A Different Perspective on Personality: An Evolutionary Theory of Universal Values

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Abstract

Personal values and traits are two related aspects of personality, yet there is a tendency for the latter to be considered the more important of the two. Indeed, broadly accepted conclusions as to the lack of influence of parental upbringing on personality have been reached solely based on trait-based research. Yet, values-based research shows differences between the personalities of only-children and siblings consistent with widespread stereotypical perceptions concerning the self-centeredness of the former group. It was once held that values were cultural adaptations while traits were heritable and stable. It now seems the two are similarly heritable and mutable. Given that traits relate to patterns of behavior that are only partially related to each other, while values are systematically related trans-situational motives for action, it seems appropriate to re-examine and rethink the relationship between the two and their relative importance in the construct of personality. We do so by stepping outside of the realms of psychology to undertake a radical review: building upward from the foundations of physical and evolutionary science. Incorporating insights from game and complexity theories, we present an evolutionary theory of values, which considers the Schwartz (1992) system of personal values as representing a pre-existing system of universal equivalents. It argues that equivalents of the values from benevolence to achievement are present in all stable systems, and the remaining values from hedonism to universalism, and a form of benevolence related to universalism, have been sequentially internalised in the evolution of self-adaptive complex living systems such as humanity.

A Different Perspective on Personality: An Evolutionary Theory of Values

Introduction

Traits and values are two important aspects of personality (e.g., Parks-Leduc, Feldman, & Bardi, 2015), yet there is a tendency for considerations of personality to focus only on the former. For example, for a paper intended to close the debate on whether birth-order affects personality development, Damian and Roberts (2015) chose the title of 'Settling the debate on birth order and personality' despite seeking to do so only with reference to Big Five related trait-based findings. According to the APA (2021) personality concerns characteristic patterns of thinking, feeling, and behaving. Yet, thoughts and feelings are inaccessible to the Big Five (McAdams, 1995). As predispositions for behavior, rather than behaviors themselves (e.g., McCrae & Costa, 1999), traits must be inferred. Nevertheless, they may be the first things strangers notice about each other's personalities (McAdams, 1995).

Values are broadly stable, deeply held, trans-situational guiding principles inextricably linked to affect. When activated, they induce feelings that affect perceptions, decision-making, and behavior (Schwartz, 1992; Bardi & Schwartz, 2003). The values of others may be discerned from patterns of behavior or verbal cues, which individuals who know each other well may do as accurately as they can for traits (Dobewall, Aavik, Konstabel, Schwartz, & Realo. 2014).

Lay conceptions of personality probably involve abstract interpretations of values and traits. The finding that popular beliefs concerning the greater self-centeredness of only-children are supported by differences in the importance given to the values of power and benevolence (Griffiths, Thomas, Dyer, Rea & Bardi, 2021), but only weakly reflected in differences in traits (Stronge, Shaver, Bulbulia, & Sibley, 2019) appears to support this conjecture.

We may come to reassess someone's agreeableness if, with greater acquaintance, we notice their agreeableness tends to manifest itself only with those whose good opinion they seek. Such a pattern of behavior might be associated with the value of power, which concerns desire for status, influence, and control, and would be consistent with known susceptibilities for environment-sensitive trait adaptation (e.g., Ellis, Boyce, Belsky, Bakermans-Kranenburg, & Van Ijzendoorn 2001) and the if/then conditionality of trait expression described by Mischel (2004).

Given the roles played by values and traits, and the relationship between them, an integrative approach that brings them together seems likely to benefit our understanding of personality. In what follows we invite a radical reconsideration of their roles. We will undertake a radical review of their evolutionary antecedents. Straying far beyond the conventional bounds of psychology, we will develop an interpretation grounded in the fundamentals of physical science. From this emerges a new perspective on the relationship between traits and values: one consistent with an evolutionary theory of universal values, or value-equivalents.

Personality traits and personal values

Traits describe what people are like, while values describe what people want from life (e.g., Parks-Leduc, et al., 2015). Vecchione, Alessandri, Roccas, & Caprara (2019, p.414) relate the five key differences between them identified by Roccas, Sagiv, Schwartz, & Knafo (2002) as follows: "(a) traits are enduring dispositions, whereas values are enduring goals; (b) traits refer to dispositional proclivities to behave in certain ways, regardless of one's intentions, whereas values refer to the goals people wish to accomplish; (c) traits vary in the frequency and intensity of their occurrence, whereas values vary in their importance as guiding principles in people's lives; (d) values are regarded by the individual as something desirable, whereas traits are not necessarily seen as desirable; and (e) values are ordered by importance relative to one another and may express conflicting motivational goals, whereas traits do not form an ordered system of priorities and do not conflict with one another".

Traits: The Big Five and HEXACO

The Big Five is the most widely accepted model of personality traits. Its five traits of neuroticism (or emotional stability), extraversion, openness to experience, agreeableness, and consciousness each comprise six facets, to which the HEXACO model added the sixth dimension of honesty/humility with four facets, as shown in figure 1.

Neuroticism	**Extraversion**	**Openness**	**Agreeableness**	**Conscientiousness**	**Honesty/Humility**
Anxiety	Warmth	Fantasy	Trust	Competence	Sincerity
Angry Hostility	Gregariousness	Aesthetics	Straightforwardness	Order	Fairness
Depression	Assertiveness	Feelings	Altruism	Dutifulness	Greed Avoidance
Self-Consciousness	Activity	Actions	Compliance	Achievement-Striving	Modesty
Impulsiveness	Excitement-Seeking	Ideas	Modesty	Self-Discipline	
Vulnerability	Positive Emotions	Values	Tender-Mindedness	Deliberation	

Figure 1 NEO-PI-R Five Factor Model (Costa & McCrae, 1992) of Big Five dimensions and facets supplemented by HEXACO (Ashton, et al, 2004) dimension of honesty/humility

Traits relate to behavioral characteristics; either directly, when immediately observable, or indirectly, when evaluated or inferred from observed patterns of behavior (e.g., Borkenau & Bielefeld, 1995). While its facets may be related, the Big Five is atheoretical and non-systemic because its traits are not dynamically interconnected (Block, 2010).

McCrae & Costa, (1999) contend the Big Five traits represent a set of basic tendencies with biological bases upon which dynamic processes give rise to characteristic adaptations, through interactions with the external environment. Such a perspective is consistent with traits being partially heritable (e.g., Plomin, 2018), broadly stable (Terracciano, McCrae, & Costa, 2010), subject to change as people grow older (Roberts, Walton, & Viechtbauer, 2006), and responsive to the environmental effects of life events such as leaving the parental home or the death of a spouse (Specht, Egloff, & Schmukle, 2011).

Values: Schwartz's Circular System

The Schwartz (1992) system of values is the leading cross-cultural values model. Its values serve as criteria by which individuals decide what is good, desirable, interesting or not (Schwartz, 1992). Based on correlations between the relative importance individuals attach to 56 component values such as ambition, honesty, and creativity, ten zonal values have been identified to describe a circular map (as shown in figure 2) with orthogonal axes labelled openness to change/conservation and self-enhancement/self-transcendence (Schwartz 1992). These zonal super-values represent useful but arbitrary divisions of a continuous motivational construct. Their relative locations reflect systemic relationships between the needs they serve and the attitudes and behavior they promote; according to whether they promote or inhibit change (openness to change/conservation) toward competitive or cooperative ends (self-enhancement/self-transcendence) (e.g., Bardi & Schwartz, 2003; Doran, 2009; Sagiv & Schwartz, 1995).

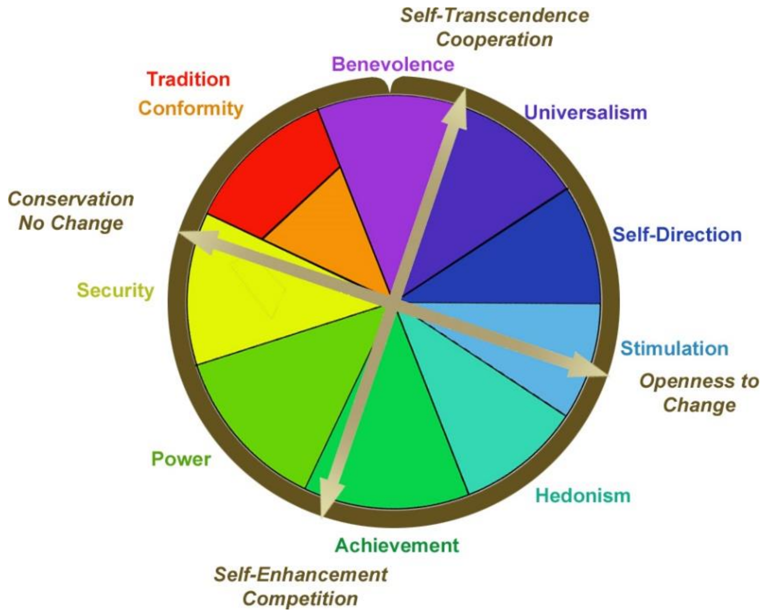

Figure 2. The Schwartz (1992) Values Circle

Values, like traits, are relatively stable (see review in Schuster, Pinkowski, & Fischer, 2019), but may change as an individual's needs, physical state, or environment changes (e.g., Bardi, Buchanan, Goodwin, Slabu, & Robinson, 2014; Vecchione, et al. 2019). Values have also been found to be heritable (Twito & Knafo-Noam, 2020; Zacharopoulos, Lancaster, Maio, & Linden, 2016) and to share a common genetic root with traits (Schermer, Vernon, Maio, & Jang, 2011). While some genes affecting personality seem to have been identified (e.g., Sanchez-Roige, Gray, MacKillop, Chen, & Palmer 2018), exactly how genes inform traits or values remains a mystery. Without the ability to identify and measure the genetic, physiological, and neurological processes underlying them, the challenges presented to those seeking to understand how each contributes to personality are considerable.

Known relationships between traits and values

There are systematic correlations between values and all trait dimensions apart from neuroticism (Parks-Leduc, et al. 2015), mirrored in similar terminology: e.g., curiosity, excitement-seeking, self-discipline, and achievement-striving (traits), and curiosity, excitement, self-discipline, and achievement (values). According to McCrae and Costa (1999), individuals are predisposed to exhibit traits such as curiosity and self-discipline without necessarily considering the corresponding values important. However, individuals tend to exhibit behavior consistent with their most important values (e.g., Bardi & Schwartz, 2003, Skimina, Cieciuch, & Strus, 2018). Vecchione, et al. (2019) found that values did not predict traits, but high levels of agreeableness and openness exerted an influence over the development of benevolence and self-direction respectively. However, in a previous study, Vecchione, Döring, Alessandri, Marsicano, & Bardi. (2016) found the values of children more predictive of behavior than traits were of values; albeit that a reciprocal relationship between the two seemed to be operating.

The 56 values are systemically related such that the relative importance of one may affect the expression of all others (Schwartz, 1992), whereas the 30 trait facets are partially correlated with and partially orthogonal (De Young, Peterson, & Higgins, 2002) to each other and values. The frequency and intensity with which all traits are expressed, and the relative importance attached to each value may be infinitely variable. Accordingly, interactions between personality traits and values are complex (Vecchione, et al, 2019).

Personality, traits, and values in a broader context

Identifying schema to explain the apparent complexity of the natural world is perhaps the unifying challenge of all scientific endeavour. In physics these are represented by the theories of general relativity (Einstein, 1916) and quantum mechanics (e.g., Feynman, 1949; Heisenberg, 1927; Schrödinger, 1926), partnered with the Standard Model of Elementary Particles and a set of universal constants. In evolutionary biology, Darwin's (1859) theory of natural selection, as updated by the modern- and second-syntheses (e.g., Provine & Mayr, 2013), provides a robust theoretical account of the simple mechanism by which all life evolves. Given human brains are complex adaptive systems (CAS) (Simon, 1995) of particles that evolved with respect to universal physical laws, insights from physics, biology, and complexity theory may enable us to develop a clearer, more fundamental understanding of the nature of personality, and of traits and values, than is possible within the conventional boundaries of psychological science.

Personality has been described as ‘the dynamic organization within the individual of the psychobiological systems that modulate … adaptations to a changing internal and external environment’ (Cloninger, 2004, p.374). It is invoked to describe consistent differences in behavior between all animals (Wolf & Weissing, 2012); even single celled bacteria (AMOLF, 2017; Keegstra, et al, 2017). It is apparent that personality is inferred when categorically similar individuals consistently behave differently in the same environment, suggesting the presence of hidden internal mechanisms or motivations. For example, the bacteria investigated by Keegstra, Kamino, Anquez, Lazova, Emonet, & Shimizu (2017) had identical DNA yet behaved differently in the same environment due to differences in their protein network (i.e., in the physical connections between cellular proteins).

All organisms are CAS (Adami, Ofria, & Collier, 2002; Brown, 1995) as are many inorganic systems, e.g., weather and oceanic (Carmichael & Hadzikadic, 2019). One of the characteristics of CAS is that perfect knowledge of all their components does not necessarily convey a perfect understanding of their behavior (Miller & Page, 2007). Accordingly, their behavior can be unpredictable and idiosyncratic: as if they have ‘a personality’; which may explain the personification of environmental CAS in the gods of ancient mythology: e.g., Horus, Thor, and Tempestes (weather), and Anuket, Poseidon, and Neptune (water).

The hidden mechanisms of human personality include thoughts and feelings, which may be expressed through actions, statements, facial, and bodily movements (e.g., Doherty, 2008). In common with all other organisms, such behavioral traits mediate the interaction of individuals with their environment (Sih, Ferrari, & Harris, 2011) toward meeting their needs (McEwen & Wingfield, 2003). As their environment changes so may their characteristic patterns of behavior.

An organism's environment logically comprises all the information impacting upon it, whether external or internal in origin. All animal behavior reflects the function of neural systems (National Research Council (US), 1989). A human brain has around 100 billion neurons with 10^{15} neural connections (DeWeerdt, 2019). Potential interactions in the internal environment of a human brain, let alone their interactions with a vastly more complex and variable external environment, give rise to a system of intractable complexity. However, human brains, and the greater CAS of which they are part, comprise and evolved from relatively simple atomic and molecular interactions. The interactions between hydrogen and carbon-based molecules that first evolved into organic metabolism (e.g., Sousa, et al., 2013) may have lacked the complexity associated with personality, nevertheless even they are amenable to consideration in terms of its motivational and behavioral components.

Fundamental environmental interactions

Motivation related to survival and reproductive needs is readily comprehensible in the context of living CAS, but not to hydrogen and carbon-based molecules. However, a universal equivalent of need – i.e., a compelling requirement – finds expression in the related principles of the second law of thermodynamics, minimization of total potential energy principle (MTPEP), and principle of least action. These underpin both evolution through natural selection (Ramstead, Badcock, & Friston, 2018), in which the genes of the best adapted, most efficient organisms are preferentially selected, and Feynman and Hibb's (1965) quantum mechanical path integrals that describe how the most efficient trajectories for systems are 'selected' from infinite possibilities.

According to the MTPEP, a body or system will tend to undergo change until it minimizes its total potential energy. Gravitational and electromagnetic fields imbue all massive and/or charged particles with potential energy, which is converted into kinetic energy under the effects of attraction or repulsion. Because of the infinite reach of these fields, all things contribute to the environment of all other things, so giving rise to a universal, all-pervasive motivation for change. In practice, due to the strength of electromagnetic and gravitational fields diminishing by the square of the distance from their source, proximity exponentially exaggerates motivational influence on behavior. Therefore, it is the relationships between proximate particles and systems that most influences their behavioral traits, and their ability to form new systems.

Protons and neutrons, the nucleons upon which all matter is based, are systems that only formed when environmental conditions in the early universe allowed, and only combined with electrons to form atoms of hydrogen and helium c.370,000 years later, when the intensity of energy in their environment dropped sufficiently to allow stable relationships between them and nucleons to be established (Tanabashi et al. 2018). Due to nucleons being 20,000 times more massive than electrons and, in the case of protons, oppositely charged, they are the most significant influence on electrons in their local environment: capturing them and determining their permitted orbital energy levels. Subsequently, in the intensely energetic environments of stars and supernovae, these basic atomic systems interacted, giving rise to heavier, more energy-efficient and stable systems; including the larger elemental building blocks of life: carbon, nitrogen, and oxygen. Further localised environmental changes potentiated the formation of progressively larger and more complex systems, each with distinctive emergent traits (e.g., Gregory, 2008).

The shared internal environments of atoms both determine and potentiate their traits. The sizes of their nuclei determine their stability, mass, and the number, and energy levels of, electrons in their outer valence shells (Bethe & Bacher, 1936). These factors explain why potassium tends to be highly reactive and argon is considered inert. But even these innate propensities are the product of, and subject to, environmental interactions. For example, the masses of nucleons, and of their constituents, are derived from interactions between their binding energies and the Higgs field (CERN, 2020). These propensities potentiate different traits in different environments. Potassium bursts into flame in water, tarnishes in air, and remains a stable shiny metal in mineral oil. Even 'inert' argon can be induced to react in an appropriate environment of hydrogen and fluorine (Khriachtchev, Pettersson, Runeberg, Lundell, & Räsänen, 2000). As with organisms, these traits mediate between the MTPEP-related 'needs' of atoms and their environment: largely through electrons seeking more energy-efficient configurations. The traits associated with simple chemical reactions may be predictable, but in more complex chains of reactions this predictability may be lost.

Chemical reactions are facilitated by the emission and absorption of photons by electrons orbiting atomic nuclei. The energy levels of permitted electron orbits follow prescriptive criteria characteristic of each element. As systems undergo change electrons may be energised such that they jump to higher energy orbits, and then, in accordance with the MTPEP, kinetic energy is released in a stream of photons as the electrons drop back to lower, stable energy states (Bohr, 1913). Electrons emit and absorb photons with energy values matching differences between the permitted orbital energy levels of the elemental atomic system to which they belong (Bohr, 1913). Photons with energy levels that fail to correspond to such differences cannot be absorbed and so are 'ignored' by an atom's electrons. When the energy received from photon bombardment exceeds the capacity of atoms to absorb it by moving electrons to higher orbits, electrons may break free (the photo-electric effect, e.g., Wheaton, 2009). This gives rise to positively charged ions attracting free electrons, facilitating a flow of electrons from locations with higher potential energy values to those with lower potentials (electricity). However, the direction of photon emission, and therefore exactly where photons will be absorbed appears randomly selected. This introduces variation upon which MTPEP based natural selection may act.

With what is effectively a photon-based currency, complex systems of atoms conduct energetic transactions that facilitate change. Each transaction operates like a binary switch: either a photon is emitted/absorbed or not. In the CAS of the human brain such transactions form the basis of all neural activity: all human perceptions, feelings, thoughts, and actions. Neural processing of information involves trillions of such binary yes/no 'decisions': neurons fire or not dependent on the rate of photon transactions, so representing the underlying 'decisions' of electrons and photons. In neural processing, as with photon exchange, if information matches prescriptive values-based criteria it is more likely to be absorbed and acted upon (e.g., Herz, Zavala, Bogacz, & Brown, 2016).

In systems of atoms such as organisms, behavioral traits may be considered outputs arising from systemic, values-based processing of environmental inputs that mediate between systemic 'needs' and the wider environment. In determining what information is of interest to individual humans, and what response it generates, it is apparent the role of personal values is not only comparable to the selective role of orbital energy values of electrons, but fundamentally reliant on it. An individual with a motivational system in which the values of curiosity and creativity (part of self-direction) are the most important is likely to find a wide range of information interesting, and so is more likely to absorb it and link it to creative outputs than someone for whom these values are relatively unimportant (e.g., Lebedeva, Schwartz, van de Vijver, Plucker, & Bushina 2019).

The action of photons on atoms, through their electrons, motivates them to occupy locations and form relationships that best satisfy the MTPEP in the context of the greater systems of which they are part. The behavioral traits of atoms mediate between them and their molecular environment. The traits of molecular genes mediate between them and the environment of the genotype, the traits of which are expressed in phenotypes, which mediate between organisms and their environments. All these systemic interactions are driven toward energy-efficiency in accordance with the MTPEP; the most energy efficient being those favored by natural selection; i.e., those that maximise survival and reproductive outputs per unit input cost.

Making sense of evolving complexity

The behavior of relatively simple physical systems such as atoms and molecules may be predictable, but the precise behavior of their component electrons and photons is not (e.g., Heisenberg, 1927). The predictability of simple systems agrees with the averaging out of probabilistic quantum events (e.g., Feynman & Hibb's, 1965), but still quantum uncertainty (Heisenberg, 1927) may contribute toward the chaotic, apparently non-deterministic behavior we associate with personality in macroscopic CAS (Brun, 1995).

The behaviors of CAS components change in response to those of others to which they are systematically networked (their environment). In large systems the number of components and possible interactions - including recurrent feedback loops - is so great as to render conventional analysis impractical (Miller & Page, 2007). In computer models of CAS, algorithms may be run cyclically to affect all components of a system in ways that mimic intergenerational genetic processes, including the potential for the algorithm to mutate. Each iterative running of the algorithm motivates the evolution of the system. The states of individual 'cells' within a CAS are determined by the algorithm with reference to the states of neighbouring cells. In organisms, Hox genes rely on comparable programming: responding conditionally to location-sensitive cues to 'switch off' specific genes; the effect of which is to delineate and define new rules for the development of different somatic regions (e.g., Lemons, 2006).

Emergent patterns in the behaviour of cell populations in CAS can be considered in terms of changeability/stability – i.e., resistance to being overtaken by alternative quasi genetic strategies - and whether these are cooperative or competitive; reflected in stasis or change that is coordinated and orderly (cooperative) or chaotic (competitive) (Kauffman, 1995). The relationship between cooperative and competitive schema or strategies is reflected in the structure of the Schwartz (1992) system of values and can be explored with The Prisoner's Dilemma. This product of game theory was developed from the work of Flood & Dresher (Poundstone, 1993) to represent interactions in which the destiny of two players is determined by a co-dependent decision each makes without knowledge of how the other will decide. Axelrod and Hamilton (1981) were the first to use iterated versions of the Prisoner's Dilemma game, involving multiple players and competing strategies, to illustrate how cooperative strategies – i.e., those targeted at optimising joint benefits – could outcompete competitive strategies – i.e., those seeking to maximise their advantage over other players. Axelrod (1997) went on to relate this work to complex, agent-based models of competition and cooperation, and to incorporate insights from the Prisoner's Dilemma into the study of Holland's (1975) genetic algorithms and CAS.

The binary option before players in The Prisoner's Dilemma is whether to cooperate or defect (i.e., compete). The game, which may be played over many rounds, may be scored in accordance with the matrix shown in fig. 2.

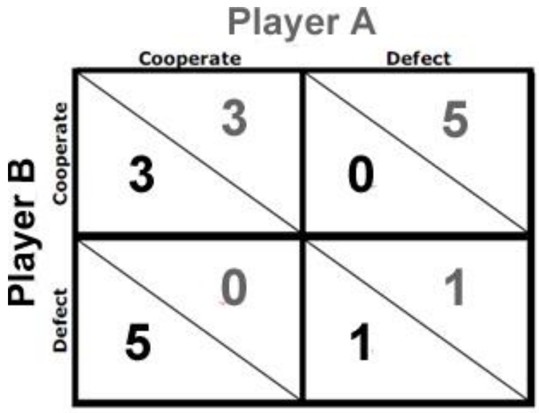

Figure 2. Prisoner's Dilemma Scoring Matrix

In the single round version of the game an attractive strategy is to always defect (compete), because it offers the opportunity to score the maximum 5 points and cannot be beaten by the other player. However, in iterated versions of the game it is better to cooperate by default but retaliate to punish a competitor (Axelrod & Hamilton, 1981). Unless competitive players can exploit a limitless resource of players pursuing 'always cooperate' strategies, they will likely encounter repeated rounds of costly conflict in which they score only 1 point. This illustrates the relative advantages of competitive and cooperative strategies. In the short-term, competition offers the greatest potential for personal gain and minimises the potential for personal loss relative to one's opponent, but, in the long-term, against a rational or otherwise adaptive opponent, it is suboptimal. In the long-term, cooperation offers the greatest potential for gains, both personally and collectively.

If points are taken to represent energy, the pattern of pay offs in the Prisoner's Dilemma can be used to model the interaction of natural systems. If two systems combine to maximise local energy conservation and minimise loss (3 + 3 = 6) this may be taken to represent cooperation. The combination of two oxygen atoms to form an O_2 molecule achieves a comparable outcome. If the two compete, much energy is lost from their conjoined system (6 – (1 + 1) = 4), leaving each with a much-reduced share of residual energy (2/2 = 1). This might be considered comparable to such violent interactions as that between potassium and water. If one component quickly overpowers the other this may be considered equivalent to the compete/cooperate combination, in which one system consumes the other (leaving it with 0 points – 'the sucker's pay-off') and less energy (1 point) is lost in the conflict, leaving a greater residual (6 – 1 = 5). A planet absorbing the energy from a meteorite might be considered representative of this. In all these examples, unlike in Prisoner's Dilemma gameplay, in the absence of intent, 'strategies' may be deemed cooperative or competitive dependent on their ability to conserve energy in the environment in which they play out.

Trivers (1971) was among the first to associate the principles of the Prisoner's Dilemma with the evolution of reciprocal altruism (cooperation) in organisms. Unlike point scoring in the Prisoner's Dilemma, organisms interact such that accumulated energy is available to influence future 'rounds of play'. Therefore, cooperating systems may gain power and competitive advantages over equivalents playing competitive strategies.

While it may be possible for systems using competitive strategies to inflict successive 'sucker's payoffs' on components of larger cooperative systems, providing cooperative systems retaliate quickly with targeted competitive strategies, their greater resources may allow them to overcome and eliminate competitors and remain relatively stable. This is effectively how organisms fight infection. Organisms' cells and cellular systems are programmed to play cooperative strategies that benefit the whole organism but have subordinate immune systems programmed to seek out and destroy bacteria, viruses, and other competitors (Nowak and Highfield, 2012).

Nowak and Highfield (2012) illustrated the limitations of unmoderated competitive strategies within a system with reference to cancer cells. The mutated genetic programming of cancer cells effectively causes them to defect and deliver successive sucker's payoffs to other cells: multiplying at their expense until the cooperative systems on which they and the host organism is dependent break down; bringing about their mutual destruction.

When considering the evolution of CAS in these terms, it is apparent that the interaction of two factors is involved: (1) propensity to change, and (2) the strategy by which change is transacted – cooperation or competition. These correspond to the axes of the Schwartz (1992) system of values: (1) conservation to openness to change, and (2) self-enhancement (competition) to self-transcendence (cooperation). Given that the universe, earth's ecosystem, humanity, individual humans, and neural systems responsible for generating our system of values are CAS, this congruence of structure suggests a shared ancestry which might allow their co-evolution to be considered in relation to a universal equivalent of Schwartz's (1992) circle (UESC).

For any system to attain equilibrium and stability it must have minimized its total potential energy locally. Its components must have achieved a cooperative state in which energy is being conserved. All such stable systems can therefore be mapped in the conservation/cooperation quadrant of the circle, as illustrated in figure 3.

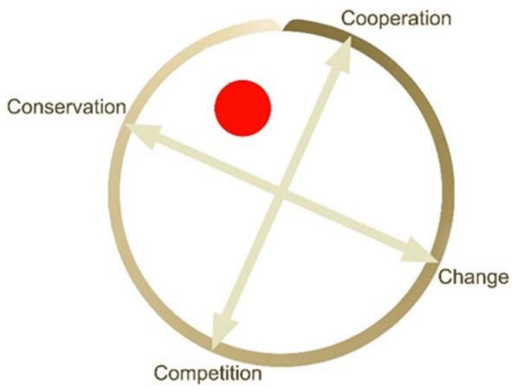

Figure 3. The red marker represents the location of a unified strategy (or combination of component strategies) of any stable system in relation to a universal motivational map with a structure equivalent to that of the Schwartz (1992) circle (UESC)

Stable systems (such as atoms of carbon and hydrogen) with motivational value-equivalents mapping in the conservation/cooperation quadrant are driven together and interact on terms defined by what may be considered a universal motivational algorithm (UMA) comprising all universal physical laws. The collision between them changes their momentum and releases kinetic energy, which becomes available as activation energy (Tolman, 1977). If this exceeds a certain threshold it will destabilize them and potentiate the creation of a new system or systems. Destabilization reflects and heralds change within the systems: moving them outside the conservation/cooperation quadrant of the UESC. Their potential energy increases temporarily to a transition state, before settling into a new stable state, or, if divided, stable states (as illustrated in figures 4 and 5). This will only result in increased complexity if the more complex configuration is more energy-efficient than the other possibilities given environmental constraints.

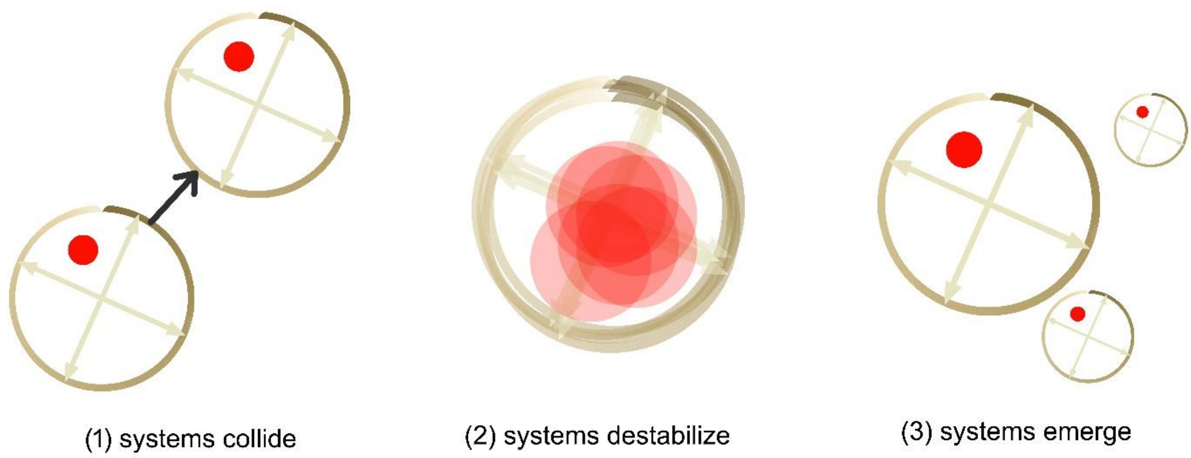

Figure 4. Value-equivalents of colliding and emerging systems in relation to the UESC

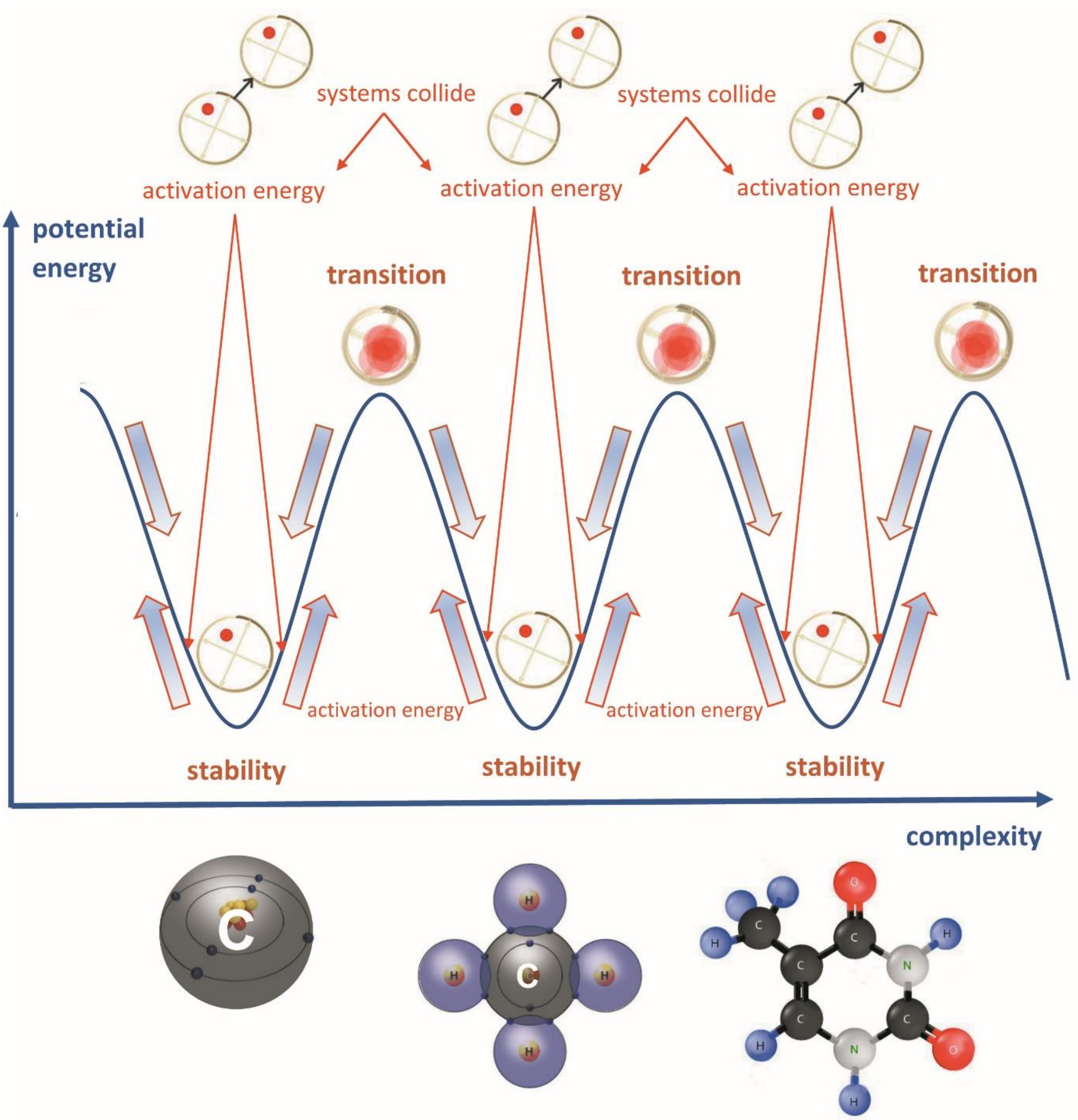

Figure 5. Systemic evolution in relation to potential energy and the UESC, potentiating the emergence of increasingly complex systems.

The evolution of local systems can be considered in phases. In each, increasingly complex configurations may emerge: from quarks and electrons, to protons, neutrons and atoms, to molecules, to more complex molecules, to self-replicating molecules, to organisms (Heylighen, Bollen, & Riegler, 1999).

For stable pre-biotic systems, located in the conservation/cooperation quadrant of the UESC, change must be initiated externally. While systemic instability arising from components engaged in competitive activity may be sustained in systems such as radioactive elements for limited periods, energy loss continually depletes them. Other systems, such as Benard cells that form when certain oils are heated, may persist in ‘far from equilibrium’ states (Kondepudi & Prigogine, 1998), but these are not self-sustaining. They endure by the absorption and dissipation of energy but cannot orchestrate its acquisition. While Benard cells are passively dependent on external energy sources, organisms achieve a similar form of dynamic stability (England, 2015) through evolved mechanisms that actively capture and process energy.

The evolution of the first living organism, running an ‘algorithm’ written into its DNA, RNA and/or proteins, can be considered to represent the emergence of a local system capable of autocatalyzing sustainable internal change (e.g. Mossel & Steel, 2005). As such, it marked the emergence of a CAS capable of maintaining itself by means of coordinated cooperative and competitive strategies with value-equivalents populating areas of the UESC other than the conservation/cooperation quadrant.

Cooperation between internal components maximises the efficiency and stability of a local system. However, competitive internal strategies are implicit in the processing of energy to sustainably power dynamic systems. Stable systems in perfect equilibrium, by definition, cannot evolve. Living systems exist in far from equilibrium states (e.g., Ornes, 2017) that maintain a balance between the efficiency and sustainability of cooperative strategies and the disruptive potential of competitive strategies.

Perversely, and as discussed previously, the most cooperative systems have the potential to be the most competitive, and the systems best able to satisfy the MTPEP may accumulate the greatest potential energy and power. Evolution of complex organisms by natural selection proceeds on this basis over the long-term: lowering the entropy of organisms (Sabater, 2006) as a consequence of a universal trend toward greater entropy. Systems/organisms able to process the largest quantity of energy – i.e. absorb and dissipate it – become better adapted to their environment (England, 2015), and so will tend to be favoured by natural selection. The associated accumulation and throughput of energy increase the ability of the system to perform work. The more this contributes to greater efficiency-enhancing cooperation within the organism's immediate and extended local systems, the better adapted the system/organism will become. In this context it is apparent that competition serves the equivalent of a waste management function in dynamic systems: removing that which undermines cooperative efficiency.

Mechanisms motivated to attack and break down (i.e., compete with) invading organisms, ingested food, and dead cells are examples of system components enacting competitive strategies that serve an overarching cooperative strategy. As such, these strategies relate to value-equivalents in the lower, competitive half of the UESC. For complex organisms to sustain themselves in dynamic, sometimes chaotic environments, the flexibility associated with value-equivalents in the pro-change half of the UESC is also required.

By weeding out the genes of organisms with traits least well-adapted to their environment, natural selection tends to reduce variance (Dawkins, 1978), and so the potential availability of genes capable of generating traits better suited to changing environments. Without the mutational effects of quantum uncertainty (Slocombe, Al-Khalili, & Sacchi, 2021) and environmental effects on genes, natural selection would be deprived of the variation necessary to sustain evolution. In computer models of CAS, which map the evolution of systems in relation to fitness landscapes[1], it has been found that evolutionary systems tend to get stuck on suboptimal peaks, and, if they are to evolve toward higher peaks, it is necessary to endow gene-mimicking algorithms with the ability to generate destabilizing random elements (Kaufmann, 1995).

A capacity for similar, internally generated experimentation is not only a key component of human creativity, but of biological processes that must adapt to uncertain environmental conditions. For example, exploratory behavior is programmed into the genes responsible for cellular construction. The microtubules that make up cellular cytoskeletons randomly grow outward from nuclei, and if they fail to make a connection with the cell membrane that satisfies certain criteria they shrink back to be replaced by new ones growing in different directions. Only when certain structural goals have been achieved does the cell assume a stable form best adapted to its environment (Kirschner & Mitchison, 1986). Comparable experimental behaviour, in which variation and selection are in evidence, can be seen in the chaotic distribution of plant seeds by air, water, and animals. However, such capabilities to explore, discover, and instigate change (strategies associated with value-equivalents on the 'openness to change' side of the UESC) pale against those of neurologically advanced humans. Equipped with brains capable of more sophisticated information storage (memory) and processing (intelligence), humans can instigate change in ways that suggest far greater levels of autonomy.

The brain can be considered a CAS that has emerged within the greater somatic CAS of which it is a part; one capable of modelling and feeding back to affect the behavior of the somatic system, its immediate environment, and, increasingly, the universal system beyond (Simon, 1995). In creating a

[1] Three dimensional representations of the relative abilities of algorithmic quasi genetic strategies to outcompete others to maximise their frequency in successive generations, in which relative success is represented as height on the z-axis of a virtual landscape.

virtual representation of the sometimes-chaotic behavior of external environmental systems, rather than evolving only in response to involuntary interactions with these, human consciousness enables us to initiate virtual interactions in our heads. Abilities to visualise and distinguish between the characteristics of things and conduct physical experiments based on thought experiments enable us to innovate and self-direct evolution, and so internalise schema from the universal system.

An Evolutionary Theory of Universal Value-Equivalents - Personal values and universal equivalence

Deutsche (Deutsch, 2011, p59) describes humans as universal constructors: “factories for transforming anything into anything”. Turing (1950) talked of a learning machine capable of mirroring the principles of evolution. Not only has humanity created such machines in computers running CAS simulations, but it is apparent the human brain responsible for designing and building such machines is itself one: one that has used theory, observation, data, and technology to build an increasingly accurate model of its environment.

As previously discussed, the process by which electrons ‘decide’ whether photons will be emitted and absorbed is effectively mirrored in that by which neurons ‘decide’ to fire, and humans decide to act. Consistent with Gell-Mann’s (1994) description of how CAS may evolve to replicate schema in the greater system of which they are part, and Simon’s (1995, p.26) description of CAS as "sets of boxes nesting within sets of boxes", it seems reasonable to suggest the Schwartz (1992) system of values may be a replication of a universal schema, i.e., the UESC. If, as we suggest, it is possible to locate all evolutionary strategies somewhere in the UESC, equivalents of each of the ten values identified by Schwartz (1992) may represent umbrella strategies for all such subordinate strategies. So, while human values relate to memes, which are subject to cultural selection (Dawkins, 1978), it may be possible to infer pre-existing physical and biological value-equivalents for particle-based and genetic schema subject to natural selection.

Values on the conservative half of the Schwartz (1992) circle and examples of how their UESC equivalents find expression in physics and biology.

The conservation values

Tradition represents replication and continuity across time. A hydrogen atom is the same today as it was billions of years ago. Meiosis copies genes from one generation to the next.

Conformity represents replication across space. A hydrogen atom in one location is indistinguishable from one in another. Mitosis copies genes across organisms in concurrent generations.

Security regulates change in relation to boundaries and rules. Electrons abide by rules and observe boundaries determined by their nuclei. Nucleotide pairs observe molecular rules, genes observe chromosome boundaries, and phenotypes observe genetic instruction.

The competitive values

Power relates to environmental influence and control. Atomic nuclei influence and control orbiting electrons. Genes influence and control somatic functioning and phenotypes.

Achievement relates to the pursuit and advertisement of success in relation to widely accepted standards. For non-living systems, such as atoms, the equivalent of achievement is arriving at and maintaining a stable physical form. For organisms, natural selection favours genes that: promote success in survival and reproduction, the promotion of fitness indicators that advertise such capabilities, and the ability to recognise and distinguish reliable indicators in others.

Evolving the potential for internally generated change

Humanity is uniquely endowed as an agent of its own evolution. Other organisms evolve primarily through genetic mutation. For them, the 'achievements' of survival and reproductive success derive from genetic accidents. The biological mechanisms they give rise to are judged by natural selection in terms of their relative energy-efficiencies; those offering the greatest returns on energy invested being favored most.

For complex organisms, abilities to recognise, evaluate, and distinguish opportunities and threats in their environment are keys to survival and reproductive success. These are aided by brains capable of replicating environmental schema that may serve as internal reference models for their cognitive systems, whether these concern the memory assisted visio-spatial capabilities of rodents in mazes (Vorhees & Williams 2014), or human soldiers in complex multi-layered environments (Walker et al., 2009). These allow previously recorded information to be compared with new inputs to assist decision-making and guide behavior. Since opportunities and threats may be many and various, the CAS that evolved to become brains would necessarily have been capable of processing, coordinating, and extracting meaning from photon-based information from many different sources in different environments. Such flexibility suggests multi-functional processing with the potential to deliver computational advantages over other organisms analogous to those of computers over single purpose devices such as typewriters, telephones, and calculators. The complexity of the genetic system that facilitated the evolution of such advanced information processing capability in humans (e.g., Plomin & Deary, 2015) may have been a gateway event (e.g., Morowitz, 1999) that gave our ancestors an enduring competitive advantage over other organisms. The more complex the interaction of genes, phenotypes, and environment required to facilitate such processing, the less likely it would have been that selection pressure on random gene mutations in competing organisms would have given rise to combinations capable of facilitating effective counter measures. If this cut the genome of our ancestors some slack from the pressures of natural selection, otherwise costly genetic mutations offering no competitive advantage, that would otherwise have been eliminated, would more likely have been tolerated and passed on. This may have been sufficient to allow the evolution of greater propensities for randomised behavior and experimentation, i.e., investment of energy in speculative activities offering no immediate return. The larger the surplus available, the greater the capacity for risk-taking, and the greater the possibility of realising long-term benefits. If long-term benefits were realised, selection pressure on genes supportive of potentially fruitful experimentation would logically translate to the increasing influence of strategies associated with value-equivalents on the pro-change half of the UESC.

Equivalents for the values of tradition to achievement (and localised cooperation associated with benevolence) may be inferred in all enduring systems. However, whereas these values represent a spectrum of cooperative and competitive strategies in the Schwartz (1992) model, for stable pre-biotic systems their equivalents appear indivisible. The 'cooperative' stability of a hydrogen atom relates to an equivalent of benevolence (energetic equilibrium: balanced sharing of resources: the essence of cooperation), maintained though time (tradition) and space (conformity) such that hydrogen atoms successfully continue to populate the universe (achievement). It is only with the evolution of living CAS that differences in strategies can be considered to differentiate equivalents of these values. By the time organisms had evolved to select between potential mates it can be inferred that an equivalent of achievement is influencing their own evolution; causing them to reject pre-existing (traditional) traits in favour of new fitness-enhancing (more powerful) traits, and so gradually replacing pre-existing (traditional) genes and gene combinations with 'higher achieving' alternatives.

The progressive values

Hedonism indirectly promotes experimentation through having fun and stimulation more directly through seeking novelty and adventure. As such, these values are less easy to find equivalence for in non-living systems. However, the non-linear behavior they promote invites comparison with the chaotic interactions between local systems that bring about novelty in the form of emergent systems. Equivalent experimentation in the genetic realm, and the innovation that occasionally results, are heavily dependent on mutation arising from chaotic interactions between DNA molecules and high energy particles in their environment (e.g., Lodish, et al., 2000). As such, equivalents of these values might be inferred in the universal system of which these local systems are part, but not in these local systems themselves. However, internal equivalents may be inferred in the previously described experimentation of complex systems such as living cells and plants. Organisms exhibiting behavior suggestive of a desire to have fun include apes (Pellegrini, Dupuis, & Smith., 2007), octopi (Zylinski, 2015), dolphins (Kuczaj & Eskelinen, 2014), and dogs (Bekoff, 2015). While playful activity may be also be attributed to social insects, it is most usually associated with invertebrates with brains large enough to support complex behaviors and cognitive abilities (Graham & Burghardt, 2010; Zylinski, 2015).

The ‘innovations’ enabled by the largely random genetic experimentation of mutation come at the cost of many ‘failed experiments’ that disadvantage or kill organisms (e.g., Keightley & Eyre-Walker, 2010). The memetic experimentation associated with the values of hedonism and stimulation is likely to be far less costly and may yield information individuals may learn and benefit from in their lifetimes. Intelligent, meme generating neural CAS effectively enable the local systems of individuals to internalise pre-existing, universal equivalents of experimentation, learning and innovation imposed on the local systems of genomes.

Self-Direction enables the creation of internally generated action plans to guide future development. It is apparent that some highly intelligent organisms such as dolphins and chimpanzees have enhanced abilities to self-direct (e.g., Morrison & Reiss, 2018), but humanity appears to have a unique capacity for independent thought and action. Perhaps the only pre-existing equivalent of self-direction in the universal system is provided by the UMA itself, and its directional goal of minimizing total potential energy in the direction of the arrow of time.

Universalism promotes gaining an understanding of all people and of the greater natural system of which we are part. The targeted learning and logical approach to problem-solving and decision-making facilitated by self-direction are readily associated with the concepts of elaborative interrogation and self-explanation identified by Dunlosky, Rawson, Marsh, Nathan, & Willingham. (2013) as facilitating an expanding knowledge base. A diverse and expanding knowledge base presents new learning opportunities as patterns within it are discovered and explored. When hitherto hidden connections are revealed, opportunities to acquire deeper levels of understanding present themselves. The feedback loop of inquiry-discovery-knowledge-inquiry potentiates an individual building an increasingly large and accurate virtual model of the universal system of which he or she is part. Other organisms may have functionally effective, if constrained, models of their environment, but that of humanity appears to be the closest to universality. The only inferable pre-existing equivalent of universalism would seem to reside in the universe itself: the nature of which the human brain, as a universal constructor, seeks to replicate in virtual form.

Benevolence (honesty, helpfulness, forgiveness, etc.) perhaps represents the motivational essence of cooperation. As such, an equivalent of it may be considered the basis of all stable systems, which is reflected in its location next to tradition and conformity (representing temporal and spatial stability respectively) in the Schwartz (1992) system. It is also the facilitator of shared learning that accelerates the acquisition of universal knowledge, and the realization that cooperative strategies provide the greatest overall returns on investment. All of which is reflected in its location next to universalism. If an individual lacks a universalist outlook, their benevolence is more likely to be allied to the localised and tribal beliefs associated with the value of tradition. Such benevolence is comparable to that encouraged by genetic relatedness – most pronounced in social insects (e.g., Hamilton, 1972) - and the reciprocal altruism exhibited by other species such as rats (e.g., Dolivo, Rutte, & Taborsky, 2016). So, while equivalents to benevolence are to be found in all organisms, only in humans can it be rationally derived from and supported by universalism. A universal equivalent of benevolence could be inferred in the principle of conservation of energy, which effectively says of energy 'what goes around comes around', enabling local redistribution to form part of an overarching sustainable strategy.

An updated perspective on values and traits

Organisms closely related to humans, such as chimpanzees, share similar physical and behavioral traits (e.g., Zihlmann, Cronin, Cramer, & Saricj, 1978) and appear to manifest Big Five traits (King & Figueredo, 1997), while those more distantly related, such as slime moulds, fish, and trees, don't. This is unsurprising given that traits mediate between the needs of an organism and its environment (Sih, et al, 2011), and over billions of years, organisms have evolved to occupy just about every conceivable environmental niche on earth. Organisms adapted to survival in environments as hostile to humans as underwater volcanic vents are among those most distantly related to humans, and so can be expected to have relatively few common traits with humanity and our ape cousins. Those of chemosynthetic bacteria include deriving energy not from food or the sun as we do but from chemical imbalances in their environment, with which they synthesise organic compounds from inorganic carbon (Dick, 2019). Enduring consistency between organismic needs and environmental conditions is conducive to the evolution of stable, genetically encoded traits, whether in humans or other organisms. Those without the physical trait of a brain cannot exhibit, let alone share, our psychological traits.

The Big Five is not systematic (Block, 2010). Its traits, like all others, describe how a system – in this case a human being - mediates its interactions with its environment. The Big Five is an atheoretical categorisation of descriptors (Block, 2010) arising from differences in the needs and motives of human individuals as they relate to threats and opportunities in their environment. By contrast, values comprise a theoretical system (Schwartz, 1992) congruent in structure with what appears to be a universal motivational system. As such, by invoking equivalents to its values, it can be used to evaluate and correlate all systematic schema in terms of their propensity to accommodate or initiate change, and whether they are competitive or cooperative. How values-based strategies play out in different environmental niches will logically give rise to, and steer the evolution of characteristic traits, and so perceptions of personality.

Values and their pre-existing equivalents are abstract concepts, whereas directly observable traits may be considered real. It is a human trait that we can recognise the existence of values. Although some traits may be heritable and enduring, they may also be considered broadly circumstantial since they are generated by the interaction of specific genes and environments. They are not systematically related to each other, which suggests they are products of a mediating mechanism rather than representations of that system. While adaptive, values are trans-situational and systematic (Schwartz, 1992). While partially heritable (Twito & Knafo-Noam, 2020), and therefore genetically encoded, the systemic nature of our value system appears universal.

Traits, whether psychological, behavioral, or physical, interact with, and so become part of the environments we process with our values. Values serve as criteria by which environmental inputs are processed to guide decision-making and behavior (e.g., Bardi & Schwartz, 2013). Relatively stable environments promote trait stability (Briley & Tucker-Drob, 2014), with similar inputs being processed to elicit consistent patterns of output behavior. Over time, behaviors initiated in relation to specific goals may become habitual, i.e., persist independently of such goals (Wood & Rünger, 2016). As with the native language one speaks and the skills one acquires, such behaviors become traits. The establishment and reinforcement of supportive neural pathways, limited availability of resources to develop and maintain alternatives, and the brain's systemic drive toward energy-efficiency (Laughlin et al., 2003) encourage automated behavioral responses to environmental triggers (Wood & Rünger, 2016), even when these relate to new challenges for which other responses might better serve goal fulfilment (Wood & Rünger, 2016). This being the case, as traits become established, they become part of the environment to which values must adapt, and in which they are expressed.

When systems interact to bring about environmental stability, or dynamic stability as it is in the case of organisms, repetitive patterns of behavior may endure sufficiently to become subject to selection pressure, in which the genes that promote advantageous traits are preferred by natural and sexual selection (Dawkins, 1978). Even within the lifetime of an individual, behaviors known to improve health and attractiveness (e.g., Tovee, Reinhardt, Emery, & Corneilssen, 1998) may become habitual (Bandura, 2004). In common with other beneficial habitual behaviors such as skills, this is facilitated by the consolidation of supportive neural pathways (e.g., Yin et al., 2009). Whether by genetic or memetic means, such mechanisms have the potential to make traits increasingly independent from the influence of personal values and from the environment in which they are expressed.

Traits serve as outputs (when expressed) and inputs (when observed) that may be processed differently by different individuals (Molden & Dweck, 2006), who are likely to have different value systems, cognitive abilities, and experiences. Accordingly, while there may be broad agreement as to the words and actions of another person, as there might be to descriptions of other environmental outputs and inputs, these may be processed differently by, and provoke different responses in, people with different value priorities. The systematic nature of values ensures that external environmental inputs are processed such that the relative importance of each value affects the environmental inputs being processed by all others. So, while, for example, a power-driven individual may otherwise be motivated to say or do anything in pursuit of greater influence and control, trait selection is likely to be more restricted if conformity or security are similarly important, since these values encourage restraint of action (Schwartz, 1992).

While personal values would appear capable of influencing and therefore preceding traits, this is not what they always do (e.g., Vecchione, et al., 2016). Consistent with humans being CAS within other CAS, the behavior of any individual's components (physical or psychological) affects the environment of all others, so affecting the system of the individual and all external systems with which it interacts. So, while any given set of value priorities may encourage certain traits in any given environment (e.g., Bardi & Schwartz, 2003), any changes in traits or trait/environment interactions will change the environment, which may, in turn, affect values (e.g., Bardi, et al, 2014), setting up a feedback loop between values and traits. For example, in accordance with a known tendency toward values/environment alignment (Bardi, et al., 2014), and in line with Gelfand et al's (2011) finding that citizens of 'tight' authoritarian societies are more conformist than those of 'looser' libertarian societies, if imprisoned in a violent, authoritarian environment from which there is no escape, even a highly self-directed individual seems likely to become more obedient. They might simply change their behavior in the short-term, but eventually it seems likely they will give less importance to self-direction and more to conformity.

While personal values could not precede traits when the latter are genetically encoded, the equivalent precursors of personal values, i.e., value-equivalents, could. When traits are acquired by habit, it seems likely the personal values held by the individual at the time of initiation will have played a role in mediating the process. The co-evolving relationship between values and traits this suggests would account for correlations between traits and values (Parks-Leduc et al., 2015), the shared genetic foundations of each (Schermer, et al, 2011), and the ability of traits and values to influence each other (Vecchione, et al, 2019).

If all behaviors and traits can be considered to represent manifestations of strategies that can be located somewhere on a UESC, it is easy to imagine how correlations between traits and values would arise. The patterns of correlations reported by Parks-Leduc, et al (2015) would appear to follow broadly predictable patterns. Openness to experience traits correlate positively with values populating the openness to change half of the circle, and negatively with those on the conservation half. Agreeableness (i.e., behavior that minimises the potential for conflict) correlates positively with values populating the cooperative (self-transcending) half of the circle, and negatively with those on the competitive (self-enhancing) half. Extraversion (i.e., outgoing behavior that likely increases the imposition of an individual's personality on others and their environment) correlates positively with values in the competitive half, and negatively with those in the cooperative half. Conscientiousness (dutiful compliance and attentiveness in relation to a task) correlates positively with all the values on the conservation half, and negatively with the progressive values of hedonism and stimulation. Adding to the Big Five with the sixth honesty/humility dimension of HEXACO, we find that its high pole correlates strongly with the cooperative value of benevolence (which includes the component value of honesty) and its low pole with the opposing competitive value of power (Anglim, Knowles, Dunlop, & Marty, 2017).

The exceptional trait in terms of its relationships with values is neuroticism, in respect of which correlations are practically non-existent (Parks-Leduc, et al., 2015). Given that people are happier and more content when they live in accordance with their values (e.g., Michelson, Lee, Orsillo, &

Roemer, 2011), and people's choices are influenced by their values (Feather, 1995), it may be that relationships between neuroticism and values are particularly dependent on the alignment (cooperation) or misalignment (competition) between values and environment. The values on the conservation half of the circumplex have been associated with anxiety (Schwartz, 2010), and trait facets such as anger/hostility and vulnerability are readily relatable to the frustration of/threats to the value of power. However, the unease or lack of contentment that one associates with neuroticism could arise from a lack of alignment between any value (or set of values) important to an individual and their environment. Such misalignments effectively create competition between values and the environmental systems in which an individual would otherwise seek to express them. It is perhaps worth adding that cooperation between values and environment is not restricted to cooperative (self-transcending) values. The performance, psychological and physical well-being contributions of person-environment fit seem to relate to values-congruence in general (Bouckenooghe, Buelens, Fontaine, & Vanderheyden, 2004; Bretz & Judge, 1994; Meglino, Ravlin, & Adkins 1989).

Given every value contributes to the motivational environment in which other values operate, lack of alignment and consequent emotional instability may also arise in those who attach similarly high levels of importance to conflicting values (e.g., Sverdlik, 2012), regardless of the wider environment in which they find themselves. Conflicting motivations raise the potential for individuals to experience stress as one value, or set of values, motivates them to seek out environments ill-suited to other values similarly important to them. For example, an individual who highly values both power and stimulation may, due to the influence of power, find the prospect of failure and, by association, making a fool of themselves, stressful, but rather than minimise the risk of these though familiarisation with and repetition of an activity, they feel compelled by the influence of stimulation to persistently move on and try out new things.

Testing the Theory

As with any theory, the utility of the foregoing may be assessed in terms of the accuracy of the predictions it allows us to make. It should be possible to find evidence that heterogenous traits are expressed by individuals with similar value systems, dependent on the environment in which they are expressed. Despite a lack of evidence for non-genetic parental and other familial effects (including birth-order related effects) on personality traits (e.g., Damian & Roberts, 2015), given the domestic environment appears to differentially affect the values of only-children and those with siblings (Griffiths, et al., (a) 2021), other characteristics such as depressive symptoms (Jin, Zeng, An, & Xu., 2019), and the more extreme domestic influence of abuse induce unidirectional effects on personality traits (e.g., Beitchman, Zucker, Hood, DaCosta, Akman, & Cassavia, 1992), it seems likely that longitudinal studies that control for the structure of individual value systems, the values and traits of parents, and other significant environmental factors, could show unambiguous effects on values and traits.

If personal values evolved from and represent a pre-existing universal system of value-equivalents, evidence for this should be found in patterns of neurological function inaccessible to conscious or cultural influence. If the influence of personal values, as distinct from pre-existing equivalents, evolved sequentially, such that the importance of the values from hedonism to universalism became increasingly influential as human intelligence evolved, evidence should be available to demonstrate that values exert a hierarchical (i.e., tradition-low to universalism-high) influence on decision-making in addition to the circular patterns associated with the Schwartz (1992) values model, and indeed this does appear to be the case (Griffiths, Thomas, & Dyer, 2021). This hierarchical influence should be detectable in the values from tradition to achievement because tradition promotes a tendency to replicate what has gone before and resist change, whereas achievement promotes a tendency to seek out and pursue strategies for winning: a willingness to change that is conditional on the potential competitive advantage on offer and the risks associated with adoption. Once innovations of thought and deed facilitated by the higher values have proved their worth, they are more likely to become attractive to those driven by achievement. The advantages then bestowed should generate trickle-down benefits for power (improved status and influence), security (the availability of prescribed strategies deemed to be effective), conformity (when they become the norm), and tradition (when future generations adopt revised cultural norms). Decisions for which there would be no direct comparison in the lives of ancestors lacking advanced intelligence would seem to offer the greatest promise in this regard.

If values evolved hierarchically so that the 'higher' values became increasingly influential, this should be evident in corresponding and ongoing cultural trends. Given that intelligence is a key facilitator of effective independent thought and action, and therefore of self-direction, the Flynn (2009) effect (that suggests intelligence is increasing) may be symptomatic of this. In cultures where freedom of expression has been allowed to flourish, it should be possible to identify long term trends in which the prevailing culture is increasingly influenced by the higher values of self-direction, universalism, and benevolence, and less by the conservative values of tradition, conformity, and security. While little in the way of a historical perspective is provided by the World Values Survey (WVS, 2020)[2] and the World Happiness Report (WHR)[3], comparison of the two suggests a link between values and happiness. Those nations having the most self-expressive/secular-rational values are found to rank amongst the happiest in the WHR: Sweden 7th, Norway 5th, Denmark 2nd, Finland 1st, and the

[2] A periodic international survey of the values of representative samples of adults conducted by a global cooperative of social scientists. The 7th wave covers the years 2017-2020 drawing from data collected from over 120,000 individuals in 79 nations.

[3] An annual survey of representative samples of 1,000 to 3,000 adults per nation in 153 nations conducted by Gallup and published by the United Nations Sustainable Development Solutions Network. Respondents are asked to rate their current happiness with their lives on a scale of 0 (worst possible life) to 10 (best possible life).

Netherlands 6th, whereas those with the most survival/traditional values ranked among the least happy: Jordan 119th (of 153), Yemen 146th, Zimbabwe 151st, Morocco 97th, and Ghana 91st. Given that self-direction and universalism correspond with self-expressive/secular-rational values (Inglehart & Oyserman, 2004), and the conservation values with survival/traditional values, this suggests a hierarchical relationship between values and the reported happiness of nations consistent with our proposed evolutionary theory.

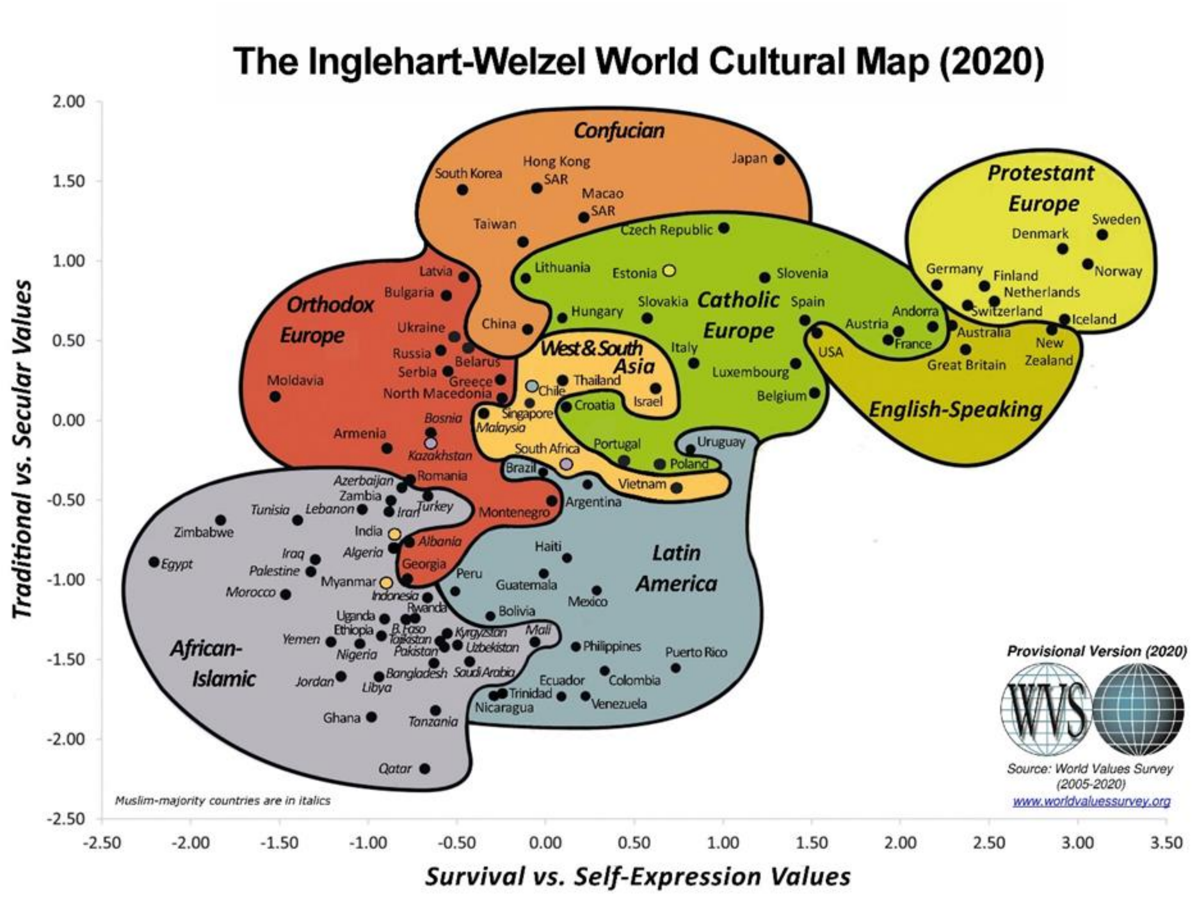

Figure 6. Inglehart–Welzel cultural map, World Values Survey (2020)

Given that values may, when activated, elicit feelings that guide decision-making (Schwartz, 1992), they may contribute to our emotional, intuitive ‘system 1’ thinking (Kahneman, 2003; Stanovich & West, 2000). As such, in addition to certain values contributing to certain heuristic biases, individuals subject to values conflicts that deprive them of a dominant value, or complementary suite of dominant values, may be less able to make satisfactory intuitive judgements on some propositions, and so may be more likely to engage rational 'system 2' thinking (Kahneman, 2003; Stanovich & West, 2000). This may lead such individuals to make different decisions to those whose dominant values allow them to make quick, intuitively satisfactory judgements. Again, evidence from our preliminary research is supportive of this (Griffiths, et al. (b), 2021).

Conclusion

When considered in the broadest frame permitted by science, and taking account of insights available from physics, chemistry, evolutionary biology, and work on CAS, a more complete understanding of the relationship between traits and personal values in the construct of personality emerges. Where the traits of systems may vary according to the environment in which they are expressed, it is apparent that the evolution of all systems can be related to a system of 'value-equivalents' capable of promoting behavioral consistency in any given stable environment.

The possibility that the Schwartz (1992) system of values provides a means to better understand, not just the nature of personality, but the interaction of all systems, would appear to be one with tremendous potential and applications in all areas of human activity. From a theoretical, psychological perspective it appears to provide a window through which to consider a unifying theory of personality, in which all aspects of personality are derived from the interaction of value-equivalents. Because these value-equivalents are universally applicable, they also provide a holistic framework within which to review the operation of individual cognitive systems, the interrelationship between individuals, groups, societies, and all other systems, living or otherwise, in our shared environment.

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