

## Free Will, Libet Experiments, Priming, Breakdown of Bicameral Mind and “Thinking Fast and Slow” by Daniel Kahneman, Penguin (Australia), 2012

### Prologue

Lupe was a young scam artist who participated in a roadside three-card trick of picking the queen, a playing card confidence game. She picked the queen twice and at the third round she suddenly lost the ability to decide and collapsed by the street side. Fans of the TV Series House M.D. may remember Season 3 Episode 20 in which a young woman suddenly could not decide which card to pick due to loss of blood flow to the brain<sup>1</sup>. Prof. Damasio (2006) provided a real-life example of one of his patients with ventromedial prefrontal damage who excruciatingly struggled to pick a date out of two dates to visit the doctor<sup>2</sup>. Our reasoning ability seems physiological as much as psychological. Prof. Kahneman in his book looks at our decision-making process from behavioural economics and psychological point of view.

Prof. Kahneman’s main proposition is that our decision-making processes rely on two mechanisms; in simple terms, a fast process, System 1, that kicks in quickly, automatically, and almost unconsciously; a slow process, System 2 that requires mental effort and attention. One of the functions of System 2 is to exert its influence by expressing, modifying, or suppressing the thoughts or actions suggested by System 1 (p. 44). When confirmed by System 2 the impressions, feelings and inclinations that starts in System 1 turns to beliefs, attitudes, and intentions. System 1 can also be trained to provide skilled responses and intuitions. It also can tilt our mind towards loss aversion, emotional consistency (halo effect), choosing the surprising over the normal, diminished sensitivity to quantities among other things. Basically, many of our poor decisions can be blamed on System 1<sup>3</sup>. Decisions are impacted by many psychological conditions that are both conscious and unconscious. Some priming prior to making decisions can unconsciously bias our decisions. He discusses *anchoring effect*, that results from a value of a quantity that people become acquainted with before estimating that quantity<sup>4</sup>. The book also helps us to look beyond the *illusion of validity* that results in often accepting the pundits to be better than the intelligent people in forecasting “emerging situations”. He advises to use both expert opinions and algorithms in predictive scenarios that require intuitive expertise as well as the use of algorithms. An example quoted in the book about the successful use of algorithm is *Apgar Score* that is used to assess the distress levels of the newborns.

Let us now diverge from the book to discuss a few of other ideas about decision making and the influence of priming on it. Priming that makes a person’s decisions to be shaped by another person’s ideas or some external information presented can be viewed as loss of

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<sup>1</sup> This reference is not an endorsement of the medical drama ‘House M.D.’ that in my opinion, may seem to normalise unethical practices through the main protagonist who makes any mean to achieve a desired end look acceptable.

<sup>2</sup> pp.192-194, Damasio A (2006) *Descartes’ error*, Vintage, London; Some ideas of prof. Damasio will be discussed later in more detail.

<sup>3</sup> Please note that the authour of this review believes that out decision making is one coherent act and takes in all the information at hand and makes the best decision under the circumstance using a rule-of-thumb logic. This does not allow for personal interests but only the information available to the decision-maker. The emphasis is placed on the way we usually arrive at decisions not the flaws of the process. This is discussed in Chapter 3 of “The lure of NOMA”, available in Amazon store: ASIN: B094JJM55W.

<sup>4</sup> Ariely D in his book *Predicably Irrational*, (HarperCollins Publishers Ltd, London, 2008) quotes an interesting example of anchoring using arbitrary coherence. He and his team primed several students using the last two digits of their social security numbers. The research illustrates how these digits influenced the pricing decisions of the students on several items offered to them. Even though the original prices were based on arbitrary social security numbers, they relatively used these prices on related items.

free will. These ideas about free will also lead us to a discussion about Libet experiments and the possible role of human ability to communicate our thoughts through language. Even though these diversions may look unnecessary at first sight, it may provide a broader perspective to the subject covered in the book being reviewed. First, let us look at Libet experiments that changed our view about some aspect of decision making, the urge-to-act.

## Libet Experiments

Prof. Libet and his colleagues based on their widely discussed experiment on the readiness potential (RP) and the urge-to-act, claim that our brains start our actions before we become consciously aware of the action we are about to undertake. It sounds bizarre but is accepted by many as a challenge to the concept of free will. As a preface to the neuronal involvement in the way we make decisions, it is opportune to further discuss this, acknowledging that Prof. Libet and his colleagues arrived at some ground-breaking conclusions through a series of widely known experiments. It has been previously established that the brain's electrical activity associated with the readiness potential starts 500ms before the action. In one of the seminal papers published in 1979 Prof. Libet *et al*<sup>5</sup> concluded that the peripheral stimuli of sufficient intensity applied to the skin on the hand or as a flash to the eye elicited a sensation before a stimulus applied to the somatosensory cortex could do so. A suitable stimulus applied to Medulla Lemniscus (LM) or a ventro-postero lateral nucleus of thalamus (VPL) also elicited a sensation close in time to the peripheral experience. While the stimulus to the cortex took its time to become a sensation the peripheral and lemniscus sensations were almost immediately felt<sup>6</sup>. The important point raised by Libet *et al* on the later cases is about the possibility of a backward referral in time to the start of the evoked potential from the stimulus. Libet *et al* (1983)<sup>7</sup> claim that while the brain acts on an urge after almost 500 milliseconds (ms) from the brain starting to evoke an electrical potential for the action, our consciousness only becomes aware of the volition about 350ms after the start of brain's readiness potential. In other words, our conscious actions start in the brain 'unconsciously' and our only resort to free will is to veto these volitions 200ms before their execution. There is much support as well as many objections to Libet *et al* on their interpretations of the results as well as the methodology used in their experiments<sup>8</sup>. Schurger (2021) questions the existence of the readiness potential itself as observing it requires averaging many trials due to the signal being an order of magnitude weaker than the noise<sup>9</sup>.

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<sup>5</sup> Libet B., Wright Jr. E.W. Feinstein B. & Pearl D.K. (1979) Subjective referral of the timing for a conscious sensory experience, *Brain*, 102 pp.193-224

<sup>6</sup> Libet *et al* (1979) had three key tables summarising their results. Tables 1B, 2B and 3B. Table 1B indicates the stimuli given to the right side and left side of the body showed no material difference in relation to the time takes for the sensation to be experienced. Table 2B asserts the same about the time difference for the sensations experienced from the stimuli to peripheral receptors and LM. Table 3b shows on average more than 200ms delay in the experience of sensations from the stimuli applied to the somatosensory cortex in relation to the peripheral stimuli. They also state that both cortex stimulation and Medulla Lemniscus stimulation requires a minimum pulse train of the intensity 60pps for a duration of 200ms to reach the neuronal adequacy required for eliciting a sensation. However, such a train to LM or VPL resulted in a sensation started almost from the first pulse. This experience is observed in a world running half a second or more ahead of our conscious experience of the world.

<sup>7</sup> Libet B., Gleason C.A., Wright Jr. E.W. & Pearl D.K. (1983) 'Time of conscious intention to act in relation to onset of cerebral activity (readiness-potential)', *Brain*, 106, pp. 623-42

<sup>8</sup> Gomes G. (1998) The timing of conscious experience: a critical review and reinterpretation of Libet's research, *Consciousness and Cognition*, 7, pp. 559-95

<sup>9</sup> Schurger A, Hu P, Pak J (2021) What is the readiness potential, *Trends in Cognitive Science*, 25(7)

What these seminal works from Libet and others tell us is that we are 500ms behind the actual events around us and our actions emerge unconsciously in the brain. Some authors believe that a call to action in the brain can even start 10s before we are aware of it<sup>10</sup>. Fried *et al* (2018)<sup>11</sup> repeating the ideas from Libet *et al* (1983) conclude that “the experience of will emerges as the culmination of premotor activity... starting several hundreds of ms before awareness.” However, Alexander *et al* (2014) claim that the RP, that also occurs in the absence of movement, does not reflect the presence of an unconscious decision to move<sup>12</sup>. They also conclude that the RP precedes hypnotically induced and volitionally induced movements. Studies involving rodents also show that medial frontal cortex seems to help timing via time dependent neuronal ramping activity<sup>13</sup>. This indicates that the neuronal processes are responsible for both evoking the actions and keeping time.

Thus, it is reasonable to assume that all conscious creatures should be considered on the questions on free will. Otherwise, we are embarking on human exceptionalism<sup>14</sup>. What evolutionary advantage will we get by having or not having free will? Did Libet experiments make us only argue about the free will using a definition of ‘will-to-act’ and the readiness potential? Should not we consider ‘thoughts’ and ‘choices’? Thus, free will becomes also about choices and decisions. If I shift my gaze from a flower to its petals, it is exercising my free will, is it not? While reading a book if I fall asleep the sleep was not my choice. If I wake up and start reading again reading is now a result of my free will. If somebody is sleepwalking or having a wet dream, does the person have free will as the conscious mind has been switched off? In *somnambulism* or *hypnotic trance*, the person does not suffer from a disease of consciousness. In such situations, there is a decreased awareness but not a loss of awareness. Thus, our brain activity related to the consciousness is still functioning. In my view, only issue here is disengagement between the consciousness and free will. In a fight or flight situation, a person or an animal can be frozen in fear and lose the ability to choose. Hence, free will, like consciousness is just a state than a permanent feature of our existence. Thus, should we too hasty to write off the freewill? Perhaps, not. This view is different from the compatibilist way of thinking. When I am angry, and my face is filled in with blood, that physiological response is not my free will. It is simply a physiological adjustment to facilitate my emotions. But if I decide to yell or smash a glass because of my anger, then I accomplish that task as an extended response to my anger under my free will. Free will, in my opinion, always determines our non-instinctual extended actions. The ordinary responses to stimuli are at the mercy of our physiological features including somatic markers that we will discuss later. In this framework, actions are confined to a person’s physiological functions or adjustments as responses to stimuli. Eye movement shifting the gaze from the flower to petals is operated by an unconscious physiological action. Changing my gaze and fixing it on the petals are subject to my will. The extended actions extend beyond the physiological changes to acts of verbal or physical acceptance or

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<sup>10</sup> Soon S.S, Brass M, Heinze H and Haynes D (2008) Unconscious determinants of free decisions in the human brain, *Nature Neuroscience*, 11 (5), pp. 543–545

<sup>11</sup> Fried I, Mukamel R, Kreiman G (2011) Internally generated preactivation of single neurons in human medial frontal cortex predicts volition. *Neuron* 69, pp548–562

<sup>12</sup> Alexander P, Schlegel A, Sinnott-Armstrong W, Roskies A, Tse P. U, and Wheatley T (2014) Dissecting the Readiness Potential: An investigation of the relationship between readiness potentials, conscious willing, and action., *Surrounding Free Will*, edited by A. Mele, Oxford University Press, pp. 205–30

<sup>13</sup> Emmons E.B, De Corte B.J, Kim Y, Parker K.L, Matell M.S, Narayanan N.S (2017) Rodent medial frontal control of temporal processing in the dorsomedial striatum. *J Neurosci* 37:8718– 8733.

<sup>14</sup> As Prof. De Waal says we should not make humanity measure of all things and look at other species from their point of view. p. 275. De Waal F (2016) *Are we smart enough to know how smart animals are?* Granta, New York

rejection of stimuli. We need to keep in mind this distinction about actions and extended actions and the role of free will in their execution. After a short discussion about priming, we will turn again to Libet experiments in following sections.

### **Premature Judgement on the death of Free will?**

With the above discussion in mind now we can again consider the book by Prof. Kahneman. Prof. Kahneman cites the classic experiment on *Florida Effect* by the psychologist John Bargh and his collaborators. It is well known that this and similar experiments later led to some controversies that prompted Prof. Kahneman to famously write what is known as "*Kahneman Train Wreck*" about social priming. However, the *Florida effect* is mentioned in the book without a reference to the controversies. Even though Prof. Kahneman does not discuss subliminal priming, the topic is very much alive in many peoples' mind with reference to marketing of a famous soft drink. To test these previous claims, different experiments were later conducted. A subliminal message of Lipton Ice only lasting 23ms used in such an experiment showed to impact the choices of thirsty test subjects to display a higher preference for the primed drink<sup>15</sup>. This and similar studies tell us that priming, subliminal or not have an impact that would not be obvious to the conscious. Second implication is that our senses can perceive the messages possibly below a neuronal threshold. This makes one doubt the conclusion from Libet experiment that the instructions Libet *et al* provided did not play a part in the urge-to-act. Their instructions were not subliminal. When a message that was subliminal can bias an outcome, is it not possible for a clear set of instructions etched into the consciousness via training trials to make unconscious bias? From the famous experiments like Milgram and Stanford we know the power of instructions given by the researchers in shaping behaviours.

Perhaps, we need to seriously think about the following possibility pointed out by Keller and Heckhausen (1990)<sup>16</sup>. They claim that the Libet *et al*'s result from 1983 can be interpreted differently. The readiness potential that arose 500ms before the action resulted from not a conscious decision 350ms after its onset but was induced by the instructions at the beginning of the experiment. The time of urge to move, based on advice to introspectively monitor an internal process, "coincides with the change of control from a lateral unconscious to a medial conscious process". Any such experiment that imitates Libet *et al* (1983) must ask the subjects to be doing something as the will to move kicks in. That is the time they record as the time of conscious decision. But this decision is totally dependent on the instructions given by the experimenter at the start. Thus, there is no other way to categorise this than considering it to be behavioural priming. The conscious decision is to move a body part while watching a clock turning away from the starting position. The other selection for Libet *et al* to be correct is that the priming being non-existent is not a very plausible explanation. If that is not so, some of the work on *Associative Coherence* that links our memories and new stories to make a coherent whole described in Prof. Kahneman's book will become hollow. It is important to consider the following from Kihlstrom (2019): "There is no reason to think that motives and goals cannot be unconscious and nevertheless

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<sup>15</sup> Karremans J.C, Stroebe W and Claus J (1996) Beyond Vicary's fantasies: The impact of subliminal priming and brand choice, *Journal of Experimental Social Psychology*, 42, pp.792–98. Priming only had effect on the individuals who claimed to be thirsty.

<sup>16</sup> Keller I and Heckhausen H (1990) Readiness potentials preceding spontaneous motor acts: voluntary vs. involuntary control, *Electroencephalography and clinical Neurophysiology*, 76: pp 351-361

influence experience, thought, and action; but further research is needed to make the case convincing”<sup>17</sup>. The author also says that there is a widespread agreement on the unconscious nature of the episodic memories. Weingarten *et al* (2016) concluded that from 84 reports based on 133 studies there was a small, yet robust, behavioural priming effect across methodological procedures and publication bias.<sup>18</sup> Thus, we have good reason to accept that the priming by Libet and his colleagues played a role in the result they got and thus, what was measured might be the unconscious crossing the threshold to become conscious. So, the death knell of free will might well not have been sounded by the Libet experiment.

## Language and Decisions

Many people are also inclined to accept that the ultimate responsibility of our actions lies with the will of a supreme being or is not solely in our hands. As the book labelled as a *cult classic* in psychology, “*The origin of consciousness in the breakdown of the bicameral mind*” by Prof. Julian Jaynes theorised we had been hallucinating our thoughts as the voices of gods during the bicameral period around 9th and 1st millenniums BC. During the social upheavals when the gods were losing control and with the spread of writing the consciousness leading to the silencing of our auditory hallucinations awakened. Breakdown of bicameral mind is not directly relevant to the current review unless it is viewed in the context of the importance of language to human consciousness. Prof. Jaynes quoting the Marbe experiment about the independence between thinking and consciousness considers it to the Michaelson-Morley equivalent in psychology. He also says that we do our thinking before we know what are to think about<sup>19</sup>. However, the crucial element here is Karl Marbe’s unconscious act of weighing started with his instructions – an act of priming. Prof. Jaynes further says that the auditory hallucination that springs in one side of the brain, was a side effect of language of which every word represents a metaphor. Like mathematics a vocabulary is like a shortcut to an object or a behavioural process. Words became abstract from its concrete origins with the help of metaphors. The subjective consciousness, an ‘analog’ of real world is built up of these metaphors. For humans, in his view, the language is crucial. The metaphors may carry different meanings for different people and may act like priming too.

The language area in the right hemisphere comparable to Wernicke’s area on the left is, according to Prof. Jaynes, responsible for the voices of gods. We became conscious by breaking free from the bicameral, mostly due to learning and culture<sup>20</sup>. The major feature of our learning and culture is language. However, as this view may confine consciousness to the language proficient humans, there should also have a different view of the world. Our brain, according to Prof. Damasio (2006) holds three interconnected structures, one that holds the image of an object, another that holds an image of the ‘self’ and the third one, a neuronal structure called convergence zone that builds a dispositional representation of the self that was perturbed by the organism’s response to the object. This structure does not

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<sup>17</sup> Kihlstrom, JF (2019) The motivational unconscious, eScholarship.org, DOI. 10.1111/spc3.12466

<sup>18</sup> Weingarten E, Chen Q, McAdams M., Yi J, Hepler J & Albarracín D (2016) From primed concepts to action: A meta-analysis of the behavioural effects of incidentally presented words. *Psychological Bulletin*, 142(5), pp 472–497. <https://doi.org/10.1037/bul0000030>

<sup>19</sup> p.36-39, Jaynes J (1993) *The origin of consciousness in the breakdown of the bicameral mind*, Penguin Books, Great Britain

<sup>20</sup> p.108 Jaynes J (1990) *The origin of consciousness in the breakdown of the bicameral mind*, Penguin Books, London

require language and can be common to animals as well. The language thus, according to Prof. Damasio, may not be the source of the self, but the source of “I”<sup>21</sup>. Prof. Damasio’s self is something that is proprioceptive and keep track of our body. The convergence zone is where we have the combined representation of real world. To describe this representation, we use language that ‘generates and access consciousness’<sup>22</sup> and the said representation as it is an added layer on top of the self requires interpretation.

Bertrand Russell believed the perception becomes human consciousness that can be illustrated using the phrase ‘I see the table’. Prof. Jaynes says both ‘I’ and ‘I see the table’ should go together as consciousness. If we accept the convergence zone that is here also aligned with Prof. Jaynes’ view, I, the self that is entangled in language and my image of the table merge as one. Language may be the glue binding *personalised* words to images<sup>23</sup>. As we mentioned earlier, the free will to see the table should engage the consciousness. The issue now is how long it takes the self to invoke the “I”, the conscious, language proficient organism who sees the table or the whole conscious experience happens simultaneously. I believe this is a critical question, we should pose, at least within the confines of our limited understanding of non-human consciousness. Do Libet experiments indicate that this process takes a share of 500ms? If that is the case, their idea of referring backward to the evoked potential of a sensation makes more sense. The brain basically subtracts the time taken to interpret the world in one’s language from the time of the formation of the dispositional representation. Perhaps, the brain only cares about what happens in the convergence zone and not how it interprets the dispositional representation in one’s dialect. Whatever lag between stimuli and perceptions or our will and actions that we experience may also be due to the mode of internal communication outside of chemical processes. The mode that we use in daily life is the one our brain chooses. As a young boy I used to think in the language I was born into but now I mainly think in English. At least that is what I believe. Natural selection, it is likely, did not choose our language but the neural infrastructure. Thus, there is likely to be a minute time gap between our thinking and our verbal expression of the same and our responses to verbal commands. Participants of Libet experiments had to unconsciously obey the experimenter’s instruction and interpret them to keep an eye on the oscilloscope to measure time. This requires constant interpretation of the instructions and the sense of metaphorical “I” to keep track of a set of metaphors. This is not likely to be an instantaneous task.

As many of us believe we are evolved to fight or take flight. In evolutionary perspective, self-preservation is paramount. Thus, a world that is 500ms behind the time of event is not ideal for survival, unless whole living world works in sync. Thus, whatever the time lag is can be deemed, at least as a theoretical possibility, to refer backward to the actual time of an event. Brain synchronises the perception and the stimulus by minimising the noise of language. Similarly, our will-to-act cannot lag far behind unless our decisions for survival are all instinctive or unconscious. Somatic marker hypothesis tells us that in simpler terms a somatic marker, like our ‘gut feel’ is certain feelings<sup>24</sup> generated by secondary emotions, the

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<sup>21</sup> p.223-244, Damasio A (2006) *Descartes’ error*, Vintage, London

<sup>22</sup> p.449 Jaynes (1990)

<sup>23</sup> Capgras syndrome tells us that the words and images should be associated with feelings to make sense.

<sup>24</sup> Prof. Damasio distinguishes feelings from emotions. We experience primary emotions such as fear, anger, happiness, sadness etc. When the bodily response conforms to one of the profiles, a kind of somatic marker, these emotions generate the associated feeling arises. There are distinct neural paths that are ignored in this description.

emotions that arise from memories and their associated emotions, connecting the predicted future outcomes with the *memories* of those emotions. Thus, the somatic markers seem to be the remembered profiles of the body's neuronal correlates corresponding to certain emotional responses. These markers can play a role in our decisions by generating some feelings that are positive or negative towards the situation encountered. This process only helps us to decide by choosing one out of a range of options. Thus, our decision-making process is not solely psychological but physiological too<sup>25</sup>. This is somewhat different to what Prof. Kahneman mainly emphasises on the role of psychological factors in our decision making even though he mentioned the physiological aspect in passing to discuss the "*affect heuristics*" (p.139). He also says that System 1 'generates impressions, feelings and inclinations' (p. 105) where the feelings may not necessarily represent the 'gut feel'.

As discussed, the language is likely to be crucial to our consciousness. It also must play a crucial role in the way each one of us interpret the facts presented to us verbally or in writing. The metaphors the words are associated with may be different for different people. The most of test scenarios that prof. Kahneman quotes in the book requires understanding of the language. But it is not the understanding itself but the interpretation of subtle nuances. When I say 85% of the cabs in the city are green to a person, that person may interpret it as 85 cabs out of 100 are green. But another person may find its meaning to be that there is 85% chance the next cab he or she sees on the street to be green. This difference may drive only one person to think probabilistically. Thus, the non-specific language and knowledge can be confounding factors in our decision-making under artificial scenarios. As we are about to discuss, the artificial scenarios can stand as language without 'feelings'.

### **Some Decision-making mechanisms and their implications**

Prof. Kahneman discusses many examples of decision-making some of which are also succinctly described in the research articles written by him with Prof. Amos Tversky and given as the appendices to the book. The criticism I have for these examples are that a fair few of them are purely academic examples that you would not usually encounter in real life. In other words, they may not kick start our somatic markers that would be tied with our real-life experiences. For example, how many of us would in daily life encounter a question about the grade point average of a hypothetical Julie who had read fluently as a four-year-old and is currently in a state university? It may be a good example for representativeness but is it so in life too? What sort of emotions and feelings this hypothetical Julie would evoke in us? There are many academic examples in the chapter on "Rare Events". The justification for these examples can be that they represent simulations of actual possibilities. Many examples of priming or anchoring can be due to the test subjects' lack of familiarity with the situations. Thus, priming provides anchors for the guesses. If the subject knows about TV sets, the person does not have to depend on priming or anchor points. They can deduce the price of a TV better. This is also true for preconceived ideas as the set of questions Prof. Rosling kept asking his audiences shows. The majority got the answers

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<sup>25</sup> Introduction: Rosling H (2018) Factfulness: Ten reasons we're wrong about the world and why things are better than you think, Sceptre, UK. This is what Prof. Rosling in 'Factfulness' considers as instincts that we developed through evolution to jump to 'swift conclusions' to avoid immediate dangers.

wrong because of their preconceived ideas or social priming<sup>26</sup>. Prof. Rosling proposes several reasons such as negativity instinct and straight-line instinct to explain why we get the answers to his questions wrong; these are about our preconceived opinions and instinctive responses. The lesson is that once we come to know ourselves and the world around us better, we make better decisions. Prof. Kahneman does not allow for the knowledge gap in his experiments. There is no proper mention, that caught my eye, about the assessment of baseline knowledge of the participants. Once the knowledge gap is allowed, there is a possibility for the decision-making process to become less alluring<sup>27</sup>.

The other point Prof. Kahneman makes is about Bayesian logic that we have to use in some situations like cab problem (p. 166). If we use Bayesian thinking in cab problem it leads to an analytical solution that is only accessible to people familiar with such thinking, perhaps not people, like me, who think on their feet. Perhaps, our brains may process information using Bayesian processes<sup>28</sup>. As Gould and Shadlen says our brain may be resorting to some innate Bayesian processes. This is unlikely to auto-drive System 1 to Bayesian responses. Perhaps, in our daily life, we only use simple logic<sup>29</sup>. As nowadays everyone is talking Bayesian, we tend to see the same even in processes that are not Bayesian at core. To add up 1 plus 1 we do not need Bayesian logic. If brain uses such sophistication, why do we often get things wrong while using fast thinking mode? It is not ludicrous to think that irrespective of the fact we use fast or slow thinking processes or instinctive process as humans we make umpteenth number of decisions each day; some in a blink of an eye.

Thus, testing our decision-making mechanisms using made-up scenarios may not provide the universal answers, especially when many of the experiments deal with a special class of people who are University students. Human nature is broader than a special cohort and may not be well represented in the experiences of such groups. I wonder what Prof. Kahneman would infer from the people who answered the questions the way he did not expect. For an example when theorising about availability only some participants got misled by the availability. The chapter on availability, Chapter 12, tells us that paradoxically, more times we list instances of some behaviours or features the less confident or assertive we feel about it. If I try to list more reasons to support my choice of words in this sentence, I become less confident about the choice. As Prof. Kahneman points out, vexation of recalling itself can make us feel bad about ourselves and in turn, about the task at hand. This task is also about the topic, the analytical thinking, and the test of memory. We do not need to be psychologists to see it. This is about our need to explain using generalisations rather than looking deeper into the thinking process. The outcome is not the logic used alone. We are products of mountain of memories and many feelings and emotions that can be associated with such memories. The decisions we make may be primed by the immediate as well as

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<sup>26</sup> Rosling (2018)

<sup>27</sup> Prof. Kahneman mentions that with the adequate training System 1 can provide skilled responses. But the mention here is about assessing the impact on prior knowledge on System 1.

<sup>28</sup> p.535-74, Gould J I and Shadlen M N The Neural Basis of Decision Making, Annu. Rev. Neurosci. 2007. 30 Note that some believe that our brains decision making process can be explained by Signal Detection Theory and Sequential Analysis. Sequential analysis determines the way our accumulating evidence on sensory signals we detect update our priors and likelihoods leading to sequential decision rules for binary decisions.

<sup>29</sup> Chap.3. Arachige D (2009) The Lure of NOMA, Ocean Publishing, Perth, suggests that our decision-making uses Rule of Thumb logic. It can be slow or fast thinking, somatic markers or pure instincts we are born with. But with us or any other species, a decision is made based on whatever information available at hand. It is a simple or inductive or deductive logic. When we drive a car, we make multitude of such decisions on rapid-fire succession to negotiate the road. They cannot all be conscious as we can talk to our passenger while we make all these decisions.



very distant lived experiences that are hidden in deep cavities in our past. Let us take a pause and divert the attention to the way to end this review.

### **Philosophical questions with pragmatic answers and a final word on the book**

As we discussed in previous sections, I am indebted to Prof. Kahneman's book for provoking many thoughts that are about the core of human nature and are apparent in some form or shape in this article. He also shows us that our decisions may not be all rational and can be coloured by priming, both in the short term as well as in the long run. It is also interesting that priming raises fundamental philosophical questions about the nature of free will. If we are under priming effects like in a hypnotic trance, we are not under our free will. However, priming should only affect our reasoning but not our choices or decisions unless we directly link the logic used for reasoning to the choice. We choose the primed option in line with our reasoning driven by priming. In case of Libet experiment on free will, there was a choice to act or veto the action. The point is the outcome is not merely the means.

In our physiological processes we, I believe, are blind to the time that is taken to interpret the world around us using our language processing power<sup>30</sup>. Our free will is about responses to the external or internal stimuli that elicit actions from both objective and subjective sense. Thus, the result of Libet experiment can also be about the effect of priming, in its case the instructions, and the language processing. Our decisions too are subject to priming influences and thus, may not arise from free will. As the studies involving the patients with Anton's syndrome or anosognosia have shown, such patients lose the connection between one side of their world with respect to the proprioception and perception. A person with damage to right cortex, may see his or her own left hand as someone else's. Thus, meaningful expressions require both body and mind<sup>31</sup>. I use the word mind here to describe the situation where physiological deficiencies can be partially repaired by a *higher* function that adjust our perceptions. For an example, split-brain patients are known to turn their heads to get cues about the other side and thus, do not feel the lack of perception in a major way. Our decision-making process thus, is subject to our information and the information at hand is subject to our physiology.

With many digressions from the major topic, our discussion so far tried to show that our neuronal structures, language, feelings, and emotions can play a reasonable part in our decision making. Even when the subject matter is accepted as about human endeavours, a question that may linger in a reader's mind is whether System 1 and 2 are about human exceptionalism. Are there any parallels in the animal kingdom? Does a monkey jumping from one high branch to another use System 1? To keep the monkey alive for a reasonable span of time, the System 1 should do an exceptional job. Likewise, our choices are not always about an artificial scenario as such scenarios do not involve same mental and physical preparedness. Thus, theoretical generalisations in Prof. Kahneman's book could have been combined with real-life scenarios. Psychologists often use games or make-believe

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<sup>30</sup> pp.889-893. Sereno M I, et al (1995) Borders of Multiple Visual Areas in Humans Revealed by Functional Magnetic Resonance Imaging, *Science*, 268 (5212). This article discusses the possibility of overlap between visual and word recognition functions in Human neocortex. This is a feature, apart from the human focus on the centre of gaze, that is not detected in nonhuman primates. Thus, we may link the images with the words.

<sup>31</sup> This is the Descartes's error that Prof. Damasio laments about in his book.

scenarios to simulate life. But a model plane in a wind tunnel can yield the information sought after by an engineer than a person made to run for life in a video game can. One is a mechanical process but the other is not. In my opinion, the slow and fast thinking processes are rather like deciding on the spot or dive deep and perhaps, procrastinate to decide. Thus, it would have been more relatable to our perceptions about the real world if this distinction about the instinctual process and analytical process has been made more explicit in the book. As we may wander from the corpus of various influences on our decision-making that are discussed in the book, we will hardly make an error free decision without a deeper analysis. Perhaps, that is something we have to accept as a fact of life.

Prof. Kahneman, a Nobel Laureate in Economics, is mainly about the factors that can influence our behaviours in financial choices and other situations where we are making decisions. The Professor's likely purpose is to inform rather than to instruct. The topics I touched in the above discussion does not do justice to the book as it covers many topics such as prospect theory, affective forecasting, regression to the mean, endowment effect, halo effect and more that were not discussed here. The examples and discussions in the book have many lessons for us to contemplate about our routine behaviours with a more grounded perspective. Thus, Prof. Kahneman's book is an extremely valuable addition to any collection of books on human nature. Millions of readers have already come to this conclusion by making this book a best seller.

Reviewed by Darshi Arachige (17 Oct 2021)