

Leading Brains in Turbulent Times

Abstract

Turbulent times are challenging for leaders and corporations for many reasons - many astutely outlined in Peter Lorange's book "Leading in Turbulent Times" which I will tie my comments into. A critical aspect forgotten in management literature is that of the brain and the psychological impacts. These are critical because these effects are colouring our view of the world and drawing leader's decision making along certain predefined paths mostly without any conscious knowledge. Not least the leaders but employees and the general population will have "turbulent brains" and understanding the underlying neuronal process - and importantly the impact on behaviours in business - can give us many clues as to what is precisely happening and give us the tools to counteract this.

The Brain in Turbulent Times

Peter Lorange's "Leading in Turbulent Times" [1] is an excellent personal perspective on the challenges of leading through challenging periods from a man who is as qualified as anybody to comment on this. I will with this paper add some perspectives from the view point of the brain and its neuronal processes. I outline in a little more detail in "Leading 100 Billion Neurons" [2] some of the neuronal processes and interventions but will summarise these here. I will interchangeably use turbulent, recession and crises (turbulent, we know, can have many implications but the recent market events have been defined by crises and recession).

The key-defining feature of recession is fear: fear of losing jobs, fear of lost wealth, fear of lost growth and fear of lost opportunities. Fear is one of the brain's primitive reactions and hence has a powerful chemical impact on the neuronal functioning with many instinctive reactions kicking in immediately. [3] This immediately impacts our brain's functioning and hence our way of thinking, our ability to process information and the way this information will be coloured. This will also affect the hormonal balance in our bodies. Fear will also be processed above other emotions, as it is the primeval survival emotion par excellence. We have human kind's survival and evolution to thank for this fear reaction.

Fear triggers two structures in the brain called the amygdala [4-6], sitting deep in the emotional seat of the brain, in the so-called, limbic system. The limbic system [7-10] itself being the heart of the brain's emotions - most information in the brain is processed through these centres. There is no such thing as rationality without emotion in the context of the brain. The amygdala are key for many processes in the brain and particularly for learning experiences. [11-13] In fear contexts the amygdala will quickly fire up and this will have numerous impacts (I will not go into the hormonal stress cascade [14] - suffice to say that this is also extremely important and can also have a long-term effect on the physical health of leaders and their employees). The following processes can be defined as the key functional impacts in the brain:

1. **Increased Emotionality:** this seems obvious but is something we need to be wary of. The amygdala are key emotional processing units, not just of fear, and amygdala activation will increase emotionality. Emotions will run high and rational argument will lose their power and miss the mark.

2. **Decreased Rationality:** the amygdala are directly linked to the prefrontal cortex. [15-17] The prefrontal cortex is our executive centre where a lot of what we consider rationality sits. [18] Planning, short term memory, balancing information, etc. As the amygdala fires up the prefrontal cortex will be inhibited. This means that **rationality decreases** - this is tied with increased emotionality in **1** At the same time our short-term memory will also be impeded - short-term memory is a key component of IQ (see fluid intelligence [19-21]) translating into **decreased intelligence** as fear increases. Obviously as we face the proverbial sabre-toothed tiger ready to chew us up, we would not be at our best for a game of chess. Similarly this also directly translates into a decreased ability to deal with complexity - so ironically when we **most need to deal with complexity we are least equipped, cognitively, to deal with it.**
3. **Increased negativity:** fear and threat will also influence a part of the brain called the ACC (anterior cingulate cortex) [22], which sits over this emotional centre of the brain and matches many of its functions but particularly those to do with **attention, focus and error detection.** [23] Fear will draw out **attention to the negative.** [24] This is a primitive instinct. If I have been walking through a forest and see a snake, my mind will then become overly sensitive to snakes. We will be drawn to the negative and particularly to the negatives that are similar to the threat. In recession periods we will be drawn to, and the press will constantly report the job cuts of companies (job cuts in boom periods of which there are also many, will go by without a soul noticing). This indeed also kicks off a negative spiral because as the negativity increases so does the amygdala activation leading to further fear and ever more increasing sensitivity to negative news and information. This will also focus our attention meaning firstly that we **do not see other threats** and secondly that we **do not see opportunities.**
4. **Action:** fear also directly influences our motor cortex, here I see this as a construct of action - action also requires an active motor cortex. The motor cortex controls all our movements. The classic fear reaction stimulates three potential actions: fight, flight, and freeze. [25] This translates into corporate contexts as fight -

aggressive action or over-energetic action. The danger here is that this is often combined with **1** and **2**, increased emotionality and decreased rationality. I often speak of the “**headless chicken syndrome**”. The fear reaction may also lead to **aggressive defensive behaviours** rather than collaborative behaviours when collaboration is likely of the utmost importance. The flight reaction in corporations leads leaders and employees to **avoid difficult situations** and avoid confrontation hoping it will all pass over, or alternatively actively running away and avoiding those difficult decisions. The freeze syndrome is that of **lack of decision-making and lack of action**. This is a potent combination with **3** (increased negativity which will further increase the freeze reflex) and inability to deal with complexity and hence a **decreased ability to make decisions** – particularly the *right* decisions.

Those are the four key impacts of fear and, as you can see, this is already dramatic. **Fear will increase emotionality, decrease rationality and ability to deal with complexity, give you a negative bias and impact your actions through a fight, flight or freeze reaction.** Yet there is more - unfortunately brain science can point to a few more insights that are also very relevant:

5. **Mirror neurons:** our brains have a massive network of neurons spread over the brain known as mirror neurons. These are brain cells that react to the actions of others. [26, 27] Simply if you watch a person move, your brain also stimulates in a similar way and you partly “move” as well. This also explains the infectiousness of action and emotions. The brain’s mirror neuron system has been shown to react to **emotions and intentions**. [28, 29] This means if there is fear in the environment, this can become **infectious** and fear in organisations will translate into employees **infecting each other with fear**.
6. **Unconscious:** fear we assume to be a conscious emotion but it isn’t. We know that, for example, just by looking at fearful faces that this will stimulate the amygdala. [24, 30, 31] In research using masked faces (subliminally cued pictures of fearful faces). The amygdala also activated even though the participants were **completely unaware** of this. [32]

This is a little more troubling for organisations as this means that not only is fear infectious, but also that it may be unconscious. In turbulent times with the newspapers, the news, talk shows and market gossip all being full of negative news (see negative bias) it is likely, nigh almost certain, that fear will be stimulated and will therefore begin to have the host of negative impacts on the brain as outlined previously without us being necessarily aware of this.

Selected Comments from “Leading in Turbulent Times”

I will cover a few points mentioned in “Leading in Turbulent Times” and highlight their relevance in terms of the brain

and why some of these are indeed crucial to leading in turbulent times from the brain’s perspective.

Trustworthiness: trust we all know is essential to business relationships. That is no news to anyone. Trust is a key emotion in the brain and one that is wired into our very survival instincts. The simple construct of “friend or foe” underlies this. We are forever balancing information and putting people into friend or foe categories. This is so strongly wired that we can see this everyday in politics. Politics plays strongly to creating enemies and pushing opponents into enemy figures (and not reasonably balanced human beings having a balanced debate). This is particularly apparent in American politics.

Trust in the brain is formed with the oxytocin system [33–35] – oxytocin a neurotransmitter is shown to **increase trusting behaviours**. [36] Oxytocin is also a critical chemical for bonding and hence loyalty also. [37] Trust also **activates the brain’s reward centres**; trust is itself a rewarding experience. [38] Meaning this is positive but for us in turbulent times it is doubly important because reward will also help to **counter balance an over active amygdala** and bring the brain back into positive balance. This is a challenge because negative bias in the fearful brain means that we are more sensitive to scenarios that can breach trust and lead to decreased loyalty from customers and employees alike. How can trust be influenced? By the following:

- i. **By aligning interests** [39] – if in turbulent times there is a perceived breach between leadership and employees this will lead to a breach in trust. This is all too often the case. Interests must be aligned.
- ii. Trust is **reciprocal** [40] and trusting organisations give trust and this is also linked to higher performance. [41] Increasing micro management is almost certain to decrease trust in organisations.
- iii. **Actions:** empty promises will lead to a breach in trust. Trust is after all built on expected outcomes of behaviours and if promises are broken, then so will trust be.
- iv. **Familiarity:** we tend to trust and like that which we are more familiar with. Remember negative bias, which makes us sensitive to fearful things but also to new experiences.
- v. **Emotional connection:** trust is an emotional state and - it is an emotional and an empathetic connection. Sharing emotions is a powerful bonding and hence trust building exercise (see communication).

Unfortunately many corporations in recession periods do exactly what is wrong and destroy trust through cutting jobs, keeping senior salaries high (both misaligning interests), increasing control systems (reducing reciprocal trust), reducing communication (see below) and making hollow promises.

Fairness: Peter Lorange talks about fairness and in the terms of the brain this is of utmost importance. A lot of research has been done with the ultimatum game when participants can accept or reject offers of money from others. [42, 43] Offers will be rejected if seen as unfair even though they mean a personal increase in wealth (with no effort). The research shows that fairness is processed

as a reward in the brain and unfairness activates the insula an area associated with **disgust in the brain**. [44–48] In short fairness is rewarding and is tightly linked to cooperation and empathy while fairness is negative but more that that unfairness stimulates the desire for punishment – research has led to the term of “**altruistic punishment**” namely that when fairness is observed a third person will be willing to pay to punish an “unfair” person through no personal gain and not having being the subject of the unfairness. [49–51] This goes some way to explaining the reaction of the general public to executive bonuses particularly in times of crises – the unfairness will stimulate a feeling of disgust and a **desire for punishment**. This within an organisation clearly has the potential for negative reactions and uncooperative behaviour – when emotions are running high in crises situations this is even more important. The brain is wired socially and social constructs such as fairness are linked to powerful emotional circuits in the brain.

Communication: many leaders are aware of the importance of communication and yet in turbulent times the stakes are raised considerably. Communication has many functions – firstly linked with **trust** above, but also as a key function of **creating clarity** and **aligning interests** (again back to trust). More than that, lack of communication, the black hole of not knowing, is a veritable poison for the brain. This in itself is known to stimulate amygdala activation [52] meaning that lack of news will also be processed as fear, further pulling a corporation into the grips of fear. Communication and information on the other hand can also oppose fear by stimulating the reward centre [53] and indeed the key tool of the most effective reward we know (**appreciation and gratitude** [54, 55]) is done through communication. In “Leading 100 Billion Neurons“ [2] I also talk about **ritualising communication** increasing the impact and the sense of control and key coordination points is extremely powerful (something used by Jürgen Dormann of ABB to great effect during their crises from 2001[2]). **Two-way communication** is also very important we know that being able to express emotions lowers them [56] so allowing employees and leaders alike to express their fears and worries is a therapeutic tool in itself and will lead to better brains. More than that it is a sign of respect. Mutual respect is a key element of trust and also of **appreciation** which is potent force in activating reward centres in the brain and counteracting fear.

Simplicity: as I noted previously in times of crises when fear is high the brain’s **rational centres are inhibited** and specifically also its ability to be able to deal with **complexity**. This raises the importance of simplicity and clarity of information and actions – and is also challenge when there is likely conflicting evidence – particularly at the start of the last financial crises, and indeed at the start of any crises. But simplicity and clarity also lies in the language we use – back to communication – the choice of words, simple sentences with simple human references, and simple concepts will give clarity and hence also give a clarity for action – the motor cortex may be inhibited and so simple, clear directions will help to get to action.

Pragmatic Optimism: a defining feature of turbulent times is the negative spiral of negative information feeding itself and becoming a **self-fulfilling prophecy**. The enlightened leader will be able to see though this negativity. Moreover through being optimistic the negative activation of the ACC

is shifted [57] this means two things. Firstly that the chances of spotting further dangers will be higher and secondly the chance of seeing opportunities will also be higher. As I noted in the section on mirror neurons, we are connected with the people around us and the leader of any corporation has a significant impact on this. An optimistic leader will lead to activating those mirror neurons of those they lead and this will **positively influence the working environment**. This optimism as Peter Lorange points out must be pragmatic. For if it is not realistic, it will carry no weight - avoiding the problems will **break trust** and lose the power.

Action & Speed: though we may believe that commitment must come before action, research in brain science also shows that the reverse can be true - **commitment may come after an action**. [58] We also know that the body influences our cognition more than we previously thought [59–64] – having something meaningful to do in times of stress and crises is **motivating and rewarding** at the same time. Therefore by creating clear and swift action many positive effects will be generated. This will **boost motivation, boost purpose, increase reward and lower amygdala activation** pushing the brain into a more positive chemical state.

The above will influence all interfaces, all the various stakeholders are also likely to have fearful brains in crises situations. So the same approach need to be taken in dealing with all the stakeholders whether employee, customer, shareholder or authorities. High emotional periods are also an opportunity to builds stronger relationships and deepen bonding. Emotional times increase bonding and loyalty whether it be negative or positive (as long as the outcome is positive). [65] Clients who are angry and have their problems solved become much more loyal than clients who never have a problem.

Interventions

I use a model of CLEARVision [2] for giving guidelines to leaders in times of crises; these are all based on brain science.



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Turbulent times are also emotional times for leaders themselves and this likely means that leaders will also be operating with a sub-optimal brain – Dr Srinivasan Pillay is a leading authority on neuroscience in business and personal development. He describes personal fear interventions in his books “Life Unlocked” and “Your Brain and Business”. [66, 67]

Understanding Emotional Drivers: SOAP

This is not the right place to go into SOAP in detail but a short outline will be helpful in understanding the importance of **underlying emotional schemata** in the brain. I approach this with Professor Theo Peters and Argang Ghadiri in our book “Neuroleadership – A Journey into the Brain for Business Leaders” (Springer, in-print). [68] The research over a century or more into neuroscience, psychotherapy and psychology points to four clear basic human needs wired into brains and lying on neuronal and chemical substrates. [69, 70] These need to be all in balance for a brain and person to be in balance. Balanced brains are also high performing brains in all respects.

Self-Esteem

Orientation and control

Attachment

Pleasure

This applies to any brain from the top to the bottom of a corporation:

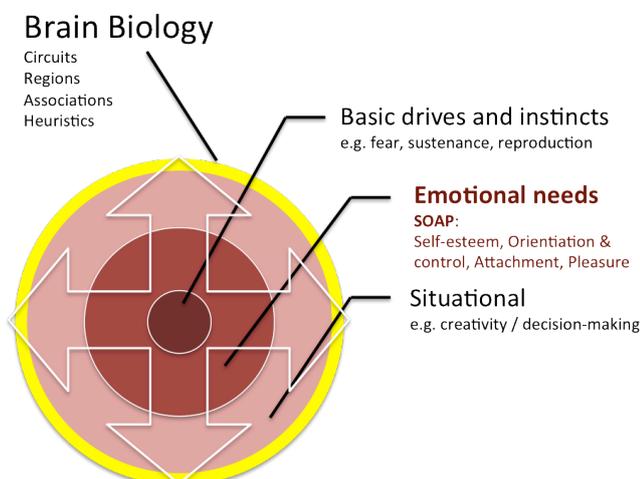
Self-esteem: is influenced in corporations through the respect, appreciation and gratitude we receive but also by personal status (not necessarily hierarchical).

Orientation and Control: visions in corporate contexts help give orientation. Control will be defined by how much influence a person has on their own environment.

Attachment: relationships with colleagues and superiors will support attachment, trust and bonding.

Pleasure: do I have fun at work or is it a negative painful experience? Hard work and challenges can also be very rewarding.

These four basic needs, when satisfied, combine to produce a motivating and stimulating environment that can overcome hurdles but more importantly these brains will be operating to the full capacity – the biggest challenge in turbulent times, I feel, is that we have to deal with sub-optimal brains at all interfaces. But understanding the underlying substrates gives a clear understanding of what is happening and why and hence also points us to the strategies to overcome these and drive a company forward through turbulent times.



Decision Making

I will touch on the area of decision-making – this is a well-researched area. Notably Daniel Kahnemen, Nobel Prize winner for Economics, has studied, for almost 50 years, decision-making heuristics – the **underlying unconscious processes** that can **steer our decisions off track**. [71] The confirming evidence trap that Peter Lorange talks about is a common one. [72, 73] This also falls into an area sometimes called hot and cold cognition. [74–76] Hot cognition occurs when we make decisions that we are emotionally attached to and hence **draw on our emotional centres making distorted and motivated decisions**. This is important when thinking of turbulent times because as we have noted a characteristic of turbulent times is that of high emotionality and hence we will likely fall into hot cognition traps. Research has shown that when we balance emotional information our emotional processing units are active [77] and indeed Drew Westen’s research into political partisans led him to say [78]:

None of the circuits involved in conscious reasoning were particularly engaged... Essentially, it appears as if partisans twirl the cognitive kaleidoscope until they get the conclusions they want... Everyone... may reason to emotionally biased judgments when they have a vested interest in how to interpret 'the facts.'

If crises situations are defined by high emotions we will then have a **flood of hot decision making**. This is troubling for a business leader: as we have seen over the last few sides, we have many emotional constructs in the brain which are **dramatically influencing the way the brain fires and processes information**. Fear and fairness are particularly notable in this context. This is challenge for leaders also because their own brain is likely in a hot cognition cycle but more importantly for the leader is to understand how their leadership team will be reacting, their employees, their customers, shareholders, and not least the general public.

In Summary

This short paper obviously does not look into various other elements such as strategy and market placement and specific areas of decision taking – but rather aims to give an overview of some of the neuronal process in place during turbulent times. The aim has been to highlight what is happening in the brain and link these to some of the points mentioned in “Leading in Turbulent Times” by Peter Lorange and hence highlight the relevance from the brain’s perspective. This shows clearly the importance of some of the strategies and precisely what we are fighting against – fearful brains. Fearful brains will be high in emotions, lower in reason and ability to deal with complexity and have various instinctive actions (fight, flight or freeze). To combat these we need to be very sensitive to fairness, reward, appreciation, and notably communication which is our most powerful tool in turbulent times. This is applicable when dealing with one’s own leadership team, employees, customers and the general public alike. Obviously strategic decision will have to be made and swift action with a clear goal and vision is also powerful for the brain. Understanding the brain can and should show us the way to counteract the “turbulent” brain and allow a leader and a company to sail safely through stormy seas.

References

- [1] P. Lorange, *Leading in Turbulent Times: Lessons Learnt and Implications for the Future*. Bingley: Emerald Group Publishing Limited, 2010.
- [2] A. Habermacher, *Leading 100 Billion Neurons*. smashwords, 2011.
- [3] R. Adolphs, D. Tranel, H. Damasio, and A. R. Damasio, "Fear and the human amygdala.," *Journal of Neuroscience*, vol. 15, no. 9, pp. 5879-5891, 1995.
- [4] M. Davis, "The role of the amygdala in fear and anxiety," *Annual Review of Neuroscience*, vol. 15, no. 1, pp. 353-375, 1992.
- [5] D. T. Cheng, D. C. Knight, C. N. Smith, and F. J. Helmstetter, "Human amygdala activity during the expression of fear responses.," *Behavioral Neuroscience*, vol. 120, no. 6, pp. 1187-1195, 2006.
- [6] N. Responses, "Responses : of Fear of the Amygdala," *Neuropsychiatry*, no. 3, 1997.
- [7] P. Karli, "Limbic System and Motivation Process," *Journal De Physiologie*, vol. 60, pp. 3-&, 1968.
- [8] J. A. Vilensky, G. W. V. Hoesen, and A. R. Damasio, "The limbic system and human evolution," *Journal of Human Evolution*, vol. 11, no. 6, pp. 447-460, 1982.
- [9] D. Ploog, "Emotions as products of the limbic system," *Medizinische Psychologie*, vol. 6, pp. 7-19, 1980.
- [10] G. J. Ter Horst, *Hormones of the Limbic System*, vol. 82. Elsevier, 2010, pp. 319-38.
- [11] S. Kilcross, "The amygdala, emotion and learning," *The Psychologist*, vol. 13, no. 10, pp. 502-508, 2000.
- [12] G. A. Clark, "Emotional learning. Fear and loathing in the amygdala.," *Current Biology*, vol. 5, no. 3, pp. 246-248, 1995.
- [13] M. Gallagher, "The amygdala and associative learning," in *The Amygdala A Functional Approach*, J. P. Aggleton, Ed. Oxford University Press, 2000, pp. 311-329.
- [14] D. F. Swaab, A.-M. Bao, and P. J. Lucassen, "The stress system in the human brain in depression and neurodegeneration.," *Ageing Research Reviews*, vol. 4, no. 2, pp. 141-194, 2005.
- [15] R. Garcia, R. M. Vouimba, M. Baudry, and R. F. Thompson, "The amygdala modulates prefrontal cortex activity relative to conditioned fear.," *Nature*, vol. 402, no. 6759, pp. 294-296, 1999.
- [16] H. L. Urry et al., "Amygdala and ventromedial prefrontal cortex are inversely coupled during regulation of negative affect and predict the diurnal pattern of cortisol secretion among older adults.," *The Journal of neuroscience : the official journal of the Society for Neuroscience*, vol. 26, no. 16, pp. 4415-25, Apr. 2006.
- [17] A. Bechara, H. Damasio, A. R. Damasio, and G. P. Lee, "Different contributions of the human amygdala and ventromedial prefrontal cortex to decision-making.," *Journal of Neuroscience*, vol. 19, no. 13, pp. 5473-5481, 1999.
- [18] E. K. Miller and J. D. Cohen, "An integrative theory of prefrontal function.," *Annual Review of Neuroscience*, vol. 24, no. 1, pp. 167-202, 2001.
- [19] T. A. Salthouse and J. E. Pink, "Why is working memory related to fluid intelligence?," *Psychonomic Bulletin & Review*, vol. 15, no. 2, pp. 364-371, 2008.
- [20] L. Stankov, "Fluid Intelligence," *Intelligence*, vol. 28, no. 2, pp. 121-143, 2000.
- [21] C. Konig, M. Buhner, and G. Murling, "Working Memory, Fluid Intelligence, and Attention Are Predictors of Multitasking Performance, but Polychronicity and Extraversion Are Not," *Human Performance*, vol. 18, no. 3, pp. 243-266, 2005.
- [22] L. Fiddick, "There is more than the amygdala: potential threat assessment in the cingulate cortex.," *Neuroscience & Biobehavioral Reviews*, vol. 35, no. 4, pp. 1007-1018, 2011.
- [23] C. S. Carter, T. S. Braver, D. M. Barch, M. M. Botvinick, D. Noll, and J. D. Cohen, "Anterior cingulate cortex, error detection, and the online monitoring of performance," *Science*, vol. 280, no. 5364, pp. 747-749, 1998.
- [24] S. S. Pillay, S. A. Gruber, J. Rogowska, N. Simpson, and D. A. Yurgelun-Todd, "fMRI of fearful facial affect recognition in panic disorder: the cingulate gyrus-amygdala connection.," *Journal of Affective Disorders*, vol. 94, no. 1-3, pp. 173-181, 2006.
- [25] H. S. Bracha, T. C. Ralston, J. M. Matsukawa, A. E. Williams, and A. S. Bracha, "Does 'fight or flight' need updating?," *Psychosomatics*, vol. 45, no. 5, pp. 448-449, 2004.
- [26] G. Rizzolatti and M. Fabbri-Destro, "Mirror Neuron Mechanism," in *Encyclopedia of Behavioral Neuroscience*, G. F. Koob, M. L. Moal, and R. F. Thompson, Eds. Academic Press, 2010, pp. 240-249.
- [27] G. Rizzolatti, "Mirrors in the brain," *How our Minds share Actions and Emotions*, 2008.
- [28] J. T. Kaplan and M. Iacoboni, "Getting a grip on other minds: mirror neurons, intention understanding, and cognitive empathy.," *Social Neuroscience*, vol. 1, no. 3-4, pp. 175-183, 2006.
- [29] M. Iacoboni, I. Molnar-Szakacs, V. Gallese, G. Buccino, J. C. Mazziotta, and G. Rizzolatti, "Grasping the intentions of others with one's own mirror neuron system," *PLoS Biology*, vol. 3, no. 3, p. e79, 2005.
- [30] A. J. and B. L., "Faces, fear and the amygdala," *Nature*, vol. 372, pp. 613-614, 1994.
- [31] D. A. Fitzgerald, M. Angstadt, L. M. Jelsone, P. J. Nathan, and K. L. Phan, "Beyond threat: amygdala reactivity across multiple expressions of facial affect.," *NeuroImage*, vol. 30, no. 4, pp. 1441-1448, 2006.
- [32] P. J. Whalen, S. L. Rauch, N. L. Etcoff, S. C. McInerney, M. B. Lee, and M. A. Jenike, "Masked presentations of emotional facial expressions modulate amygdala activity without explicit knowledge.," *Journal of Neuroscience*, vol. 18, no. 1, pp. 411-418, 1998.
- [33] J. Conlisk, "Professor Zak's empirical studies on trust and oxytocin," *Journal of Economic Behavior & Organization*, vol. 78, no. 1-2, pp. 160-166, 2011.
- [34] L. Welberg, "Trust in oxytocin," *Nature Reviews Neuroscience*, vol. 9, no. 7, p. 500, 2008.
- [35] M. Kosfeld, M. Heinrichs, P. J. Zak, U. Fischbacher, and E. Fehr, "Oxytocin increases trust in humans.," Nature Publishing Group, 2005.
- [36] M. Kosfeld, M. Heinrichs, P. J. Zak, U. Fischbacher, and E. Fehr, "Oxytocin increases trust in humans," *Nature*, vol. 435, no. 7042, pp. 673-676, 2005.
- [37] L. F. Palmer, "Bonding Matters : The Chemistry of Attachment Oxytocin : A Bonding Hormone Bonding Matters : The Chemistry of Attachment Vasopressin & Protection," *World*, pp. 1-4, 2010.
- [38] F. Krueger et al., "Neural correlates of trust.," *Proceedings of the National Academy of Sciences of the United States of America*, vol. 104, no. 50, pp. 20084-9, 2007.
- [39] C. Boudreau, M. D. McCubbins, and S. Coulson, "Knowing when to trust others: An ERP study of decision making after receiving information from unknown people," *Social cognitive and affective neuroscience*, vol. 4, no. 1, pp. 23-34, 2009.
- [40] W. Van Den Bos, E. Van Dijk, M. Westenberg, S. A. R. B. Rombouts, and E. A. Crone, "What motivates repayment? Neural correlates of reciprocity in the Trust Game," *Social cognitive and affective neuroscience*, vol. 4, no. 3, pp. 294-304, 2009.
- [41] S. D. Salomon and S. L. Robinson, "Trust that binds: the impact of collective felt trust on organizational performance.," *Journal of Applied Psychology*, vol. 93, no. 3, pp. 593-601, 2008.

- [42] A. Widman, "Neuroeconomics and the Ultimatum Game : A Glimpse into the Rationale of Fairness and its Role in the Brain," *Stanford Journal of Neuroscience*, vol. 2, no. 1, pp. 2-6, 2008.
- [43] Y. Wu, Y. Zhou, E. Van Dijk, M. C. Leliveld, and X. Zhou, "Social Comparison Affects Brain Responses to Fairness in Asset Division: An ERP Study with the Ultimatum Game.," *Frontiers in human neuroscience*, vol. 5, no. November, p. 131, 2011.
- [44] T. Singer, B. Seymour, J. P. O'Doherty, K. E. Stephan, R. J. Dolan, and C. D. Frith, "Empathic neural responses are modulated by the perceived fairness of others," *Nature*, vol. 439, no. 7075, pp. 466-469, 2006.
- [45] G. Tabibnia, A. B. Satpute, and M. D. Lieberman, "The sunny side of fairness: preference for fairness activates reward circuitry (and disregarding unfairness activates self-control circuitry).," *Psychological science : a journal of the American Psychological Society / APS*, vol. 19, no. 4, pp. 339-47, Apr. 2008.
- [46] G. Tabibnia and M. D. Lieberman, "Fairness and cooperation are rewarding: evidence from social cognitive neuroscience.," *Annals Of The New York Academy Of Sciences*, vol. 1118, no. 1, pp. 90-101, 2007.
- [47] L. Moretti and G. Di Pellegrino, "Disgust selectively modulates reciprocal fairness in economic interactions," *Emotion*, vol. 10, no. 2, pp. 169-80, 2010.
- [48] M. J. Crockett, "The neurochemistry of fairness: clarifying the link between serotonin and prosocial behavior.," *Annals Of The New York Academy Of Sciences*, vol. 1167, no. 2006, pp. 76-86, 2009.
- [49] D. J.-F. De Quervain et al., "The neural basis of altruistic punishment," *Science*, vol. 305, no. 5688, pp. 1254-1258, 2004.
- [50] J. H. Fowler, T. Johnson, and O. Smirnov, "Egalitarian motive and altruistic punishment," *Nature*, vol. 433, p. E1-E2, 2005.
- [51] E. Fehr and S. Gächter, "Altruistic punishment in humans.," *Nature*, vol. 415, no. 6868, pp. 137-40, 2002.
- [52] M. Zaretsky, A. Mendelsohn, M. Mintz, and T. Hendler, "In the eye of the beholder: internally driven uncertainty of danger recruits the amygdala and dorsomedial prefrontal cortex.," *Journal of Cognitive Neuroscience*, vol. 22, no. 10, pp. 2263-2275, 2010.
- [53] E. S. Bromberg-Martin and O. Hikosaka, "Midbrain dopamine neurons signal preference for advance information about upcoming rewards.," *Neuron*, vol. 63, no. 1, pp. 119-126, 2009.
- [54] A. M. Wood, J. Maltby, R. Gillett, P. A. Linley, and S. Joseph, "The role of gratitude in the development of social support, stress, and depression: Two longitudinal studies," *Journal of Research in Personality*, vol. 42, no. 4, pp. 854-871, 2008.
- [55] K. L. Tucker and D. Funder, "Getting the Most Out of Life: An Examination of Appreciation, Targets of Appreciation, and Sensitivity to Reward in Happier and Less Happy Individuals," *Journal of Social and Clinical Psychology*, vol. 26, no. 7, pp. 791-825, 2007.
- [56] M. D. Lieberman, N. I. Eisenberger, M. J. Crockett, S. M. Tom, J. H. Pfeifer, and B. M. Way, "Putting feelings into words: affect labeling disrupts amygdala activity in response to affective stimuli.," *Psychological Science*, vol. 18, no. 5, pp. 421-8, 2007.
- [57] T. Sharot, A. M. Riccardi, C. M. Raio, and E. A. Phelps, "Neural mechanisms mediating optimism bias," *Nature*, vol. 450, no. 7166, pp. 1-5, 2007.
- [58] T. Sharot, B. De Martino, and R. J. Dolan, "How Choice Reveals and Shapes Expected Hedonic Outcome," *Journal of Neuroscience*, vol. 29, no. 12, pp. 3760-3765, 2009.
- [59] R. Pfeifer and J. Bongard, *how the body shapes the way we think*. MIT Press, 2007, p. 394.
- [60] S. Gallagher, *How the Body Shapes the Mind*, vol. 20, no. 1. Oxford University Press, 2005, p. 284.
- [61] "Embodied Persuasion: How the Body Can Change our Mind | in-mind.org." [Online]. Available: <http://beta.in-mind.org/node/312>. [Accessed: 26-Feb-2011].
- [62] D. Kirshner and J. A. Whitson, "Understanding Embodied Cognition," *Cognition*, vol. 23, no. 1, pp. 1-5, 2010.
- [63] B. Lorey, M. Bischoff, S. Pilgramm, R. Stark, J. Munzert, and K. Zentgraf, "The embodied nature of motor imagery: the influence of posture and perspective.," *Experimental Brain Research*, vol. 194, no. 2, pp. 233-243, 2009.
- [64] M. Wilson, "Six views of embodied cognition," *Psychonomic Bulletin & Review*, vol. 9, no. 4, pp. 625-636, 2002.
- [65] S. S. Pillay, *Life Unlocked*. New York: Rodale Books, 2010.
- [66] S. S. Pillay, *Your Brain and Business*. New Jersey: FT Press, 2011.
- [67] T. Peters, A. Ghadiri, and A. Habermacher, *Neuroleadership - A Journey Through The Brain for Business Leaders*. Springer.
- [68] K. Grawe, *Neuropsychotherapy: How the Neurosciences Inform Effective Psychotherapy*. Lawrence Erlbaum Associates, 2006.
- [69] S. Epstein and I. B. Weiner, "Cognitive-experiential self-theory of personality," in *Comprehensive Handbook of Psychology Volume 5 Personality and Social Psychology*, vol. 5, M. J. Lerner, Ed. John Wiley & Sons, Inc., 2003, pp. 159-184.
- [70] D. Kahneman, *Thinking, Fast and Slow*. New York: Farrar, Straus and Giroux, 2011.
- [71] J. S. Hammond, R. L. Keeney, and H. Raiffa, "The hidden traps in decision making," *Harvard Business Review*, vol. 84, no. 1, p. 118, 2006.
- [72] R. Pohl, *Cognitive illusions: a handbook on fallacies and biases in thinking, judgement and memory*. Psychology Press, 2004.
- [73] Z. Kunda, "The case for motivated reasoning.," *Psychological Bulletin*, vol. 108, no. 3, pp. 480-498, 1990.
- [74] D. P. Redlawsk, "Hot Cognition or Cool Consideration ? Testing the Effects of Motivated Reasoning on Political Decision Making on Political Decision Making," *Political Science*, 2002.
- [75] S. J. Read, D. Simon, and D. Stenstrom, "Hot Cognitions in Coherence-Based Reasoning and Decision-Making Study 1 : Adversarial and Inquisitorial Investigations," *Read*, pp. 1465-1470, 2007.
- [76] D. Westen, P. S. Blagov, K. Harenski, C. Kilts, and S. Hamann, "Neural bases of motivated reasoning: an fMRI study of emotional constraints on partisan political judgment in the 2004 U.S. Presidential election.," *Journal of Cognitive Neuroscience*, vol. 18, no. 11, pp. 1947-1958, 2006.
- [77] D. Westen, *The Political Brain: The Role of Emotion in Deciding the Fate of the Nation*. PublicAffairs, 2007.