

The Nature of the Beast

Why everything is the way it is, people do the things they do, and how you can successfully change the world and innovate when 90% of those that try - fail.

How genetics and our neurology impact our perception, behaviour, choices, and innovation success. An evidence based toolkit for organizations from start ups to large corporates.

“If I have seen further, it is by standing on the shoulders of giants.”

– Isaac Newton

For those familiar with E.O. Wilson and the evolution of the science of Socio-biology, Paul R. Lawrence and Nitin Nohria’s work and their book Driven, Lt. Col. Dave Grossman and his book On Killing, or Robert Wright who wrote The Moral Animal - it is they who deserve the credit.

“If the genius of invention were to reveal tomorrow the secret of immortality, of eternal beauty and youth, for which all humanity is aching, the same inexorable agents which prevent a mass from changing suddenly its velocity would likewise resist the force of the new knowledge until time gradually modifies human thought.”

- Nikola Tesla

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A Quick Forward

When I was 13 and a freshman in high school - a math teacher gave the class a formula and said, "Use this formula to get the right answer." I asked why the formula worked. He replied, "That is math way beyond this class, just use the formula."

As crazy as it might sound, and as hard as I tried, I couldn't make myself do it. I had to work out each problem without using the formula or I had to understand why the formula worked. The first exam, I received a very poor grade. I had barely finished the first problem when time ran out. It was probably the first time I had received a grade in math lower than a B - and it was a fail.

My math teacher asked me why I had done so poorly. He became very annoyed when I explained that I just wasn't comfortable using the formula unless I understood why it worked. In hindsight, I think he thought I was challenging him - which I wasn't. Long story short, two more terrible exams, parental involvement, a transfer to another class, and the new teacher taking the time to explain the proof, and I went back to getting good grades.

I tell the story because it reveals an aspect of my nature. I have a compulsion to ask and understand "Why?" As someone who has repeatedly worked to develop new and innovative products (some successfully, sometimes not), it bothered me immensely that there was no solid answer to the age-old question of why some products succeed and yet so many others fail. None of the explanations available stood to scrutiny. To make matters worse, new explanations seemed to rise and

fall faster than fashion trends and every new product I worked on – success or failure - magnified my need for an answer.

In the same year as my math struggles, either looking for something to impress a girl or compelled by an English assignment, I was flicking through a copy of my Mom's Norton Anthology of English Literature. I loved Richard Lovelace's "To Althea from Prison" and stumbled upon Percy Shelley's "Ozymandias":

*I met a traveller from an antique land
Who said: Two vast and trunkless legs of stone
Stand in the desert. Near them, on the sand,
Half sunk, a shattered visage lies, whose frown,
And wrinkled lip, and sneer of cold command,
Tell that its sculptor well those passions read
Which yet survive, stamped on these lifeless things,
The hand that mocked them and the heart that fed:*

*And on the pedestal these words appear:
'My name is Ozymandias, king of kings:
Look on my works, ye Mighty, and despair!'
Nothing beside remains. Round the decay
Of that colossal wreck, boundless and bare
The lone and level sands stretch far away.*

A few years later, my first "real job" boss asked me, "why has every great and powerful civilizations – to a one – despite every advantage, eventually collapsed?" Ozymandias immediately came to mind and my compulsion to understand why kicked in. Once again, no available answer could stand to scrutiny. Throughout the decades that followed, I continued to seek an answer.

Quite unexpectedly, my quest for answers to these seemingly unrelated questions came together. I read Driven by Paul Lawrence and Nitin Nohria from Harvard and The Moral Animal by Robert Wright just after re-reading The Rise and Fall of Great Powers by Paul Kennedy. All had great value to offer, but both Driven and The Rise and Fall had internal inconsistencies, were not consistent with my experiences, and had too many elements that were contradicted by other robust research.

The three together, however, provided a whole new direction to explore. Long story short, I believe that what I put forward here is correct and well supported by evidence. There is far more research and evidence available than what I have included. That said, I'm sure wiser and more informed minds might find issues. Given the total complexity of the topic and the number of disciplines from which research has been drawn, this is to be expected. Even if this occurs, for one piece of evidence or another, I will remain satisfied with this answer for one reason above all others. Taken as a whole, the notion that we all manifest genetically originated motivational drive traits offers something that no other explanation has: consilience. It provides a single consistent explanation across all arenas of human activity and their associated disciplines of study - from the diffusion of technology and economics to neuroscience and from political science to evolutionary development psychology.

Despite the strong support consilience represents, and its satisfying nature, I am aware that the ideas being put forward have a specific and limited scope. As such, I hope all who agree with the theories and evidence put forward as well as

the conclusions that have been drawn or can be drawn, will resist the temptation too apply them to broadly as has happened with Disruption Theory and so many others.

SUMMARY

In this book I will attempt to describe the genetic and neurological forces driving human behaviour and influencing our choices to adopt and resists new things, the impediments to effective innovation these inherited neurological traits create, and - in book 2 - a variety of tools that can be used to overcome these barriers.

In summary, I submit that human behaviour is substantially influenced by genetically dictated neurological structures. These structures both produce specific behavioural traits or drives and govern our perception of the world. They specifically motivate us to pursue a variety of forms of relative outcomes including belonging, status, mastery, and novelty. Each of these physical neurological structures and the corresponding motivational drives they foster dictate the perception and pursuit of a unique form of value. In many cases these alternative and non-interchangeable forms of value have greater influence on our decisions and behaviours than rational self-interest or even self-preservation. The most important of these is the pursuit of relative status - which is more highly valued than money or even life by a portion of every population. The universal expression of these traits in all human populations has as a by-product a set of consistent, predictable and scale invariant patterns of behaviour within and between groups. These patterns in turn explain a host of seemingly irrational societal scale behaviours.

In addition, our genetically dictated neurology is entirely built from a common building block structure shared by everything from the nematode worm to chimpanzees. The combination of these evolved preconfigured drive modules with these standard building blocks that store information almost exclusively by associating the stimuli pattern of something new with a pattern of stimuli previously stored (in the form of a collection of interconnected neurons representing that similar or related pattern) places fundamental boundaries on how we perceive our world and the things in it.

Our misunderstanding of the influence of these often entirely subconscious motivational drive traits coupled with the impact of the pattern and association dependent nature of our neural building blocks – and thus our storage of experience and our perception of the world - represent the primary impediments to successful innovation. More specifically, successful innovation is hindered by the paradigms embraced by decision makers, subgroups and cultures within organizations, the paradigms held by customers and whole markets, the misunderstanding of the role of the discrete forms of value dictated by these genetic traits, and the reality that human decision making is largely the function of a social dynamic rather than individual preferences or purely an individual process.

Consilience – Evidence supporting genetically originated motivational drives

Importantly, this explanation offers consilience across disciplines and arenas of human activity. Status and group belonging have long been accepted as primary drivers of human behavior in sociology, psychology, business management, and even international relations. Functionally specific neural modules are an accepted reality within the neurosciences. Evolutionary developmental biology, developmental psychology and the study of inheritance have established the sequential expression and epigenetic or environmentally responsive nature of genetic traits in humans. While controversial when introduced, sociobiology or evolutionary psychology and the genetic origins of a variety of influences on behavior are now widely accepted.¹ This is also true of epigenetics and the influence of environmental factors on both the cosmetic expression of phenotype and the expression, timing, and ultimate nature of some genetic traits.

From economically irrational purchases such designer fashion labels or assets during a market bubble to the broad resistance of scientists to new discoveries as described by Khun (1996), the horrors of the Nazis, and the rabid pursuit of Facebook friends who have never actually been met, irrational behavior on a group and societal-scale is common in every arena of human activity. This patterned societal-scale behavior, including the disruptive diffusion of new products, is brought about by the adoption of a paradigm driven by the scale

¹ Chi-Hua Chen, et al, “Genome-wide analyses for personality traits identify six genomic loci and show correlations with psychiatric disorders” *Nature Genetics* 49, 152–156 (2017)
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invariant influence of our innate competition for status, the desire for belonging, our fear of exclusion, and an aggregate reluctance to challenge others dictated by our inherited and evolved genetic traits.

The interaction of these drive-traits, and in particular status, belonging and our willingness to challenge others, provides a single consistent explanation or ultimate cause for all such occurrence and across all arenas of human activity. The evolution of specific neurological structures and associated drive traits as an explanation of these phenomena also passes the four requirements established by Eugene Fama, creator of one of the foundation stones of modern economics the Efficient Market Hypothesis, for any new explanation of societal scale behavior: (1) it must explain more, (2) be simple, (3) be supported by data and observation, and (4) be refutable by experimentation.² Further, given the growing access to vast amounts of data, the Drive Traits Theory can be readily applied to generate meaningful analysis and predictions. Irrespective of the difficulties associated with studying genetic traits and their relationship to behavior in humans, the evidence for Motivational Drive Traits (1) specifically and, in my opinion, unequivocally refutes the ideas that underpin Eugenics and (2) have pragmatic and readily discernable implications for policy makers, educators, community leaders, business leaders, venture capitalists, portfolio managers and others.

² Fama, Eugene. "*Efficient Capital Markets: A Review of Theory and Empirical Work*," The Journal of Finance, 25(2), Papers and Proceedings of the Twenty-Eighth Annual Meeting of the American Finance Association New York, December, 28-30, 1969 (May, 1970), 383-417.

PART 1 – A HOST OF PUZZLING QUESTIONS & WHAT WE THINK WE

KNOW

How is it that suicide becomes a willfully embraced behavior in so many cultures, religions and political movements? From Vikings volunteering for human sacrifice and kamikazes during World War II to Islamic extremists today, culturally endorsed and wilfully embraced suicide is commonplace throughout history.

Why have intelligent people perpetually sought opportunities to pay absurdly high prices for all manner of things of little or no actual value? From shares in “pre-revenue” Internet companies in 2000 or tulip bulbs during the mania of 1637 to pet rocks in 1975 or Birkin handbags³ today (these retail for \$12,000 and have sold for as much as \$222,912)⁴, why would people pay substantial sums of money, sometimes as much as the cost of a family home, for something with little or no actual value

Why do people make obviously irrational choices on a societal scale? How is it possible that an entire nation would adopt the crippling practice of breaking their daughter’s feet, folding the broken



³ Or any Velban good.

⁴ \$222,912 U.S. dollars - <http://fortune.com/2015/06/23/hermes-birkin-investment/>

bones and toes underneath, then binding the mangled mess simply so the feet would appear small - a practice popular in China into the twentieth century?

What could explain the ridiculous wigs worn by the royal courts of Europe throughout the 17th and 18th century or the recent gangster jeans fad of pants literally sagging so below the waste they often fall off?



What causes a whole generation of adolescents to say “That’s sick!” instead of “That’s awesome!” to describe something we used to describe as “cool”? Why do millions rabidly pursue ‘likes’ on Facebook, and how could anyone have supported or currently support the horrors of Nazism, the Khmer Rouge, or ISIS?

As a species we seem to perpetually pursue irrational outcomes and make entirely irrational decisions on a group and societal scale.

Directly on the topic of innovation, why, despite countless experiments, the constant use of new methods, the investment of vast sums of shareholder money, and the efforts of many of humanities best and brightest, do 90% to 95% of new products, innovation initiatives, and organizational change initiatives fail? And, having identified the topic of this book as innovation, what could Vikings, suicide bombers, and gangster jeans possibly have to do with it? Why are the answers to these seemingly unrelated questions fundamental to solving the puzzle of innovation and new product success?

A new theory from the intersection of economics, neuroscience, genetics, and psychology offers a fascinating and compelling answer. It delivers a single common explanation not only to the above questions but also for a host of other societal scale phenomena. Critically, it offers new insight into why only a handful of new products succeed while so many fail, including some seemingly superior ones. The story's most compelling contribution, however, may be what this new interdisciplinary science tells us about how we humans make decisions, how we can make better decisions, and how we can actually predict behaviour.

A New Explanation for Disruptive Success is Required

In February 2012, Kodak which once employed 145,000 people shut down. In the same year Blockbuster Video, which once employed 60,000 people across 9,000 stores, announced it would close down half of the mere 600 stores that remained. A few months later it announced it would close down the rest. After decades, more than 100 years in the case of Kodak, tens of thousands of workers lost their jobs, franchisors hoping to retire had to make new plans, and investors who had held on to what had been blue chip stock only a few years earlier - lost any value that remained. Today, while data shows most C.E.Os. are optimistic, it also shows they are living in fear. This fear, and for some of us our own, is no longer about corporate downsizing but about total disruptive obsolescence. The challenge, despite all of the experts and consultants, the new methods, the investment of billions in innovation labs, “agile” development programs, and minimum viable products, 90-95% of new products continue to fail. And the vast majority of participants in these programs just don’t know why. Worse, many have given up on the idea that it is possible to know why – instead adopting fail fast fail cheap not as a method for directed experimentation but simply as low cost trial and error.

For several years now the annual Price Waterhouse Coopers C.E.O. survey has reported half to three quarters of all C.E.Os. consider the rate of technological change and disruption as one of their primary concerns.⁵ Research done by

⁵ <https://www.pwc.com.au/publications/pdf/seizing-the-future-feb16.pdf> and

others including McKinsey and Company and the Economists Intelligence Unit report that a majority of C.E.Os. feel “the rate of change is accelerating, they expect their business to be disrupted, or that their industry is currently being disrupted.”⁶ “Disruptive innovation” is the buzz-phrase of the decade and billions of dollars are being invested in consultant fees, hack days, minimum viable products, recruitment, and more.

Despite these efforts the success or failure rate for new products, innovation initiatives, and start-ups has not improved. If considered in scientific terms, since 2005 alone, hundreds of thousands of experiments in the form of new products and new start-ups have been conducted and less than 10% have yielded the expected result.

Sure, business is a complex arena. But if any scientist conducted a series of experiments and 9 out of ever 10 attempts, produced results radically different from what their hypothesis predicted, they would conclude that their underlying ideas and hypothesis were wrong. This is what we must do here. To successfully innovate, we must re-examine our underlying beliefs and assumptions about why new products or businesses succeed, why people make the decisions they do, and the causes of widespread or disruptive success.

<https://www.pwc.com/gx/en/C.E.O.-survey/2015/assets/pwc-18th-annual-global-C.E.O.-survey-jan-2015.pdf>

⁶ <https://www.pega.com/sites/pega.com/files/docs/2016/Jun/digital-transformation-agenda-2016.pdf>

Clayton Christensen's Theory of Disruptive Innovation

There are several accepted explanations for highly successful, innovative, and disruptive new products. The leading candidate is Clayton Christensen's theory of Disruptive Innovation. Put forward in 1997 it achieved near ubiquitous acceptance within a decade. Today, C.E.Os. continue to relentlessly use the two words and invest heavily in projects to innovate and disrupt others or to prevent being disrupted. A recent Bloomberg article referred to Disruptive Innovation Theory as "possibly the sexiest" thing to have emerged from American business schools - ever.⁷

Yet, as the theory moves toward the level of accepted fact, a number of questions are emerging. Contrary to the years of headlines and the endless predictions of imminent disruption for nearly every industry, most large companies just keep chugging along. The pervasive media hype coupled with the fad like use and misuse of the term have produced growing scepticism. More problematically, despite the efforts of many of the world's best and brightest, and the aforementioned investment of billions of dollars, only a handful of the teams who set out to disrupt markets succeed in doing so.

Amplifying the situation, academic challenges have been raised by respected professors questioning the veracity of both the theory and its' supporting case

⁷ <http://www.bloomberg.com/news/articles/2015-10-05/did-clay-christensen-get-disruption-wrong->

studies.⁸ While many have been resolved in favour of Disruption Theory, according to a review published in the MIT Sloan Management Review, less than 10% of the examples cited by Clayton Christensen in his own work conform to his own model.⁹ Clayton Christensen himself has stated that the theory “breaks down” under a variety of conditions and both he and his colleagues have openly and repeatedly expressed concerns that most projects intended to disrupt will fail because the theory is so misunderstood and widely misapplied.

While Disruptive Innovation Theory clearly explains events some of the time, and the book (The Innovator’s Dilemma) is a must read for any serious innovator, product manager, or senior executive, it clearly does not explain all disruptive or wildly successful new products (noting that contrary to what many think it was never intended to). The theory offers insight into some decisions, but it does not explain why rational executives continue to regularly make irrational choices. Nor does it explain why some products like the iPod achieve widespread rapid success while other seemingly superior products, or at least more feature rich and yet less costly ones, fail.

⁸ King, Andrew A. and Baljir Baatartogtokh, “How Useful Is the Theory of Disruptive Innovation?” MIT Sloan Management Review Magazine: Fall / September 15, 2015; and <http://www.bloomberg.com/news/articles/2015-10-05/did-clay-christensen-get-disruption-wrong-> ; and

<http://www.newyorker.com/magazine/2014/06/23/the-disruption-machine>

⁹ King, Andrew A. and Baljir Baatartogtokh. “How Useful Is the Theory of Disruptive Innovation?” MIT Sloan Management Review September 15, 2015

Given the evidence and the fact that even its most ardent critics acknowledge that Disruptive Innovation Theory is correct in specific situations, it must be a component of any answer. But there must also be more to the story.

Gladwell's Tipping Point

Another popular explanation for wildly successful products is the idea of a viral *Tipping Point*. Malcolm Gladwell's book of that title sold millions of copies.

Whether the result of different types of people who promote and convince others to adopt new things or that of a psychological contagion, Gladwell points out that successful products spread like viruses. The success of the book coupled with the success of products like Hotmail and the emergence of seemingly successful 'viral' marketing campaigns has generated wide spread acceptance of the desirability of "viral" characteristics in product design and marketing.

Once again, however, trying to make something "viral" has proven exceedingly difficult and virtually impossible to predict or rely upon. For every success attributed to viral by design characteristics such as found in PayPal, DropBox's referral program, the Blendtec YouTube "Can it blend" video campaign, or LinkedIn - there have been a multitude of failures such as the Cheeto's Orange Underground campaign, Google Hangouts and Wave, Rdio (radio streaming service based on what your friends were listening to), and a host of start ups that haven't reached sufficient prominence to be familiar (look up Color¹⁰).

What is undeniable is Gladwell's observation that fads spread through populations much like a virus. But, correlation is not causation. The widespread rapid adoption of a product, or its inverse and the irrational resistance that often occurs within groups and populations, cannot be attributed to "psychological

¹⁰ <http://techli.com/2012/04/10-greatest-startup-failures/#>.

contagions” as implied by Gladwell and proposed by Nobel laureate Robert Shiller. There is simply no such thing. Products, fads, ideas, and memes spread through human populations in patterns similar to viruses not because they are - or even share characteristics with - active viral contagions but because they both move through the same medium (a population of humans in this case) and both rely on the interacting social nature of the individuals who comprise it.

Further, research on adoption has specifically shown that influential individuals are not the cause of adoption cascades. One study states “Under most conditions, we would argue, cascades do not succeed because of a few highly influential individuals influencing everyone else but rather on account of a critical mass of easily influenced individuals influencing other easy-to-influence people.”¹¹

Just as Christensen has tried to correct efforts to use his theory in situations for which it was never intended, so too Gladwell stands by his observations but not the conclusions and overly simplified attempts at universal application many try to make.

¹¹ Watts, Duncan J. and Peter Sheridan Dodds. “Influentials, Networks, and Public Opinion Formation.” JOURNAL OF CONSUMER RESEARCH, Inc. " Vol. 34 " December 2007 All rights reserved. 0093-5301/2007/3404-0002\$10.00

Moore's Crossing the Chasm

Finally we must consider Geoffrey Moore's book Crossing the Chasm (and Everett Roger's Diffusion of Technology on which it is based).¹² It is another bestseller, and considered by many to be the bible for marketing and selling disruptive products to mainstream customers. Every product manager, marketer, and entrepreneur worth their salt will be familiar with Moore's idea that consumers fall into one of five groups; innovators, early adopters, early majority, late majority, or laggards. Instead of looking at the successes, Moore seeks to explain why specific technology products fail. Like Gladwell, however, Moore's groups have proven impossible to predictably identify. People regularly appear to be innovators or early adopters in some situations but are seen as late majority or even laggards in others. Further, while Moore describes a pattern seemingly followed by some product failures, his examples are highly limited, he does not discuss the many exceptions and does not define the causes for adoption of those that succeed.

Examples of the Wildly Successful and Disruptive

Just briefly, before we go further in our quest for an explanation, let's take a quick look at some examples of the wildly successful offerings and disruptive technologies whose success we seek to understand and explain. Many in the list

¹² Moore, Geoffrey A. Crossing the Chasm. Collins Business Book HarperCollins Publishers, New York, (2002).

have come close to delivering business nirvana; high margins, premium status actively pursued by consumers, growth in users and engagement, and a virtual monopoly in a large, profitable, and expanding market. Several are the elusive unicorns (businesses that go from start up to billion-dollar valuation) lusted after by venture capitalists. Others are historical. But all changed markets and some changed the world.

This list is hardly exhaustive and includes both examples that conform to Clayton Christensen's Disruptive Innovation Theory as well as many that were simply wildly successful and disruptive to incumbents or a market as a result of their success.

	<u>Products</u>	<u>Technologies</u>	<u>Business Models</u>	<u>Combinations</u>
Disruptive	<ul style="list-style-type: none"> • Google (1998) • Wikipedia (2001) • Google Maps (2005) • iPhone (2007) • Netflix streaming (2007) • YouTube (2010) • Skype (2004) • PlayStation (1995, 2000, 2006) 	<ul style="list-style-type: none"> • Printing press (1377-1440) • Hydraulic earth moving • Transistor Radio (1950) • Mini-Mills (~1970's) • Personal Computers (~1980's) • Floppy Disks • Mobile phones (1980's - 1990's) • The Internet, Web & e-mail (1990's) • Ecommerce • Digital photography (1990's-2000's) • USB thumb drives • LCD (2010) 	<ul style="list-style-type: none"> • Ford and the Model T assembly line (1908) • Barnes & Nobles (1990's) • Amazon.com (1995-1999) • UBER (2010) • Craigslist (2000) • EBay (1996) 	<ul style="list-style-type: none"> • Webmail (late 1990's-2000's) • iTunes (2001)
Non-Christensen but wildly successful or disruptive none the less	<ul style="list-style-type: none"> • BIC Crystal Pen (1950's-1960's) • Kodak instamatic (1960's) • VWBug (1950's) (& Toyota Corolla (1960-1990)) • Polaroid instant camera (~1970's) • Nike (~1970's) • The Pet Rock (1976) • Boom boxes (Late 1970's-early 1980's) • Sony Walkman (1979) • Calvin Klein Jeans (1981) • MSDos (1981), Word, & Excel • Reebok Freestyle (1982) • Quicken (1983) • AOL (~1993) • Funny animal GIFs & videos (1990's -2000's) • iPod (2001) • Facebook (~2004) • Twitter (2006) • Go Pro (2006) 	<ul style="list-style-type: none"> • Muskets (1400's) • Steam engine (1800's) • Rifles (1800's) • Iron and Steel Ship Building • WiFi 	<ul style="list-style-type: none"> • Singer (Franchising and instalment plans 1880) • McDonalds (1953) • MSWord (1980's-1990's) • Sabremetrics (1990's) • AirBnB (2009) 	<ul style="list-style-type: none"> • Merchant Housing, Tract Homes & Car Ports (~1950's) • Starbucks (1990's-2000's) • Nespresso (1990's-2000's) • Red Bull Energy Drink (1990's-2000's) • Zwiffer (2000's) • Tesla Model3? (2003)

This list clearly shows that not all classically “disruptive” new entrants take down an established player or industry let alone do so in an instant as is often portrayed. Some create whole new markets. Time scales range wildly from a few years (the time it took Netflix to put Blockbuster out of business after switching to “on-demand” streaming or Google Maps to dislodge Garmin), to decades (the time between digital photography’s invention by Kodak and the technology eventually consuming it), to centuries (the time it took muskets to fully replace bows and arrows).

Even for the classically disruptive successes, not all can be attributed to Christensen’s model of a new entrant targeting a small part of a market willing to sacrifice quality for price followed by the failure of incumbents to assess the potential impact of new technology resulting in the new entrant moving up the value chain as that technology improves. Designer jeans, for example, disrupted Levi Straus. Intuit’s Quicken accounting software drove a host of other accounting software providers out of business. The Sony Walkman was the iPod of its day, the iPod, iPhone, BeBop drone, and GoPro camera can hardly be considered purchases made by people prepared to sacrifice quality for price. Wang Laboratories, and other manufacturers of word processors and workstations, were disrupted by personal computers when personal computers cost more and were substantially more complex. Few of these relied on new business models or a truly new technology. Some targeted existing demand and some created entirely new markets. But the vast majority, strictly speaking, do not comply with Christensen’s Disruptive Innovation Theory.

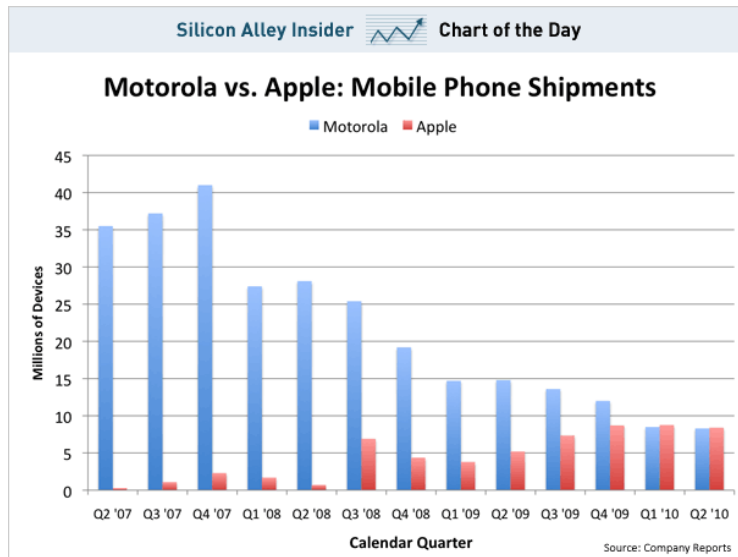
Further, a surprising number were opportunities specifically rejected by incumbents. These included Kodak's rejection of digital photography, Blockbuster's rejection of Netflix, and IBM's rejection of an opportunity to purchase MS DOS. As such, any theory must explain why smart executives regularly make irrational decisions or fail to pursue obviously good ideas while consumers and whole societies seem to wildly adopt them and vice versa.

Things Shared by Wildly Successful Products and the Story of Abraham Wald

As many experts have done previously, we might start by examining the characteristics shared by the successes.

- Successful entrants all follow a classic S adoption curve. While time scales vary, after a period of gradual adoption, growth for all accelerated through the bulk of an accessible market and then slowed until adoption had occurred by most, but not quite all of those that remained. Contrary to common perception, even the most disruptive of products are adopted gradually at first. Queues may have greeted the launch of the iPhone, but despite the earlier success of the iPod, the iPhone sold only a few hundred thousands units in its first quarter and only 3 million units in its first year. Hardly an unprecedented volume for a flagship mobile phone product. In contrast, the Motorola Razr sold millions of units in its first quarter, more

than 15 million units in its first year and 110 million units in first three years. Many were predicting the iPhone would fail more than a year after its launch.



- Nearly all initially experienced spontaneous demand from a niche market. The product or service either alleviated a pain point so significant, or they were so appealing to a specific group, that upon hearing about the new offering or being exposed to it, potential customers within that niche actively sought it out.
- Each had something that enabled them to, in Moore's words, "cross the chasm" between fringe, niche, or early adopters and mainstream.
- Finally, they all had some public aspect of consumption or generated discussion and awareness.

There are, however, problems with this approach. Christensen, Moore, Gladwell and others have made these observations and thousands of projects have been launched trying to emulate these and other characteristics associated with some

but not all of the successes. The approach has yielded undoubtedly valuable observations and contributed to the development of a variety of new widely adopted methods such as agile, lean start-up, and design thinking. The usability and aesthetic appeal of any number of products has improved. But the proliferation in use of these new methods and the emulation of various product characteristics has not substantially improved results.

To achieve our goal of understanding why some products succeed and others fail, to develop a set of tools that enables us, as executives, investors and entrepreneurs, to better identify the projects that are likely to succeed - we need to look elsewhere.

Surprisingly, we are going to start with the story of Abraham Wald and how a statistician saved thousands of lives.

Wald was born at the turn of the last century in what was then the Austro-Hungarian Empire. Like many, he migrated to the United States before World War II where he became a Statistics Professor at Columbia University in New York. As the War unfolded, he was recruited to work for the Statistical Research Group (SRG), a collection of mathematicians tasked with aiding the war effort doing calculations on things like how to disperse bomber aircraft in order to maximise the probability of both hitting a target and the damage done or the optimal path a fighter airplane should take in pursuit of an enemy aircraft. Not really a place you'd expect to find someone who saved thousands of lives.

But just as statistics and bomber losses during World War II are probably not typical topics for most readers, Wald was not your typical mathematician.

Part of the Allied strategy was to try and destroy the Nazi's industrial capacity. To destroy the factories that made the tanks and airplanes their army and air force relied upon. To hit these targets with any degree of accuracy required the bombing raids be conducted during the day. This had horrific consequences on the Allied bombers and crews. Without any fighter escort, it was common for 1 in 4 planes to be shot down on each mission and for 50% of bombers that did make it back to be severely damaged, often landing with multiple wounded or dead crew members.

Contemplate just for a moment going to work each day with a 1 in 4 chance that you and your team weren't going to make it home, knowing that if you did make it home one of your colleagues was none the less going to be killed or wounded, and even if you did make it home today it was a virtual certainty that you wouldn't make it to Friday. Losses were so bad in the early days of American involvement that raids over Germany were even put on hold for a period. Here is where Wald went to work. How could these losses be reduced?

As part of this project, Wald was given a report produced by researchers from the Centre for Naval Analysis. The report outlined their study of aircraft that had safely returned from missions. These were the successes and like our literature on innovation it was an understandable place for the researchers to focus. Even more so, when you consider that the successful aircraft were all they had to go

on. No one could see the planes that were shot down. The Nazi's weren't going to cooperate and allow access to the wreckage. Even if you could get to the downed aircraft, being shot down generally resulted in a catastrophic impact with the ground, which would obscure much of what might be learned.

So the team of experts analysed where the returning planes had suffered the most damage. The recommendation from the navy team of pilots, aircraft engineers, and analysts was to place additional armour on the areas showing the largest number of hits. This recommendation was based on two underlying assumptions, the returning planes were representative of where all bombers were hit and those areas of the plane that took the most damage needed the most protection.

Wald, however, disagreed. He recognized that the answer didn't lie with the successes. He could see the planes that made it back often looked like Swiss cheese, often missing shockingly large chunks of wing, tail or fuselage. What he could not see was what brought the planes down and he refused to accept that some areas of a plane simply got hit more or less than others. Bullet holes were everywhere and with only a few exceptions, largely proportional to the exposed area of the plane.

So he challenged the 'experts'. Instead, he looked at where the returning planes had the fewest hits. He hypothesized that if so many planes could make it back with holes in the same places, no armour was needed there. Where it was needed is where planes that didn't come back had holes.

He recognized that the data and observations that had been amassed were incomplete. They were missing data from the huge number of planes that didn't return. He questioned the fundamental assumptions of the experts and their conclusions. Ultimately he was proven right. His recommendation to add armour where returning planes had the least amount of damage was adopted and proved highly effective.¹³ The answer was in what couldn't be seen and in questioning accepted wisdom. The result, Wald saved thousands of lives. To this day his work is considered seminal in the fledgling field of operational research and applied statistics.

Our goal might not be to save lives, but the key lessons are the same. We need to look beyond the successes. We need to challenge the assumption that their characteristics alone can reveal why they succeeded.

The List of Shared Characteristics Prompts Bigger Questions

With Wald in mind, a quick look at the characteristics shared by these super successful products makes it clear that, just like the Naval teams incomplete sample of planes, we aren't looking at a complete picture or all the data. The characteristics shared by all of the products and technologies in our list, rather than just some, are characteristics also shared by a vast array of other successful things from scientific theories and medical treatments to fashion and

¹³ For example, add it to locations that would stop both pilots from being killed by a single burst of enemy fire and around the engines to ensure the planes could fly home.

management fads, sporting methods (the Fosbury flop in high jumping, the move away from underhanded free throws in basketball, Sabremetrics in baseball), political movements, cultural norms, and even the rationalizations that underpin asset market bubbles. Not only does this approach fail to consider data from the failures, the narrow focus on relatively modern commercial products fails to consider data from all of the relevant successes.

Even if we only consider the narrow list of modern commercial examples, the products included are so diverse and contain such dissimilar things that any comparison of tangible characteristics would seem impossible. While we might develop a seemingly logical and defensible explanation for the success of the iPod and how consumers were making a rational choice in adopting it based on features and value, how can we compare that to the characteristics of Facebook, Pinterest or Candy Crush that prompted their adoption or the entirely irrational purchase of pet rocks - let alone the adoption of foot binding, Phrenology, Freudian psychology, the Third Wave¹⁴, or any number of tech start-ups? The tremendous variation amongst the successes leads to two unavoidable conclusion; (1) disruption and widespread adoption cannot be attributed solely to technological change or even characteristics of a product and (2) it is a common phenomenon in nearly every arena of human activity.

¹⁴ <http://www.thewavehome.com/faq.htm> also see the book *Hassling* by Sylvia Williams or the book and film *The Wave* by Todd Strasser directed by Alex Grasshoff <http://www.imdb.com/title/tt0083316/>.

Further, a comparison of readily observable characteristics does not explain both the wild success of some products (like the iPod) and the simultaneous failure of others (such as more feature rich less expensive mP3 players). Such a comparison does not shed light on how Kodak could both rationally invent but then irrationally reject the opportunity for digital photography or how companies like Blockbuster and IBM could be offered the chance to buy Netflix or Microsoft at multiple stages and yet fail to recognize the opportunity they represented.

A review of shared characteristics simply cannot explain our rational and irrational choices as individuals, groups, or on a societal scale. Like Abraham Wald's bombers, the solution lies in what we can't see. In the case of new products and innovation, light must be cast on the assumptions underpinning all new products. Given the countless experiments that continue to generate results radically different from what is expected, assumptions and beliefs that we must conclude are flawed.

PART 2: HOW WE THINK WE THINK. EXISTING THEORIES AND MORE

PROBLEMS!

What can explain both our rational nature, for which there is prolific evidence, and at the same time the widespread irrational choices of individuals, groups and whole societies? What can explain the resistance to new products, methods, and technologies within organizations such as Kodak as well as their rapid adoption by whole external consumer populations?

Here is where our questions about suicidal Vikings, the barbaric practice of foot binding, and paying absurd amounts for companies that have yet to generate revenue let alone profits come into play. Rather than looking solely at characteristics of the successful product or idea, the answer is found in an examination of the other side of this multivariable equation. From scientific theories and new memes to new products, all succeed within the shared medium of a human population. Rather than looking at the product, we must examine how individuals, groups and whole societies make decisions and thus interact with these new ideas, products and technologies.

Cognitive Biases

A large segment of the academic community currently tries to explain the seemingly irreconcilable aspects of our behaviour, our rational and irrational choices, in three ways. First, they propose a growing list of what are called

cognitive biases.¹⁵ The idea of a cognitive bias has two elements. First, it presumes that we have a core or primary rational decision system. Second, it proposes this otherwise rational system is biased away from a logical choice by the presence of certain characteristics.

One of my favourite biases is the “Ikea effect.” In short, repeated experiments have shown that people value things they successfully build or make more than exactly the same thing in a pre-assembled form.¹⁶ In fact, people will over value their construction even when it is somewhat shoddy by comparison to a preassembled version. We know this because clever researchers like Dan Ariely, Michael Norton, and Daniel Mochon (professors at Duke, Harvard, and UC San Diego universities respectively) have had large randomly selected groups of people build standard Ikea ‘Kassett’ boxes, create items out of Lego, or create Origami birds then offer them the chance to bid on and purchase their creations. In each case another group of randomly selected individuals would bid on preassembled but otherwise identical versions of the same products or creations. In each case the average bid of builders was higher than the average bid of the non-builders.

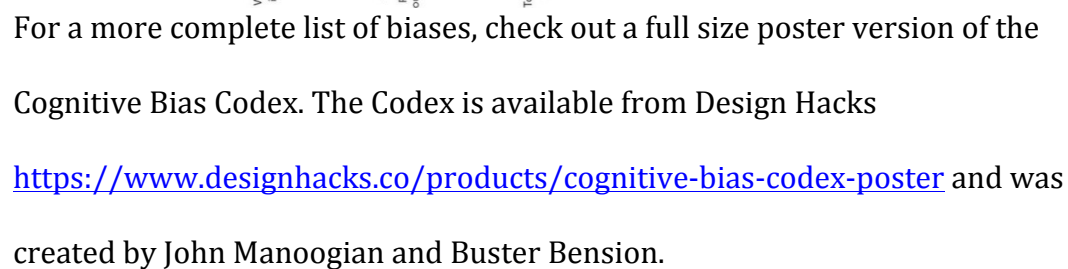
In addition to the Ikea effect, this kind of experimentation has demonstrated a growing list of “on average” biases including things like the Anchoring bias, an

¹⁵ The definition of cognitive bias is a tendency “to think in certain ways that can lead to systematic deviations from a standard of rationality or good judgment.”

¹⁶ Norton, Michael I., Daniel Mochon and Dan Ariely. The “IKEA Effect”: When Labor Leads to Love. *Journal of Consumer Psychology* Volume 22, Issue 3, July 2012, Pages 453–460

over reliance on the first observation or first piece of information presented, Confirmation bias, a tendency to only listen to or accept information that confirms a pre-existing idea or perception, the Bandwagon effect, Clustering illusion, Recency bias, and more. To date there are somewhere between 150 and 250 of these labelled and generally accepted biases.¹⁷ All, however, simply represent a growing list of exceptions to the accepted idea that we are otherwise rational.

¹⁷ Baron, J. (2007). *Thinking and deciding* (4th ed.). New York City: Cambridge University Press. [ISBN 9781139466028](#)



While there is substantial evidence supporting some of these biases, many others are scientifically suspect. More problematic from our perspective of explaining both rational and irrational choice are the ever-growing size of the list and the continued use of “on average” results to draw conclusions about a biases existence.

Even when we consider only those biases for which there appears to be solid evidence, the increasing number of exceptions to the underlying foundation that we are otherwise rational points strongly to both a flaw in that foundation and in the idea that fixed biases are the explanation for all instances of irrational behaviour or choice. Just as we would doubt the theory of gravity if an ever increasing number of circumstances were observed in which chairs or people started floating up off the floor, so to we must question the accepted notion of a single rational decision making system. At a minimum we must question that “being rational” means pursuing economic self interest and self preservation. Realistically, we must question both.

The conclusion that these biases exist is also based on the “average” values or choices of experiment participants. In each case, however, there are groups whose values are above and below this average. Generally speaking, 30% of individuals won’t manifest the bias in question. This in no way detracts from the conclusion that the bias will appear in the behaviour of an average population but at the same time it proves, whatever the cause, their impact on individuals can be radically variable and a substantial number of people are not affected at all.

Further, for those biases with more certain evidentiary support, work conducted thus far has failed to identify any effective methods by which people can overcome these biases. According to one recent study, of four strategies for overcoming biases tested, only one delivered even a moderate improvement. Methods that had limited or no effect included offering warnings about the possibility of a bias, providing details of the likely direction and specific nature of a bias commonly seen influencing a decision, and providing actual feedback on the biased nature of a decision or choice. Even “offering an extended program of training with feedback, coaching, and other interventions designed to improve judgment” yielded only moderate results.¹⁸ Our apparent inability to incorporate knowledge of these biases or alter our decisions suggests that some of our core assumptions or hypothesis underpinning our rationality, the functioning of the brain, and the existence and functioning of these ‘biases’ must be flawed.

A Herding Instinct

“If a picture is worth a thousand words, a metaphor is worth a thousand pictures.”

– Daniel Pink

¹⁸ Bazerman, M.H., Chugh, D., & Milkman, K.L. (2008) How can decision making be improved? Working paper.

Bazerman, M.H. & Moore, D. (2008) Judgement in Managerial Decision Making (7th ed). Hoboken, NJ: John Wiley & Sons, Inc.

Fischhoff, B. (1982). Debiasing. In D. Kahneman, P. Slovic, & A. Tversky (Eds.), Judgement Under Uncertainty: Heuristics and Biases. Cambridge: Cambridge University Press: 422 – 444.

The second popular explanation for both many irrational group behaviours and the widespread rapid adoption of new things is the notion of herding. Often cited as an example are the odd events of the morning of the 27th of March 1913 in Columbus Ohio.¹⁹ As James Thurber the American storyteller wrote:

"...as I recall it, about noon.... High Street, the main canyon of trade, was loud with the placid hum of business and the buzzing of placid businessmen arguing, computing, wheedling, offering, refusing, compromising...Suddenly somebody began to run. It may be that he had simply remembered... an engagement to meet his wife, for which he was now frightfully late. Whatever it was, he ran east on Broad Street (probably toward the Maramor Restaurant, a favorite place for a man to meet his wife).

Some body else began to run, perhaps a newsboy in high spirits. Another man, a portly gentleman of affairs, broke into a trot. Inside of ten minutes, everybody on High Street, from the Union Depot to the Courthouse was running.

A loud mumble gradually crystallized into the dread word 'dam'. The dam has broke!' The fear was put into words by a little old lady in an electric [car], or by a traffic cop, or by a small boy: nobody knows who, nor does it now really matter. Two thousand people were abruptly in full flight. 'Go

¹⁹ <http://www.dispatch.com/content/stories/local/2012/03/27/the-dam-didnt-break-but-it-made-a-good-story.html>

east!' was the cry that arose - east away from the river, east to safety. 'Go east! Go east! Go east!'

A tall spare woman with grim eyes and a determined chin ran past me down the middle of the street. I was still uncertain as to what was the matter in spite of all the shouting. I drew up alongside the woman with some effort, for although she was in her late fifties, she had a beautiful easy running form and seemed to be in excellent condition. "What is it?" I puffed. She gave me a quick glance and then looked ahead again, stepping up her pace a trifle. "Don't ask me, ask God!" she said."

According to the Ohio State Journal, a paper published at the time, and The Columbus Dispatch, which retold the story as part of the cities bicentennial, it's true. The story is noteworthy both for its mention of an electric car in 1913 and because it is an excellent example of why many researchers propose herding as an explanation for irrational group behaviour.

Other evidence cited in support of a herding instinct in humans includes one of my personal favourite pieces of social psychology research. Originally conducted by Stanley Milgram, famous for his obedience experiments involving men in white lab coats instructing subjects to administer electric shocks despite the screams of protest from the recipients, Milgram had a group of his colleagues stand on a public sidewalk and stare up roughly in the same direction at an

empty window.²⁰ Milgram would then count how many passers by would look up as they passed and how many would stop and look up.

Despite often being cited as evidence of a human herd instinct or an inclination to do what others do, Milgram's research actually showed that while most passers by (86%) did glance up, only a very small number of passers by – just 4% - would stop to see what the fuss was about. This percentage would increase if Milgram amassed more colleagues to stand falsely transfixed and looking up.²¹ But even with 15 actors staring into space, less than half (40%) of passers by would stop.

Despite the lack of hard evidence about herding and despite more recent research showing that in fact people and many primates pay close attention to where others are looking and what they are doing but don't copy or mimic behaviour unless it is observed to deliver a benefit,²² innumerable peer reviewed papers have been published concluding our herding instinct and 'mirror neurons' are responsible for all manner of behaviours.²³ It is claimed that we

²⁰ Milgram, S. *Obedience to Authority: An Experimental View*. Harper and Row, New York, (1974).

²¹ Milgram, Stanley; Bickman, Leonard; Berkowitz, Lawrence. "Note on the drawing power of crowds of different size." *Journal of Personality and Social Psychology*, Vol 13(2), Oct 1969, 79-82. <http://dx.doi.org/10.1037/h0028070>

²² Gallup, Hale, Sumpter, Garnier, Kacelnik, Krebs & Couzin. 2012. Visual attention and the acquisition of information in human crowds. *PNAS* <http://dx.doi.org/10.1073/pnas.1116141109>

²³ Lindstrom, Martin. *Buy-ology: How everything we believe about why we buy is wrong*. Random House Business Books, London. 2008.

Kameda, Tatsuya., Keigo Inukai, Thomas Wisdom, and Wataru Toyokawa. "The Concept of Herd Behaviour: Its Psychological and Neural Underpinnings"
DOI:10.1093/acprof:oso/9780198723202.003.0002

will copy nearly any behaviours or choice for no other reason than being aware that someone else has already taken the action. Economists and share market researchers are particularly fond of herding as an explanation for market trends and bubbles.²⁴

There are, however, several problems with the herding metaphor when applied to humans. First, while it is a powerful image that appears to describe rare occurrences such as Thurber's story of people running down the street, no one has been able to replicate herd responses or identify what exactly might trigger such a response in humans. For every instance where the description would appear appropriate, there are hundreds of events with virtually identical characteristics that have not triggered a herd response. Further, applying the herding metaphor to the broad range of human behaviours to which it is widely ascribed – everything from adopting Twitter to buying an iPhone or stocks and shares – reveals a misunderstanding of the nature of herding, flocking, and schooling instincts in all other animals who manifest such a trait.

Animals do not in fact have an instinct to “herd.” Seeing others move does not trigger collective movement. Herding is what is known as an “emergent phenomena.” Contrary to popular perception, herding and herd movement is a by-product of a collection of distinct instincts or traits. These instincts motivate

²⁴ Prechter, Robert R. Jr. “Unconscious Herding Behaviour as the Psychological Basis of Financial Market Trends and Patterns” *The Journal of Psychology and Financial Markets* 2001, Vol. 2, No. 3, 120–125

Raafat, Ramsey M., Nick Chater and Chris Frith. “Herding in humans”. *Trends in Cognitive Sciences* 2009, Vol.13 No.10 doi:10.1016/j.tics.2009.08.002

individuals to move to a position ‘within’ a group, to respond to the warning behaviours of neighbours (one of which is running) and to move away from potential threats.²⁵ Collectively, these three discrete instincts produce the group behaviour we label as herding. So to accept herding as the explanation for group behaviour in humans would require that we also accept it evolved and occurs for entirely different reasons than it has for every other animal that appears to manifest this emergent behaviour pattern.²⁶

Importantly, humans and most animals do not simply do something because they see others do it. As humans, we may pay special attention to certain behaviours but we don’t unthinkingly buy shares or sneakers simply because others have. As Iain Couzin, the lead researcher of a 2012 study, put it:

“There is not nearly as strong copying behaviour as people previously thought based on the inherently limited Milgram data. We demonstrate that those data have been misinterpreted.” The tendency to look where someone else is looking may “serve an adaptive

²⁵ King et al.: “Selfish-herd behaviour of sheep under threat.” Publishing in the *Current Biology* - July 24, 2012

²⁶ There are examples of convergent evolution, creatures that have evolved virtually identical physical traits despite no heritable link. These, however, only occur where similar selection pressures and physical forces can be observed on the creatures. This is not the case for humans and herd animals. It is also possible that different instinctual behaviour combinations in two different species could generate similar emergent phenomena. There is, however, no collection of behavioral traits that can be identified in humans that combine to provide a causal connection to the diversity of human behaviors to which the term herding is applied.

function” in terms of directing people to important information, but “it is not so strong that individuals get drawn into blindly copying.”²⁷

Thinking Fast and Slow

Finally, Nobel laureate Daniel Kahneman and others have proposed and built a substantial case that humans rely on two decision systems; one fast and one slow.²⁸

The fast decision system is comprised of a collection of habits, learned shortcuts or ‘stored procedures’ called heuristics. This fast system is our brain operating on autopilot in the name of efficiency and speed. The slow system is our conscious decision making ability.

Many will have had the experience of arriving home after a hard day to the odd and somewhat disconcerting realization that you can’t recall much of the journey from your office. In effect, you’ve done it so many times your brain has stored a pattern that it runs to complete the task without conscious engagement - freeing your brain to consider other things or simply conserve energy.

²⁷ Gallup, Hale, Sumpter, Garnier, Kacelnik, Krebs & Couzin. 2012. Visual attention and the acquisition of information in human crowds. PNAS <http://dx.doi.org/10.1073/pnas.1116141109>
<http://blogs.discovermagazine.com/notrocketscience/2012/04/23/what-are-you-looking-at-people-follow-each-others-gazes-but-without-a-tipping-point/#.WBA3UuF94xc>

²⁸ Kahneman, Daniel. Thinking, Fast and Slow. Published by Farrar, Straus and Giroux, New York, Now York. 2011.

Choices pushed into our conscious brain take longer to make – a problem you don't want to have if confronted by a threatening group of lions or strangers. They also consume substantially more energy. According to Kahneman and others, irrational decisions are explained by attributing them to our autopilot fast system and its misapplication of some stored habit or its failure to consider some important information outside the normal pattern of stimuli that prompted the patterned response.

Too Many Exceptions

Even when we consider all three explanations together, however, there are too many exceptions for any one, or all three combined, to be accepted as the explanation for the peculiarities of human behaviour and choice. While some cognitive biases are well supported by experimental evidence, many are not. Herding is neither predictable nor well supported by evidence. In both cases, these ideas are often little more than convenient explanations applied after the fact rather than demonstrable causal relationships. The inappropriate application of a habitual fast decision system can explain some poor decisions. But it can not explain irrational decisions made by large, well informed groups, who have deliberated for months including corporate executives, NASA engineers, investment fund managers, or any number of government agencies. Neither can any, or all three combined, explain the fundamentally irrational but premeditated choices of individuals such as those who volunteer for military service in time of war, a fireman running into a burning building, base jumpers,

the 9-11 attackers, or the Magdarama (people who are willingly crucified each year in the Philippines).

Kahneman's fast and slow decision systems, or System 1 and System 2 according to K. Stanovich and R. West, while of unquestioned importance, also leave unexplained a clear third form of decision-making; scenarios where a slow conscious decision is made but to consciously go with one's "gut." These include conscious choices made with awareness of insufficient information and uncertainty as well as situations where we choose to override a logical, rational, assessment simply because it doesn't "feel right." Sometimes these gut decisions are good and sometimes they are bad. They are often irrational. But they are neither the product of biases on an otherwise rational decision system nor of a habit or fast decision system overriding a slow conscious one.

True But Wrong – A barrier to overcoming barriers

"Don't get involved in partial problems, but always take flight to where there is a free view over the whole single great problem, even if this view is still not a clear one." –Ludwig Wittgenstein

Given all of the evidence supporting both biases and the existence of a fast and slow decision system, how can these realities be both true but wrong? How can two mutually contradictory theories, like neoclassical economics and behavioural economics, both be right? How can Clayton Christensen's theory of

Disruptive Innovation, theories like the Efficient Market Hypotheses and the Law of Supply and Demand, and Gladwell's Tipping Point be both true and incorrect?

Many will be familiar with the parable of the six blind men and the elephant or J.

Godfrey Saxe's poetic adaption:

*It was six men of Indostan, to learning much inclined,
who went to see the elephant (Though all of them were blind),
that each by observation, might satisfy his mind.*

*The first approached the elephant, and, happening to fall,
against his broad and sturdy side, at once began to bawl:
'God bless me! but the elephant, is nothing but a wall!'*

*The second feeling of the tusk, cried: 'Ho! what have we here,
so very round and smooth and sharp? To me tis mighty clear,
this wonder of an elephant, is very like a spear!'*

*The third approached the animal, and, happening to take,
the squirming trunk within his hands, 'I see,' quoth he,
the elephant is very like a snake!'*

*The fourth reached out his eager hand, and felt about the knee:
'What most this wondrous beast is like, is mighty plain,' quoth he;
'Tis clear enough the elephant is very like a tree.'*

*The fifth, who chanced to touch the ear, Said; 'E'en the blindest man
can tell what this resembles most; Deny the fact who can,
This marvel of an elephant, is very like a fan!'*

*The sixth no sooner had begun, about the beast to grope,
than, seizing on the swinging tail, that fell within his scope,
'I see,' quoth he, 'the elephant is very like a rope!'*

*And so these men of Indostan, disputed loud and long,
each in his own opinion, exceeding stiff and strong,
Though each was partly in the right, and all were in the wrong!*

*So, oft in theologic wars, the disputants, I ween,
tread on in utter ignorance, of what each other mean,
and prate about the elephant, not one of them has seen!*

This parable aptly describes the current state of much of the debate about human decision-making, innovation methods, disruption theory, and the seemingly perpetual occurrence of virtually identical debates in business every time a new management fad is introduced and across disciplines from palaeontology to linguistics. Seemingly contradictory theories, often where each is able to disprove the other, each able to predict events in some situations but not others, each correct, but also incomplete. Invariably each will foster constituents to take sides, form groups and compete for status despite the reality that both theories are at worst wrong and at best incomplete.

This is common in arenas where we see an ever-increasing degree of specialization due, at least in part, to status being conferred to those who are demonstrably correct or have an ability to predict and drive outcomes. Such specialization has yielded fantastic insights, efficiency and periodic competitive advantage. But in almost all cases it has come at the price of narrowed perspectives and increasingly rigid paradigms. These have distracted us, if not blinded us, to appreciating the nature of the beast as a whole. Our study and understanding of innovation, product development, even business and economics as disciplines, are all simply the study of human decision-making artificially narrowed to a specific arena. In the case of successful or disruptive innovation, it is the influence of our universal decision making processes that give rise both to the conditions that leave a company vulnerable to disruption

and which produce the rapid and wide spread adoption of successful innovations.

As A.C.Doyle's Sherlock Holmes said, "...when you have eliminated the impossible, whatever remains, however improbable, must be the truth." In this case, the existing explanations for human decision-making must either be incomplete or flat wrong. The truth is there must be another explanation.

Three Accepted Truths about Decision Making & Human Nature

“The surest way to corrupt a youth is to instruct him to hold in higher esteem those who think alike than those who think differently.” - Friedrich Nietzsche

To move beyond the current explanation, the paradigm of a “sometimes rational” decision process thrown off by bias, a blind need to herd, or unthinking fast habits, we must look deeper. These existing theories as well as nearly every decision we make, and every decision made by the world’s business leaders, investment managers, lawmakers, government officials, and innovators are all underpinned by a series of “accepted truths.” These truths include the ideas that (1) we are fundamentally rational in pursuit of self-interest and self-preservation, (2) that all of our brains are constructed and function in roughly the same way and (3) that decision-making is an internal and individual process. It is these accepted truths, the very foundations for our understanding of human decision making, that must be questioned.

We Are Rational

First, we accept that, like ourselves, the majority of those around us are rational. We don’t withdraw money from the bank to cast it in the wind walking down the street. We don’t pay more for a VW Bug than we would for a high end Mercedes Benz. And, we don’t generally put our lives on the line or play Russian roulette.

This belief in our own reasonableness is mirrored in both our subconscious and conscious predictions of the behaviour of others. Just as we prioritize family, wellbeing and monetary security or gain, we universally accept that others prioritize these things as well. We accept without thinking that their behaviour will be predictably similar to our own. Setting aside the occasional silliness, the random nut job, or our one and only eccentric friend, we make our decisions based on an accepted belief that others will act rationally just as we do.

Even for those familiar with the evidence from behavioural economics supporting a number of more reliable biases on rational decision-making, as discussed earlier our awareness of these exceptions and even our efforts to overcome these biases almost never influence our actual choices or our prediction regarding the behaviour of others.

We are the same and our brains work the same

Second, for everyone to behave and make choices like we do, we also accept the idea that everyone's brains are constructed and basically function the same.

More specifically, we believe our decision-making processes and the machinations of our brains that produce decisions are the same for all people.

We, of course, know that people are different, different heights, different cultures, different in a host of ways. But when we make a decision, we accept without consideration that other people are the same as us when it comes to how their brains function. If mathematical analysis is required for decisions

involving money, we will use our mathematical ability for all such decisions and so will others. We universally accept that we use our whole brain for each decision we make, or at least all of the relevant capabilities, and that we do so in the same way each time we face a similar situation. The information used, the experiences drawn upon, and the complexity of thinking may be different, but the fundamental mechanisms of decision-making are not.

Decision making is purely individual

Finally, we universally consider decision-making an individual and personal process. It is something we do in the isolation of our own heads. We may seek and consider the opinions of others. We may try and build consensus or be swayed by another's comments. We might believe that subliminal messaging can influence our thinking. But we never question the idea that we control our decision-making or that it is something that occurs entirely within us – every decision the product of an individual mind.

The Evidence Shows Otherwise

As it turns out, these accepted truths are entirely wrong. We are not rational in the way most people think. The evidence shows money, rational self-interest and even self-preservation are not the only or even the most powerful drivers of our behaviour and choices. Status and novelty, frequently with no economic value, are regularly more motivational than money. Every year people around the

world donate billions of dollars to charity (\$300 billion in United States alone), a substantial proportion of this is donated anonymously, people around the globe behave altruistically in economic experiments, they risk their lives for others, and they take their own lives all with no possibility of benefit. Simply put, the evidence is overwhelming – we are not rational in the way most people think.

The evidence also shows that not only are we not all the same in how our brains make decisions, as individuals the components of our brain involved in decision-making can be different even between two very similar decisions. And, despite the fact that decision-making is something that occurs within the physical structure of our own brain, it is almost universally the product of a group or social dynamic.

The consequences of these misunderstandings, from failed economic policies to failed new products and massive investment losses every time a market bubble burst, have been costly to say the least. Despite having been developed by unquestionably rational engineers for rational people just like you and me, more than 90% of new products fail. Survival rates for start up businesses and the success of internal change programs in organizations large and small are equally poor. In most large organizations, it is simply accepted that there will be irrational resistance to change. And it's not just at work. The safety of our children is affected by the seemingly irrational choices made by other adolescents, parents and even the occasional school administrator. The irrational behaviour of extremist groups around the world threatens the peace. The irrational behaviour of elected officials generates ineffective policy and huge

amounts of government waste. Understanding how and why people behave the way they do is of fundamental importance not only for innovation but also for decisions made on a daily basis across every profession.

PART 3: A NEW DESCRIPTION OF HUMAN DECISION MAKING, CHOICE AND BEHAVIOUR

It is not the strongest of the species that survives, nor the most intelligent that survives. It is the one that is the most adaptable to change.

—**Charles Darwin**

All our knowledge has its origins in our perceptions.

—**Leonardo Da Vinci**

A multitude of modules battling it out

So how do our brains work?

First up, our decisions are not the product of a single cohesive system, or even biases on an otherwise rational set of fast and slow systems. Instead, decision-making is the product of a host of discrete interacting neural structures or modules almost battling it out for influence and control. In addition to our slow conscious reasoning ability and the fast heuristic or habit based decision systems documented by Kahneman and others, we have both a host of distinct neural circuits or modules and a substantial volume of neural mass that is entirely experience-dependent and interconnected in a way unique to each individual.²⁹

²⁹ Medina, John. Brain Rules. Scribe Publications, Brunswick, Victoria. Australia. 2011

The shared neural modules are inherited genetic traits. Except for those born with prosopagnosia, a rare condition commonly referred to as “face blindness”, we are all born with a facial recognition circuit. Like facial recognition, these modules enable specific capabilities such as relative comparison or they motivate us to pursue outcomes. In the same way that we seek to satisfy hunger or pursue opportunities to fornicate, these modules also motivate us to pursue seemingly abstract outcomes such as **belonging**³⁰, **status**³¹, **novelty**³², and **mastery**.³³ While these appear to be abstract, each of these drive trait circuits is simply a function of the relative comparison of one individual to another or a set of characteristics for something newly observed compared to those associated with something similar previously stored.

³⁰ Lieberman, Matthew D. *Social: Why Our Brains are Wired to Connect*, Oxford University Press, Oxford. 2013.

³¹ van den Bos et al., “Pyrrhic victories: the need for social status drives costly competitive behaviour” *Frontiers in Neuroscience* 23 October 2013 doi: 10.3389/fnins.2013.00189

Lawrence & Nohria, *Driven*, Jossey-Bass A Wiley Company, San Francisco. 2002.

Aronson, Elliot. *The Social Animal*, 7th Edition. W.H. Freeman and Company New York. 1972, 1995.

Berger, Jonah. *Contagious: Why things Catch On*. Simon and Schuster. London, Great Britain. 2013 (Note discussion of Social Currency)

Nelissen, Rob M.A. and Marijn H.C. Meijers, “Social benefits of luxury brands as costly signals of wealth and status” in *Evolution and Human Behaviour*, Volume 32, Issue 5, September 2011, Pages 343–355 (Note status is judged in first seconds of meeting).

³² Benjamin, Jonathan, et al. “Population and familial association between the D4 dopamine receptor gene and measures of Novelty Seeking”, *Nature Genetics* volume 12. January 1996. Pg 81-84.

Ebstein, RP, et al. Additional evidence for an association between the dopamine D4 receptor (D4DR) exon III repeat polymorphism and the human personality trait of Novelty Seeking. *Molecular Psychiatry* (1997) 2, 472-477.

Berlyne, D.E. *Aesthetics and Psychobiology*. Appleton Century Croft. New York. 1971.

Being Humans: Anthropological Universality and Particularity in transdisciplinary perspectives. Edited by Neil Roughley. Walter de Gruyter GmbH & Co. Berlin. ISBN 3-11-016974-6.

³³ Pink, Daniel, *Drive*, Riverhead Books Penguin Group New York. 2009

Critically, unless we have specifically trained ourselves not to do so, these modules compete for influence whenever they are stimulated and will influence a decision irrespective of any logical or rational connection to the situation.³⁴

Anything and everything active at a point in time has an influence

As an interconnected web of electrochemical circuits, any connected and activated module will or may influence a decision process even if it is irrelevant to a logical conscious analysis. As a result, the modules or circuits that participate in any given decision can change even between two virtually identical events simply because different modules were active, for whatever reason, at the time a decision is made.

Emotions like sadness, the bolstering presence of friends, or a recent competitive victory in anything from chess, tennis or boxing to the competition for a promotion or commissions at work, will influence or alter how we behave and the choices we make. Whether the emotion coincides with a chemical release or

³⁴ Lerner, Jennifer S., Deborah A. Small, and George Loewenstein. "Heart strings and purse strings carryover effects of emotions on economic decisions." *Psychological science* 15.5 (2004): 337-341.

Salvador, Alicia, et al. "Testosterone and cortisol responses to competitive fighting in human males: A pilot study." *Aggressive Behavior* 13.1 (1987): 9-13.

Mazur, Allan et al. "Testosterone and Chess Competition." *Social Psychology Quarterly*, vol. 55, no. 1, 1992, pp. 70-77. www.jstor.org/stable/2786687.

Bernhardt, Paul C., et al. "Testosterone changes during vicarious experiences of winning and losing among fans at sporting events." *Physiology & Behavior* 65.1 (1998): 59-62.

Kivlighan, Katie T., Douglas A. Granger, and Alan Booth. "Gender differences in testosterone and cortisol response to competition." *Psychoneuroendocrinology* 30.1 (2005): 58-71.

not, these influences subconsciously impact our choices even in entirely unrelated arenas.

A great example of this is the impact of sports teams on share markets. When a person's favourite team wins or loses, something that has nothing to do with share values, it none the less has a measurable impact on trading behaviour, investor confidence, and share market prices.

According to a Goldman Sachs report released in 2014, "Looking at history, there is a clear pattern of outperformance by the winning team in the weeks after the World Cup final. On average, [the national share index in the victor's country] outperforms the global market by 3.5% in the first month [following the match] – a meaningful amount."³⁵ And its not just national teams and major events such as the World Cup. According to research led by Chris Veld at Monash University in Melbourne Australia "When they [investors] feel happy [because their chosen sports team is on a winning streak] they buy more stock. They are also more likely to buy than they are to sell."³⁶

Other research shows, it is not just the involvement of emotional circuits. In his 2011 article "The Science of Why We Don't Believe Science" Chris Mooney

³⁵ <http://www.goldmansachs.com/our-thinking/archive/world-cup-and-economics-2014-folder/world-cup-economics-report.pdf> <http://www.irishtimes.com/business/personal-finance/world-cup-has-striking-effect-on-activity-in-financial-markets-1.1842489>

³⁶ Kaplanski, Guy and Levy, Haim and Veld, Chris and Veld-Merkoulova, Yulia V., "Do Happy People Make Optimistic Investors?" (February 13, 2015). Journal of Financial and Quantitative Analysis (JFQA), Volume 50, (2015), 145-168.

Also see <http://www.irishtimes.com/business/personal-finance/world-cup-has-striking-effect-on-activity-in-financial-markets-1.1842489>

writes, “We push threatening information away; we pull friendly information close. We apply fight-or-flight [circuits] not only to predators, but to data itself.” The result, not only do various people use different modules to make contextually very similar decisions or choices, as individuals we will tackle very similar choices or decisions at different times using different modules depending on what is active at the time or what neural circuits are activated by the specifics of a situation.

Decision making is the product of a group dynamic

Finally, the evidence shows our decision processes are almost universally the result of a social dynamic.

A powerful example of this is the story of Hiroo Onoda. On the 9th of March 1974, roughly 30 years after World War II ended, Major Yoshimi Taniguchi of the Japanese Fourteenth Area Army, who had decades earlier become a bookseller, issued an official order on behalf of the Japanese Government to Second Lieutenant Hiroo Onoda to “cease military activities”. For 30 years, Onoda had continued to raid local farms in the Lubang area of the Philippines, burning crops, and even killing civilians. When a Japanese tourist found him in the mountains, Onoda refused to surrender until ordered to do so. In response, the Japanese government found his former commander and flew him to Lubang to give the order.

As surprising as one hold out might be, Onoda was not alone. There were many others. Shoichi Yokoi held out for 28 years in Guam. Dozens of others held out for 5 to 15 years. In many cases these hold outs were in small groups. Onoda was part of a group of four for the first four years. While cultural norms played a role, nearly all spent years living in isolation despite either knowing the war was over or having substantial reason to believe the war had ended. Each continued to live and make decisions based on their perception of what others might think of their choices. In this case, what others would think of their decision to surrender.

These examples highlight a critical side effect of our drive to be part of one or more groups, to not be ostracised, and to compete for status within those groups. These men were not crazy. Their decisions were not poorly informed. Instead they were based on their perception of what others would think of them and specifically the perceived impact of a choice on their status within the groups that defined their self-identity.

Repeated experiments have shown that much if not most or even all of our decision-making is the product of such a social dynamic. For example, informing people how much energy their neighbours use influences their energy consumption.³⁷ The best method of predicting the behaviour and response of any individual is the behaviour and response of members of their social groups faced with the same situation.

³⁷ <https://blog.opower.com/2013/06/want-to-predict-human-behavior-use-these-6-lessons-based-on-data-from-10-million-households/>

In 2006 Matt Salganik, a Princeton University sociologist, conducted research using 14,000 participants who were divided into several groups and provided access to a music download web site. Most of the groups listened to, rated and downloaded songs they liked and were able to see what songs others rated or downloaded. But one group was entirely comprised of individuals with no exposure to the choices or ratings of others. In theory, if people truly picked music based on their personal preferences, the most downloaded pieces would be comparable both in the groups where participants had no information on what others liked and in the groups where information was shared. Instead the researchers found tremendous variation across all groups. Which songs were rated highly often appeared to be dependent on who the first participant to rate a song in the group happened to be and what they rated.³⁸

Matthew D. Lieberman describes in his must read book Social: Why our brains are wired to connect a series of experiments including one conducted by Keise Izuma:

"Keise Izuma conducted a study in Japan in which participants in the [fMRI] scanner saw that strangers had characterized them as sincere or dependable. Having someone we have never met and have no expectation of meeting provide us with tepid praise doesn't seem like it would be rewarding. And yet it reliably activated the subjects' reward systems.

³⁸ Salganik, Matthew J., Peter Sheridan Dodds, and Duncan J. Watts. "Experimental study of inequality and unpredictability in an artificial cultural market." *science* 311.5762 (2006): 854-856.

When participants in this study also completed a financial reward task, Izuma found that the social and financial rewards activated the same parts of the ventral striatum, a key component of the reward system to a similar degree."

When a group of individuals were asked to bid money to try to win touching statements made by others about them, a large proportion of the participants were willing to give back their entire payment for the study, just to get to see these special words. We may give lip service to the power of money, but the power of knowing we are loved can be just as potent.

He goes on to say:

"...studies like Izuma's suggest that social regard might be a primary reinforcer as well. The brain's reward system is activated as a result of such praise, even from strangers who have no control over that Christmas bonus. **Evolution built us to desire and work to secure positive social regard.**"

"Our brains have evolved to experience threats to our social connections in much the same way they experience physical pain... That the brain has a network [or collection of modules] devoted to this kind of mindreading of others is ... surprising ... even though social reasoning feels like other kinds of reasoning, the neural systems that handle social and nonsocial reasoning are quite distinct, and literally operate at odds with each other

much of the time...

Our brains are built to ensure that we will come to hold the beliefs and values of those around us... In my research, I have found that the neural basis for our personal beliefs overlaps significantly with one of the regions of the brain primarily responsible for allowing other people's beliefs to influence our own. The self is more of a superhighway for social influence than it is the impenetrable private fortress we believe it to be."³⁹

Lieberman relates another example of research showing the subconscious impact of others on our decisions and perceptions:

"On October 21, 1984, President Ronald Reagan and his challenger, former Vice President Walter Mondale, held the second of two nationally televised presidential debates in the run-up to [that years] presidential election. President Reagan remained popular, but his support was softening in light of growing concerns about his age.

His poor performance in the previous debate, three weeks earlier, had opened the door to questions about his mental fitness. If re-elected, Reagan would become the oldest sitting president in U.S. history (he was seventy-three at the time of the debate).

³⁹ Lieberman, Matthew D. Social: Why our brains are wired to connect. Oxford University Press, Oxford. 2013

Reagan's performance at this final debate is frequently cited as a turning point in the election, when Reagan's popular support solidified, contributing to the largest electoral landslide in history."

How did Reagan demonstrate that he was still in command of all of his faculties? Did he display his erudition on the current issues of the day? Did he play to his own strengths by vigorously attacking Mondale on issues like foreign policy or the tax code? No. It was Reagan's comedic timing that allowed him to carry the day.

Reagan delivered a series of prefabricated one-liners with aplomb, regained his momentum, and never looked back. The most notable zinger came when the moderator asked him if age was a concern in the election. Reagan famously replied, "I will not make age an issue of this campaign. I am not going to exploit, for political purposes, my opponent's youth and inexperience." Mondale, not exactly a spring chicken at fifty-six, later commented that he knew at that very moment he had lost the campaign.

That night, nearly 70 million Americans watched the debate and came away convinced that the Gipper still had his mojo. Any fears people had that President Reagan had slipped were assuaged.

But how we as a nation reached this conclusion on that night is surprising. Reagan himself didn't change our minds about him. It took a few hundred people in the audience to change our minds. It was their

laughter coming over the airwaves that moved the needle on how we viewed Reagan.

Social psychologist Steve Fein asked people who had not seen the debate to watch a recording of it in one of two ways. Some individuals saw clips of the debate and the audience's reaction as it was played on live television, while others saw the debate without being able to hear the audience's reactions.

In both cases, viewers heard the president deliver the same lines. Viewers who heard the audience laughter rated Reagan as having outperformed Mondale. However, those who did not hear the laughing responded quite differently; these viewers indicated a decisive victory for Vice President Mondale. In other words, we didn't think Reagan was funny because Reagan was funny. We thought Reagan was funny because a small group of strangers in the audience thought Reagan was funny. We were influenced by innocuous social cues.

Imagine watching the debate yourself (or maybe you did watch it). Would you think audience laughter could influence your evaluation of the candidates? Would you be influenced by those graphs that CNN shows at the bottom of the screen during [some more recent] debates to indicate how a handful of people are responding to the candidates, moment by moment? Would it sway your vote? Most of us, I suspect, would say no. The notion that our decision about who should be the president of our

nation could be altered by the responses of a few people in the audience violates our theory of human nature, our sense of “who we are.” We like to think of ourselves as independent-minded and immune to this sort of influence. Yet we would be wrong. Every day others influence us in countless ways that we do not recognize or appreciate.”

This research on the variable effect of the presidential debate is valuable for two reasons. First, it demonstrates the subconscious nature of the influence of others and second, it demonstrates the impact of status. When shown the debate without the emotion of an audience, viewers concluded Mondale had won. But when an audience of people is introduced and they laugh at Mondale, status was conferred to Reagan at Mondale’s expense. Rational assessment was overwhelmed by the subconscious influence of the vestigial circuits and our hard-wired incorporation of what others think.

These examples and a variety of other research shows that virtually all publically viewable choices and behaviours, as well as those that might become publically known, reflect a subconscious incorporation of how we think others will judge us and an assessment of the predicted impact on our sense of belonging, our relative status, and if others will feel challenged.

Paint by the numbers scaffolding with plasticity not a blank slate

Our brains are comprised of a combination of preconfigured modules originally evolved to execute in fixed ways in response to specific patterns of stimuli as well as a large quantity of neurons predestined to store or adapt based on experience. How we know this is a testament to the wonders of modern medicine.

Visualise a man on the operating table. The theatre is a buzz with activity. The patient is fully awake, surrounded by surgeons and nurses. Despite being fully awake, he feels no pain and is able to chat with the operating surgeon. Now, probably best to stop visualising. The man being operated on is having brain surgery. His head is literally open, his wrinkly grey cortex readily visible and exposed to the room. The surgeon is touching tiny areas in the patient's brain with an electric wand activating tiny clusters of neurons and asking what the patient feels or experiences. "I taste peanut butter." "Someone has touched my hand." For people who suffer severe and life-threatening epilepsy, this kind of operation is a normal occurrence.

Now picture a similar scene. But this time, a number of scientist and neurologist from universities like Cal Tech, UCLA, MIT, and Tel-Aviv, including prominent individuals in their fields such as Quian Quiroga, Liela Reddy, G. Kreiman, Christof Koch and Itzhak Fried are also in the room, in a room near by, or on the other side of the world - and they are leaping out of the chairs cheering.

Why are these normally reserved individuals, cheering?

This time the patient isn't being prodded with an electric wand but is being shown pictures. His head is covered with electrical sensors that enable individual neurons to be identified when they fire or 'spike'. Every time a picture of Jennifer Aniston is shown, a specific neuron fires.⁴⁰ It doesn't fire when any of the other hundred facial images the scientists have are shown. It only fires when the various different pictures of Jennifer Aniston are shown. Another individual neuron is found that fires whenever any of the various images of Bill Clinton are presented. These were not the only neurons firing of course. Neurons in the facial recognition module were triggered as well as others in various areas of the brain. But the discovery of individual neurons firing associated with specific people was none the less cause for celebration. It confirms a great deal about how our brains function. As John Medina, author of *Brain Rules*, writes:

"...there is nothing in our evolutionary history suggesting that Jennifer Aniston is a permanent denizen of our brain wiring (Aniston wasn't even born until 1969, and there are regions in our brain whose designs are millions of years old)...a great deal of our brain is hard-wired NOT to be hard-wired. Like a beautiful, rigorously trained ballerina, we are hard-wired to be flexible.

⁴⁰ Quiroga, R. Quian, L. Reddy, G. Kreiman, C. Koch & I. Fried "Invariant visual representation by single neurons in the human brain"

Nature 435, 1102-1107 (23 June 2005) | doi:10.1038/nature03687; Received 1 December 2004; Accepted 3 February 2005

Searching for the Jennifer Aniston Neuron, Scientific American Volume 308, Issue 2, Jan 15, 2013
Why your brain has a 'Jennifer Aniston cell' , New Scientist 23 June, 2005

We can immediately divide the world into those who know Jennifer Aniston or Bill Clinton and those who do not...Our brains are so sensitive to external inputs that their physical wiring depends upon the culture in which they find themselves.

Even identical twins do not have identical brain wiring. Consider this thought experiment: Suppose two adult male twins rent the Halle Berry movie Catwoman, and we viewed their brains while they watch. Even though they are in the same room, sitting on the same couch, the twins see the movie from slightly different angles. We find that their brains are encoding visual memories of the video differently, in part because it is impossible to observe the video from the same spot. Seconds into the movie, they are already wiring themselves differently.

One of the twins earlier in the day read a magazine story about panned action movies, a picture of Berry figuring prominently on the cover. While watching the video, this twin's brain is simultaneously accessing memories of the magazine...his brain is busy comparing and contrasting the comments from the text with the movie...the other twin is not. Even though the difference may seem subtle, the two brains are creating different memories and neural connections of the same movie."

Our brains are a powerful mix of preconfigured circuits that are activated by specific patterns of stimuli and generate preconfigured patterns of response as

well as neurons ready to store new experiences through a mix of interconnecting these preconfigured circuits and building entirely new patterns.

While we are not born with preformatted information about our family, grammar, or an image of a lion, we are born with an infrastructure of preconfigured neural circuits and modules that make learning and storing a host of things substantially easier. Researchers call these preconfigured structures “experience independent”. Our facial recognition circuit is a good example.



While radically different, the above images all generate a pattern of visual stimuli with certain common characteristics. This pattern of stimuli triggers one of these pre-configured circuits and as a result you recognise all of these images as faces. Thankfully, the pattern of stimuli generated also triggers other neurons – and thus you can recognize each as a face and as something more specific, a tiger, Jennifer Aniston, a cartoon smiley face, and...something else. It could be a

cartoon character but it also could be something out of a horror film. But it has a face.

In this case, it's a blob fish. The Ugly Animal Preservation Society voted this denizen of the sea the ugliest of creatures in 2013.⁴¹ (Hard to believe but there is an Ugly Animal Preservation Society – animal conservation with a sense of humour.⁴²)

Our brains do not start as blank slates, but more like “paint by the number” canvases or a building’s frame and scaffolding before cladding, walls, or content. A bathroom and kitchen are part of every home, are recognisable early in construction, and serve the same purpose in all homes even though when finished they have tremendous cosmetic differences in appearances. John Medina describes the brain at birth as the highway, rail network and sewage system of a country fully laid out but before anyone lives there.⁴³ A host of primary “experience independent” infrastructure is in place. Then, like an evolving city, the local roads, alleys and laneways, are put in place as new houses or memories are built through interaction with the world, learning and experience.

Like faces, our brains store all information in the form of patterns of interconnected neurons triggered by and therefor representing specific patterns

⁴¹ <http://www.bbc.com/news/science-environment-24040130>

⁴² <http://uglyanimalsoc.com/>

⁴³ Medina, John. Brain Rules. Scribe Publications, Brunswick, Victoria, Australia. 2008

of stimuli. The larger and more complex these patterns, the more circuits connected within the pattern, the more they incorporate both externally and internally generate stimuli, the more inclusive and broad the concept they represent. Virtually all such stored patterns incorporate one or more of our inherited pre-existing modules or circuits. The most powerful metaphors encompass very large and extended networks of neurons including a host of both preconfigured experience independent circuits and related experience dependent image patterns, emotions, concepts, and information.

The plasticity of the connections to and from these pre-existing neural circuits, their ability to alter themselves and their interactions in response to repeated usage, lack of use, or even our conscious desire, enables our responses to change throughout life. But just like our facial recognition module, our brains are built from collections of both partially predefined circuits and learned experience. As a result, these neural building blocks coupled with the electro-chemical processes our brains rely upon are responsible for both much of the commonality of our behaviour and much of the individual variation in decision-making.

Importantly, these preconfigured modules can have a profound impact on behaviour as well as perception. Before we look at their impact in humans, let's look at two of my favourite examples from the world of Leopards, Lions and Orangu-tans.

Legadema the Leopard and Oscar the Orang-utan

In a classically magnificent 2006 National Geographic special, a group of naturalists and a film crew documented the life of Legadema the leopard as she roamed the Botswana's Okavango Delta. On one fateful day, Legadema was observed successfully hunting and killing an adult baboon.

If you know anything about baboons and leopards, this was an extraordinary accomplishment. Baboons are fierce creatures, which are often equal or even larger in size, and a dangerous enemy of leopards. They are even considered by many as more dangerous to people than the leopard.

Having succeeded in bringing down the adult baboon, Legadema picked up the carcass and dragged it toward a nearby tree for safe keeping out of reach of any passing hyenas or lions – all of which would readily steal away the feast from the much smaller leopard.

On reaching the base of the tree, Legadema put the carcass down to get a better grip. Suddenly a baby baboon appeared from below where it had been clinging to its now deceased mother's belly.

The expectation of all observers was that Legadema would quickly enjoy a second and free meal. Instead, the leopard promptly ignored its hard won dinner, lay down next to the baby baboon and began licking and grooming it. Then when hyenas approached, she gently picked up the baby baboon by the scruff of its neck - just as she might one of her own cubs. Leaving the mother's carcass for the

hyenas, she took the baby baboon up the tree to safety and continued to groom and let it cling on for warmth as night fell.⁴⁴

The same behaviour has since been observed with a lioness.⁴⁵



Anyone familiar with the mythology behind Rudyard Kipling's Jungle book or the story of Tarzan will know that – while to my knowledge never verified – it is not an uncommon tale for human babies to have been spared and even raised by creatures from wolves to gorillas.

⁴⁴ National Geographic - A Journey of birth, life and death in Africa. Dereck and Beverly Joubert. Leopard named Legadema. Location: Mombo, in Botswana's Okavango Delta.

⁴⁵ Photographer Evan Schiller and Lisa Holzwarth.
<http://voices.nationalgeographic.com/2014/04/03/baby-baboons-dramatic-encounter-with-lions-ends-with-a-heroic-twist/>

Why don't these babies get eaten?

Because they have evolved to be 'cute'. Just like as a face triggers our facial recognition circuit due to the universal elements of the pattern of stimuli faces generate, babies generate a pattern of stimuli with shared characteristics including disproportionately large heads, big eyes set fairly low on the face, small noses, and round soft bodies.⁴⁶ This pattern triggers a preconfigured module in the brains of adult Leopards, lions – and humans - evolved to ensure that we take care of our young.

In this case, the baby baboons generated a pattern of stimuli, visual, auditory and possibly other, that triggered innate circuits in the leopard that have evolved to be triggered by its own cubs. The collection of "it's a cub" circuits in turn triggered an interconnected set of "care for cub" response circuits and thus the observed behaviour. These circuits clearly have priority over the "get food away from thieves" circuits. As with a duckling imprinting on a human child, this example shows the "blind" and non-conscious nature of these modules once triggered by a relevant stimulus pattern.

In another example of such circuits at work, a series of experiments have been conducted with "educated" chimpanzees, orang-utans, and other primates. In these experiments a chimp will be offered two bowls, each containing a clearly

⁴⁶ <http://blogs.unimelb.edu.au/sciencecommunication/2013/08/26/the-science-of-cuteness/>

unequal quantity of treats such as raisins or jellybeans.⁴⁷ Whatever bowl they picked would be given to another chimp sitting visibly in an adjacent cage. Strangely, every primate picked the bowl with the largest number of candies even though by doing so he or she would wind up with the smaller number himself. This behaviour is consistent across multiple species of primate and every time the experiment is run.

Next, the Chimps were offered bowls each containing a single plastic card. On the card was a number in large print. Remember, these are educated primates who had, in this case, learned number symbols. The experiment was then repeated and this time the number of treats corresponding to the number on the card in the bowl selected would be given to the nearby primate and the one doing the picking would receive the number of jelly beans indicated by the card not selected. Suddenly, Oscar the Orang-utan and the other primates tested started picking the smaller number so that they would receive the greater amount themselves. Their choices became rational.

The inability of primates to choose the lesser amount when looking at actual food but to do so when symbols are substituted shows both the power of neural modules triggered by stimuli patterns and how abstraction or an ability to push a decision into conscious or higher order brain functioning can enable these innate

⁴⁷ Boysen ST, Berntson GG, Hannan MB, Cacioppo JT (1996) Quantity-based interference and symbolic representations in chimpanzees (*Pan troglodytes*). *J Exp Psychol Anim Behav Process* 22:76–86

Boysen ST, Mukobi KL, Berntson GG (1999) Overcoming response bias using symbolic representations of number by chimpanzees (*Pan troglodytes*). *Anim Learn Behav* 27:229–235

circuits to be overridden. When a pattern associated with the food circuit was directly activated by stimulus, the chimpanzees and orang-utans were instinctively compelled to choose the larger portion. When the use of symbols or abstraction was used, the food circuit was only indirectly linked to, these primates were able to consciously and rationally make choices.

In humans, the facial recognition module and other modules are known to function in a similar way with a distinct sequential process.⁴⁸ A specific module is activated by patterns of visual stimuli corresponding to that generated by a face. This module is linked to a host of additional experience independent and dependent neural circuits including one that is specifically fired by “cute” faces and another that only fires for faces we are familiar with as immediate family. This module then compares the visual stimuli pattern to other connected neuron patterns, each individual set of which represents the visual stimuli of a specific face previously seen. These are in turn linked to other modules and sets of neurons. Each of these interconnected stored patterns of neurons corresponds to some additional associated piece of information physically linked to via neuronal connection such as a persons name, the nature of our relationship, their status, and more.

Most facial patterns are also associated with a variety of other circuits including neurons in the emotions module. As a result recognized faces are often

⁴⁸ Carter, Rita. Mapping the Mind. University of California Press, Los Angeles. 2010. pg. 121

associated with an emotional state and a handful of other universal characteristics. Is this face a friend, lover, a member of our group, a foe, someone of higher status or lower status? Does this face make us feel happy or angry? Is this face I don't recognize dangerous, trustworthy, or not? The power of faces, emotions, and these modules in humans is revealed by research that shows watching liked characters in a nightly TV program results in many viewers reporting being as satisfied with their "relationships" as those who interacted face to face with real friends.⁴⁹

This entire process occurs sub-consciously. It is entirely automated. Our consciousness is only aware that we recognize someone we know and a "mood" we associate with that pattern of stimuli activated neurons. Or, in the case of a stranger, we may simply feel nervous without drawing any conscious connection to why.



Importantly, this facial recognition circuit is hardwired. Only a pattern of stimuli that includes key elements of the pattern generated by a real face, those elements required to trigger the circuit, will do so. But anything that generates

⁴⁹ Derrick, Jaye L., Shira Gabriel, and Brooke Tippin. "Parasocial relationships and self discrepancies: Faux relationships have benefits for low self-esteem individuals." *Personal Relationships*, 15 June (2008), 261–280. DOI: 10.1111/j.1475-6811.2008.00197.x

those stimuli will trigger the “it’s a face” circuit whether it’s our ugly Blob fish, the shading around a pile of rocks on the surface of Mars, or an emoticon :)

In addition to links to emotional states, face patterns have links to neurons representing various groups of people and the characteristics that define those groups. They link to patterns of neurons which store the characteristics defining relative status, sounds, names, sequences of events, stories, and a host of other memories associated with that person.

The partially fixed nature of our storage of faces, and many other types of information, is critical to our understanding of value, how we perceive things and both innate behaviour patterns and learned heuristics.

The basic elements of the stimuli pattern which represent a face, or more accurately, the associated neural structure activated by this pattern of stimuli, is fixed and innate. The particulars of each face, however, are “empty” neurons and new connections filled in or created by observed stimuli. Such pairings of innate structures with dynamically associated or “experience dependent neurons” are common for most modules in humans. In humans, just as in animals, pre-existing modules are triggered by patterns of stimuli or signals generated by other modules. Some of these modules will dictate physical responses unless we have specifically trained ourselves to override them.

While there are a broad variety of these modules, what is critical is our awareness that these modules exist and compel most of us to pursue specific relative outcomes such as status and mastery. Further that these circuits,

modules and neural structures exert a normalizing influence on how we store information in the form of patterns, metaphors and narrative, how we perceive the world, make choices, and behave.

While there is evidence to support a great many of these inherited neural modules or behavioural traits, only a few are critical for explaining breakout products, stock market bubbles and societal scale phenomena.

Relative Comparison

“Men do not work to maximize their economic benefits, any more than they try to maximize their physical comfort. What does a billionaire need a second billion for? To be of higher rank than a fellow billionaire who only has a single billion.”⁵⁰ – J.H. Barkow

First amongst these modules is our innate compulsion to relatively **compare**. We will compare virtually any set of things that share characteristics and thus can be compared.⁵¹ Pre-eminent amongst things we compare are people.⁵² We compare nearly everyone we encounter to each other and to ourselves.

⁵⁰ Barkow, J.H., 1975. Strategies for self esteem and prestige in Maradi, Niger Republic. In: Williams, T.R. (Ed.), *Psychological Anthropology*. Mouton Publishers, The Hague, pp. 373–388.

Barkow, J.H., 1989. The transition from primate dominance to human self esteem. In: *Darwin, Sex, and Status*. University of Toronto Press, Toronto, pp. 185–195.

⁵¹ Ariely, Dan. Predictably Irrational. HarperCollins Publishers, London, (2008).

Not only do we have an innate drive to compare people and to compare any set of things with shared characteristics, the very structure of our nervous system requires storage in the form of patterns of stimuli and specifically by the association of a new pattern with an existing one. This requirement to store new things almost exclusively by association to one or more existing neural patterns has a profound impact on our perception.⁵³ When we look at a new product for example, we think about it in terms of things we are already familiar with. Strong metaphors dominate our communication of knowledge and this drive to compare appears to be one of our primary forms of analysis and judgment.⁵⁴

Label & Communicate

"Language is a process of free creation; its laws and principles are fixed, but the manner in which the principles of generation are used is free and infinitely varied."

⁵² Corcoran, K., Crusius, J., and Musweiler, T. "Social comparison: Motives standards, and mechanisms." In D. Chadee (ed.), *Theories in Social Psychology*, Wiley-Blackwell, Oxford, UK, (2011), 119-139.

Kruglanski, Arie W. and Mayseless, Ofra. "Classic and current social comparison research: Expanding the perspective," *Psychological Bulletin*, 108(2), (1990), 195-208.

Slaughter, V., Stone, V. E. and Reed, C. "Perception of faces and bodies: Similar or different?" *Current Directions in Psychological Science*, 13, (2004), 219-223.

⁵³ Anderson, James A., Silverstein, Jack W., Ritz, Stephen A., Jones and Randall, S. "Distinctive features, categorical perception, and probability learning: Some applications of a neural model," *Psychological Review*, 84(5), (1977), 413-451. doi: [10.1037/0033-295X.84.5.413](https://doi.org/10.1037/0033-295X.84.5.413)

Hall, Geoffrey. "Perceptual and associative learning," *Oxford Psychology Series*, No. 18, New York, Clarendon Press/Oxford University Press, (1991).

Solari, Soren, Smith, Andrew, Minnett, Rupert and Hecht-Nielsen, Robert. "Confabulation theory." *Physics of Life Reviews*, 5(2), (2008), 106-120.

⁵⁴ Geary, James. *I is an Other, The Secret Life of Metaphor and How it Shapes the Way We See the World*. HarperCollins, New York, (2011).

Even the interpretation and use of words involves a process of free creation.” -

Noam Chomsky

“Fluency in a language requires embracing the delusions of a culture.”

We are driven to **Label and Communicate**.⁵⁵ We are born with a variety of innate facial expressions and gestures that carry very specific meanings to those around us.⁵⁶ The unique facial expressions for anger, disgust, fear, happiness, sadness, and surprise are universally shared across cultures.⁵⁷ People who are born blind will raise their arms wide above their heads in celebration when they are victorious in competition.⁵⁸ They have never seen others display dominance or pride in this way. It is instinctual. We all do it.

In addition to a handful of facial expressions and posturing displays, human babies also instinctually vocalise in response to specific situations such as when separated from their mother and they stop when returned.⁵⁹ We are born with a

⁵⁵ Tomasello, Michael. *Origins of Human Communication* (Jean Nicod Lectures). Bradford Book The MIT Press. Cambridge, Massachusetts, 2008.

⁵⁶ Tracy, Jessica L. and Robins, Richard W. “*The nature of pride.*” In *The Self-Conscious Emotions: Theory and Research*, Jessica L. Tracy (ed.), The Guilford Press, New York, (2007).

⁵⁷ Ekman, P., Sorenson, E. R., & Friesen, W. V. (1969). Pan-Cultural Elements in Facial Display of Emotions. *Science*, 164, 86-88.

Ekman, P. (2016). What Scientists Who Study Emotion Agree About. *Perspectives on Psychological Science*, 11(1), 31-34.

⁵⁸ Tracy, Jessica L. and Richard W. Robins. “Show Your Pride : Evidence for a Discrete Emotion Expression” *Psychological Science* 2004 15: 194 DOI: 10.1111/j.0956-7976.2004.01503008.x

⁵⁹ Christensson, K., Cabrera, T., Christensson, E., Uvnäs-Moberg, K. and Winberg, J. (1995), Separation distress call in the human neonate in the absence of maternal body contact. *Acta Pædiatrica*, 84: 468–473. doi:10.1111/j.1651-2227.1995.tb13676.x

Lieberman, Matthew D. *Social: Why our brains are wired to connect*. Oxford University Press, Oxford. 2013

compulsion to make noise, to interact with others and to associate sounds, words, and symbols or labels to collections of similar things.⁶⁰ We will label nearly anything observed as being the same or similar. In so doing we establish and learn common or shared words and symbols. We communicate. Language is in part a product of these innate drives and in part the product of exposure to the reoccurring sounds, symbols and structures used by others. Language provides a great example of the cosmetic variation associated with what we imprint on. Language is not innate. It is the by-product of our drives to communicate, label, and mimic observed aspects of the behavior of others during early childhood.⁶¹ The drives to communicate and to label are universal. The cosmetic characteristics of communication, such as grammar, specific words, and symbols are learned.

⁶⁰ Buonomano, Dean. Brain Bugs: How the Brain's Flaws Shape Our Lives. W.W. Norton & Company, New York, (2011), 62-65.;

LeDoux, 2002;

Sakai, Kuniyoshi L. "*Language acquisition and brain development*," Science, 310.5749 (2005) 815-819.

Saxton, Mathew. Child Language: Acquisition and Development. SAGE Publications Ltd, London, (2010).

⁶¹ Everett, Daniel. Language: The Cultural Tool. Profile Books, London. (2012).

McComb, Karen and Stuart Semple. "*Coevolution of vocal communication and sociality in primates*." Royal Society Biology Letters, 1(4) (2005) 381-385 doi: 10.1098/rsbl.2005.036.

Solari, Soren, Smith, Andrew, Minnett, Rupert and Hecht-Nielsen, Robert. "*Confabulation theory*." Physics of Life Reviews, 5(2), (2008), 106-120.

Grouping and Social Bonding

"No man is an island."

John Donne (1624)

In addition to our drive to associate and label similar things, we are specifically driven to define ourselves as part of and be perceived by others as being a member of one or more **Groups** of people.⁶² As with our drive to communicate, this drive interacts with our drives to relatively compare and to label things with shared characteristics. In this case the characteristics shared are an individual's associations with others. Importantly, this drive to group is in addition to the innate circuits associated with identifying members of our immediate genetic family.⁶³

A handful of species have been shown to develop "friendships." In humans, friendship groups are pursued and valued as an end in itself. Like other traits, the spectrum of expression and its proportions are universal and reflect the

⁶² Baumeister, Roy F. and Leary, Mark R. *"The need to belong: Desire for interpersonal attachments as a fundamental human motivation,"* Psychological Bulletin, 117(3), (1995), 497-529. doi: 10.1037/0033-2909.117.3.497

Hornsey, Matthew J. *"Social identity theory and self-categorization theory: A historical review,"* Social and Personality Psychology Compass, 2(1), Blackwell Publishing Ltd, 204-222, SN 1751-9004-<http://dx.doi.org/10.1111/j.1751-9004.2007.00066>. (14 Jan 2008)

Turner, John C., Hogg, Michael A., Oakes, Penelope J., Reicher, Stephen D. and Wetherell, Margaret S. Rediscovering the Social Group: A Self-categorization Theory, Basil Blackwell, Cambridge, MA, (1987).

Tajfel, Henri. "Experiments in intergroup discrimination." *Scientific American* 223.5 (1970): 96-102.

⁶³ Newman, Barbara M. and Philip R. Newman. "Group Identity and Alienation: Giving The We Its Due" *Journal of Youth and Adolescence*, Vol. 30, No. 5, October 2001

Postmes, Tom, et al. "Individuality and social influence in groups: inductive and deductive routes to group identity." *Journal of personality and social psychology* 89.5 (2005): 747.

survival, reproductive, and evolutionary benefit consistent with perpetuated genetic traits. More people report having “friends” (95%) than “normal” eyesight (93%).⁶⁴ Bizarrely, the “the closer friends become, the less they tend to keep track of who has done more or less for one another.”⁶⁵ The closer we are the less what we do for our friends or what they do for us matters and the more we value our relationships with them for its own sake and not some economic benefit.⁶⁶

Our drive to define and be part of groups goes beyond friendship circles. We are compelled to define ourselves by many groups the members of which we do not have traditional social bonds with but with whom we share characteristics enabling a shared label and with whom we compete for status. Studies on the neurotransmitter oxytocin have shown that people universally create layers of ‘in groups’, ‘out groups’ and strangers and behave toward each in very specific ways.⁶⁷ “We all have a need to belong. Signs that others like, admire, and love us are central to our well-being...and we conform to cultural norms to avoid standing out.”⁶⁸

⁶⁴ Lieberman, Matthew D. Social: Why our brains are wired to connect. Oxford University Press, Oxford. 2013

⁶⁵ Lieberman, Matthew D. - ibid

⁶⁶ Lieberman, Matthew D. - ibid

⁶⁷ Lieberman, Matthew D. - ibid

Tajfel, Henri. "Experiments in intergroup discrimination." *Scientific American* 223.5 (1970): 96-102.

⁶⁸ Lieberman, Matthew D. - ibid

Fairness, Altruism or Conscientiousness

“Do unto others as you would have them do unto you.”

- The Golden Rule

“Experimental evidence indicates that human altruism is a powerful force and is unique in the animal world.”

- Ernst Fehr & Urs Fischbacher

There are genetic traits that incline us toward **fairness and altruism**. Most of us are born with an innate module that motivates us to be willing to share with others as well as endure a cost for punishing those that are seen as not sharing or being fair with either ourselves or members of our group. Studies of two year olds show that they become equally happy when they are able to help someone else as when they receive something that they want.⁶⁹ It also appears the trait predates humans. Various primates also manifest this drive for fairness and along with dogs are known to judge people based on how fairly they interact with others.⁷⁰

This is a particularly complex drive trait with a variety of both innate and environmental influences. Our perception of fairness and the appropriate level of altruism are influenced by cultural and group norms that we learn or imprint

⁶⁹ Hepach, Robert; Vaish, Amrisha; Tomasello, Michael. “The fulfillment of others’ needs elevates children’s body posture.” *Developmental Psychology*, Vol 53(1), Jan 2017, 100-113. <http://dx.doi.org/10.1037/dev0000173>

⁷⁰ Andersona, James R., Benoit Buchera, Hitomi Chijiwa, Hika Kuroshimaa, Ayaka Takimotob, Kazuo Fujitaa. “Third-party social evaluations of humans by monkeys and dogs.” *Neuroscience & Biobehavioral (Online)* 7 January 2017 <http://dx.doi.org/10.1016/j.neubiorev.2017.01.003>

on.⁷¹ Critically, altruism, fairness or conscientiousness is a universal trait manifesting on a standard spectrum found within all populations and cultures.⁷²

While the behaviours motivated by this module are regularly described in terms of fairness, the reality is that, on average, we overvalue our own contribution and undervalue the contributions of others. We are uniquely aware of our own contributions but generally only accurately perceive the contributions of others when we directly observe them or where we have first hand experience to understand the specific effort, magnitude and value the contributions based on relative terms.

⁷¹ Holmes, Bob. "Did emotions evolve to push others into cooperation?" New Scientist, (28 July 2010), <http://www.newscientist.com/article/dn19232-did-emotions-evolve-to-push-others-into-cooperation.html#.U2g7ga2Sxkg>.

Mason, William A. and Mendoza, Sally P. Primate Social Conflict. SUNY Press, Albany New York, (1993).

McRaney, David. You Are Not So Smart. Oneworld e-Publications. (2012).

⁷² Joseph Henrich, Robert Boyd, Samuel Bowles, Colin Camerer, Ernst Fehr, Herbert Gintis, Richard McElreath, Michael Alvard, Abigail Barr, Jean Ensminger, Natalie Smith Henrich, Kim Hill, Francisco Gil-White, Michael Gurven, Frank W. Marlowe, John Q. Patton, David Tracer. (2005). "Economic man" in cross-cultural perspective: Behavioral experiments in 15 small-scale societies. *Behavioral and Brain Sciences*, 28(6), 795–814.

Ball, Philip. (2004). Critical Mass - How One Thing Leads to Another. New York: Farrar, Straus and Giroux.

Aknin, Lara B., Christopher P. Barrington-Leigh, Elizabeth W. Dunn, John F. Helliwell, Robert Biswas-Diener, Imelda Kemeza, Paul Nyende, Claire Ashton-James, Michael I. Norton. "Prosocial Spending and WellBeing: Cross-Cultural Evidence for a Psychological Universal" Working Paper 11-038. <http://www.hbs.edu/faculty/Publication%20Files/11-038.pdf>

Axelrod, Robert and William D. Hamilton. "The Evolution of Cooperation". *Science*, New Series, Vol. 211, No. 4489 (Mar. 27, 1981), pp. 1390-1396 Published by: American Association for the Advancement of Science Stable URL: <http://www.jstor.org/stable/1685895>

Ellis, Lee. "A biosocial theory of social stratification derived from the concepts of pro/antisociality and r/K selection," *Politics and the Life Sciences*, 10(1), (1991), 5-23.

Laland, Kevin and Brown, Gillian R. Sense and Nonsense. Oxford University Press, Oxford, (2002).

Even where precise valuation is possible, we will generally keep slightly more than half and expect less than half when sharing or being shared with. We also have an individual threshold below which the notion of inequality, the neural circuit representing unfairness, won't be triggered. Finally, our perception of fair effort or fair sharing is influenced by our perception of the relative status of those involved. People who feel they are of higher status perceive they should get more and people who perceive themselves as of lower relative status are accepting of less.

Our drives to be part of a group and for a sense of fairness or appropriateness are so strong that they influence our actions even when on our own. Individual behaviour occurs almost exclusively in context of others. Humans, like other primates, are genetically inclined to conceal or hide certain types of actions including sex.⁷³ Even when we are alone or out of sight, however, most of us make decisions and act with a view to how others will perceive our actions. As a result, our actions and decisions, even where totally subconscious, remain predictable as if we were in the company of others or were specifically seeking to influence the perception of others.

⁷³ For those that site exhibitionists as evidence contrary to this point, two forms of exhibitionism are relevant and neither, in fact, contradicts this assertion. First, the small number of people who seek to perform sexually explicit behavior in front of others. These people are consistent with a spectrum of expression for the trait. The second group includes those that appear to be exhibiting often private behaviors in front of others but are specifically doing so to communicate their status or seeking status from a group by being seen interacting with another who either has status or in a way that will confer status.

Mastery

“The Hula Hoop sold millions and launched global competitions. People think and create schemes to beat Roulette. Many spend years of their life becoming concert pianists and yet work at McDonalds. We are not just driven by money.”

- Professor Mary Yeager UCLA (I found this in a journal amongst notes for an economics class I took in the late 1980s – Professor if this wasn’t you, my apologies.)

We are driven, to varying degrees, to **master** skills and ways of doing things.⁷⁴

From puzzles like Sudoku and games like Candy Crush to skills like piano, chess or karate, we are innately driven to invest in learning and mastering skills, even ones with no practical value. We often rationalize the pursuit of these skills in terms of enjoyment, the personal satisfaction of having achieved a level of capability or the value of praise from others. In the end, however, this drive to learn skills and pursue a degree of mastery is innate.

On average we all pursue a minimum degree of mastery for a diversity of activities we are exposed to. For many, mastery is pursued above economic self-interest and, for some, mastery is even pursued at great risk to self preservation. While anecdotal, one survey of 3,000 high performing employees reports that

⁷⁴ Deci, Edward L. “Effects of externally mediated rewards on intrinsic motivation,” Journal of Personality and Social Psychology, 18(1), (1971), 105-115.

Deci, Edward L. and Ryan, Richard M. (eds), Handbook of Self-determination Research, University of Rochester Press, Rochester New York, (2002).

Pink, Daniel H. Drive, The Surprising Truth about what Motivates Us. Riverhead Books, New York, (2009).

76% state that trade mastery more than money when considering career decisions.⁷⁵

Novelty

"Our own relentless search for novelty and social status locks us into an iron cage of consumerism. Affluence has itself betrayed us."

- Tim Jackson (Economist, Professor, TED speaker)

We seek **novelty**.⁷⁶ We are driven to store sequential patterns of events and situational characteristics. We innately observe the actions of others and the outcomes, storing in long term memory patterns of action or behaviour seen as delivering beneficial outcomes.⁷⁷ We are driven to attribute and associate cause,⁷⁸ to explore the unexpected and the novel experience, in order to complete an associated pattern of cause and effect.⁷⁹ Most critically, to varying degrees, we are driven not only to be curious and investigate the unfamiliar to

⁷⁵ <https://medium.com/@wbelk/76-of-high-performance-employees-say-trade-mastery-not-money-most-important-in-career-decisions-e0c457884d2e>

⁷⁶ Deci, Edward L. *"Effects of externally mediated rewards on intrinsic motivation,"* Journal of Personality and Social Psychology, 18(1), (1971), 105-115.

Pink, Daniel H. *Drive, The Surprising Truth about what Motivates Us*. Riverhead Books, New York, (2009).

⁷⁷ Ferrari, et al. 2009; Macleod, 2010; Meltzoff, 1988; Swaminathan, 2010

⁷⁸ In: S.W. Ganged and J.A.Simpson (Eds.) *The Evolution of the Mind: Fundamental Questions and Controversies* (pp. 111-118). New York: Guilford Press. Article: "Chimpanzee and Human Intelligence Life History, Diet, and the Mind", Jane B. Lancaster and Hillard S. Kaplan, Page 118.

⁷⁹ Kelley, Harold H. *"The processes of causal attribution,"* American Psychologist 28(2), (1973), 107-128.

satisfy this need to associate cause but are motivated to actually pursue novel experiences, to try new things and to create and store new experience patterns.

Status

"Give me enough ribbon and I shall conquer the world."

Napoleon Bonaparte

One of, if not the most significant drive trait, is our drive to pursue relative **Status**.⁸⁰ Status in other primates is derived from either physical dominance or from social influence. In humans, status can readily be thought of as a proxy for physical dominance in determining reproductive opportunity and access to resources such as food and shelter. It extends, however, well beyond just physical stature or observable social influence. Status in humans reflects a variety of traits and can reflect our value to the troop inclusive of non-physical characteristics (such as ways of doing things or the strength and breadth of social bonds rather than just physical might). We pursue fame, a form of social influence, as status. We pursue friendships and deep forms of influence over smaller groups. And we pursue a role that is acknowledged by our social groups. Status also reflects abstract associations and learned or imprinted social norms.

⁸⁰ Frank, 2001 / Huberman et al., 2004 / Washington & Zajac, 2005 / Lawrence & Nohria. Drive. Wohlforth, William C. and Kang, David C. "Hypotheses on Status Competition" (2009). APSA 2009 Toronto Meeting Paper. Available at SSRN: <http://ssrn.com/abstract=1450467>.

Boyce, Christopher J., Gordon D.A. Brown and Simon C. Moore. "Money and Happiness: Rank of Income, Not Income, Affects Life Satisfaction". Psychological Science April 2010 vol. 21 no. 4 471475 Published online before print February 18, 2010, doi:10.1177/0956797610362671

To avoid unnecessary pecking order battles, we have evolved to use labels and symbols to identify status in others. Critically, for most:

- (1) What confers status is imprinted on based on our observations at key stages in our lives and key points in the expression of the drive for status trait.
- (2) While the drive for status is entirely innate and virtually ubiquitous, like other drives it manifests across a spectrum. Some people are like Napoleon and crave it while others don't seem to care about it at all. Most of us are driven to seek status to a degree within a small variance of the average.
- (3) For those who express the drive for status at the low end of the range and another drive at the high end (such as novelty, mastery, or grouping), that drive will play a more significant role in influencing decisions. For those who express multiple drives at the high end of their possible ranges each will play a role. The nature of status is such that unless the person expresses the drive at the absolute low end of the spectrum, it will interact with the other drives to guide individual choice in ways that are mutually satisfying to each drive. For example, someone with a high drive for mastery and even a low drive for status is most likely to obtain status based on mastery of a particular skill and not by some other means (such as political persuasion, economic gain, etc.). The effect of this is to make status appear as if it had hierarchical priority over the other drives.
- (4) We almost universally value status more than economic utility.

In various economic studies the level of life satisfaction or happiness of the individuals tested, irrespective of how much money they earn, was lower in all

situations where they made less than their peers. In another series of studies, subjects were asked if they would prefer to make \$50,000 a year and their friends and others made \$25,000 a year or if they would prefer to make \$100,000 year but others would be earning \$200,000. Similar questions were asked in regards the intelligence of one's children relative to others, physical attractiveness, vacation time, praise from supervisors, and car safety. Would you prefer 2 or 4 weeks vacation time given your peers get something less or more? Contrary to any rational assessment of the quality of life, a majority of subjects consistently choose the lesser option - to make less money – the \$50,000 per year option - so long as it is more than their peers.⁸¹ As a rule, humans prefer “to do better than others, even if it means getting less for themselves. People don’t just care about how they are doing, they care about their performance in relation to others.”⁸² In nearly all cases, superior relative status is more important than rational economic well being for the average person.

Another often cited piece of research proclaims that we are more afraid of death than public speaking. This claim is somewhat flippantly based on a survey of 2,500 people conducted in 1973 wherein 41% respondents reported their greatest fear as public speaking and only 19% stated they feared death.⁸³ Often

⁸¹ Solnick, Sara J. and David Hemenway “Is more always better?: A survey on positional concerns” *Journal of Economic Behaviour & Organization* Vol. 37 (1998) 373-383

Frank, Robert H., 1985. *Choosing the Right Pond: Human Behaviour and the Quest for Status*, Oxford University Press, New York.

⁸² Berger, Jonah. *Contagious: Why things Catch On*. Simon and Schuster. London, Great Britain. 2013

⁸³ Bruskin Associates (1973). *What are Americans afraid of? The Bruskin Report*, 53, p. 27.

this is given as an example of our fear of rejection. A more likely explanation is that public speaking involves tremendous risk to personal status. If the question were rephrased, people would report equal or greater fear of dancing or performing on stage in front of others (depending on their abilities). This fear is less about rejection as it is about the potential loss of status should you mess up in front of a large audience. This conclusion also explains why successful performers and actors are held in such high esteem. Both their skill and their comfort risking failure in front of the masses demonstrates confidence and confidence confers status in the arena within which it is expressed.

This drive for status is already leveraged by many businesses. In his book Contagious: How to Build Word of Mouth in the Digital Age, Jonah Berger writes:

"Just like many other animals, people care about hierarchy. Apes engage in status displays and dogs try to figure out who is the alpha. Humans are no different. We like feeling that we're high status, top dog, or leader of the pack. But status is inherently relational. Being leader of the pack requires a pack, doing better than others... doing well makes us look good. People love boasting about the things they've accomplished: their golf handicaps, how many people follow them on Twitter, or their kids' SAT scores. A friend of mine is a Delta Airlines Platinum Medallion member. Every time he flies he finds a way to brag about it on Facebook. Talking about how a guy he saw in the Delta Sky Club lounge is hitting on a waitress. Or mentioning the free upgrade he got to first class. After all, what good is status if no one else

knows you have it? But every time he proudly shares his status, he's also spreading the word about Delta."

And status influences decisions and behaviours in every aspect of life.⁸⁴ Research shows that:

- "Status was a significant predictor of whether a college was invited to participate in the NCAA postseason basketball tournament, independently of performance considerations."⁸⁵
- "Research on jaywalking indicates that people will more often conform to the behaviour of a seemingly high-status person than someone who looks less respectable."⁸⁶
- The pursuit of status is a primary driver of who we will help in a work environment. Specifically, to balance our need to demonstrate a willingness to cooperate with our pursuit of relative status, employees are most likely to help other employees who are "moderately distant from

⁸⁴ Stephen Peter Rosen, *War and Human Nature* (Princeton: Princeton University Press, 2005); Robert H. Frank, *Choosing the Right Pond: Human Behavior and the Quest for Status* (New York: Oxford University Press, 1985); Frank, *Luxury Fever: Why Money Fails to Satisfy in an Era of Excess* (New York: Free Press, 1999); Frank, "Positional Externalities Cause Large and Preventable Welfare Losses," *The American Economic Review*, 95 (May 2005); Robert Wright, *The Moral Animal: Evolutionary Psychology and Everyday Life* (New York: Pantheon, 1994); and C. Loch, M. Yaziji and C. Langen, "The Fight for the Alpha Position: Channeling Status Competition in Organizations," *European Management Journal* 19, (February 2001).

⁸⁵ Washington, Marvin and Edward J. Zajac. "Status Evolution and Competition Theory and Evidence." *Academy of Management Journal* 2005, Vol. 48, No. 2, 282–296.

⁸⁶ Aronson, Elliot. *The Social Animal*, 7th Edition. W.H. Freeman and Company New York. 1972, 1995.

Mullen, Brian., Carolyn Copper and James E. Driskell. "Jaywalking as a Function of Model Behavior". *Personality and Social Psychology Bulletin*. Vol 16, Issue 2, pp. 320 - 330
10.1177/0146167290162012

themselves in status – both above and below them.” Other employees who are too close in relative status pose more of a threat. “Help you provide could help them pass you in status, or make it more difficult for you to pass them.” Fellow employees who are “moderately distant” – above or below - pose less of a threat.⁸⁷

- “People prefer high status. While status often brings material reward, people prefer higher status as an end in itself. If the possible payoffs from a game include both material rewards and social status, people will often seek status, under some circumstances accepting substantial trade-offs between status and material rewards...”⁸⁸
- “Status competition is ubiquitous...informal hierarchies of status recur throughout world politics...such hierarchies have emerged in every international system of which we have knowledge, including the modern European states system.”⁸⁹

⁸⁷ Doyle, Sarah P., Robert B. Lount, Jr., Steffanie L. Wilk, and Nathan C. Pettit. “Helping Others Most When They Are Not Too Close: Status Distance as a Determinant of Interpersonal Helping in Organizations.” *Academy of Management Discoveries* June 2016 2:155-174; published ahead of print November 23, 2015

⁸⁸ Wohlforth, William C., David C. Kang, “Hypotheses on Status Competition.” Paper prepared for delivery at the 2009 Annual Meeting of the American Political Science Association, Toronto, Canada. K. Fleissbach, et.al., “Social Comparison Affects Reward-Related Brain Activity in the Human Ventral Striatum,” *Science* 318, (23 November 2007); Robert H. Frank, *Choosing the Right Pond: Human Behavior and the Quest for Status* (New York: Oxford University Press, 1985); Robert Wright, *The Moral Animal: Evolutionary Psychology and Everyday Life* (New York: Pantheon, 1994); Richard H. Thaler, *The Winner’s Curse: Paradoxes and Anomalies of Economic Life* (New York: Free Press, 1992).

⁸⁹ Wohlforth, William C., David C. Kang, “Hypotheses on Status Competition.” Paper prepared for delivery at the 2009 Annual Meeting of the American Political Science Association, Toronto, Canada. Evan Luard *Types of International Society* (New York : Free Press, 1976); and *War in International Society* (London: Tauris, 1986); Charles Doran, *Systems in Crisis: New Imperatives of High Politics at Century’s End* (New York: Cambridge University Press, 1991); Martin Wight, *Systems of States* ed. Hedley Bull, (Liecester: Liecester University Press, 1977); Michael Mann,

- “Much of the history of international relations concerns pushing and jostling over relative rank rather than fateful contests for world leadership or knock-down, drag-out struggles for survival. The underlying issues at stake which complicate interstate cooperation often have less to do with the nature of a given international order than with relative status within that order.”⁹⁰

Roles

“Every job is a self-portrait of the person who does it. Autograph your work with excellence.”

– Unknown

We are driven to define ourselves as having a **“Role”** or a label that encompasses characteristics that make clear our function and value within each group to which we are or want to be a member.⁹¹ Our drive for a role is manifest years after birth and is most plastic at a specific post adolescence stage in our development.⁹²

The Sources of Social Power (Cambridge: Cambridge University Press, 1986); Adam Watson, The Evolution of International Society (London: Routledge, 1992).

⁹⁰ Wohlforth, William C., David C. Kang, “Hypotheses on Status Competition.” Paper prepared for delivery at the 2009 Annual Meeting of the American Political Science Association, Toronto, Canada

⁹¹ Possibly a more accurate explanation is that we are driven to generate a basis for both ourselves and others to rationalize our inclusion and the sharing of resources, social investment, reproductive opportunity and status with us.

⁹² Hogg, Michael A. “A social identity theory of leadership,” Personality and Social Psychology Review, 5(3), (2001), 184-200.

Roles can have a variety of characteristics and we may have different roles within each different group to which we belong. We may define ourselves as the joker in our social group and a blacksmith within our community group. This is important for two reasons.

First, people generally define themselves as part of the larger group of people who have the same role or profession throughout a society even though this role defined group may not be formally organized or even ever gather together. We nonetheless compare ourselves and compete for status with others who have the same role both within and across subgroups and often across society as a whole.

Second, people will use their conscious abilities much more in context of their perceived roles relative to other decision-making situations. An engineer will utilize his/her conscious ability to solve a design challenge, a stockbroker will consciously assess information on an investment opportunity, and a medical doctor is much more likely to utilize his/her conscious abilities when diagnosing a patient than when deciding which coffee shop to visit or which TV to purchase. This is not to say people don't use and rely heavily upon learned heuristics or mental shortcuts in role related contexts, they do.⁹³ Rather, for the variety of

Richerson, Peter J. and Robert Boyd. Not by Genes Alone: How Culture Transformed Human Evolution. University of Chicago Press, Chicago Illinois, (2005).

Turner, John C., Hogg, Michael A., Oakes, Penelope J., Reicher, Stephen D. and Wetherell, Margaret S. Rediscovering the Social Group: A Self-categorization Theory, Basil Blackwell, Cambridge, MA, (1987).

⁹³ van den Berge, Kees. "Cognitive Diagnostic Error in Internal Medicine." Thesis, Erasmus University Rotterdam, the Netherlands (2012) (ISBN 978-94-6169-178-1)

reasons mentioned, conscious problem solving and engagement are more prevalent in the context of one's role.

Willingness to Challenge

"Disenting opinions save lives." – Sadly they are often not shared aloud.

"If everyone is thinking alike, then everyone isn't thinking." - George S. Patton

"I want people to challenge me...I insist on not being the smartest guy in the room. But if I hear everything, then I can help craft the smartest idea in the room. Here's the thing: Phil was a genius. I'm not a genius, so I need other people to help me do genius thins." – David Lubars

While status and belonging are the two most powerful drives, their influence is amplified or mitigated by our third most influential trait, our **willingness to challenge others**. For those who have spent a lot of time with dogs or are fans of Cesar Millan, you'll know that the first puppy that runs over from the litter and wants to play is often not the puppy you want to pick. It may seem more fun than the runt of the litter, but this lack of timidity is also often an indicator of a puppy already manifesting its willingness to challenge and its drive to be dominant. In humans, dominance or a willingness to challenge others is, along with social

status, one of the handful of characteristics we instinctively and automatically judge within seconds of first meeting new people.⁹⁴

Like many traits, neural plasticity ensures experiences throughout life can cause a person's willingness to challenge others to rise or fall. But we are born with a starting point willingness that is determined by our genes. Just as puberty expresses at a different age given different environmental conditions⁹⁵, so to our willingness to challenge others responds to environmental conditions. It is a common misunderstanding that testosterone drives violence. What few know is that testosterone levels selectively rise, generally after not before a person is victorious in a competition or altercation with a stranger but not friends.⁹⁶ If you take 20 of the meekest individuals and put them together on a desert island

⁹⁴ (Dominance) Dovidio, John F. and Steve L. Ellyson, "Power, Dominance, and Nonverbal Behaviour" Part of the series Springer Series in Social Psychology pp 129-149 Pattern of Visual Dominance Behaviour in Humans (1985) DOI: 10.1007/978-1-4612-5106-4_7

Mannes, Albert E., Shorn "Scalps and Perceptions of Male Dominance" Published online before print July 16, 2012, doi: 10.1177/1948550612449490 Social Psychological and Personality Science March 2013 vol. 4 no. 2 198-205

(Status) Nelissen, Rob M.A. and Marijn H.C. Meijers, "Social benefits of luxury brands as costly signals of wealth and status." *Evolution and Human Behaviour* Volume 32, Issue 5, September 2011, Pages 343–355 <http://dx.doi.org/10.1016/j.evolhumbehav.2010.12.002>

⁹⁵ Kristian Almstrup, Marie Lindhardt Johansen, Alexander S. Busch, Casper P. Hagen, John E. Nielsen, Jørgen Holm Petersen, Anders Juul. Pubertal development in healthy children is mirrored by DNA methylation patterns in peripheral blood. *Scientific Reports*, 2016; 6: 28657 DOI: 10.1038/srep28657 and

Deardorff, Julianna., et.al. "Father Absence, BMI, and Pubertal Timing in Girls: Differential Effects by Family Income and Ethnicity" *Journal of Adolescent Health* 2011 May; 48(5): 441–447. Published online 2010 Sep 20. doi: 10.1016/j.jadohealth.2010.07.032

⁹⁶ Jiménez M, Aguilar R, Alvero-Cruz JR. "Effects of victory and defeat on testosterone and cortisol response to competition: evidence for same response patterns in men and women." *Psychoneuroendocrinology*. 2012 Sep;37(9):1577-81. DOI: 10.1016/j.psyneuen.2012.02.011

Flin, Mark. et.al. "Male Testosterone Levels Increase When Victorious in Competition Against Rivals, but Not Friends. Team spirit and rivalries reflect how humans evolved to form coalitions." May 14, 2013 <https://research.missouri.edu/news/story.php?300> Article by: Jerett Rion

where there is competition for reproductive partners and resources, it will only be a matter of time before competitive interaction results in a victory for one and a loss for others, an associated increase or decrease in testosterone levels for the victors, the emergence of two or more distinct groups, and the emergence of social status and a hierarchy based on the nature of the competition.

Rationalization

"Brain: an apparatus with which we think we think." — Ambrose Bierce

We are built to automatically **Rationalize**.⁹⁷ Our brains are constructed to literally fabricate reasons and explanations for our choices and actions.

The drive to rationalize relies on several related and interconnected modules. We have specifically evolved to observe the behaviour of others and store their actions in long term memory when we observe they have had a decidedly positive or negative consequence.⁹⁸ We are driven to associate a cause and store

⁹⁷ Goldie, Peter. The Mess Inside: Narrative, Emotion and the Mind. Oxford University Press, Oxford, (2012).

Heine, Steven J. and Dehman, D. R. "Culture, dissonance, and self-affirmation," *Personality and Social Psychology Bulletin*, 23 (1997), 389-400.

Jones, Dan. "The argumentative ape," *New Scientist* (26 May 2012), 33-36.

LeDoux, Joseph. Synaptic Self, How our Brains Become Who We Are. Penguin Books, New York, (2003).

McRaney, David. You Are Not So Smart. Oneworld e-Publications. (2012).

Tenbrunsel, Ann E. and Messick, David M. "Ethical fading: The role of self-deception in unethical behavior," *Social Justice Research*, 17(2), (2004), 223-236.

⁹⁸ Ferrari, P. F., Bonini, L. and Fogassi, L. "From monkey mirror neurons to primate behaviors: Possible 'direct' and 'indirect' pathways," *Philosophical Transactions of the Royal Society Biological Sciences*, 364(1528), (2009) 2311-2323, doi: 10.1098/rstb.2009.0062

patterns or sequences of events to outcomes. Where we cannot observe the cause directly, we will nonetheless associate a cause communicated to us by others or entirely fabricated from other reassembled memories. Where we cannot readily observe a cause, do not have a pre-existing associated explanation, or an acceptable one is not offered to us by others, our brain will fabricate one by assembling associations with previously stored patterns that share characteristics. This drive to rationalize is regularly activated when we are prompted to explain our heuristic-driven behaviors and subconscious decisions after the fact.⁹⁹ It generates seemingly reasoned explanations for our actions, where the real basis of the action was simply a subconscious, automated, and patterned response.

In an early experiment revealing our brains need to confabulate or rationalize why we made a choice, subjects were shown two pictures of different faces. They were asked to pick which one they preferred. The subjects were then distracted, the picture the subject had selected was removed using slight of hand, and the subject then asked why they preferred the picture that remained. The face they

Macleod, Mairi. "You are what you copy," New Scientist, no. 2758, (2010), 40-43.

Meltzoff, Andrew N. "Infant imitation after a 1-week delay: Long-term memory for novel acts and multiple stimuli," Developmental Psychology, 24(4), (1988), 470-476.

Swaminathan, Nikhil. "Monkey see, monkey don't: Learning from others' mistakes," Scientific America Mind & Brain, January/February, (2011), online
<http://www.scientificamerican.com/article/monkey-see-monkey-dont/>

⁹⁹ Kelley, Harold H. and Michela, John L. "Attribution theory and research," Annual Review of Psychology, 31(1) (1980), 457-501.

Kurzban, Robert. Why Everyone Else Is a Hypocrite. Princeton University Press, Princeton New Jersey. (2010).

Nisbett, Richard E. and Wilson, Timothy DeCamp. "Telling more than we can know: Verbal reports on mental processes," Psychological Review, 84(3), (1977), 231-259.

actually liked less. Focusing only on the surprisingly large number of instances where the subject did not realize that the swap had been made, researchers would ask why the subject preferred the image. Subjects would promptly give a variety of reasons for why they liked the face that remained. One subject was shown a picture of a woman wearing earrings and another of women not wearing earrings. Her preferred image was the one of the woman NOT wearing earrings. After the secret swap, when she was asked why she liked the image that remained, the image of the woman wearing earrings, the subject answered, "I like the earrings." Follow on experiments have been conducted on consumer products and even political and moral issues. For the latter, subjects were given a questionnaire and asked to rate their level of agreement or disagreement with various statements. Their questionnaires were gathered, their results manipulated, the modified results were then handed back to the subjects and they were asked to explain why they supported a statement they had actually marked as something they did not support. Again, subjects would spontaneously rationalize and generate an explanation for a position they did not hold.¹⁰⁰

A huge number of the decisions we make each day are made subconsciously. Our brains use stored patterns to deal with a situation so as to preserve our limited conscious capacity for awareness and conscious thought related to things for which we don't have stored patterns. As a result, we are often only conscious of

¹⁰⁰ Johansson, Petter et. al. "Failure to Detect Mismatches Between Intention and Outcome in a Simple Decision Task." *Science* 310, 116 (2005); DOI: 10.1126/science.1111709

<https://www.psychodramaaustralia.edu.au/choice-blindness-%E2%80%93-lars-hall-and-petter-johansson>

or consider why we have taken an action if we are asked after the fact. As with memories which are reassembled every time we think about a past experience rather than stored as whole concepts, our explanations for why we took an action generated by a subconscious process are often only assembled if we are prompted. Why we say we took an action and why we really did are often very different, especially where the action was generated by our fast habitual system rather than pre-planned and consciously decided upon. Actions prompted by stored patterns or subconscious responses taken without conscious consideration will subsequently be rationalized and explained not in terms of the stored patterns that prompted them but rather in terms generated by this automated drive to rationalize.

Rationalizing draws on our innate consideration of the motivations, intentions and predicted judgements of others. Our compulsion to rationalize will engage our drive for fairness. We subconsciously and automatically consider what others may think. We have a subconscious compulsion to justify our actions. We automatically complete a pattern of cause and effect, an association of purpose and a reason for our action with its' outcomes to align the observed outcomes with our drive for fairness and with what was expected.

Adaptability

"The measure of intelligence is the ability to change."

– Albert Einstein

Our ability to **adapt** our stored patterns, to consciously or subconsciously abandon or alter one set of imprinted stimuli in favour of another has a substantial genetic component. Our adaptability trait specifically refers to the changeability of the preconfigured but experience dependent neural circuits relied upon by our drive traits and the information these circuits “imprint” on or store.

This is not general intelligence or memory but our ability to specifically alter the circuits initially linked by genetic instruction to our vestigial drive modules. Like the neural circuit linked to by the duckling’s “follow my parent” module and the image that it locks onto, these circuits appear to be less flexible than other neural areas. It is known that our information storage or general memory can be strengthened or expanded through practice. The adaptability or alterability of these innate experience dependent circuits, however, appears across a population and reflects a standard bell curve distribution for genetic traits. A small number have a very poor ability, a small number have tremendous ability and the vast majority of us have abilities within a very narrow range of the average.

A Partial List Only – There’s also serving others, creating, and more

“This is just a part of my nature and everyone’s nature, to offer oneself to serve at the critical moment when the emergency becomes articulate.”

- *Leonard Cohen*

This list of behavioural or decision influencing traits is not exhaustive. There are additional traits for which there is substantial evidence and even more that are strongly indicated but not proven.

We are all familiar with the “Fight or flight” response. This circuit is another good example of the how simple circuits have been incrementally built upon to produce increasingly complex behaviours. In mammals, the basic circuit has two associated components. The first is the circuit that is activated by stimuli associated with members of its own species. When this circuit is active, rather than simply fight or flee, a more complex series of pathways or circuit are activated resulting in five basic options, “Posture, mate, submit, fight or flight.” When dogs encounter dogs, lions encounter other lions and when people encounter other people, we universally posture, submit, fight or flee.

In addition to these primordial traits, many people clearly have a drive to create. Artists are the obvious manifestation of this, but employees of all description want to create, influence how things are done or have their ideas heard. There would also appear to be a drive motivating some to serve – sometimes to serve another individual or group and sometimes a seemingly abstract cause or purpose. It is unclear, however, if these are unique traits or a by-product of the combination of some subset of traits such as novelty, fairness, and status combined with learned aspects of culture. In either case it is important to note

that the above list only contains traits fundamental to our discussion of innovation and societal scale phenomena.

PART 4: ALL ABOUT GENETICS AND FREE WILL

“There’s no such thing as free will.

But we’re better off believing in it any way.”

So read a 2016 headline in The Atlantic magazine.¹⁰¹ Earlier in the same year, an article appeared in Scientific America entitled “Free Will: We're convinced that it exists, but new research suggests it might be nothing more than a trick the brain plays on itself.”¹⁰²

Stephen Cave wrote in the Atlantic article “Many scientists say that the American physiologist Benjamin Libet demonstrated in the 1980’s that we have no free will.” Libet and others have shown that we begin to activate muscles in response to a visual stimuli or that areas of our brain appear to give instructions before our conscious brain is activated let alone could make a decision to act. “The conscious experience of deciding to act, which we usually associate with free will, appears to be an add-on, a post hoc reconstruction of events that occurs after the brain has already set the act in motion....If we could understand any individual’s brain architecture and chemistry well enough, we could, in theory, predict that individual’s response to any given stimulus with 100 percent accuracy.” Other experimenters have proceeded to do just this, predicting the

¹⁰¹ Stephen Cave, “There’s no such thing as free will” The Atlantic June 2016
<http://www.theatlantic.com/magazine/archive/2016/06/theres-no-such-thing-as-free-will/480750/>

¹⁰² <https://blogs.scientificamerican.com/mind-guest-blog/what-neuroscience-says-about-free-will/>

choices of subjects as much as 4 seconds before fMRI scanning indicated they had made the decision or were consciously aware of the choice.

If you are like me, your response to such claims is “Rubbish!” Fundamental to who we are is a belief that we control our own decisions. Whatever the evidence, such a conclusion is at total odds with our perception of life and worse – we do not want to believe it. For the same reasons, people have always resisted the idea that human behavior is a product of our genes. For most, the idea that we control our own choices, that our choices and our lives are not predetermined, is fundamental to who we are and our sanity. Thankfully, as we will see, you would be right in proclaiming “Rubbish!” The evidence clearly supports the existence of free will.

In considering these drive traits, their impact, and the universally shared outcomes they generate, however, we need to both acknowledge the reasons a genetic origin for human behaviour has been resisted for so long and the reality that free will and genetic origins for behaviour are not mutually exclusive. To appreciate the ramification of this duality and the impact the genetic origins of certain behaviours have, we must, once again, correct several common misperceptions about the nature of genetic evolution and acknowledge several barriers to our objectivity.

First our free will, our seemingly self-evident ability to make rational choices coupled with the tremendous cosmetic variation in behaviour over the course of an individual’s life and between individuals, have long fuelled resistance to any

proposal that our behaviours might have a genetic basis. The evidence, however, is clear that our behaviours are largely rooted in our genes. Unlike the basic circuits in animals that produce specific actions in response to specific situations or patterns of stimuli, in humans these circuits have an added level of complexity. Rather than dictating specific behaviours our drive traits motivate the pursuit of relative outcomes. The specific cosmetic details that define or correspond to these relative outcomes are learned or imprinted on and thus vary between cultures, generations, and even social groups. Also contrary to behaviour in many animals these genetically originated motivational drives co-exist with and can be overridden by free will and learned habits. This gives the impression of tremendous variation in behaviour where in fact there often is little or none.

Second, our perception of what a “behaviour” is often obscures our objective assessment and understanding of it. Think of any behaviour - eating, sex, socialising - and you will almost certainly think of the purpose behind it rather than just the specific sequence of actions that comprise it or the pattern of stimuli that trigger it. As we will see, to objectively understand the mechanisms of behaviour we must set aside the idea that all behaviour is purposeful.

Evolution is blind. New variations of traits occur without purpose. Those that provide a reproductive benefit survive. As do many that simply don't inhibit reproduction or survival. The same is true of our behavioural traits.

Third, the same laws of evolution, inheritance and expression that govern all other genetic traits govern motivational drive traits. These laws, contrary to

what many expect, explain much of the perceived variability in behaviour – the very same variability that is often cited as evidence against a genetic origin for behaviours.

Let's take a closer look at free will.

Free Will, Habits, Heuristics and Behavioural Variety

"[Research] suggests that what we think of as free will is largely an illusion; much of the time, we are simply operating on automatic pilot, and the way we think and act - and how well we think and act on the spur of the moment - are a lot more susceptible to outside influences than we realize."

- Malcolm Gladwell

"Free will is an illusion. People always choose the perceived path of greatest pleasure."

- Scott Adams

Despite the occasionally provocative headline and some interesting research, there is certainty that we have conscious free will and our "slow" decision system is capable of non-reactionary self-controlled rational decision-making.¹⁰³ All research to date suggesting otherwise does not in fact prove that we do not have free will. Rather, it simply proves that we do have a highly efficient fast or reflexive decision system that largely operates subconsciously in a variety of

¹⁰³ Foka-Kavaliaraki, Yulie and Hatzis, Aristides N. "Rational after all: Toward an improved theory of rationality in economics," Revue de Philosophie Economique, 12(1), (2011), 4-51. Available at SSRN: <http://ssrn.com/abstract=1692441>.

Jensen, Michael C. "The nature of man," Journal of Applied Corporate Finance, 7(2), (1994), 4-19.

situations. Like so many other examples, these provocative conclusions have captured headlines and status for the researchers in question but represent a grossly incomplete picture.

As discussed earlier, we have a fast system, a slow system, and a variety of genetically dictated physical neural modules that, unless we have specifically trained ourselves to override them, govern or substantially influence aspects of our behavior and choices. But, our genetically dictated behavioural traits both co-exist with and specifically prompt the use of conscious rational assessment and choice in a variety of circumstances innately determined, learned and wilfully chosen.

While there is insufficient evidence to understand how consciousness arises from the physical structures and electro chemical processes of the brain, the evidence for freewill, conscious thought and rational choice is so strong it would be silly to argue with it. Contrary to the idea that we are entirely limited by pre-stored behaviours and learned mental shortcuts, or blindly controlled by psychological contagions as popularized by Malcolm Gladwell and Robert Shiller, it is clear that humans are explicitly capable of pushing virtually any decision into conscious processing - especially with practice.¹⁰⁴

¹⁰⁴ Duhigg, Charles. The Power of Habit: Why We Do What We Do in Life and Business. Random House, New York. 2012.

Kahneman, Daniel. Thinking, Fast and Slow. Published by Farrar, Straus and Giroux, New York, Now York. 2011.

Ambiguity or the unexpected often pushes things into conscious assessment, as can the use of abstract symbols and the prior choice to push all decisions of a type into conscious consideration.¹⁰⁵ Critically, conscious assessment enables an override. With practice, self-awareness and a conscious choice to specifically consider types of decisions allows all but the most rudimentary, or physically restricted reflexes, to be overridden.

While there is irrefutable evidence showing genes and our fast decision system impact our behavior, specifically that our motivational drive traits, character types and genetically dictated neural structures influence our decision processes, the simple reality is that these influences are not strictly deterministic. Every time we initiate an experiment, every time we do our taxes or pay our bills, we are demonstrating our capacity for free will.

Rather than relate study after study confirming that we are capable of exerting free will and, unlike our primate cousins when looking at food, overriding heuristics and instinct, let us consider just three dramatic examples.

First, let's look briefly at the "happiest man alive", Matthieu Ricard. A distinguished academic with a Ph.D. in biochemistry, Dr. Ricard moved to Tibet and became a Buddhist monk in the early 70's. After more than two decades

While we can choose to consciously consider anything, generally speaking, most of us don't. Daniel Kahneman has convincingly shown that most of us make the majority of each day's decisions subconsciously based on just such stored mental short cuts, habitual patterns of stimuli and response or heuristics.

¹⁰⁵ Duhigg, Charles. *The Power of Habit: Why We Do What We Do in Life and Business*. Random House, New York. 2012.

devoted to meditation, Dr. Ricard has taken part in a variety of research programs including studies on happiness conducted by the University of Wisconsin-Madison. The consensus conclusion of these studies is that those who choose to achieve greater happiness, and use meditation to do so, succeed. Beyond this, sustained meditation generates physical neural changes enabling measurements of happiness and contentment far beyond the scale normally encountered with average research subjects. In short, Matthieu Ricard made a series of conscious choices. His choices have not only enabled him to achieve sustained levels of happiness and satisfaction but appear to have produced physical changes to his brain aligned with those chosen outcomes. These studies paradoxically show both the continued role of our genetically determined physical neural structures and our ability to exert free will and through conscious choice and effort achieve them.

Second, while less well researched by academia, let us consider the no less dramatic performance of U.S. military training. In particular the general combat training used by the Army and Marine Corp and advanced training given to Special Forces such as the Navy Seals, Army Rangers, and Marine Snipers.¹⁰⁶

We have a genetic inhibition against killing.¹⁰⁷ Throughout the history of

¹⁰⁶ Couch, Dick. The Warrior Elite: The Forging of SEAL Class 228. Three Rivers Press, New York, Reprint edition (January 28, 2003).

¹⁰⁷ Grossman, Dave. On Killing: The Psychological Cost of Learning to Kill in War and Society. Back Bay Books. New York. 1996.

warfare, until relatively recently, killing was the exception not the norm.¹⁰⁸ As late as World War II, 80% of front line combat troops did not fire their weapons at the enemy. The U.S. military's leading expert estimates the norm is 2% of people have little or no compunction against killing. Between 10% and 20% can overcome their inhibition or will overcome it much more readily than others. 10% will not kill another even in self-defense. During a fire fight the remaining 70% will fire above the heads of their opponents, will fire without aiming (to look like they are participating with little risk of actually killing anyone), or will find other needed tasks with which to engage themselves (taking wounded from the battlefield, reloading weapons, relaying messages, etc.). Yet through specific training programs coupled with the education of soldiers on how their unit's – and their friends - survival is served by adopting certain heuristics, this 80% non-participation rate was reduced to 5% to 10% by the end of the 20th century. This represents both conscious choice on the part of the all-volunteer forces choosing to go through the training and the power of learned heuristics (ingrained through training) to overcome instinct.

The conscious choices made by the members of military Special Forces are even more revealing. Through a combination of practice and will power, the men and woman of special forces the world over, regularly override reflex, instinct, pain and fear. The situations they find themselves in during training and in the real

¹⁰⁸ Keegan, John. A History of Warfare. Random House. New York. 1993

Grossman, Dave. On Killing: The Psychological Cost of Learning to Kill in War and Society. Back Bay Books. New York. 1996.

world are totally unique. Unlike Dr. Ricard and the ingrained heuristics built up over time in the regular army, the primary mechanism learned in Special Forces training is self-awareness and conscious self-control in the face of these unique situations.¹⁰⁹ They learn to push decisions of virtually any type into their conscious decision making system.

For example, they will make a conscious choice to lower their heart rate so as to aim more accurately even as buckets of spiders are dumped upon them. Crawling under their uniform and over their faces, they are still able to resist flinching, reduce adrenal response, further lower their heart rate and stay focused and motionless (ready to squeeze the trigger and accurately hit their target). They are able to override natural instincts and stay focused on a task while ten feet under water having their breathing apparatus and scuba mask removed. They regularly override pain thresholds to continue moving and running while carrying hundreds of pounds of gear long after most of us would have given up in exhaustion. They are able to do this not just because of physical conditioning. Ultra-marathon runners, Australian Rules football players and others would regularly be considered more fit. Instead, they succeed because they consciously choose to keep going. They choose to push decisions normally reserved for primal circuits into their consciousness where they exert free will (noting that they often use any number of consciously selected mental tricks to assist in achieving this).

¹⁰⁹ Couch, Dick. The Warrior Elite: The Forging of SEAL Class 228. Three Rivers Press, New York, Reprint edition (January 28, 2003).

Research on breaking bad habits and forming new good ones also reveals more detail on the neurological process of choosing to make a change. For most of us, specifically selecting a type or category of decision that we will push into consciousness for determination rather than letting it be dealt with by a stored heuristic (innate or learned), is the first step in forming a new habit or breaking an old one. The fact that we are universally able to do this is evidence that free will is the ultimate arbiter of our mind and behavior.

The philosophical debate about what is reality and what is perception masking as reality aside, humans can choose to override instinct, habit and even our natural state of the fast decision system using heuristics or mental shortcuts. While it is hard, it would appear to work like any other muscle. The more we practice and build that muscle over time and through regular use, the greater our will power and conscious rational free will becomes.¹¹⁰ Simply put, free will is a reality and the most powerful if sometimes least utilized decision making force.

So, if we have rational free will, how do our genes and these byproducts of evolutionary and genetic processes drive societal scale phenomena like the tech stock bubble of 2000, the Tulip mania of the late 1630's, or fads such as the craze for Doc Martin shoes, Cabbage Patch dolls, the massive success of the Harry Potter books or A Brief History of Time by Stephen Hawking (certainly the

¹¹⁰ Noting that many researchers suggest that our will power reserves function much like a bucket. Constant use will drain the bucket and rest in the form of time where will power is not necessary is required to refill the bucket. Further, research shows avoiding temptation or situations that require the use of will power is an easier and more reliable way of changing a habit.

record holder for the book which has sold the most copies never actually read), or the explosive take up of Hotmail, Facebook and the iPod?

While heuristics and learned shortcuts are frequently used,¹¹¹ our motivational drive traits influence how we perceive risk, how we perceive value and what we value as well as influence both the formation of all learned heuristics and our conscious rational decisions.

Objective Analysis of Behaviour and the Perception of Purpose

Now, lets talk about sex. Or at least our perception of behaviour and its connection to a perception of purpose with sex as the example.

Most would agree that, at some stage in life, nearly all humans have an innate sex drive, an inherent desire to pursue a sexual release. But what is sexual release? As mentioned, our very perception of what the word “behaviour” means and the specific words used to describe behaviours often interfere with our objective observation and understanding of it. We invariably think about the perceived purpose of behaviour and its outcome rather than the stimuli prompting it and the associated or paired response. Many presume that we have a drive to reproduce rather than simply a drive for sexual release. We perceive the logical purpose of reproduction as the basis for the behaviour’s existence.

¹¹¹ Kahneman, Daniel. Thinking, Fast and Slow. Farrar, Straus, and Giroux, New York, (2011).

Further, our own experience with the concept of sex has a specific form. For the majority of us it is defined by intercourse between two people. Many find it difficult to imagine, let alone accept, that other people have a very different concept of sex. Some pursue intercourse between a person and a car (Mechanophilia) or with a tree (Dendrophilia). Yet these preferences not only occur, a vast array of preferences (albeit less dramatic) occur in a fashion consistent with a genetic origin for preference and in accordance with the rules governing the interaction of neural circuits.

In the case of our sex drive, reproduction is purely a by-product of the evolved behavioural drive to pursue sexual release with “others” who have certain characteristics.

The simplicity of these circuits in most animals is evidenced by one experiment involving turkeys where in males were readily triggered into mating behaviour by a wooden spoon decorated with a few small pieces of coloured cloth. This rudimentary imitation nonetheless generated the right stimuli pattern to trigger the male turkey’s circuits – literally. The popularity of porn makes it clear that humans are not as dissimilar as we would like to think.

Individuals who carry the sex drive trait have been so successful in producing offspring who then also carry the trait that it has become virtual ubiquitous. But, while we may choose to have children or chose not to have them by using birth control, our drive to have sex is not a drive to reproduce. It is simply a drive for sexual release that has become nearly universal because it happens to produce

offspring. As Richard Dawkins put it “the watchmaker is blind.” Purpose does not drive the trait or behaviour’s existence. The drive as a trait is the product of random mutation. Objectivity about the realities of what generates a behaviour trait versus our perception of its purposeful existence and its cosmetic details is critical for our understanding.

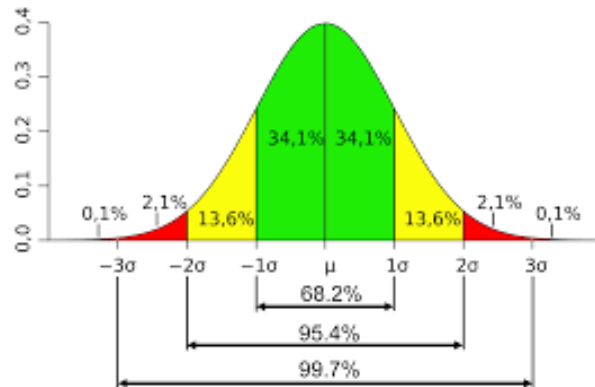
Our behavioural drive traits for status, mastery, altruism, etc. don’t exist because we purposefully sought the benefits they deliver. Rather, they have been perpetuated because the individuals and groups containing individuals who have these traits have been more successful at reproducing offspring who in turn survive to have their own offspring.

Genetic Traits Manifest Across a Spectrum

As mentioned earlier and contrary to common perception, variation is a standard aspect of genetic traits. Like other traits, our motivational drives manifests across a spectrum. Further, and again contrary to the general understanding, many genetic traits are not a “you have it or you don’t” propositions. Just as human height ranges from as little as a meter to well over two meters, so too an individual’s desire for sex, status, novelty, or mastery can range from virtually non-existent to almost all encompassing.

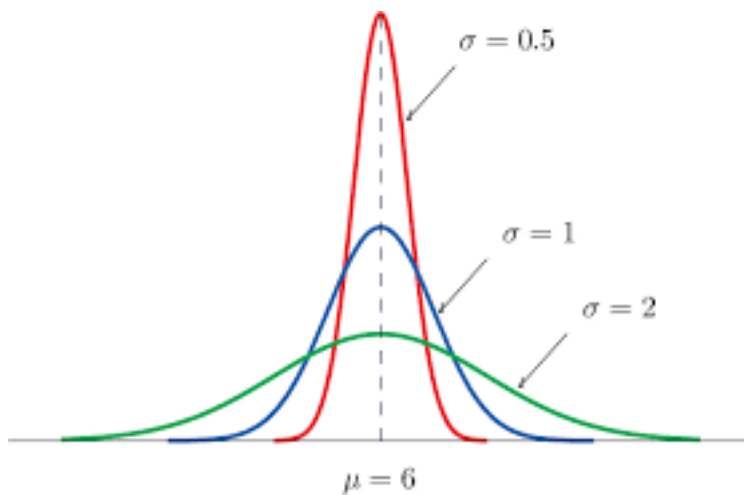
Like height, individuals will manifest different variations of these genetic drive traits and thus express the associated motivational drives differently. The relative proportion of each form of expression conforms to a bell curve

distribution within each population. A small number of people will express each trait at each of its extremes and most will be near the average.

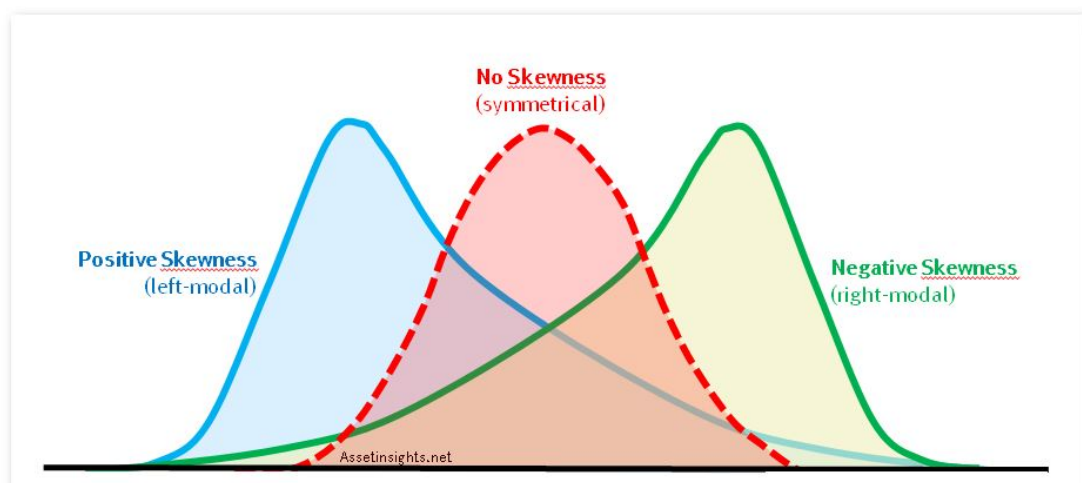


At one end of the spectrum for the genetic drive to fornicate are people like the Sheldon character in the popular TV show the Big Bang Theory. Sheldon is an asexual individual with no interest whatsoever in sexual behaviour. At the other end of the spectrum are so called “sex addicts.” These include real life individuals such as Russell Brand (the English comedian and ex-husband of Katie Perry), Tiger Woods (the professional golfer), Kari Ann Peniche (it’s not just men), and Kendra Jade Rossi (both of whom appeared on Dr. Drew’s Celebrity Rehab TV program). In the middle are the vast majority of the rest of us.

For traits that deliver substantial reproductive benefits, the bell curve of variation will be tall and narrow. For traits that are associated with less survival or reproductive pressure the curve will be shorter and wider.



It may also be forked into two curves, one representing a dominant trait suited to current conditions and another for a recessive trait that provides superior survival or reproductive benefits in a different set of reoccurring conditions.



While our expression of some traits may move from their starting point at birth as the result of experience or environmental factors during our lives, we all exhibit each drive trait on a common spectrum and the proportion of each society at each starting level of expression falls into this bell curve distribution.

Given every group or population over a minimum size will include individuals across the entire spectrum, each group will contain at least a few members who are at each extreme, some consumed by a need to pursue status and some who are seemingly not interested in it at all. Every group will contain some who seek novelty or mastery more than others, and a majority who are near average in their pursuit of each.

Genetic Traits Manifest At Stages

In addition to manifesting across a spectrum from high to low, our drive traits manifest in a specific sequence. Different traits manifest for the first time and manifest to different degrees at specific stages in our development. Again, contrary to common perception, our genetic coding is not finished manifesting at birth. Just as a caterpillar turns into a butterfly, humans manifest distinct stages of development defined by the expression of genetic traits well after birth.¹¹² Recent studies have shown, for example, that the male brain does not finish developing until approximately 25 to 28 years of age. In the case of our sex drive, from birth to somewhere around 10 to 13, we have no drive for sexual release at all. At puberty, the drive emerges and peaks for woman between 25 and 38 and

¹¹² Douglas, Kate. "10 mysteries of you. 4 teenagers," New Scientist (8 August 2009), 30-31.

Geary, David C. and Bjorklund, David F. "Evolutionary developmental psychology," Child Development, 71(1) (2000), 57-65.

Geary, David C. and Huffman, Kelly J. "Brain and cognitive evolution: Forms of modularity and functions of mind," Psychological Bulletin, 128(5), (2002), 667-698.

Nicholls, Henry. "Quantum evolution," New Scientist, 2794. (8 January 2011), 28-31.

for men between 17 and 28. Generally, it then declines. For some it falls off rapidly and to zero. For others it falls off only slightly and never ceases. The age or phase of development in which it expresses, in which it declines and its' magnitude in each stage are nonetheless substantially a product of our genes.

Like our sex drive, our other motivational drive traits manifest for the first time and peak at distinct stages. Matthew Lieberman writes:

*"...neuroscience research indicates ... there are multiple social networks in our brains, sets of brain regions that work together to promote our social well-being... These networks each have their own strengths, and they have emerged at different points in our evolutionary history moving from vertebrates to mammals to primates to us, Homo sapiens. Additionally, these same evolutionary steps are recapitulated in the same order during childhood."*¹¹³

Our drive to be social and for group belonging outside our immediate family emerges after 5 to 8 years of age, peaks during or just following adolescence, then plateaus or continues until well past middle age. Our pursuit of status typically emerges with puberty, and so on. During young adulthood, the average

¹¹³ Lieberman, Matthew D. Social: Why our brains are wired to connect. Oxford University Press, Oxford. 2013

expression of the drives for status and novelty and our willingness to challenge others are higher than during the rest of our lives.¹¹⁴

The variable timing and changing magnitude of expression within and across individuals at different stages in life is another reason for both the observed differences within and between individual behavior and the reluctance of many to ascribe a genetic origin to behavior. Despite these variations and the vast cosmetic differences in the outcomes pursued, all populations are observed pursuing status, novelty, mastery and more.

Genetic Traits Are Influenced by Environment – Our Drives are Epigenetic

In addition to manifesting across a spectrum and to varying degrees at distinct stages, many of our drive traits are epigenetic.¹¹⁵ That is to say, the genes manifest differently in response to specific environmental conditions. As it turns out, having the gene for a trait doesn't necessarily mean you will manifest it. The reality is more subtle and complex. You may have the genes but only manifest the trait if exposed to certain environmental conditions, or manifest the trait to a different degree or at a different age given different environmental conditions.

¹¹⁴ Kotler, Steven. "Training the brain of an entrepreneur," Forbes Magazine. (15 May 2012). <http://www.forbes.com/sites/stevenkotler/2012/05/14/training-the-brain-of-anentrepreneur/>.

¹¹⁵ Pray, L. A. (2004, July 5). Epigenetics: Genome, meet your environment. The Scientist, 18, p. 14. / Douglas, 2009 / Geary & Bjorklund, 2000 / Geary & Huffman, 2002 / Nicholls, 2011

Locust provide an extraordinary example of this. Under normal conditions, they are a fairly standard and solitary insect. When they come into close contact with each other, specifically their hind legs touch, they go through a transformation in both physical form and behaviour. Silent genes carried since birth are triggered and cause a Jekyll and Hyde transformation. They grow dramatically in size and change from creatures that prefer to live in isolation to gregarious swarming plagues. These changes are so dramatic that many biologists not familiar with the locust would view a before and after example and be certain they were entirely different species. In fact, as recently as the 1920's it was thought the same creature in the two different states were from two different species.

The same is true of many human traits. The age of puberty for children is, for example, predictable based on the age their parents went through puberty. Male children, however, will go through puberty slightly later than expected when in environments with a large number of potentially competing older males. Female children go through puberty slightly earlier if they live in a household without a father.¹¹⁶ The inherited genes that determine when puberty will occur are present and fixed at birth. These variations are therefore caused by the interaction of the genes with the environment causing the genes to express

¹¹⁶ Deardorff, Julianna., et.al. "Father Absence, BMI, and Pubertal Timing in Girls: Differential Effects by Family Income and Ethnicity" *Journal of Adolescent Health* 2011 May; 48(5): 441–447. Published online 2010 Sep 20. doi: 10.1016/j.jadohealth.2010.07.032

differently. One study even suggests that one in seven gay men owe their sexuality to being born into a family with many older male siblings.¹¹⁷

The expressions of many of our genetic drives are impacted by environmental factors. And it is not just the age or phase at which a trait expresses. Just like chimpanzees and other primates, human males go through physiological changes when they become a group leader. High testosterone does not cause someone to challenge others. Rather, an individual's testosterone levels rise when preparing for and after winning competitive events against out group members or individuals seen as challenging for status (such as tennis and chess tournaments). "Based on these recent findings, we argue that the role of testosterone in human social behavior might be best understood in terms of the search for, and maintenance of, social status."¹¹⁸ Again, the genes for prompting testosterone production are present and fixed at birth. How they express is determined by interaction with the environment.

From an evolutionary standpoint, this makes perfect sense. If we consider the drives to pursue relative status and to pursue opportunities to fornicate, our success in pursuing relative status produces increased testosterone, which in

¹¹⁷ Blanchard, R. 2001. Fraternal birth order and the maternal immune hypothesis of male homosexuality. *Hormones and Behaviour* 40:105-14.

Ridley, Matt. Nature via Nurture: Genes, Experience and What makes us Human. Harper Perennial, London. 2004.

¹¹⁸ Eisenegger, Christoph, Johannes Haushofer, and Ernst Fehr. "The role of testosterone in social interaction." *Trends in cognitive sciences* 15.6 (2011): 263-271.

Newman, Matthew L., Jennifer Guinn Sellers, and Robert A. Josephs. "Testosterone, cognition, and social status." *Hormones and Behavior* 47.2 (2005): 205-211.

turn produces an increased drive to fornicate and thus more children with the trait for those who are successful. As social creatures, if testosterone and sex drive were fixed at birth or only increased in response to physical confrontations for pecking order our group as a whole would be weakened by constant fights.

By instead making testosterone and reproductive opportunity dependent on a variety of factors including relative status, mastery or social influence, the group is not weakened by a constant loss or injury of members and at the same time a superior more dynamic and flexible evolutionary benefit is achieved. Unlike with physical traits that deliver a survival or reproductive benefit which can only spread over the course of many generations and have a proportional impact on a group, the spectrum of trait expression coupled with the relative nature of the outcomes each trait motivates people to pursue results in a scale invariant influence for each trait on every population. No matter how large a group, or how many subgroups it is comprised of, a small number of individuals will manifest each drive to a greater degree than others in each group.

In the case of status, whether a group contains 20 people or 200, high status can only be had by a few but will always be pursued even within a group assembled from the 10 meekest or most passive individuals. The shared or universal nature of these traits, coupled with our instinctual drive to consider how others will perceive our actions, has a scale invariant influence on the behaviours and choices manifest by all groups of people irrespective of size. In addition, behaviours that deliver increased status, mastery, or useful knowledge as the result of a pursuit of novelty, social cohesion, etc will be dynamically generated

over time, will spread through a population, and will deliver benefits in a way that is freed from the limitations of physical reproduction.

PART 5: OF PATTERNS, PARADIGMS AND PERCEPTION – OR HOW FORM

DICTATES FUNCTION

Imprinting, Interaction and Variable Thresholds Produce Cosmetic Variation

In addition to variation caused by the spectrum of expression and the interaction of genes with the environment, the

focus of our drive traits are subject to extraordinary cosmetic diversity.

Much the way a duckling imprints on a pattern of stimuli corresponding to its' parents, or mistakenly on a small child or even a dog, many of our behavioural drive traits are associated with physical neural structures that imprint on observed environmental stimuli having specific predefined characteristics.



While the drive for sexual release is nearly ubiquitous (for people of certain ages), our preferences for how we each seek sexual release are influenced by a variety of observed factors. The same is true for our drive for status, for a role, and for mastery. These drive trait modules are linked to and can be thought of as sharing circuits that are designed to imprint on specific types of observed stimuli.

Ducklings won't imprint on just anything. I don't think anyone has ever tested an elephant, but a duckling won't imprint on a balloon that blows by, a cricket or other ducklings. Ducklings will only imprint on things that have a specific set of features and thus generate a pattern of stimuli with specific characteristics that in turn trigger a genetically predetermined neural circuit. At birth the circuit is present and primed but empty. It is an experience independent neural structure, with a component hard wired to be experience dependent to a specific pattern of stimuli. The first time a matching set of stimuli occurs, so long as a minimum degree of interaction occurs, the observed stimulus fills in the blanks and is stored. In the case of a duckling, the first thing above a certain minimum size, that moves in a non-cyclical fashion, that make sounds and is experienced during a very specific time window (13-16 hours after hatching). The absence of any one of these characteristics or no encounter during the critical time window will prevent the circuit from being activated and prevent imprinting from ever occurring. But, anything that has these characteristics, even something very different from an adult duck, will trigger the circuit and be imprinted upon (including a cardboard box with a noise maker placed inside set upon a moving remote control toy train).

The same is true in humans for the module that inhibits incest. Linked to our facial and voice recognition circuits is a cluster of neurons that specifically record information on individuals we interact with a great deal as infants and toddlers and thus consider 'family.' Studies have shown the majority of people will not feel any sexual attraction to their brothers, sisters, or other children they were raised with (such as in a Kibbutz) when they have grown up together (the

Westermarck effect). But tests done on brothers and sisters raised apart from infancy show this instinctual inhibition is absent.¹¹⁹

What we view as cute, attractive or beautiful is also in part a by-product of the combination of inherited modules and learned experience. Some characteristics are predetermined by our genes and fixed while others are imprinted on.

Universally we view faces and bodies that are symmetrical as more attractive than those that are not. We view certain curvatures, ratios of shoulder width to waste and hip, ratios of distances between key points on the face, the distance between the eyes for example relative to the distance between the eye and the tip of nose, as more beautiful than those that deviate further from these fixed, genetically determined ratios.

Other characteristics are a product of our experiences at key stages in life. Do we prefer blonds or brunettes? Do we view leather as alluring or business suits? These cosmetic details are imprinted on based on our perception that they confer status, that others find them desirable, or simply because we observed them at a point in time when our sex drive or positive emotional circuits were active. Critically, many of our drives are associated with both genetically predetermined or innate characteristics and cosmetic or experience dependent characteristics that the drive circuits are specifically designed to imprint upon.

¹¹⁹ [Add] Nature vs Nurture. / Incest inhibition circuit trait.

Our drive for status provides a great example of this. For most, what confers or is associated with status is based on observations at key lifecycle stages corresponding to points in the expression of the status-drive trait itself. Thus the cosmetic aspects of the outcomes motivated by this drive and pursued by individuals can vary from culture to culture, peer group to peer group, and generation to generation but the drive and pursuit of relative status does not.¹²⁰

Among the Tarahumara people of northern Mexico, status is determined by who can run the furthest or for the longest period. For the adult population of New York or London, the car you own or your profession confer status. Amongst teenagers at an average high school, it may be based on who wears the latest Nike shoe or who performs best at a drinking game. In each group, the cosmetic characteristics of status are radically different. But in all cases competition for status is the norm.

Some of what confers status is innate, such as beauty – the proportionality of a person's features and visual indicators of health – or their physical stature and athleticism. Some of what confers status is developed such as that associated with specific roles within a group or society, fame or the number of social connections a person is known to have. Some is learned and symbolic such as the ridiculously large white wigs of 18th century Europe or the deference shown by

¹²⁰ Barkow, J.H. (1989). *Darwin, Sex, and Status: Biological Approaches to Mind and Culture*. Toronto, ON, Canada: University of Toronto Press. (1989)

family, friends and community toward other specific individuals, groups or symbols.

The cosmetic details of what we perceive as conferring relative status will also vary at distinct stages in life as a result of the sequential expression of our other genetic traits.¹²¹ In all populations and cultures, however, individuals are observed to pursue relative status.¹²² And, status is amongst just the handful of characteristics including sexual orientation, trustworthiness, intelligence, dominance, and promiscuousness that we universally, but subconsciously, draw conclusions about within milliseconds of first meeting a person.¹²³

The status circuit relies on our relative comparison circuit and the circuits that enable us to consider what others are thinking. Like the duckling, it also links to another pattern or circuit of neurons that has specifically evolved to store or in this case link to circuits that store stimuli patterns we have observed as delivering status within our groups. Just like the duckling imprinting, hopefully, on its mother - this connected set of neurons is preconfigured to create links only to things with certain specific characteristics. As such, our drive for status is only limited by what a person is exposed to by their family, peers and society and those things which we observe or perceive as conferring status to others or ourselves. But the circuit and its function are a dictated genetic trait.

¹²¹ Maynard, Douglas W. "*On the functions of social conflict among children*," American Sociological Review, 50. (1985), 207-223.

¹²² Brown, Donald. Human Universals, McGraw Hill, New York, (1991)

¹²³ People Decide These 8 Things About You in Just Seconds _ Larry Kim _ Pulse _ LinkedIn.pdf (break this down and site individual sources for each item)

Pattern Storage & Pattern Response – The Foundation Building Block of All Brains,
The Inequality of Facts, the Influence of Culture and the Importance of Paradigms

"The limits of my language mean the limits of my world." –Ludwig Wittgenstein

These memory or storage neurons, both those linked to by our genetically dictated drive trait modules and those comprising our dynamic or entirely experience dependent neural mass - all have the same prehistoric origin. Despite their different roles, their structure and how they function is virtually identical. Understanding how these universal building blocks impact our perception is of equal importance as understanding our drive traits when explaining our choices and resultant behaviours.

Despite the differences between the Nematode worm and a typical human, neurons in both are virtually identical and our nervous systems are surprisingly similar. So much so Shawn R. Lockery, a professor in the University of Oregon's Department of Biology and member of the Institute of Neuroscience, states "You can find the same neuron in any animal you look into and learn to understand how individual neurons function."¹²⁴

This reality is just one of the common misconceptions we must first address to understand how the physical structures of our brain impact our perception. Next is the reality that while there are specialized sensory nerves, the rods and cones in our retinas for example, the typical nerve cell is virtually identical to the

¹²⁴ <https://around.uoregon.edu/content/nematode-brains-offer-window-human-sleep-problems>

typical neuron. As a result, the majority of the nerves and neurons in our systems function individually and collectively in the same way and our nervous system and brain should be considered as a single holistic system not two separate systems tradition suggests (one for sensing things and one for processing inputs and making decisions).

Second, nerve or neuron cells are not the tiny little things that generally come to mind. Individual nerves or neurons can stretch up to a meter in length.

Individual modules or circuits in the brain can include neurons and direct linkages to other neural circuits or storage patterns in the furthest or most remote areas of the brain. Our neural circuits are not geographically or logically limited.

Third, circuits or decision influencing modules are often composed of cells throughout the body. There are as many neurons in a human's gastrointestinal track as there are in a typical house cat's brain. While our gastrointestinal track might be smarter than the average cat, it is primarily just a more complicated collection of the same pattern sensing / pattern response circuits found in the Nematode. It is fully automated unless we specifically train ourselves to override the circuits that comprise it – which while difficult - some people do. Consider real life individuals such as Stevie Starr and Hadji Ali or fictional characters such as Hannibal Lecter (from the movie Silence of the Lambs) who are able to swallow things and regurgitate them at will, research on mindfulness showing

people have a surprising capacity to exert a conscious influence over their heart rate,¹²⁵ or even research on people who can control their body temperature through meditation.¹²⁶ The key take away here being that “thinking” does not occur exclusively in the brain but in many cases is a dynamic function of all sensory nerves and neurons active at the time or interlinked with the circuits and modules involved in a decision. Our confidence level and decisions on a basketball court, for example, can be subconsciously influenced by minor hunger sensations from our stomach and the price we are prepared to pay for something will be influenced by unrelated emotions triggered by watching a sad video prior to the purchase decision.¹²⁷

My favourite example of the role our extended nervous system plays is documented in research on people who have had facial Botox treatments. We empathise by mimicking facial expressions and flinch when we see someone else get hit just as if we had been hit. But our ability to empathise relies on the nerves in our faces as much as on the circuit in our brains. People who have facial Botox treatments have a diminished ability to understand how others are feeling.¹²⁸

For example, people who have had Botox score lower on empathy measures

¹²⁵ Delizonna, L.L., Williams, R.P. & Langer, E.J. “The Effect of Mindfulness on Heart Rate Control” *Journal of Adult Development* (2009) 16: 61. doi:10.1007/s10804-009-9050-6

¹²⁶ Kozhevnikov M, Elliott J, Shephard J, Gramann K (2013) Neurocognitive and Somatic Components of Temperature Increases during g-Tummo Meditation: Legend and Reality. *PLoS ONE* 8(3): e58244. doi:10.1371/journal.pone.0058244

¹²⁷ [ADD][reference to sad videos impacting price people are prepared to pay]

¹²⁸ David T. Neal, Tanya L. Chartrand. “Embodied Emotion Perception - Amplifying and Dampening Facial Feedback Modulates Emotion Perception Accuracy” Volume: 2 issue: 6, page(s): 673-678 Article first published online: April 21, 2011; Issue published: November 1, 2011 DOI: <https://doi.org/10.1177/1948550611406138>

after the treatment then before. By deadening the facial nerves that form part of these circuits, Botoxing stops their effective participation and measurably diminishes the effectiveness of the associated modules in whole.

As previously highlighted, genes in all living things control complex physical structures not simply the growth of individual cells. In the case of animal behaviors, these structures are comprised of specific interconnected groups of sensory nerves and neurons. These circuits store or, more accurately, are configured to be activated by specific patterns of stimuli. In turn they trigger patterns of responses. A nematode worm has a set of sensory nerves and neurons that are triggered by specific patterns of stimuli corresponding to that generated by its food. When triggered, this preconfigured set of neurons in turn triggers a set of preconfigured neurons that activate the worm's body and reflexively move it toward that food by moving in a way that amplifies or increases the stimuli detected. If the stimuli detected diminishes, the worm will change its direction until it finds a path that produces an increase in stimulation.

In all animals, circuits comprised of a pairing of stimuli detection neurons and response neurons, each triggered by a predetermined set of stimuli and in turn triggering a predetermined set of neurons which produce the response represent the basic core building blocks for all nervous systems. While utilized differently, this same standard building block comprises a substantial portion of all neural mass making up our brains.

In the case of the nematode worm, it has a total of 302 nerve cells or neurons.¹²⁹ Just 66 of these form the smallest cluster of cells that can be considered a brain.¹³⁰ This brain manages conflicting or competing directives generated by its various default circuits. While more complex, identical building blocks control the food a garter snake will eat and the flocking of birds. These creatures are not aware or conscious of why they manifest these behaviors. They are simply the byproduct of genetically determined structures that respond to specific, increasingly complex, patterns of stimuli (or patterns and collections of patterns of stimuli) by generating specific, increasingly complex, patterns of response.

All of this is relevant because we use these same building blocks to store all experience and information in the form of patterns of stimuli. Or more accurately, information is stored in the form of interlinked sets of nerves and neurons activated by specific patterns of stimuli corresponding to each stored experience or piece of information. Complex information is stored as interlinked collections of associated pattern storage circuits and their corresponding sets of nerves and neurons. We store new information most readily, and possibly exclusively, by associating new elements or new stimuli patterns or components

¹²⁹ [Add] [<http://www.animalresearch.info/en/designing-research/research-animals/c-elegans-nematode-worm/>] "A team have investigated how *C. elegans* 'smells' food, triggering receptors, which in turn activate particular nerve pathways and lead to certain types of movement, enabling the worm to reach its food source. Despite the clear differences, this particular piece of 'circuitry' shares many features with the way that the retina senses light in mammals, and how this information is used by the brain to initiate other tasks.¹" [Describes stimuli pattern triggering response pattern in a nematode]
<http://www.nature.com/nature/journal/v450/n7166/abs/nature06292.html>

¹³⁰ R Windoffer, W Westheide. "*The nervous system of the male *Dinophilus gyrociliatus* (Polychaeta, Dinophilidae): II. Electron microscopical reconstruction of nervous anatomy and effector cells.*" The Journal of Comparative Neurology, 272, 475-488, 1988
<http://dx.doi.org/10.1002/cne.902720403>

to pre-existing ones. Learning is by association. The starting point is the collection of innate pre-existing patterns of neurons that are activated by and store specific types of stimuli such as faces or more accurately stimuli patterns that have specific characteristics. These innate patterns of neurons are the foundation upon which all new experience is stored and they continue to impact our brains and perception even though we are capable of almost free form and directed association or retention. Our seemingly free form storage of memories and information is still comprised of collections of neural patterns conforming to the default building block structure, most of which had been stored previously and all of which have been built on top of this primal genetically dictated layer. In all cases storage occurs in the form of sets of neurons corresponding to sets of stimuli either observed or internally generated by other circuits or modules.

One of the things that sets humans apart is that our neural structures send and receive signals to and from other neural modules and circuits including our conscious systems rather than responding solely to patterns of externally generated stimuli. The responses generated by our circuits are not necessarily directed at triggering muscular or glandular responses but may be directed simply at other neural modules or memory. This enables entirely internally generated feedback loops and thus actions based on entirely internally generated triggers – e.g. consciously generated signals from one set of modules to others. At some level, this may be the origin of consciousness. What is critical here, however, is the influence this ancient building block structure has on our perception.

These neural building blocks are the foundation of all the circuits in our brain. We literally perceive the world in terms of patterns of stimuli previously stored as interconnected neurons associated with other patterns of stimuli collectively triggered by an event that form our impression of some experience or thing. The association and physical linking of sets of neurons each representing a pattern of stimuli associated with some set of characteristics is the basis of all information storage or memory. The more characteristics stored the more sets of neurons that are interlinked.

This core structure has a variety of influences. We are highly efficient at recognizing and completing partial patterns.¹³¹ Think of the first few notes of your favourite song. If you heard just those notes and the music stopped your brain would continue playing through the completion of the first phrase of music without any conscious effort or even delay. “A long long time ago in a galaxy far.....” or “E equals MC...” Even people unfamiliar with Star Wars or physics will know how to complete these sentences - again without any conscious effort or delay. Once these patterns are stored, even a partial match will trigger the entire circuit or pattern of neurons. For the same reason, the association and interconnectedness of patterns of neurons, one memory, familiar phrase or smell, even single words will bring to mind a host of connected images, memories and emotions. All of which are a by-product of being connected to the pattern of neurons triggered.

¹³¹ Guzman, Segundo Jose, Alois Schlögl¹, Michael Frotscher, Peter Jonas. “Synaptic mechanisms of pattern completion in the hippocampal CA3 network” *Science* 09 Sep 2016: Vol. 353, Issue 6304, pp. 1117-1123 DOI: 10.1126/science.aaf1836

The activation of interlinked or associated circuits profoundly impacts our perception. Even the language we are speaking at any point in time literally changes how we perceive things and how we solve problems.¹³² Lera Boroditsky, a professor of psychology, neuroscience, and symbolic systems at Stanford University, asked the question, does treating objects as masculine or feminine in the grammar of a language make speakers think of those objects differently? She writes, "It turns out that it does. In one study, we asked German and Spanish speakers to describe objects having opposite gender assignment in those two languages. The descriptions they gave differed in a way predicted by grammatical gender. For example, when asked to describe a "key" — a word that is masculine in German and feminine in Spanish — the German speakers were more likely to use words like "hard," "heavy," "jagged," "metal," "serrated," and "useful," whereas Spanish speakers were more likely to say "golden," "intricate," "little," "lovely," "shiny," and "tiny." To describe a "bridge," which is feminine in German and masculine in Spanish, the German speakers said "beautiful," "elegant," "fragile," "peaceful," "pretty," and "slender," and the Spanish speakers said "big," "dangerous," "long," "strong," "sturdy," and "towering." This was true even when testing was done in English, a language without grammatical gender. The same pattern of results also emerged in entirely non-linguistic tasks (e.g., rating similarity between pictures). The languages we learn and use have a

¹³² <https://psych.stanford.edu/~lera/papers/sci-am-2011.pdf>
http://www.slate.com/articles/news_and_politics/uc/2014/06/can_language_influence_our_perception_of_reality.html
<http://www.linguisticsociety.org/content/does-language-i-speak-influence-way-i-think>

surprising influence in shaping how people think. Teaching English speakers new grammatical gender systems influences mental representations of objects in the same way it does with German and Spanish speakers. Apparently even small flukes of grammar, like the seemingly arbitrary assignment of gender to a noun, can have an effect on people's ideas of concrete objects in the world."¹³³

This occurs because there are physical links between the neurons that store each word and those that store the concept of each gender. These gender storage circuits are in turn also associated and physically linked with different concepts and words.

Just like our drive traits piggyback on our relative comparison module, our storage of information and experience is based on an ever-increasing number of interlinked circuits that store new things by piggybacking on and leveraging existing previously stored patterns.

The ramifications of this are manifest in our almost universal reliance on metaphors. In some cases these metaphors have a literal basis in our experience as a result of further piggybacking of neural systems. Lieberman writes:

"Most of the words we use to describe feelings of social rejection or loss involve the language of physical pain. We say, "She broke my heart," or

¹³³ https://www.edge.org/conversation/lera_boroditsky-how-does-our-language-shape-the-way-we-think and L. Boroditsky et al. "Sex, Syntax, and Semantics," in D. Gentner and S. Goldin-Meadow, eds., *Language in Mind: Advances in the Study of Language and Cognition* (Cambridge, MA: MIT Press, 2003), 61–79.

“He hurt my feelings,” or that a girlfriend’s leaving “was like being punched in the gut.” Psychologists are discovering that language that sounds metaphorical is often less metaphorical than first supposed. When it comes to social pain, the language of physical pain is the metaphor du jour all around the world. This is true in Romance languages like Spanish and Italian, which share roots with English, as well as in Armenian, Mandarin, and Tibetan. It is unlikely that this metaphor would spring up again and again across the globe if there were no connection.”

In the case of socially induced emotional pain these descriptions should be considered almost literally true. Our social networking modules are directly interconnected with the same pain sensitivity and reward modules activated by physical sensations or injuries. The social or emotional event not only causes real pain but causes the same brain areas associated with the perception of physical experiences to be activated.

The same piggybacking construction underpins all other metaphors. Considering something by way of metaphor makes tangible the pre-existing stored patterns we associate with the most familiar element in the metaphor. Even where we consciously create a new metaphor to use, it ‘comes to mind’ because some of the many stimuli patterns and associated circuits that are active and comprise our mental picture are in turn associated with or linked to the metaphor we create or select. When the metaphor is used often enough a new set of physical links between the associated neural circuits, or a more efficient pathway connecting them, will develop.

Just as the gender associations of our language influence our perception of physical objects, metaphors and the things we associate with the metaphors known reference point have a substantial impact on our perception. In addition to the specific characteristics of the known element of the metaphor, we also associate a host of unintended characteristics derived from the extended web of interlinked things and ideas rarely if ever consciously considered.

This is part of the strength of a good metaphor. The more interlinked elements, the more we feel we understand. Metaphors dominate our communication. The automobile was first called a horseless carriage, many textbooks still suggest that electrons orbit the nucleus of an atom like planets orbit the sun (they don't), new businesses are described in terms of existing ones (eHarmony but for job seekers, Uber but for Camper Vans, "We are doing for marketing what Salesforce did for sales..."¹³⁴) and so on. Whole languages from Egyptian Hieroglyphics to Chinese characters are based on image representations. The iPhone is still called a phone even though making phone calls was only one of its many functions when launched and despite the reality that, for most users, time on their 'phone' is dominated by uses other than making phone calls (such as social media, email, watching videos, taking selfies, using maps, and playing games).

The key take away is that our perception of nearly everything is in terms of other things we are already familiar with. Thinking or communicating about new

¹³⁴ Simple Pty. Ltd. cofounder James Charlesworth describing Simple's product in an article published online <http://which-50.com/marketing-platform-simple-raises-10-million-eyes-us-expansion/>

things without referencing the familiar or using metaphors is difficult. This extends to the paradigms we embrace, our understanding of facts, and how we perceive ourselves. Each of these is in turn comprised of collections of patterns and their association to both specific pre-existing circuits and those developed as a result of experience, exposure or proactive learning.

We therefor do not rationally consider one fact relative to another or one paradigm or theory relative to another if we have no frame of reference or pre-existing collection of patterns to enable a comparison or to which to connect and associate the new information. We may associate something with the innate cluster of neurons representing fact or certainty, acknowledge it as true, yet because we have not associated it with other relevant patterns and their respective physical neuronal structures, we literally do not see it as relevant or rationally incorporate it into our thinking.

Where a piece of information contradicts a long accepted or deeply held belief or paradigm that forms part of our identity, or our basis for belonging or status, irrespective of the facts or evidence, the majority of people will first seek an alternate explanation for the information rather than give up that paradigm and thus their identity, belonging, or status. If an alternative explanation can not be found, unless status will be lost by failing to adopt the new paradigm, most will consider it merely the subjective opinion of another rather than a certainty. Many more will simply flatly reject it. Thus not all facts, let alone all information, are treated the same even by our conscious rational processes.

Our primary form of analysis is the relative comparison of things to each other based on shared characteristics rather than an analysis of unique characteristics.¹³⁵ We store and recall information and memories specifically by associating things based on shared characteristics or elements including their association to innate circuits such as emotions. As a result, our perception of something is determined as much by the existing stored neural patterns we associated it to as those activated by the stimulus it generates. These “stored” metaphors, which are often dramatically inaccurate, substantially influence how we perceive reality and result in several unique forms of “fact” or truth.

The first of these is something we have learned as a “fact,” associated with the neural circuit representing the label or concept of fact, but where we have not associated it with the innate neural circuit for predictable certainty. This can result in situations where we are able to accurately talk about or answer questions on a subject but none the less fail to incorporate the information into our thinking and decision processes.

Second are pieces of information we have associated with our circuit for “certainty” but not with patterns, concepts, and other information to which it logically relates. This again can produce knowledgeable conversation but still results in behaviours that seem to contradict this knowledge unless we are

¹³⁵ Ariely, Dan. Predictably Irrational. HarperCollins Publishers, London, (2008).

(People) Wood, Joanne V. “Theory and Research Concerning Social Comparisons of Personal Attributes” *Psychological Bulletin* Copyright 1989 by the American Psychological Association inc. 1989, Vol. 106, No. 2, 231-248 0033-2909/89/\$00.75

actively and consciously thinking about how the information may relate at the time. This produces those times when after an event you find yourself saying, “I knew that. Why didn’t I use it?”

Third, there is information we have associated with both our circuit for “certainty” and most or all relevant patterns and other circuits to which it relates. This will generally result in its rational use.

Finally, there is a subtype common to both categories of information or ideas that we accept as true and have associated with our circuit for certainty. These are pieces of information we associate directly or indirectly with our self-image or more specifically they are a defining element of a group to which we belong, an accepted basis for status, etc. The more a piece of information or concept is associated with our certainty circuit and our self identity circuit, our role, or how we perceive status and thus the more engrained, numerous or reinforced its neural connections, the more a conflicting piece of information will trigger our fight or flight circuit and the harder it is to “correct” if it is in fact inaccurate, wrong, or a reality that changes over time. As such, not all facts, let alone all information, are treated the same even by our conscious rational processes.

Moving beyond individual facts, the same realities apply to collections of facts, concepts, metaphors, and paradigms. Good examples of this, and the dramatic nature it can have, include (1) the medical community’s belief that bacteria could not survive in the acidic environment of the stomach and therefore their rejection throughout the early 1980’s of research showing that bacteria not only

did survive but are the cause of many peptic ulcers and (2) the continued rejection by neoclassical economists of proof that asset market bubbles occur and that people are predictably irrational.

As Clayton Christensen has pointed out, his theory of Disruptive Innovation fails to accurately predict outcomes in domains where “innovations impact an individual’s or group’s belief system, values or world views.” Our drive traits, the different forms of fact, the neurological preference for metaphors, and the reliance of self-identity on paradigms explain why. The paradigms learned or imprinted on by individuals define the groups to which we belong, how we perceive relative status, and thus the basis for relative comparison between individuals and the criteria by which we compete. While these paradigms can change and new ones learned, we must be aware of them to initiate the change.

How We Perceive and Conceive of Products & Services is Artificially Limited

Our stored and associated patterns of observation, their association to other circuits, and the “certainty” circuit, form the basis of our reality. This extends well beyond simple individual facts or objects. Paradigms encompass complex, multifaceted patterns including cultural norms and biases. These cultural and group paradigms can have a deep and granular impact.

From a practical innovation stand point, our paradigms for viewing the world, our structured tendency to perceive anything new in terms of existing patterns

and familiar things, literally determines how we will perceive a new product or possible solution to an issue. This regularly limits our ability to see what's possible relative to what is.

The same is true for every prospective customer in the marketplace. The vast majority of people think about products and services based on an existing frame of reference defined by what is currently available or how a job is currently done for them. As a result, superior options may be rejected solely for an inability to perceive accurately what's on offer.

Nobel laureate and noted physicist Richard Feynman and author Michael Michalko have discussed the "expertise paradox – the more expert one becomes in an area of specialization, the less creative and innovative that person becomes. The people who know more, see less; and the people who know less, see more." But it's not just experts. Psychologist Cheves W. Perky conducted a series of experiments in the early 1900's, that have subsequently been replicated, "showing that holding a mental image of something interferes with our perception and understanding." In one of Perky's experiments she asked subjects to visualise a banana and project that image in their mind on to the wall. She would then have a very dim slide of a banana actually projected on the wall. Additional subjects would enter the room. As expected, all new subjects brought into the room would report seeing the slide image of the banana on the wall. Surprisingly, however, the test subjects asked to first visualise an image of the banana and project it onto the wall in their minds eye, could not see the image. According to Michalko, people will "always try to assimilate new insights, ideas

and concepts into their [existing] view. Their mental image of the established view interferes with their perception and understanding of new ideas and concepts.”

For most consumers and executives, whenever a product or service is considered, a mental image of the current features, the job a product does, the need it fulfils, and the characteristics of the customers who use the product are the starting point. These elements are considered as if fixed in time and unchanging. Judgements and ideas are then universally oriented around this existing image and these existing characteristics.

For internal innovation decisions this is highly problematic. Such perspectives are bounded by a host of artificial or vestigial constraints from the technologies available when a product was historically conceived to the paradigms or biases inherent in the individuals, organizations, and cultures that originally considered how a need might be satisfied.

“It seems that success itself can create bounds that prevent executives from using readily available information. Swiss watchmakers invented quartz technology, but as Michael Tushman of Harvard Business School and his colleagues have shown, their dominance in mechanical watches prevented the Swiss from recognizing the future path of the entire watch industry. They essentially gave the quartz technology away and, as a result, lost most of the global watch market to U.S. and Japanese firms. More broadly, Tushman documents a common pattern: Success in a given technical area impairs firms

from using new technologies outside that area, even when they are available in-house.”¹³⁶

Often the only valuable element to consider for any existing product paradigm is if that product serves to fulfil an ultimate need or only a proximate one because at the time the market was originally developed that was all that was possible. Even where an individual or organization is able to set aside elements of an historic paradigm, they almost always remain bound by readily observable perceptions of the current market segmentations, competing offerings, the current basis for competition between products, internal procedures, business models, and current technologies rather than thinking about what a market and the competition will be like in 2, 5 or even 10 years or how a customer need might be better fulfilled without current limitations.

The more these paradigms are shared by members of a group and the more they form part of the self identity of the group or its members – something that is common amongst loyal employees and dedicated product teams, the harder it is for members to embrace a new challenging paradigm. Even within small groups or teams, these innate, pre-existing patterns and our genetic drives can produce outcomes that overwhelm rational thinking. Study after study show that in group situations a majority of people will agree with an opinion expressed or endorsed by the majority of a group even when they know it to be wrong.

¹³⁶ Max H. Bazerman and Dolly Chugh. “Decisions Without Blinders.” Harvard Business Review. 2006 Jan; 84(1): 88-97, 133.

In one often-repeated study, test subjects were asked to join a group or panel of individuals. Unknown to them the panel was comprised of experimenters rather than additional test subjects. A card with three lines drawn on it would be handed to one of the experimenters on the panel. They would be asked to examine the card, state out loud if they felt the lines were all the same length or to name which one was longer or shorter before handing the card on to the next member of the panel. Despite the fact that one of the lines was obviously shorter than the other two, the experimenters were instructed to always state they felt the lines were all the same length. In this context, the subject of the experiment would almost universally also state they felt the lines were the same length.¹³⁷

Groupthink is even more pronounced when the situation is complex and an authority figure is introduced. A majority of people will endorse something they “know” to be wrong and even do so in private if someone of high status, an expert or someone who is perceived as having mastery in a relevant field, has expressed the view. Especially where that view has been expressed with confidence. Despite the increased tendency for the use of conscious reasoning abilities, groupthink is a well-documented phenomenon in many professions. The compounding effect of these forces on how a flawed view of a market or its needs can influence decisions can have disastrous consequences.

¹³⁷ Aronson, Elliot. The Social Animal, 7th Edition, W.H.Freeman and Company New York. 1972, 1995.

Asch, Solomon. “*Effects of group pressure upon the modification and distortion of judgement.*” In M. H. Guetzkow (ed.), Groups, Leadership and Men, Pittsburgh, Carnegie, (1951), 117-190.

Asch, Solomon. “*Studies of independence and conformity: A minority of one against a unanimous majority,*” Psychological Monographs, 70(9), (1956), article 189, 1-70.

These factors determine how we perceive the needs of customers or consumers, how we perceive current solutions, and – to use Christensen’s parlance - how we think about “the job a product is hired to do”. Objectively identifying and assessing the paradigms we and our target customers have, the distance between the paradigm and the real limitations imposed by the laws of science and what current technology can deliver, as well as the influences of our drive traits on our decisions in relation to these realities, is critical both to organizational leadership and new product success.

As discussed, possibly the most influential aspect of paradigms is their role in defining groups and how status is conferred. Status within many religious groups is conferred by demonstrations of devotion or commitment to rules. Orthodox Jews memorize the Torah, some Shiite Muslims and Filipino Catholics whip themselves bloody, and in groups from Isis to Enron or Wells Fargo, status is conferred by ever more extreme demonstrations of behaviour seen as aligned with the group’s internal norms and values. In academia and medicine whole careers are tied to the acceptance of specific theories that if overturned can relegate an entire university department or laboratory to irrelevance. In the workplace, veritable armies of consultants and senior executives have status specifically because they and many others accept a collection of paradigms, theories, or business practices often despite the fact that in some cases these ideas are demonstrably flawed. While economic arguments can be made for some of these behaviours, others can only be explained by the pursuit of status. When money is considered a proxy for status the explanation appears to fit all.

The dependence of status on paradigms often makes challenging those paradigms risky. Even where status is not connected, to raise questions about an accepted method, process, or basis of analysis, we must overcome our inherent reluctance to be seen as disagreeable.

Elliot Aronson writes:

“In a classic experiment by Stanley Schachter, several groups of students met for a discussion of the case history of a juvenile delinquent named Johnny Rocco. After reading the case, each group was asked to discuss it and to suggest a treatment for Johnny on a scale that ranged from “very lenient treatment” on one end to “very hard treatment” on the other. A typical group consisted of approximately nine participants, six of whom were real subjects and three of whom were paid confederates of the experimenter. The confederates took turns playing one of three roles that they had carefully rehearsed in advance: the modal person, who took a position that conformed to the average position of the real subjects; the deviate, who took a position diametrically opposed to the general orientation of the group; and the slider, whose initial position was similar to the deviate’s but who, in the course of the discussion, gradually “slid” into a modal, conforming position. The results clearly showed that the person who was liked most was the modal person who conformed to the group norm; the deviate was liked least. In a more recent experiment, Arie Kruglanski and Donna Webster found that when the nonconformist voiced a dissenting opinion close to the deadline (when groups were feeling the pinch to come to closure), they were

rejected even more than when they voiced their dissenting opinion earlier in the discussion."¹³⁸

This makes objectivity difficult for all and dissenting particularly difficult where many of a group's underlying theories or paradigms are partially correct but incomplete, or true in some conditions but not in others. Real life examples of this are apparent in the extreme resistance of economists and policy makers to those who have shown that core pieces of the foundations of modern economics are not universal laws but rather situation dependent. Despite unquestionable evidence that humans are not always rational, the law of supply and demand doesn't always hold true, and markets are not always rational, whole universities have taken sides and the debate continues to rage.

In business, Motorola's disastrous Iridium project is attributable to the refusal of senior executives to accept that the paradigm underpinning consumer choice of mobile phones and carriers had changed. Geographic coverage was no longer the primary determinant. This coupled with a total lack of alignment within the organization between how status was conferred and objectivity regarding

¹³⁸ Aronson, Elliot. The Social Animal, 7th Edition. W.H. Freeman and Company New York. 1972, 1995.

Schachter, S. (1951). Deviation, rejection, and communication. *Journal of Abnormal and Social Psychology*, 46, 190-207.

Kruglanski, A.W. & Webster, D.W. (1991). Group member's reaction opinion deviates and conformists at varying degrees of proximity to decision deadline and of environmental noise. *Journal of Personality and Social Psychology*, 61, 212-225.

commercial assessment and decision making drove the company to bankruptcy.¹³⁹

Thresholds

The final characteristic of our neural structures that must be incorporated into our thinking is the universal existence of an activation threshold for all neurons and thus all circuits or modules. In addition to our perception being influenced by the interconnected physical realities of the pattern storage / pattern response nature of these core building blocks, each neuron requires a minimum threshold signal to be activated. If the combination of electrical and chemical inputs from other connected neurons does not achieve this activation threshold¹⁴⁰, the thing in question won't be considered. Thus circuit thresholds universally impact our perception of value and our decisions.

Many people will walk by a five-cent coin on the street. It doesn't overcome the threshold required to activate a perception of value. Most wouldn't consider prostitution. But a truly life changing amount will be treated differently by some. The exact threshold level required is unique to each individual and each circuit and may change upward or downward over time through use or lack of use, but all circuits have a required minimum threshold to be activated and therefore required to perceive a value or acknowledge and incorporate an input into our

¹³⁹ Finkelstein, Sydney. Why Smart Executives Fail. Penguin, New York. (2004)

¹⁴⁰ LeDoux, 2003

decision process. Below a certain level, value will not be considered. Above a certain level it will automatically be perceived and relatively compared. This outcome will influence both subconscious and conscious decision processes. This is not to say everyone and everything has a price, quite the opposite. Rather, we will not perceive value at all, in any of its unique forms, unless the relevant threshold has been reached. Further, if stimuli activate our status or belonging circuits they may override our monetary value circuit irrespective of the value it perceives.

[Note: For the economists out there, thresholds on circuits and therefor the acknowledgement of value explain much of the research on “money illusion”.]

Hebbian Plasticity

Finally, and as most are aware, how these circuits change over time and how our drives manifests is influenced by our experiences. Our experiences, thoughts, and thus the usage or activation of each circuit and the connections between them have the effect of reinforcing neural patterns and pathways associated with those that are repeatedly used or diminishing the influence of interlinked sets of neurons infrequently used. Even where pathways, circuits or modules are substantially genetically determined, repeated exposure to an experience with a particular set of cosmetic details or repetition of a stimulus and response can create new connections and pathways or reinforce and alter the thresholds required to trigger them.

If a frequently activated neural pathway is part of a circuit that triggers a particular response, such repetition makes that particular response more likely. This is in part why athletes and musicians practice and why avoiding situational triggers is effective when trying to change a habit. Avoiding the stimuli that trigger a habitually used pathway while building a new trigger and pathway will weaken the first through lack of use while building and strengthening the new habit.

The triggering of neurons also has a chemical component. We often associate these with addiction. In these cases an increasing level of the chemical is required to generate the associated response. As a result, repeated exposure makes a circuit harder to trigger rather than easier. In both cases, the mechanism being impacted is a circuit's threshold and one or both of these aspects of neural electro-chemical functioning influence the threshold signal required to trigger all neural circuits.

The key considerations to take from this discussion of the dynamic and changeable nature of our neural circuits include: (1) If a relevant circuit's threshold for a stimulation is not reached, that circuit will not be triggered and we won't perceive or be influenced by the associated stimuli - no matter how relevant. On the flip side, if activated a circuit may influence our decision even where it has no logical relationship to the decision at hand. (2) Such pathways can be strengthened or fade based on use or lack of use. (3) We can alter these connections and the influence of any circuit or module through repetitive use or exposure as well as through conscious choice. Finally, (4) while these factors

produce variations in the cosmetic aspects of behaviour and explain its dynamic nature they do not, without explicit practice, diminish the influence of our genetically dictated behavioural drive traits.