

# Biological Determinants of *Mens Rea*: When Choice Fails to Compensate for Biopsychological Perseveration

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## Abstract

*In jurisprudence, to establish the intent component of mens rea, or guilty mind, and the true attribution of criminal responsibility to an offender, an individual must be shown to have acted with voluntary purpose during the commission of the criminal act. Individual free will has long been the criminological touchstone of determinism, using volition as a key to establishing that intent. Logically then, if volition of action is impaired, so too is the element of mens rea removed. While biological causation has all but been removed from the current notion of criminal determinism, there are, however, numerous implications that remain unresearched with regard to the psychological and subsequent behavioral impact of certain biological factors.*

*To discount the chemical interactions within the organic structure of the human host where the psyche resides is tantamount to overlooking the foundation on which the free will must essentially rely to formulate those choices. Biological referencing is an evolutionary and essential factor of individual volition. If the biological decision-making system is faulty or imbalanced, so too will be the behavior be faulty and imbalanced, thus diminishing the component of behavioral volition and mens rea. Because the following paper will explore research into various aspects of organic factors that impact mens rea, a concept specific to the individual, all sociological theories that do not address the biological impact on the individual will be excluded.*

## Introduction

In law, *mens rea*, Latin for guilty mind, refers to purposeful criminal intent. Combined with intent there is also an element

where guilty knowledge is combined with willfulness of action. This definition implies that mere knowledge that an act is prohibited is not enough, but that the ability of an individual to willingly prevent his or her commission of the act must also be intact.<sup>1</sup> The general capacity of an individual to rationally understand the nature and effect of his or her actions, rather than specific mental or psychological processes, reflect an individual's legal capacity to regulate his or her behavior. This distinction impacts the level to which criminal responsibility may be affixed or mitigated for engaging in forbidden activities.<sup>2-4</sup> However, criminal behavior is often irrational,<sup>5</sup> and just as often criminal acts continue to reoccur even when there is little or no reward to the actor.<sup>6</sup> The behavior can persist even when the criminal has been previously punished for that precise behavior.

Many criminal behaviours are seemingly obsessive, repetitious and escalate over the course of the criminal's life span,<sup>7</sup> and, in lieu of a more specific definition, the repetition of senseless ideas and pointless actions are considered a signature of mental illness.<sup>8</sup> Using mere personality distinctions to delineate mental illness as espoused by the majority of current social scientists seems to agree with Thomas Hobbes who wrote, "...to have stronger and more vehement Passions for any thing, than is ordinarily seen in others, is that which men call Madnesse (sic)."<sup>9</sup> B. F. Skinner, wrote:

"A scientific analysis of behavior must, I believe, assume that a person's behavior is controlled by his genetic and environmental histories rather than by the person himself as an initiating, creative agent; but no part of the behaviouristic position has raised more violent objections."<sup>10</sup>

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Skinner knew that the notion of an individual's "mind" was simply an inadequate description of the function of a brain and a body residing within a specific environment. In this perspective the personality, or self, is simply the reaction of a biological entity within a historical context. This leads to the difficulty of attributing *mens rea*, or guilty mind, to certain behaviours that result from an imbalanced biological system.

The M'Naughten Rule has long been the benchmark of the Criminal Justice System in establishing mental defectiveness, and thus establish the guilty mind and volition requirements for a conviction. The history of the establishment of this rule is based on an unusual murder in England in 1843. Daniel M'Naughten, a Scottish woodcutter, shot and killed Edward Drummond in London. Drummond was secretary to England's Prime Minister Sir Robert Peel. At the time of the murder M'Naughten was acting under the belief that he was actually shooting the Prime Minister because he believed there was a plot against him. When he reached trial, M'Naughten's attorneys asserted that he should be acquitted because he was obviously insane and did not understand what he was doing. M'Naughten was acquitted of the murder, ultimately leading the House of Lords to issue the following ruling later that same year:

To establish a defense on the ground of insanity, it must clearly be proved that, at the time of the committing of the act, the party accused was laboring under such a defect of reason, from disease of the mind, as not to know the nature and quality of the act he was doing; or if he did know it, that he did not know he was doing was wrong.<sup>3</sup>

In time, American jurisprudence incorporated the M'Naughten Rule, and specifically the notion of not attributing guilt if the actor suffered under such a mental defect of reason that he or she could not know the nature and quality of his or her behavior during the commission of the act. Further, the American Criminal Justice Sys-

tem has repeatedly attempted to modify the rule to include advances in modern psychological sciences, specifically with the inclusion of the notion of the offender's irresistible impulse.

Further modification of the rules pertaining to the notion of criminal intent was added with the Durham Rule, or the product test of criminal liability, but it failed to address a specific definition of mental defect, and has fallen into disfavor over time. In a further attempt to define the mental status of an offender with regard to sanity, the American Law Institute's (ALI) Model Penal Code Test was adopted in some jurisdictions. The ALI's modified M'Naughten, which included the substantial capacity clause, is used in some States to establish mental defect in criminal actors, but this too has lost favor in recent years. The history of these ongoing modifications is described in detail by Hess and Weiner,<sup>11</sup> Melton, Petrila, Poythress, and Slobogin,<sup>3</sup> Nurcombe and Partlett,<sup>12</sup> and Shapiro.<sup>13</sup> While the mental parameters of varying levels of criminal responsibility are clearly defined by Rogers,<sup>14</sup> Hess and Weiner,<sup>11</sup> and Melton, et. al,<sup>3</sup> there remains no standardized and accepted test of criminal intent that can satisfactorily establish to what extent the behavioral willfulness of a perpetrator may have been impeded by a physiological imbalance, and thus could be less than completely voluntary, and therein lies the problem.

For an individual to have any kind of genuine quality existence, it is essential that he or she believe that his or her sensory-perceptual evaluation of the environmental and social surroundings is an accurate representation of the objective reality. When reality is not accurately represented to the individual, and when his or her subsequent behavioral presentations begin to manifest that mental disorganization, we refer to that condition as insanity. By definition *mens rea* must be based on the attribution or drawn inference that the individual is, in fact, perceiving and

processing the environment as an objective reality, and making rational choices with voluntarily intent. The current belief of most social scientists is that criminality is simply a free-will choice, unbound by biologically predisposed determinants. However, increasingly some enlightened social scientists are beginning to view ongoing criminality as a clinical condition,<sup>15</sup> or as a predisposed biological, and thus medical, condition,<sup>6</sup> rather than merely an issue of choice. Even some strict cognitive scientists are beginning to view individual experience as more important than previously thought.<sup>16</sup> Empirical evidence gathered over the last decade seems to indicate that this is the area where social scientists should be researching if we are to find the truth regarding the causation and treatability of criminality. Unfortunately, too many social scientists have been focusing on the *social* rather than the *scientist*,<sup>17</sup> choosing to exclude more prosaic explanations of human behavior such as genetic predisposition, adaptation, natural selection, and natural biological functioning. Instead, most attempt to explain human behavioral causation through the means of psychosocial speculation and numerical approximation models. Renowned criminologist Edwin Sutherland all but denied biological determinism of criminal behavior much like current models.<sup>18</sup> Sociologist Emile Durkheim also rejected biological causation, as did psychologist Albert Ellis, until Ellis realized that social and socio-environmental conditions were merely minor factors that influenced or aggravated human biological nature.<sup>19</sup>

Behavioral science's ongoing minimization of the implications of the human organic constellation (that is, the neuroanatomic, neurochemical, and bioelectric nature of human existence) when assessing an individual's evolved capacity to formulate criminal intent has left society wanting.<sup>20</sup> The unfortunate fact is that the last few decades have demonstrated that human behavioral science is a field with *satis eloquentiae, sapientiae parum*

(full of talk short of wisdom). In spite of their perspicaciousness, simple truths are often far too mundane for the professional academician and behavioral scientist. In spite of innumerable books on the subject, an incalculable number of journal articles and treatises, and countless millions of dollars spent on research, we actually seem farther from any genuine resolution to the issue of cognitive intent and behavioral volition. Thus, these questions unfortunately remain: if potentially pathological organic-biological factors can so negatively and severely impact the brain's sensory-perceptual capacity and subsequent behavioral activation systems (ultimately deviating the individual's decision-making processes, essentially inciting obsessions, perseveration of previously deviant action, and even triggering unwanted ego-dystonic compulsivity, etc.), how much of the afflicted individual's behavior can truly be considered voluntary, and at what point should we consider the guilty mind replaced with the faulty mind?

### Biological Factors

#### *Endogenous Biological Factors of Behavior*

Genetic predisposition and biological irregularities are more common in unstable personalities than previously believed.<sup>21-23</sup> Schizophrenia and depression are now known chemical imbalances, rather than viewed as character weaknesses. The behavior of the afflicted often presents a serious problem to society, but currently victims of schizophrenia and depression are being treated medically with good success. Even minor damage, alteration, or biological imbalance to any one of the various parts of the human brain has been known to result in unstable,<sup>24-27</sup> potentially violent,<sup>28,29</sup> and antisocial behaviour.<sup>23,30</sup> Unusual frontal lobe and limbic system processes have also been identified in antisocial personality disorder<sup>31</sup> and psychopathy (Robert Hare, personal communication, January 27, 2001, respectively). Dysregularity for any one of a number of possible reasons can cause ag-

gression,<sup>32</sup> obsession and compulsion,<sup>33</sup> memory problems,<sup>34,35</sup> and the inability to function appropriately in social situations.<sup>2</sup>

Researchers have indicated that there are clear neurophysiological and neurochemical differences between offender and non-offender populations, and according to their research, the type of offense committed by the perpetrator frequently correlates with known behavioral changes within clinical populations.<sup>36</sup> Walsh also studied the impact of exogenous toxins on endogenous psychological constructs that result in aggressive and criminal behaviours,<sup>37</sup> and that will be discussed further in the next section. Impetus for these studies originate in the discovery of clinical evidence that links documented localized brain damage and antisocial behavior,<sup>38,39</sup> and evidence based on relative levels of neurotransmitters that point to a resemblance between certain classes of criminal offenders to similar profiles that characterize various neuropsychiatric disorders.<sup>40</sup>

Evidence further suggests that a diminished neuropsychological status is related to both early onset and subsequent persistence of antisocial behaviours,<sup>41,42</sup> and in some cases may be attributable to something as seemingly minute as insufficient prenatal nutrition.<sup>43</sup> Although the range and type of these neuropsychological impairments can vary widely, there is a demonstrated association between numerous test variables in experimental groups and antisocial behaviour.<sup>38</sup> In 2,862 twin-pairs, nature more than nurture proved more specifically causal regarding diagnosed conduct disorder in those twin-pairs with chronic behavior disruption, clearly suggesting a more biological proclivity toward certain types of acting-out, and further suggesting that there is a connection between an individual's behavior and their psychosocial interactions based on a more genetic influence rather than socio-environmental factors.<sup>44</sup> Hare happened upon what seemed to be "inhuman"<sup>6</sup> electroencephalogram (EEG) patterns in criminally

psychopathic subjects. These patterns were subsequently confirmed by further examination. Additional strong evidence of the connection between maladaptive brain functions and antisocial behavior in EEG patterns that should incite social scientists to pursue the biological perspective of criminal causality has been reported.<sup>45</sup>

Genetics can predispose an individual to having unusual neurotransmitter levels in the brain resembling certain offender populations, and was reported to have played a role in behavioral presentations as reported by Walsh<sup>37</sup> and Balyk.<sup>40</sup> Balyk also investigated the relationship between serial sex offenders, pedophiles, and rapists and found their behavioral patterns to resemble those manifested in the more socially benign diagnosis of obsessive-compulsive disorder, which is largely suspected to be a serotonergic disorder that is responsive to common antidepressants such as selective serotonin reuptake inhibitors (SSRI's).<sup>20,46</sup> In unpublished clinical trials Balyk found that paraphiliac compulsive thoughts and urges responded to SSRI's in the same fashion as the more non-criminal urges of otherwise unremarkable obsessives,<sup>40</sup> and Coleman et al. substantiate the use of Serzone as effective with non-paraphilic compulsive sexual behavior.<sup>47</sup> Fluctuating serotonin levels may also be involved in the intensity of aggressive behavior, and dysfunction in the dopamine system is highly correlated with an individual's dysfunctional incentive-reward system and subsequent unstable behaviour,<sup>48</sup> and even addiction compulsions.<sup>49</sup> Compulsions, along with aggressive urges and behaviours, are also common in Tourette's Syndrome, in addition to the tics and abnormal movements that characterize this condition.<sup>50</sup> In some patients, these aggressive urges are reduced by SSRI's.<sup>51</sup>

Research has similarly implicated what appears to be an evolutionary based biophysical cause of other socially unacceptable behaviours,<sup>37</sup> including child abuse<sup>53</sup> and child sexual assault among them.<sup>54</sup> The biological basis of obsessive-compulsion

has been researched and discussed by Pigott and Seay,<sup>33</sup> as well as sexual aggression in psychopathic populations,<sup>55</sup> and even rape in general populations.<sup>17</sup> Even something as biologically necessary as the level of testosterone, the endogenous chemical that determines the extent of “maleness,” was found to be much higher in 692 male inmates incarcerated for more violent crimes.<sup>56</sup> In spite of the few above mentioned factors, the social justice system continues to treat all offenders’ formulation of mens rea and subsequent criminal behavior as equal, and often uses structured, mandated sentencing formulas to exact social retribution. This treatment is something akin to a physician diagnosing each new patient with the same disease and administering the same medication to every patient entering a hospital emergency room.

#### *Exogenous Biological Factors of Behavior*

Hamilton and Hardy’s Industrial Toxicology (HHIT) states that chronic low-level exposure to metallic elements such as lead, manganese, and mercury lead to altered mental states that feature heightened irritability or aggressiveness.<sup>57</sup> Lead has been known to have behavioral effects for centuries (HHIT, pp. 70-76). HHIT also lists inattention, hallucinations, delusions, poor memory, and irritability as symptoms of chronic exposure to low levels of lead. Elevated lead levels have also been found in mentally retarded children,<sup>58</sup> hyperactive children, and behaviourally disturbed children.<sup>59,60</sup> The Edinburgh Lead Study found significant relationships between serum lead levels and antisocial and hyperactive behavior, wherein the highest lead levels coincided with the greatest degree of disturbed behavior as recorded by teachers.<sup>61</sup>

Other researchers investigating the potential of lead to impact antisocial behavior found elevated lead levels in violent adults. Levels of hair lead in 19 violent criminals were found to be elevated when compared to 10 non-violent criminals.<sup>62</sup> William J. Walsh, one of the researchers involved in the Beethoven’s

Hair Project (<http://www.hripte.org/beethoven.htm>; see also: <http://www.anl.gov/OPA/whatsnew/beethovenstory.htm>) reported, after analyzing a hair sample, that Beethoven actually died of lead poisoning. Beethoven, who gradually went deaf, was well known for bouts of irrational temper and a generally foul disposition later in life, which were usually attributed to the pseudo-scientific assessment of “artistic temperament.” Walsh also analyzed hair mineral levels in several thousand violent offenders and found them to have consistently elevated levels of hair lead.<sup>63</sup> Included in his database are also 24 pairs of twins consisting of an offender and a non-offender twin. Offenders consistently showed higher lead levels than their twin.

Other exogenous factors should also mitigate criminal responsibility due to their impact on individual volition if found in the offender. Chronic exposure to low levels of mercury is known to produce a syndrome called *erethism*, characterized by increasing self-consciousness and shyness coupled with heightened irritability. Spehar noted that miners in California were reported to be able to recognize this syndrome in themselves, and would become irritable to the point where they would have to quit their jobs, as they were increasingly incapable of taking orders from their supervisors or supervising others (HHIT, pp. 84-96). Marlowe found elevated levels of mercury accompanying elevated lead levels in his samplings of socioeconomically disadvantaged children,<sup>60,64</sup> a population highly represented in criminal proceedings.

Other substances commonly found in the environment impact an individual’s ability to formulate legitimate volition as well. An elevated level of manganese in the body is known to raise the potential for aggressiveness in individuals. Gottschalk’s research found elevated levels of manganese in violent offenders.<sup>65</sup> Other researchers have found unusual amounts of cadmium in aggressive and hostile individuals,<sup>66</sup> and elevated levels of aluminum in irrita-

ble and aggressive subjects.<sup>67</sup> Common behaviours after exposure to all these metals are heightened irritability and hostility, and some form of subsequent aggression. More serious exposure to lead prompts subjects to present with not only the above-mentioned aggressiveness, but also with decreased judgment, attention, and intelligence. Can volition of action be appropriately attributed to an individual who engages in a socially prohibited act who is acting under the duress of exogenous poisoning? Some research implicates metal poisoning as a possible cause in cases of violence occurring in sudden outbursts, such as in the case of impulsive spouse and child abusers.<sup>53</sup>

#### *Dietary Factors of Behavior*

For the sake of simplicity, we can look at diet and criminality from two basic standpoints: too little of something in a diet provoking certain forms of criminal or aggressive behavior; and conversely too much of something in a diet provoking certain types of similar undesirable behavior. Animal research studies indicate that levels of aggressive behavior increase on a tryptophan deficient diet in male monkeys and in rats.<sup>68</sup> This would be interesting trivia were it not that there was evidence to suggest that higher tryptophan intake coincides with lower homicide rates<sup>69</sup> and that diets high in corn, which is low in tryptophan, are associated with elevated homicide rates.<sup>70</sup> The theoretical reason for such tryptophan related aggressiveness is that tryptophan is the precursor of serotonin, low levels of which also seem to be implicated in certain forms of violent behaviour.<sup>40</sup> Low levels of tryptophan means less raw material that can be converted to serotonin, therefore subsequently lowered levels of this neurotransmitter which regulate well-being.<sup>68</sup> Low levels of serotonin, as discussed above, impact affect, mood, and subsequent behavior.

There is indirect evidence that other nutrients, or their lack, may affect crimi-

nal or delinquent behavior. Schauss compared three groups of probationers.<sup>71</sup> One group received systematic dietary instruction and information, a second group received just dietary instruction, and a third group received standard probation counselling and casework. Schauss found that both of the diet groups had a significantly lower recidivism rate than the standard treatment group, though only the first group, combined instruction and information group, had their improvement established within the 95% level of confidence.

Occasionally the body's intolerance to a common substance may also trigger mental states that potentiate behaviours that might never have become manifest without the ingestion of the substance.<sup>72</sup> A substance as simple as sugar ingested in gross amounts can trigger criminal or other socially unacceptable behaviour.<sup>23,30</sup> Fluctuation of serum glucose to extremes, such as hypo- and hyperglycemia, trigger violent mood swings in metabolically sensitive individuals,<sup>75</sup> and has been used successfully as a defense to establish diminished capacity in murder trials (see: [http://www.state.co.us/gov\\_dir/cdps/academy/ar1197.htm](http://www.state.co.us/gov_dir/cdps/academy/ar1197.htm)).

#### *Deviant Arousal Subroutine Theory*

##### *Historical Basis of Deviant Arousal Subroutine Theory*

Arousal and psychological activation are biological functions that influence personality and behaviour.<sup>38</sup> When external stimulation activates internal arousal mechanisms in a human, stereotypical information is usually processed first due to the human capacity for, and survival reliance upon, pattern recognition.<sup>77</sup> Non-deviant and non-criminal response options, or procedural variations to stimuli, are then cognitively generated and evaluated for their potential usefulness to the individual in returning to a state of equilibrium.<sup>78</sup> While deviant variations in the arousal mechanism may occur even in an otherwise normal system, in most instances an appropriate response set is generated quickly, even by offenders. The non-offender, however, uses

a theoretically more socially weighted internally refined acceptance-rejection criteria-set to assess and project potential outcomes that prevent him or her from engaging in socially deviant acts. Conversely, in the chemically dysregulated system, the generated deviant subroutine is not correctly rejected in spite of a potentially equal acceptance-rejection criteria-set. In fact, the deviant subroutine appears to create an emotional and cognitive glitch similar to a skip on a record, a tape loop, feedback from an open microphone,<sup>79</sup> or a computer macro.<sup>40</sup> A computer macro is a set of actions written or recorded within a program, a subroutine if you will, designed to accomplish repetitive tasks within the program. Loftus describes the data storage and retrieval processing of human memory as similar to that in a computer:

“Computer retrieval does not allow equal access to all possible pieces of information. Frequently retrieved items or high-priority items are usually kept maximally accessible. The hierarchy of storage allows the system to branch quickly to the appropriate subject, and data associated with that subject are often stored in the same position, in the same record. This suggests that human memory might depend strongly upon the quality of the organization of the hierarchy. When a particular retrieval is performed several times, the programmer may devise a “macro,” a subroutine which will perform that search automatically...this use of a human macro would be more efficient but less flexible (p.175).”<sup>34</sup>

Memory is the biological function associated with specific behavioral activation, to generate candidate actions and allow cognitive processing of optional behaviours, that when executed would result in the most productive or desired result. The constant flow of information between the memory (producing candidates) and the cognition system (evaluation prior to execution) can cause a thought loop, or feedback like that of holding a microphone in front of a public address system speaker. The sound, or in the case of the brain, the thought, amplifies it-

self upon itself. If the encoding of a deviant candidate is closely associated to other frequently used data within the hierarchy, the deviant or fixation macro is then frequently triggered as well. Kosslyn and Koenig identified two distinct looping functions in the brain, the complex loop and the motor loop.<sup>26</sup> The complex loop (in the frontal lobe) plans and composes behavior, and the motor loop executes those plans (p. 305). The complex loop would be the most likely place for memory-like storage of the macros. Kosslyn and Koenig further stated:

“Implicit memory reflects changes in representations that are only revealed when the representations are used in a specific kind of processing...memory is often revealed by repetition priming, where a previously perceived stimulus biases the system to encode a subsequent stimulus in the same way. Such priming occurs when a residual pattern of activation remains in the subsystem after the stimulus is perceived...which results in ‘automatic’ performance that does not employ the action programming, instructions generation, or movement monitoring subsystems (p. 386).”<sup>26</sup>

Automatic behavior based on deviant priming and storage is essentially the foundation of fixated macros, which is the beginning of the larger, biologically based, deviant arousal subroutine. Balyk describes the fixation macro as similar to brain functions in paraphilia and obsessive-compulsive disorder (OCD):

“Because of the apparent similarities between the paraphilias and OCD, it may be possible to understand why an otherwise ‘reasonable’ individual who operates fairly rationally in other aspects of his life will act irrationally to a particular sexual-erotic stimulus. Elsewhere it has been stated that the contact-specific rituals of OCD seem like pre-packaged sequences of behaviours that are executed upon trigger by a stimulus. These pre-packaged sequences seem similar to computer programs known as macros (p. 30).”<sup>40</sup>

He also states that “the most likely area

for the storage of...(the) macros [mole- cularly encoded] is the temporal lobe (p. 34)." The frontal and temporal lobe weighs heavily in much of the research on deviance.

Recently some social theorists and re- searchers have published information re- lated to the so-called meme theory of in- formation transmission.<sup>80</sup> Meme theory anthropomorphized the description of thoughts transmitted as if by virus from one subject in a population to another, lik- ening the process to a microscopic biologi- cal virus moving from one physical host to another until many members of that population becomes infected. These trans- mitted thoughts, or thought contagions, are similarly likened to a software virus. Lynch stated:

"Like a software virus in a computer network or a physical virus in a city, thought contagions proliferate by effectively 'pro- gramming' for their own retransmission. Beliefs affect retransmission in so many ways that they set off a colorful, unplanned growth race among diverse 'epidemics' of ideas. Actively contagious ideas are now called memes (p. 2)."<sup>80</sup>

Memetics, a germ theory of ideas, de- scribes a distal, external theory of thought contagion. A deviant arousal subroutine (DAS) theory describes a proximal, inter- nal thought contagion. Once an individual is infected, the disease will run its course in the host without intervention, the same way a physical or computer virus will com- plete its purpose over time. As with a physi- cal virus, some extremely virulent thought contagions and deviant arousal subroutines are most probably incurable, but can be treated to the point of remission.

The individual may even view the DAS as ego-dystonic, or internally repulsive, and yet return to that specific thought varia- tion repeatedly in a cycle of approach (ob- session) and avoidance (repulsion). The ego-dystonia may even exacerbate the macro, as the need for relief from the stress of the cycle of arousal is required to return the biological system to equilibrium, and

is self-rewarding from the gratification achieved,<sup>81</sup> and thus is programmed for its own re-transmission. The victim of the macro may be biochemically incapable of doing otherwise, as gratification and thought absorption precludes even per- sonal safety.<sup>82</sup> This is due to the idea that biologically the variant thought deviation subroutine has synaptically plasticized, or cognitively and emotionally solidified at the molecular level within the individual's neural network, and will remain un- changed indefinitely without biological compensation. Proclivity toward absorp- tion (as defined by Tellegen and Atkinson)<sup>83</sup> and fantasy-proneness (as described by Wilson and Barber)<sup>83</sup> may play a factor in imaginal attachments, and could explain why certain personality pro- files closely approximate certain profiles of offender populations.<sup>85-91</sup> The individ- ual's generalized reality orientation and ob- jective sensory-defining processes give way to an autocentric, subjective experi- encing modality wherein the feedback loop, or macro, becomes self-perpetuating.

#### *Biological Specifics of the Deviant Arousal Subroutine*

Organic source excitation creates in- ternal pressure to achieve the fixated aim or object of the variant regardless of the individual's moral revulsion or any social prohibition against the act. The fixated aim or object is thought to represent some frac- tured aspect of the individual's self that needs to be reclaimed,<sup>92</sup> and the mental object of the obsession has inherently per- sonal, emotional, and semantically sym- bolic representative properties. Sexual fet- ishes, pedophilia, and long-term unreward- ing criminality are perfect examples of the deviant arousal subroutine (DAS) within a dysregulated biological system.

Initial subjective emotional revulsion of the DAS appears to systematically desensitize gradually over time due to the con- tinual approach-avoidance of the unrelent- ing macro, negatively impacting the indi-

vidual's entire affective value set, and thus increasing the potential of reoccurring thought macros based on the malfunctioning neurological constellation. This gradual desensitization and approach-avoidance macro also may explain a criminal's progressive escalation pattern over time. As desensitization of the repulsive thoughts increase (from constant DAS exposure), escalation of ego-dystonic behavior becomes psychologically easier to accept to the budding offender. Historically, what used to be considered a lifestyle of "impurity in thought and deed"<sup>93</sup> or the view of a criminal as one who 'only [has] energy for evil'<sup>94</sup> can now be modified to include a more rational approach to causation, including a more medically based perspective. "Exaggerated tension of the nervous system stimulates sensuality" but over time ultimately "decreases potency"<sup>95</sup> resulting in a form of psychological and neurological desensitization to the initial stimuli.<sup>96</sup> Fear is replaced with episodic obsessive fixation, as gradually a complex ritual and reward schedule is established. Learning and reasoning are a creative process indicative of intelligence and intent, but individual intelligence, learning, and volition disappears when the DAS is triggered, as positive synaptic weight is produced in the neural network based on physical reward (possession of the desired item, realizing the deviant goal, reaching orgasm, etc.), and psychological and physiological reinforcement are gained (temporary discharging the stress of the macro). Johnston asserts with reference to genetics and learning that:

"Each individual's personal experiences awaken and regulate the broad developmental plan that is stored in archives of DNA and handed down from generation to generation. In this manner both the 'pre-wiring' of the brain during development and the 're-wiring' of the brain as a result of an individual's environmental experiences depend on the structural modification of neural networks achieved by genes responding to specific chemical signals in their environment. That

is, both phylo-genetic learning, achieved through natural selection over generations, and ontogenetic learning, arising from an individual's unique experiences, share this common mechanism of neural modification mediated by protein synthesis....given all we have learned about the interaction between genes and environment over the last fifty years, it is difficult to understand why arguments still persist over whether a particular behavior is the product of one factor or the other; it is always both (p. 33)."<sup>25</sup>

Some strong anecdotal evidence also exists to indicate that when the individual is actively caught in the mental tape-loop or macro, the fixated, compulsive ritual itself appears to be more rewarding than the eventual release. Behaviours learned over time by the offenders designed to free the individual from an ever-increasing tension produced by the mental repetition of the fixated material begin to manifest. Federal Bureau of Investigation (FBI) profilers in the United States researching violent and sexually violent serial offenders indicate that these perpetrators almost always display a component of ritual in their crime scene behaviours designed to fulfill a specific fantasy.<sup>97-99</sup> Often the perpetrator is physically unable to perform certain acts specific to the fantasy, such as orgasm during rape, or even sustained erection, yet the ritual or fantasized act is still thoroughly enacted.<sup>100,101</sup> In general, these fantasies are vividly persuasive, composed of partly real stimuli and partly imagined specifications.<sup>92</sup> Aversion and resistance are gradually overwhelmed by the continuous onslaught of eidetic fantasy or real hypermnsiac memories of prior related experiences flashed upon the individual's internal biological projection screen (e.g., the "mind's eye") in the brain. Diagnostically, fantasy, symbolism, ritualism, and compulsion are the essential elements of sexual obsession.<sup>102</sup>

EEG results of experiments with heightened mental imagery clearly indicate that alpha rhythms decrease, resulting in

increased activity in the brain's occipital and parietal regions.<sup>103</sup> Marks noted symmetrical and widespread activity in the frontal, temporal, and parietal cortex with vivid imagery, but most particularly in the posterior region of the subject's left hemisphere.<sup>104</sup> Fantasy images then reinforce and further fuel the body's already stimulated state additionally feeding the heightened mental imagery. Magnetic Resonance Imaging (MRI) scans verify involvement of the left inferior temporal lobe in the ongoing imagery, and even indicates activation extension into the left lateral occipital lobe, particularly in abstract presentations.<sup>105</sup> Increased mental arousal stimulates a biological response<sup>106</sup> involving breathing and heart rate, effectively impacting and reinforcing the individual's affect due to the physical reinforcement, which subsequently refuels the subject's mental imagery in a vicious circle of mutually increasing interaction.

The MRI also indicates gender differences in oxygenation of blood in the brain,<sup>107</sup> and gender differences in reported depressive defensiveness in EEG results,<sup>108</sup> with males demonstrating a greater oxygenated blood flow and differential defensiveness to depression, potentially explaining why more men than women engage in socially deviant acts based on fantasized scenarios due to strong physical reinforcement of the mental imagery and differential affective controls. The MRI also indicates differences between normal brain structure and those of psychotic individuals, and those suffering from specific personality disorders,<sup>109</sup> and differences between brain functioning in addicts and non-addicts.<sup>110,49</sup> Positron Emission Tomography (PET) scans indicate frontal lobe involvement even in imaginary aggression,<sup>111</sup> and PET scans also verify blood flow differences in the brain relative to mental imagery of childhood sexual abuse and related post traumatic stress.<sup>112</sup> Mental images generated in the brain clearly impact physiology, and can even overwhelm other necessary cerebral activities, including the

behavioral inhibition system.<sup>113</sup>

Socially acceptable arousal variants are generated to cope with the ever increasing tension, but these options are often unable to assuage the growing need to act out the DAS macro, leaving the individual a virtual slave to the limitations imposed by the appetite of the habitual craving.<sup>114</sup> Only minor variations of the central theme of the fixation are ever processed, as most fail to clearly address the focus, or object, of the DAS, and domain non-specific alternative variations fail to satisfy the requirements necessary to terminate the macro. The individual must act in accordance with the conditions set forth in the demands of the DAS to be set free. Sublimation of the requirements for termination of the macro appear short-lived, and often must escalate progressively toward the behavioral completion of the DAS sub-routine for the individual to be successful in finding relief.

After biological release (goal attainment), the internal processor that generates apperceptive attribution and eidetic fantasy projections in the mind's eye temporarily stabilize due to biophysical changes in the individual, but only until organoleptic environmental stimuli or internal biological re-presentation re-activate the sub-routine in the plasticized neuro-circuitry. Carnes referred to this triggering criterion as the arousal template, "...which builds on preferences already determined in our genetic code."<sup>115</sup> The inflicted individual is for all intents and purposes trapped, essentially a slave to the biochemical macro once it is activated. Psychotherapy will not help until the biological system is appropriately compensated.

#### *Final Considerations of the DAS*

A clear distinction must be noted here. This disquisition of biologically diminished capacity in various populations is not to be considered a behavioral capacity defense for an individual who voluntarily ingests a

known consciousness-altering substance and subsequently commits a criminal act, although it should be noted that substance abusers often have higher concentrations of certain endogenous chemicals, and specific deficiencies of others, and clearly this population has differential brain activation patterns. Nor does this treatise stand in defense of an individual who is by genuine choice a career criminal. The notion of the non-voluntary DAS as a mental incapacity is thought to exist in long-term, chronically afflicted individuals with escalatingly abhorrent thought and behavior patterns. Typically, these individuals would also present with comorbid emotional or mood disturbances.<sup>116</sup>

#### *Impact on Rehabilitation*

Society simply cannot rehabilitate an offender to a state that never previously existed.<sup>5</sup> An offender's domain-specific fixation will have existed long before his or her legal violation manifested. Incarceration quite simply will not defeat the deviant psychological macro, as the DAS is biologically entrenched. Similarly, incarceration is unnecessary once biochemical compensations are administered. The only issue left at that point is habilitation. Treatment of this offender is "not a question of re-socialization, it is an issue of socialization. Many of these offenders have never been socialized to begin with" (Robert Hare, personal communication, January 27, 2001). Traditional psychotherapy may even exacerbate post-release violence and recidivism in some populations.<sup>117,118</sup>

This writing should not serve to imply that no current social or psychological intervention is successful in treating an offender. Nor should this imply that the perpetrator of a legally prohibited socially aberrant act should be released without treatment, for he or she will simply re-offend when the deviant arousal subroutine is triggered. Rather, this writing should suggest that the second-time offender, or other early-stage recidivist, be completely

medically screened, psychologically assessed, and an appropriate and genuinely correctional treatment regimen implemented. While the initial cost to society might be somewhat higher, the number of long-term incarcerated prisoners would be greatly decreased, and a potential taxpayer returned to the work force. Research has previously indicated that punitive measures are highly ineffective, and specifically with certain populations.<sup>119</sup> The above noted data does suggest that there are dozens of both endogenous and exogenous factors that are associated with diminished individual capacity and impact an individual's voluntary actions. While it is unlikely that a criminal gene will ever be discovered,<sup>24</sup> the Human Genome Project may answer several criminological questions that have plagued social scientists for years.

#### **Conclusion**

*Mens rea*, state of mind, perception, intent, volition, and consciousness itself are quite simply acts of brain morphology. Human consciousness is hardly an evolutionary luxury, or an epiphenomenon as it has been referred to by some cognitive psychologists. Rather, it is a physiological necessity evolved to increase survival potential, configured and defined using the body's electrical, chemical, hormonal and genetic compositions. Ironically, even the "origins of a sense of justice lie in our evolutionary history".<sup>50</sup> Consciousness and intentional determination, however dynamic and individualizing, is thus woefully subject to the physical limitations imposed by the organic system of the host. All men may be created equal in some idealistic sense, but all men are not created equal in the biophysical, electrochemical sense. *Mens rea*, the ancient and most probably outdated legal term borrowed from Latin for guilty mind, is simply not distributed equally between the functional and dysfunctional systems. The totality of individual human experience such as perception, emotion,

cognition, and behavior, is housed in a neurologically complex, chemically diverse and fragile transmission and reception system.

An individual may demonstrate *mens rea* by plan, intent, and subsequent action, and the self-same individual may also have the substantial capacity to understand the nature and effect of his or her actions, and may even have a deep appreciation of the range of penalties for engaging in the conduct. But the same individual may also be inflicted with an electrochemical imbalance or similar biophysical pathology that initiates, perseverates, and even escalates a state of mind that precludes the individual's ability to voluntarily conform his or her conduct to societal norms, causal imbalance first triggering the deterioration of evaluative discrimination, followed by the reduction and ultimate loss of biomechanical behavioral control mechanisms. An individual's criminal intent (*mens rea*) in these cases can easily be established, but willful volition (*liberum arbitrium*), a major component of guilt, cannot.

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### 3. Questions & Answers on The Morphology and Fine Structure of Bacteria.

The section contains questions and answers on size, shape and arrangement of bacterial cells, cell wall, structures external and internal to the cell wall.

Diet choice is a complex area because there are a number of factors that affect the population's and an individual's choice of food. These have been divided into 6 key determinants: Biological determinants such as hunger, appetite, and taste. Economic determinants such as cost and income. Physical determinants such as access, education, skills and time.

#### BIOLOGICAL DETERMINANTS

Biological factors that determine health may be classified as either endogenous or exogenous. Endogenous biological determinants include genetic heritage and immunity that is passively acquired from maternal antibodies passed across the placenta or transmitted in maternal milk. Genetic heritage is determined largely by responses to biological and physical environmental challenges to which human ancestors were exposed.

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