



How free is our free-will?

Reflections from a neuroscientist

By Harvey McMahon

*Oh, thou, who didst with pitfall and
with gin
Beset the road I was to wander in,
Thou wilt with predestined Evil round
Enmesh, and then impute my Fall to sin!*
The Rubáiyát of Omar Khayyám

*I realize that I don't have what it takes. I can will
it, but I can't do it. I decide to do good, but I don't
really do it; I decide not to do bad, but then I do
it anyway. My decisions, such as they are, don't
result in actions. Something has gone wrong deep
within me and gets the better of me every time.*
Romans 7:18b-20 (The Message)

Summary

Free-will is fundamental to our sense of wellbeing, and underwrites our sense of morality, our judicial system and the Judeo-Christian faith. However, science has provided evidence that free-will may be an illusion. In this paper I explore how the brain functions as the seat of our individual free-will and how we are also part of a *collective-will* expressed by cultural or religious groupings. In both cases free-will is an emergent property where decisions are expressed creatively rather than simply responsively. Yet we may not be as free as we like to think, but within boundaries shaped by our individual histories, our genetics and our environment we can make decisions that determine our character, relationships and future.

Introduction

Freedom is paradoxical

Choice is characteristic of our culture. We want to chart our own paths through life and so we value freedom to choose, but our choices appear to limit our freedom. If we choose to marry, we at once limit the relationships we will have with others, though paradoxically we open up new freedoms that come, for example, from being settled in our choice. This principle applies to all our choices: what we freely choose today changes the future possibilities. Thus freedom is not unconstrained choice, for with each choice we limit our freedom, and in so doing shape our environment and ourselves.

*Free-will: an illusion?*¹

Are we so constrained by our culture, our relationships, our job, and our families that in fact we have little choice? Add to this the subconscious² working of the brain, processing cues of which we are not conscious. Thus the brain may even be making decisions for us,³ and we may not be aware of these, or only become aware of them after the event. Take, for example, a withdrawal reflex, where we immediately withdraw our hand from a hot fire; we only become aware of the 'decision' to move after the event. If this is really how the brain works then we may need to reconsider our perceived ability to make choices.

Consider these examples: 1) I am angry, having high testosterone levels, and I feel the urge to kill. Am I still responsible for what I do under these circumstances? Through the lens of science, for every choice there must be a

Our free-will is
constrained or shaped
by our past and
present experience, by
our genetics, by our
environment and by
our creator.

1 In many dictionaries the term free-will is not hyphenated. I hyphenate it here because I don't consider free-will to be completely free, and thus the understanding of free is coupled to an understanding of the will. A good source of information on free-will is the Information Philosopher: www.informationphilosopher.com.
2 Subconscious: the part of consciousness that is not currently in focal awareness. Some refer to this as the unconscious, but this word has not been used here because in medicine to be unconscious is to be unresponsive.
3 I make decisions, but at a molecular level it is my brain that processes the cues and gives weight to the various factors; internally debates the issues and comes up with a solution, various possibilities or an impasse. Thus in one sense I am my brain, and when I die my brain dies (or vice versa). This does not mean that the information stored in my brain, which forms my character, cannot be uploaded to 'the cloud' and live on, even after death, and await a new embodiment.

cause, and so it appears that prior experiences or genetics or other factors are really to blame. Through this lens we are no more than robots with a set of inputs and a range of possible outputs. 2) I am deeply religious, and believe my situation is determined by God or by karma. I do not fight for a better existence, more wealth or power, but accept my situation as inevitable. This viewpoint is just one of a number that puts our lives at the mercy of a higher power and removes from us a category of choice. 3) I am a student choosing a career. I may choose to be a doctor but in reality I may not have the IQ or the temperament. Do I have a choice? A well-articulated defence of free-will as an illusion is given by Sam Harris⁴ but I will argue below that free-will is not an illusion but is constrained by many factors.



Free-will: its significance

Our will is driven by aspirations and desires, dreams and imagination, and these matter to us because they impact on our identity and wellbeing. Free-will also underpins ethics, where choices are made in the light of moral principles. In fact free-will underpins all choices.

Furthermore, free-will underpins the role of intentionality and guilt in the judicial system. Indeed, our Western culture as a whole is built on guilt. For example, at times we do something because we feel guilty for failing to do it - as measured against a cultural or community standard (as

opposed to a legal standard). The very idea of rules or laws implies that we have a choice or ability to obey. How can the law command us to do certain things if we do not have the ability to do them? Thus even the concept of obedience implies we have a choice.

What is free-will?

Free-will is the ability to choose deliberately between options. Free-will is a cognitive concept, involving the mind. It cannot be regarded as the opposite of determinism, where events have cause and effect *outside* human control (see diagram 1). The activity of the mind⁵ embraces situations of non-determinacy where free-will is absent (e.g. nervous tics and epileptic seizures). So the term free-will only applies to cognitive processes where we use our minds to make choices. The will is free in the sense that it is not completely determined. However, it is not *completely* free but occurs within the boundaries of predetermined factors (see diagram 2). These predetermined factors may, for example, be biological features of life that are non-negotiable, such as breathing; however, almost all that matters to us (the things we think about) are initiated or modified by an act of the will, from how we spend our time to what moulds our character.

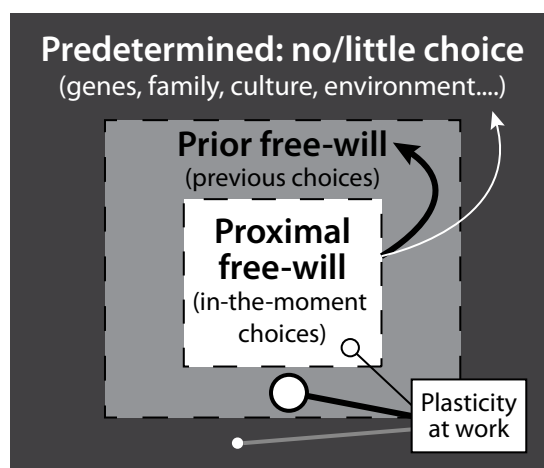


Diagram 2

One can categorise various types of free-will, from *proximal free-will* (shown in instant decisions), to *prior free-will* (where there is a previous history to decisions).⁶

Instant decisions that matter invoke active cognition (as we weigh the options), but instant decisions can also be inconsequential (like whether to have tea or coffee⁷), invoking little active cognition. Both of these give a strong sense of free-will in the moment: proximal free-will.

Prior free-will, where the immediate decision is highly constrained by past decisions, may still invoke much active cognition, but has less sense of freedom. I go to work today not because I make a decision to do so when I get up. No, I



Diagram 1

⁴ S. Harris, *Free Will*, Simon and Schuster, 2012.

⁵ From a scientific perspective the brain is a physical object, and the mind represents the thinking processes that the brain carries out. Since these neurological processes are based in neurons they are also physical. Thus a description of the mind will encompass how the brain senses, integrates and stores information, and how it analyses and predicts outcomes. We still need many layers of information, which includes the physical, to give a complete description of how the mind works.

⁶ There are also two types of decisions. For 'automatic' decisions a particular situation has been encountered so many times before, or learning (as in playing in an orchestra) has been so effective, that the person reacts non-reflectively

and automatically. But there are also 'reflective' decisions in which the pros and cons of a decision (should we go to war in some foreign country?) are weighed up carefully before a decision is made. In reality there is a continuum between these two types of decisions, with most building on the results of past decisions. My categorisation in this article is based around perceptions of free-will: in the moment, in the past, or no free-will being exercised at all.

⁷ I am claiming that so long as instant decisions do not invoke at least some active cognition then they do not invoke free-will. Thus there must be an extreme of instant decisions that are truly processed subconsciously, although many of these decisions may well have invoked free-will in the past.

made this decision in the past and while I am conscious I can re-evaluate the decision (e.g. if I feel ill), yet the choice does not have to be constantly re-evaluated. These two extremes, *proximal* versus *prior* free-will, show there is a continuum, with most decisions building on results of past decisions, and indeed all these decisions are made within predetermined boundaries (see diagram 2).

The relationship between this understanding of free-will and intentionality is complex. To the extent we deliberately choose, and can foresee potential outcomes, there is a level of intentionality, and we can be held responsible for the outcome. However, if we could not foresee the consequences of decisions made in the past, to what extent are the outcomes intentional?⁸ There is, further, a grey area for intentionality where reason has been suppressed (and we may not know precisely why), or has been applied in a flawed way (if we have not given reasonable weightings to various thoughts or actions) and non-intentional consequences result. Despite the caveats, in general each of us is responsible today for what we did yesterday because these were acts of free-will, or actions resulting from an absence of self-control. The responsibility for evil can be lessened by considering our circumstances but it never excuses us because at some point in the past we have actively participated in shaping who we are today.

This understanding of free-will reveals that at any given moment we are less free than we may like to think, because of *prior decisions* and other largely predetermined factors. While neuroscience has not done away with free-will, it helps us to see why we act the way we do, in a reliable manner consistent with previous choices and accumulated character. At the same time we can decide reflectively at the present moment to act in an uncharacteristic way counter to our previous choices. We are not determined by our past, but certainly influenced by it.

How the brain works

Our brains are like a control centre, receiving inputs from all around us and from our own physiology, integrating this information with memories of the past and predictions of the future, resulting in an output. If it were possible to receive a brain transplant from a donor then we would find that we have received not only a different set of memories, habits, and aspirations, but also a different character and consciousness.

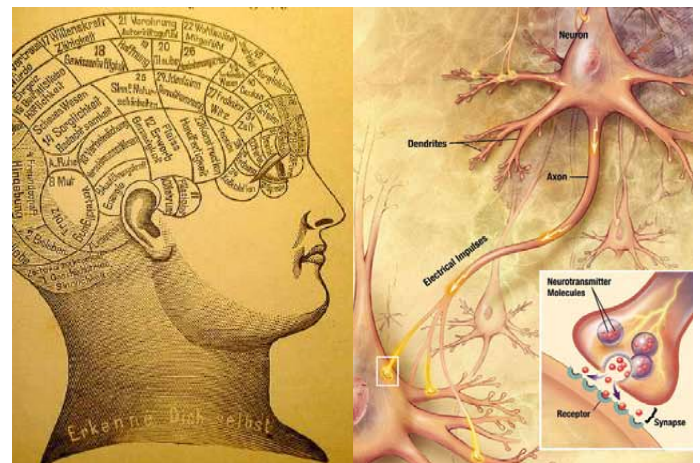
The cells that make up the circuits of the brain are called neurons and the connections between these are synapses. A mouse brain has approximately 100 million neurons while the human brain has approximately 100 billion neurons. These neurons are highly connected and thus inputs into one area of the brain can be integrated with information coming from other areas of the brain. However, not all information bounces around our brains before an output is computed. For example, in a reflex arc an input results in an output with the involvement of a minimal circuit. In fact many basic reflexes work at the level of the spinal cord, with brain activity only needed for initiation and modulation of the activity.⁹

The more neurons are involved and the more integration

of information the slower an output. Thus speed in a reflex arc is ensured by minimal numbers of neurons.

Most of the activity of the brain occurs below the level of our consciousness (even when we are awake), which we call subconscious processing. Active (conscious) cognition is only invoked where the outcome from various inputs is not determined.

Many processes in the brain move from active processing to progressively more subconscious processing over time when repeated (as they become learned or instinctive). When we began life as a baby we learned how to walk, talk and eat by conscious effort. We concentrated on the activity, but as the motions of walking and word formation were learned they became more innate and invoked less conscious active cognition, allowing us to 'concentrate' on where we needed to walk to, or the content of the message to be spoken. Even these can become partly subconscious, especially when the brain is 'tired' or preoccupied with other things. Thus you may have had the experience of driving home and wondering when you got there how you managed to take the right turns, and negotiate the lights and traffic. This is not all good news as even our bad habits, which at one time were learned, are now second nature because the subconscious has taken control.



By conscious effort we can suppress habits, or modify our learned behaviours. However, to do so, the activity in question needs to be brought once again into active cognition. Moving activities into the subconscious involves much less brainpower, or brain activity, than when the same activity is being learned. More significantly, the learned subconscious processing is fast. You can know this in practice, when you consider the speed with which a tennis player can respond to an approaching ball, or the speed with which a musician interprets the written music and plays the notes. This is fast because, like a reflex arc, it involves minimal and well imprinted circuits.

While moving items into the subconscious increases speed, it also frees up 'space to think'. There is an old adage that claims men can only do one activity at a time. There is some truth in this sentiment as our active cognition

8 The Torah has a category of sin offering for non-intentional sins (e.g. Lev. 4) where guilt is assumed.

9 Y. Gerasimenko et al, 'Initiation and modulation of locomotor circuitry output with multisite transcutaneous electrical stimulation of the spinal cord in noninjured humans', *J. Neurophysiology* 113, 2015, pp.834-842.

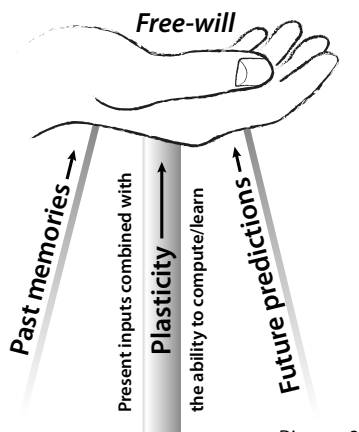
appears to have a limited capacity. It is difficult to multitask when the tasks in hand involve active cognition, and for the limited multitasking we can do, this involves rapid attention switching.¹⁰

A challenge to free-will from science

In the 1980s Benjamin Libet carried out experiments showing that subconscious brain activity appeared to precede conscious decisions.¹¹ Is it possible that all decisions are preceded by subconscious activity and if so, does this mean that we are not responsible for our choices?

I believe the subconscious brain activity recorded in the Libet experiment is expected and simply shows that the brain prepares in advance for the activity in question. This is like the situation where we are primed for conversation when we walk into a room full of people, although the decision as to what to say has not been made. The Libet experiment cannot distinguish between brain activity associated with the build-up to the decision and the activity associated with the moment of decision.¹² Thus *neurological determinism* based on the subconscious workings of the brain does not mean that active cognition and free-will do not supervene in the process.

While many reviews and papers on opposite sides of this argument have been written,¹³ there is no pure experimental



paradigm to test free-will as meaningful choice. So although the Libet-type experiment is often invoked to claim we have no free-will, and it may well help explain how the brain can make choices that do not invoke active cognition or prepare for choices, it does not address how and when cognitive decisions are made.

Emergence of free-will

Individual neurons do not have free-will, but it is an emergent property of neuronal networks. Nevertheless the properties of the individual neurons must give rise to the possibility. Firstly, each neuron in our brain is alive and its maintenance leads to a background spontaneous firing activity. We understand much about how firing rates are set but we understand little about how 'background' firing activity influences decisions

being made. Secondly, like weather forecasting one should be able to analyse all the inputs and predict the output for each neuron, but unfortunately it is more complex than this, because many constants (e.g. firing properties of neurons) are variables over time, being tuned by the network.

Free-will sits on a tripod of *past* memories, *present* inputs (combined with abilities to compute and learn) and *future* predictions and aspirations (see diagram 3). Together these form the molecular underpinnings for free-will.

Memories

Without memories we would not be able to recall possibilities and past experiences and so could not be informed as to what our choices are. From this information we make predictions as to possible outcomes and their risks.

In other words, we consider the different inputs and outputs and give various *weights* to these. Two people presented with precisely the same information may well not make identical decisions because of the different weightings (judgements) given to the information. In the absence of memories, our decisions are uninformed, dependent only on limited 'in-the-moment' information. This latter form of free-will is largely unintentional, and may feed into future decisions by affecting the plasticity of the system, perhaps even leading to an unintentional habit.

Plasticity

When a mouse first opens its eyes, activity in the visual cortex increases and there is a rapid increase in the number of synapses within the first few days as new connections are made during this learning phase.¹⁴ Just like the mouse we are constantly learning new information, meeting new people and acquiring new skills, which all require that our brains are 'plastic', which means our brains are mouldable. At the synaptic level this means that new synapses can form or existing synapses can be lost or modified. At a molecular level there can be changes in the expression of various proteins which in turn influence the excitability of a given synapse or circuit. Now consider this trajectory: the choices we make influence the patterns of behaviour that we develop which are laid down as neuronal pathways. These in themselves influence other choices... so in this sense we are masters of our own destiny... all because we have a 'plastic' brain (i.e. not completely preprogrammed). We can change, of course we can, but it is difficult. If we make certain choices repetitively, they turn into learned behaviours because neuronal pathways have been laid down. To change these we need to change the behaviours or language patterns and lay

10 R. Fischer & F. Plessow, 'Efficient multitasking: parallel versus serial processing of multiple tasks', *Frontiers in Psychology* 6, 2015, p.1366.
 11 B. Libet, C. A. Gleason, E. W. Wright & D. K. Pearl, 'Time of conscious intention to act in relation to onset of cerebral activity (readiness-potential). The unconscious initiation of a freely voluntary act', *Brain* 106 (Pt 3) 1983, pp.623-642. A. R. Mele, *Surrounding Free Will*, Oxford University Press, USA, 2014.
 12 A thorough discussion of the Libet experiment and other similar experiments can be found in the Mele reference and on the Information Philosopher website. My view is that the experimental paradigm used in Libet-type experiments does not so much examine brain activity associated with active cognition and

free-will, as brain activity associated with a largely non-consequential random event. Why should one need to think about which button to press or hand to move, when it is inconsequential? Also many of the experimenters appear to assume that consciousness happens at the moment we are sure, as opposed to being a more nuanced process.
 13 P. Haggard, 'Human volition: towards a neuroscience of will', *Nature Reviews Neuroscience* 9, 2008, pp.934-946. P. G. Clarke, 'The Libet experiment and its implications for conscious will', *Faraday Papers* 17, 2013. Available at: www.faraday.st-edmunds.cam.ac.uk/Papers.php.
 14 M. Li, et al, 'Synaptogenesis in the developing mouse visual cortex', *Brain Research Bulletin* 81, 2010, pp.107-113.

down new circuits. Plasticity is thus key to the possibility of free-will (see diagram 2). While memories of past experiences may not be completely eradicated, they can be scaled back by the new experiences that occupy our minds as we choose to dwell on other things.

Creative will - bringing our thoughts into existence

A basic tenet of science is the law of cause and effect: what we observe has a cause and so is worth investigating. Thus, in defending free-will, if we say that something does not have a prior cause, then this can appear 'antiscientific'. However, when free-will operates it is not so much that there is no cause, but that the causes do not dictate the precise outcome. In the engine of our car, when the right ingredients come together there is a spark. So in our minds the process of creativity brings different outcomes for different people. I call this '*creative imagination*', which one could also think of as *creative indeterminism*. So much of our thinking and imagination is limited to our minds, but these seek expression in language or behaviour. In fact, they must be expressed if we are not to feel trapped. They can be expressed in kindness, or a word of encouragement, but also in physical creations, e.g. our gardens, the way we cook, the things we make. One of the main driving forces in these expressions of our creative imagination is our will. We feel the urge, we feel the compulsion, we feel the drive. This is part of who we are, so we want to harness its power. This spark of creative imagination is in part the very essence of free-will. Arguably this spark is the very same engine that creates meaning.¹⁵

It may be helpful to distinguish between the drive for creativity (motivation, which may be encoded in our brains), and creativity itself. The drive for creativity may be the activation of a reward pathway combined with emotions, thoughts, experiences and opinions. The drive may also be inspired by nature and other things or people around us, but fundamentally the expression of creativity is unique and is expressed in different ways and in different circumstances by different people.

Invoking the collective-will

Mindfulness and cognitive behavioural therapy are predicated on harnessing the will to change our behaviours by altering patterns of thinking. Science agrees that by disciplining our thoughts, or by repeating patterns, we lay down new neural pathways and so we change who we are and who we become. However, we do not need to go it alone. Our strengths and our abilities may be weaknesses or disabilities for others, so as a community we complement each other and are stronger together. We all need to be part of a community and can all benefit from the transformative power of shared experience.

The choices we make influence the patterns of behaviour that we develop which are laid down as neuronal pathways.

Thus the church when composed of a group who share together can be transformative. It taps into not only our own willpower to change but that of the community in a reciprocal relationship. One wonders if Alcoholics Anonymous would be as successful if it were not a group sharing experience, with mutual encouragement and ultimately with people expressing a collective-will and changing each other.¹⁶

We all live in communities; these may be an extended family, or a group of work colleagues, or residents of a local neighbourhood. Our freedom is influenced by the perspective or will of the community. This is both protective, where the wayward are checked and good is encouraged, and liberating, in that cares are shared. In fact a collective morality develops, where principles of caring for others (the young, the sick, the elderly, or the foreigner) take precedence over self-indulgence. Social cohesion holds together many a strained relationship or wayward child.



Thus free-will rises above individualism, and takes on relational value. Who we are, is not so much a question decided by the individual but a community quest.¹⁷

Reflections of a Christian

The Bible ascribes a deep significance to the struggles of our will. It shows us how holiness is both a gift and a choice, as our character is changed through the sanctifying work of the Holy Spirit, and as we think new thoughts and create fresh habits. It also shows us paradoxically how God's will constrains us and yet frees us. Though not exhaustive, below are just a few thoughts.

Is human free-will compatible with divine sovereignty?

The scope of divine sovereignty and the nature of human free-will are key issues in Christian theology. Different theological traditions have expressed these concepts, their proper limits, and the relationship between them, in different ways.¹⁸

15 Creative imagination can also in some instances be destructive or unhelpful.

16 Mob behaviour (crowd or herd mentality) is another example of collective-will in action where people act differently from the way they would individually; this is often associated with a perception of less individual responsibility.

17 If there is a collective will, then there can be collective responsibility and as a response there can be a collective forgiveness. How liberating this must feel, where as a community we forgive, not based on an individual's whims but based on what is good and right.

18 For example, *Predestination and Free Will: Four Views of Divine Sovereignty and Human Freedom*, ed. D. and R. Basinger, Downers Grove, IVP, 1986.

An issue at the heart of such debates is the concern that if we maintain that God is eternal, omniscient and absolutely sovereign, it becomes difficult to accommodate the possibility that we have free-will. If God determines all future events, how can our choices be free? If God knows our thoughts before we think them, then where is the freedom in thinking?

To press the point, if God knows everything before it happens and the future is completely determined, then choice becomes illusory. Alternatively, it could be a misunderstanding which arises from a life lived within the constraints of time, while God, outside of time, can and does know all things about us, past, present and future.¹⁹ However, the Bible affirms divine sovereignty,²⁰ and far from suggesting that free-will is an illusion of our temporal existence, the language of the Bible underlines the significance of mankind's ability, and responsibility, to choose.²¹

So, if we accept that the sovereignty of God and the free-will of mankind coexist, then there is a tension, but why should they be in opposition to each other? Here, the insights of neuroscience help us to frame the debate. As I have already discussed, our free-will is not as free as many like to think, but is constrained or shaped by our past and present experience, by our genetics and by our environment.

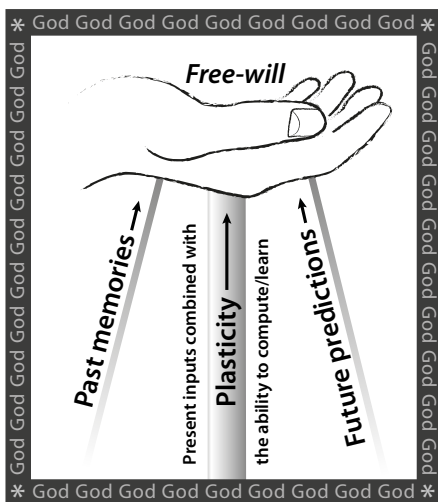


Diagram 4

In addition, the Bible tells us that our lives are shaped by our omnipresent God,²² so our lives are in his hands and his plans supervene on ours. In some way our lives are framed or surrounded by the providence of God (see diagram 4). Despite all the boundaries within which we operate, we are still free to make choices that determine our character, relationships and future. This paper highlighted earlier, the large open space for free-will and determinism to operate side by side between the extremes when they operate in parallel (see diagram 1). Indeed, the Bible makes clear that acts of sacrificial love, the possibility of meaningful relationships, and the guilt that results from wrongdoing, all hang on the premise that we possess free-will. It could be that God chooses in his sovereignty not to control our choices under normal circumstances, but in other circumstances God can

control the hearts of kings²³ and individuals²⁴ if he wishes, just as he restrains evil in the world²⁵ and directs the ways of man.²⁶

So how can we affirm God's sovereignty over the future and yet simultaneously believe in our ability to determine, at least in part, our own destiny? Here are some ways in which

we might take steps towards reconciling these convictions. First, free-will does not thwart God's ultimate plans because this freedom (within limits) has been given by God himself, who has foreknowledge of all the possible choices, and so his plans take into account these possibilities. Secondly, the Bible is not a manual for *individualism*, but reveals how the *church* is to be the body of Christ.²⁷ In this view, God is interested in how the church proclaims his glory: whether

we join in with this is our choice. By analogy with science, just as the indeterminism in an atom²⁸ does not define the overall property of the material, the indeterminism within an individual does not necessarily define the trajectory of the population which can be defined and predictable.



There is a similar dilemma in God's dealings with Pharaoh and the Egyptians over the enslavement of the Israelites. On the one hand God's sovereign will is being done and it may appear that Pharaoh is no more than a pawn in the hand of God.²⁹ On the other hand we read of Pharaoh himself deciding not to let the people go.³⁰ Both aspects happen at the same time. Even if God deserved credit for how Pharaoh acted, this does not render Pharaoh free of responsibility for his decisions.³¹ We do not know all the influences and motivation, both past and present, that would have contributed to his decision, but it is clear that his past thoughts and actions will condemn him. Likewise we also stand condemned, but for the grace of God. We can blame our past or others for our present bad choices, but when God looks at the heart, or when we examine our motivations, we never have far to look

19 Readers are referred to 'A Brief Theology of Time', a Cambridge Paper by Paul Mills, for an exploration of some of these issues, *Cambridge Papers* Vol. 7, No. 1.

20 Ps. 139:4, 16; Prov. 21:1, 16:33; Isa. 10:5-6; Eph. 1:11.

21 Josh. 24:15; Matt. 3:2; Jas. 4:4.

22 Acts 17:26-28.

23 Prov. 21:1.

24 Rom. 9:22-33.

25 Gen. 11:1-9; Rom. 1:24; Rev. 20:7.

26 Prov. 16:33.

27 1 Cor. 12:27-31.

28 Newtonian physics implied that everything about matter can be known, but quantum physics challenged this view, showing that there is inherent uncertainty at any given moment.

29 Exod. 4:21.

30 Exod. 8:15.

31 Exod. 7:3, 4.

before our sinful nature, our selfish motives and choices in the past, as well as our obstinacy in the moment, condemn us.

With the above in mind the following definition of free-will can be offered: *Free-will is the ability to choose intentionally within limits placed by a sovereign God, with resulting human responsibility.* Free-will is not the opposite of determinism: one can have free-will within the limits set by determinism. Indeed our relationships and our decisions are not absolutely predetermined, and this is a reflection of the freedom given to us by being made in the image of God. So, we have the best of both worlds, where we have freedom to make decisions and yet our personal future and that of the world are secure.

Freedom for relationship

The primary choice we all need to make is whether to have a relationship with God. This decision opens up a new arena of possibilities, a new direction in life and a security for the future. Here we are confronted with the fact that, but for the grace of God, we are unable to turn to Christ and be saved: 'What is impossible with men is possible with God.'³² However, even when God has intervened to establish a restored relationship with him, we find it hard to follow his ways. Our choices can be inconsistent with one another, emerging from a mixture of selfish ambition, past experience and our feelings at any given time. So how do we change our will, or how is our will changed - from without or within, or both?

In Proverbs we read that we should guard our hearts;³³ we should watch what our minds are exposed to and what we meditate on, as this influences our character and future decisions. Paul urges us to have 'the mind of Christ',³⁴ meaning that we should think like Christ. The more biblical the influences around us, that come through our relationships or what we read, hear or see, the more likely we are to have something akin to the 'mind of Christ'. We are also called to be transformed by renewing the mind,³⁵ and its attitudes.³⁶ At an organic level this operates by changing our habits and attitudes, and thus the neural pathways are changing. At a spiritual level this comes about by the Spirit of God at work in us effecting this transformation. Thus having the mind of Christ comes through being made in the likeness of God, reflecting the image of God and through having his Spirit within us. These are aspects that are beyond the scientist to precisely understand, but as with dark matter, there is more to the story of how the mind works. We are left in no doubt that change is a two-way experience: God works in us to change us and we must at the same time make every effort to change ourselves.³⁷

On a day-to-day basis, we are profoundly influenced by the

Our exercise of free-will day by day is influenced by the relationships we have, and indeed this is bidirectional.

Grace is the ultimate expression of free-will, a free-will expressed by God to us and expressed through us to humanity.

fact that we live in a world of relationships. An urban resident in England who moves to the Australian outback will change as new relationships, both with the people around them and with their surroundings, affect them. Our exercise of free-will day by day is influenced by the relationships we have, and indeed this is bidirectional, for we influence others and the environment around us, just as they influence us. The quality of our relationships determines the extent and type of the influences upon our desires, whether positive or negative, great or small. Thus, one of the major choices we are left with on a day-to-day basis is which relationships we choose to prioritise.



Our relationship with God is the most influential relationship we have, whether we recognise it or not, as we carry this relationship with us every day and all day. God is omnipresent in time and space. In contrast, relationships with our family may be long-term, but they are not always able to be with us. Furthermore, our relationship with God provides a moral compass against which all our decisions are made, commonly referred to as our conscience. Even if we do not recognise the existence of God and reject him, consciously or subconsciously, that relationship (or non-relationship) continues to be a factor affecting our decisions and in the long term affects neuronal pathways, and thus the development of our character.

What happened in Eden³⁸ constrains our freedom, due to our inherited sinful nature, but God can liberate us from the guilt of the past and help us live today in true freedom.³⁹ We can live with confidence in community because we find ourselves primarily accountable to God, and not to the opinions and changing morality of society. We also know that God understands and forgives our frail judgements and actions, holding nothing against us.⁴⁰ In addition, we are nurtured through his loving restraint and in the way he gives us responsibilities, and taught through the

32 Luke 18:27; John 3:3.

33 Prov. 4:23.

34 1 Cor. 2:16.

35 Rom. 12:2.

36 Eph. 4:23.

37 2 Pet. 1:5, 6.

38 Gen. 3.

39 John 8:36.

40 Rom. 3:21-26.

exercise of the responsibilities he gives us, and not through laws with their penalties and immediate consequences. Thus, our freedom in Christ is extended beyond what is humanly possible. We have a position in life that is not achieved through the sole exercise of our free-will, but is a gift from God.

As a believer we are adopted into a new community, the church. Like the collective-will expressed in our other communities, the church with its new relationships and motivations provides a rudder for our will, putting constraints on our selfish desires, encouraging us as, together, we strive to be more Christlike. Add to this the reality of grace. We can show love to a colleague or a friend, on a reciprocal basis,⁴¹ but to extend grace to those who offend us is infinitely more difficult. It requires a deliberate decision to do so. In a similar manner the only reason we have freedom in Christ is because of the grace extended to us. We do not get what we deserve, but the opposite – justification, acceptance and love. This is a supreme gift, engraved on our hearts through the cross. No robot, no matter how sophisticated the programming, is able to replicate grace, because as a concept it does not ‘make sense’ and thus cannot be programmed. Grace is the ultimate expression of free-will: God’s free gift to us was given of his own free choice and can be expressed by us to our fellow human beings.

Conclusions

I have argued that our present choices are heavily constrained by consequences of prior decisions and things we cannot change, and can therefore appear largely predetermined. Nevertheless, the nature of our mind, its plasticity and ability to weigh up and decide, shows us that free-will flourishes within these constraints. Free-will is an intrinsic aspect of being human: it is not the invention of a Christian

Free-will is an intrinsic aspect of being human and does not evaporate in the absence of a Christian worldview.

worldview. However, a fuller understanding and experience of free-will is found in a relationship with eternal significance and in the experience of grace. *Neurological determinism* is challenged by *creative indeterminism* in the brain; the downward pull of human sin is challenged by the grace of God demonstrated on the cross which has the potential to change our existential exercise of free-will. We are made in the

likeness of our Creator and we can be no happier than when we are acting as he would have us act within the limits of the world in which he has placed us.

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Dr Harvey McMahon FRS, a guest contributor to *Cambridge Papers*, works at the MRC Laboratory of Molecular Biology, on the Cambridge Biomedical Campus. As a Group Leader in the Neurobiology Division, his work focuses on synaptic transmission, neurodegeneration and membrane curvature as an organizing principle for eukaryotic cell biology. www.endocytosis.org

41 Matt. 5:47.

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