The Bicameral Expert

On the neuropsychology of intuition and its role in modern society

Abstract: Experts are becoming increasingly essential to the functioning of many aspects of modern society. However, the development of expertise reliably and at scale is still a challenge due to systemic educational failures and a lack of understanding of the general mechanisms that govern expertise. Building on areas of consilience between the works of Jordan B. Peterson, Julian Jaynes, and the expertise literature, general neuropsychological mechanisms that govern intuition are proposed. This understanding of intuition is then related to the manifestation and development of expertise, and implications for the role of experts in society are discussed.

Keywords: intuition, expertise, bicameralism, neuropsychology

I. INTRODUCTION

Leaders in the military and business sectors have long since concluded that the world is becoming more volatile, uncertain, complex, and ambiguous, or "VUCA" (Lawrence 2013). Although the term was originally intended for a military context in a post-Cold War era, it quickly found purchase in boardrooms around the world following the internet boom in the 90s and 2000s, the 9/11 attacks, and the rise of social media, startups, and international trade.

Perhaps the defining feature of a "VUCA" environment is the difficulty one faces when making decisions. Continuous and increasingly rapid technological innovations pose constant threats to entire industries and ways of doing business (Schwab 2016), which makes long-range planning extraordinarily difficult. Although it is true that modern leaders have access to unprecedented amounts of data to aid their decision-making processes, it is also true that parsing that information, extracting relevant insights, and applying them to emergent problems *in a timely manner* has proven to be extraordinarily difficult. Much of that data is self-contradicting or inconclusive, which creates additional difficulties for leaders responsible for forecasting, strategy, and decision-making.

The realities of the modern world, the nature of information processing, the limits of human ability, and the hierarchical structures of most organizations create countless bottlenecks where individuals find themselves responsible for making decisions about matters which they know little about and don't possibly have the time to understand. This is especially true in the political realm, which can have profoundly negative consequences for the health and economic outlooks of entire nations (Cummings 2013).

In such a "VUCA" world, organizations, institutions, and even individuals have become increasingly reliant on *experts* to help guide their decision-making. This is especially true of many governments, who have been making ever-greater use of consultants in recent years. For example, the United States spends many billions of dollars on consultants, and the true extent of this expenditure is not known or even properly tracked (Howlett et al. 2017). Similarly, Australia has spent several billion dollars over the last decade on contracts with Deloitte, Ernst & Young, KPMG, and PwC (West 2020), Canada is on track to spend over sixteen billion dollars on consultants in 2022 (Snyder 2021),

and the United Kingdom currently spends close to a billion pounds on external consultants *per annum* (Hart 2020).

In other realms of society, parents have largely outsourced the tasks of raising their children to experts like teachers and social workers, and the rising level of popularity that therapists and life coaches are experiencing suggests that modern adults are even willing to accept an expert's opinion on their own minds and personal lives (Lasch 1979).

Although it is undeniable that experts are essential to the functioning of modern society, our ability to develop expertise reliably and at scale is currently limited. Our postsecondary institutions, which we have relied on for decades to nurture the minds and characters of future generations, are currently failing to teach critical thinking, independent decision-making, or even basic literacy and numeracy (Strong 2021). This system-wide failure, which extends to the primary and secondary school systems (Caplan 2018), is having cascade effects in industry. Organizations are finding themselves desperately short on leadership-track employees. So-called "skills gaps" are endemic. Many millennials are going back to school, one way or another, in order to better align with a job market that their undergraduate education did a poor job of preparing them for.

Beyond the systemic failures in the West, another one of the most significant challenges in the development of expertise lies in the specificity of expertise itself. In many respects, training a world-class musician seems very different from developing a skilled engineer or businessperson, and both of these endeavours seem to stand apart from the training of a chess master. As a result, the extraction of generalizable mechanisms of expertise and universal principles for its development is still very much an ongoing mission.

Given these realities, this paper is intended to serve several purposes. First, it builds upon areas of consilience between the works of Jordan B. Peterson, Julian Jaynes, and the expertise literature to propose some general neuropsychological mechanisms that govern intuition. Second, it connects this proposed understanding of intuition to the manifestation and development of expertise. Finally, it offers thoughts on the role of intuition and expertise in modern decision-making processes, which are becoming increasingly systematized and influenced by computer modelling, "big data", and artificial intelligence.

II. EXPERTISE & NEUROPSYCHOLOGY

Historically, psychologists have used observation, interviews, tightly-controlled experimental investigations, and large samples of survey data to deduce underlying principles that govern human thought, feeling, and action. However, after the development of brain scanning and imaging techniques, such as electroencephalography (EEG) and functional magnetic resonance imaging (fMRI), psychologists gained access to the inner workings of the human mind itself. For example, many researchers found that activity in certain regions of the brain was associated with certain sensations or thoughts, and that damage to certain areas of the brain resulted in specific impediments.

These new tools and techniques were quickly applied in the field of expertise studies, which is considered to be a sub-discipline of psychology. Whereas researchers of decades and centuries past had to satisfy themselves with comparing the physical characteristics of "exceptional" brains with "average" ones (Spitzka 1907), today's researchers can observe the brain activity of chess players, athletes, and artists in real-time and make strong conclusions about the relationships that exist between expertise and mental activity.

One of the reasons that these technologies have become so popular in expertise studies is due to the nature of expertise itself. As some researchers have correctly observed, the

performance levels routinely reached by some experts are almost inconceivable, particularly when one considers the speed at which experts can respond to environmental stimuli. For example, skilled radiologists can identify seventy percent of pathologies within a few hundred milliseconds of seeing an image, tennis players can successfully return an opponent's serve travelling at one hundred and fifty miles per hour, and chess players can regularly deduce the optimal move after a mere glance at the board (Bilalić & Campitelli 2018). Due to the speed at which they occur, these manifestations of expertise are not conducive to study by interviews or think-aloud protocols, leaving expertise researchers largely in the dark until fMRI, EEG, and other such technologies were invented.

Of particular interest to expertise researchers is the role of intuition, snap judgements, and "gut feelings" in expert decision-making, especially in time-sensitive situations. In operating rooms, battlefields, sports arenas, and other high-stress circumstances, decisions made "in the moment" become highly consequential, and it is in these situations that experts are most easily differentiated from novices. It is also these types of investigations that are made possible by fMRI and EEG machines, and where neuropsychology – the study of the mind's inner workings – becomes highly relevant.

It is within the context of time-sensitive decision-making that the theories of Jordan B. Peterson and Julian Jaynes will be discussed. Their work, when combined with the existing literature in the field of expertise studies, provides a great deal of insight on the possible origins of intuition, its role in human decision-making, and the development of "good instincts" in human beings. As will be suggested, people are more capable than they are made to feel by modern systems, and the development of true expertise is more attainable than is currently believed.

III. THE ORIENTING REFLEX & INTUITION

Dr. Jordan B. Peterson is a Canadian psychologist and scholar who has achieved a high degree of academic influence as well as a great deal of popularity with the public. His lines of thinking on matters of human psychology and the improvement of both individuals and society is captured in his 1999 opus *Maps of Meaning: The Architecture of Belief*, which is an examination and juxtaposition of ancient myths and modern neuroscience interspersed with interpretation of alchemical texts, dreams, and other mystical motifs.

Despite some of the more esoteric content that might give "mainstream" academics pause, *Maps of Meaning* is built on solid neuropsychological foundations, one of which is the profound importance of anomaly in all aspects of life. As Peterson (1999) documents, human beings are biologically designed to be captivated by novelty, something that was first scientifically described by Russian neuropsychologists E.N Sokolov, O. Vinogradova, and A.R Luria in the mid-1900s and furthered by numerous researchers since those initial investigations.

The human response to anomaly, called the "orienting reflex" by Sokolov (1969), takes place between two hundred and five hundred milliseconds. This response mechanism causes us to *involuntarily* notice and attend to differences in the environment, such as brown objects on the sidewalk, someone saying a word that sounds like our name, or the presence of movement in our peripheral vision. When given such sensory cues, our attention is refocused, our thoughts are diverted, and our emotions may become dysregulated depending on what we have encountered. We may even find ourselves deploying the "fight/flight/freeze response", a set of hardwired responses designed to keep us safe in potentially dangerous situations (Thompson et al. 2014).

However, as previously discussed, experts routinely manifest extraordinary levels of performance compared to amateurs, even when they are forced to make decisions or take action within this timeframe of two hundred to five hundred milliseconds. Even in situations that involve danger, experts who are trained for such situations, like pilots, soldiers, and firefighters, can respond more effectively and calmly to anomalies that could be life-threatening to themselves or others.

Many of these experts' responses could be said to be based on *intuition*, which is defined by Oxford Languages as "the ability to understand something immediately, without the need for conscious reasoning". Somehow, experts are able to perceive cues in the environment, assess their situation, and coordinate an effective mental, verbal, or physical response before they even have time to consciously think about what they have encountered.

The curious and unavoidable fact that experts routinely display far superior intuition within their domains of expertise raises important questions as to how this is possible. What are the precise mental processes that govern expert intuition? Do experts experience different brain activity than amateurs? If so, where do these differences come from? Although expertise researchers have developed robust answers on their own, the additional perspectives offered by Peterson's and Jaynes' work strengthen and deepen those answers considerably.

IIII. INTERNAL REPRESENTATIONS

Researchers of expertise and expert performance have known for several decades that long-term memory (LTM) plays a significant role in many displays of superior performance. This is perhaps most famously true in the case of chess, where expert players have been found to make extensive use of "chunks".

Essentially, a chunk is a patterned group of pieces and their associated potential moves that has been committed to memory, and is derived from past games played or from situations encountered during study and research of famous games. Referring to chunks during play helps chess experts simplify, expedite, and refine their decision-making processes, and their use is believed to be partially responsible for a master's ability to assess boards at a glance (Gobet & Charness 2018). It is estimated that chess masters have anywhere from ten thousand to over one hundred thousand chunks stored in their LTM (Simon & Gilmartin 1973).

The use of LTM is not specific to chess players, however: skilled radiologists have been found to refer to extensive memory banks of previous images when making a diagnosis, even when exposed to the image for tenths of a second (Bilalić & Campitelli 2018). Memories of past situations, either firsthand experience or case studies derived from firsthand experience, guide professional practice in many disciplines, including business, medicine, and law, and an expert's relevance in those disciplines is often related to their ability to quickly assess situations and apply the relevant methods to address them.

The general consensus among expertise researchers seems to be that the use of LTM in this way, particularly when "chunking" or referring back to similar scenarios in memory, is a significant contributor to an expert's ability to respond quickly to novelties they encounter. By organizing and reorganizing their specialized knowledge into easily-retrievable chunks, "schemas", or "scripts", experts can truncate otherwise complex decision-making processes and come to accurate conclusions at speeds unattainable by novices.

In addition to being able to quickly refer to their LTM for guidance in novel situations, another important factor that contributes to an expert's superior intuitive performance is

situation awareness (SA), defined as "the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning and the projection of their status in the near future" (Endsley 1988). This crucial aspect of expertise, especially as it pertains to expert responses within the timeframe of hundreds of milliseconds, is believed to be a complex and ongoing information processing endeavour on the part of the expert. As the definition of SA suggests, experts are responsible for first perceiving anomalies that might be lost upon less trained observers, then understanding what those environmental perturbations "mean", and finally being able to use the information at hand in the present to anticipate what is most likely to happen next (Endsley 2018).

However, SA is not simply a matter of "keeping one's eyes open". It is a complex endeavour driven by a mixture of environmental input, information processing mechanisms like "chunking", and a pre-existing value structure that can assign meaning to environmental inputs and allow for goal-driven activity to occur. Without this value structure, the expert would not have the ability to begin "chunking" in the first place as they would lack any basis for beginning their LTM search process. This is the problem encountered by well-read amateurs who quickly find their "book knowledge" failing in the field: they simply are not able to apprehend, comprehend, and respond to novelty within the timeframes required by the situation. Succinctly put, one does not learn to drive a car by reading a book on how to drive.

Thus, developing an expert's intuition is often dependent on the development of "mental models", or *internal mental representations* of real-world systems (Endsley 2018). A well-developed mental model of a system will take into account its significant features, how it functions, the underlying relationships between components of the system, and how the system behaves when under stress. Examples of this include a physician's personal understanding of the workings of the human body, a pilot's knowledge of their plane, or a successful business leader's insight into the operations and culture of their company.

Given the extraordinary amount of information available in the cockpit of a plane or an operating room and the limited nature of human attention, knowing which stimuli to attend to and which to ignore becomes very important. Thus, at the level of perception, a mental model gives the expert a value structure that helps them determine which environmental stimuli are most relevant.

Additionally, given the vast complexity of real-world systems, a mental model provides experts with a sufficiently accurate intuitive understanding of what "should" be happening compared to what is happening. Furthermore, when deployed in tandem with LTM search and environmental scanning protocols, a mental model and the representation of relationships it embodies allows an expert to quickly determine why something might be wrong and what could be done about it.

Finally, being able to make projections about the future can have profound implications for action in the present. This is true in both classical areas of expertise study, such as move anticipation in chess, and oblique areas of expertise such as industrial process management. Therefore, a mental model allows an expert to anticipate what is most likely to happen and begin their decision-making process within those boundaries. It also allows them to focus their mental effort on tasks that are most likely to bring about desired future results.

Taken together, these features of mental models provide experts with a great deal of focus in situations that novices would find bewildering. Instead of being distracted and confused by an array of environmental stimuli and forced into a fight/flight/freeze response,

an expert armed with a mental model and a cache of knowledge in their LTM is able to come to conclusions within hundreds of milliseconds, and often without being able to fully explain how they arrived at those conclusions.

However, it is interesting to note that the use of internal representations to interpret, model, and anticipate real-world events is not a practice unique to experts. In *Maps of Meaning*, Peterson documents that E.N. Sokolov decided humans developed such representations following his investigations into the orienting reflex[i]. Whereas Sokolov and his colleagues were interested in how humans modelled facts and events, however, a great deal of time and effort in *Maps of Meaning* is dedicated to demonstrating that people indeed model facts but primarily concern themselves with *value*.

Specifically, Peterson uses both accepted science and structural analysis of ancient myths to demonstrate that the internal representations humans develop in all areas of life take the general form of an unbearable present, an idealized future, and a plan of action[ii]. Together, these three things provide a basis for interpreting and responding to the world in a productive manner. With such a "map" in place, we are able to assign valence to novelty and respond to it appropriately.

Essential to Peterson's perspective is his belief that the world, as experienced by human beings, comes loaded with meaning: things are seen as threatening or inconvenient if they appear to disrupt our plans or call our goals into question, but promising or opportune if they appear to be of benefit. Peterson holds that because people are always pursuing one or more goals, they are constantly directing their attention towards what seems important, figuring out what it means for them, and deciding what to do about it, if anything. This extends the relevance of the expertise researchers' findings far beyond isolated manifestations of superior performance and into the population-at-large, as it suggests the development of more explicit or appropriately complex models and value structures will result in a higher quality of life. The early evidence on the topic, involving a "future authoring" intervention developed in part by Peterson, seems to suggest that this is indeed the case (Schippers et al. 2015).

Another psychologist whose work concurs with the expertise researchers' findings on internal representation is Julian Jaynes, an American psychologist active between the 1960s and 1990s. Jaynes, who studied both animal behaviour and human consciousness, defined the development and use of internal representations as an important feature of consciousness in his 1976 book *The Origin of Consciousness in the Breakdown of the Bicameral Mind*[iii]. Jaynes' theory was that humans have developed an internal representation of *themselves*, which they can then project into an imaginary world in order to model different plans of action and their potential consequences. He called this projection the "Analog I".

Although a full examination of adjacent disciplines is beyond the scope of this paper, it is also interesting to note that emerging lines of thinking in cognitive science also align with the theories of internal representation developed by Peterson, Jaynes, and the expertise researchers. In particular, Karl Friston's work on "predictive processing" and "free energy" suggest that the brain may essentially be wired to minimize surprise (Friston 2010). In other words, beyond having internal representations of the world in the first place, it seems like we are wired to make our mental models conform to the "real world" as closely as possible.

Overall, the general consensus of many lines of thinking on this topic is that humans create maps, mental models, or internal representations of the real world. These maps have an implicit or explicit value structure that

helps to assign meaning to environmental stimuli, set parameters for LTM search activity, and guide skillful action. A well-developed map is especially necessary for high-stress situations typically encountered by experts, where environmental inputs are plentiful, cognitive capacity is limited, and quick responses are needed.

V. BICAMERALITY

Although the existence of this complex and necessary mental activity is already intriguing, deeper questions quickly emerge about the physical activity of the brain during expert decision-making processes. What areas of the brain are activated when an expert encounters an anomaly and experiences an intuition? How does the physical structure of the brain contribute to these processes? Finally, like in some cases of intuition, how is it possible for someone to "know" something without being able to verbalize what it is they know or how they know it?

Although a full examination of the relationship between neuroscience and expertise is beyond the scope of this paper, an area of agreement between Peterson's and Jaynes' work that seems highly relevant to expertise researchers is their mutual emphasis on the partnership between the "right brain" and "left brain". The family of functions that each hemisphere of the brain is responsible for, combined with the ways in which they relate and communicate to each other, not only serve to illuminate why we think the way we do, but how intuition may have developed in the first place.

As Peterson observes in *Maps of Meaning*, the right hemisphere of the brain appears to be specialized for pattern recognition, pattern generation, holistic thinking, and operation in "unknown territory". It is less language-fluent than the left hemisphere, which seems to be designed for symbolic processing, linear thinking, and detail-oriented activity in "known territory". When an anomaly is encountered, the brain first gives meaning to what has been apprehended, which is a right hemispheric activity, and then generates plans to respond to the stimulus, which is largely done by the left hemisphere. One of the central ideas in *Maps of Meaning* is that this progression from unknown anomaly to known quantity, driven by involuntary contact with and attention to novelty, is one of the fundamental aspects of human life. This would also seem to be the case for expert decision-making, as the literature previously discussed demonstrates that experts first make meaning from their surroundings and then respond.

Furthermore, Peterson contends that these psychological patterns are captured in many ancient myths and even modern religions, which have archetypical figures or motifs that reflect the operations of the right brain and left brain. Prominent examples include the Great Mother archetype, nurturing and devouring, who embodies nature and right-brained chaos, and the figure of the Great Father, protective and tyrannical, who embodies societal/divine structure and left-brained orderly activity. The "hero" archetype is seen as the individual or character that mediates between chaos and order, confronting anomaly and bringing the "spoils of victory" back to the proverbial village.

Two decades before Peterson released *Maps of Meaning*, Julian Jaynes also made extensive use of ancient myths to derive insights about the workings of the human brain. In *Bicameral Mind*, he analyzed the *Iliad* and found a few notable things: first, the Greek words that are typically associated with the mind, such as *psyche* and *nous*, had different meanings at the time the *Iliad* was written and corresponded not to mental qualities, but to physical ones. Second, Jaynes observed that the heroes in the *Iliad* do not display any introspection whatsoever. Throughout the entire tale, they simply receive instructions by the gods and act in accordance with those instructions. There are no side-stage soliloquys or internal conflicts. This is a very curious detail, as the lived mental experience of the characters in

the *Iliad* seems to be very different from what we consider the human mind to be like today.

In *Bicameral Mind*, Jaynes draws upon his knowledge of history and neurology to describe why this might be so. He notes that hearing the voices of "the gods", whether alone or in the presence of a statue or idol, was commonplace in the ancient world. He also observes that there are periods in ancient history where the gods were reported to have gone silent, and that great efforts were made by ancient peoples to revive those voices. Perhaps most crucially, he points out that communication between the right and left sides of the brain is largely funneled through the corpus callosum, a mass of two million fibres that serves as the main line between the two hemispheres, and that a great deal of these connections correspond to speech areas in the left hemisphere of the brain.

Jaynes concluded, perhaps controversially, that instead of "thinking" about things and coming to conclusions, ancient peoples likely had a more hemispherically divided or "bicameral" mind, where the ability of the right brain and left brain to communicate was not yet fully developed. Instead, people simply heard voices in their heads that commanded certain courses of action. Although it sounds outrageous, this theory helps to explain the strange experience of mind depicted in the *Iliad* and other ancient texts, the ancients' obsession with idols and statues of gods, the countless references to communication with gods, and even prophecies, visions, or schizophrenia.

Combining Peterson's and Jaynes' perspectives in the context of expertise and intuition, it seems like an expert's response to an anomaly consists first of a right-brained response, where meaning is made of the stimulus and global hypothesis formation takes place, followed by a left-brained process where that information is used to formulate a response of some sort. The communication between these two hemispheres is moderated by the corpus callosum and may have taken the form of hallucinated voices sometime in the past for reasons of efficiency[iv]. For various reasons, which are explored in *Bicameral Mind*, those voices have since gone silent.

Both Peterson's and Jaynes' theories have been met with significant criticism, however Jaynes' thinking is decidedly more controversial. Despite their disagreements, even Jaynes' critics acknowledge that there is weight to what he is saying: psychologist and blogger Scott Alexander admits that he has encountered both patients and "regular" people who swear that they hear God's voice during their prayers, and that he is aware of a new therapeutic technique called Internal Family Systems which relies on the formation of an internal dialogue between patients and parts of their personality[v] (Alexander 2020). If he had been alive for the advent of Internal Family Systems therapy, Jaynes might point out that type of internal dialogue is very reminiscent of the ancient Egyptian text *Dispute Between a Man and His Ba* and totally consilient with the theory of a bicameral mind. He might further argue that people who benefit from Internal Family Systems are more "bicameral" than average.

VI. THE "INNER VOICE" & INTUITION

According to Jaynes, the transition between a bicameral mindset and a modern mindset took place in late antiquity, leaving human beings yearning for divine guidance ever since. Occasionally, rare people have appeared whose minds appear to bear vestiges of bicamerality; depending on their context, they have been either labelled as mystics, visionaries, or madmen. One famous example is Jeanne D'Arc, who said she was compelled by divine visions and voices to approach the Dauphin and assume partial control of the French army.

Some of these "bicameral minds" have even been scientists, which makes the role of bicameral insight harder to discount. August

Kekulé claims to have stumbled upon the structure of benzene, a ring-shaped molecule, while daydreaming about a snake eating its own tail. *Maps of Meaning*, a psychological text, contains references to dreams and visions, including some of Peterson's own, and it seems clear that these dreams were very influential in the development and writing of the text.

However, perhaps one of the strongest and most obvious case studies that demonstrates the potential value of a bicameral mind is that of Socrates. After being sentenced to death, Plato records in *Apology* that Socrates addressed the court and made reference to what he called his *daimonion*, an inner voice present since childhood that admonished him whenever he was about to do something wrong[vi]. Socrates mentions that it was his *daimonion* that compelled him to remain in Athens and face trial rather than flee into exile, and that he chose to honour this voice rather than to ignore it.

Although he does make reference to the divine in his address, Socrates seems to recognize that this voice is in his mind, is unique to him, yet that it is somehow separate from him. This is evidence of what Scott Alexander would call a "theory of mind"[vii], something that Jaynes suggests was developed in late antiquity and contributed to the eventual silence of the gods.

The example of Socrates and his *daimonion* seems like not only an effective bridge between hearing the voices of "the gods" and the modern experience of mind, but is also a relatable case study for many people in modern society who claim to have an "inner voice" of some sort. In case studies of people who claim to experience such a phenomenon, they have reported an inner voice telling them to switch professions or join protest movements[viii]. This voice is even reported to "take over" and speak for such individuals at times where decisive action is required (Heery 1989). In most cases, this inner voice is experienced as a positive guiding force, far from the terrifying hallucinations reported by schizophrenics.

But what of the people who do not have "prophetic" dreams or visions, and who lack an "inner voice"? Perhaps the only novel claim made in this paper is that intuition can and perhaps should be understood as a manifestation of bicameralism.

What seems to be happening, in general, is that a "map" or "mental model" is generated by an individual which is then held in both sides of the brain – linguistically in the left hemisphere, conceptually and holistically in the right. When an anomaly is encountered (as defined by the mental model), the right side of the brain uses metaphor and comparison to figure out a general plan of what "to do". When a conclusion is reached, this is experienced as the *feeling* of "knowing something", and is typically preverbal (nondeclarative) knowledge. At some point, this information is funneled through the corpus callosum to the left side of the brain to be made explicit: this can be an instantaneous or long process, depending on the insight and its complexity. The completion of this process results in an individual being able to "put into words" what it is they have been able to intuit.

The corpus callosum, although it contains two million fibres, is only capable of transmitting but a fraction of the information processed in the right hemisphere to the left. As humans developed language, Jaynes contends that this enabled information to be encoded from the right hemisphere and transmitted to the left, where it was experienced as a hallucinated voice, then as an "inner voice", and eventually as a voiceless intuition. Depending on their level of bicamerality, it seems like people may either experience visions, voices, strong intuitions, or weak intuitions, and that this colours their experience of the world dramatically. These profound differences in perspective could account for the disparities that exist in the spiritual development of saints

and laypeople, the difficulty that Western society has with accommodating nonlinear insights, and in the general difficulties in communication that exist between highly bicameral people and the modern-minded population.

Supporting evidence for the extension of Peterson's and Jaynes' work in this way happens to come from one of the only papers on the neuropsychology of intuition that this author could find, which confirms that intuition is generally a right hemispheric activity (McCrea 2010).

VIII. RELEVANCE TO EXPERTISE

The role of intuition and expert judgement in modern society has changed significantly over the past century, especially with the advent of "big data" and artificial intelligence. However, even before computing was widely adopted, organizations were known for being highly bureaucratic and resistant to internal innovation. In such an environment, experts were (and are) called upon to complete specific tasks according to set procedures, functioning merely as a small cog in a larger machine. Famous engineering failures like the Ford Pinto and the Space Shuttle Challenger disaster are testaments to the priority placed on institutional objectives over professional judgement, even when data is presented alongside intuition. Furthermore, superiors often demand that experts document and justify every significant decision explicitly, which leaves little room for intuition. Outside of the startup sector, resources are almost never dedicated to an idea or hunch someone happens to have, and even organized research and development activity is scarce these days.

However, the expertise literature, *Maps of Meaning*, and *Bicameral Mind* would suggest that intuition not only plays a more important role in decision-making than many people would like to admit, but that it often represents a correct – albeit pre-verbal – judgement. As is clearly demonstrated in the expertise literature, reliably superior performance is possible within the timespan of the orienting reflex, which precludes even conscious thought. An intuition attained after a few seconds or a long period of contemplation is certainly just as capable of being "correct", or at least sufficiently correct for purposes of the situation, as one attained within hundreds of milliseconds. Even an "inner voice" or "God's voice", long thought to be personalized peculiarities or pathologies, could very well be manifestations of such intuition.

Yet, intuition is heavily discounted within organizations and in many areas of society. Why is this the case?

It would seem that three primary drivers behind this devaluation of intuition are greed, skepticism, and pride. Greed, the first, is the prioritization of outdated or economic objectives in the face of an expert urging a review for technical, humanitarian, or organizational reasons. Skepticism, the second, is a hallmark of Western thought and is likely derived from the propensity to deconstruct linguistically rather than perceive holistically: such an approach makes it difficult to "see" what an expert "sees", as it precludes (perhaps even bypasses) the holistic thinking required to make the mental connections needed for insight. The third and most pernicious reason, pride, is a human universal and is manifested as a rejection of new information and a deep dislike of being incorrect.

Furthermore, the works of Peterson and Jaynes, understood in relation to one another and to the expertise literature, help to illustrate the relationship that exists between mental models, or "maps", and intuition. A well-defined map, ideally an explicit one, seems to play an important role in the right hemisphere's response to anomaly. The instinctual feeling that something is "right" or "wrong" is likely facilitated by the right hemisphere's ability to think holistically: an

anomaly that doesn't "fit" with the current model is experienced as "wrong", incorrect, or incongruent, and one that does is felt to be "right", or that it "fits" or "makes sense". Given their well-developed maps in specific domains, it stands to reason that verified experts with good track records should be given a great deal of trust in how they operate, as the way they make meaning from their surroundings will be vastly different – and more nuanced – than laypeople or novices.

But what of artificial intelligence? Since such programs are already capable of processing more data in a shorter timeframe than even expert humans, is it not logical to assume that expertise and intuition will be replaced by computerized decision-making in the near future?

Here, the existence of mental models and their role in expert decision-making seems like it could actually give humans some advantages for now. As noted by Peterson, an expert's mental model does not just model facts, as computers do now, but also keeps track of *values*, an extremely complex *human activity* that is still a difficult problem in the field of computer science. Additionally, beyond being molded by their training and study, many of the world's best experts have been shaped by their upbringings and major life events, which is something that computers cannot replicate. As a result, even the most advanced artificial intelligence available in the foreseeable future will have a difficult time making "human" decisions, particularly in areas that concern people's lives or futures.

It is also worth considering that the incomprehensible diversity of human life and experience on Earth is, in many ways, what has given rise to expertise in the first place. From the ancestors of *homo sapiens* who learned to harness fire and make hand tools through trial-and-error to modern experts armed with textbooks and best practices, the improvement of "how we do things" has almost always come from an encounter with anomaly and the subsequent problem-solving activity it unavoidably engenders.

As Peterson discusses in *Maps of Meaning*, it is impossible for humans to escape anomaly, and in fact our bodies, brains, ancient myths, world religions, and modern societal structures are designed to help us confront it in a courageous and proactive manner. In many ways, experts are the heroes of society, insofar that they are the ones responsible for confronting anomaly on behalf of their fellow citizens. Some experts, such as doctors, firefighters, and soldiers, are explicitly hailed as heroes for their work, particularly when it is dangerous or of high consequence.

Now and in the future, especially as the world continues to become more complex, experts will be needed time and again to provide insights and guidance on important matters. As a result, it becomes increasingly important to understand how experts make their decisions, in what circumstances intuition is reliable, and what situations require the development of best practices. Educational practices that develop mental models must be developed and a mere "information transfer" approach abandoned. An increased emphasis must be placed on holistic and relational thinking *in addition to* the deconstructive linear thought endemic in Western society, so people will be able to better understand the decisions that experts make.

Above all, people need to be encouraged to develop good instincts themselves, and then *trust them*. Although listening to an expert is often a well-advised course of action, it is also the case that people can be led astray by intellectuals with elaborate ideas that claim to explain reality. Far too many cult leaders, criminals, and fools throughout history have encouraged people to ignore their better instincts to catastrophic effect. Both experts and the general population, therefore, stand to benefit from listening to that still small voice.

REFERENCES

Alexander, S., "Book Review: Origin of Consciousness in the Breakdown of the Bicameral Mind", SlateStarCodex (2020)

Bililać, M., Campitelli, G., "Studies of the Activation and Structural Changes of the Brain Associated with Expertise", Cambridge Handbook of Expertise and Expert Performance – 2nd Edition (2018)

Caplan, B.D., "The Case Against Education: Why the Education System Is a Waste of Time and Money", Princeton University Press (2018)

Cummings, D., "Some thoughts on education and political priorities" (2013)

Endsley, M.R., "Design and evaluation for situation awareness enhancement", Proceedings of the Human Factors Society 32nd Annual Meeting (1988)

Endsley, M.R., "Expertise and Situation Awareness", Cambridge Handbook of Expertise and Expert Performance (2018)

Friston, K., "The free-energy principle: a unified brain theory?", Nature Reviews Neuroscience (2010)

Gobet, F., Charness, N., "Expertise in Chess", Cambridge Handbook of Expertise and Expert Performance – 2nd Edition (2018)

Hart, C., "Government spending on consultants hits £980m", Supply Management (2020)

Heery, M.W., "Inner Voice Experiences: An Exploratory Study of Thirty Cases", Journal of Transpersonal Psychology, Vol. 21, No. 1 (1989)

Howlett, M., Brouillette, C., Coleman, J., Skorzus, R., "Policy Consulting in the USA: New Evidence from the Federal Procurement Data System - Next Generation", Presented to ICPP III (2017)

Jaynes, J., "The Origin of Consciousness in the Breakdown of the Bicameral Mind", Houghton Mifflin, Mariner Books (1976)

Lasch, C., "The Culture of Narcissism: American Life in an Age of Diminishing Expectations", W. W. Norton & Company (1979)

Lawrence, K., "Developing Leaders in a VUCA Environment", UNC Executive Development (2013)

McCrea, S.M., "Intuition, insight, and the right hemisphere: Emergence of higher sociocognitive functions", Psychology Research and Behavior Management (2010)

Peterson, J.B., "Maps of Meaning: The Architecture of Belief", Routledge (1999)

Plato, *Apology* (399 BC)

Schippers, M.C., Scheepers, A.W.A. Peterson, J.B., "A scalable goal-setting intervention closes both the gender and ethnic minority achievement gap", Palgrave Communications (2015)

Schwab, K., "The Fourth Industrial Revolution", Currency (2016)

Simon, H.A., Gilmartin, K.J., "A simulation of memory for chess positions", Cognitive Psychology (1973)

Strong, Z., "Micro-Universities" (2021)

Snyder, J., “Costs for consultants hired by government to rise by $6 billion under Liberals”, National Post (2021)

Sokolov, E.N. (1969). The modeling properties of the nervous system. In Maltzman, I., & Coles, K. (Eds.), Handbook of Contemporary Soviet Psychology (pp. 670-704). New York: Basic Books.

Spitzka, E.A., “A Study of the Brains of Six Eminent Scientists and Scholars Belonging to the American Anthropometric Society, together with a Description of the Skull of Professor E. D. Cope”, American Philosophical Society (1907)

Thompson, K.L., Hannan, S.M., Miron, L.R., “Fight, flight, and freeze: Threat sensitivity and emotion dysregulation in survivors of chronic childhood maltreatment”, Personality and Individual Differences, Volume 69, 2014, Pages 28-32

West, M., “Government spending on consultants still soars despite economic calamity” (2020)

HELPFUL QUOTES

[i] **E.N. Sokolov, "The modeling properties of the nervous system" (1969)**
"One possible approach to analyzing the process of reflection is to consider the nervous system as a mechanism which models the external world by specific changes that occur in its internal structure. In this sense a distinct set of changes in the nervous system is isomorphic with the external agent that it reflects and resembles. As an internal model that develops in the nervous system in response to the effect of agents in the environment, the image performs the vital function of modifying the nature of behavior, allowing the organism to predict events and actively adjust to its environment."

[ii] **J.B. Peterson, "Maps of Meaning: The Architecture of Belief" (1999)**
"Along with our animal cousins, we devote ourselves to fundamentals: will this (new) thing eat me? Can I eat it? Will it chase me? Should I chase it? Can I make love to it? We model facts – there is no doubt about that. But we model facts to keep track of meaning. We may model facts, and it is no doubt useful to do so. We must model meanings, however, in order to survive. Our most fundamental maps of experience – maps which have a narrative structure – portray the motivational value of our current state, conceived of in contrast to a hypothetical ideal, accompanied by plans of action, which are our pragmatic notions about how to get what we want."

[iii] **J. Jaynes, "The Origin of Consciousness in the Breakdown of the Bicameral Mind" (1976)**
"A most important 'feature' of this metaphor 'world' is the metaphor we have of ourselves, the analog 'I', which can 'move about' vicarially in our 'imagination', 'doing' things that we are not actually doing. There are of course many uses for such an analog 'I'. We imagine 'ourselves' 'doing' this or that, and thus 'make' decisions on the basis of imagined 'out-comes' that would be impossible if we did not have an imagined 'self' behaving in an imagined 'world'. In the example in the section on spatialization, it was not your physical behavioral self that was trying to 'see' where my theory 'fits' into the array of alternative theories. It was your analog 'I'. If we are out walking, and two roads diverge in a wood, and we know that one of them comes back to our destination after a much more circuitous route, we can 'traverse' that longer route with our analog 'I' to see if its vistas and ponds are worth the longer time it will take. Without consciousness with its vicarial analog 'I', we could not do this."

[iv] **J. Jaynes, "The Origin of Consciousness in the Breakdown of the Bicameral Mind" (1976)**
"Consider the evolutionary problem: billions of nerve cells processing complex experience on one side and needing to send the results over to the other through the much smaller commissures. Some code would have to be used, some way of reducing very complicated processing into a form that could be transmitted through the fewer neurons particularly of the anterior commissures. And what better code has ever appeared in the evolution of animal nervous systems than human language? Thus in the stronger form of our model, auditory hallucinations exist as such in a linguistic manner because that is the most efficient method of getting complicated cortical processing from one side of the brain to the other."

[v] **S. Alexander, "Book Review: Origin of Consciousness..." (2020)**
"I know some very smart and otherwise completely sane evangelical Christians who swear to me that God answers their prayers. They will ask God a question, and they will hear God's voice answer it. God's voice may not sound exactly like an external voice, and it may give them only the advice they would have given themselves if they'd thought about it – but they swear that they are not thinking about it, that their experience is qualitatively different than that. And these are normal people! ...

There are even whole forms of therapy based on this kind of thing. In Internal Family Systems, the therapist asks the patient to conceptualize some part of their mind (maybe the part that's producing a certain symptom) as a person, and to talk to it. I know people who swear that this works. They approach their grief or anger or anxiety, and they get a clear image of what "he" or "she" looks like, and then "he" or "she" talks to them. Usually he/she tells them some appropriately psychological sounding thing, like "Hello, I am your anxiety, and I'm only inflicting these fears on you because we were abused as a child and I want to make sure nobody ever abuses us like that again". Then the patient talks to their anxiety and hopefully strikes a bargain where the patient agrees to take the anxiety's perspective into account and the anxiety agrees not to make the patient so anxious all the time. Some people swear by this, say it's helped them where nothing else can, and absolutely insist they are having a real dialogue with their anxiety and not just making up both sides of the conversation."

[vi] **Plato, "Apology" (399 BC)**
"You have heard me give the reason for this in many places. I have a divine or spiritual sign which Meletus has ridiculed in his deposition. This began when I was a child. It is a voice, and whenever it speaks it turns me away from something I am about to do, but it never encourages me to do anything."

[vii] **S. Alexander, "Book Review: Origin of Consciousness…" (2020)**
"Theory-of-mind is our intuitive model of how the mind works. It has no relation to intellectual theories about how the mind is made of cognitive algorithms or instantiated on neurons in the brain. Every schoolchild has a theory-of-mind. It usually goes like this: 'the mind is an imaginary space containing things like thoughts, emotions, and desires. I have mine and you have yours. I can see what's inside my mind, but not what's inside your mind, and vice versa. I mostly choose the things that are in my mind at any given time: I will thoughts to happen, and they happen; I will myself to make a decision, and it gets made. This needs a resource called willpower; if I don't have enough willpower, sometimes the things that happen in my mind aren't the ones I want. When important things happen, sometimes my mind gets strong emotions; this is natural, but I need to use lots of willpower to make sure I don't get overwhelmed by them and make bad decisions'."

[viii] **Heery, M.W., "Inner Voice Experiences: An Exploratory Study of Thirty Cases" (1989)**
"It operated once, that I can remember, in the civil rights movement, when I was in Mississippi in 1961,and I was part of a visitation to Jackson, where the Freedom Riders were. There were a group of 40 or 50 of us in this room in a black college, and they were asking for people to volunteer to go with seven or eight into the airport restaurant, which meant we'd be arrested and go to jail. They needed a white Protestant minister, and they asked two or three times. They were about ready to leave, and the Rabbi who was heading up the delegation said, "Well, we haven't got a white Protestant minister yet," and then I heard this voice say, "Well you've got one now," and that was me. I was so surprised that it was me, that I had said that. It came from some very deep place in me. I was hearing it and saying it at the same time… I wasn't uncomfortable about it. That's what I wanted to do, that's what I believed in, and that's what in my deepest self I wanted to do. I was never dissatisfied or upset or distressed by what I had said, but it surprised me."