that you're not triggering.

Our stress circuitry is designed for episodic threats, not continual change and non-stop pressure. When the amygdala trips, stress chemicals are released into the body. The original intent was to provide the chemical soup necessary to fuel running away or fighting. But when the "predator" is someone across the table in the boardroom who has just attacked our favorite project, we don't actually run away. Powerful chemicals are released without a way to exit the system. Instead, they circulate, damaging the body and leaving us primed to be even more easily triggered.

Long term unaddressed stress can physically atrophy the hippocampus (required for conscious learning and memory formation). At this point, we don't know whether this damage is repairable. What we are doing in our corporations to our best and brightest thinkers is nothing short of criminal. It is not intentional, but requires our awareness and intention.

THE AMYGDALA and STATUS

Among the most interesting amygdala triggers is status. We are social animals and all social animals have deep instinctive patterns around issues of status. Where we fall in the social pecking order predicts our survival, both in terms of our lifespan and the pleasantness of that life, as well as the very survival of our genes. Status determines such fundamental needs as what we eat, how much shelter we are afforded, the desirability of our sexual partners, and whether we are beaten or protected. As such, we are biologically programmed to be exquisitely sensitive to indicators of status.

Each organization, culture, social class and subgroup has status indicators. Status has to do with wealth, physical appearance, position, family background, education, knowing the "in" people, and a host of other indicators. The main reason that people are concerned with title, even when it affords no more pay or authority, is that is confers status, both within the organization and outside it. We also gain status by being right and by having our ideas accepted over another's. We lose status through exclusion. In fact, the most threatening of all status losses is social exclusion, and we are biologically programmed to respond to signals of exclusion as extreme danger.

Brain scans conducted by Matthew Lieberman at the University of California, Los Angeles show a rapid redirection of neural activity away from the prefrontal cortex and into the amygdala in the presence of indicators of social exclusion. This creates a paradox in organizational settings. We are biologically programmed to unconsciously seek and display status. On the other hand, such displays move others out of the most productive parts of their brains, at least for the kinds of activities crucial to a knowledge-based endeavor.

The solution is simple and not easy for most. We must first be consciously aware of the multiple ways that status plays out in our organizations. Executives can notice how they have unconsciously imposed their status and learn to moderate this tendency. Leaders can confer and equalize status to the extent necessary to allow each individual in the organization to have a valued identity and dignity. This does not mean a world of no titles or hierarchy, but rather that influence is exercised less through power and more through enrollment. The simple act of including someone in a higher level conversation or asking for an opinion and then listening with an open mind confers status.

Coaching can provide strategies for overcoming the natural reactivity brought on by the status displays of others. Leaders must be able to recognize when they are reacting to status and not real threat, and respond consciously, not instinctively. They must have cultivated sufficient cortical strength (ability to secrete GABA and calm their own amygdala, see next section) to overcome the innate biological tendency toward reactivity and further status display. This is one area where we're biologically driven in ways we need to override in order to be optimally effective in the world we've created.

NEOCORTEX: PREFRONTAL CORTEX

Now that we've visited the three basic levels of the brain, let's return back to the most recently developed part of the brain, the neocortex, and explore in more detail a portion of it called the prefrontal cortex (PFC). This part of the brain lies directly behind the forehead and is central to the kinds of processing that are critical to success in modern day organizations.

We can see from scanning the list that many of the most important brain abilities for successful organizations occur in the prefrontal cortex. The more developed the PFC, the more "maturity" a person exhibits. It is here where we connect with others through attuned communication. The PFC allows us to empathize, and to access our intuition and morality. When the going gets tough, it allows us to keep our cool and continue to think rationally and creatively.

Critically important for strategic organizational success, the PFC projects out into the future and thinks of possibilities that don't exist today. Human beings are intrinsically future-oriented. We are the only animal for whom a great deal of our neural processing is devoted to imagining various future possibilities and creating advance strategies for dealing with them. We exist in a constant stream of "what ifs" or "if this, thens…." These are called "remembered futures" or "alternative time paths of the future." We imagine a possible future and then forecast what we'll need along the way to get there. This sensitizes us to pick up on certain stimuli

Summary of Prefrontal Cortex Functions

Function	Explanation	Implications
Attuned Communication	Ability to accurately assess the emotional state of another and communicate so that they feel "gotten."	Builds relationship and trust. Calms the amygdalae of both parties. Allows higher thought process to prevail.
Emotional Balance	Ideally, keeps the limbic system revved up enough to give our lives meaning and "zing," while keeping it calm enough for us to respond appropriately and wisely.	Determines the correct balance of emotional reactivity and calm.
Response Flexibility	Capacity to override or stall an inappropriate amygdala hijack. Can recognize when activation profiles of the past aren't applicable to the present situation.	Empowers us to exercise "veto power" over our impulses, to act on higher principle, rather than past programming.
Insight/Mental Time Travel	Construction of "remembered futures" and "alternative time paths of the future."	Allows for strategic thinking and the ability to notice relevant information and trends.
Empathy	Ability to feel the emotional state of another.	Builds compassion and trust.
Fear Moderation	Ability to accurately assess the real level of threat and respond appropriately.	Saves extreme reactions for truly extreme situations.
Intuition	Process of allowing in and processing information from the neural networks surrounding the heart and the gut.	Gives us access to the internal feelings which provide preverbal information about situations.
Morality	Capacity for thinking about the larger implications of our behavior.	Can you say "Enron?"

which we would not otherwise notice. Out of the 1000s of things we could notice, we notice those that are consistent with what we've imagined.

A healthy PFC allows for conscious discernment. It allows us to be both connected to and differentiated from others. Differentiation means we can be in the presence of another's pain or anxiety without detachment *and* without becoming flooded with emotion ourselves. If we cannot experience disappointment or pain without becoming overwhelmed, we respond by shutting down. Part of maturity is the ability to stay connected and open to new ideas, while having our own independent, strong thinking. A healthy PFC allows us to become observers of our biology and our implicit emotional patterns and impulses. It allows us to discern which actions are most productive and moral.

Imagine what it would be like to work in an organization where everyone's prefrontal cortex was robustly healthy and where amygdalae were under control. What kinds of churn could be avoided? How much more fun would people have? How much more fulfilling and exciting would coming to work be? How much more creative, flexible and strategic would we become?

So what keeps the prefrontal cortex in good shape?

The first six items on the chart have been empirically proven to be outcomes of the consistent presence of a safe and caring parental figure who accurately reads and appropriately responds to a child's emotional state. All nine are supported by mindfulness practices such as meditation. The same practices that support good health generally support PFC health as well: sleep, exercise, good diet, sunlight. Our computers wouldn't work well if we poured diet cola in them and left them on 24/7. Neither do we!

Sleep is particularly important. As a leadership coach, I have the opportunity to observe many different corporate cultures and lack of sleep is endemic to all of them. We pride ourselves at answering email at all hours of the night. The global economy is driving an expectation of 24/7 availability for many positions. What is clear from brain scans is that lack of sleep drives us out of the prefrontal cortex and into the more primitive regions of the brain. Neurologically, high quality thinking and decision-making from people with sleep-starved brains is an impossibility!

Exercise is also critical. Aerobic activity has been shown to promote neuroplasticity (nerve growth and rewiring…in other words, learning.) When we get our blood pumping, we rev up the circuits for new learning as well. Exercise also serves the important function of burning off the stress chemicals that build up in the body from the numerous tiny (or not so tiny) amygdale firings we have throughout the day. Exercise clears the decks.

What we eat affects brain health. Caffeine (often consumed in large quantities to overcome shortage of sleep) has been shown to decrease blood flow in the grey matter (neocortex) and increase activation of the amygdalae. Many of our diets are inconsistent with the production of healthy brain chemistry. We ignore hunger indicators and then fill up on sugar and junk food snacks when blood sugar levels drop. Instead of feeding our brains with a consistent flow of the high quality ingredients necessary for the production of serotonin and other mood regulators, we wait until our brains are crashing. By then, our brains are in crisis mode and will compel us to reach for the first available kick start we can find. Sugar and caffeine rev us back up, but don't provide any healthy staying power.

Sunlight promotes the production of serotonin. Most people in corporate environments are chronically sunlight-deprived. Have you ever experienced an immediate mood lift by simply exiting your front door and allowing the sun to hit your face? The effect is more than merely psychological. Your brain responds to the UV radiation by secreting serotonin, the "feel-good" brain hormone.

Meditation and mindfulness practices have been empirically shown to improve PFC functioning as well. Brain scans of long term meditators show a thickening of the regions of the PFC associated with impulse control, fear control and empathy. The act of regular meditation has actually changed the physical structure of the brain in a positive way. Meditation isn't the only effective mindfulness practice. Anytime we step back, breathe, get present, and take stock of a situation from a neutral observation standpoint, we engage and strengthen the PFC.

ACTIVATION PROFILES: IMPLICIT AND EXPLICIT PROCESSING

An important distinction in understanding the human brain is implicit (unconscious) versus explicit (conscious) learning and memory. We identify with our conscious mind because, well, we're aware of it. The trap, however, is in assuming that this mind calls the shots throughout most of our waking hours. It does not.

The vast majority of information that we take in, process, act upon and store occurs in the implicit realm in an area called the basal ganglia. Of course, we do sense and record information explicitly, but this turns out to be a very small proportion (less than 1%) of what our brains do. We are constantly scanning the environment, taking in sights, sounds, smells and other sensations. At lightning speed, we feed this information through pre-established neural circuits in order to make sense of the world and produce a useful interpretation of the current set of data. Only very select pieces of data bubble up to the level of the conscious mind. What we choose to think and how we set up our environment influences which pieces of information are privileged in this way.

Since we have very little capacity for conscious processing, most of our learning takes place in the implicit realm. Implicit neural patterns are laid down with no "focal memory", that is, we have no specific memory of an experience. It does not involve the hippocampus. Processed through the basal ganglia, implicit memory

is fast, easy and requires very low energy expenditure. All learning before the age of two and most before the age of five is implicit. This is why we have very few conscious memories of early childhood. That part of the brain has not developed yet. We are exposed to behavior patterns over and over in our family and/or culture. Over time, these patterns are coded in our minds as the "correct" way of doing things. Most of our beliefs about the world are acquired in this way. Notice, however, that we never consciously evaluated or chose those beliefs. They accumulated through osmosis.

Over our lives, we acquire a huge library of implicit "feeling" memories. These memories, or neural activation profiles, are established through repetition and focus over time and allow us to quickly make sense of the situations we find ourselves in. We can sort through the millions of pieces of data available in any given moment and piece together a narrative that allows for coherent action. We could not function without our activation profiles. We wax poetic about the fresh openness of childhood, but the downside is that young children are not yet equipped to move through the world unassisted. They cannot sort through the jumble of data the world throws at them and safely navigate it. This is what our unconscious activation profiles do for us.

The downside of activation profiles is that they are just one way of filtering the universe and are not necessarily the best or most functional. They are simply the result of the best conglomeration of the patterns we have been exposed to through our parents and culture. The profiles allow for fast judgment in the moment by creating a top down set of constraints on how we see the world. The older we get, the more constrained we tend to become. The insidious nature of our implicit patterns is that they produce judgments that feel like "truth." We tend to see perception as neutral, and assume that given the same set of inputs, people will "see" the same things. The reality is that our sensory apparatuses are not at all impartial. The same light patterns may strike the retinas of two individuals, but the signals that the brain decides to code and interpret will be very different, based on the prior history of those two people.

Any time we experience a big mismatch between our implicit patterns and what we perceive explicitly, our amygdala warms up. This explains why we feel uncomfortable in unfamiliar cultures and environments. We constantly make assumptions in our interactions with others while assuming that the others are making the identical assumptions. Conflicts occur when incompatible sets of assumptions crash up against each other.

Explicit memory is processed in the hippocampus. It is factual in the sense that we can point to an explicit experience. It is autobiographical. We can "tell the story" of how we got that memory. Explicit learning, however, is expensive processor time. We have limited resources available for this and need to manage it wisely. Yet, in most corporate cultures, we squander this resource, known as "working memory" as though it were limitless. We act as if our capacity for taking in explicit information is inexhaustible, resulting in mind numbing end-to-end meetings where very little information absorption occurs.

Meanwhile, implicit learning plows ahead, unimpeded by limited processor capacity. As leaders, we pay vast amounts of attention to the piles of explicit data we hope and assume our people will absorb. We pay very little attention to the implicit stories which will more fundamentally inform their choices and behavior. Are the stories your people are learning about what is important and meaningful the ones you want them to have? Do you even know what they are?

Our neural activation patterns compete. We can hold multiple stories, but only one can fire at a time. When we introduce a new "story" or way of looking at the world into the organization, the first hurdle is even getting people to recognize and understand it, given the top down constraint of their existing viewpoint. Once the new story is recognized, it co-exists with the older more established pattern. Since these neural pathways share neurons, only one can fire at time. Neurons that fire together wire together. (Donald Hebb, 1949) In other words, the story that is reinforced the most survives and gets stronger, while the other atrophies.

Unconscious myths drive organizations and leaders can influence the revision of non-functional stories and encourage the formation of productive ones. Because we code beliefs and stories from exposure to the patterns and behavior of others, this has huge implications for culture change. When we announce change initiatives, but fail to address the myriad ways that individual and organizational behavior supports the old story, we are doomed to failure before we start.

One of the biggest impacts we can make on creating healthy cultures is to build organizational understanding of the degree to which our perception and behavior comes from these implicitly created neural patterns. This awareness opens the possibility for generative conversations regarding the patterns that stand in the way of success and the commitments which might be necessary to stabilize new patterns. By managing attention, the mind can observe the implicit realm of the brain and in doing so profoundly shift those patterns. We'll explore this further in the next section, on attention density and learning.

An associated phenomenon is neural rings or neural priming. The neural pathways related to any particular activation profile warm up whenever that pattern fires. The brain sorts through all its millions of connections and readies the pertinent information and activation profiles which might be useful in the current situation. If I say any word, for example "dog," your brain will warm up concepts related to dog, like "leash" or "kennel." If you like dogs, positive emotional circuitry will be activated. If you are frightened by them, you may feel a vague sense of unease.

The warming of circuitry increases the likelihood that we will notice related things in the environment. For instance, if I start to date a new person and we're discussing his interests, I may start to notice

magazine articles and conversations that otherwise would have been outside my conscious awareness. If I'm taking the subway home from work, I will hear the radio in the break room announcing a subway shutdown, whereas if I've driven to work, it remains background noise. Much of the leader's job in a knowledge-based organization is ensuring that the appropriate content and emotional circuits are activated, so that our behaviors are positive and we notice the right information.

The leader who can say "I don't know" is making a very powerful statement about the possibility for learning in his or her organization. He/she is saying, in essence, "I'm not convinced that the activation profiles I have are all there is, or even the best there is." Another powerful aspect of mature leadership is the ability to balance the possibility of being wrong or incomplete with the need to take a stance. It is the balance between spinelessness and rigidity.

LEARNING and CHANGE:
ATTENTION DENSITY and AHA MOMENTS

We're designed to conserve our neural patterns. Those patterns are what allow us to sort through the millions of incoming sensory signals that bombard us every moment of our lives. They allow us to notice what is relevant and to discard the rest. We don't have a lot of conscious bandwidth (working memory). In order to function, we need most of our behavior to be run by established neural patterns that make sense of this random world.

Any neural pattern that has kept us alive up to this point is protected by the brain, even if our conscious neocortical thinking recognizes that it no longer serves us. We have to devote precious conscious bandwidth to changing and our brains are loath to do that. We try to conserve our working memory for dealing with situations where we don't already have a strategy. Besides, when we change one neural pattern, it could impact another with unknown consequences. So, we're biologically programmed to resist change.

Everyone knows that habits are hard to change. If all it took to shift behavior was an understanding of the logical basis for the change, the billion dollar diet industry in this country would collapse instantaneously. Yet, the irony is that most corporate change initiatives and leadership development programs fail to go much beyond logical explanations (usually presented as one-time events in PowerPoint bullet points!)

A primary way in which neural pattern change occurs is through conscious attention. The components of change through attention involve:

- Bringing implicit pattern(s) into conscious awareness
- Recognizing the indicators that we are about to follow an impulse
- Taking advantage of the split second that we have to decide to act differently
- Having an alternate behavior pre-rehearsed for that moment, and
- Repeating this sequence enough times in rapid succession to hold the new neural pathway stable enough to cause preferential wiring in the new configuration.

Succinctly said, if you rapidly and consistently focus attention on a specific neural pathway over time it will re-route. The term "attention density" describes the act of focusing attention to hold neural circuits in place, resulting in creating new neural pathways and even new neuron growth. Without the mindfulness of our PFC, our brain follows the activation profile of least resistance. The deeper the pattern, the stronger that impulse will be.

We have the ability to consciously recognize and override biological impulses and compulsions, but the window to act is extremely small. Unless we have made a commitment to change and have prepared an alternate response, the opportunity comes and goes faster than we can catch it. Sensory data comes in through our external sensing organs, is passed through our heart/gut circuits and our activation profiles, into our limbic system for emotional processing and we select a response all in the space of about 0.3 seconds. From that point we have only about a 0.2 second window during which the PFC can consciously override the impulse and choose a new behavior. If we miss that window, the response dictated by our implicit patterning will prevail.

Again, we see the value of having an organization filled with well-developed, healthy PFC's. The stronger the PFC, the greater the capacity to resist impulse. Consider, again, the steps:

- Pause before action
- Recognize the undesired impulse
- Experience the discomfort of resisting the impulse
- Choose another path

All require fear moderation, response flexibility and mental time travel. These simply do not exist in great supply in environments where people are under constant physical and emotional stress. When we practice these steps, we strengthen the brain circuitry of change. It becomes easier and easier to catch ourselves and redirect. Interestingly, developing the capacity for mindful and conscious change tends also to develop our patience, compassion and humor. We come to understand why change is so hard, not only for us but for others. We encounter implicit patterns in ourselves that we never before knew existed. As we come to recognize how we've imposed our beliefs on others without conscious knowing, we have more wisdom and patience in allowing others the space for their own discovery.

Some deeply ingrained brain patterns like depression, anxiety, and OCD have a genetic component. It would be easy to blame our behavior on poor genes, but whether and how these genetic components show up is also subject to the influence of conscious choice and attention. If we believe "it's just the way I am and there's no way to change it," that will be largely true for us. If, however, we use all the tools available to us to hold attention density in a way that

counteracts our genetically inherited wiring tendencies, those neural wirings can change to more functional configurations. Without awareness and intention, however, we default to our genes.

If we truly want to change, we can stack the deck in our favor by setting up our environment to help us focus. This can include reminder systems and enrolling others in helping with the change. The presence of a coach or therapist can help sustain attention on a particular area of their client's development. When an individual changes, those around him/her still have brains that are primed to notice the old behavior, not the new. Part of creating an environment that gives us a chance to change is priming those around us with a new story so that they can notice us differently and reinforce our efforts toward new behavior.

Leaders can facilitate change by creating a positive emotional context. Since moods and emotions predispose the firing of certain neural networks over others, we want the desired change to have a positive emotional affect. Since change fires our "difference" circuitry, it automatically warms the amygdala. However, change is less threatening when it comes as the result of a decision we made, rather than one imposed on us. Thus, inclusion sets a positive emotional context for change. Leadership can hold attention on the new desired patterns, orient conversation around them, reward and re-enforce them. Especially powerful is publicly noticing, in a way that confers status, those who are changing in the desired ways.

Attention density is one mechanism of learning, but there are others. The "aha" moment is key to new neural growth and wiring. In brain scans of subjects who have solved a puzzle through novel thinking, we see the equivalent of neural fireworks. When subjects are told the solution, very little nerve activity occurs at all. This points to the importance of discovering and/or participating in the solution. When leadership simply supplies the answer, very little learning and neural excitement occurs. When, conversely, people are given the tools to arrive at a solution themselves, it is a memorable neural event with lasting results. When leaders combine an "aha moment" with the right emotion and then reinforce it with sustained attention, they create a potent recipe for learning and change.

CONCLUSION

We've considered the reasons neuroscience is relevant to leadership and looked at the principles of brain science that form the basis for understanding how to create brain-friendly working environments. Whether you are an executive or an individual contributor, a coach or a client, I'm sure that the concepts have already sparked new connections and "aha's" for you.