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Freedom or Determinism: In Light of Recent Neuroscientific Discoveries

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ABSTRACT
Recent advances in neuroscience and cognitive psychology have led researchers and philosophers alike to grapple with questions concerning humanity's free will. The findings of Libet, Treisman, and more recently, Barrett may initially seem to point confidently towards a deterministic stance on human free will; however, after a careful review of their findings it becomes increasingly clear that their findings suggest the opposite: humans have the intrinsic freedom to decide, to act, and to feel. In this essay, I assert that the dissonance between science and free will is fabricated from a misunderstanding of what the scientific literature has suggested in light of determinism. Furthermore, I would contend that free will is not a fallacious concept that, by nature, cannot coexist with the deterministic-like hypothesis that science has only somewhat suggested. By examining the findings of Libet on readiness potentials, the results of modern studies in cognitive psychology on attention, and recent research on the constructive nature of emotions, I propose an intermediate perspective, one that encompasses the triumphs of modern-day science without discrediting our freedom. In this way, I assert that there is no discord between modern scientific findings and the basic tenets of free will.

KEYWORDS
Freedom, Determinism, Neuroscience, Cognition, Psychology, Free Will

The recent advances in biochemistry, molecular biology, and cognitive neuroscience have led many to question how constructs like freedom—and other constructs that are so closely tied to the human experience—can coexist with the expanding body of literature suggesting the presence of a strong deterministic predisposition to the human condition. For, if we are the product of things that, for the most part, are vastly out of our control, like our genes, our environment, and our neurology, how do we reconcile our unique experiences as human beings? How do we explain the tenets of free will and personal autonomy in the face of scientific findings that point towards determinism? These questions have become stumbling blocks in the minds of many people, scientists and philosophers alike, leading them to believe that free will simply cannot coexist in the realm of modern-day science that seems to point heavily towards the role deterministic predispositions play on the human experience. Proponents of the belief that modern science provides ample evidence that the human condition is largely deterministic are not apt to believe that we are autonomous creatures, free to make our own decisions, thereby posing some serious questions as to how we think, act, and behave. Likewise, those who champion the belief that we are wholly free and autonomous individuals are criticized for their ignorance in light of the scientific evidence. This divide in perspective, while very real, is grossly unnecessary. I would argue that the dissonance between science and free will is fabricated from a misunderstanding of what the scientific literature has suggested in light of determinism. Furthermore, I would contend that free will is not a fallacious concept that, by nature, cannot coexist with the deterministic-like hypothesis that science has only somewhat suggested. By examining the findings of Libet on readiness potentials, the results of modern studies in cognitive psychology on attention, and recent research on the constructive nature of emotions, I propose an intermediate perspective, one that encompasses the triumphs of modern-day science without discrediting our freedom. In this way, I assert that there is no discord between modern scientific findings and the basic tenets of free will.

Modern scientific brain imaging techniques have allowed researchers to delve into the depths of the mind and quantify the initiation of a voluntary act. The neural delay for conscious intention, described by what neuroscientists call the readiness potential, is a neural marker that is "recordable on the head starting up to a second or more prior to the actual muscle activity" (Libet 1992, 262). This electrical charge has been thought of as "an indicator of brain activity

that is involved in the onset of a volitional act" thereby leading researchers to question whether "the conscious wish or intention to perform that act precede[s] or coincide[s] with the onset of the preparatory brain processes, or does the conscious intention follow that cerebral onset?" (Libet 1992, 262). Researchers performed a comprehensive study to determine which comes first: the conscious intention to perform an act or the readiness potential. The results clearly showed that onset of the readiness potential precedes the subjects' conscious wish to perform an action by about 350 msec (Libet et al., 1982). These findings suggest that our actions are predetermined by neural activity prior to our conscious decision to perform those actions, therefore posing some serious questions as to whether we are free to perform those actions in the first place. To describe these findings, Libet and colleagues developed what is called the "cerebral time-on theory" which states that "the transition, from an unconscious mental event to one that reaches awareness and is consciously experienced, can be a function of a sufficient increase in the duration" of the neural activities such as the readiness potential (Libet 1989). In this way, "neural activities whose duration is below some minimum substantial duration could mediate a mental function that remains unconscious" but, "when such activities persist for longer than a minimum time of up to about 500 msec, subjective awareness of the mental function can appear" (Libet 1992, 265). While the explanation proposed by Libet and colleagues seems to accurately describe their findings and offer a strong argument for determinism, it is imperative to note, as Libet does, that "the changes in durations of the appropriate neural activities may be affected, for example, by changes in the attention process" (Libet 1992, 265). Therefore, slight alterations in our attention, can contribute to whether or not these readiness potentials essentially become volitional acts. And because attention is a vastly conscious cognitive construct, this leaves room for free will to play a role.

Cognitive psychologists define attention as "focusing on specific features, objects, or locations or on certain thoughts or activities" (Goldstein & Mackewn, 2005). In most, but not all cases, when we focus our attention, we are doing so via conscious volition. According to Treisman's widely accepted model of attention, the attended message (the message that we focus on) gets through stronger than the weaker, unattended message and that the strength of the attended message has a direct relationship to our conscious ability to attend to that message

(Goldstein & Mackewn 2005; Treisman 1964). But what implications does this have for free will in the context of the readiness potential?

Combining these findings in neuroscience with those demonstrated in cognitive psychology leaves ample room for free will to coexist in the realm of readiness potentials. Drawing from Libet's "cerebral time-on" theory, the longer readiness potentials persist in our unconscious, the more likely they are to become a part of our subjective awareness (Libet 1992, 265). In this way, readiness potentials can be likened to the unattended messages that pass through the attenuator at a weaker strength—they do not enter into consciousness until we consciously attend to them. Once we consciously attend to them, only then are action potentials fired resulting in the initiation of a voluntary act. Therefore, it is our conscious attentive processes that give rise to the action potentials that characterize our volitional acts. In this way, by adjusting our perceptual load to attend to these readiness potentials, we are able to control our actions. To put it another way, readiness potentials don't evoke voluntary action, only action potentials can do that, and so by directing our attention to a readiness potential, it enters into our conscious experience and allows us to be free to perform voluntary actions. So the question isn't so much about which comes first, "the conscious intention to perform a voluntary act" or the readiness potential; but rather, the question becomes this: At what point do we decide to attend to this background neural activity? As Libet points out, the fact that we can adjust the rate at which these readiness potentials enter into consciousness via our attention (or lack thereof), points directly to the notion that we, as human beings, are mostly free to attend to messages and stimuli in our environment, or at the very least, have the capacity to freely attend to these stimuli.

So once we attend to these messages, are we essentially "stuck" in such a way that we have to perform these actions because the background neural activity entered into consciousness?

To put it simply, no. Even Libet recognizes that, once the wish to act enters consciousness (as a result of prolonged readiness potentials, at least according to Libet) "the subject can consciously control the outcome of that volitional process, for example, by vetoing, i.e. blocking its final expression as a motor act" (Libet 1992, 270). For, "if the conscious control function itself is initiated by unconscious cerebral processes, one might argue there is no role at all for conscious free will even as a controlling agent" (Libet 1992, 270). Essentially, if consciousness merely

describes our perception of our own existence, and does not lend itself in any way to control our actions or give us the liberty to freely choose our actions, then what is the purpose of consciousness? There would be no purpose. In this way, Libet distinguishes between the "conscious control of an event" and the phenomenon of "becoming aware of the volitional intent" to perform said action/event, arguing that these are separate phenomena (Libet 1992, 270). By making this distinction, Libet recognizes the limitations of his findings and, "given the difference between a control and an awareness phenomenon… we should recognize that there is presently no specific experimental test of the possibility that conscious control may require an unconscious cerebral process to produce it" (Libet 1992, 270).

Thus far we have seen how Libet's discovery of readiness potentials, when coupled with more recent research in cognitive psychology, leaves room for human free will. However, many still question the validity of free will in regard to other facets of the human experience, such as our emotions. Proponents of determinism would claim we are largely the byproduct of our neurophysiology and neurochemistry—our thoughts, feelings, and emotions are largely predetermined and wholly out of our conscious control, and thus, any actions performed while in negative emotional states cannot be fully attributed to the person experiencing the emotion. The deterministic perspective on emotional free will is based largely in the classical view of emotions, which posits that emotions are analogous to fingerprints in that they are composed of "a distinct pattern of physical changes" that result in our experiences of them (Barrett 2017, 3). In this way, "the 'fingerprint' of emotion is likewise assumed to be similar enough from one instance to the next, and in one person to the next, regardless of age, sex, personality, or culture" (Barrett 2017, 3). Evidence for this perspective comes from rather primitive studies in which researchers flash an exaggerated facial expression on a screen and ask participants what emotion they are viewing, and "from this evidence, scientists concluded that emotion recognition is universal" (Barrett 2017, 7). These researchers then reasoned that "the only way expressions could be universally recognized, [was] if they [were] universally produced" leading them to the drastically bold and wide-sweeping conclusion that "facial expressions must be reliable, diagnostic fingerprints of emotion" (Barrett 2017, 17). This explanation is satisfactory for the proponents of determinism; for it is intuitive that we all share common emotional expressions that serve as "fingerprints" that ultimately render us enslaved to our biological systems. However, with the surge in technological

advances came the ability to look at emotions as they are experienced in real-time. Facial electromyography (EMG) and Facial Action Coding (FACS) allowed researchers to observe minute changes in facial expressions that were previously undetectable. Furthermore, the evidence from these studies "present a serious challenge to the classical view of emotion" in that "in study after study, the muscle movements do not reliably indicate when someone is angry, sad, or fearful; they don't form predictable fingerprints for each emotion" (Barrett 2017, 7). This finding captured the attention of psychologists and researchers alike, highlighting the need for a more comprehensive hypothesis for the nature of emotions, and leading many to believe that there is no "one size fits all" facial expression for each emotion we experience.

But what implications do these findings have on not only the theory of emotion, but also on the basic tenets of free will? As aforementioned, the deterministic viewpoint describes emotions according to the classical view, in that emotions are these innate, natural responses that are biologically ingrained and have universal features. If emotions are intrinsically rooted in our biological system, then when we act in accordance with our emotions—when we react out of anger or frustration—we cannot be held responsible for those actions as they are the result of our biology and not our free will. But modern-day science offers little evidence for the classical view of emotions. Instead, an overwhelmingly large amount of research points to what Barrett calls the constructive nature of emotion. According to Barrett, the brain synthesizes sensory inputs to create an emotion in real time, and then adjusts these responses accordingly. Furthermore, Barrett advocates for emotional free will, citing countless studies that show that humans are largely in control of their emotions, and that with this heightened awareness of our control over our own emotions comes a great deal of responsibility for our actions.

Perhaps this is best illustrated in the United States legal system, which distinguishes between crimes committed in the "heat of passion" and premeditated crimes. The U.S. legal system "assumes that emotions are part of our supposed animal nature and cause us to perform foolish and even violent acts" thereby offering a sort of cop-out explanation that "partially mitigates a person's responsibility for his actions" (Barrett 2017, 221). This explanation, termed the heat-of-passion defense, "depends on assumptions from the classical view of emotion" (Barrett 2017, 221). Barrett cites the example of the Boston Marathon

bomber, Dzhokhar Tsarnaev who's trial weighed heavily on his expression of remorse for his actions, for if he showed remorse in the courtroom and pleaded that he was caught up in emotions over which he had no control, he would be less likely to receive the death penalty for his crimes. In this way, the court system has fallen into the deterministic-like classical view of emotions that render us no longer responsible for our actions that were performed out of intense emotion. However, as growing amounts of scientific literature indicate, this deterministic viewpoint of emotions is unfounded in modern neuroscience and psychology. To put it simply: emotions are not biologically ingrained responses that are out of our control; but rather, science has shown that humans have nearly full control over their emotions. And with emotional control comes emotional free will. And, as with any form of free will, comes responsibility for one's actions.

In conclusion, the discovery of readiness potentials and the findings and theories of Libet, while they may initially seem to point to a wholly deterministic theory of human behavior, do in fact, leave ample room for free will, especially when these findings are taken in light of recent research in cognitive psychology on human attentional paradigms. The distinction between awareness and consciousness is necessary when interpreting these findings. Moreover, other facets of the human condition also point to freedom over determinism. While the classical view of emotions was the leading theory behind emotional regulation for a substantial amount of time, recent advances in research have shown that emotions are not ingrained into our biological systems. With this paradigm shift from the classical view of emotions to the constructive nature of emotions came an inherent shift from emotional determinism to emotional free will. The recent findings of the constructive nature of emotions coupled with growing evidence for emotional free will have created the need for humanity to take increased responsibility for their emotions and their actions. For increases in freedom undoubtedly come with increases in responsibility. In total, the surge of findings in neuroscience and cognitive psychology seem to point towards freedom over determinism and, as a result, there is no inherent dissonance between recent scientific discoveries and free will.

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