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# An Analysis of Free-Will

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# Introduction

A belief in free-will is a widely held assumption, dating back to at least 800 B.C.E., in the era of Greek mythology (Dorin, 2014; Mastin, 2008). Prior to the institutions of philosophy and science, Greek myths discussed humans interacting with gods and being held accountable for their actions and decisions, implying that humans were ultimately in control of their behavior. Belief in responsibility or our ability to make free choices was likely held prior to the Greek myths as well, since it is commonly used as a justification for any institution of law.

In reaction to the tales of arbitrary gods came the first thinkers searching for causes in the natural world. These were the Greek *physiologoi,* the earliest coming in around 600 B.C.E (Mastin 2008). Their primary assumption was the belief that the causes of events in the physical world were natural laws governing material phenomenon (Dorin, 2014). Following the *physiologoi* were the Atomists of 500 B.C.E. Democritus and Leucippus were among the first of these philosophers claiming, remarkably, that everything was made of tiny particles called atoms which were subject to causal laws and nothing else. So begins what is likely the most challenging aspect of the debate on free-will: reconciliation with determinism.

The form of the debate between free-will and determinism is typically contingent upon two things: the precise definition of free-will and the various determinisms it is said to be at odds with (Dorin, 2014). A simple definition of free-will, which will be refined in subsequent chapters, is the ability to act outside of necessity, such that it can be true that one's actions did not have to happen. It is the ability to act in any possible way despite events that have occurred in the past. We can also define determinism generally as the belief that anything that happens (including human action) occurs necessarily, as a result of previous events. Consider the behavior of billiard balls or dominoes, which move in a fashion that is dictated by preceding movements. When a billiard ball strikes another ball, it is said that the movement of this second ball is *determined* by the movement of the first ball. Determinism reduces reality to atoms that behave in a manner similar to billiard balls and dominoes, such that everything happens in accordance with preceding movements and forces. The problem with this notion arises when it is applied to human behavior, as it seems to indicate an absence of control or responsibility. For if all of our actions and decisions have preceding causes, which in turn have preceding causes, all the way back to a time long preceding our existences, how can we be free or responsible?

In just the last couple of centuries, science has done a particularly good job advancing the notion of determinism by demonstrating that exact effects follow from specific causes, always. However, in order for science to inform our discussion on free-will, we have to define free-will in a way that allows it to be investigated and challenged. That is the method of scientific investigation. The simple definition proposed earlier, however, does not lend itself to falsification. It is the intention of this paper to present information in science that undermines free-will to the extent that the position may be scientifically untenable. Additionally, a philosophical analysis of both sides of the free-will debate will be provided, without necessarily answering the question as to whether or not humans possess it.

The paper will be organized into four major chapters. The first chapter will address the analysis of free-will by physiologists and neuroscientists. This chapter will highlight the causality of the neuromuscular system and examine the phenomenon that is referred to as

"voluntary" muscle movement by way of understanding the simpler model: reflexive muscle movement. Chapter two will investigate free-will as argued by behavioral psychology or behavioral analysis. This growing branch and scientific approach to psychology has developed a well-reasoned philosophy that is usually at odds with the notion of free-will. Its principles—which are based on the environmental control of behavior—have interesting consequences for our conception of freedom. The third chapter returns to the great conversation on free-will in philosophy. Several philosophical arguments will be examined from both recent and historically famous philosophers. The goal of this chapter is to analyze different concepts in the free-will debate, question the intelligibility of some of those concepts, and advance my opinion with respect to the free-will debate. Finally, the last chapter will discuss implications in law and morality. If our society exists in a world in which free-will is merely an illusion, what do we make of responsibility and punishment?

# Chapter 1
## Physiology and Neuroscience of Free-will

## Introduction

Free-will is typically conceived of as an ability expressed by the brain and manifested through the brain's ability to cause a voluntary behavior. Thus, one actively demonstrates his or her free-will through his or her actions and behaviors. With that premise in mind, the role of this section will be to flesh out an understanding of the ways in which the human body physically engages in behavior. Because the main goal of this section is to highlight the deterministic causality underlying each of our actions, there will be a thorough discussion of the physiology of bodily movements. Following this discussion will be an analysis of free-will from current studies in neuroscience.

We will begin addressing the question of how exactly humans engage in actions, and whether behavior is determined. There are two organ systems primarily responsible for action in our bodies: the nervous system and the muscular system. The muscular system is controlled by the innervation of two broad groups of neurons: sensory neurons and motor neurons. Motor neurons can subsequently be broken into two classes as well (somatic and autonomic) but I will only focus on somatic motor neurons because they are responsible for the movement of skeletal muscles—the muscles responsible for what has been called voluntary actions and behaviors.

## Reflexive Movement

The same skeletal muscles moved in a supposedly voluntarily fashion often contract in an unconscious, reflexive fashion in response to particular stimuli (Fox, 2013, p. 387). It will be easier to understand the physiology of voluntary movement if we begin by surveying the physiology of reflexes because reflexes provide a much simpler model for investigating the determined nature of action. Explaining the nature of reflexive movement will also help understand how environmental stimuli can necessitate our actions.

The process of a reflexive movement is referred to as a reflex arc, and it consists of five major steps: receptors, afferent conduction, interneurons, efferent conduction, and target muscles. The reflex arc begins when an area of sensory receptors are stimulated by energy in the environment. These receptors exist at one end of sensory neurons, with the other end leading to the brain or spinal cord. Motor neurons then carry the messages away from the brain or spinal cord to the target muscles. Some reflex arcs have more steps than others, depending on the type of reflex. The important thing to keep in mind is that the same physical processes are taking place. These processes are physiologically known as graded potentials, action potentials, and synaptic transmissions. Each are made possible by the process of diffusion.

### *Diffusion*

The entire human body is made up of an arrangement of molecules and ions. All of these particles are in a state of constant, seemingly random motion—even those that form solid structures—because they have an inherent thermal energy. To be clear, the movement is not truly random because it occurs in accordance with some cause. Yet we are currently unable to explain

those causes. It is this chaotic motion of particles that makes diffusion possible. If there is a high concentration of dissolved molecules in one area of a container and a low concentration of molecules in another area, the motion of these particles will tend to reduce the difference in concentrations. When molecules are moving about chaotically in an area where they are in high concentration, they consistently collide with one another. These collisions do not really disperse the molecules within the container. However, some of these molecules will move about in seeming randomness toward areas of the container in which the molecule is not in high concentration. When molecules move in these directions, they disperse, since they are not colliding as often as they had been. This means that even though movement is chaotic, molecules and ions will tend to move from an area of high concentration to an area of lower concentration, until an equilibrium is established. When molecular movement takes place down the concentration gradient from areas of high to low, without the input of any extra energy, this is referred to as simple diffusion. Diffusion is one of the most important physical processes for life. It is the process that allows the transport of electrical signals in our nervous system, which in turn, permit bodily responses.

## *The Reflex Arc*

The first step of a reflexive response takes place in sensory receptors, which are all in relatively close contact with the environment. The body is composed of several different kinds of receptors, specified to receive different forms of energy from the environment (Fox, 2013, p. 267). Receptors associated with muscle movements are cutaneous receptors, proprioceptors and visceral receptors (Fox, 2013, p. 268). Energy acts as a stimulus to the receptors that are specialized to receive it. Upon stimulation, the energy is converted into an electrical signal that can be transmitted through the nervous system, allowing us to react to a given sensation.

When the receptor of a sensory neuron is stimulated by energy, ion channels in the membrane of the neuron. Since the outside of a neuron has a higher concentration of sodium ions than the inside of the neuron, sodium ions rush into the cell at a very high rate when the ion channels are opened as a result of diffusion. Electrostatic pressure also causes the sodium ions to rush into the cell because the positively charged sodium ions are attracted to the negatively charged intracellular environment of the neuron. The inside of the neuron is negatively charged at around -70mV.

As the positive sodium ions rush inside of the neuron, they begin to make the neuron more positively charged. If enough ions enter the cell to reach a membrane potential of -50mV, a threshold is reached and voltage-gated channels in other parts of the neuron are triggered open, causing even more sodium ions to enter rapidly until the membrane potential reaches +30mV. This opening of sodium ion channels is triggered along the entire sensory neuron in a systematized, deterministic fashion. It is the rapid entering of sodium ions along a neuron that is the electrical signal in our nervous system (Fox, 2013, p.172).

When an action potential reaches the terminal end of the afferent neuron, it continues to trigger the opening of ion channels in its membrane. These ions cause the release of a specific neurotransmitter from the axon terminal into the synaptic cleft—the space between adjacent neurons. When neurotransmitters are released by one neuron and received by another, the synaptic cleft is known as a chemical junction. Neurons also communicate electrical signals

when they are physically touching one another via gap junctions (Pinel, 2014, p. 90). The released neurotransmitters from the pre-synaptic neuron are received by receptors in the membrane of the adjacent post-synaptic neuron. This reception triggers the opening of ion channels in the membrane of the post-synaptic neuron, which once again results in the inward diffusion of sodium ions. If that threshold of -50mV is reached, the action potential will be propagated down this next neuron similarly, until it reaches another neuron. These determined processes occur along sensory neurons, to the interneurons that make up the brain, and then to the motor neurons that innervate muscles. The effector organ or target muscle receives the electrical signal and elicit a response. All of these processes occur in less than a second and involve multiple muscles (and therefore multiple neurons) for most actions. Once the given environmental stimulus acts on the receptors, the reflexive movement is determined.

## Voluntary Muscle Movement

Most of us would already concede that our reflexes are beyond the control of our free-will. We want to know about voluntary muscle movements, which seem to causally originate in the brain and not depend upon environmental stimulation. Voluntary behaviors are often attributed to inner causes within the brain because they cannot easily be identified anywhere else. It is argued that endogenous initiation of behavior is possible because of the "higher functions" of the brain (see Immanuel Kant's argument in the Philosophy chapter). But instead, certain factors might be causing higher brain functionality, which in turn cause "voluntary" control of skeletal muscles, such that under particular conditions, particular voluntary actions happen by necessity. In this section we will follow the steps of a non-reflexive movement backward to see if we can come to a region in the brain that allows a word like "voluntary" to exist. It will be helpful for us to conceptualize the brain itself as a collection of interneurons, synapses, and neuron-support cells. Thus, when I refer to a structure like the *primary motor cortex*, I am referring to a specific region or collection of neurons that are functional related to one another (in this case, the shared function is motor control of body parts). It will be easier to conceptualize voluntary movement if we use an analogy to explain the organization or hierarchy of the brain's circuitry of neurons.

### *The Hierarchy of the Brain*

John Pinel points out in the ninth edition of *Biopsychology* that the organization of the brain might be best thought of as a business hierarchy, in which groups of neurons send orders to other groups of neurons (2013, p. 191). To be clear, the "orders" here are just a series of action potentials that ultimately determine whether or not adjacent neurons fire. At the lowest level of the hierarchy are the skeletal muscles, which can be conceptualized as the workers of the organization. These are the guys mechanically carrying out the goals of the business. They perform the actions because they are ordered to by their bosses. Tracing back the steps of the reflex arc, we know that those bosses are the motor neurons (or *lower motoneurons)* that fire action potentials into the muscles. Recall from our discussion of reflexes that motor neurons are stimulated by signals from interneurons in the brain and spinal cord. The same occurs in the voluntary movement of skeletal muscles as well. But with voluntary movements there are many more cerebral interneurons involved in the steps of the action.

The lower motoneurons receive their orders from upper motoneurons that contribute their axons along descending nerve tracts in the spinal cord (Fox, 2013, p. 400). The axons of upper motoneurons descend from the primary motor cortex of the brain. Thus, the upper motoneurons are stimulated by other interneurons that branch into the primary motor cortex. Although the primary motor cortex is the major origin of the interneurons that synapse with the motor neurons in the spinal cord, it is not the only one.

We can conceptualize the upper motoneurons as the manager of all the bosses (the lower motoneurons) that order the workers (the muscles). But in a business, a manager's actions can be superseded by the actions of a higher level; a CEO can intervene at any level in the hierarchy of a business and dictate action. Similarly, the "CEO" of the brain can communicate and dictate action at any level of its hierarchy. Thus, although many of the action potentials received by motor neurons in the spinal cord comes from the primary motor cortex, it may also come from other, higher levels of the hierarchy, making it difficult to follow the action potential back to a precise location in the brain.

The question now is what are the other hierarchical levels in the brain? It makes sense for us to think that freedom of the will is an ability expressed by the part of the brain that is the highest level (the CEO) in the hierarchy. We intuitively think of the highest level as the conscious, rational, decision-making part of us, which we appear to be in control of (though it is difficult to conceptualize who it is that is doing the controlling and who or what is being controlled. An analysis of the "self" is given in the next chapter). So which brain structures are involved with the higher levels, or with the activity that we often associate with the highest level? Where does that first action potential originate for voluntary behaviors?

In our hierarchical model, we know so far that the muscles receive "orders" from lower motoneurons, in turn from upper motoneurons, in turn from the primary motor cortex. The primary motor cortex receives is stimulated by neurons in the secondary motor cortex. It has been found that neurons in this area are typically more active (fire more; convey action potentials with greater frequency) just prior to the initiation of a voluntary movement and continue to be active until the action is completed (Pinel, 2014, p. 194). The activity of the secondary motor cortex is controlled by the dorsolateral prefrontal association cortex, which has also been shown to fire just before a voluntary response and all the way up until the response has been completed (Pinel, 2014, p. 193). Indeed, neurons in many cortical motor areas fire in *anticipation* of motor activity.

The dorsolateral prefrontal association cortex appears to only receive its "orders" from one more level: the posterior parietal association cortex. This area of the brain informs the nervous system of the position of body parts and external objects—a fitting function for the seeming commander of voluntary action. Interestingly, one study found that when low levels of electrical stimulation were applied to inferior regions of this area of the brain in conscious human neurosurgical patients, the patients experienced an intention to perform a certain action, suggesting that intention is merely electrical activity in the brain, rooted in deterministic causality (Desmurget et al, 2009). When the electrical stimulation was applied in high levels, the patients thought they had already performed the action, despite never actually doing it. The present summary represents the current state of understanding of the brain hierarchy.

### *Evaluating the Hierarchy of the Brain*

Perhaps the posterior parietal association (PPA) cortex truly is the seat of the will—the apex of the pyramid that gives us the ability to engage in actions in accordance with whatever we decide. But is this will free to act without being constrained by antecedent causal necessity? Can it fire action potentials without being stimulated by other neurons? According to Desmurget et al. (2009), neurons in this part of the brain do characterize intentions when fired, but only after they have been stimulated to fire by something else. To be sure, it is the definition of an association cortex to be an area of the brain in which firing action potentials ("information" in lay terminology) from multiple sensory systems converge. In this case, the PPA cortex receives sensory information from the visual, auditory, and somatosensory systems, all of which allow the localization of the body in space (Pinel, 2014, p. 191).

So the activity of the highest level of the brain hierarchy is at least heavily influenced by sensory information from the outside world. As cortex, it is a part of the largest part of the brain—the cerebrum—which, as a whole, is devoted to sensory input and voluntary muscle movement (Fox, 2013, p.210-11). Interestingly, the cerebrum is also responsible for our decision making ability (Fox, 2013). This could be due to the fact that our decisions require perceptions of our environment because decisions are manifested as behaviors in our environment. Perhaps though, this functional arrangement reveals that our decisions to engage in actions are *necessitated* by input from the environment.

It could be argued that the only kinds of decisions necessitated by sensory input are those that are concerned with aspects of the physical environment from which the sensory input comes. For example, perhaps the decision to walk around a puddle is dependent on the sensory perception of that puddle. Perhaps the decision to pick up a dollar off the ground is dependent on the sensory perception of the dollar. But there seems to be a missing factor in each of these cases. Our decision cannot be necessitated on sensory input alone, for we must also have a learning history associated with that decision; we must have experience with the consequences of walking in puddles and picking up dollars. Therefore, in combination with sensory input, it may be the case that the activity of the PPA cortex is determined by one's past experiences. Consider the CEO of an organization. Before he can carry out any given decision, does he not have to consider various factors that weigh into such a decision? Does he not have to consider the environmental circumstances, and were there not sources of information or feedback from the outside world that led him to his given decision? And was not his ability to engage in such a decision learned as a result of his prior experience, such that everything leading into the decision ultimately came from outside sources? That indeed seems to be the case, and the same might be said of the PPA cortex, in which experiences or learning manifest as strengthened connections between neurons that have regularly communicated with one another. An analysis of the neuronal basis of learning is beyond the scope of this paper, but theories involving long-term potentiation (LTP) provide possible explanations (Pinel, 2014, p. 280-284).

## Neuroscience on Free-will

Studies in behavioral neuroscience support the idea that our decisions are associated with past experiences via reward systems in the brain (Cheney & Pierce, 2013). Specifically, it has been found that the neural basis of reward involves the relationship between endogenous opiate and

dopamine systems in the brain (Cheney & Pierce, 2013, p. 7). Although behavioral science has made it clear that we can analyze the relationship between the environment and behavior without turning to neuroscience, many neuroscientists have conducted research relevant to the free-will debate. Before wrapping up our analysis of voluntary movement, let's turn to some of their findings.

What might be the greatest difficulty in using neuroscience to advance our understanding of free-will is that science has not been able to provide a universal, uncontroversial definition for what freedom of the will means. In order for science to be informative, the scientific community must have a consensus about what it is they are investigating so they can know whether or not particular findings contribute to the knowledge of that phenomenon or not.

A brilliant article by Roskies (2010) summarizes some of the different definitions neuroscientists have accepted for investigating free-will. The author begins by pointing out that our conception of freedom is all but inseparable from our conception of volition, which she defines broadly as "a construct used to refer to the ground for endogenous action, autonomy, or choice." She admits that this is still a controversial claim. In effect, the author has only replaced the term "free-will" with the term "volition", which leaves us facing the same problem—how do we define volition *physiologically* for the purposes of research? Roskies' article explores the findings of research that investigated volition according to different definitions, including volition defined as initiation, intention, and executive control.

## *Volition Defined as Initiation*

The development of brain imaging techniques provided information for the study of volition as initiation, and more specifically, that there are important differences between the initiation of voluntary and reflexive actions. Studies using these techniques have shown that endogenously generated actions involve the activation of primary motor cortex, supplementary motor area (SMA) and dorsolateral prefrontal cortex, while simple stimulus-response (reflexive) actions involve activation of a network of parietal and premotor cortices that help mediate the sensory guidance of the action.

Prior to the availability of brain-imaging techniques, electroencephalography (EEG) recordings showed the slow development of a negative electrical potential 1-2 seconds prior to motor activity (Roskies, 2010). This potential was named the readiness potential (RP). It was discovered that the magnitude of the RP was greater in self-initiated motor acts than in stimulus-response movements. Importantly, it was also discovered that this potential preceded one's conscious perception of their intention to move. The importance of this finding, as Libet (1985) pointed out, is that it suggests that our actions are often initiated unconsciously, which may undermine many interpretations of free-will.

Another study performed by Thaler et al. (1985) found that lesions made to the pre-supplementary motor area in monkeys resulted in an inability to perform self-initiated actions, but not reflexive actions. Further evidence implicating the involvement of the SMA in self-initiated actions is provided by Fried et al. (1991). In their study, when direct electrical stimulation was applied to the SMA, the human subject felt an urge to initiate movement. When greater stimulation was applied, movement took place. These findings suggest that "voluntary" movements are causally based in electrical signals, which, as we have discussed, are

physiologically manifested deterministically. It remains to be known whether or not this artificial stimulation did what one's "self" or another inner cause normally does.

## *Volition Defined as Intention*

Roskies states that intentions can be thought of as the gap bridging deliberation and action. Some define intention as the cause of voluntary movement, such that it is strongly related to initiation, but it can also be defined more abstractly, along the lines of "conscious plans for future actions that precede those actions". Whether or not an intention is formed consciously is debatable.

Many presume that freely willed actions are necessarily consciously intended. As previously stated, studies performed by Benjamin Libet in the 1980's have suggested that conscious awareness does not always precede our intentions to act. If the readiness potential increases unconsciously in preparation of forming an intention, the intention itself seems to be a part of a causal sequence which the subject did not actively endorse. If one's intentions just come about in this manner, such that they are not formed through active, conscious endorsement, is it fair to say that we are responsible for the actions that follow them?

It is important for us to cross-examine the astounding results of Libet's research, for they have been widely criticized and his initial argument against human freedom has come to be significantly weakened. In his initial study, Libet had patients record the moment when they became consciously aware of their intention to move. It was revealed that neural activity (in the form of the readiness potential) preceded the patients' conscious awareness of an intention to move by 350 milliseconds (ms). One criticism of Libet's study is that it does not allow researchers to know whether the RP is always followed by movement. If it isn't, RP may not really reflect movement initiation (Mele, 2006). Other studies have pointed out that the RP is not as closely tied to movement initiation as other neural signals, like the lateralized readiness potential (LRP). Some have shown that the LRP may in fact come *after* the conscious intention to move (Trevena & Miller, 2002).

Overall, Libet's studies are important because they reveal that some repetitive motor movements might not be consciously intended. His work has also motivated subsequent research on consciousness and movement. In general though, studies in neuroscience investigating volition as intention have been inconclusive and Libet in particular has done little to undermine the notion of human free-will.

## *Volition Defined as Executive Control*

Another common interpretation of free-will from a scientific perspective is that it lies in our ability to control lower levels of the brain. Exercising freedom then involves being able to inhibit the actions carried out by other levels. Importantly, interneurons in the brain tend to be inhibitory in nature (Fox, 2013, p. 389). With respect to neurotransmitter activity, inhibition refers to activity that hyperpolarizes adjacent neurons, rendering them much less likely to fire action potentials.

In his studies on the readiness potential, Benjamin Libet suggested that the lag in time between the RP and action could leave time for conscious intervention that would inhibit that action. This executive intervention would then be our way of exercising freedom. Studies

following those of Libet's confirmed that areas in the frontal cortex are involved in voluntarily inhibiting self-generated action (Brass & Haggard, 2007).

Additionally, evidence reported from ERP and fMRI studies have shown that the neural signals of intentionally not acting, or deciding not to act after forming an intention to act, are very similar to those of decisions to act (Kühn & Brass 2009b, Kühn et al. 2009a). This indicates that both the commission and omission of acts are fundamentally similar, which has important implications. If one's actions are not necessitated such that we can be held morally responsible, we are both culpable for the actions we perform, and for the actions we refrain from performing.

## Limitations of Physiological Analysis of Free-will

There are a few limitations to the preceding investigation that require rectification. First, science's understanding of neural conduction has been based on the Hodkin-Huxley model presented in the 1950's (Pinel, 2014). The Hodkin-Huxley model was based on the study of large, squid motor neurons, which may differ from other neurons in important ways, especially considering the fact that there are hundreds of different neurons in the mammalian brain. Thus, what has been learned through the 1950's squid studies may not be generalizable to the human brain. Which brings us to the another limitation: cerebral neurons (interneurons) act differently than afferent and efferent neurons. Some are capable of firing continuously after input has ceased, while others either do not display action potentials or display them differently (like conveying an action potential "backwards.").

The third limitation is that the nervous system is not merely the transferring of messages between neurons as I have implied. Glial cells, the non-neuronal cells of the nervous system, have recently been shown to release chemical neurotransmitters, contain receptors, conduct signals, and influence synaptic transmission between neurons. Little is known about the physiological importance of glial cells, but it is clear that the brain is much more than neuron-neuron connections.

The aforementioned limitations do not indicate that the nervous system is inherently capable of permitting freedom of the human will. It is still the case that the method of communication between cells of the nervous system is the action potential. Whether or not that action potential is communicated electrically or chemically, between neurons, glia, or both, it is a determined event caused by the diffusion of ions.

## Conclusions in Neuroscience and Physiology

Studies in neuroscience that have researched free-will according to different definitions have helped people to understand the particular parts of the brain involved in the initiation, intention, and executive control over "voluntary" action. Although the studies have pointed to specific regions that we can investigate further for questions on free-will, we are still uncertain as to whether or not the firings of neurons in these regions are initiated entirely by one's own consciousness. If instead, the firings are caused by preceding activity ultimately stemming back to causes outside of an organism's control, free-will would be impossible because one's brain activity would be determined. There is much left to be revealed about the brain, but our current understanding makes the defense of free-will incredibly difficult given our deterministic understanding of action.

What then is free-will in physiology and neuroscience? Although we cannot answer definitively whether or not we have it from a neurophysiological point of view, I think we can say what it must be. If we are taking free-will to be the ability of some part of the human brain to initiate an action entirely, such that one's actions are not all necessitated, we are left with a strange idea to contemplate. Free-will would have to be the ability of the brain to open ion channels in the membrane of a nervous system cell without previous stimulation, such that that cell begins to depolarize through the diffusion of ions, subsequently conveying this depolarization across many other nervous system cells, ultimately producing a particular action.

Strangely, it could be the case that the highest level in the brain hierarchy allows ultimate control by endogenously initiating the opening of ion channels. But even if the hypothesized CEO—the posterior parietal association cortex—allows an individual to carry out whatever action he so ever desires, it is important to realize that the desire to engage in a certain action is itself influenced (if not necessitated) by one's past experience. Acknowledging that our desires rely on the consequences of past experiences brings us to the science of human behavior, which has also developed by assuming the truth of determinism. The next chapter explores and criticizes free-will within this discipline.

# Chapter 2
## Behavior Analysis and Freedom of the Will

## Introduction

One of the most compelling arguments against free-will comes from the science of human behavior. As I stated, it assumes the truth of determinism like other sciences. Today, the science of behavior is referred to as *behavior analysis* and is defined as an experimental approach to the study of the behavior of organisms (Cheney & Pierce, 2013, p. 1). For clarification, behavior is defined as anything an organism does, overtly or covertly. Behaviorists have typically regarded all actions, thoughts, and feelings as varying *responses*, a word made synonymous with "behavior".

As a science, behavior analysis grew out of B.F. Skinner's behaviorism in the early-mid 20th century. Although the field itself was met with resistance when first championed by Skinner, it is currently recognized for its validity as a scientific discipline. But because some of the criticisms persist, we will begin by reviewing the philosophy of the science, followed by an overview of its basic principles. This foundation will contribute to our analysis of free-will.

## Science and Human Behavior

This section borrows its title from B.F. Skinner's 1953 book of the same name. In it Skinner recognized the function of science as the discipline that seeks to discover order in the world, by acting on the assumption that the world is lawfully ordered. This is another way of defining determinism. As Skinner points out, one has to accept the truth of determinism in order to develop a science of human behavior, which aims to specify the conditions that manipulate a person's behavior. If one can discover these conditions, behavior is then capable of being predicted and controlled (p. 6). Many people are uncomfortable accepting a science like this because it undermines our cherished belief that man is a free agent whose behavior is the product of some inner cause, like the will. Additionally, a science that can predict and control behavior is clearly liable for abuse on a scale that differs greatly from the ways in which other sciences can be abused. But as Skinner writes, this is a problem of application, not a problem of scientific discovery.

The science of human behavior is also difficult to accept because it changes our perspective on humanity in a way that is not dissimilar to other scientific breakthroughs. Human life was removed from its pre-eminent center when Copernicus discovered that the Earth did not sit at the center of the universe (Skinner, 1953, p. 7). Darwin's theories had a similar effect, establishing humanity's biological place in the world. For many, a science of behavior presents a contemporary threat to our conception of ourselves. It implies that we are not only *merely* advanced animals, removed from the center of the universe—we are advanced animals that are ultimately controlled by the conditions of the environment, instead of ourselves.

Accepting determinism with respect to human behavior is challenging. Many bring forth pre-scientific or extra scientific objections to maintain a belief that human behavior is something more than that of other organisms. As Skinner points out, the principle of indeterminacy is often cited as evidence against determinism; it is argued that the physical sciences reveal undetermined

events at the subatomic (quantum) level (Skinner, 1953, p. 17). Thus, in trying to observe ordered phenomena, a physicist may have to accept observing an event that "wasn't supposed to happen" or that happened in a way that is not subject to predictability and control. If physical events are not entirely determined, one can reason their way to free-will with apparent ease: "Because chemical events are the products of physical events, chemical events are not determined. And since biological events are the products of chemical events, biological events are therefore undetermined. Thus, because psychological events have been conceptualized as the products of biological events, psychological events are not determined either."

But as Skinner makes clear, accepting the principle of indeterminacy does not mean our behaviors are free. It merely puts such events out of the range of prediction and control (Skinner, 1953, p. 17). In philosophy, it is recognized that the truth of indeterminism alone is not enough for humans to have free-will, a point that will be discussed in the following chapter. Even though some behaviors might be beyond the range of prediction and control, it doesn't mean behavior as a whole is removed from the realm of scientific law. It is a mistake to reason that the complexity of human behavior implies self-determination or control by inner causes. Rather, it reveals that the nature of the subject matter can be difficult to understand in its entirety. Nevertheless, through behavioral analysis, the last several decades have witnessed advancements in the effectiveness of educational practices, treatment for individuals with psychiatric disorders, treatment for the developmentally disabled, staff management, self-management, and many other areas. The benefits have resulted from a science that assumed determinism was applicable to human behavior.

## Behavioral Conditioning

The applied use of behavior analysis has been made possible through an understanding of the principles of human behavior. In the previous chapter, I spoke of the two ways in which humans respond physiologically: through voluntary and reflexive muscle movement. I also presented the idea that responses are brought about by preceding stimuli in the environment—a point that will be discussed once again in subsequent paragraphs. The following paragraphs introduce the ways in which the environment controls behavior.

Behavior analysts assume that behavior results from complex interactions between genetic inheritance and experience with the environment (Cheney & Pierce, 2013, p. 31). When organisms learn new ways of behaving in reaction to environmental changes, *conditioning* is said to have taken place. When organisms exhibit behavior and the consequences manifested in the environment determine how likely that behavior is to happen again, *operant conditioning* is in effect. When behavior controlled by one stimulus comes under the control of another stimulus as a result of an association between the stimuli, *respondent conditioning* is in effect. A stimulus is defined as any energy change in the environment that ultimately acts upon the organism; sounds, sights, tastes, temperatures, textures, smells, biochemicals, or electrical signals, are all examples reducible to energy changes. Each mode of conditioning employs certain principles that allow researchers to control and predict the behavior of organisms, including people. Since our presumed capacity for free-will is made manifest by our behavior, it is important to understand these principles because they will allow us to understand how the environment controls our behavior and to what extent.

## *Respondent Conditioning*

As in the first chapter, we will begin by exploring the concept of respondent conditioning—the mode of learning concerning an organism's reflexive behaviors. These behaviors are written into the genetic language of a species, emitted at a certain rate, and typically necessary for survival. Newborn babies engage in many reflexive behaviors that are directly related to their well-being (Cheney & Pierce, 2013). The rooting reflex takes place when a stimulus touches the cheek of the infant, permitting oral attachment to the mother's nipple during breastfeeding. The grasping reflex takes place when a stimulus touches an infant's hand, allowing the infant to learn how to eat and manipulate objects in its environment. In each of these cases, no prior learning was necessary for the response to take place. The reflexes were controlled by antecedent stimuli and made possible by a capacity that was inherited through genetics.

Well known physiologist Ivan Pavlov became interested in the reflexive behavior of salivation and sought to understand the relationship between reflexive behaviors and antecedent stimuli. Not surprisingly, Pavlov found that when he first presented the stimulus of a ringing bell to his dogs, salivation did not take place. However, this changed after he repeatedly presented the sound of the ringing bell *with, or just prior to,* the food. Initially the bell was referred to as a neutral stimulus because it had no effect on salivation. It ultimately became a conditioned stimulus because it evoked salivation after going through a pairing procedure with the unconditioned stimulus of food. Pairing neutral stimuli with unconditioned stimuli in this manner is the method by which organisms are respondently conditioned.

## *Operant Conditioning*

In an analysis of free-will, reflexive behaviors are of far less importance than operant behaviors. Operant behaviors are those that become strengthened or weakened (occur more or less frequently) as a result of the consequences that become manifested in the environment (Cheney & Pierce, 2013, p. 31). These are the behaviors that one thinks of when one envisions demonstrations of free-will. When an organism's behavior is regulated by its consequences in the environment (the consequential stimuli), *operant conditioning* is taking place.

The operant behaviors of infants are emitted at some frequency on the basis of their genetic endowment (Cheney & Pierce, 2013). These genetically instructed behaviors become strengthened or weakened through consequences manifested in the environment. For this reason, behaviors are said to adhere to selectionist principles. Just as Charles Darwin proposed the long-term adaptation of species on the basis of natural selection, B.F. Skinner proposed the adaptation of individuals in their lifespan according to behavioral selection (Cheney & Pierce, 2013, p. 8). In both cases, incredible complexity can come about. Thus, the behaviors that ultimately represent seeming manifestations of the will can actually be the product of environmental selection by consequences. An increase in the future frequency of a behavior as a result of its consequences is termed reinforcement. The consequential stimulus or stimuli that cause this increase are referred to as reinforcers. Punishment is just the opposite, occurring when the consequential stimuli cause a given behavior to decrease in frequency.

Infant babbling presents us with a good example of how operant conditioning can lead to the development of complex behaviors, like talking. When an infant first babbles, she is producing a range of vocal responses according to her biological inheritance. With time, parents

and other people in the community *reinforce* certain vocal responses that approximate English words; a random "da" sound is reinforced with lots of attention because it approaches "dada" which approaches "daddy" (parental attention has become reinforcing itself because it is a stimulus that has been paired with such unconditioned stimuli as food and warmth, as well as the conditioned stimuli of a parent's voice and smile). These babbles or vocalizations were initially emitted at a random frequency according to genes, but became selected for via environmental consequences on the basis of their similarity to English words. Additionally, as the infant develops, parents gradually ignore the simpler babbling and only reinforce the infant for producing vocalizations that more closely approximate actual words. This form of selective reinforcement is called shaping.

Shaping is relevant to our discussion of free-will in that it provides an account of ways in which the environment can control the development of more complex behaviors. When behavior is shaped, responses that are no longer close enough to the target response are ignored (i.e. not reinforced) and are subsequently extinguished. And just as the people in the aforementioned example acted as the environment that selected for certain infant responses, other environments select for the behavior of any other kind of learning organism, whether or not people are present. Ultimately, then, behavior becomes a function of its consequences, with reinforcing consequences selecting for an increase in the behavior that produced said consequential stimuli and punishing consequences selecting in an opposite manner.

Consider another example that demonstrates the control of operant behavior by stimuli. When a child whines at the store, his parents give him candy in an effort to reduce the aversive sound of his crying. However, the child has both the genetic constitution to find sweet things reinforcing and a learning history in which he has experienced the reinforcing taste of candy. Once the child has received candy as a consequence, he is much more likely to cry again next time because in the past, crying has resulted in the reinforcing stimulus of a sweet taste in his mouth. We say "much more likely" because a variety of other *behavioral contingencies* might be acting on the child concurrently. Perhaps whining around his dad in the shoe department of the store resulted in reinforcing candy, but whining around his mom in the grocery department resulted in a punishing shout. The likelihood of the whining behavior occurring again depends on the antecedent stimuli, such as the location in the store, the parent whom the child is with, whether or not the child has a satiated stomach, whether or not there is currently a raspberry sucker in the child's mouth, etc. Operant behaviors are thusly the result of complex control by both antecedent and consequent stimuli. This point will continue to be emphasized.

## Complex Human Behavior as Evidence of Free-will

To this point, we have covered the concept that human behaviors are initially emitted at some frequency due to our genetic makeup. These behaviors are subsequently strengthened, weakened or made more complex according to changes in the environment that allow reinforcement, punishment and shaping. In addition to being controlled by the consequences manifested in the environment, operant behaviors are also controlled by the stimuli that precede them. Reflexive (or respondent) behaviors are also controlled and elicited by antecedent stimuli. With this understanding of behavioral principles, we can have a more informed discussion on free-will from the perspective of this science.

Although we have stressed the causal connection between behavior and environmental conditions, it may be suggested that the obviousness of our free-will persists to the extent that the burden of proof remains with behavior analysts. But if we observe nothing more than antecedent and consequent stimuli controlling behavior by increasing or decreasing its likelihood—depending on genetic makeup, prior experience, and concurrent contingencies—there will be no need for turning to free-will as a cause of behavior. For I can assure that a brilliant behavior analyst can at least hypothesize a scientific explanation for any given behavior without it. But there are still important points to address. Firstly, organisms are clearly capable of responding in novel situations, without influence from past experience. Additionally, behavioral explanations are frequently criticized for their simplicity, especially regarding explanations of human behavior—how do we account for things like self-control and choice? These counterpoints are well-placed and are worth turning our attention to.

## *Rule-governed Behavior*

The rule-governance of behavior provides an explanation as to how organisms can act or decide to act in particular ways despite never having a reinforcing or punishing history for those actions or decisions. Thus, rule-governed behavior can explain many of the more complex, but common, human behaviors in which the consequences are not obviously clear.

A behavior is said to be rule-governed when it is under stimulus control by a rule, which is a kind of verbal stimulus (Baum, W. M., 2005, p. 159). Rules can be thought of as verbal descriptions of contingencies that allow literate beings to understand the relationship between a particular behavior and its consequences. Consider the following example of exposure to a rule. I approach the entrance to the local trails and there is a sign that reads, "No camping allowed." The writing on the sign is a kind of visual verbal stimulus and it acts as a rule describing the contingency associated with camping behaviors (setting up a tent, living in the tent overnight, etc.). I may not have ever had experience with the consequences of following or breaking this rule. Indeed, I might not have ever been to these trails at all, yet whether or not I camp there is a behavior that is still controlled by environmental conditions. For everyone has had the experience of following rules or breaking rules *generally*; everyone has learned that the breaking of a written rule is likely to be met with some punishment if it is caught.

In addition to the presence of the written rule, a variety of other conditions will determine whether or not camping occurs. Examples of other factors playing into the camping behavior contingency are the individual's personal experience with breaking or following rules generally, whether or not there is pressure from friends to camp (and therefore the past consequences of giving into that pressure or denying it come into play), whether or not the individual has camped recently or years ago, whether or not other enjoyable camping places are located nearby, the antecedent motivating operation, etc. The main point is that even when individuals have not had experience with the consequences of a certain action, the decision is still controlled by external factors and past experience.

For many individuals, rule following has been reinforced by others to the extent that it is reinforcing to follow rules even when nobody is around. We often describe this behavior as a virtue: integrity. Perhaps, when a child follows a rule, the immediate reinforcement is some awareness that a rule is followed, whereas the greater reinforcement (for which the immediate

reinforcement gets its value) is delayed. For example, a child picks up the toys in her room while her father is out and is immediately reinforced by the awareness that the father's rule has been followed. But following this rule is only valuable because, in the past, the child has been reinforced more directly (with praise, or escape from an upset father, as examples) for following this rule when the father is present. Perhaps the child is immediately, but covertly, reinforced for rule-following because she has learned that following rules will come with reinforcement when dad comes home, tying the reinforcement for following the rule in the present with the more directly experienced reinforcement of the past.

As we grow older, we are taught to follow rules when there is no immediate reinforcement from others, and when there is no clear delayed reinforcement from others either. We are taught to follow rules for the sake of the rule and nothing else and we are taught to do so at all times. Thus, when a young man tells the truth when he could have derived clear reinforcement for lying, the reinforcement he receives is the consequence, "I followed a rule, for the sake of a rule, and that is what is good, so I have done good". This consequence of personal praise, in addition to the past history of reinforcement for rule-following, control the individual's behavior even in the absence of more obvious reinforcement, like social praise. There we have a behavioral explanation for morality. One is taught that following particular rules is what is good and right, and one has been reinforced early in life for doing what is good and right, such that one comes to do that which is good and right (following rules), even when there appear to be no obvious, direct acting consequences. In all actuality, the consequences are ultimately rooted too far back in an individual's learning history for us to observe.

## *Self-Control*

Another avenue for our inquiry into free-will through the behaviorist perspective is the concept of self-control. B.F. Skinner discusses it in "*Science and Human Behavior".* He points out that our current behavioral analysis has left humans in a seemingly helpless position, a statement we are certainly in agreement with. He states that, by emphasizing the controlling power of external variables, an organism's behavior seems to be merely "a repertoire—a vocabulary of action, each item of which becomes more or less probable as the environment change (p. 288)." We have described humans as mere mechanistic actors of a grand, environmentally driven play. Free-will would seem to be entirely absent from the equation. And yet, as Skinner writes, it would appear as if we still retain some self-determining ability:

> "[Man] is often able to do something about the variables affecting him. Some degree of 'self-determination' of conduct is usually recognized in the creative behavior of the artist and scientist, in the self-exploratory behavior of the writer, and in the self-discipline of the ascetic." P. 288

In analyzing the process of "self-control", we too often neglect to identify what is meant by the "self". Indeed, it seems that we separate a human into two beings when we discuss the notion of self-control: the controller and the controlled. Incidentally, one might pose the question, who is controlling whom? It appears that the self is controlling the physical organism, but what then is "the self"?

The "self" concept has historically taken the role of a hypothetical cause, meant to explain behavior when no other external variables can be identified (Skinner, 1953). As Skinner

points out in, "*Science and Human Behavior*", similar explanations were appealed to in the precursors of the physical sciences. Personified beings were used to account for many natural processes: Dionysus determined the extent to which one's plants would grow, Poseidon controlled the weather conditions across oceanic voyages, and other anthropomorphized gods acted similarly. The same problems of personification have plagued the science of human behavior, in which the "self", or inner being, has been continuously identified as a cause for complex phenomena. The physical body of a human executes some behavior because the inner self is said to have willed it. The outer man gets what the inner man wants. The temptation to appeal to the inner self is great, as it always explains complicated behaviors that we don't understand. But what is the self and does it exist the way we conceive it to? An alternative analysis might explain what the "self" really is and why it always appears to be an agent in the causation of our actions.

There are times when we are aware of a behavior we are engaging in. For example, I am aware of my typing as I complete this sentence. However, our ability to be conscious of our actions is limited for some reason or another. Although an analysis of consciousness is beyond the scope of this paper, it is nevertheless true that we are conscious of behaviors only some of the time and not always. I may, for example, tap my foot while typing this paragraph and not be aware of it. If I happen to become aware of this tapping, it might be said that I have discovered myself tapping my foot. By saying, "I discovered myself", I am saying, quite naturally, that "I" am a discoverer of a being that is tapping a foot. My foot. "Myself" has been discovered by "I". We separate the two beings when really there exists only one that has become aware of behavior that he was previously unaware of. The temptation for this mode of communication is so great because of our learning history. We are constantly perceiving other people engaging in actions. We become conscious of our own occurring behaviors the same way we become conscious of others' occurring behaviors. Because we are mostly becoming aware of the occurring behaviors of others, we generalize when we become aware of our own behavior, treating it as the behavior of an "other". Thus, we begin treating ourselves as discoverer and discovered when there is truly only one being that was not conscious of something, but then came to be so.

What we mean by self-control then, is engaging in behaviors that affect the likelihood of our other behaviors. When an individual is said to exhibit "self-control", they are still engaging in behavior (Skinner, 1953, p. 228). It so happens that this behavior is meant to change or prevent another behavior of the individual. The relevance of self-control in this discussion is directly related to the extent to which our self-control behavior demonstrates the causality of our will and not the manipulation of the environment. If it is our will that allows us to engage in behavior that affects the likelihood of our other behaviors, perhaps we have retained freedom and are not in the "helpless" position described by Skinner.

If self-control is engaging in one response to change the likelihood of another response, we can think of the response being prevented as the *controlled response* and response doing the preventing as the *controlling response* (Skinner, 1953, p. 231). To provide a simple example, consider an instance in which someone mistakenly insults an individual to his or her face. Upon realization of this mistaken insult, one may promptly cover his mouth. In this instance, the covering of the mouth is the controlling response, meant to prevent further speech, which is the controlled response. Specifically, this simple example of self-control is an example of physical

self-restraint. Another technique of self-control is to change the antecedent stimuli, thereby eliminating the occasion for the response (Skinner, 1953). We do this when we refuse to even look at the inside of a box of donuts in order to prevent the occasion for grabbing one and eating it. Depriving and satiating are other techniques, as are uses of aversive stimulation.

Whatever the example or technique employed, instances of self-control usually take place when a response would lead to positive and negative outcomes simultaneously (Skinner, 1953, p. 230). Eating a donut would certainly provide immediate reinforcement, but shortly thereafter, conditioned guilt to certain individuals. Ravaging the dessert table would provide reinforcement to one with a satiated stomach, but also conditioned feelings of embarrassment when the other guests aimed judgmental glances. In addition to having an association with outcomes that are simultaneously reinforcing and punishing, instances of self-control seem to be involved in cases in which there is a competition between one's naturally reinforcing behaviors and one's learned behaviors. By naturally reinforcing behaviors, I am referring to what the individual would most likely do had he not been subject to the control of a societal environment. In the donut example, one would feel immediate gratification for consuming the donut because of the genetic disposition for sweet tasting stimuli. The additional consequence of guilt is something we learn, as a result of our exposure to a society. (This guilt may prevent the eating of the donut, depending on the extent to which we have been conditioned by environmental variables. If one's parents, teachers, friends and caretakers never discouraged poor nutrition, the donut might be more likely consumed. If an individual never learned through some external means—such as an instructional book, video, or classroom lesson—that eating donuts is unhealthy, the donut might be more likely eaten. Assuming the individual has been conditioned to value good health, he might not eat the donut, *depending upon several other external variables,* such as satiation, the presence of other people in the room, etc.)

With the above analysis in mind, self-controlling behaviors seem to be dependent upon one's previous conditioning in a society, and not some inner "self". It appears one prevents an unwanted behavior, despite its naturally reinforcing consequences, because of the socially aversive consequences, indicating that self-controlling behavior is still controlled by its results in the past. I will grant that in some cases of self-control, the forthcoming punishing consequences are not socially aversive. To use the donut example to excess, consider that an individual might cease to eat donuts simply because eating donuts has resulted in an aversive stomachache. Still the behavior is the result of the control of external variables. Ultimately, as Skinner writes:

> "If this is correct, little ultimate control remains with the individual. A man may spend a great deal of time designing his own life—he may choose the circumstances in which he is to live with great care, and he may manipulate his daily environment on an extensive scale. Such activity appears to exemplify a high order of self-determination. But it is also behavior, and we account for it in terms of other variables in the environment and history of the individual. It is these variables which provide the ultimate control." p. 240

## *Choice*

There is still a nagging question for the advocate of free-will. Indeed, we might be under constant, inevitable pressure to behave as external variables induce. Behavior may be the mere winning out of the influence of outside factors, even when those outside factors are entirely unobservable, as rule-governance suggests. Yet in those instances of self-control and decision-making, in which a competition has likely taken place between a natural contingency and a social contingency, what is it that *chooses* which way to behave? Is choice not the reason that one of these contingencies wins out in our demonstration of self-control, and would this choice not reflect our own free-will? In behavior analysis, choice occurs when an organism has multiple available response options, but that does not mean the choice isn't determined.

Analyzing choice from the behavioral perspective requires an investigation into the distribution of operant behavior across alternative sources of reinforcement (Cheney & Pierce, 2013). The reinforcement of those behaviors occurs in accordance with some type of schedule as prescribed by the behavior analyst. A schedule of reinforcement is an arrangement of antecedent and consequent stimuli, prescribing how stimuli will set the occasion for a response and in what way this response will come to be reinforced (Cheney & Pierce, 2013). For example, suppose a rat in an operant chamber has been conditioned to press a lever whenever the chamber light comes on. When the rat happens to press the lever five times, it is provided with water reinforcement. The light is referred to as the antecedent, discriminative stimulus that sets the occasion for the response. The water is the consequent stimulus acting as a reinforcer to the lever pressing behaviors emitted by water-deprived rats. In this situation, the effect would be an increase in the frequency of the "five-press" behavior of the rat, so long as the rat did not become satiated with water. This particular example demonstrates the use of a *fixed ratio (FR)* schedule, specifically, an FR 5 schedule. There are a handful of other simple schedules of reinforcement.

To study choice, behavior analysts typically employ concurrent *variable interval* (VI) schedules; schedules in which a given behavior is reinforced after it occurs after some average length of time. This type of schedule is employed because other schedules produce exclusive choice of responding. When exclusive responding occurs, one can no longer study the distribution of responses amongst alternatives, which is the behavioral definition for choice.

Consider one type of setting that behavior analysts have used to study choice: the two key operant setting. A human subject is placed in a room with two switches that are several meters apart. In these situations, researchers would tell the individual that he can do anything he likes, typically leading to the pressing of the switches, which would result in the presentation of, let's say, monetary reinforcement (Cheney & Pierce, 2013, p. 256). With concurrent FR schedules on each switch, a person quickly learns the best way to respond; if one switch reinforces behavior with $10 after five presses, while the other switch reinforces behavior with $10 after ten presses, the subject will spend all of his time pressing the first switch in order to maximize his payoff (Cheney & Pierce, 2013, p. 256). For FR schedules, choices are not being made. Additionally, if concurrent *fixed interval* (FI) schedules are presented, the human subject eventually learns which switch reinforces behavior after the least amount of time, resulting in predictable, patterned responding. Animals respond similarly to humans when FI or FR schedules are used to study choice. When a subject does not and cannot know whether switch one or two will produce the

best reinforcing outcome, he has to make choices. For this reason, variable interval schedules are said to be good models for studying choice.

There have been many studies that have looked at the distribution of human and animal behavior across alternatives (i.e. choice) and the findings are fascinating. These studies have shown that the rates of responding correlate to the rate of reinforcement. More specifically, the relative frequency of responses matches the relative frequency of reinforcement for those responses. This is known as the *matching law* and it has been applied to free operant choice made by humans (Cheney & Pierce, 2013). The matching law implies that we engage in a behavior to the extent that it is reinforced. Our choices align with the rate of reinforcement provided by the chosen option. Let me present one example with a more familiar topic.

The weekend comes around and your friend comes up to you and asks you if you'd like to drink. You say yes, having had a learning history in which an affirmation to that question subsequently resulted in pleasurable or reinforcing consequences (consider all the typical "pleasure-inducing" consequences of being intoxicated). You have such a great time drinking and you experience all of the regular reinforcers that follow that behavior. Additionally, the next day, you experience a mild headache (nothing real painful) and a little anxiety because your homework is one day closer to being due and you didn't reduce any of that anxiety the previous night. These two consequences are aversive. Suppose after a few weeks of fun nights out, the value of the reinforcing consequences of drinking becomes reduced because of excessive exposure to those consequences. Additionally, the value of the consequences of making minimal progress on your semester's homework begins to increase to "really aversive". Now, your friend calls you up on Friday and asks you to come out and you have to make a choice. Your response, which is a decision in this case, will match the option that holds the most reinforcing value. In this example, it seems that it would be more reinforcing to escape the looming anxiety at this point. I think few of us doubt the fact that you could have chosen to go out with your friends (many of us have experienced the regret of putting off responsibilities just a little too long). But if you were to actually choose the option that has less reinforcing value, the subsequent aversive consequences (the value of which are high) would then decrease the likelihood that you make that decision in the future under similar conditions. Thus, the decision to drink or not drink will match the extent to which drinking or not drinking is reinforcing.

## The Inevitability of doing what is Most Reinforcing

The notion that humanity is completely controlled by the influence of external variables is counterintuitive. It is truly the ever-present appearance of freedom that stifles these kinds of arguments. Additionally, people have been conditioned to find the notion of freedom extremely reinforcing, making it a difficult idea to let go of. An additional, somewhat less behavioral argument may help further my claim.

Let me start with this simple proposition: one can never do what he does not want to do. There may be questions as to what one means by "want" given our current discussion, but I would like to set them aside for a moment; treat the word as it is traditionally used. We can never do what we don't want to do, no matter what we might say about our actions otherwise. For example, someone might say, "I don't want to do my homework". Nevertheless she ends up doing her homework. Did she do something she does not want to do? Superficially, yes, but

actually, no. Looking a little closer, it is clear that she must have wanted to do her homework. Perhaps she did not want to get bad grades or she did not want to have her teacher scold her. She wanted to do her homework in the sense that she wanted her homework done and only she could make that happen. If there's anything she did not want, it might be the want for the completion of the homework to not involve effort. Or perhaps she did not want there to be an aversive outcome for not doing homework. Essentially though, she wanted to do her homework because she did it.

If we take the preceding example and replace the concept of "want" with the concept of "reinforcement", we come to the conclusion that one can never do what is not reinforcing. This is the same conclusion reached by our behavior science analysis of free-will. Although one might think they are doing something that is not reinforcing, they are instead trying to avoid something aversive, which is in itself reinforcing. The previous example demonstrates this well. On occasion, we say we "don't want to do homework" even though we do it anyways. This seems to be contraindicative of the notion that we always do what is most reinforcing (or what we most want), but indeed, it is apparently more reinforcing to avoid the aversive consequences of not doing homework rather than skipping homework itself. To be sure, this is circumstantial. For some people, escaping from doing homework entirely may be more reinforcing.

Additionally, one might think they are doing something that circumvents reinforcement, when they are actually becoming subjected to something that is more reinforcing. Take, for example, the witty student who walks into a behavioral study on choice and jumps up and down instead of ever pressing either lever. Alas, he receives no money but feels as though he got the best of the researcher and demonstrated his freedom. Has he in fact demonstrated freedom? No. He has demonstrated behavior that provided him with greater reinforcement than the money. To be clear, he could have done something other than jumping, even if it was just looking around the room. Ultimately, he still acted in accordance with what was most reinforcing.

## Free-will as an Explanatory Fiction

Much of my analysis of free-will has already been taken note of by behaviorists. A great number of behavior analysts have rejected free-will, dating back to B.F. Skinner himself. Their reasons for this denial differ from those we might read about in a piece of philosophical literature. Although determinism is championed in this science as it is in all others, behaviorists aren't arguing for the incapability of free-will and determinism (this position will be addressed in the next chapter of this paper). Rather, behaviorists refer to free-will and other inner causes collectively as *explanatory fictions*.

An explanatory fiction is a fallacy of reasoning in which one invents a name for the cause of a behavior. What makes it fallacious is that the evidence for this cause is entirely inseparable from the behavior it is said to explain, giving it a kind of circularity (Michael, 1993). The real problem with creating explanatory fictions in science is that it undermines the goal of discovering and describing functional relations between independent (cause) and dependent (effect) variables (Michael, 1993). Behavior analysts have acknowledged this problem. If we try to point to the will as the ultimate cause of someone's behavior (or even our own), we can in no way separate our evidence from that cause from the evidence that is the effect. "How do you know he exercised his will?" "He refrained from punching that man?" "How did he refrain from punching that man?" "Through the exercising of his will".

The flaw of creating explanatory fictions like "the will" is easy to see when the explanation concerns another person's behavior. Why, then, should this flaw persist when we think of our own behavior? Part of the problem comes back to the consciousness of our subjective experiences. As Skinner elegantly writes in *Beyond Freedom and Dignity*:

> "the problem [faced by behaviorists when dealing with consciousness] arises in part from the indisputable fact of privacy: a small part of the universe is enclosed within the human skin. It would be foolish to deny the existence of that private world, but it is also foolish to assert that because it is private it is of a different nature from the outside world. The difference is…in its accessibility. There is an exclusive intimacy about a headache, a heartache, or a silent soliloquy."

We are so tempted to make something more out of our internal world because of how deeply and emotionally exclusive it is. We'd like to say that we willed our action to be one way and not another because although we "felt temptation" to act one way, we overcame this urge and decided to act another way. But, so far as a rationale being is concerned, was not this decision to act another way in alignment with reinforcement and a learning history in the environment? Aren't we merely giving into the choice that we are driven to act in accordance with more than the other options, as we have understood those options? To say it differently, we're just abiding by reinforcement in a different way—a way that looks to be beyond simple reinforcement and to a whole other extent. But that isn't what we're dealing with. Even when we grow to adults and become more reasonable and the control of our behavior becomes internalized and less conspicuous, we have no more right to refer to "the autonomy of human will" as a cause than we do when that individual is an infant (Skinner, 1971, p. 63). Again, as Skinner writes,

> "The individual tells himself what to do and what not to do, and it is easy to lose sight of the fact that he has been taught to do so by the verbal community." P. 64

> "The verbal community specializes in self-descriptive contingencies. It asks such questions as: What did you do yesterday? What are you doing now? What will you do tomorrow? Why did you do that? Did you really want to do that? How do you feel about that? The answers help people adjust to each other effectively. And it is because such questions are asked that a person responds to himself and his behavior in the special way called knowing or being aware. Without the help of a verbal community all behavior would be unconscious. Consciousness is a social product. It is not only not the special field of autonomous man, it is not within the range of a solitary man." P. 182-3

## Conclusions in Behavioral Science

In support of free-will, one might have been tempted to appeal to our ability to choose. In those situations where we engage in self-control, or even in regular everyday decisions, it has seemed as if a decision-maker has the ultimate say with respect to our choices. But if studies demonstrate the extent to which our choices are predictable, and therefore controllable, is there really a decision-maker involved? It seems that we are merely organisms that things are happening to; integrating centers that receive endless input by external stimuli, which subsequently determine our responses. Indeed, this has been the major implication behind operant conditioning, which we defined as the consequences of a behavior determining how likely it is to happen again. I will say once again that the notion of "likelihood" or "probability" does not grant that we are free from behavioral principles. It merely means that given certain antecedent stimuli that constitute a

specific situation, one is likely to engage in certain behavior if that behavior resulted in direct or indirect reinforcement in the past. The probability is influenced by several variables, all of which are ultimately external. The extent to which an organism is satiated or deprived of a stimulus affects its value as a reinforcer or punisher, as do the countless other stimuli involved in any given situation. This makes predictability of certain behaviors extremely difficult in the real world, as is the case with our use of language.

From a behaviorist perspective, I propose a concept of freedom that, strictly speaking, isn't such. Freedom is the state of being in which one is controlled by stimuli that one consents to or is complacent with. Although one might be comfortable with this kind of control, it is control nonetheless, and ultimately, determined control, such that true freedom is actually impossible. True freedom would be having the ability to act this way or that, or any other number of ways, even in the face of a particular set of antecedent conditions and with a particular learning history. It would be the ability to make a choice in defiance of all of past history, like a domino that turns and falls right when all preceding dominos had been oriented in such a way that it was going to fall left. But that kind of true freedom seems undesirable. For would it not represent the ability to make choices amongst alternatives, without past experience, without present influence, and without want or desire? Who would seek this freedom? Who would want to fulfill impartial inclinations? The remark itself appears altogether contradictory, for how could one be inclined to make decisions without any current influence, experience, or desire?

In summary, it seems that we have explored all of the important avenues for a behavioral analysis of free-will. Responses are the only means by which an organism would be able to manifest its freedom and we have pointed out that responses are elicited by antecedent stimuli, and occur in accordance with our genetic inheritance and learning history. One's learning history consists of the strengthening or weakening of neural connections such that certain behaviors become more or less likely depending on the particular environmental conditions. Essentially, all human responses are reflexive in the sense that they are necessitated by preceding conditions. The actual difference between a reflex and an operant behavior is subtle. Both occur by necessity when antecedent conditions are exact. While a reflex happens when the corresponding antecedent stimulus is present, an operant behavior may or may not happen all the way up until the moment of its occurrence. This is because operant behavior is subject to the control of many more variables than reflexive behavior. For this reason, operant behavior is seen as probabilistic, but at the same time it is still determined; given a particular learning history, a particular genetic makeup and particular antecedent stimuli, a particular response will occur by necessity.

This analysis fits nicely with the discussion from chapter one on the physiology of reflexes and voluntary behavior. The next chapter will explore free-will in its original domain: philosophy.

# Chapter 3
## Philosophy on Free-will

## Introduction

The question of whether or not human beings possess free-will is historically a philosophical one. As stated at the introduction of this paper, it is a conversation that can be traced back over two millennia. That being said, it is not the intention of this chapter to cover every avenue of the discussion. Instead I will examine some famous arguments and some of the particularly compelling contemporary arguments, rounding out this analysis of free-will.

To analyze the problem of free-will as it is understood in philosophy, we must stick to a single definition. Many different definitions have been explored in philosophy, but I'll borrow Robert Kane's. His states that free-will is "the power to be the ultimate creator and sustainer of one's own ends or purposes" (Honderich, 2014). The important aspect of this definition is the part about being the ultimate creator, such that we can be ultimately responsible for causing sequences of events that, in turn, lead to one's decisions and actions. If free-will is truly the ability to create the first cause in a chain of events that leads to some behavior, then we should first turn our attention to causality. In philosophy, the great conversation on cause and effect is encapsulated by the term *causation*.

## Causation and Determinism

Philosopher David Hume once concluded that "in the single operation of bodies, we never can, by our utmost *scrutiny*, discover anything but one event following another". This quote comes from one of his writings on causality, "Causal Connection is Constant Conjunction". Since Hume's passing over 200 years ago, philosophers and scientists are still unable to observe anything other than one event following another. For example, we see a golf club swing, and then we see a soaring golf ball and we say that the swing of the club caused the movement of the ball. But we are technically unable to say that the swing of the club caused the movement of the ball—we can only say that all evidence and all experience suggests that this causal connection is present. Relying on observations that we can predict is acceptable in science. We're comfortable saying, "In the past, when this cause was present, this effect resulted, suggesting a very strong likelihood that this cause produced this effect". In philosophy, debate ensues with respect to the belief that effects follow from their causes in such a way that a given cause will *always* give rise to a given effect, by necessity.

Why is it that a particular cause necessarily produces an exact effect? It may be helpful to understand the word "cause" as not merely one event, but rather a multitude of causes or conditions. The term *causal condition* might be a more appropriate for the time being. For an effect to follow from its causal condition, the causal condition must be sufficient. That is, everything that is required for the effect to be produced must be present within the cause. So let us imagine any possible effect—we'll call it effect A. If effect A be produced, its causal condition was indeed sufficient for its production. If effect A is not produced, but possible nonetheless, there must be some aspect of the causal condition missing, such that it was not sufficient. Consider what we must conclude when we see the flipping of a light switch leading to

the production of light from a light bulb. If the light is emitted from the bulb, it is clear that the preceding causal condition was sufficient for the production of the light. If the light is not produced, there is apparently at least one aspect of the causal condition that is missing because the light did not turn on. When all aspects of the causal condition are present so that the bulb *could* produce light (including the flipping of the switch), the bulb *must* produce light. Therefore, when we have a given set of causal conditions that *can* cause effect A (in other words, sufficiently capable of producing effect A) effect A *must* be produced, for if it is not, or if some other effect is produced, we do not have the exact set of causal conditions that produced it to begin with. It follows that when causes are sufficient, their effects follow by necessity. Thomas Hobbes states this well in, *Causation Itself, Determinism, and their Compatibility with Freedom*.

> I hold that to be a sufficient cause, [is] to [be that] which nothing is wanting that is needful to the producing of the effect. The same also is a necessary cause. For if it be possible that a sufficient cause shall not bring forth the effect, then there wanteth somewhat which was needful to the producing of it, and so the cause was not sufficient… Hence it is manifest, that whatsoever is produced, is produced necessarily; for whatsoever is produced hath had a sufficient cause to produce it, or else it had not been.

In another one of his works, Hobbes goes on to argue how this notion is ultimately compatible with freedom. That argument will be examined momentarily. Also, for ease of communication, we will return to using the word "cause" rather than what is more accurately referred to as an exact set of causal conditions.

The belief that specific effects correspond to specific causes is the bulk of the philosophical and scientific position of *determinism.* Determinism states that for any given event, there exist conditions for which no other effect could result (Honderich, 2014). Cause A produces effect A, always. Many philosophers and scientists believe that the laws of nature dictate a determined world in which all effects follow from causes because they must. This is the position that motivates the debate regarding the possibility of free-will. If determinism indeed holds, we must ask how free-will can possibly exist if everything is an effect necessitated by a previous cause. For this would seem to suggest that reality could never be different from what it actually is. Does this not require us to believe that our actions could never be different from what they actually are? If our actions are all determined, then choice and decision making present one of the most convincing illusions to humankind (as we discussed in the previous chapter).

There are however many that argue that determinism does not exclude the potential for our free-will. In general, these positions are usually classified as *compatibilistic* because they argue for the compatibility of free-will and determinism (Honderich, 2014). The opposing position is referred to as *incompatibilism*, which is, then, the belief that free-will is impossible if the world is determined and could therefore exist only in an undetermined world (Honderich, 2014). I would like to turn first to compatibilism.

## Compatibilism

I recently alluded to a compatibilist argument put forth by Thomas Hobbes. Although many have already criticized this philosopher's argument (as Kant stated in *The Critique of Pure Reason*, "it is a wretched subterfuge to seek to evade this [dilemma of freedom and determinism] by [using]

a comparative concept of freedom [(i.e. redefining or conflating definitions)]"), we will give it some attention. It is important to set the stage for Hobbes's position by considering the argument he was objecting to. Hobbes had found that many were arguing that freedom is not compatible with determinism because, in a determined world, one cannot do anything other than what he or she actually does. He begins then, in *Leviathan* by considering the definition of freedom. He comes up with a *negative* definition, in which freedom or liberty is defined as being present when there is an absence of opposition or constraint. Hobbes concludes that in most cases one is not facing physical constraint or opposition, so one is free to act in accordance with his will. Accordingly, a free man then is one who "by his strength and wit" is not hindered from doing what he has a will to do. He continues on with examples:

> When a man throws his goods into the sea for fear the ship would sink, he does it nevertheless very willingly, and may refuse to do it if he will. It is therefore the action of one that was free. So a man sometimes pays his debt, only for fear of imprisonment, which because nobody hindered him from detaining, was the action of a man at liberty.

Hobbes is arguing for a kind of freedom that is compatible with determinism, which is, freedom from opposition or force. Here, I agree with Kant in that Hobbes has evaded the dilemma of freedom and determinism by conflating definitions and supporting an irrelevant kind of freedom. The freedom philosophers must argue for in this debate, and the one that we need for responsibility, is a *positively* defined freedom. It isn't the *absence* of opposition or constraint (which is meaningful no doubt), but the *presence* of an ability that allows the origination of causes in ourselves. Hobbes incorrectly developed his argument around a negative definition.

I would also like to present two additional objections to what was just quoted from *Leviathan*. First, and most importantly, can a man really refuse, as Hobbes claims, to act one way and not another if his act is the effect of a necessary cause? If Hobbes' claim is true, it would seem to suggest that although a situation is fixed in as much as it is one causal condition and not another, it can somehow have one effect in which the will thereby acts one way or another effect in which the will thereby acts some other way. Thus, Hobbes is claiming that the same causal condition can produce at one instance effect A and at another instance effect B. But this would be contrary to Hobbes's own words in *Liberty and Necessity*, in which he states that it would be a contradiction "to say, the cause may be sufficient, that is to say, necessary, and yet the effect shall not follow". Because of the existence of this contradiction, it would not be unfair to demand a revision from Hobbes (although such a demand would fall upon deaf ears), in which he must agree that "when a man throws his goods into the sea", he does so because antecedent causes or conditions were of one sort and not another. Whether the man does or does not throw his items into the sea is not a matter of freedom given one causal circumstance; it would merely be two causal conditions leading to two different actions and outcomes. Once again, his negative definition of freedom from opposition and force is not the freedom we need to be questioning.

For my second objection, in line with some of the reasoning invoked in the behavioral science chapter, I would like to point out that the man in Hobbes's example who pays his debt for fear of imprisonment is in fact hindered in such a way that Hobbes should not consider him free. The man's behavior is being controlled by rules specifying the consequences of his actions, or by his past experience with being punished for not following rules. The control of his behavior

by a rule is an example of an inconspicuous constraint implemented by an agency of law enforcement. To say that this threat of punishment is not control (and therefore not a hindrance) is to say that the threat is not acting in a way that affects the debtor's actions. And yet it is. Experience with the consequences of breaking rules is precisely what affects the debtor's actions. It is merely a weaker or less obvious control than being forcefully or literally pushed into doing something, by say, another person. Thus, the rule itself is a hindrance to his behavior, and we ought to conclude that the man is not free according to Hobbes's definition because of the existence of this hindrance.

## *Ansgar Beckermann's Argument*

I mentioned that many philosophers have already argued against compatibilist positions similar to Hobbes's. Let us now turn to a more contemporary philosopher, Ansgar Beckermann, who initially advances a compatibilist position, but comes to uphold free-will with a modified position. According to Beckermann, certain conditions must be met in order for a given action or decision to be considered free, such that an individual can be held accountable for it in a determined world (Honderich, 2014). Beckermann gives three such conditions: (1) an individual must have been able to do otherwise (other alternative decisions could have been made), (2) the choice made amongst the alternatives must depend on the individual (referred to as authorship), and (3) the choice itself must not be made under any constraint (that is, it must be free).

Beckermann begins by attempting to uphold the first condition, which is commonly referred to as the *condition of alternative possibilities* (*AP*). Many have argued that for an individual to be free, they must be able to act otherwise in any given situation. But if everything is determined, is it possible for one to act differently than they ever actually do? Beckermann maintains that one can indeed act differently in at least some situations. He bases his argument on G.E. Moore's observation that the word "can" or "able" is contextually ambiguous (Honderich, 2014). Beckermann states that even in a determined world, one *can* do otherwise in the sense that she may have the *ability* to do otherwise. For example, in accordance with a preceding chain of events, one might be causally determined to remain seated in a chair, and yet, she nevertheless possesses the ability to stand considering the functionality of her brain, spinal cord, motor neurons, and leg muscles. From this premise, Beckermann proposes that we also possess the ability to decide differently in a given situation even if our actual decision is deterministically fixed.

I find the support for this first condition to be particularly weak. In this instance, quibbling over definitions seems to circumnavigate the actual issue, which is that no matter what one is *able* to do (in Beckermann and Moore's sense of the word), one is unable to exercise this ability freely. Speaking in terms of potential, it is true that in any given situation we possess the ability to do other things than we have been determined to do. The problem at hand is that the ability that is exercised in any given situation is determined, regardless of whether we have the potential to have another ability of ours exercised. The same logic applies to decisions; the issue is that a certain decision is necessitated in a given situation and that our ability to manifest any other decision in that moment is inherently impossible if determinism holds. Thus, we retain our abilities in circumstances with respect to our potential, but not with respect to the actual manifestation of such abilities. This latter criterion is what is important for the discussion of

alternative possibilities and how that relates to free-will. Given my analysis, it seems that in a determined world, one is still unable to do otherwise in any given situation, meaning he or she is not acting freely.

Recall that Beckermann's second condition referred to something known as authorship, or, having a certain action or decision belong to the organism in question. For an action to be an organism's own, the organism must be autonomous in the sense that its movements are determined by internal control mechanisms that do not always respond in the same way to the same kind of stimulus. Beckermann claims that the actions of some organisms are not merely simple reflexes to stimuli and that we can choose to act in multiple ways given one particular antecedent condition. The choice of the action that is actually performed must be dependent on the organism's own internal control mechanism. If the decisions that precede these actions rely on the internal control mechanism, the organism is the owner of it.

There are many aspects of this portion of the argument that I disagree with. First, is it true that certain beings do not always respond the same way to the same kind of stimulus? I will grant that it does appear as if organisms respond differently when presented with the "same" stimuli. However, it seems likely that the stimuli preceding a given action are not the same, such that the causal condition that determined action A is not present when action B occurred (despite appearances). To say that an organism can respond differently to the same exact stimuli would be analogous to saying that an organism can act differently despite its being affected by the same exact causes. However, this would contradict the central premise of determinism, which Beckermann is seeking to uphold in his argument for the compatibility of free-will in a determined world. Thus, Beckermann must either revise his argument for the advancement of the second condition in support of compatibilism, or provide much more support for how freedom would be compatible with indeterminism (which would no longer be an argument for a compatibilist position).

Additionally, I can grant that it is certainly the case that the mechanism Beckermann speaks of is internal in the sense that it is within an organism's body. But it is still as subject to deterministic laws and the natural order as things that are outside of the body. Instead of a being deciding through these internal mechanisms, I suggest that organisms are just acting out complex reflexes determined by external factors and specific stimuli. These reflexes are in a way analogous to the operations of a computer, which is surely complex too, in that once the computer receives a specific command, it necessarily responds a given way in accordance with its internal components. The computer also takes in complicated data, somehow processing it and delivering a response, yet all of this is determined. Humans may function similarly, or at least, analogously, with respect to the numerous stimuli affecting our brains.

Beckermann's third condition in support of compatibilism states that in order for a decision to be free, it must not be subjected to constraint (or necessity). Beckermann acknowledges that this condition is the trickiest to satisfy in a determined world and he relies on an interesting argument by Robert Kane to come up with a solution. We will examine this argument in another section. For now, it is important to note that Beckermann uses the argument from Kane to uphold a small but important degree of indeterminism, which grants some amount of self-determination. Thus, it is advanced that this degree of indeterminism allows people to have control over their thoughts, desires, and the like. But in accepting the truth of

indeterminism, Beckermann has strayed from a compatibilist argument, because compatibilism is the belief that free-will is compatible with a determined world. For now, we will proceed with the "compatibilist" conclusion eventually drawn by Beckermann.

Keeping in mind his belief in self-determination, Beckermann ultimately comes to conclude that humans are biological beings, subject to the natural order, and yet free from manipulation by that natural order. Rather than depriving us of freedom, he argues, nature gives people the potential for an additional specific capacity that makes freedom possible. This capacity is the ability to be aware of our desires, reflect on them, and control them, thereby intervening in the natural, mechanistic progression that would normally take place. The natural capacity also allows us to consider various components factoring in to any given situation, allowing us to see many of the potential consequences of our actions. According to Beckermann, the extent to which this capacity develops is dependent on instructions and training, which eventually teach us to refrain from complying with the shorter term gratifications in pursuit of the longer term ones. If everything goes as planned, the adult comes to have this capacity well-developed, which allows them to consider all of the various relevant factors and freely choose an action based on such considerations. Beckermann states that the choice would only be free if it truly came from that internal decision-making capacity.

This last point mentioned by Beckermann has an intuitive pull to it. In spite of our entire past being determined, including the determination of our past wants, desires, thoughts and actions, it still seems as if our current selves can break the deterministic chain by merely considering, or deliberating, before acting in accordance with any given want, thought or desire. For example, let us say that a man is at the store and he is trying to decide whether he's "in the mood for" chocolate or fruity candy. Consider the fact that even though he may have been previously determined to like chocolate candy more than any other kind (suppose he was genetically predisposed to favor chocolate and his entire life experience with chocolate has been a favorable one), it seems that he could successfully deliberate and choose fruity candy, if only to be whimsical. The question we must ask is, was this a free choice? Assuming the decision-making capacity spoken of by Beckermann has successfully developed and has allowed this man to consider alternatives and choose amongst them, is he truly free? In the strictest sense of the word, it would seem as if he isn't and it would follow that neither are we. Being presented with various choices and choosing amongst them after some time of deliberation cannot express freedom in a determined world. For every aspect of the process is still determined. The number of choices presented is determined, as is the duration of the deliberation and the preceding disposition for certain choices. Even the desire to be whimsical is the result of some preceding condition in the past. In a determined world, everything that happens comes about by necessity.

## Incompatibilism and Indeterminism

If free-will is not compatible with determinism, it can only be salvaged by turning to incompatibilist arguments. Incompatibilists recognize that determinism and free-will cannot be reconciled and therefore deny the existence of one or the other. One incompatibilist approach is to support free-will by upholding indeterminism—a position termed Libertarianism. Indeterminism is the belief that the exact same causal condition can result in different effects. We proceed with an investigation into indeterminism.

## *Immanuel Kant's Argument*

As a whole, indeterminism finds much less support in the realm of science and philosophy than determinism—currently there is little empirical evidence in support of it. In a moment we will examine scientific support for indeterminism, but for now, we will set aside concerns about the truth of the claim and focus solely on arguments in support of the position. The following excerpt from Immanuel Kant in "*The Critique of Pure Reason"* lays the groundwork for his argument supporting indeterminism. He begins with an explanation of determinism and its incompatibility with free-will.

> "The necessity in the causal relation [of things in time] can in no way be united with freedom…For, from the first it follows that every event, and consequently every action that takes place at a point of time, is necessary under the condition of what was in the preceding time. Now, since time past is no longer within my control, every action that I perform must be necessary by determining grounds that are not within my control, that is, I am never free at the point of time in which I act."

Here, Kant affirms much of what we have just covered: events follow from causes by necessity. Amongst his support for determinism, Kant begins to make a case for an important special instance of indeterminism. He states that, "pure reason, as a merely intelligible faculty, is not subject to the form of time, and hence not subject to the conditions of the temporal sequence". Essentially, Kant has argued that all events under conditions of time must be determined. Reason, however, is apparently a faculty that stands outside of time, such that it is not subject to the deterministic laws or the natural order. Kant concludes his essay by supporting the notion of free-will and its compatibility with a *mostly* deterministic world.

> "The very same subject, being on the other side conscious of himself as a thing-in-itself, also views his existence insofar as it does not stand under conditions of time and himself determinable only to laws that he gives himself by reason; in this existence of his, nothing is, for him, antecedent to the determination of his will."

Ultimately, Kant leaves us with the notion that free-will is possible if we ascribe rationality to a realm subject to indeterminsitic laws. Kant concludes that reason, as a *merely intelligible faculty*, is not subject to the form of time. Indeed, our ability to reason would seem to be nonexistent in the physical world. And if reason did exist outside of space and time, it is at least conceivable that deterministic laws would not apply. But all of this is assuming that our reasoning ability is extra-scientific in the sense that it is a non-physical process. If materialism holds and all of reality—including the mind—is merely physical, reasoning is a complicated electrochemical process occurring in human brains, subject to deterministic laws just like other processes under "conditions of time".

I grant that our capacity for reason is much more complex than science is currently able to explain. However, our ignorance of these processes do not make them extra-scientific or non-physical in the sense that they become subject to the laws of an indeterminsitic realm. Qualities once attributed to the mind have become increasingly explained by neuroscience and, in some cases, behavioral analysis. It's true that the world could be dualistic, with the mind existing as non-physical, but then we are left to surmount the philosophical challenges of dualism. How does the non-physical mind interact with the physical brain? In what way does the immaterial

exist if not physically? What would be the explanation for immaterial forces being limited in their influence, for science provides strong support that physical matter is only guided by physical forces. There are other issues with a dualistic worldview that are beyond the scope of this paper.

Even if Kant is correct in his evaluation of reason, it doesn't follow that we have free-will. As many philosophers have pointed out, indeterminism is a necessary condition for free-will but not a sufficient one. If causes can have more than one possible effect, it also needs to be granted that we can intentionally direct causality such that we can truly be the ultimate cause for the occurrence of an action. Even if we say that Kant is claiming that our will allows this exact ability, we are still confronted with problems—the problems of *agent causation,* as Peter van Inwagen and others have pointed out—which will be discussed shortly.

## *Robert Kane's Argument*

Although we have criticized aspects of Immanuel Kant's indeterminism, I find it unlikely that he would formulate the same argument in today's era, in which the mind is popularly reduced to the brain and all mental events considered conditional upon the existence of neural events. Current discussions on free-will pick up where Kant left off though: indeterminism in the brain. The idea is that relatively recent discoveries in physics allow for the possibility of undetermined neural processes. Though many contemporary philosophers and scientists uphold determinism, many of them are formulating arguments based on indeterminism at a micro-level in order to salvage free-will from an incompatibilistic perspective. Robert Kane is among them. Kane adapts his reasoning to discoveries in modern physics and has developed an interesting and strong argument for the possibility of human free-will.

Robert Kane begins in *Reflections on Free Will, Determinism, Indeterminism,* by clarifying his definition of freedom. Indeed, as we have stated, there is more than one interpretation of the word and its meaning plays an important role in free-will arguments. Kane argues that there exists at least one kind of freedom worth wanting that is incompatible with determinism, and that incompatibilists should be talking about this freedom rather than freedom from restraint, addiction, coercion or political oppression. This incompatible freedom, which Kane refers to as free-will, is "the power to be the ultimate creator and sustainer of one's own ends or purposes."

With this definition, Kane proposes we move in a new direction with respect to the free-will discussion. He states that, when discrediting the compatibility of free-will and determinism, most incompatibilists' arguments appeal to the *condition of alternative responsibilities,* or, *AP,* as we have previously discussed with Beckermann. Once again, the argument here is that an agent is only free if she could have acted otherwise, which is, as we previously mentioned, inherently impossible in a determined world. Because arguments based on AP have been debated to stalemate, Kane proposes we turn toward the Aristotelean notion of *ultimate responsibility* (*UR*):

> "To be ultimately responsible for an action, an agent must be responsible for anything that is a sufficient reason for the action's occurring…Compare Aristotle's claim that if a man is responsible for wicked acts that flow from his character, he must at some time in the past have been responsible for forming the wicked character from which these acts flow."

To be compatible with free will, the condition of ultimate responsibility does not require alternative possibilities for every action in our past. Instead, it requires that we could have done otherwise with respect to at least some of our past actions, namely, those that have formed our present character. Kane calls these *self-forming actions*, or *SFAs*. If we did not have freedom with SFAs, there is nothing we could have ever done to be different from who we are. The appropriate question to ask now is, how can we have freedom with SFAs in a determined world? Indeed, in a determined world, this would be impossible. But even in an undetermined world, in which effects are the result of randomness instead of necessity, we need something else to save free-will; if our actions are happening because of randomness in physics, our actions would be arbitrary or capricious, not willed. The "will" aspect of free-will is as necessary as the "free" aspect.

What we now require for a modern argument in support of free-will is a scientific approach with at least some indeterminacy *and* intention with respect to self-forming actions. Kane meets these prerequisites by presenting the idea that our intentions to act in certain ways can cause indeterminacies at the cellular level in the brain. During difficult times in our lives, we are torn between competing visions of who we should be or what we should do. According to Kane, these are instances in which the SFAs occur. Suppose, as an example, that we are torn between making it to class on time and helping a stranger with a broken down car. During these cases, we experience tension and uncertainty about our choice. Kane argues that this uncertainty is "reflected by movement away from thermodynamic equilibrium in our brain, making it sensitive to micro-indeterminacies at the neuronal level." These cases of inner conflict might result from a clashing or crossing of competing neural networks. Once some activation threshold has been reached in the form of extensive reasoning, we make a decision that contributes to the formation of our character. The decision is undetermined, yet rational and intentional because neural circuits in our brain were intentionally competing for the manifestation of the will as an action.

Kane's reasoning leads us to the conclusion that self-forming actions can be resolved intentionally and indeterminably. As Aristotle would suggest, we can thusly be held responsible for "wicked acts that flow from our character" for we have seemingly had chances to create the character from which those wicked acts are said to have flown. I find Kane's argument to be a rather strong one, yet there are still aspects of it worth calling into question. First, is a choice really considered free in an instance of a self-forming action? If we permit that the choice is intended and undetermined and ultimately made because of "extensive reasoning", what is it that has allowed the extensive reasoning to decide amongst the competing intentions? It would seem that we still are not free since each of the competing intentions to act a certain way have all been determined by our life history and our genetics. Additionally, the duration of the extensive reasoning—which, ultimately allows the activation threshold of one of the various intentions to be reached—would seem to be determined as well. If we do not have control over the amount of time we reason over our intentions, how can it follow that we have control over the outcome such that we are ultimately responsible for it? Are we to say that people are responsible for their behavior because that behavior resulted from one of a multitude of competing intentions, each of which were determined and of a certain likelihood to win out over the others?

### *Quantum Indeterminism*

I also want to call into question Kane's claim to indeterminism at the neuronal level. Kane rests the validity of this claim on discoveries in quantum physics. It has been suggested by physicists that at the quantum level, particles have no definite properties until they are observed (Wartick, 2011). The earliest studies of quantum mechanics revealed that the behavior of elementary particles changes when those particles are measured, suggesting that the properties of the most basic elements of reality are probabilistic and not determined.

If the world is not determined on the most fundamental level, is it really determined at all? Although this indeterminsitic interpretation of quantum mechanics has survived for several decades, contemporary research has revived an interpretation of the strange results of the quantum experiments in the 1920's. That forgotten interpretation held onto the idea of a concrete, non-probabilistic reality in the face of what appeared to be evidence for the undetermined behaviors of particles at the quantum level.

The modern experiments studied the effects of an oil droplet bouncing on the surface of a liquid (Wolchover, 2014). The droplet would create waves in the liquid with every bounce, while the waves from past bounces affected the movement of the droplet. The droplet's movement was affected by its own ripples such that it began to behave in a way previously thought to be peculiar to fundamental particles at the quantum level—"including behaviors seen as evidence that these particles are spread through space like waves, without any specific location, until they are measured" (Wolchover 2014). This growing body of research on the behavior of oil droplets guided by "pilot waves" in a fluid reveal that features of apparent quantum indeterminism can be replicated on a scale at which we can clearly recognize a determined mechanism of causality. Some researchers have interpreted the findings of the oil droplet experiments as revelatory of the fact that the particles of reality are as definite as oil droplets, and that they only appear to behave indeterministically because of undulations in space and time (Wolchover, 2014). However, a deterministic account of quantum mechanics is not widely held by physicists.

## The Real Problem of Free-will

Let us grant every possible concession to Kane, Kant, and the like, who argue for an incompatibilistic freedom—that is, freedom in a world that is only mostly determined world, and therefore, at least minimally undetermined. We shall suppose that this minimal level of indeterminacy takes place in the brain, whether it is due to our rational faculty standing outside of conditions of time or to micro-indeterminacies at a neuronal level. We will also grant that a given action or decision is the result of a preceding intention or desire of the will and that this will was not causally motivated by preceding experiences or conditions (which is truly difficult to comprehend), but only by the rational activity of the agent in question. And we will also grant that determinism does not fail when it comes to our intentions producing a given action. Now we are left with the notion of agent causation, in which a given being or organism can be the creator of the initial link of a causal chain simply by willing. This then meets our criteria for free-will as discussed at the beginning of this section. But is such a concept actually desirable, or even intelligible? Peter van Inwagen shares his thoughts on the subject and it leads us to an astounding conclusion.

According to van Inwagen, appealing to agent causation does nothing to solve the problem of free-will (Honderich, 2014). I will explain by drawing out an example. Suppose that a given individual decides to demonstrate her freedom of the will by clapping her hands. An apparent causal antecedent of this hand clapping is some neural event taking place in the individual's brain, such that had this brain-event not occurred, neither would the hand clapping (recall our explanation of voluntary muscle movement). Because we are holding on to the popular theory of agent causation, we must hold that the brain event or events that precede the hand clapping are caused by the agent herself. If we hold that the hand clapping was indeed a free act, we must hold that at some time prior to the action of hand clapping, the individual was both able to clap her hands and able to refrain from clapping her hands. Now, says van Inwagen, let us suppose that by some extraordinary miracle, God returns the world to the exact moment before she decided to clap her hands. What would happen? Well, if indeed the choice or act was a free one, we are forced to conclude that we do not know what will happen. She might clap her hands, or she might not, considering that we are assuming that determinism does not hold and that the exact same preceding conditions may lead to different outcomes. If, then, God were to miraculously intervene and continuously bring the world back to the moment before the hands were clapped, there would have to be times when she freely chose to clap her hands and times when she freely chose not to. But that would leave the hand clapping to merely a matter of chance. If we take away the constant intervention and replay by God, the action would still seem to be left to a matter of chance without determinism. If chance is truly responsible for the decision, then it can no longer be true that the woman was able to clap and able to not clap before she "made the decision". Instead, she was just the subject of randomness. Hence, the inclusion of agent causation has only served to identify the impossibility of an undetermined free act.

## Conclusions in Philosophy

The question as to whether or not human beings possess free-will is probably unanswerable. At least it remains that way for now. As Wolfgang Prinz points out in, *Explaining Voluntary Action: The Role of Mental Content*, there are at least three unreasonable metaphysical demands we must make to uphold free-will. First, we have to believe that there is an insurmountable gulf between the mental and the physical world, and that the mental world acts in accordance with different laws, or perhaps no laws. Second, we have to hold that the mental is capable of intervening in the physical realm, a major problem of dualism. Lastly, we have to largely uphold determinism while suggesting that there is principled, local indeterminism that allows free-will.

Our philosophical analysis of free-will has left us in a strange place. Evidently, free-will is not compatible with determinism because everything that an organism ever does is the result of causes and effects that precede the individual's existence. An organism can never do anything other than what it actually does. We must conclude that compatibilism is false. Additionally, what appears to be the opposite position is also false, for free-will is also incompatible with an undetermined world because that would mean effects follow from causes by matters of chance. We are faced with the idea that free-will is not possible with determinism or indeterminism, and yet the world is either one or the other. It seems to be the case then that free-will is an altogether unintelligible concept. An illusion made absurd by bringing it to light.

# Chapter 4
Implications

## Introduction
If our multidisciplinary analysis has sufficiently revealed the impossibility of human free-will, it would seem that entire belief systems inconsistent with both science and logic. Without free-will, how can we salvage responsibility? Without responsibility, how can anyone do anything worthy of praise or blame? Additionally, what happens to religion without free-will? What happens to the criminal justice system and society? The final section of this paper will endeavor to explore the implications behind a world in which free-will is merely a very convincing illusion.

## Morality
One of the first closely-held principles to be questioned in response to our analysis is that of responsibility. Philosophers in particular have questioned whether or not one can be morally responsible for anything if they could never do anything other than what they actually do. This point was touched on in the previous chapter. According to Peter Van Inwagen, "There is an inseverable connection between free-will and moral responsibility." Philosopher Harry Frankfurt also acknowledged this connection and developed what is now a relatively well-known argument around it.

Frankfurt's argument advances the notion that one can be morally responsible even in a determined world. He first asks us to consider a man named Jones, who has reasons for engaging in a certain immoral act—immoral act A. Suppose Jones is also threatened to do immoral act A—threatened in such a way that any rational man would have to comply—such that had he not had his own reasons for performing the act, he would be forced to by the implementation of the threat. In this case, Jones is incapable of doing anything other than immoral act A, which is purportedly analogous to the state of affairs in a determined world. According to Frankfurt, Jones is still morally responsible even though he could not do otherwise, considering he had chosen to perform immoral act A without the coercion from the threat. After presenting slightly modified examples (in order to delineate important differences amongst cases in which one should be held morally responsible and cases in which one should not), Frankfurt concludes that the argument from alternative possibilities (see Philosophy chapter) should be clarified such that a person can be held morally responsible even if they could not do otherwise. That is, he believes the principle ought to say something along the lines of, "one is not morally responsible for an action only if the following criteria are met: first, they could not have done otherwise. Second, the given circumstances actually played a role in the bringing about of the action (i.e. the threat in the Jones example). And third, the person did not want to do what they did."

If Frankfurt's position holds, we are left with the idea that one can still be morally responsible even when they are unable to act in any other way. But I disagree with this conclusion. I grant that Frankfurt might be correct in an *undetermined* world in which one's choices and decisions mattered in a moral sense. By that I mean, in the Jones example, Frankfurt is concluding that Jones is actually responsible for his actions despite being unable to do otherwise because he has chosen himself to perform immoral act A, the threat is not actually

bringing about the enactment of immoral act A, and, for his own reasons, he wants to perform immoral act A. But even when these criteria are met, determinism (which Frankfurt espouses) undermines the possibility for us to be morally responsible, ever. For it is not merely the presence of the threat that is keeping Jones from doing otherwise. In fact, Jones's decision must have been determined such that he could not have decided otherwise. When every effect is the necessary result of preceding causes, everything that happens *must* happen. Every action must happen and all of the deliberation and reasoning and wanting going into a decision must happen in an exact way and to an exact extent. When one considers that everything they are and everything they do is the result of causes that date back to the beginning of all events, we seem unable to salvage the concept of responsibility.

If one cannot be held morally responsible for any action or decision, the entire ideology of morality seems to become meaningless. Resting upon this ideology are the broader ideologies of many religions, as well as the social ideology by which many "free" countries hold individuals accountable for their actions.

## Law and Criminal Justice

Order is kept in our world largely because we hold others accountable for actions we collectively consider unacceptable. In American culture, we value equality and independence. Therefore, it *feels* true that we ought not to infringe on other people, or to keep them from doing what any of us want to do. When people infringe on others more than our legal system has defined as acceptable, we allow officers to infringe on them for the sake of restoring the order we value. Thus, we have police in our society to intervene when people harm others and we collectively discourage it in the form of enforced punishment and social disapproval.

Our culture assigns responsibility to actors. We hold people to their crimes and tell them that they shouldn't have done what they did and that what they did was wrong. Most importantly, we presume that criminals could have done something other than infringing upon another human being's right to be left unharmed. We impose the punishment and blame the criminal for what they've done and use them as an example to others—we say, "everyone look, this is why you don't steal, or rape, or murder. It's wrong and you'll be punished. Do something other than those things because you are free to decide".

Our system of enforcement is eminently practical. By holding people accountable you justify inflicting punishment on others and the result is an overall decrease in criminal activity. People grow up in a world where they can learn from the consequences of actions we collectively deem illegal without having to experience those consequences personally. The criminal justice system is necessary for the sake of maintaining values that matter to us most: safety, pursuit of happiness, autonomy, and many others. Consider all the benefits of order that could not be made possible without enforcing punishment on behaviors that harm people or intrude on them. It is also much easier to say that criminal behavior is ultimately caused by something in the individual instead of addressing a problem with society's arrangement of contingencies that shape the individual's behavior.

Given our analysis of free-will, our legal system might be acting on a bad assumption. What if nobody can help doing what they do? If determinism holds completely then everyone is merely behaving in ways determined by external variables. Whether those mechanics correlate to

human behaviors that produce happiness and reverence in other people or pain and grief is fundamentally irrelevant. Certainly it matters to us on the scale that we live our lives on, but at the most basic level, we might be merely an impressive sequence of falling dominoes in that everything we do and everything we are is simply inevitable.

Is it fair then to hold people accountable for their criminal activity if it was the only thing they could have ever done? After all, we don't hold people accountable for their hair color or the sound of their voice. As Skinner writes in *Beyond Freedom and Dignity*,

> "The concept of responsibility is particularly weak when behavior is traced to genetic determiners…If we do not punish a person for a club foot, should we punish him for being quick to anger or highly susceptible to sexual reinforcement? The issue has recently been raised by the possibility that many criminals show an anomaly in their chromosomes…what must be changed is not the responsibility of autonomous man, but the conditions, environmental or genetic, of which a person's behavior is a function."

Although one has no control over their genetics or the particular environment that they were predisposed to in life, we still require the use of punishment through our legal system. The alternative is embracing the consequences of a world where other people can be harmed and infringed upon freely. For even if criminals could do nothing but criminal activity, we still have to decrease the frequency of those behaviors.

However, what is so important to keep in mind is that it is the criminal behaviors we are punishing and trying to excise—not the people emitting those behaviors. For we recognize that people are inherently equal insofar as we all just came into existence one day, and not of our own accord. Now, I hope, we also recognize that an individual's genes and environment necessitated their behavior, such that it isn't truly his or her fault for doing what they did. Thankfully, we've come to know through behavioral science that the environment controls our behavior to such a considerable extent that we never really have to "right-off" someone as a criminal and not worry about what happens to them. We can interact with those people in particular ways and expose them to particular environments that may keep them from doing what we collectively discourage and help them to understand why those things can't be done. Although a criticism of the management of others' behavior is that it is too controlling, we ought to realize that control is the *only* way we can alter someone's behavior. Skinner sums this up well in *Beyond Freedom and Dignity*,

> "Good government is as much a matter of the control of human behavior as bad, good incentive conditions as much as exploitation, good teaching as much as punitive drill. Nothing is to be gained by using a softer word. If we are content merely to "influence" people, we shall not get much farther from the original meaning of that word—'an ethereal fluid thought to flow from the stars and to affect the actions of men'"

Even when an individual's brain is structured or chemically oriented in such a way that no change in particular behaviors is possible, we can recognize that that being is still a person and that that person has been determined to have a particularly unlucky life. It may be necessary that we restructure the legal system around the premise that there are no ultimate inner causes and that the true purpose of punishment is to decrease undesirable behavior.

# Conclusion

Our understanding of the human neuromuscular system reveals nothing but determined, causally necessitated processes being carried out. Although the brain is not completely understood, it is clear that it is a structure made up of neurons, and that neurons communicate as a result of fired action potentials. Given our understanding of action potentials, free-will would presumably have to be the spontaneous, endogenous opening of protein channels in the membranes of ions. Our limited understanding, along with centuries of science, suggests that the world may continue to be discovered as a deterministic one, where particular effects (including behaviors) happen by necessity given particular causal conditions. Findings in neuroscience are currently inconclusive, but if free-will is to be discovered in the sciences, it will be through research in this discipline.

The discipline of behavioral analysis has revealed over the course of the last century that human respondent behaviors are necessitated given particular antecedent conditions and that all other behaviors (operants) are selected for on the basis of their consequences. Behaviors that are reinforced increase in future frequency by definition, while punished behaviors do the opposite. As verbal beings, we are taught to respond to descriptions of behavioral contingencies without ever experiencing the consequences of those contingencies first hand. In other words, we can act in accordance with rules that others tell us, or that we tell ourselves, even though we've never been exposed to the consequences of following or breaking those rules specifically. In general, our rule following behavior has been reinforced and our rule breaking behavior has been punished.

Although it is tempting to consider self-control an exception to the environment's control of one's behavior, the "self" may be an illusion. We perceive stimuli associated with the activity of other people and we have similar perceptions of our own actions such that it is easy to separate one's being into that which is perceived and that which is perceiving. But the two beings are one. Self-control behaviors are still behaviors and are just as under the control of the environment of other behaviors. We establish rules for ourselves and follow them because of both our ability to respond to as a listener of our own verbal behavior, and our ability to learn from experiences.

Choice and decision making give the appearance that people have free-will, but again, behavioral analysis has provided other explanations. According to the matching law, behaviors occur to the extent that they are reinforced. Our choices are governed by the reinforcement produced by those choices. We are inherently incapable of intentionally doing what we do not want to do (i.e. what is not reinforcing). Any demonstration of a behavior that one claims to have not wanted to do is instead a demonstration of a different want that the individual manifested. That is, even behavior under aversive control (negative reinforcement) is maintained by some sort of reinforcing consequences.

Behavior analysts have come to reject the idea of free-will because it does not function as an explanation for behavior. More importantly, any science is impossible if it does not operate under the assumption of determinism, because cause and effect are no longer capable of being reliably understood. If we do identify free-will as a cause in a determined world, we then have to ask what the cause of that is. If there is no cause for free-will and it just somehow manifests, it

becomes a circular explanation for behavior. For the only evidence that one's free-will is causing a behavior is the existence of that behavior itself, revealing that the evidence for the cause is the same as the evidence for the effect.

Many philosophers have accepted determinism as a law of reality, but others have not. We have come to understand the brain and behavior by assuming a deterministic system, and have not yet reached a point at which indeterminacy seems to hold. As a strategic assumption, determinism has held and has led to the advancement of science. In that regard, assuming the truth of determinism has been much more beneficial than assuming the truth of indeterminism. But free-will is incompatible with both determinism and indeterminism, even though those seem to be our only options. If determinism holds, everything that happens must happen, and everything that a person is is the result of events that had to happen. That is, one's genetics were necessary and beyond one's control, and one's environment was necessary and beyond one's control, until that person reached an age where they started living out the life that was merely the product of genes and the past environment. If indeterminism holds, events occur by chance, which also creates problems for accountability. Thus, as a philosophically paradoxical and scientifically untenable position, free-will can only be accepted axiomatically—a starting point in a belief system that appears to be at odds with reason and science.

If we admit that behaviors are controlled by the environment, we no longer have to attend to free-will as a cause. By manipulating variables in the environment, we can improve people's lives by controlling their behavior in desirable ways. We can remove aversive forms of control that we consider unacceptable, as well as those forms of control that are bad for people in the long run despite their reinforcing consequences. Overeating, poor eating habits, gambling, substance abuse, polluting, littering, aggression, sexual assault, violence, theft, and other problem behaviors may have reinforcing consequences, and the proliferation of such behaviors contribute substantially to the most important issues our society is presented with. We can continue to place causes inside of organisms and make efforts to influence behavior using a list of ineffective measures or we can take steps towards reforming our society such that it arranges effective contingencies that will appropriately and ethically increase the frequency of behaviors that are good for the person and society, and decrease those behaviors that aren't. It is problem behaviors that need to be dealt with and removed rather than the people emitting those behaviors.

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