THE NEUROSCIENCE OF WESLEYAN SOTERIOLOGY: THE DYNAMIC OF BOTH INSTANTANEOUS AND GRADUAL CHANGE

by Alan C. Weissenbacher

Abstract. In his work *Rewired: Exploring Religious Conversion*, dealing with Wesleyan soteriology and neuroscience, Paul Markham claims that when one incorporates biology as an epistemic restriction in theologies of conversion, doctrines of instantaneous conversion are invalidated. He asserts that conversion must always be gradual, because the mechanism by which the brain changes in response to experience does not occur instantaneously; rather change is initiated and consolidated over an often lengthy span of time. I argue, however, that doctrines of instantaneous conversion are maintained when taking neuroscience into account. First, for doctrines of conversion that hold to the imputation of Christ's righteousness, neuroscience is irrelevant, because statements of instantaneous change are in terms of a relational status and not biological. Rapid conversion is maintained as a metaphysical position. Second, an embodied and neurologically realized change is expected in theologies of conversion that hold to impartation and, contrary to Markham, immediate change is neurologically possible in a variety of ways.

Keywords: conversion; justification; Paul Markham; neuroplasticity; neuroscience; nonreductive physicalism; salvation; spiritual transformation; John Wesley

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In his work *Rewired: Exploring Religious Conversion* dealing with Wesleyan soteriology and neuroscience, Paul Markham makes the claims that the view of nonreductive physicalism is the best way to establish holistic, embodied transformation within soteriology, and that the nonreductive physicalist view of the human person requires a gradual view of conversion. Nonreductive physicalism is a position in philosophy of mind that holds the mind to be an emergent property of the physical system of the brain which has causal efficacy, acting in a downward manner to affect the physical substrate. It is a materialist position, but it does not reduce all mind and behavior to microphysical parts. Markham (2007) argues

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that Christian conversion is a process involving normal human biological capacities characterized by a change in social-moral attitude and behavior (virtue acquisition) as facilitated by community participation (131). Conversion must involve one's biology, and as such it must respect biological constraints. The biological constraints considered involve neuroplasticity, a term which describes how the brain "rewires itself" in response to the experiences a person undergoes, the process of which is foundational for explicit and implicit rational and emotional learning and, for Markham, the means by which one develops holy tempers and virtues over time. He thus incorporates neuroscience into his soteriology, where it functions as an epistemic restriction. He holds that the science of brain plasticity demonstrates that brain change does not occur instantaneously but is rather initiated and consolidated over an often lengthy span of time, and thus conversion that recognizes embodiment must be gradual. In other words, immediate change is impossible, and the rich testimonies of experiences of immediate transformation both in scripture and religious history such as those of Paul of Tarsus, Augustine in the garden, or John Wesley when his heart was strangely warmed, are illusionary at best. Additionally, since Markham holds that the brain cannot change instantaneously, he believes theologies holding to the idea of such instantaneous change must therefore rely on an immaterial soul that can transform from unholy to holy (124).

Contrary to Markham's conclusions, I argue that incorporating neuroscience into soteriology accommodates doctrines of immediate as well as gradual change. Change within salvation is debated as to whether it involves the imputation or impartation of righteousness, and Markham's conclusions are incorrect when applied to both aspects of change. First, the possibility of immediate neurological change is irrelevant in theologies of imputation. Here statements of instantaneous change relate to a relational status with God and do not make biological claims. Statements involving imputation do not depend on a particular position in mind/body philosophy or the presence of an immaterial soul. Immediate biological change is warranted, however, in theologies involving impartation, and these doctrines should take neuroscience into account. Contrary to Markham, however, immediate change is neurologically possible in doctrines of impartation and can occur in a variety of ways.

Markham makes his arguments for laudable goals that I wish to affirm. He desires to counter the tendency found in some denominations to focus exclusively on the saving of souls to the neglect of holistic personal transformation for moral action in the world. He also stresses the essential role of community in the spiritual life, countering strictly interior and individualistic views of Christian spirituality. While the points which inspire his reasoning are commendable, his arguments, however, do not hold either theologically or neurologically. I advance that maintaining the instantaneous and the gradual together is more reflective of traditional

Wesleyanism and does more justice to doctrines of salvation than eliminating one in favor of the other, and such can be done when taking neuroscience into account.

Theology of Change

First, while it is beyond the scope of this article to address the many and varied positions within mind-body philosophy, Markham appears to suggest that nonreductive physicalism is the best way to respect embodiment within doctrines of salvation, positing only three philosophical options: reductive materialism, dualism, and nonreductive physicalism. First, the fact that Markham (2007) uses John Wesley, an avowed dualist,[1] as his example *par excellence* of a theologian who reflects embodied soteriology undercuts this line of argumentation (46). Second, it is likely other mind-body positions can support embodiment to greater or lesser degrees, especially given the fact that there are other monist positions that stress physicality apart from nonreductive physicalism. Further work examining soteriology and the different positions on the mind and body with an eye toward which ones respect embodiment best is warranted.

After opening the possibility that multiple positions within mind-body philosophy can respect embodiment, I now turn to the more pertinent argument of whether an embodied view of salvation requires that all change be gradual. The main question when analyzing the idea of conversion and change within salvation is a change from what to what? What is the goal and nature of Christian transformation?

To address these questions, I highlight the long debate within soteriology whether God's righteousness is imputed or imparted. Contrasting Martin Luther with the Council of Trent, the Catholic view was that justification was a process where the individual steadily became more and more holy through the impartation of righteousness linked to the sacramental system of the church. In this approach, the nature of embodied change is applicable. Righteousness is imparted bodily and should be realized in physical actions. Luther's view of justification, however, was not based on the intrinsic qualities of the sinner but rather on the relationship between God and sinners established by divine decree: where does a person stand in relation to a divine decision? For Luther, justification is in terms of one's relation to God in terms of status. Righteousness is imputed not imparted. For Luther, the nature of sin is so severe that humans cannot make any move on their own toward God. Christ's "alien righteousness" must be imputed to the believer, and the redemption of humanity is from God's unmerited favor. Thus for the Christian theologies that hold to imputation, many statements of immediate change deal with a change in relational status, and thus biology and the existence or nonexistence of an immaterial soul are irrelevant.

Turning specifically to Wesleyanism, does Wesley hold to a soteriology of impartation or imputation? Markham does an admirable job examining aspects of the neurological and psychological dynamics of "spiritual" formation within Wesleyanism, but his points regarding conversion would have been better served had he provided some examination of justification, regeneration, and other more precise terms used in Wesleyan doctrines of salvation. Unfortunately, "conversion" is an ambiguous term.[2] According to Wesleyan scholar Henry Knight (2001), Wesley rarely uses the term, and when he does his use of it is inconsistent, sometimes equating it with repentance and sometimes to sanctification (44). Although Markham's use of the term is synonymous with the entire salvation journey from justification through subsequent growth in sanctification, Wesley's use of conversion is best considered to encompass justification, regeneration/new birth, and the witness of the Spirit, which is the inner conviction of being a child of God (Borgen 1972, 151).

According to Knight (2001), salvation for Wesley was both instantaneous and gradual, and Wesley never wavered in his belief that most conversions (justification, regeneration, and the witness of the spirit taken as a whole) were instantaneous. The instantaneous is based on Wesley's view of the fallen nature of humanity. If the corruption of humanity was not complete, then salvation can be conceived as being entirely gradual. But since the corruption is complete, an instantaneous transformation is warranted as a necessary precondition for growth in sanctification (44). It is the instantaneous that provides the foundation, and relationship with God that then enables the gradual process of moral formation. Salvation is by faith, and faith is a gift of God, thus the instantaneous aspect safeguards both the gratuity of grace and God's sovereignty. Wesley used the term justification to indicate the imputation of God's righteousness, and it is synonymous with the idea of pardon. The new birth, synonymous with regeneration, is the work that God then does within a person, renewing one's fallen nature and producing peace, joy, and the love of God and others, as well as power over sin. The new birth is an impartation that changes the dispositions of the heart. Wesley thus holds both to imputation and impartation.

It is important to mention that while many conversions were instantaneous for Wesley, this was not the goal of human life; rather, the goal is the renewal of the heart in love. Wesley stressed developing holy tempers through a therapeutic understanding of salvation which is process-oriented. Christian formation through spiritual disciplines, community involvement, accountability, and faithful discipleship reveal Wesley to take the gradual aspects of salvation seriously. The gradual aspect emphasizes that people empowered by grace cooperate with God, while the instantaneous reveals that there is a point of actualization. Welsey's *via salutis* (way

of salvation) is a gradual process, yet there are key instantaneous moments along the way that highlight the realization of God's grace.

The fact that Markham neglects to unpack the various elements of salvation may be because Markham builds the theological aspects of his argumentation upon Randy Maddox's (1994) conception of responsible grace,[3] which states that Wesley proposes a *via salutis* that emphasizes the gradual unfolding of grace in human life as opposed to abrupt transitions in an order of salvation illustrated by an *ordo salutis* (order of salvation), where salvation can be seen as a series of successive and ascending steps (158). Thus, terms such as "justification" or "regeneration" become less important. Maddox is not ignorant of distinctions that emerge in Wesley's soteriology, but they are dismissed as due to Wesley addressing pastoral situations and are not meant to be reflective of a deliberate scholastic method.

Wesleyan theologian Kenneth Collins (1997) points out several flaws in Maddox's reasoning. He states that the order of salvation Wesley posits emerges from the use of Scripture, insights from tradition, and the employment of these elements to a pastoral setting. Wesley's *ordo salutis* emerged from both a deliberative process that included the pastoral, reflecting a reasoned theological position brought to bear in application. Second, salvation for Wesley was not "an indefinite thing, ever subject to the vagaries of time and circumstance, but marked by a certain form and recurring normative elements with particular characteristics" (186). If one follows Maddox, each soteriological distinction becomes one of degree, minimizing the qualitative distinctions that Wesley makes between points of the Christian journey. And while Wesley uses similar vocabulary pertaining to justification and sanctification, this does not discount their differences (188–90). Collins highlights the need to recognize both the instantaneous and gradual elements of Wesleyan salvation, stating that focusing only on key instantaneous moments neglects Wesley's counsel to continue growing in the grace of God, and to neglect instantaneous elements to focus only on the gradual nature of redemption is to fail to recognize decisive changes in one's being that results from God's transforming grace (190). Wesley's treatment of religious experience indicates that there are moments where one moves from one state to another, such as being under the law to being in the evangelical state (238). To quote Collins (1997) critiquing Maddox, "The Wesleyan way of salvation is not some amorphous process marked by barely distinguishable increments of grace, it rather highlights several significant points along the way, some of which for Wesley are instantaneous" (186).

Neuroscience of Change

Elements within Wesleyan theology, namely his idea of regeneration within the conversion event, include the idea of rapid, embodied change. Such

should be neurologically realized. The question then is what degree of change is warranted. In Wesley's work *Farther Appeal,* he describes the new birth as a "vast, inward change." And in his sermon "The New Birth" he describes the change as raising one from death to sin to a life of righteousness—a change that involves the whole person. Thus at first glance, when one speaks of a neurological change that reorients a person's life so as to bring peace, joy, loving God and others, and a power over sin, a massive reorganization of the brain might be expected. Yet this need not be the case. As stated by Collins (1997), the completeness of this change refers to the integrity of its beginning and should not be mistaken for or a substitute for the further growth in grace that is required in the sanctification process. A baby's birth is complete, yet there is certainly more left to do in relation to its maturity (111). The new birth marks the beginning of a lifetime of gradual change, but is also an immediate qualitative change that brings a new kind of life (113).

Mark Graves (2009), research fellow in neuroscience and moral action, conceives of the new birth as a reorienting principle when discussing the nature of neurological change and salvation. The neurons of the brain are organized into patterns called neural networks, which are distributed among local areas as well as across regions of the brain. A particular experience may activate an individual particular or novel neural network, which, when consolidated, perhaps "instantaneously" through a heightened emotional response occurring during activation, will influence other networks and subsequent neural activations. One's current brain configuration constrains what options are available to a person in the future—what thoughts and choices arise in a particular situation. An experience of justification and new birth can consolidate a particular neural network with far reaching implications for the future. While Graves relates that a particular faith decision may produce little shift in overall neural activity, a small change can end up pervading one's decision making so as to eventually shift one's dispositions as a whole. A change in one area of the brain can eventually shift the entire system. The firing of a single neuron can modify the global state of the brain, as demonstrated by neuroscientist Yang Dan (Li, Poo, and Dan 2009).

A decisive neurological change that changes the trajectory and possibilities for the future need not involve a massive neurological reorganization. A small-scale perturbation can become amplified to affect the entire system, and such can be explained, as well as other means of rapid brain change, through understanding the brain as a complex dynamical system.

Early models of brain functioning often involve locating the physiological basis of behavior at the level of individual neurons where individual cells are triggered by a stimulus to produce a behavior, on a portion of the neuron such as the synapse or dendritic spine, to biochemical changes within the synapse, or to modification of neuronal DNA or RNA. Papers

examining these levels are copious. The neural correlates of behavior are based on these cellular and molecular processes, true, but in a larger context they should be viewed at the level of neural networks, as mass action among large populations of neurons within various systems and subsystems, not to mention that these systems are nested within the larger systemic framework of one's external family, community, and the wider world.[4] According to neuroscientists Christine Skarda and Walter Freeman (1990), the "biological basis of behavior is not only globally distributed in the network, it is a self-organized process that requires the use of the analytic tools of nonlinear dynamics" (276). The brain's complex, nonlinear, dynamical system that exhibits self-organizing behavior causes it to resist full explanation in a reductionistic manner. There are properties of such a system, like turbulence in fluid dynamics, which cannot be explained by the properties of the parts. Explanations must take into account the behavior of the system as a whole instead of mere individual neurons or individual stimuli.

One essential feature of a dynamic system is that small uncertainties can be amplified over time through the nonlinear interaction of a few elements. Thus, one need not necessarily look for massive cortical reorganization in an immediate, life-altering conversion. Rather the neural correlates of an immediate conversion could be small, yet have profound implications for both the present and future development of the individual.

Among other features of chaotic, nonlinear dynamical systems are rapid state transitions. Nonlinear dynamical systems can reach a point of bifurcation, a transition that is either one state or another. Without describing the complex mathematical equations involved,[5] a nonlinear dynamical system can exhibit an abrupt phase transition from configuration A to configuration B without there being an evolution between the two states. The system is either A or B, and can flip from one to the other without an intermediate progression. Additionally, the system need not be restricted to two states. It can consist of a multitude of states to which the system can abruptly transition without an intermediary progression. A neurological example of this was experimentally documented by Skarda and Freeman (1987) over thirty years ago, where chaotic dynamics provided the foundation for rapid state transitions involved in odor recognition.

Markham is not unaware that a chaotic system like the brain can undergo dramatic reorganization in a very brief time span. However, he makes an interesting move, declaring that as long as something has a context it can be considered as part of a gradual process, and, therefore, it should not be considered instantaneous or rapid. For example, he states that Paul's road to Damascus experience was only possible and only makes sense in the context of his history as a persecutor of the Christian faith, and thus this conversion experience can be seen as a gradual process. Thus, for Markham, for anything to be considered instantaneous it must be acontextual, and since nothing is without context, nothing can then be

considered instantaneous. His argument against the instantaneous becomes unassailable by definition. I believe this argument misunderstands the very character of the experience. The instantaneous makes sense as instantaneous because of its context. Paul's character was one way in one moment, then a dramatic reorganization of his personality took place, producing someone with new values and priorities. This also does not preclude further advancement in growth. All need not be reorganized to permanent perfection. The instantaneous can be seen as an abrupt transition in the context of the gradual process of one's life. Dean Blevins (2009), in a critique of Markham, describes such using the philosophy of emergence, a key philosophical concept that Markham uses, in relation to religious "events" where a person can experience the advent of emergent properties during religious transformation that then exert a new form of downward causation upon the individual (245).

Another characteristic of chaotic, nonlinear dynamical systems is the formation of attractors. According to Francis Heylighen (2001), who studies the emergence and evolution of intelligent organization, a dynamical system, independently of its type or composition, always tends to evolve towards a state of equilibrium. This state of equilibrium is called an "attractor," and nonlinear systems tend to have several through which they can fluctuate (3). Esther Thelen and Linda Smith (2006), pioneers in applying dynamical systems theory to cognitive science and psychology, describe human behavioral patterns as relatively stable attractor states (275). The question then arises as to how behavioral patterns and their correlated attractor states change.

To illustrate the idea of an attractor, if one rolls a small metal ball onto a table in which grooves have been cut, it will find a groove and remain there. Jostling the table lightly will be unlikely to dislodge the ball. If the groove is small, however, the ball may leave and roll into a deeper, "more stable," groove. The deeper the groove, the greater the perturbation required before the ball will leave to enter a new location. It is also possible that regular perturbations will cause the ball to move among several grooves, but a strong disruption could send the ball to an entirely new area of the table and thus make it unlikely that the ball will to return to its original place or pattern. The brain operates in a similar manner where the more stable the behavioral pattern or "groove," the stronger the disruption required to move it into a different state where new patterns will coalesce. As stated by physicist Grégoire Nicolis (1989), self-organizing, dynamical systems, when driven from equilibrium, form new attractors (331). Even small disruptions when built up can cause a shift in the system. Thelen and Smith (2006) describe a person walking up a hill with increasing elevation (275). Walking is a stable attractor for human locomotion and a normal gate can be maintained until the elevation becomes such that a system shift is required where the person must then use all four limbs to continue

to progress. Ever gradual changes in elevation produce minor changes to walking behavior, but once a critical value is reached, a large change in the pattern develops, and a new state emerges. Considering this in light of a Wesleyan theology of conversion, a moment of crisis in one's life could drive one's brain state out of equilibrium, and when the brain reorganizes, it may form new attractors, and thus one's neurology and associated behaviors will be different. Also, small changes in one's life may build up to a "tipping point" where the brain will reorganize and the person and associated behavioral correlates coalesce into a new way of being.

System-level chaotic dynamics provide mechanisms for rapid brain change. Additionally, rapid brain change is seen at a synaptic level through what is called spike timing dependent plasticity (STDP). In STDP the order and timing between presynaptic and postsynaptic spikes, which is the electrical signal transmission in the sending and receiving neuron, determine the sign and magnitude of long-term potentiation (LTP) or depression (LTD), the long-term enhancement or diminishment of neural signaling on a time scale of milliseconds (Feldman 2012). And while spike timing is not the only factor governing LTP and LTD,[6] it is an important factor of varying degrees at various synapses and should be considered in a multi-factor approach to plasticity also including firing rate, dendritic depolarization and membrane properties, neuromodulators, synaptic cooperativity, and changes in anatomical connectivity. Traditional plasticity emphasizes frequency of activation or correlated activations for long-term change, while STDP emphasizes temporal order of activation in short time scales. Typically in STDP, LTP occurs when presynaptic spikes lead postsynaptic spikes by up to 20 milliseconds, and LTD occurs when postsynaptic spikes lead presynaptic spikes and excitatory post synaptic potentials (EPSPs) by up to 20–100 milliseconds, and plasticity typically requires 60–100 pre-post spike pairs to occur. The mechanism of STDP varies due to synapse type and location, yet this process shows that brain change can operate on very short time scales with an effect on long-term change.[7]

When discussing synaptic plasticity, there is the time necessary to induce a change as well as the time scale for the change to persist due to consolidation. Abigail Morrison, Markus Diesmann, and Wulfram Gerstner (2008) provide an experimental review of the time scales observed for various forms of plasticity (461). Focusing on long-term plasticity, they describe how it is sensitive to presynaptic firing rate over a time scale of tens or hundreds of milliseconds. Long-term plasticity is also influenced by the exact timing of the pre- and postsynaptic spikes on a time scale of milliseconds. Induction of long-term plasticity can occur in less than a second (460). In STDP, a train of 60 spikes at 20 HZ, occurring in under 3 seconds can induce a change lasting more than an hour, and then early phase LTP can be stabilized and consolidated into late-phase LTP on a time scale of hours. There are even early experiments that report long-term

potentiation and depression induced by spike timing on a scale of 10 milliseconds (Markram et al. 1997). Also, homeostatic changes of synapses may occur in the form of rescaling of synaptic response amplitudes on a time scale of hours.

Focusing only on the synaptic changes found at the neural level in traditional LTP and LTD can suggest a relatively static and compartmentalized brain structure where signals travel in a well prescribed manner with transmissions dictated by patterns of anatomical connectivity, which change slowly over time as one learns, practices, and inculcates new habits. Such anatomical effects upon neural development and associated behaviors are well documented. However, there is also a functional connectivity that provides for dynamic and moment-to-moment fluctuations in activity. While LTP and LTD influence neuronal interactions, which neuronal populations actively communicate at any particular moment depends on the state of activity in the network itself, and this responsiveness can change rapidly (over milliseconds to seconds) to meet the active behavioral demands that are regularly encountered, encounters which demand a quick response. As described by neuroscientists Bailal Haider and David McCormick (2009), this responsiveness is recognized as mediated by rapid alternations in excitatory and inhibitory synaptic barrages generated within specific local subnetworks. Patterns of synaptic bombardment control on a moment-to-moment basis the probability of spike generation in the recipient neurons. Haider and McCormick hold that concerted changes in synaptic activity in local networks serve as a key mechanism for determining action potential rate and timing in single neurons as well as serving as a context for past and present network activity, linking ensembles of neurons together in a behaviorally relevant fashion. Synaptic barrages operate in a holistic manner, functionally associating and dissociating information across vast cortical territory, while simultaneously modulating interactions both between and within individual cortical neurons.

While multiple means of rapid change within the brain are advanced, these should be seen as a holistic process of mutual and overlapping interactions that all contribute to whole-brain operation. Brains can change rapidly. Nonlinear dynamic systems can undergo instantaneous change through a system flip. Behaviorally significant neural events can be understood as periodic or steady state phenomena, and when undergoing a system flip new neural events will occur. When driven from equilibrium, perhaps through some crisis, neural networks can form new attractors. At the behavioral level, this will likely be seen as a change in previously expected patterns of action. And when taking into account the early induction of long-term plasticity in addition to late-phase consolidation, spike timing, and control through local networks, much of this can occur over time scales on the order of milliseconds. There are even other observed dynamics of rapid brain change including map expansion where the

function of a brain region enlarges on the basis of performance. Enlargement is seen within the first few minutes of practice and the rapid enlargement can persist (Grafman and Litvan 1999, 135). Also, if a particular neural pathway is damaged or blocked, a previously unused pathway may become unmasked (Ramachandran, Rogers-Ramachandran, and Stewart 1992). For example, there are likely multiple ways one can drive home from work. If one's typical route is blocked by road construction, one will take a different path to achieve the same result. Finally, while this article has focused on many of the bottom-up possibilities for rapid brain change because these were the primary focus of Markham (2007), mechanisms for top-down rapid change exist as well through the neuroendocrine response. For example, a stressful or dramatic experience can cause the abundant release of hormones that can result in widespread synaptic reformation.

Conclusion

Theologies of conversion posit a change on the part of the believer. As embodied creatures, changes in behavior should be accompanied by changes in the correlated neural networks. Thus soteriology should involve neuroscience. Markham states that since long-term brain change is a gradual process involving lengthy periods of time required to learn and inculcate new habits, neuroscience does not support doctrines of rapid conversion, and such doctrines must be abandoned. However, for doctrines of conversion that hold to the imputation of Christ's righteousness, neuroscience is irrelevant, and rapid conversion can be maintained as a metaphysical position. For doctrines of conversion that hold to impartation, however, an embodied and neurologically realized change should be expected. The pertinent question for doctrines of conversion that insist on imparted righteousness is then how rapidly a brain can undergo changes that persist.

Brains can change rapidly. They must in order to respond to the ever-changing circumstances of daily life. There are several ways in which rapid neurological change within a conversion event can occur. First, an immediate conversion event need not rely on massive brain change; a small change would be sufficient, one that could then be developed into the rest of the neural systems as one "works out their own salvation." Second, an immediate conversion event could involve a rapid state change within the brain or a reorganization after a neurological system was pushed far outside equilibrium. Additionally, spike-timing–dependent plasticity illustrates how cellular and molecular changes can occur within the brain over very short time spans, and large functional changes can occur rapidly through local network control. There are cases of massive neuronal reorganization that occur when preexisting neuronal pathways are blocked,

forcing the brain to quickly adapt, and where cortical maps reorganize to take over neural "real estate." Thus there are several means, and possibly co-occurring means, by which immediate change can be neurologically realized. Using neuroscience as an epistemic restriction for soteriology, and for conversion in particular, does not invalidate instantaneous change, but rather highlights how both the instantaneous and gradual work together, a view that I hold as reflective of traditional Wesleyanism.

It would be presumptuous to attempt to proscribe a particular biological processes to any particular instantaneous experience within the order of salvation. We really do not know what exactly may have occurred neurologically to particular people. Perhaps one of these means occurred, and the mechanism need not be the same for everyone. Perhaps there are means yet to be discovered. However, the fact remains that rapid neurological change is possible. One can respect biological constraints and maintain the classical Wesleyan position holding both instantaneous and gradual elements together within salvation.

Notes

1. While clearly a dualist, Wesley affirmed that the aspects of a person, whether spiritual, moral, physical, rational, or emotional, were deeply interrelated. See Mann (2006). Dualists need not denigrate the physical in favor of the spirit or posit a sharp demarcation between aspects of a person; however, the question of the causal joint between the physical and spiritual remains a challenge.
2. For various types and motifs of conversion, refer to Rambo (1993). While he stresses conversion as a process that occurs over time, he does not rule out elements that may be sudden. Bernard Lonergan (1972) stresses that transformation is at the heart of conversion and supports a more gradual view. Len Sperry (2002) examines various types of conversion: somatic, affective, intellectual, moral, sociopolitical, and religious/spiritual. Kenneth Collins and John Tyson (2001) provide a more detailed examination of the various approaches and debates regarding conversion specifically within Wesleyanism. For a Biblical exposition of conversion as an event (instantaneous) which leads to a process, of which the definition includes personal and community formation, cognitive and moral change, and changing religions as well as deepening one's commitment within one's religion, refer to the authors Joel Green and Ben Witherington within Collins and Tyson's edited volume.
3. According to Collins (1997), the phrase "responsible grace" is meant to connote the dynamic of cooperation between humanity and God in grace and not meant support or deny a particular *ordo salutis*. It rather merely provides an overarching term to the entire spiritual life regardless of one's stage in the process (187).
4. The discovery of the brain operating as a chaotic dynamical system supports what philosopher Merleau-Ponty (1942) suggested nearly a century ago, believing that brain function tested in an artificial lab setting under the mechanical brain paradigm did not do justice to an animal outside of that setting. Rather he suggested that animals had internally generated states of cortical activity, generating behavior within the organism instead of behavior being a passive reaction to stimuli. The underlying causes of the behavior were the brain, body, and environment in a dynamic and ongoing relationship.
5. For an examination of the mathematics involved, see Wildman and Russell (1997).
6. For a description of various mechanisms for LTP and LTD refer to Citri and Malenka (2008).
7. For reviews and history of SPTD refer to Markram, Gerstner, and Sjostrom (2011), Caporale and Dan (2008), Sjostrom et al. (2008), and Dan and Poo (2006).

References

Blevins, Dean. 2009. "Neuroscience, John Wesley, and the Christian Life." *Wesleyan Theological Journal* 44: 219–47.

Borgen, Ole E. 1972. *John Wesley on the Sacraments*. Grand Rapids, MI: Zondervan.

Caporale, Natalia, and Yang Dan. 2008. "Spike Timing-Dependent Plasticity: A Hebbian Learning Rule." *Annual Review of Neuroscience* 31: 25–46.

Citri, Ami, and Robert C. Malenka. 2008. "Synaptic Plasticity: Multiple Forms, Functions, and Mechanisms." *Neuropsychopharmacology* 33: 18–41.

Collins, Kenneth. 1997. *The Scripture Way of Salvation: The Heart of John Wesley's Theology*. Nashville, TN: Abingdon Press.

———, and John H. Tyson, eds. 2001. *Conversion in the Wesleyan Tradition*. Nashville, TN: Abingdon Press.

Dan, Yang, and Mu Ming Poo. 2006. "Spike Timing-Dependent Plasticity: From Synapse to Perception." *Physiological Reviews* 86: 1033–48.

Feldman, Daniel. 2012. "The Spike-Timing Dependence of Plasticity." *Neuron* 75: 556–71.

Grafman, Jordan, and Irene Litvan. 1999. "Evidence for Four Forms of Neuroplasticity." In *Neuronal Plasticity: Building a Bridge from the Laboratory of the Clinic*, edited by Jordan Grafman and Yves Christen, 93–105. Berlin, Germany: Springer.

Graves, Mark. 2009. "Justification in the Brain as Shift of Real Possibility." In *Proceedings of the The Society for the Study of Psychology and Wesleyan Theology Annual Conference*. Anderson, IN, March 5.

Haider, Bilal, and David A. McCormick. 2009. "Rapid Neocortical Dynamics: Cellular and Network Mechanisms." *Neuron* 62: 171–89.

Heylighen, Francis. 2001. "The Science of Self-Organization and Adaptivity." *The Encyclopedia of Life Support Systems* 5: 253–80.

Knight, Henry. 2001. "The Transformation of the Human Heart." In *Conversion in the Wesleyan Tradition*, edited by Kenneth J. Collins and John H. Tyson, 43–55. Nashville, TN: Abingdon Press.

Li, Cheng-yu, Mu Ming Poo, and Yang Dan. 2009. "Burst Spiking of a Single Cortical Neuron Modifies Global Brain State." *Science* 324(5927): 643–46.

Lonergan, Bernard. 1972. *Method in Theology*. New York, NY: Herder and Herder.

Maddox, Randy L. 1994. *Responsible Grace: John Wesley's Practical Theology*. Nashville, TN: Kingswood Books.

Mann, Mark. 2006. *Perfecting Grace: Holiness, Human Being, and the Sciences*. New York, NY: T & T Clark.

Markham, Paul. 2007. *Rewired: Exploring Religious Conversion*. Eugene, OR: Pickwick Publications.

Markram, Henry, Wulfram Gerstner, and Jesper Sjostrom. 2011. "A History of Spike-Timing-Dependent Plasticity." *Frontiers in Synaptic Neuroscience* 3: 1–24.

———, Joachim Lubke, Michael Frotscher, and Bert Sakmann. 1997. "Regulation of Synaptic Efficacy by Coincidence of Postsynaptic APs and EPSPs." *Science* 275(5927): 213–15.

Merleau-Ponty, Maurice. 1942. *La Structure du Comportement*. Paris, France: Presses Universitaires de France.

Morrison, Abigail, Markus Diesmann, and Wulfram Gerstner. 2008. "Phenomenological Models of Synaptic Plasticity Based on Spike Timing." *Biological Cybernetics* 98: 459–78.

Nicolis, Grégoire. 1989. "Physics of Far-From Equilibrium Systems and Self-Organization." In *The New Physics*, edited by Paul Davies, 316–47. Cambridge, UK: Cambridge University Press.

Ramachandran, Vilayanur, Diane Rogers-Ramachandran, and M. Stewart. 1992. "Perceptual Correlates of Massive Cortical Reorganization." *Science* 258(5085): 1159–60.

Rambo, Lewis R. 1993. *Understanding Religious Conversion*. New Haven, CT: Yale University Press.

Sjostrom, Jesper, Ede A. Rancz, Arnd Roth, and Michael Hausser. 2008. "Dendritic Excitability and Synaptic Plasticity." *Physiological Reviews* 88: 769–840.

Skarda, Christine, and Walter Freeman. 1987. "How Brains Make Chaos in Order to Make Sense of the World." *Behavioral and Brain Science* 10: 161–95.

———, and ———. 1990 "Chaos and the New Science of the Brain." *Concepts in Neuroscience* 1: 275–85.

Sperry, Len. 2002. *Transforming Self and Community: Revisioning Pastoral Counseling and Spiritual Direction*. Collegeville, MN: Liturgical Press.

Thelen, Esther, and Linda B. Smith. 2006. "Dynamic System Theories." In *Handbook of Child Psychology*, edited by William Damon and Richard M. Lerner. Hoboken, NJ: John Wiley and Sons.

Wildman, Wesley J., and Robert John Russell. 1997. "Chaos: A Mathematical Introduction with Philosophical Reflections." In *Chaos and Complexity: Scientific Perspectives on Divine Action*, edited by Robert John Russell, Nancey Murphy, and Arthur R. Peacocke, 49–92. Notre Dame, IN: University of Notre Dame Press.