Economics, Society, and the Pre-eminent Role of Values

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Abstract

 This paper proposes that in the causal hierarchy of emergence in a society, and particularly in its economic ordering, a pre-eminent causal role is played by the purpose and values that social structures embody, either explicitly or implicitly (i.e. empirically determinable). This takes place in the context of the interaction between social, economic, political, and legal systems, which can be characterised as a multilevel adaptive feedback control system in analogy with the way homeostatic systems work in biology. Underlying this, modular hierarchical structuring enables agency of individuals to emerge from the underlying physics and biology, contrary to claims by some physicists, as well as enabling the agency of meso-level institutions in analogous ways, contrary to claims by many economists. Downward causation underlies an extension of the Principle of Biological Relativity (Noble 2012) to these contexts, with all emergent levels being equally necessary to outcomes that occur. .A complex interaction between rationality, emotions, values, and perception shapes individual and social actions, with outcomes being crucially influenced by individual and institutional values, and with those values being shaped by a circular interaction between individuals, groups, and society. Narratives are a key way of understanding in this context. Meta-analysis of how values and meaning shape outcomes underlies moral action. Key features of the discussion are, a characterisation of the core nature of social and individual values as lying on a spectrum from totalitarian to self-sacrificial; the distinction between claimed and empirical values, leading to the idea of ethical dissonance; and consideration of how this all works out at different organisational levels in society. Through these mechanisms meaning and values are a preferred aspect of causation at many social levels, and particularly the meso-level, contrary to implications of reductionist viewpoints based in physics, evolutionary theory/genetics, neuroscience/psychology, and economics. We define dimensions of poverty resulting from our viewpoint, including political poverty, legal poverty and moral poverty. Overall, the claim is that values provide a metric on multi-dimensional utility functions.

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1. Introduction: Economics, society, and values

It is claimed by Noble and Ellis (2022)[1] that purpose and values have a pre-eminent role in influencing outcomes in individual human choices. But this is also true in society. As clearly pointed out by Snower and Wilson in their target paper (Snower and Wilson 2022),[2] the economy and society are deeply intertwined,[3] with multilevel dynamics playing a crucial role, and with meso-level entities intervening between the individual and societal level, a point also made by Bellah *et al* (1992), Arthur (1999). This paper considers how those multilevel interactions takes place, relating them to similar issues arising in biology and computational systems, and emphasizing how in the end it is values and meaning (whether explicit or implicit) that play a key role in shaping outcomes in these interacting social and economic systems because we "align" our behaviour with our values, to varying degrees, across all activities. They thus in effect provide a preferred level of causation in society as well as at the individual level, playing out at all social scales (Carney 2021).

1.1 This paper

This paper looks at the foundations enabling this all to happen, enabled by common principles that apply in physical, biological, social, and computational systems. The latter shape social and economic interactions via algorithms that implicitly embody values; economic theories do so also. This paper firstly sets the scene of hierarchical structuring and where values fit in (§1.2), and then explains the basic model of social interactions that we propose which is the context whereby values determine outcomes (§1.3). The following sections are,

Section 2: *The essential basis: mechanisms, reductionism, and explanation***.** This section proposes specification of underlying mechanisms as the appropriate way to analyse emergence in both biology and social systems. Deep analogies between the way emergence takes place in biology and in organisations are explored, both being based in the functioning of modular hierarchical structures. This section emphasizes the effectiveness of same level emergent laws that arise via the combination of upward and downward causation, and the key feature of interlevel causal closure. **Section 3:** *Meso-level organisations in society, and their causal powers***.** This section emphasizes the agency of, and importance of, meso-level structures in society. It is centrally based in Elder-Vass (2010). **Section 4**: *Rationality, perception, emotion, and values*. Rationality allows reasoned action and abstract causation to take place. However there is a complex interaction of emotion, rationality, and values that guides thought and action, where values can be characterised as lying along a spectrum from extreme authoritarianism to enlightened caring for others. Narratives play a key part in this interaction. **Section 5**: *The requirements for moral action.* This section discusses how the individual agency underlying organisational agency is enabled by adaptive selection of goals, which in turn is allowed by lower level stochasticity: a core feature of brain function It emphasizes the importance of values in considering options and making decisions,

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[1] There is inevitably some overlap between this paper and Noble and Ellis (2022).
[2] For background to that paper, see https://evonomics.com/the-making-of-rethinking-the-theoretical-foundation-of-economics/.
[3] See also Giddens (1984), Smelser and Swedberg (1994), Parsons and Smelser (1998), Smelser (2013).

and the key role of meta-reflection in an ongoing multilevel social process as the basis for moral action. Taking these processes into account, causal closure only occurs when all levels are included, from the physical to the psychological and social levels, where values are realised. **Section 6:** *To what degree do values determine outcomes?* There are different outcomes at various scales in society and in different contexts in the real world; confounding aspects other than values affect outcomes, while empirical and stated values may differ. Nevertheless the basic principles outlined here are crucial, as summarised in **Section 7**: *Values and purpose overall influence the nature of society and economics*. The causally key feature in both social and individual contexts is that of values (explicit or implicit) and meaning, because their effects in terms of aligning behaviour extend to all domains (welfare, social, economic, political, and legal). Due to the interactions we discuss here, the underlying physics, genetics, physiological, and neuronal functioning enable but do not determine specific social and economic occurrences. They follow and constrain rather than shape outcomes.

The following further key issues are embodied in the discussion:

- **Evolution of life is not simply a case of ruthless competition**. It is a history of emergence over time of ever higher levels of cooperation (O'Madagain and Tomasello 2022) as the major evolutionary transitions occur (Szathmáry and Maynard Smith 1995), with that cooperation being in tension with ongoing competition (Lee *et al* 2019). Evolutionary theory does not provide a rationale for ruthless competition in economics or society.

- **Not all causes are physical**. Through the power of symbolism and logical analysis, mental causation (Crane 1992, Jackson 1996, Menzies 2003, Robb and Heil 2013) and abstract causation (Simon 1962, Ellis and Kopel 2019) occur and shape physical outcomes (Ellis 2005). This does not take place by overriding or altering physics, but by setting the context in which physics operates. No mysterious spooky action is taking place: rather interlocking hierarchical mechanisms shape outcomes, with abstract thoughts being represented through neural states (Churchland 2012, Vargas and Just 2020) and algorithms shaping computational processes (Dasgupta 2016). In this way abstract entities such as money, laws, closed corporations, symbol structures including algorithms, and narratives exert causal powers that have changed social history (Harari 2014).

- **Our analysis is crucially dependent on the emergence of human agency and moral responsibility**. A huge amount has been written about this from a philosophical viewpoint, and we will not undertake an in-depth engagement with that large literature. We rather refer to Pink (2004), List (2014, 2019), Gabriel (2017), Talbert (2019), O'Connor and Franklin (2021), Baggini (2021), and Ellis and Gabriel (2021) to provide a philosophical foundation for our contention. What rather discuss how this is possible when one considers the nature of biological causation: we are concerned with whether mechanisms exist that allow this to occur. In response to reductionist arguments denying this is possible (Van Inwagen 1975), often based in the idea of supervenience (Kim 2005, McLaughlin and Bennett 2021), a key part of this paper, developing from Murphy and Brown (2007), Ismael (2016), and List (2014), is the claim that such mechanisms do indeed exist and enable the required agency (Elder-Vass 2010) . Kim's argument fails because physics *per se* is not causally complete (Ellis 2020a, Kleiner and Hartmann 2021). Our view is broadly compatible with the defence of free will in List (2019), using

the same elements, but completing them by adding comments on the relation of downward causation to molecular stochasticity that is discussed in Noble and Noble (2020).

- **Equally, our analysis is dependent on the existence of meso-level social structures – organisations - that have causal powers**: they are not just the same as the summation of their members, and their agency affects social and physical outcomes (Giddens 1984). Such emergence (King *et al* 2010) forms a central part of our argument. It is implied in Arthur (1999) and Snower and Wilson (2022), however it is denied in standard economic theory (see e.g. Keen 2011, Snower and Wilson 2022). It is emphasized by Sawyer, who states

  "*Social emergence is the central problem of the social sciences. The science of social emergence is the basic science underlying all of the social sciences, because social emergence is foundation to all of them. Political science, economics, education, history, and sociology study phenomena that socially emerge from complex systems of individuals in interaction*" (Sawyer 2005:189).

A careful analysis by Elder-Vass (2010), taking both philosophy and mechanisms into account, demonstrates that meso-level social structures do indeed have emergent causal powers (Hodgson 2000), as is implied by consideration of their effects in the world (Harari 2014). That is why their implicit or explicit values matter.

- **The spectrum of moral values and the dimensions of poverty.** We introduce a spectrum of moral values (§4.2) which applies in each societal sector (social, economic, political, legal) and allows us to identify dimensions of poverty (§7.2), which as well as political and legal poverty includes the concept of moral poverty.

1.2 The key role of values in determining individual outcomes
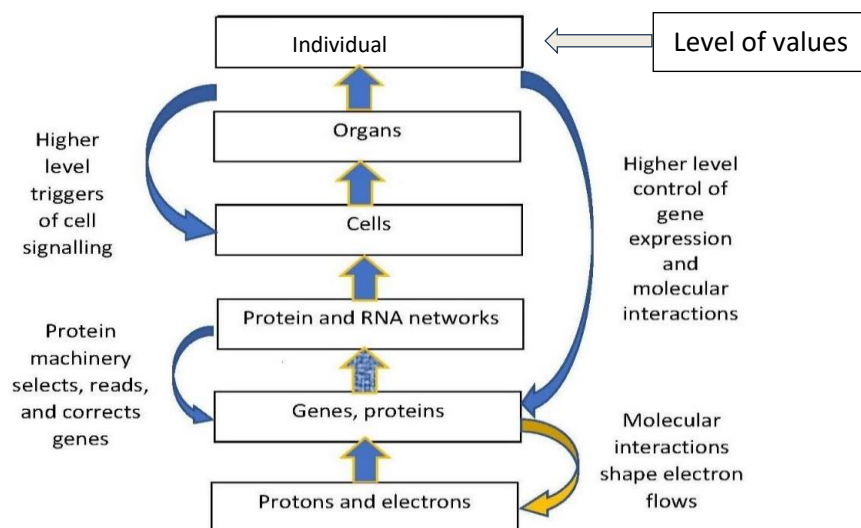
Figure 1*: The interplay between bottom up and top down interactions in an individual* (*after Noble 2012, Ellis and Kopel 2019). Causal closure occurs because the upwards arrows range from the bottom physics level to the level of the whole individual, and the downward arrows reach all the way down again, allowing causal closure between all levels to occur (Ellis 2020a). Values and meaning occur at the level of the individual person, together with rationality and emotions (see* **Figure 2***). There is a higher level ("Society") shown in* **Figure 3***.*

Just like every other complex emergent system, digital computers,[4] living beings,[5] brains,[6] organisations,[7] and societies are modular hierarchical structure for very good functional and developmental reasons (Simon 1962, 2019, Booch *et al* 2007). One of us has proposed a *Principle of Biological Relativity* (Noble 2012, 2016): in the case of biology in general, there is no privileged level of causation: all emergent levels are equally important in causal terms (also Emmeche *et al* 1997). Each level in **Figure 1** is carrying out dynamical processes crucial to the organism as a whole (O'Connor 1994, Gilbert and Sarkar 2000). This contrasts with views where genes or neurons provide a privileged level of causation (Dawkins 2016, Crick 1994), or the underlying physical levels are doing all the work (Greene 2020, Carroll 2021),[8] all else being epiphenomena arising out of the physics.

We analyse causation in terms of the relevant mechanisms (Glennan 1996, Craver and Tabery 2019). Upward emergence takes place by a combination[9] of lower level effects through coarse graining (Flack 2017), black boxing (Ashby 2013), or symmetry breaking (Anderson 1972). This emergence takes place on functional, developmental, and evolutionary timescales. Examples are symmetry breaking occurring in the case of crystals, leading to emergence of quasi-particles and resulting condensed matter properties (Simon 2013, Guay and Sartenaer 2018), and in macro-molecules underlying biological emergence (Lehn 2004), which have come into being via evolutionary processes (Wagner 2014). Through developmental processes (Harold 1995, Wolpert *et al* 2000, Gilbert 2001, Gilmour *et al* 2017) based in metabolic and gene regulatory networks using cell signalling processes (Berridge 2014), these molecules produce emergent cells, tissues, physiological systems, and organisms. In the case of human beings, these include the neural networks of the brain, allowing thought and decision making. Together, these systems comprise the individual as a whole.

This Principle holds because upward emergence is not all that takes place: in addition downward causation occurs in the hierarchy of emergence (Emmeche *et al* 2000, Noble 2008, Murphy et al 2009, Noble 2012, Ellis 2012, 2016, Pezzulo and Levin 2016), as indicated in **Figure 1**, where "causation" is defined in terms of difference making (Menzies and List 2010, Kment 2010, Pietsch 2016). This underlies the same-level effective laws that occur at each emergent level (Noble 2012, 2016, Ellis 2020),[10] enabled by physiological systems (Rhoades and Pflanzer 1989, Hall and Hall 2020). The result is that no emergent biological level is the crucial causal level, and neither is the underlying physics level: each is equally significant in terms of enabling what happens, all are needed.[11] Emergent layers have their own dynamic, irreducible to lower level concepts.[12]
This applies not only to biology but also to physics and engineering (Ellis 2020) and computing (Ellis 2016: Ch 2,

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[4] Tanenbaum (2006), Ellis (2016):Ch.2, Dasgupta (2016).

[5] El-Hani and Emmeche (2000), Campbell and Reece (2005).

[6] Churchland and Sejnowski (1994), Raut *et al* (2020), Leopold *et al* (2020).

[7] Schneeweiß (1995).

[8] Carlo Rovelli has expressed such a view to one of us (GE): all dynamical interactions except those of fundamental physics are epiphenomena, determined by the underlying physical interactions. Carroll is explicit this is so (Carroll 2021, 2022).

[9] We avoid the word "summation" here as that implies linearity ("the sum of the parts") which is usually not the case.

[10] See "Level Specific Laws" in Gilbert and Sarkar (2000).

[11] This can be expressed as *Contrastive Causation* (Schaffer 2005, Menzies 2008, Sinnott-Armstrong 2021).

[12] Many examples of such emergent properties are given in the enlightening Online tutorial on emergence and collective phenomena by Nigel Goldenfeld.

Dasgupta 2016), and so to technology (Arthur 2009:32-43), as well as to social and economic systems. It is in the end a *Principle of Emergent Effectiveness*: a statement of effective powers occurring at all emergent levels in physics, biology, engineering, digital computer systems, society, and ecosystems. In each case, all of the levels are required to enable the causal closure that determines the outcomes that actually occur (Ellis 2020a). Structures at each level carry out the functions appropriate to that level, all interacting with each other.

All biology reflects purpose or function (Polanyi 1976, Hartwell *et al* 1999, Gomez-Marin and Ghazanfar 2019, Allen and Neal 2020, Noble and Noble 2022, NAS 2022), characterised in the systems-theoretic sense of identifying the function of a biological trait through an analysis of the role the trait plays within an organized system in contributing to both its own persistence and the persistence of the system as a whole (Allen and Neal 2020). However when intelligent life arises, key new elements arise that are not present in simpler biological systems. Symbolism and language (Deacon 1998, Donald 2001, Tomasello 2019, Damasio 2021) enable social communication and rational thought (Ginsburg and Jablonka 2019:477-480), and social structures enabling function (Giddens 1984). Then abstract thoughts can be causally efficacious at the psychological level: they shape physical outcomes via design, planning, and action (Ellis 2016), as evidenced by existence of roads, dams, vehicles, aircraft, buildings, computers, and so on. None of these could exist without the causal efficacy of rational thoughts and analysis (Ellis 2005, Chang 2020, Robb and Heil 2021), underlying the cognitive neuroscience of human decision making (Fellows 2004, 2017). This has led to transforming technology of many kinds (Bronowski 2011, Arthur 2009, Blockley 2012). Physical sciences based in mathematics and experimentation gave rise to outcomes such as motor vehicles and air travel as technological emergence took place (Burmaoglu *et al* 2019). In each case different thoughts and plans result in different physical outcomes (alter the plan, the outcome is different). Furthermore social structures and social agreements, laws, and rules are causally effective at the social level[13] (Elder Vass 2010, Harari 2014), as are algorithms implemented in computer software that underlie digital computer and internet functioning (Ellis and Drossel 2019, Dasgupta 2016).

Thus emergent properties and associated efficient causation, represented by effective theories, hold at each level in Figure 1 (Simon 1862, Ellis 2020). In the case of intelligent beings, these outcomes are influenced by the mental interactions of the individual as a whole - the top level in Figure 1 – enabled by brain function, integrating sensory and interoceptive data and making action choices as a result, with reflexive monitoring of activity (Giddens1984:Figure 1, p.5). One can represent the way that this integration occurs as in **Figure 2**, with intellect, emotions, and values interacting to determine outcomes. This is a highly simplified version of the LIDA extension of the global workspace model of brain function (Franklin *et al* 2012, 2013). It is an effective theory of interactions at the topmost level in **Figure 1.**

One should note firstly (**Figure 2**) that rational operations are themselves hierarchically organised, as is evidenced by the hierarchical structure of language (letters, words, phrases, sentences, paragraphs, etc) and of

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[13] Recall that in this paper we are using `cause' in the sense of difference making. The problems arising from how non-material causes mesh with physical causes (e.g. Noble & Noble, 2020) are not addressed. It is sufficient for this paper that non-material causes evidently do result in different physical states (see e.g. Dasgupta 2016).

logical deduction. Thus as occurs in the case of digital computers (Ellis 2016: Ch 2), one has a (vertical) physical implementation hierarchy as represented in **Figure 1**, and a (horizontal) logical hierarchy, as noted in the middle box in **Figure 2.** Secondly, we will claim below that it is the interaction of Values, Meaning, and Purpose with the processes of rational analysis represented in **Figure 2,** and elaborated in **Figure 10** below, that in the case of each individual is a key influence on all that happens (Noble and Ellis 2022), albeit being also modulated by the emotional drivers represented there. They do not influence just individual decisions, but rather all decisions we make across all spheres. Thus even when the influence is small in particular situations, the effects are cumulative. Analogous effects occur in organisations (Bellah *et al* 1992) and society (Parsons 1984).
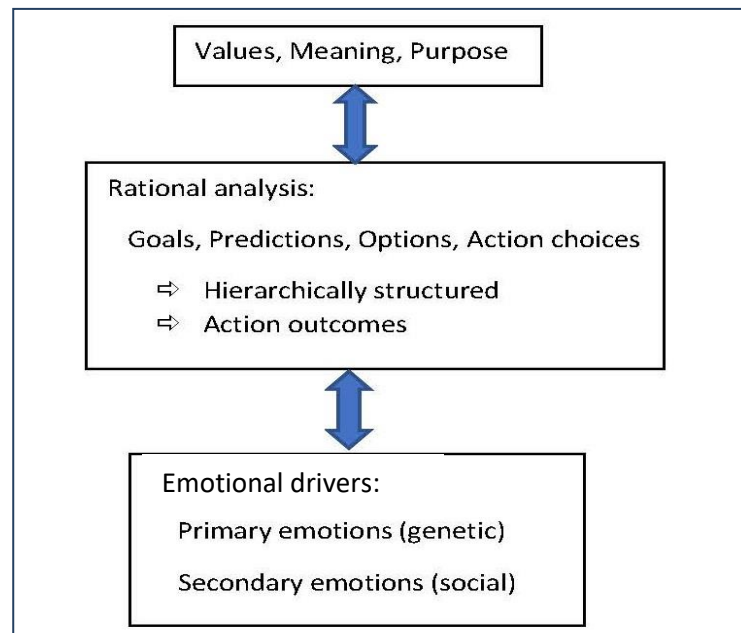
Figure 2: **The dynamics of interaction at the top level in Figure 1**. *Rational analysis, emotional drivers, and `Telos' (values, purpose, and m*ean*ing) interact with each other. These interactions are characterised as C1, C2, and C3 in* **Figure 3**. *They represent an effective theory at Level L6 in that figure.*

We can represent the conjunction of these dynamics as in **Figure 3**. Thus we claim (Noble and Ellis 2022) that in the case of an individual person, when intelligence shapes outcomes, the overarching factor providing a framework for outcomes is purpose, meaning, and values as represented in **Figure 3**.[14]

Note that we are not saying that values change anything about the nature of physics: they do not affect or amend the nature of particles or the laws of physics in any way, which hold in fixed unchanging form at all times and places. What they affect is the outcomes of those unchanging laws at specific times and places by changing the context within which they operate (Noble 2008, 2012, Ellis 2016).

Indeed contrary to what some effectively claim (Kim 2005 , Carroll 2021), the laws of physics do not, by themselves, determine any outcomes at all. Those are shaped by boundary conditions (Bursten 2021), initial conditions, and constraints (Juarrero 2002, Noble 2012, 2022), so physics by itself is not causally closed (Ellis 2020a, Kleiner and Hartman 2021); neither is genetics, as implied by Dawkins (2016).

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[14] As discussed below, the use of the label "level", while defensible, could also be replaced by "sphere", see **Figure 7**.

	System	Function	Effective laws
C1	Value system	Giving values, meaning, purpose	Constrains choices
C2	Cognitive system	Reasoning, rationality, choice	Selects actions
C3	Arousal systems	Guiding rationality via emotions	Motivates actions
L7	Society	Social interactions	Social, Economic, Political, Legal, CS
L6	Individual	Integrating functions together	C1, C2, C3 Interaction
L5	Organs	Basic functions of life	Physiology
L4	Cells	Basic processes of life	Cell biology
L3	Protein and RNA networks	Information controls outcomes	Cell signalling
L2	Genes, Proteins	Molecular basis of life	Molecular biology
L1	Protons and electrons	Underlying Physical interactions	Laws of physics

Figure 3: The hierarchy for the brain. *The context C1 of values (ethics), meaning, and purpose ("Telos"), realised in level L6 in the way depicted in **Figure 2**, is shown here as the highest factor in the control hierarchy of intelligent beings. Each emergent level L2-L6 shapeswhat happens at each lower level; each of these lower level enables what happens at each higher level. The physical, ecological, and social environment interacts with these levels in complex ways. The value/meaning context C1 is realised at the psychological level L6 and affects all that occurs at that level, and consequently what happens at all lower levels. The level L6 is affected by the societal value system CS at level L7 that in the end crucially affects societal choices.*

The crucial issue, obscured by the physicists' conception of an "isolated system" (there is no such thing in the real universe: Von Bertalanffy 1950, Peacocke 1989, Ellis 2020a, Cuffaro and Hartmann 2021) is,

What determines these conditions and constraints? This is what determines outcomes.

For individuals, causal closure in real-world contexts only occurs when values and meaning are taken into account, because they provide a basis for choices made across all spheres, influencing the direction and purpose underlying all else. They are both motivators and constraints that are a key aspect of difference making.

1.3 Economic interactions with Society: The dimensions of welfare

The same is broadly true of organisations (Simon 1962). An analogue to **Figure 3** exists for national organisations, see **Figure 4.** However this does not characterise the interlevel interactions in the same straightforward way as in the biological case (**Figure 1**). That is determined by the abstract organisational structure which determines what roles individuals and the various sections play in the organisation. An organogram characterises how individuals (level L1) relate operationally to the various higher levels (L2-L5): an individual may be a President, CEO, branch manager, computer operator, truck driver, salesperson, etc. Such roles are determined by the organisational structure as set out in its Constitution and decisions made by the Board of Directors or

management, and consequently in documents setting out Terms of Employment. This is the abstract structure underlying organisational emergence and functioning, as we discuss below.

		System	Function
C1		Value system	Values, meaning, purpose
C2		Planning system	Data analysis and optimisation
C3		Motivation system	Promoting commitment
L5		National office	Directing local sections according to criteria C1-C3
L4		Local (town, city)	Basic functional entities
L3		Departments	Specific operational areas
L2		Sub-departments	Specific operations
L1		Individuals	Running the organisation
L0		Material stuff	The physical foundations

Figure 4: A simplified generic hierarchy for national organisations. *The guiding systems C1-C3 occur at the national level as choices by the Board of Directors in conjunction with the CEO, and are diffused to lower levels, as discussed later.*

The whole is imbedded in higher levels L6 of national laws and regulations and values and L7 of international agreements, not shown in **Figure 4**, these determining the nature of the socio-economic system in a country, and in relation to other countries. Agreements at either of these higher levels can reach down to influence the levels shown in **Figure 4**.

Choices made at the organisational level L5 shape what happens at all levels, as is made clear by many examples, ranging from social decisions to do with economics and capitalism overall (Einstein 1949, Mayer 2018, Collier 2018, Stucke and Ezrachi 2020, Carney 2021) to value choices made by individual companies, e.g. by Boeing that led to the Boeing 737-MAX disaster(Englehardt *et al* 2021) and by Facebook and Twitter as to how to deal with fake news and misinformation. Similarly decisions made at Levels L6 and L7 regarding how to deal with immigration and the Coronavirus pandemic reach down to shape all lower levels.

Consequently these effectively form a privileged factor in the hierarchy of structure and causation for organisations and society. The values embodied in social structures such as meso-level organisations are crucial over-arching constraints on, and motivators for, social decisions and behaviour, and hence for physical outcomes due to the effective agency of these organisations, making action choices based in purpose and values, often embodied in constitutions and mission statements (Drucker 1995, Carney 2021:358). Changed values or purpose result in different outcomes. This is true for organisations as much as for individuals.

To give this proposal teeth, we need, firstly, to justify the proposal that agency occurs in the case of meso-

level organisations, based in, but more than, the agency of the individuals composing them. We do that below (Sections 3.2 and 5.1) . Secondly, following Snower and Wilson (2022), we need to give an analysis of the multidimensional nature of welfare in society - human and social flourishing - and its relation to economics. As Snower and Wilson emphasize, welfare cannot be simply reduced to a one dimensional economic utility function to be maximised by altering one variable. Our needs are far more complex than that. They involve psychological, social, economic, political, and legal aspects, all taken into account when we make choices (Giddens 1984, Parsons and Smelser 1998, Smelser 2013).

The basic idea proposed here, based in (Ellis 1980, 2000), is to categorise, in addition to those aspects of welfare that are directly measurable, on the one hand the features in society that control conditions leading to good or bad community quality of life, and on the other hand effects resulting from this quality of life. Thus what follows is in essence a Capabilities approach (Sen 1985, 1993, Orton 2011, Alkire 2002, Alkire 2005, Alkire *et al* 2015). These are integrated in a causal model of the features in society affecting and affected by social and economic conditions, represented as a set of feedback control loops that control welfare in society in a multi-level adaptive feedback control ("cybernetic") system (Wiener 1961, Ashby 1964).

The point of this approach is two-fold. Firstly, determining fully the state of welfare by itself is difficult because it involves complex social and psychological aspects, but measuring factors either affecting welfare, or resulting from it, is much easier; witness for example the many studies of "standard of living" (that is, of the flow of resources leading to good welfare) on the one hand, and of features such as infant mortality rates and life expectancy (results of the state of welfare) on the other. The present approach provides a comprehensive framework for relating these causes and effects. Secondly, it is a well-established result from control theory, demonstrated conclusively in the biological and engineering areas, that reliable attainment of goals in the face of largely unpredictable disturbing forces is possible only through feedback mechanisms that compare desired goals with the actual situation and generate correction signals as a result; these actuate mechanisms that take steps to correct any errors occurring. This is the fundamental insight of cybernetics (Wiener 1948, Ashby 1964, Beer 1966), and is applicable to any goal-directed system. In biology, it is labelled homeostasis (Cannon 1929, Guyton 1977, Hall and Hall 2020, Modell *et al* 2015). It applies equally in the organisational and social sphere (Beer 1973, 1978, 1981, Scott and Davies 2007: 90-93). The nature of this process is discussed in Section 2.2 (see **Figure 8**).

The Quality-of-Life (`QOL') adaptive feedback system: In the present context, the idea is to envisage society as a system whose purpose is to create a good quality of life for its constituent populations via feedback control processes, and then to characterise how well it can succeed in doing so, that is, how closely or poorly it approximates to this ideal. This does not necessarily imply that the social system will have been consciously constructed to do this, although for many aspects of society this will indeed be the case. Rather the approach is that irrespective of the explicit or implicit aims of those who control it, we regard the social system from the viewpoint of a particular population or group in terms of structures enabling success in attaining their desired goals. Thus we regard it as a

cybernetic system (the "Welfare Feedback System") with the function of improving the quality-of-life of groups in society, and then consider how capable it is of producing the results desired in the case of a particular group. It may be very efficient, or totally inefficient. In the first case, quality of life will be good; in the second case, it will be bad, perhaps so bad that one should talk of poverty or destitution (Section 7.2). It will also have aspects of adaptive selection, another key principle underlying emergence (Kauffman 1993), as we discuss below (Section 2.2).

The model of necessity incorporates representations of the social, economic, political, and legal aspects of society, and the way they are interrelated. For each group, the analysis characterises how well society functions in letting them attain their own goals. These are in turn are directed by the values and ethical norms that are the key causal factor we discuss in this paper. The overall framework based on these ideas is explained in depth in Ellis (1980) and references therein, and is summarised in Ellis (2000). Its broad structure is shown in **Figure 5**. It represents the features affecting and affected the welfare situation of a group in terms of a set of causal levels shown there. More details of each level are shown in **Figure 6** and **Figure 18**.
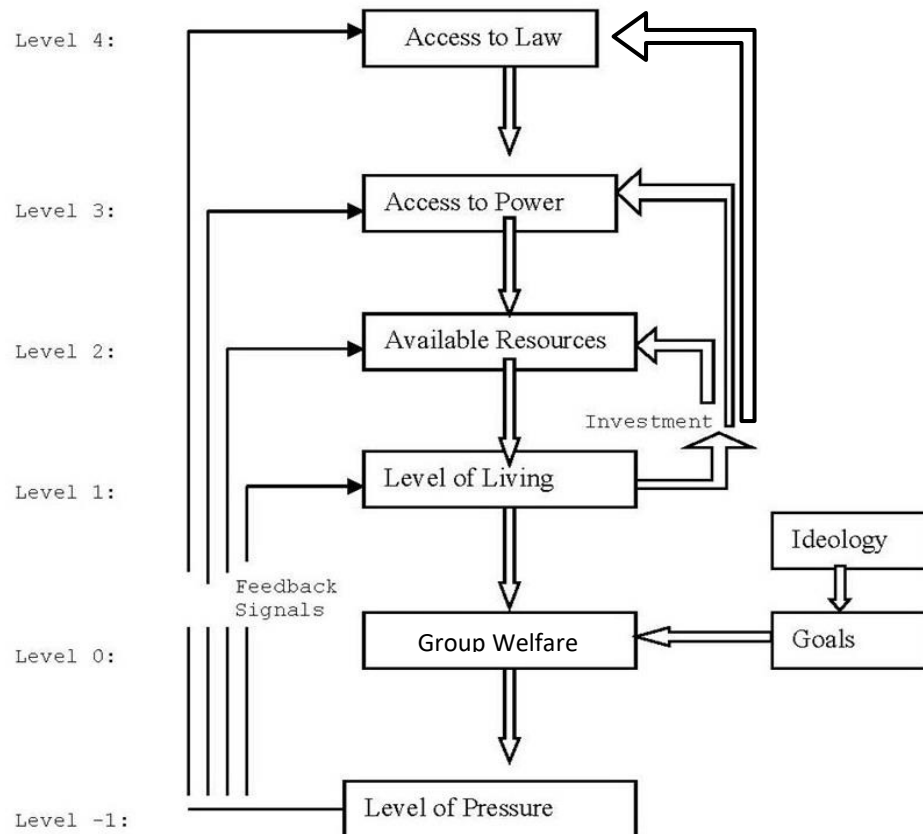
Figure 5: A basic outline of the "Quality of Life" feedback system in society, *determining the welfare of a particular group. Similar systems exist for each group in society.*

The basic idea (see equation (5) and **Figure 8**) is that any difference $E(t) = S(t) - G$ of system state variables $S(t)$ from goals G drives the system to reduce that difference, as far as is allowed by the relevant constraints $C(t)$. Equilibrium is reached when $E(t) = 0$, which is the same as $S(t) = G$. Thus G is effectively the utility function for the system, shaping demand for resources and goods, but is a much broader multi-dimensional concept than in usual

economic theory, as it covers physiological, psychological, social, political, and legal issues as well as economic ones.   Because societies are changing all the time, it will vary with time: **G** = **G**(t), and depends on context (different societies have different goals). Possible supply of goods is determined by the constraints **C**(t). All these variables are vectors of high dimension (they each have many components).   Overall, this is a dynamic theory of how multidimensional utility is maximised, rather than an equilibrium theory of utility maximisation.

LEVEL 4: ACCESS TO LAW

Administrative Procedures	Legal Procedures	Legal Freedom

LEVEL 3: ACCESS TO POWER

Direct Political	Direct Economic	Indirect	Persuasive	Coercive	Political Freedom

LEVEL 2: AVAILABLE RESOURCES (Stock)

Natural	Human	Economic	Techno-logical	Enabling	Economic Freedom

LEVEL 1: LEVEL OF LIVING (Flow)

Physical Welfare	Safety	Investment	Higher Needs	Organi-sation	Loss of Resources	Social Freedom

LEVEL 0: STATE OF WELFARE

Physio-logical	Safety	Belonging-ness	Esteem	Self-Actualisation

LEVEL -1: LEVEL OF PRESSURE

Physio-logical	Social	Economic	Political

Figure 6: Classification of aspects of the causal levels affecting quality of life, *according to the scheme outlined in Figure 5, into their major different components. The choice of goals will be a more or less well defined set of choices for some of the variables in Levels 0 and above; others will not be chosen. However what they are will be determined in key ways by the values represented in the box labelled in Fig. 5 as "Ideology".*

The basic level is Level 0, the STATE OF WELFARE (see **Figure 6**). It is difficult to accurately assess this level, because of important social and psychological effects on wellbeing. It consists of two major components, one concerned with Physical Welfare (nutritional status, strength, disease, etc), and one with Socio-cultural

Well-being (family life, community life, morale, etc). Maslow's *Hierarchy of Needs* (Maslow 1943) suggests how these aspects are related to each other.[15] These are indicated by subjective indicators of happiness.

The first causal level is Level 1, the LEVEL OF LIVING. This is concerned with the deployment of the flow of available resources and amenities which make possible the maintenance and improvement of the State of Welfare; that is, with consumption patterns to enhance welfare, characterised as "utility" as in standard economic theory. This is where economic decisions are made either for consumption or investment. Thus one would find here for example the way available income is used in expenditure on food and medical services, on payments for housing, and so on. Thus this is the level where market forces play a key role in shaping outcomes, decentralising optimisation decisions via the "hidden hand" (Bellah *et al* 1992, §3; Carney 2021, §6). However the way that resources are used to increase welfare implied here is not a narrow financial one. It encompasses all resource usage leading to increased welfare, using the term `resource' in its widest sense to include, for example, clean air and quiet, unspoiled countryside, art galleries and symphony concerts; that is, it is any feature whose use or deployment can be controlled to improve the group's welfare. Thus a beach or wilderness area is a resource I `consume' when I visit it; a parking space is a resource I use when I park in it. The main ways the flow of available resources can be used to increase the group's welfare are for physical welfare and safety; for `higher' needs; for organisational purposes; and for economic, political, or legal investment on behalf of future welfare rather than use for immediate consumption to increase present welfare. It is lessened by loss of resources for any reason, and constrained by the freedom available to direct this flow of resources as desired. Through this broad definition, it includes the kinds of social– economic interactions that are the topic of the Snower-Wilson paper.

What can be achieved by choices at this level is determined by the stock of resources available to the group. The second causal level (Level 2) is that specifying the quantity and nature of RESOURCES AVAILABLE to the group (Level 1 was a rate of flow level; level 2 is a stock or quantity level). We can consider these resources as divided into natural resources, human resources, economic resources, technological resources, and enabling resources (**Figure 5**). Resources may be convertible to other resources at some `exchange rate' or `terms of trade' (e.g. by a manufacturing process or by trading). Because of its convertibility, money is one of the most important of these resources. This is the level where exchange and production/manufacture takes place.

The resources available to the group are in turn determined by the group's access to the power structure in society. Thus the third causal level (Level 3) is ACCESS TO POWER. By definition, `power' consists of those features of the social system which can lead to allocation of new resources to the group's benefit, or affect their allowed use (Bellah *et al* 1992:§4) by shaping laws at Level 4. Such power can be exerted by virtue of coercion, trust, standing or authority in the community, or by essentially political mechanisms in the first case, and by legislation in the second. The access to power need not be direct, as long as it is effective; access to mass media or social media is an important feature here. Institutional forms and controlling regulations are

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[15] For a useful generalisation of Maslow's work, see Heylighen (1992).

particularly important organisational resources in society, so the ability to control these features, which to a considerable degree determine the effective resources available to the group, is an important aspect of power.

The fourth causal level (ACCESS TO LAW) is activated if relevant laws and regulations stipulate that specific resources should be made available to the group, but the relevant political authorities nevertheless fail to do so. Thus one can make legal appeals to attempt to make them comply with the regulations. Because this kind of action can in principle control aspects of the political process as well as other activities in society, we have shown it as LEVEL 4, above the level of Access to Power. In general we may expect groups to try activating these mechanisms if the others have failed to work as they are supposed to; for example, they may try to have the election or the activities of a politician declared invalid, or test proposed legislation against the State's Constitution.

The four higher levels discussed so far (`access to law', `access to power', `available resources', and `level of living') each control the level below in the sense of enabling or limiting what can be done at that level. The final level in the main causal set is Level -1, which is the LEVEL OF PRESSURE. This is the level manifesting the results of a good state of welfare, or the lack of it. The two main kinds of pressure are `consequential' pressure (automatic results of a state of welfare, often of a medical or social nature, e.g. a high death rate due to a poor health situation or a high crime rate) and `societal' pressure, which may act through institutionalized channels or in other ways (protests may be sent to officials, complaints laid through `official channels'; public protests may be held; general discontent may exist and be manifested in opinion polls, and so on). They can be aimed at changing any of the higher levels.

The final element in the main set of feedback loops is what will be called the GOALS of the group. This comprises factors acting as a reference signal for the system, determining in which direction the group wishes to influence events. Comparing this desired state with the actual state results in control signals (evidenced in the `level of pressure') which flow through the three major feedback loops to the three higher levels of control, and thereby attempt to influence the flow of resources and so alter the groups future state in the desired direction. The goals are a vision of a possible future; in economic terms, they are a form of multi-dimensional utility function. They can potentially have components for every one of the aspects of welfare identified above, though many may be either absent, or undetermined: the group is indifferent to them in these cases.

Although this is not necessarily the way they will operate, it is convenient to think of the four main feedback loops as operating sequentially. An example will make this clear. Suppose the parents and headmistress of a school agree that smaller classes are desirable for the pupils (an issue at level 0 due to conditions at level 1).

First, the pressures generated (meetings with the headmistress, Parent-teacher association meetings, etc) will result in feedback to Level 1, where it is considered whether the need can be met by revised use of the existing flow of resources (a room can be converted from a store room to a classroom; teachers can be asked to teach extra classes instead of doing library duty; and so on). If this proves not to be a feasible method of solution of the problem, the second feedback loop (to Level 2) is activated. That is, it is considered if other resources from the stock of resources available to the school might be brought into play to provide the extra flow of resources needed, if

necessary through conversion of the form of these resources (e.g. monies set aside in a development fund are used to build a classroom; school buildings are rented out at night, thus creating an extra income which can be used to pay salaries; and so on).

Suppose it is not possible to meet the needs this way, because the school has already (within the possibilities allowed by the institutional framework) allocated all its resources. The third feedback loop is then activated: the authority controlling the relevant power (the local education authority) is asked to make more resources available to the school. This department will in turn consider action through the main three feedback loops: it will consider if it can re-allocate its own existing flow of resources to deal with the problem (actions are considered that are `without financial implications'); it may bring into play unallocated resources from its reserves (it may allocate funds in hand to pay new salaries); or it may apply in turn to its relevant resource-providing authority (perhaps a local authority executive committee) for further funds needed.

It may be that the relevant legislation governing the local authority stipulates that such funds should be made available to the school when needed but they refuse to do so. Then appeal can be made through courts or other statutory appeal mechanisms to try to get the situation rectified. This is the final available level.

To complete the overall picture of the feedback system, two further features need to be considered. First, an important mode of resource use is the use of a resource flow to either build up future resources or to increase future access to power, so that the group's position in the future will be improved; that is, INVESTMENT may take place. In particular this covers economic investment, including investment in technology of various kinds and in research, as well as financial investment. Political investment takes place through such activities as expenditure on a political campaign, on mass media, or lobbying politicians or trade union officials. Legal investment takes place by lobbying on forms of legal power and their implications, thus shaping the legal system, or by buying judges.

Second, the goals that are consciously set by the group, or that are not explicit but are implied by their actions, are influenced by a variety of factors related to their aims and expectations. They partly depend on the group's perception of its situation, but also reflect their psychological, cultural, ethical, and ideological or religious stances; for want of a better label, all such influences have been lumped together under the label IDEOLOGY. This is where values and purpose enter, and shape outcomes as a whole (Bellah *et al* 1992, Carney 2021): the central theme of this paper. We will identify some of the dimensions of these values later (Section 4). Inclusion of this label also reminds us that the responses of groups in society, and even their perceived levels of welfare, can be altered by changing these aspects while all else remains unchanged, e.g. by a propaganda campaign, or a religious conversion. The key point we return to later is that goals depend on, and embody, the values of the group concerned, and the way they relate to meaning and purpose.

This system can be represented at various levels of detail, both in terms of functions considered and time scales. How many components are there, in principle? The answer is a great many. Indeed each entry in the Yellow Pages of a telephone directory for a city represents needs that are being met by some organisation or other, as do the ubiquitous advertisements on the internet and social media. An idea of these dimensions of

welfare is given in the more detailed representation of these levels in the Appendix (**Figure 14**). To be sure, there are equivalence classes of many kinds representing *classes of needs*: hairdressers, hotels, bookshops, cinemas, motor cars, holiday offers, travel options, and so on, as categorised in the advertisements; but there are fine differences between them that can determine choices made, including geographic location, special times (Summer, Winter, Christmas, weddings, birthdays), and special events (Olympic Games, conventions, etc). Some outcomes are contextually determined and thereby have priority (the rent must be paid by Friday, the train leaves at 4pm, and so on) and some are determined randomly (my friend told me about a holiday they had, the shop ran out of butter, it rained that day, and so on). Some arise by a grand plan determined by narratives and stories which shape overall understanding.

Overall, this is a characterisation of a very high dimensional utility function, and a dynamical mechanism that aims to maximise that utility in a societal context characterised by resource constraints. It is a model of the dynamical interactions whereby a social system deals with radical uncertainty (Kay and King 2020) by homeostasis and adaptation Key points are,

- **The system is adaptive**: it can function either via existing feedback mechanisms in society that are there precisely in order to correct errors that may occur, as in any feedback control system; or they can function by changing the system itself in an adaptive way, if the first method fails to produce the desired result; that is, it has an evolutionary character.

- **Downwards causation** occurs via setting constraints on what happens at lower causal levels through the nature of social structures. It can also happen by changing the lower level elements that make up the system; these are in essence formal causation and material causation, in Aristotelian terms (Ellis and Horn 2023).

- **Values and Meaning**: The box labelled "Ideology" in **Figure 5** is where purpose, meaning, and values occur. If they are changed, the outcome of the whole system changes. That is why values have a pre-eminent role in determining outcomes (Bellah *et al* 1992:136-17, Carney 2021). A change in values corresponds to higher level processes: adaptively changing goals in feedback control, or the criteria whereby selection takes place (Ellis 2012).

- **Different groups** There is such a system for each group in society that is coherent enough that they can meaningfully be represented by such a system. These groups compete with each other for dominance in the context of society as a whole: we will not model that political, economic, and social struggle here. It results in the various such systems that each group experiences; **Figure 5** is the outcome, in each case.

- **The ecological context** The whole set of such interacting social entities in turn interact with the surrounding ecological context (Figure 5 in Ellis 1984) and its functioning (Smil 2022), which requires key policy decisions (Stern 2009, Carney 2021). This is a crucial interaction, but we will also not model that interaction here.

- **Equilibrium or mechanisms?** Standard economic theory tries to deal with the equilibrium states of such a system, if equilibrium occurs. The problem is that the context is seldom if ever in equilibrium (Keen 2022), hence downward effects on any distinct group will ensure they also are not in equilibrium. That is why a focus on mechanisms to achieve desired states, as in this approach, may be profitable .

- **There is inverse such system** of a similar nature whereby society tries to shape individual and organisational behaviour and values (**Figure 14**), resulting in causal closure (**Figure 15**). Individuals and groups try to shape society and organisations homeostatically and adaptively to their needs, while society and organisations within it try to do the same for meso-levels organisations, groups, and individuals through the same or related social structures.

2. The Essential Basis: Mechanisms, Reductionism, and Explanation

There is a huge literature on emergence and reductionism, see Clayton and Davies (2006), MacDonald and Macdonald (2010), Hohwy and Kallestrup (2008), Brigandt and Love (2017), O'Connor (2021), and references therein. We claim the same basic mechanisms operate in all complex systems: in biology, in engineering systems such as aircraft and digital computers, and in organisations and social systems. This section lays out these basic principles and mechanisms. As regards social structures, the view we take is largely based on the careful analysis in *The Causal Power of Social Structures* (Elder-Vass 2010, hereafter CPSS), which has many references to the relevant philosophical literature. He claims that the analysis should be based in the concept of mechanisms (Fodor 1974, 1997, Piccinini and Craver 2011, Brigandt and Love 2017, Craver and Tabery 2019). We refer particularly to CPSS because the author has taken care to phrase his analysis in a way that applies across the board, because of its general framing.

Upwards and downwards causation Emergence of entities with causal powers is in the end possible because as well as upwards emergence, downwards causation (Noble 2008, 2012, Ellis 2012, 2016, Voshoolz and Gabriel 2021) takes place in physics, biology, the brain, engineering, including computers, society (Berger 1963, Berger and Luckmann 1966), and also in organisations (Beer 1981, Elder-Vass 2012, Ellis 2016).

Causation We define causation in terms of difference making (Menzies and List 2010, Kment 2010, Pietsch 2016). This supports the causal autonomy of higher-level properties because high-level variables, due to their multiple realizability at lower levels, are often the most robust counterfactual difference-makers of lower level variables. This definition can be used counter-factually, when time need not enter, or in a mechanistic context, when it is based in the passage of time: effects occur after their causes.[16] It applies at each emergent level,[17] as well as in both upwards and downwards senses.

A word of caution here. Defining cause in terms of difference-making is a reasonable first-approximation to assessing causal roles in multi-factorial processes. But it should be noted that it is often not a *sufficient* measure of causation when those processes display strong robustness, such that the system can continue to operate even in the absence of an otherwise significant causal factor. It is then necessary to dig deeper into the networks of causation. One way to achieve better assessments of causation is to construct multi-factorial models, from which the causal role of each factor can then be unravelled through defining all the conditionals under which the causal

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[16] Hence it assumes a solution to the problems of the passage of time and the arrows of time (Ellis 2022).
[17] Which is Efficient Causation, see Ellis and Horn (2023).

role of any particular factor can be deduced. As an example, in assessing multi-genetic causation we then end up with statements like 'in the absence of genes X, Y and Z, gene A is necessary for the system to function, whereas in their presence, gene A's function is hidden'. Similar conditional statements must also apply in multi-factorial social causation.

Causal Powers The powers and properties of an object or entity can be ascribed to the organisation of its physical parts into a particular kind of complex whole; the resultant causal properties are emergent properties that depend on the details of such organisation (O'Connor 1994, CPSS:45, Barnett and Seth 2021, Mediano *et al* 2022, Rosas *et al* 2022). Actual events are always the outcome of an assemblage of interacting powers that happen to interact at a particular time and place (CPSS:47). Consequently, to develop causal explanations for some specific object or entity, one needs two complementary processes (CPSS:48):

- One must identify causal powers by observing partial emerging regularities in multiple events, which allows us to theorise the existence of underlying causal mechanisms that are responsible, subject to circumstances, for the observable degree of regularity (which is *retroduction* to give effective theories).

- To explain specific past events, one must identify the set of causal powers that interacted to produce them, and how they affected each other through the processes of effective theories (which is *retrodiction*).

The processes are complementary because the real causal powers identified by retroduction are the building blocks underlying emergent function. Interaction between the parts that produce an emergent property may be called the ***mechanism*** concerned. Describing how higher level outcomes arise through lower level mechanisms can be called a ***redescription*** at the lower level (CPSS:24-25). Such a process of redescription does not undermine the fact that the outcome depends on the higher level structure; on the contrary, it shows *how* this is so: it specifies the mechanism involved at the lower level.

All these considerations arise also in the case of abstract structures such as design for a building or a computer program or a legal system, which are also modular hierarchical structures. A digital computer functions via a hierarchy of virtual machines, that are abstract mechanisms (Tanenbaum 2006, Ellis 2016:§2, Dasgupta 2016). Similarly, laws in society are mechanisms that enforce property rights, rules of the road, and so on.

Existence and stability In order for an entity to have emergent properties, it must exist (CPSS:33). Thus it must come into existence via processes of ***morphogenesis*** (structure creation), which involves long term (evolutionary) aspects as well as shorter term (developmental) aspects, and then remain in existence via processes Elder-Vass labels as ***morphostasis*** (structure maintenance). Actually the latter term is a bit misleading as it suggests a static situation, whereas in biology the processes keeping an entity stable are dynamic processes of metabolism and homeostasis (Guyton1977, Hall and Hall 2020), with similar processes operating in organisations (Wiener 1948, Ashby 1964, Beer 1966, 1978, Scott and Davis 2007). Also the processes of morphogenesis and morphostasis are not separate: they combine to give EVO-DEVO processes where each influences the other (Gilbert *et al* 1996, Gilbert 2001, Carroll 2005, 2008). Analogous processes apply to the ecosystem of organisations in a society (Parsons 1966:21-29).

Emergentist ontology Elder Vass summarises the elements of emergence in (SPSS:66-67). He identifies the structural elements of a general emergentist ontology, and then considers how to map the concepts of a specific discipline onto this structural ontology (CPSS:68). One must identify the following:

a)   The particular types of entities that constitute the objects of the discipline.

b)   The parts of each type of entity and the sets of relations between them that are required to constitute them into this type of entity.

c)   The emergent properties or causal powers of each type of entity.

d)   The mechanisms through which their parts and the characteristic relations between them produce the emergent properties of the wholes.

e)   The morphogenic causes that bring each type of entity into existence.

f)   The morphostatic causes that sustain their existence.

g)   The ways these sorts of entities with these properties interact to cause the events we seek to explain.

Applying the method requires five types of iteration, which may lead to iterating a metatheory (SPSS:71-75). There are five ways of validating this process (SPSS:75-76).

Necessary and Sufficient Conditions Overall, the point is that real world outcomes need both necessary and sufficient conditions; necessary conditions, such as the laws of physics, do not by themselves suffice. The set of sufficient conditions are characterised by the above approach. One will not in general characterise them all,[18] but one will aim to complete a sufficient part of this program to attain a satisfactory explanation of the specific phenomena in question. Any set of same level laws, such as the regularities occurring in molecular biology or at any of the underlying physics levels, are necessary but not sufficient to determine specific outcomes, which are the result of all the interactions at all distinct levels with their own characteristic variables and effective laws.

Morphogenetic causes in biology are the EVO-DEVO processes whereby evolutionary selection and drift shapes biological emergence in a largely adaptive way in the long term (Gardner 2009, Wagner 2014), and developmental processes shape it in the short term (Gilbert 2001, Wolpert *et al* 2002). The two processes interact in an ongoing way (Carroll 2005, 2008, González-Forero and Gardner 2021), leading to emergence of biological systems in general, and the major evolutionary transitions (Szathmáry and Maynard Smith 1995) in particular. Analogous processes of adaption and selection happen in social systems through evolutionary processes (Parsons 1966), and in particular through technological innovation (Beinhocker 2006).

Morphostatic causes Organisms are kept going on the one hand by metabolic processes that provide them with materials and energy they need, transform them to usable forms, and get rid of waste products and heat, and on the other by homeostatic mechanisms that counter disturbances arising and help attain desired goals. These are feedback control processes, discussed below (Guyon and Hall 2020). There are analogues of both kinds of processes in organisations, necessary in order that they function and survive: they utilise energy and resources of all kinds to achieve their aims, and dispose of waste materials and heat. These are controlled via predictive

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[18] For example, existence of the Universe, Sun, and Earth are necessary conditions for life to exist on Earth.

modelling processes that help attain desired goals (Forrester 1961, Roberts 1981).

Interaction between them All processes in complex systems interlink. The interaction between morphogenetic causes and morphostatic causes in biology is discussed in Pascal and Pross (2015), considering how thermodynamic stability and replicative stability jointly lead to persistence.

2.1 Causation in modular hierarchical structures: emergence at every level.

The entities and the relations between them: Both life and social systems are in the end based in material stuff, so physical structure matters. In biology and engineering, function is enabled by form (Brewer and Burrow 1980), that is, by the structuring of this matter. All complex emergent systems are based in *modular hierarchical structures* for sound functional and evolutionary reasons, where each word is important. The basic principle is to take a complex task and break it down into simpler tasks that are performed by modules, the outcomes of individual modules then being combined to produce the desired emergent functionality. This will usually take place through multiple levels, which is where hierarchy arises (Martins *et al* 2010). Variables at a level **L** underlie emergence of variables and functional relations at higher levels **L+M**, for example molecules arise out of particular configurations of atomic nuclei and electrons, cell walls and nuclei arise out of suitably structured combinations of biomolecules, and tissues arise out of particular configurations of the right types of cells (and hence out of atomic nuclei and electrons), and so on (Campbell and Reece 2005, and see **Figure 1**). This structuring enables the key features of abstraction and information hiding (Booch *et al* 2008), so that a user of a module is not concerned with the internal structure or variables of the module: all that matters from the exterior viewpoint is that it performs the desired functions, which are multiply realisable in terms of module internal structure and operations. Such structuring is the only practicable way that a truly complex system (life, digital computers, a city, an economic system) can come into existence (Simon 2019, Booch *et al* 2008).

The emergent properties. Efficient causation takes place at every level. This is the principle of biological relativity (Noble 2012) extended to cover more general cases than just biology, although it of course includes that case. The underlying protons and electrons are interacting with each other via the electromagnetic force. The genes and proteins interact through complex interaction networks, with their own rules of interaction, for example as characterised by behaviour of network motifs (Alon 2019). They are contained within reaction containers such as cells and their organelles, with ingress and egress carefully controlled by voltage gated (Catterall 1995) and ligand gated (Hucho andWeise 2001) ion channels. The electrons enable this, but the logic of the networks and ion channel operation determines outcomes at the ion/electron level. Proteins have immensely complex structure that underlies these interactions (Petsko and Ringe 2004). The physiological systems have their own logic enabled by their structure (Campbell and Reece 2005), for example controlling metabolism and enabling homeostasis and homeorhesis as central features of biology at each level (Hall and Hall 2020), all facilitated by the underlying cellular and molecular structures. Neural networks in the brain (Hopfield 1982, Churchland and Sejnowski 1994) enable predictive processing of incoming data (Clark 2013), analysis of experiences and storage of memories via neural

network plasticity, prediction of action outcomes, analysis of other people's motivations, and so on (Papadimitriou *et al* 2020). Emergent higher level structures perform new kinds of function at each level, described by the variables appropriate to that level (Anderson 1972, El-Hani and Emmeche 2000). That amounts to real causation at each level (Noble 2012): effective relations apply at all mesoscopic levels (Bizzarri *et al* 2019).

Effective Laws This is equivalent to the existence of Effective Laws (Castellani 2002:260) governing the time development of the relevant variables $X_L^j(t)$ at each emergent level **L** (Ellis 2020). They are represented by evolution equations for these variables in terms of variables at the same level, essentially of the form

$$X_L^j(t_1) = f_L^j(X_L(t_0),t_1), \quad C_L(t) = 0 \ (t_0 \leq t \leq t_1). \tag{1}$$

These may be a set of partial differential equations, a set of ordinary differential equations (and thus a dynamical system), a set of difference equations, or equations for probabilities (Hacking 1990), and $C_L(t)$ are constraints on possible interactions (and hence outcomes) at time t. An effective equation for level **L** can be tested for suitable ranges of initial data $X_L(t_0)$, and so validated in that context (all effective laws have limited domains of validity). It is autonomous from other levels in the sense that only level **L** variables occur in equation (1); indeed existence of such effective causation is what *defines* emergent levels. Examples might be the dynamics of a block sliding down an inclined plane;[19] of gene regulatory networks at the cellular level; or of neural networks at the physiological level.

They are irreducible to lower levels because essentially higher level variables occur at emergent levels and play key causal roles, for example topological properties of biological networks (Navlakha *et al* 2014) and of polymers (McLeish *et al* 2019) can only be described at the emergent level. Examples of such emergence are the heart (Noble 2002), immune system networks (Shilts *et al* 2022), and neural networks organised in three spatio-temporal patterns (Bolt *et al* 2022) with synchronisation of modes (Cabral *et al* 2022), resulting in synergistic interactions that are the emergent drivers of human cognition (Luppi *et al* 2022, Isomura *et al* 2020). Such macroscale causation is a general fact about causal relationships in biology, is scientifically detectable, and is not a quirk of any particular measure of causation (Comolatti and Hoel 2022). Heylighen (2001) has an excellent summary of how this all works.

No privileged level of causation This autonomy of higher-level difference-making causes is defended by Menzies and List (2010) and Woodward (2021). As efficient causation happens at every level, and indeed is required at every level in order that the whole functions as needed in physiological terms, in general in biology,

>"A priori*, there is no privileged level of causation. … there is no privileged scale at which biological functions are determined"* (Noble 2012).

This is confirmed by the very existence of these levels: evolutionary processes have caused them to come into being, because each is crucial to survival. If any were missing, the whole would not function or survive. The same is true in engineering, e.g. as regards the physical hierarchy of digital computers (Tanenbaum 2006, Dasgupta 2016) or aircraft. In this case, they have been designed as they are in order to enable the entity as a whole to function.

Meso-level organisations In the case of a society, the corresponding statement is that in order that the society as a whole functions, the causal powers of individuals, of the society as a whole, and of multiple levels of meso-level

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[19] See https://www.physicsclassroom.com/class/vectors/Lesson-3/Inclined-Planes.

organisations below the level of society as a whole are all needed. That is why they exist.[20] This is a main theme we will be developing below. It is why the causal power of social structures (Elder-Vass 2010) is a key issue.

2.2 Mechanisms of emergence: upwards and downwards causation

How does such same level ("efficient") causation work, in functional terms?

Mechanism of Emergence The existence of effective laws (1) at an emergent level **L** in a specific context depends on both lower and higher levels, because their outcomes are enabled by a combination of upwards emergence and downwards causation, as indicated in **Figures 1** and **7**, which leads to emergence of such laws.

Upwards emergence takes place by *coarse graining* (Robertson 2020), as in the kinetic theory of gases, *symmetry breaking* as in solid state physics and in chemistry (Anderson 1972), and by *black boxing*: emergence of logical outcomes in the given context (Ashby 2013), as in the case of digital computers (Dasgupta 2016).

Downwards causation takes place firstly via *boundary conditions* and mechanisms based in *structural constraints* (Juarrero 2002, Noble 2012, Pezzulo and Levin 2016, DiFrisco and Jaeger 2020). Noble (2012) states,

> *"Modelling of the heart, and its experimental basis, shows that downward causation is necessary and that this form of causation can be represented as the influences of initial and boundary conditions on the solutions of the differential equations used to represent the lower level processes".*

Structural constraints can be regarded as a form of boundary conditions (a fluid can't flow through the walls of a pipe, a cell membrane prevents molecules drifting away). We develop this in **A)** below.
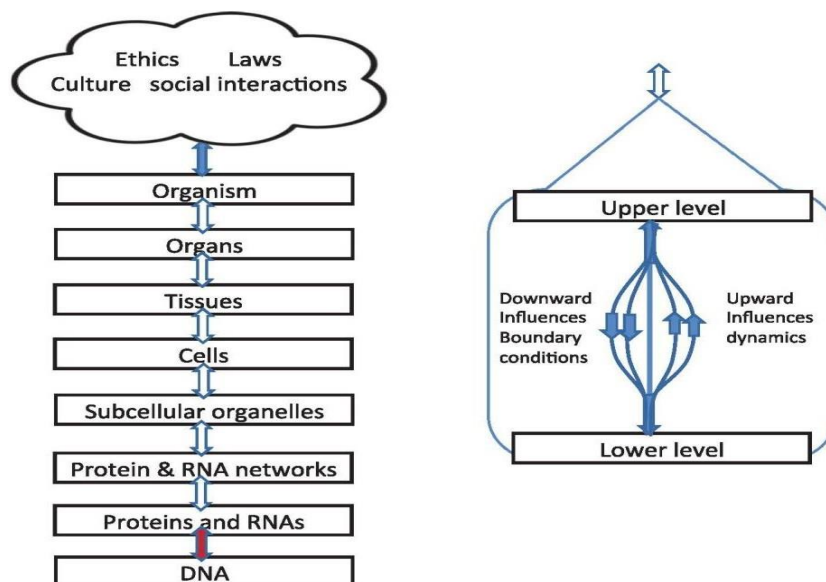
Figure 7 *Left*: ***Representation of levels of interaction*** *emphasizing that upward and downward causation operate simultaneously and are shown as double arrows. Causal closure occurs only when all these links are taken into account.* **From** Noble *et al* (2019).
Figure 7 *Right*: *diagram showing that, within each bidirectional causal arrow, there are different forms of causation, up and down.* **From** Noble *et al* (2019).

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[20] Proviso: provided they succeed in surviving for a reasonable length of time, because they meet some need.

Secondly, downward causation takes place by higher levels shaping lower level constituents according to higher level needs. They can *create needed lower level entities*, as occurs when specific proteins are generated through gene regulatory networks,[21] or *combine lower level entities*, as when amino acids are linked to make proteins. They can *modify lower level elements,* as happens in developmental processes that determine cell types from pluripotent cells (Harold 1995, Gilmour et al 2017), *or delete lower level elements*, as happens in adaptive selection (Holland 1992) and apoptosis (Meier *et al* 2000, Lawen 2003).[22] This leads to the idea of "*understanding the parts in terms of the whole*" (Cornish Bowden *et al* 2004). We develop this in **B)** below.

Stochasticity at the molecular level then allows higher level processes to select from an ensemble of favourable lower level outcomes via these various processes, thereby decoupling higher levels from the apparent inevitability of decontextualised lower level physical laws. Such stochastic dynamics is a core principle of molecular machines (Hoffmann 2012), enabling extraction of order from chaos via asymmetric energy landscapes, of development (Gottlieb 2007, Kupiec 2014), and of brain function (Deco *et al* 2008). This provides a potential grounding role for responsibility as it allows emergent mental processes to shape lower level outcomes by such selection (Shadlen and Roskies 2012, Noble and Noble 2018, 2020), see §5.2. Furthermore downward causation by using information entails patterns of patterns that constrain forces and allow accumulation of information by repeated cycles of selection (Farnsworth 2022), hence living organisms depend on the whole history of life, including all the stochastic aspects of historical evolution and climate history. Underneath this lies the fact that optimisation processes are enhanced by stochasticity (Palmer 2022).

Multiple Realisability A key feature of all forms of downward causation is multiple realisability of higher level needs at lower levels (Gillett 2002, Piccinini and Maley 2014, Batterman 2018, Bickle 2020), which is the reason that the essential causal processes can be regarded as occurring at the emergent level: they can be regarded as natural kinds at the emergent level but not at the lower levels (Ellis 2020). Multiple realisability means that the specifics of the lower level realisations are irrelevant: they must just belong to the equivalence class that corresponds to attaining the needed higher level outcome, which is the essential causal element driving lower level dynamics. This is enabled by the modularity (Booch et al 2007) and degeneracy, so that many specific details of lower level dynamics (e.g. which atom is where) do not matter. As stated by Edelman and Gally (2001):

> "*Degeneracy, the ability of elements that are structurally different to perform the same function or yield the same output, is a well-known characteristic of the genetic code and immune systems. Here, we point out that degeneracy is a ubiquitous biological property and argue that it is a feature of complexity at genetic, cellular, system, and population levels. Furthermore, it is both necessary for, and an inevitable outcome of, natural selection.*"

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[21] These processes are frequently called *gene regulatory networks* (GRN), but that nomenclature does not make it clear that the DNA is regulated. It does not itself perform the regulation. That is done by the proteins, lipids (forming the membraneous controlling boundaries), metabolites, and many other molecules.

[22] A malign example is given by Paul Humphreys in Aeon: <u>transformation of people by mob contexts</u>.

This is explored in the case of the brain by Bechtel and Mundale (1999), Price and Friston (2002), Figdor (2010), and Piccinni and Maley (2014). The same is true in organisations: different material elements can perform the same function, different micro procedures can give the same result, different people can perform the same task.

A) Downward causation via boundary conditions and constraints Downward causation takes place when the constraints in (1) are due to higher level structures. Constraints $C_{L+M}(X_{L+M}^k(t)) = 0$ on higher level variables X_{L+M}^k at level **L+M** shape what happens at that level, and hence constrain what happens at lower levels from level **L+M-1** down to a level **L** (Juarrero 2002). Thus

$$C_{L+M}(X_{L+M}^k(t)) = 0 \quad \Rightarrow \quad C_L(C_{L+N}(X_{L+N}^k(t)) = 0, \quad M \geq N \geq 0 . \quad (2)$$

Just like electric connections in an integrated circuit (level **L+1**) constrain flows of electrons (Level **L**) between specific transistors, existence of axons in the brain constrain action potential spike chains to travel from one particular neuron to link to another at a synapse. The specific pattern of such connections in each person's brain is what distinguishes them from other people. These are structural constraints. Boundary conditions, such as voltage or molecular density gradients across a membrane, also constrain what happens (Noble 2012).

If constraints **C** are **time independent**: $dC_{L+M}(t)/dt = 0$, then higher levels shape what can happen at lower levels in a fixed way. Physical examples are a wall holding up a roof (and so all the atoms making up the roof), an electrical wire connecting two transistors (channelling the electrons that make up the current), a furrow in the ground channelling water (and so channelling the water molecules to flow along the channel), and so on.

If the constraints are **time dependent**: $dC_{L+M}(t)/dt \neq 0$, for example a switch closes a circuit (hence altering the circuit topology), they enable higher levels to control lower level outcomes (in this case, enabling electrons to flow in a wire and so generate a current and thereby light a light bulb). Thus if (2) holds, (1) is modified to

$$X_L^i(t_1) = f_L^i(X_L^j(t_0),t_1)), \quad C_L(C_{L+N}(X_{L+N}^k(t)) = 0, \quad M \geq N \geq 0 \ (t_0 \leq t \leq t_1) \quad (3)$$

for $i,j = 1,…,N_L$, $k = 1,..,N_{L+M}$, showing the effect of interlevel constraints.

Homeostasis/Feedback control A key case in biology is homeostasis (Cannon 1929, Milsum and Roberg 1973, Guyton 1977, Hall and Hall 2020, Modell *et al* 2015) operating via feedback control (**Figure 8**), which takes place at every emergent level in living organisms (Bechtel and Bich 2021). This is the same process as a cybernetic system in engineering (Wiener 1948), configured to attain a desired goal **G**.

Goals are reliably attained only in systems that are goal-seeking, as opposed to those that run on the basis of some pre-programmed set of rules. Large or small things will go wrong, outside influences will interfere with one's plans, or one's initial ideas or actions may be slightly inaccurate in their aims or implementation. Therefore continual corrective action is needed to keep the activity on course. This requires determining what is happening, comparing it with what should be happening, and then taking whatever action is necessary to make reality coincide with the previously chosen plan or goals. A level **L** detector measures the system state and compares it with the goal **G**. If there is a difference larger than some threshold it controls an activator that changes the level **L** state so as to make it tend towards the goal; this thereby controls level **L-1** conditions. The constraints **C** that

structure such feedback are the systems that channel a) information about the system state to the comparator, b) information concerning the error to the controller, and c) the control signal from the controller to the activator. Feedback control is one of the great fundamental principles of biology, and also in organisations.
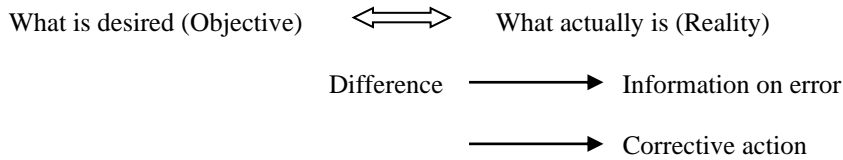
What is desired (Objective) ⟸⟹ What actually is (Reality)

Difference ⟶ Information on error

⟶ Corrective action

Figure 8a: *The basic principle of feedback control systems in biology, engineering, and any social setting.*

Controller

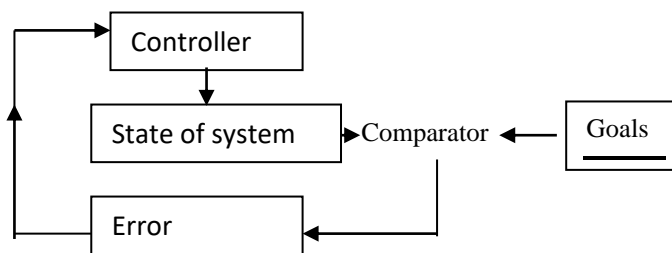State of system ▶Comparator ◀ Goals

Error

Figure 8b: *The information flows that underlie a feedback control system (and give it its name).*

Figure 8: The nature of a feedback control system.

More formally (see **Figure 8a**), what is desired is compared with actuality; the difference generates an error message **E**. That error message is fed back to a controlling element of some kind that corrects for the error. It is helpful to picture this process in terms of the information flows that occur in a feedback-control system (see **Figure 8b**). The equations governing this are,

$$\mathbf{E}(t) = \mathbf{S}(t) - \mathbf{G}, \quad \mathbf{S}(t_1) = \mathbf{F}(\mathbf{S}(t_0), \mathbf{C}(t), \mathbf{E}(t)), \; t_1 \geq t \geq t_0, \quad \mathbf{F}(\mathbf{S}(t), \mathbf{C}(t), 0) = \mathbf{S}(t) \qquad (4)$$

where the function **F** is chosen such that **E(t) ➔ 0.** Here, **S**(t) is the system state at time t, **G** is the goal state, **E**(t) is the error at time t (the difference between the actual and desired state), and **F** is the control function for the state **S**(t) with **C**(t) the boundary conditions or constraints determining what is possible (e.g. resource limits).[23]

An example is a thermostat that changes temperature (a level **L** variable) by controlling a heater (an emergent system) so as to attain the desired temperature T_0 at the macro level **L**. If the temperature is too low, the system turns the heater on, and hence changes the mean speed of motion $<v>^2$ of molecules (a level **L-1** variable). This is thus a case of top down causation: in terms of difference making, a different thermostat setting at the higher level results in different molecular speeds at the lower level. The system structure is emergent: leave all the components unchanged but disconnect one wire, then the topology is changed, and it does not work.

This principle underlies the way that engineering control systems work and living organisms function. Indeed, all purposive activity that reliably attains goals works this way. Immensely complex feedback control systems occur in plant and animal physiology, resulting in goal seeking and apparently purposeful activity at all levels of the

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[23] More detailed models include noise, and are solved by using Laplace transforms.

biological hierarchy (Gomez-Marin and Ghazanfar 2019). The processes in each living cell (Alberts *et al* 2018) are controlled by numerous feedback control loops associated with metabolism and the activities of enzymes at that level; the temperature of the human body is maintained accurately through physiological control loops at the macroscopic scale; heartbeats are automatically regulated at the physiological level (Noble 2002); and so on. Higher level conditions can homeostatically control lower level conditions via signalling molecules (Berridge 2014), as happens in metabolic networks (Goelzer *et al*. 2008) and gene regulatory networks (Jacob and Monod 1961, Monod *et al* 1963). Thus, plants and living beings embody hierarchically structured feedback control, determining top-down action in their hierarchical structure., and adaptive homeostasis can control the functioning of homeostatic systems (Davies 2016). This is a case of emergence: none of this can be described by coarse graining.

Branching Logic The key point then is that time dependent constraints enable the emergence of a form of *branching logic*, such as in the case of the thermostat,

$$\text{IF } \{E > 0\} \text{ THEN } \{\text{turn on heater}\} \text{ ELSE } \{\text{not}\}. \tag{5}$$

This emergence of an (IF ….THEN … ELSE) logic is in sharp contrast to the underlying laws of physicswhich by themselves entail no such branching logic. Their nature has an inevitable quality:

$$\text{(Initial data) + (laws of physics) } \rightarrow \text{ (unique outcome)}, \tag{6}$$

with no contextually determined branching allowed.[24] Dynamical branching as in (5) occurs when one applies those universal laws in biological or engineering contexts with context-dependent constraints related to function. You do not have to know the initial data to predict outcomes: they depend only on the system goal, which is the contextual variable. The mechanism is structured to make this the case, through natural selection (in the case of biology, Campbell 1974) or by design (in the case of engineering, Dieter and Schmidt 2021).

Logic via conformational change of biomolecules The crucial "lock and key" recognition mechanism of molecular biology (Cramer 1994, Morrison et al 2006) underlying cell signalling (Berridge 2014) enables logical branching of the form,

$$\text{IF } T(X) \text{ THEN } F1(Y) \text{ ELSE } F2(Y) \tag{7}$$

at the molecular level, where Y is a dynamic variable at level L and X is a control variable at level L or L+1. This underlies adaptive responses to context and enables function to emerge from physics, which is what distinguishes biology from physics (Hartwell *et al* 1999), and allows the contextual interpretation of information to have causal power (Nurse 2008, Farnsworth *et al* 2013),

A key further example of such emergence of logic is voltage gated ion channels in axons of neurons, where context-dependent conformation change of the ion channel enables logic of the form,

$$\text{IF } (\Delta V \text{ outward}) \text{ THEN (channel closed), IF } (\Delta V \text{ inward}) \text{ THEN (channel open)} \tag{8}$$

where ΔV is difference the voltage across the cell wall. This logic at the macro-molecular level (Lehn 2004) reaches down to the physics level where it alters constraints in the underlying Hamiltonian (Ellis and Kopel

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[24] In the case of phase changes, branching dynamics occurs, but is uniquely determined by physics alone.

2019). The inflow of ions then alters the voltage across the ion channel, so circular causation occurs (Noble *et al* 2019) and underlies the oscillations that create action potential spike chains. Ligand gated ion channels similarly play a key role in molecular signalling (Berridge 2014). Allosoteric regulation of enzymes by binding effector molecules at sites distinct from the enzyme's active site (Monod *et al* 1963, Perutz 1989) allows introduction of AND and NOT operators into logical operations that generalise (7).

Networks and topology of networks Once on has logical elements, they can be combined in networks of arbitrary complexity, which are irreducible emergent entities. The network outcomes (their functionality) depends on the network topology, and the strengths of connections between nodes (Navlakha *et al* 2014). Key biological examples are metabolic networks, gene regulatory networks, immune networks, and neural networks. The topology of the network (characterised by graph theory) is an irreducible higher level emergent feature, which determines lower level outcomes in a downward way.

When networks shape outcomes, one cannot determine higher level outcomes from lower levels by coarse-graining, as suggested by Flack (2017): rather one must deduce higher level outcomes by logical combination of black box outcomes, as explained in *Design for a Brain* (Ashby 2013), or determine them by detailed experimental investigation, as in the work by Freimer *et al* (2021) and Shilts *et al* (2022) examining the architecture of immune networks. Neural networks allow feedback control to be extended to predictive processing of incoming data and enactive processes in the brain (Clark 2013, Friston 2012, Gallagher and Bower 2013, Friston 2018) and associated actions (Wolpert *et al* 1995, Tucker 2009, Shergill *et al* 2013).   Furthermore networks are not all that can occur: high-order structures and behaviours can be interrogated by using hypergraphs and simplicial complexes (Battiston *et al* 2021, Rosas *et al* 2022).

Multiple realisability: Reprise While one can in principle give detailed data at the lower physical levels that will determine outcomes, multiple realisability together with molecular level stochasticity means this is completely irrelevant in practice. It is true the higher level variables emerge from the lower level ones: but there is a dynamic at work at each higher level that has its own integrity and logic that cannot be encapsulated using only lower level variables (Simon 1962, Gilbert and Sarkar 2000). Physical networks determine outcomes due to their specific connectivity patterns, as in the case of neural networks (Churchland and Sejnowski 1994, Nolte *et al* 2020). The same holds for metabolic networks and gene regulatory networks, with their complex combinatorial logic (Su *et al* 2022), immune networks (Freimer *et al* 2022), and protein signalling networks (Garrido-Rodriguez *et al* 2022).

The emergent higher level logic – e.g. existence of network motifs (Alon 2019) - determines the outcomes, and chains down to shape outcomes at the electron/ion level, as also occurs in the case of voltage-gated ion channels (Ellis and Kopel 2019). In each case multiple realisability is a key feature of what is going on:

> *The higher level variables and effective laws at level **L+N** are multiply realisable in terms of lower level **L** variables. It is not the specific lower level realisation that matters in terms of physical outcomes, but the*

*equivalence class[25] of lower level variables that all realise the same emergent effective laws (Ellis 2020). This equivalence class is a level **L** representation of the causally effective level **L+N** emergent variables. Atomic and molecular level stochasticity randomizes lower level variables within such an equivalence class.*

The huge dimensionality of the multiple realisability of genotype-phenotype maps play a key role in evolutionary processes (Wagner 2014).

Organisations similarly are crucially shaped by physical, functional, and abstract constraints.

Physical constraints will place limits on what organisations can do: specifically what physical entities and materials they have at their disposition (trucks, warehouses, refrigerators, computers, bricks, cement, perishable items, etc) determines what functions they can carry out, including, are there sufficient personnel available to carry out all the needed tasks, whether physical labour, mental work, or management?

Functional constraints go a step further: are the resources available sufficient to achieve the desired goals? Can they mesh together as required? Do the employees have the required capacities for their tasks?

Time independent abstract constraints play a key role in organisational function. Examples are constitutions, organisational structures and associated definitions of functions, the rules of play of football, traffic rules, and so on. They are causally effective via realisation in terms of symbolism such as rule books, stop street signs, and so on, and affect physical stuff in a social context: for example a stop sign causes all the atoms in an automobile to come temporarily to a stop in the vicinity of a specific street sign.

Time dependent abstract constraints enable logical branching to occur, e.g. traffic lights do so:

$$\text{IF \{Red\} THEN \{Stop\}, IF \{Green\} THEN \{Go\}.} \qquad (9)$$

Similarly it occurs in changes in rates of exchange, interest rates, etc. controlling functioning of an economy; prices set by the general manager nationally determine what happens in all branches locally. These are all enabled by brains functioning in the context of a specific society, enabled by logical branching at the molecular level (Ellis and Kopel 2019). Such abstract causation is discussed further in Section 3.2.

Feedback control (**Figure 8**) is a key feature in organisations of all kinds: in businesses, in education (feedback is the core of teaching), in voluntary organisations, and indeed in all properly conducted purposeful organisational activity (Forrester 1961, Beer 1966, Lane 1997, Scott and Davis 2007). It is the foundation of social organisation, as it is the basis of the QOL feedback system described in Section 1.2.

B) Downward causation via Adaptive Alteration of Lower Level Variables The second key form of downward causation is time-dependent alteration of the set of variables at level **L** due to the effect of variables at higher levels **L+1** to **L+M**. This has been labelled "machresis" by Gillette (2017). This happens on three different timescales: functional, developmental, and evolutionary.

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[25] See https://en.wikipedia.org/wiki/Equivalence_class for a definition and examples.

1. On functional timescales, it can be due to (a) selective intake of lower level entities, as happens for example at the molecular level in biology via ion channels, or (b) creation of lower level elements, such as creation of molecules via gene regulatory networks and metabolic networks (Sauer and Teusink 2018), which occur in an interlocking hierarchically structured way (Goelzer *et al* 2008). It can be by (c) fusion of lower level entities, as in chemical reactions (Humphreys 1997) and in linking of amino acids to create proteins (Watson et al 2013), or (d) by selectively exporting entities, as happens via ion channels in membranes and by secretory systems, or (e) deletion of selected lower level entities, as when the immune system eliminates pathogens (Delves and Roitt 2000), and in selective deletion of cells through apoptosis (Meier *et al* 2000, Lawen 2003).

2. On developmental timescales, in addition to (a)-(e), (f) alteration of the nature of lower level entities takes place, as happens at the cellular level during developmental processes that determine cell types on the basis of positional information (Wolpert *et al* 2002, Carroll 2008, Freimer *et al* 2022) and so create tissues.

3. On evolutionary timescales, (g) specific genes and proteins undergo preferred reproduction via processes of natural selection, with others dying out (Campbell 1974, Heylighen 1999, Wagner 2014). This process is driven by emergent physiological needs that cannot be described at any lower level, for example antifreeze proteins in Arctic cod allowing functioning in temperatures below zero degrees Celsius, better oxygen binding by haemoglobin in the bar-headed goose allowing higher flight in mountainous terrain, and improved perception via opsins that underlie colour vision (Wagner 2014:107,112). Stochasticity plays a key role in the variation and selection process by providing an ensemble of varied genotypes (and hence phenotypes such as proteins and associated physiological systems) to select amongst, hence one can talk of probabilistic epigenesis (Gottlieb 2007) as an interlevel process. Indeed this is a general feature of adaptive selection: there must be a source of variation to provide an ensemble of entities to select from. Generic optimisation processes are often improved by introducing such an element of randomisation (Palmer 2022).

We denote these effects, classed together, as adaptive selection S_{L+M} of lower level variables due to higher level context, cascading down from a higher level **L+M** to alter the set of variables $\{X^j_{L+J}(t)\}$ at each level **L+J** **(L+M ≥ L+J ≥ L)** to give a new set of variables $\{X'_{L+J}{}^j(t)\}$ at level **L+J** that obey relevant selection criteria C_{L+J} deriving from selection criteria C_{L+M} at level **L+M.** The outcome is the adaptation map

$$S_{L+M}(X_{L+M}{}^k(t),t) \ (k = 1,..,N_{L+M}): \{X_{L+J}{}^j(t_0)\} \Rightarrow \{X^\#_{L+J}{}^j(t_1)\}, \quad L+M \ge L+J \ge L \ . \tag{10}$$

Through these interactions, the relevant variables X^i_{L+J} at a level **L+J** are altered by processes at higher levels **L+M** and (1) is replaced by

$$X'_L{}^i(t_1) = f_L{}^i(X_L{}^j(t_0),X^\#_L{}^j(t_1)), \quad C_L(t) = 0 \ (t_0 \le t \le t_1), \ (i,j = 1,…,N_L, \ k = 1,..,N_{L+M}) \tag{11}$$

where $\{X^\#_L{}^j(t_1)\}$ is given by (10). This is crucially different than the billiard ball model of kinetic theory that underlies many physicists' views on reduction and emergence, where the billiard balls have immutable properties unaffected by context. That is not the way biology works. A key feature is the role constraints play by shaping theoretical morphospaces and functional constraint boundaries (McGhee 2007). Overall, one arrives at the concept of "*Understanding the parts in terms of the whole*" (Cornish Bowden *et al* 2004).

As evolution is a specific case of such processes that is key to our existence, three comments on evolution are in order: re 1) multilevel evolution, 2) EVO-DEVO processes, and 3) Gene-Culture co-Evolution.

1) **Multilevel evolution** A first crucial feature of evolutionary processes is,

> Selection shapes all emergent levels L_l in Figure 1 simultaneously. It has to do so, because they all work together to enable the organism to function (Noble 2012, Ellis 2020a). In particular, evolutionary selection is not confined to either the gene level or the organism level.

In particular, group selection sometimes takes place, see Wilson and Sober (1994), Wilson and Wilson (2008), leading to an opposite understanding to the "selfish gene" perspective (Johnson *et al* 2012).

 2) **EVO-DEVO** A second crucial feature of evolution is that evolutionary and developmental aspects interact with each other. It is developmental systems that make it possible for an organism to exist (Wolpert *et al* 2002), so it is they in particular that are selected by evolutionary processes (Oyama *et al* 2001). Their action then alters evolutionary outcomes, leading to the Evolution-Development interaction (Evo-Devo) view of the dynamics taking place (Carroll 2005, 2008, Gilbert 2001). Organisms both shape and are shaped by the environment, so that the activities of the organisms themselves play a role in their own evolution (Buskell 2019, Gilbert 2023).

3) Gene-Culture co-Evolution Consequently, a third key feature is that gene-culture co-evolution takes place: Darwinian evolutionary processes apply to cultural evolution and thereby affect genetic evolution, see Cordes (2006), Mesoudi *et al* (2006), Nelson (2006), Wilson and Wilson (2007), Henrich *et al* (2008), Claidière et al (2014), Cordes (2019), Turner *et al* (2020). The most important example is the evolution of a symbolic brain (Deacon 1998) and consequent development of communication by language which has transformed our social and technological life (Harari 2014). Gontier (2021) emphasizes the hierarchical aspects of what is happening.

   Organisations carry out similar processes that alter lower level elements: as regards its physical element, its products, and the people constituting the organisation.

As regards materials, one has *addition*: selected stuff of approved quality is imported, *alteration*: it is worked on in various ways (manufacturing/repair), and *removal*: products are exported when completed, while waste products (solids, liquids, and gasses) are separated and removed, and heat must be disposed of. Thus the physical elements of the organisation (buildings, machinery, advertising billboards, and so on) are adapted to its needs, incurring an environmental cost. As regards people, one has

Addition: Applicants for a post are taken into the organisation after a selection process, thus determining who will constitute the organisation (Carney 2021:319). This requires a pool of alternative people to choose from.

Alteration: A neophyte is turned into an expert through mentorships and training programs, thus changing their functional nature and hence usefulness to the organisation (Carney 2021:320). They may be moved to other departments or promoted to other positions in the organisation, thus altering their organisational role.

Deletion: A selection process takes place after a trial period, where they are either kept on in the organisation, or let go, depending to what degree they meet selection criteria and perform well.

Thus the people in an organisation are adapted to fit their organisational role by these processes.

 Multiple realisability exists here too, to some degree: the point of a bureaucratic organisation is that it does not matter who fills a specific role as long as they carry it out according to the stated rules. The role is separate from those who occupy it. That is the nature of a role.

   This also works for **organisational products/outcomes**: they are adapted from time to time to suit the current market, or to influence it, or even to create a new market. This takes place often by a series of trials, discarding the failures, which is the same pattern of adaptive selection. Again the key point is one must have a variety of options to choose from (Danchin *et al* 2011); then that choice can be made to best meet high level purposes both in terms of meeting some societal need, and so in terms of financial returns (Mayer 2018).

   Similar processes take place for **departments** or **branches** of an organisation: they are created, adapted, and sometimes closed. In summary, various processes adapt both lower level and intermediate level organisational components (people, departments) so as to fulfil higher level organisational purposes. Finally organisations are subject to both evolutionary processes, where organisations of that type have come into existence (banks, armies, governments, hotel chains, railroads, and so on) and developmental processes (how this particular organisation came into existence), as well as structure/function relations that shape them on a day to day and weekly basis.

   In summary, in each case there are different kinds of causation at each emergent level **L** because they obey different effective laws (1) at for different variables $X_L^j(t)$, and with intertwining of upward and downward causation relating what occurs at the different levels by the processes just discussed, as represented in (3) and (11); indeed this interlevel dynamics is what enables the same level effective laws to emerge. Effective causation is needed at every level in order that desired overall outcomes emerge, because they each represent a different aspect of the complex multiscale dynamic in operation that is crucial to the overall outcomes (Noble 2012).

   2.3 Causal closure is an interlevel affair

Given this context, causal closure is an interlevel affair An example is the way that smoking causes lung cancer (Pearle and Mackenzie 2018). The emergent levels are indicated in Figure 9. The process starts at the social level L9, where[26] a sophisticated advertising industry spends very large sums of money to persuade the public to smoke, based on extensive market research as to what kind of advertising works, as well as pressure arising from peers during interaction at social events, where they engage in smoking and persuade others to do so. This acts down to the individual psychology level L8 where rationality and emotion battle it out:[27] "If I smoke, I'll enjoy it", "If I smoke I'm likely to get cancer". If the outcome is a decision to smoke consistently, then one runs into a well-established causal effect at the physiological level L7: lung cancer is a likely eventual outcome (Pearle and

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[26] To be fair, this was the case in the past; not so much nowadays since laws in many countries have inhibited such advertising. But that itself is then a key form of constraint shaping downward causation in this context.

[27] See **Figure 2**, and **Figure 12** in Section 4.1

Level	Name	Dynamic
L9	Sociology/Economics	Smoking advertising, social pressure
L8	Individual Psychology	"I enjoy smoking": rationality, emotion
L7	Human Physiology	Smoking causes cancer: causal relation
L6	Cell biology	Uncontrolled cell duplication
L5	Gene regulatory networks	Protein production based on DNA code
L4	Macromolecular Chemistry	Regulatory molecules binding, conformational changes
L3	Quantum chemistry	Molecules bond ➜ macromolecules
L2	Atomic Physics	Atoms bind to give molecules
L1	Particles	Electron/proton interactions

Figure 9: Levels involved in smoking causing lung cancer.

Mackenzie 2018). Note that this statement can be made without any knowledge of the underlying mechanisms: it is a purely level L7 relation. However it is based in what happens at the cell biology level L6 (uncontrolled cell duplication due to smoke particles) which in turn is due to consequent effects on gene regulation at level L5 – which is due to those particles having been inhaled at level L7. The level L5 dynamics is a result of conformational changes of macromolecules involved in regulatory binding at Level L4, in turn based in the way quantum chemistry at Level L3 underlies existence and folding of proteins. This is due to the way atomic physics at Level L2 underlies physical chemistry, in turn based in particle physics at Level L1. Efficient causation takes place at each level LI, as described by the effective laws at that level, and is different at every level. This is all driven in a downward way (L9 ➜ L1) as indicated above – none of it would happen without the tobacco industry - but is enabled in an upward way (L1 ➜ L7): none of it would happen if physical forces did not enable physiology. The occurrence of lung cancer then affects future dynamics: it alters levels L8 and L9 in the future, as the level L7 effects are perceived individually and socially.

The necessary and sufficient conditions for a specific outcome to occur must thus be fulfilled, and that takes place only when all the interacting levels (**L1-L9**) that affect each other by upwards and downwards causation through the processes just discussed are taken into account. Thus causal closure in a social context only takes place when effects of all relevant lower level and higher level variables are included from the underlying physics level to the psychological level and the sociological level (Berger 1963, Longres 2000). These reach down to lower levels: experiences at the psychological level are embodied as memories via gene regulation that changes neurons (Kandel 2001), and social interactions alter neural connection (Cacioppo *et al* 2002). Driving a taxi, music

lessons, learning mathematics, and singing in a choir alter brain microstructure, in all cases reaching down to alter constraints at the electron level (Ellis and Kopel 2019).

*In mathematical terms, causal closure only takes place when evolution equations for **all** the variables $X_L^j(t)$, involved in the interlevel links from level **L** to level **L+M** represented by (3) and (11) are included in the set of equations considered. And that is why variables at all the levels **L+M** to **L** must be included to get a closed set of equations; otherwise we will not have evolution equations for at least one variable $X^j_{L+J}(t)$ that plays a role in determining the outcomes, so the overall outcome will be undetermined.*

Circular causation takes place. This overall dynamics allows circular causation to take place, because causation chains all the way down from **L9** to **L1** and then all the way back up from **L1** to **L9,** forming a closed loop. This is shown in **Figure 10** in the context of the Hodgkin cycle (Noble 2022) at the cellular level. This is an extension[28] of the analysis of Noble, Tasaki *et al* (2019) illustrated, in different ways, in **Figure 3** and **Figure 7**.
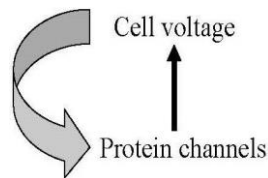

Figure 10 An example of circular causation in physiology. *The Hodgkin cycle represents the fact thatglobal cell properties such as electric potential control molecular level properties, such as ion channel proteins, which in turn determine changes in cell properties.* From Noble *et al* 2019.

Causal closure and Overdeterminism The well-known argument against autonomy of higher levels due to overdeterminism of lower levels (Kim 2005, see the summary in List 2019, Ch 5) is therefore wrong, because, due to (**3**) and (**11**), the underlying physical level **L0** is not by itself causally closed, as assumed by Kim (2005) and others (Greene 2020, Carroll 2021). That completely undermines the argument from the alleged causal completeness of the physical level, which is a fiction (Kleiner and Hartmann 2021).[29]

The true situation is that effective causation (1), extended to (3), (11) by interlevel effects, takes place at each well-established level (Gilbert and Sarkar 2000), including the physics levels, which is simply not the same thing as having causal completeness at any of these levels *by themselves*. In particular, in a biological context, the physics level **L1** of electron-proton interactions is not overdetermined when downward causation takes place because (by (3), (11)) its outcomes depend on higher level variables (Ellis and Kopel 2019, Ellis 2020a, 2021).

What replaces this idea of causal completeness? Given this context, organisational closure (Mossio and Moreno 2010) takes place via ***closure of constraints*** (Montévil and Mossio 2015, Juarrero, 2015) and ***of adaptive processes***. This is key in brain evolution and development (Wilson and Prescott 2022), as well as in the case of organisations. All interacting levels must be taken into account.

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[28] "Extension" because it includes the underlying physical level.
[29] See also Murphy and Brown (2007:233-236).

3. Meso-level organisations in society, and their causal powers

What about society and social institutions? Society as a whole (Berger 1963) is a complex of interacting individuals and meso-level institutions (**Figure 11**), overall forming an adaptive modular hierarchical social structure. The universal functional needs of all societies (Aberle *et al* 1950) are met by this web of interacting structures and institutions (Bellah *et al* 1992), each with specific functions, constitutions, regulations, and procedures.

A very similar analysis applies as in the case of biology (Simon 1962), because there are strong analogies between biology and society for good functional reasons. In the case of a firm, both natural selection and homeostasis occur (Penrose 1952, Heylighen and Campbell 1995, Damasio and Damasio 2016).
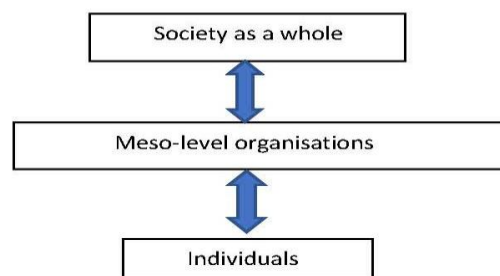

Figure 11. ***Individuals function in meso-level organisations*** *which together form society as a whole.*

The social world is composed of many overlapping and intersecting structures[30], each of which has causal power to influence human individuals (CPSS:4).[31] There are large scale social structures such as a national government, regional structures such a local government, and local structures such as a city council. There are national banks with local branches; national or international companies that operate local franchises; international organisations such as the Red Cross that may have local chapters; football leagues with local clubs; bridge clubs and tennis clubs; and so on. They together form the fabric of a society. Each of them has causal powers: they each carry out specific functions that together enable the functioning of the society as a whole, fulfilling its functional needs (Aberle *et al* 1950) and organising the drivers of growth (Carney 2021:245). "Society" is an abstraction representing the total of all these entities, the people comprising them, and arguably the complex of interactions between them. Note that we do not use the phrase "the sum of all these entities" because that implies a linearity of their interactions, which is certainly not the case. The society as a whole in turn interacts with other societies, together forming the international context, as well as interacting with the natural environment and the biosphere.

Upwards causation occurs via the combinations of effects of individual agents, but collectives (companies, banks, Universities, legislatures, etc) come into existence that have causal powers in their own right, and exert downwards effects on their constituent members by analogous mechanisms to those just discussed (Berger 1963, Berger and Luckmann 1966). These meso-level structures each play causal roles in society (Bellah *et al* 1992), affecting both the individuals making up the society, and how the society as a whole evolves.

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[30] Social *structures* is a generic term, including *organisations* and *institutions* with varied powers and activities.
[31] As stated before, "CPSS" refers to *The Causal Power of Social Structures* (Elder-Vass, 2010).

Organisational agency requires on the one hand agency of those individuals making up the organisation, and on the other emergence of structures that enable those individuals to function together as an emergent entity that is more than the sum of its parts. That is possible through the existence of organisational structures and procedures that have been devised so as to fulfil specific purposes (Drucker 1995, 2012, Carney2021:325-326, 358). Note the implicit term "organised" in the concept of an *organisation*: the entity is structured so as to fulfil a function, and this has been purposefully done (Scott and Davis 2007).

3.1 The Ontology of social structures

We follow Elder-Vass by claiming that to make sense of social structures one must employ the concept of emergent structure-as-a-whole, and identify the social entities that have causal powers (CPSS:81-82). These are entities structured by structure-as relations, thereby causing (partial) empirical regularities.

Determining the ontology of social structures is laid out in detail in (CPSS:79-88). Following Elder-Vass (see the general procedures outlined above in Section 2.1), we must:

- Identify the particular types of entities that constitute the objects of the discipline,
- Identify the parts out of which these structures are made,
- Identify the relations between the parts that lead to an emergent whole,
- Identify the emergent properties arising out of these relationships,
- Identify the relations and events that brought it into existence,
- Identify the relations and properties that maintain it as a stable but mutable structure.

All of these jointly constitute the emergent ontology of the organisation that enable it, more or less successfully, to attain desired out comes. The sting in the tail is what the word "desired" means, which is the central burden of this paper. The larger context is that other societies interact with and affect any specific society, as does the natural world. We look at these issues in turn.

A) Identify the particular types of entities that constitute the objects of the discipline.

One is concerned here with the social structures of all kinds that together make up a society (Berger 1963) and thereby meet the functional needs of the society (Aberle *et al* 1950): shops, restaurants, banks, hospitals, schools, universities, sports clubs, courts, police, manufacturers, transport companies, and so on. These are organisations of various scales that each have specific purposes and functions, and associated identities. An organisation *per se* is an abstract structure that can own things, act in social contexts, and be held responsible for those actions. These all display emergent properties (Hodgson 2000). This is made possible *inter alia* by the concept of a Corporation (Bellah *et al* 1992:98-100). According to *Investopedeia,*[32]

> "A corporation is a legal entity that is separate and distinct from its owners. Under the law, corporations possess many of the same rights and responsibilities as individuals. They can enter contracts, loan and borrow money, sue and be sued, hire employees, own assets, and pay taxes."

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[32] https://www.investopedia.com/terms/c/corporation.asp.

Thus they are constituted specifically so as to have causal powers. Developing the concept of a corporation was a key social innovation that transformed economic history (Harari 2014). Its existence is enabled by law.

B) Identify the parts out of which the structure is made

Organisations (a) are based in the people who carry out its activities (employees, managers, owners, members, etc), who each have individual agency (Section 5.1) and may be assigned to sections, departments, teams, committees, and so on. (b) They have physical components (buildings, vehicles, computers, desks, chairs, etc), which is where the concept of ownership enters. This involves both stable entities such as land and buildings, owned on long timescales, and transient entities owned on short timescales, such as cement, sand, clothes, furniture, kitchenware, and so on, that are either utilised, or bought and sold on an ongoing basis. These may include biological items such as cows, horses, chickens, sugar, milk, wheat, fruit, flowers, etc. Some are of use on an intermediate timescale such as computers and automobiles. (c) They will have financial assets of various kinds that enable their activities. (d) They will have information that is acquired, stored, analysed, and exchanged, often via computer systems connected to the internet. These particularly relate to financial aspects of the organisation. (e) They also have key abstract aspects that shape the physical processes and outcomes. These include their founding documents, constitutions, mission statements, and so on; roles and responsibilities as stated in job descriptions; relations between roles characterised by organograms; systems and procedures; budgets, production schedules, and so on. (f) A key aspect is organisational culture (Scott and Davis 2007:212-214, Miller 2019), which plays a central role in outcomes; and this includes effective norms and embodied values.

C) Identify the relations between the parts that lead to an emergent whole

The mechanisms through which their parts and the characteristic relations between them produce the emergent properties of the wholes range from physical relationships whereby cement and bricks form buildings of a particular design, to the abstract relations just mentioned, curated by the officers of the organisation. These include a constitution that formally structures the organisation, operating procedures that codify day-to-day operations, organograms and role descriptions that identify responsibilities of managers and employees, rights and duties set out in contracts and HR documents. The members of the organisation will be assigned to committees and other roles (head of department, team captain, secretary, salesperson, manager, machinist, etc) defined by these structures. In general these relations will be of a hierarchical nature, with the whole having parts (national office, regional offices, local branches, and so on) each of which in turn will have components as needed: sections, departments, committees, and so on, each with associated roles: head of finance, pay clerks, accountants, head of school, teachers, sports coaches, janitors, team members, etc.

These interact on a day to day basis at each emergent level of their modular hierarchical structuring, as well as between levels, to enable organisational functioning as required. Thus each organisation will have a structure of control (Scott and Davis 2007:202-214) relating Boards of Directors, CEOs, finance directors, local branch directors, committee members, employees, and so on, in the case of a commercial organisation, or Chairmen, Committee, Team Captains, members, etc in social/sports organisations.

Abstract Modular Hierarchical Structures Organisations are at heart abstract structures – that is what defines them – that are realised though physical entities[33]: the people that constitute their membership on the one hand, and the material stuff that they control on the other. Like biological organisms, organisations are also generically structured in a modular hierarchical way, because otherwise they are very difficult to either created or understand (Simon 2019) and will not be able to perform complex tasks. Certainly this is the case for large organisations, say those that employ more than a hundred people. The structuring is more flexible and variable than in the cases of biology and engineering, as it is not restricted by the nature of physical possibilities: it is rather a logical structure that must obey the rules of logic together with the definitions involved. Nevertheless abstract structuring is a key aspect of emergence of economic, political, legal, and social systems, as well as the underlying language, mathematics, and scientific understandings that enable them. Examples are data bases, catalogues and directories, rule books and legal systems, algorithms and digital computer programs, academic subjects such as mathematics, physics, and microbiology, and so on. Upwards and downwards causation occurs in these structures also, right down to the physical levels whereby the abstract structures are instantiated. Multiple realisation also applies at each downward step to each lower abstract level, and then down to the physics levels involved in realisation of these structures. But it is people who power the process.

> *It is these relations which enable the organisation as a whole to be more than the sum of its parts: because of them, it is not "nothing but" a group of individuals. It is structured so as to act as entity in its own right, able to do things its members could not do on their own.*

These will be formalised in documents laying out these structures, its purposes, and the responsibilities required of occupants of any specific role in the organisation. This is the abstract structure of the organisation, which is realised by appointing specific individuals to each of these posts, which are multiply realisable in that they can be filled by different individuals: the role itself is logically independent of those who carry it out. Expectancies related to different roles - policeman, judges, doctors, nurses, teachers, and so on - shape the way people understand and react to the social context when interacting with those filling these roles (Longres 2000).

D) The emergent properties or causal powers of each type of entity arising out of these relationships

 A legislature passes laws, a manufacturer makes furniture or automobiles, a civil engineering firm builds roads or bridges, a University instructs, examines, and awards degrees, and so on. These are all emergent outcomes enabled by the parts acting according to the structuring relations to produce outcomes that would not otherwise be possible. Genuine emergence takes place: no individual could produce an Airbus or an iPad, so the whole is much more than the sum of the parts that make it up. Thus causal powers emerge by this mechanism.

E) **Identify the relations and events that brought it into existence**

Any organisation did not exist at one time, but now does: this is the diachronic dimension of emergence. It has both evolutionary (long term) aspects: how did this class of organisations arise to fulfil what purposes, and how did the class of organisations evolve over time?, and developmental (shorter term) aspects: how did this particular

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[33] So they are recursively organised sets of rules and resources (Giddens 1984:25).

organisation come into existence over time? How did it develop from its beginnings?

The first is often related to technological advances (Arthur 2009): new kinds of functions arise through new technologies, steam engines, aircraft, the internet, cell phones, social media, based in advances in solid state physics and computing (Beinhocker 2006). However it may also relate to conceptual advances such as new forms of banking, or new ways of using the new technologies, such as Facebook, Airbnb, Amazon, and so on.

As to specific organisations, they come into existence as ideas in an entrepreneur's mind, which is where imagination and rationality enter (Drucker 2012, Edersheim 2007), but then it must be properly conceptualised with goals decided, structures and functions conceptualised, founding documents drawn up and registered legally, support garnered and fund raising must take place, and so on (the process of "organising", Scott and Davis (2007)). Then it starts functioning, maybe growing and opening branches, maybe decaying, falling into bankruptcy, and closing.

The dynamics determining how organizations come into being is itself an example of evolutionary selection, as discussed by Penrose (1952) and Heylighen and Campbell (1995). For example, branches of an organization may be opened and closed according to their perceived operational success in the light of the organizational goals, and the same applies to Departments within branches. These are developed, tried out, altered, expanded or closed in what amounts to an evolutionary process.   Ostrom (2015) discusses the evolution of institutions for collective action.

The same evolutionary principles apply to technologies that underlie operations of many organizations (Arthur 2009) and resulting engineering applications (Vogel 2000, Blockley 2012). Indeed they apply to design processes in engineering (Dieter and Schmidt 2021). We have emphasized above that Darwinian evolutionary processes lead to gene-culture co-evolution, with group selection taking place (Wilson and Sober 1994, Wilson and Wilson 2008). This then carries over to the economic context (Biglan and Cody 2013), as emphasized by Snower and Wilson (2022). Indeed the entire welfare feedback system (**Figures 5, 6**) is subject to evolution, as is the inverse one (**Figure 14**). Furthermore these processes may be claimed to operate on the scale of society as a whole (Parsons 1964, 1966).

F) Identify the relations and properties that maintain it as a stable but mutable structure

What are the mechanisms that keep it running on a daily basis, and that maintain its stability in the face of an environment that may be hostile in many ways, but also offers opportunities? What mechanisms and processes enable it to adapt in a predictive way to current and foreseen future challenges, and to safeguard against unpredicted challenges that may emerge? These processes are essentially the same as those in biology, discussed above: homeostasis, adaptive selection, and predictive processing of future situations based in current data and past experience.

Because organisations in the end attain their agency via their members, of crucial importance are the processes for gaining members on the one hand, and for members to leave or be removed on the other. Thus there will be processes of recruitment, induction, development and training, assessment, reward or censure, disciplinary proceedings, and resignation, retirement, or ejection. Also key are processes of institutional memory, so as to not have to keep relearning the lessons of the past.

3.2 Causal Powers of Meso-Level Organisations

Emergent Nature of social structures As just discussed, social structures exist as entities with complex ontologies that make them distinct from those who make them. This leads to emergent properties: they thereby are not just the summation of their members, organisations themselves have causal powers (CPSS:45,50, 144-168), which is why their implicit or explicit values matter (Mayer 2018, Collier 2018)**.** This **e**mergent effectiveness of meso-level social institutions forms a central part of our argument, in parallel with the Principle of Emergent Effectiveness in biology. It is defended implicitly in Beer (1973), Arthur (2021), and Snower and Wilson (2022), however it is denied in standard economic theory, where only individual agency is taken to be meaningful.

The causal powers of meso-level structures. Meso-Level Social structures demonstrably have causal powers: thus firms produce goods, universities award degrees, banks lend money, power utilities provide power, football clubs win or lose games, restaurants serve meals, and so on. None of this could happen unless those structures had the relevant powers, enabled by the individuals who are appointed to specific roles in the organisation. Society as a whole influences individuals in key ways, but that happens mainly through specific meso-level structures such as these (Bellah *et al* 1992), and through associated expectations and cultures. Elder-Vass argues,

> "*There are social structures that possess causal powers, but these entities are not whole societies.*[34]
> *Instead there are many social entities, and indeed kinds of social entities, that possess social powers…..*
> *Most of the powers that usually have been attributed to society as a whole belong to somewhat smaller*
> *and more clearly definable social entities: structures at an intermediate level between individual and*
> *society that can have more specific effects*" (SPSS:7, 82).

The people making them up are not just any set of people: they are groups of people with specific abilities, linked by abstract structures created for some purpose (Vaill 1992). Parallel to physiology in biology, organisational units in any organisation exist to accomplish something: they have a mission or objectives, and a leader/manager who is perceived to be centrally accountable for the formulation and accomplishment of those objectives.

The degree to which a society *as a whole* has causal powers is dependent on its nature and the context. In many ways societies are indeed just aggregations of the complex interacting system of institutions and people out of whom they are made. Some emergent powers of a society overall however do occur, as when one society declares war on another and invades. A President makes the declaration, but it is the society as a whole that is at war. Also legislative assemblies in societies have the capacity to pass laws on behalf of the society as a whole that apply to all individuals and regional entities in them, for example relating to taxation or social benefits or reproductive rights, thus acting as an entity with identifiable causal powers that act down to individuals.

As to the meso-level organisations themselves, in general they too will be modular hierarchical structures (Schneeweiβ 1995, Scott and Davis 2006:46-50,97-98), and the same issue arises as regards their internal functioning: to what degree is agency allowed to the structures at the periphery as against control from the

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[34] As noted below, we disagree here to some extent: there are contexts where societies as a whole do have causal powers. Nevertheless the essential point is well taken: day to day life is mainly effected at the meso-level.

centre? This is issue of delegation of decisions is a key issue discussed by Etzioni (1964:28-29), Beer (1981, 1978:§ 6.2), and Carney (2021:pp.322-323).

Agency of social structures arises via upwards and downwards causation Upwards and downwards causation occurs in social structures by similar processes to those in biological systems, as just discussed. Upward causation occurs by the constructive meshing together of interactions of lower level components, whether people or emergent organisational structures or indeed their physical outcomes. In the end this depends on the existence of individual agency, which we discuss below (Section 5.1). Downwards causation occurs by setting constraints on the one hand, and by creation, selection, modification, and deletion of lower level entities on the other: this leads to causal closure only when all interacting levels are taken into account. This allows the emergence of collective intentionality (Schweikard and Schmid 2021) and collective responsibility (Smiley 2017).

Constraints are a key feature of society overall (Giddens 1984) and of social structures in particular, thus for example a credit rating determines borrowing levels allowed by a bank, which in turn constrains amounts of money that can be withdrawn from an ATM. In computer programs used by organisations, setting of parameters controls logical branching, in parallel to (3), thereby constraining all following outcomes. A legal process may constitute either civil or criminal proceedings, an overall abstract parameter whose value changes all options. Applicable laws will be different in these two cases, which will affect relevant considerations and hence description and representation of those statuses at all levels: the concept "crime" applies in the one case and not the other, and so will be a key variable or not depending on context.

Nature of and selection of effective variables The very meaning of abstract variables is contextually dependent. In a legal system, certain laws will apply only to people satisfying a particular criterion, e.g. being citizens, a selection process leading to branching causation:

$$\text{IF \{NOT citizen\} THEN \{X applies\} ELSE \{Y applies\} .} \tag{12}$$

That status will change if they become citizens, which is a process governed by regulations depending on values of abstract variables such as categorisations of birth place and age. In computer programs variables may be locally defined within modules, or globally defined; this allows relevant variables to be selected for use in a particular module, and passed to them, e.g.

$$\textbf{\textit{A20-40}} := \{\text{ages } \textbf{\textit{A}} \text{ between 20 and 40}\}, \quad \textbf{\textit{I10}} := \{\text{incomes } \textbf{\textit{I}} \text{ above \$10,000 per month}\} . \tag{13}$$

The Principle of Emergent Effectiveness: This principle holds also in social systems and organisations, proclaiming the causal effectiveness of every meso-level, and is reflected in the need for every level to be there: they have been conceived, planned, and implemented in such a way that the organisation can function as a whole. Each level is there to carry out a specific function. The links may be very tight, as for example in legal systems, manufacturing organisations (aircraft, computers, automobiles, and so on), and banking systems, but they may be much weaker, as evidenced in the variety of organisational structures and operating procedures, such as occur in department stores, restaurants, football leagues, educational systems and their component schools, and so on.

Appointment Committees A specific example is an appointment committee for an organisation. It will be set up in terms of the organisation's constitution, which will specify its role, structure (e.g. chair, secretary, number of ordinary members) and how members are appointed to the committee. It will also specify committee procedures, such as decisions being taken by a simple majority or a two thirds majority, and constraints, such as equity requirements (e.g. female candidates may get preference if candidates are equally qualified). Decisions will be taken by debate between the members based in the stated procedures and requirements, but also influenced by psychological interactions between the committee members, and informal status and reputation of specific members. These kinds of interactions make the committee an entity that is more than the sum of its parts – the basic emergence requirement that underlies downward causation. The decision is not the result of any individual member's actions alone. It then results in an appointment being made to a position in the organisation - selection of an individual to fulfil a specific organisational role. This is downward causation from the committee to determine the specific individuals making up the organisation – who then influence its functioning in an ongoing way.

Causation in organisations is an interlevel affair. In any organisation direction must be given from the top to shape lower level operations and goals and indeed shape organisational identity (it is an entity that is *organized* for a purpose), but their implementation is enabled bottom up – by the actions of all the individuals making up the organisation, the whole working together to determine the specific outcomes that actually occur. Furthermore the direction pursued at the top may often be influenced by bottom up processes of consultation. The underlying issue is the process of organisational design (Scott and Davis 2007) and its relation to purpose (Drucker 1995).

Organizational purpose and goals All organizations have a purpose, otherwise they would not exist: it is the reason they were created. However problem definition is a complex process (Dieter and Schmidt 2021:p.10), and deciding what organizational purpose should be – specifically, how wide its scope should be - is a key part of leadership and management (Drucker 2012). The outcome of considering this issue is creation of a hierarchy of goals (Etzioni 1964:6-8, Mohr 1973) that supply the value premises which underlie decisions (Simon 2013, Scott and Davis 2007:53-56). In this hierarchical structure of ends,

> "*Each member of a set of behavior alternatives Is weighted in terms of a comprehensive scale of values – the `ultimate' ends*" (Scott and Davis 2007:54).

The function of goals is multi-dimensional: they have a cognitive function, a motivational function, a symbolic function, a justification function for actions taken, and an evaluator function (Scott and Davis 2007:184). But additionally they have a normative nature: they implicitly or explicitly relate to what is desirable in a moral sense.

Note that the fact there is such a moral dimension does not imply that actions of any particular individual, group, or organization will necessarily be morally good: rather that they will lie somewhere on the moral spectrum presented in **Figure 13**, whether they make this explicit or not, and this will be a key feature influencing choices and outcomes. They influence judicial, political, economic, social, and health outcomes (Etzioni 2010): that is, they influence choices made at all levels of the "Quality of Life" feedback system (**Figures 5** and **6**).

Causal closure requires all levels Interlevel causal closure is again needed in order that a social structure can function. The individual affects society via the welfare feedback system (Figure 5), and society influences individual lives in many ways (Berger 1963, Berger and Luckmann 1966, Bellah *et al* 1992, Longres 2000). It influences what resources and possibilities are available to individuals. It shapes perception in key ways: these are influenced by language, attitudes to risk, and particularly attitudes to aesthetics, purpose, and morality. It influences the secondary emotions in crucial ways, for example what is considered shameful is quite different in different societies. These are all downward influences from society to individuals, as studied by social neuroscience (Cacioppo *et al* 2002, Pfeiffer *et al* 2013). These interactions literally rewire our brains.

This emergent effectiveness of social entities is denied by some social theorists and economists, who claim the social institutions are nothing but the sum of the people who comprise them (Hodgson 2000). Together with CPSS, we disagree. Additionally we point out that there is a crucial contrast between such social science theories, and understandings of how to actually run organisations (Vaill 1992, Drucker 1995, 2012, Edersheim 2007, Scott and Davis 2007). The latter deal with the practicalities of how emergent organisational function can be made to emerge from the combined actions of individual actors through suitable organisational structuring, functional allocations, and control mechanisms (processes, procedures, etc).

Collective and Individual agency The agency of meso-level structures is enabled by actions, within the context of their abstract and physical structuring, of the individuals that make them up; but this is not just the summation of the powers of those individuals. Because of the existence of the social organisations to which they belong and their roles in it, they can accomplish feats that would otherwise be impossible (Harari 2014). This is possible because of the actions of those who those who belong to it, fulfilling various roles coordinated by those who run it. Vaill (1992) expresses it this way:

> "*Running an organisation means [..] repeatedly and successfully exercising influence on others in a dignifying and empowering way on behalf of the variety of objectives, priorities, and constraints existing in the organisation, using many different kinds of knowledge, common sense, and skill*".

This is true at all levels in the organisation: if it is to function successfully, each unit or subunit must have someone in charge, irrespective of how the purposes and strategic and operational decisions are reached.

This clearly requires that those people have agency as individuals. We discuss how that is possible in Section 5.1. However that agency is limited and constrained by the social context (Giddens 1984). Thus there is an intricate interplay between individual and social agency, which allows both levels of agency to exist.

The larger context Other societies interact with and affect any specific society, as does the natural world. The intergroup actions take the form described in Section 1.2: they have social, economic, political, and legal dimensions, with each group adjusting its context as best it can to attain its desired multidimensional goals (Ellis 1980). These interactions are constrained and shaped by the social context as a whole, that is, by the total interacting set of social structures, constrained on the one hand by the material resources available and on the other by the abstract structure of the society (laws, constitutions, roles, etc) that shape social life.

In turn this is all affected by the ***natural environment***: landscapes, mineral deposits, rivers and lakes, dams, vegetation, climate and weather, and the ***built environment***: roads, buildings, dams, infrastructure of all kinds, which provide both threats such as global climate change and opportunities. These all must affect policy decisions made in a realistic way – that is, taking into account how the world really works (Stern 2009, Smil 2022).

3.3 Abstract Causation

Through these structures and relations, organisations are capable of abstract causation (Ellis and Kopel 2019): that is, carrying out operations based in abstract logical systems such as rules of football or laws governing ownership, that enable or constrain physical outcomes. Furthermore abstract thought, including use of mathematics, results in physical outcomes through engineering design to produce plans for artifacts such as an Airbus aircraft, a digital computer, a skyscraper, and so on (Ellis 2016), or when controlling motion of motor vehicles coordinated via traffic lights (see (9) above). A great example of abstract causation is this:

> *"Consider one particular copper atom at the tip of the nose of the statue of Sir Winston Churchill that*
> *stands in Parliament Square in London. Let me try to explain why that copper atom is there. It is*
> *because Churchill served as Prime Minister in the House of Commons nearby; and because his ideas*
> *and leadership contributed to the Allied victory in the Second World War; and because it is customary*
> *to honour such people by putting up statues of them; and because bronze is the traditional material*
> *for such statues, and so on. Thus we explain a low-level physical observation - the presence of a*
> *copper atom at a particular location - through extremely high level theories about emergent*
> *phenomena such as ideas, leadership, war and tradition"* (Deutsch 1997: p.22).

Similarly causation due to social contexts and understandings also occurs via abstract entities such as concepts of money (Silver 2021), theories of justice (Miller 2017), moral principles (Richardson 2018), visions of The Good Society (Bellah *et al* 1992), concepts of democracy (Birch 1993), and so on: these each in the end have physical outcomes. Such abstract causation is deeply embedded in the context of social meaning and practice. A key form of abstract causation in society is via regulatory frameworks (OECD 2010, Zhao 2017, DCAF 2023, OECD 2023).

Abstract entities. Some may argue that it's not a given that thoughts and plans are abstract entities and that one does not need that assumption in order to follow our argument through. While we agree with that point, we reaffirm our position that thoughts and plans are abstract entities, and justify it as follows, because it is an important point.[35]

We start with a question: what is the ontological (existential) nature of the rules of chess? They are clearly causally effective as they determine what moves are allowed on a physical chessboard. How do they do this and what is their nature? An example is the King Rule:

<div>

KingR: *King can move exactly one square horizontally, vertically, or diagonally.*   (14)

</div>

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[35] We here repeat material from Noble and Ellis (2022), because it is germane to our overall argument.

Our position is that this is a logical rule, and hence is both abstract, and causally effective through being implemented by brain states. A common physicalist response is that KingR is *nothing but* a brain state, and the same goes for all the other rules of chess: hence they are physical, not abstract. The issue then is, *whose* brain state? Kasparov? In that case does the rule cease to hold when he dies? If not who else's brain state? Magnus Carlsen? Or my nephew, who is learning chess, and can now recite the rules perfectly? They are realised in a very large number of brains. It becomes clear on reflection that the laws are *not* the same as any individual's brain state. That is not a tenable position. They are represented in correlated brain states of many individuals. They are also,

- *Spoken about* when playing, or when teaching in a class, or in videos that teach the rules;
- *Written* in chess books, or on blackboards;
- *Presented* in Spanish or French or German or Chinese or Arabic, in any of these formats;
- *Represented* in algorithms used in chess playing computers;
- *Realised* in electronic states of transistors in digital computers running chess playing programs;
- *Embodied* in the physical play actually carried out using legal moves;
- *Spoken about* on television, in films such as *The Queen's Gambit*, or in casual conversation.

To get clarity on the ontology entailed, we must distinguish the rules themselves from their representations. Our position is that the *rules themselves* are *abstract logical entities*, such as KingR, which can be realised in many ways.

They are *multiply realisable* in that they can be represented in a variety of physical ways such as just listed; the rules themselves are not the same as any one of these specific realisations. One can propose that the rules are comprised in the set of all realisations whose logic agrees with that stated by the FIDE Permanent Commission for the Rules of Chess. These form an *equivalence class* of representations (in *all* cases, *all* the logic rules that are represented agree). That abstract logical structure can be regarded as the ontological nature of the rules of chess. It is causally effective by being realised in any one of the physical representations mentioned here. This proposal has the advantage of tying into the key role of multiple realisability in downward causation: the rules can be causally effective via any realisation, and a key point is the following (Noble and Ellis 2022):

> *"The rules of chess apply to all games of chess, not just some specific cases – just like the laws of physics apply to all physical events, not just specific situations. The laws of chess provide a unifying set of laws that govern a whole range of physical phenomena by setting abstract constraints on what can happen, that get realized as constraints on physical motions of specific chess pieces on specific chess boards."*

Thus abstract causation occurs here via a set of abstract laws that apply in generic circumstances. This is the kind of unification one aims for in the hard sciences. Laws do not apply only to individual cases.

Digital Computing and Abstract Causation Digital computers provide examples *par excellence* of abstract causation (Dasgupta 2016). He characterizes three classes of computational artefacts (p.22/23):

- **One class is material,** and obeys the laws of physics; all kinds of computer hardware are material computational artefacts;

- **A second class is entirely abstract:** "*They not only process abstract symbol structures, they themselves are symbol structures and are devoid of any physicality thought they may be made visible via physical media such as marks on paper or on the computer screen. So the physico-chemical laws do not apply to them. They neither occupy physical space nor do they consume physical time*". Procedures one uses to write text or send emails exemplify such abstract artefacts;

- **A third class are both abstract and material:** *"They are themselves symbol structures and in this sense are abstract; yet their operation causes changes in the material world: signals are transmitted across communication paths; … physical states of devices change; and so on; their actions depend on underlying material agents to execute the actions. Because of this nature, I call this class* liminal, *(meaning a state of ambiguity, of betwixt and between). Computer programs or software is one vast class of liminal computational artefacts."*

The author states "*What we call "The computer" is a symbiosis of the material, the abstract, and the liminal*", and gives a list of elements of each class on pages 24-25 (Turing Machines are listed as "Abstract artefacts" and discussed on pages 25-29). Finally, what is the relation of all this to our main claim of the importance of goals in determining outcomes? The author states (pages 30-31):

> *"Computational artefacts are made things: they process symbol structures signifying information, data, or knowledge… Clearly computational artefacts are not part of the natural world… Human beings bring these artefacts into existence .. they are the products of human thought, human goals, human needs, human desires. Artefacts are purposive: they reflect the goals of their creators".*

This is the reason for their existence as artefacts (Simon 2019, Ellis and Drossel 2019).

Underlying features of abstract causation It is enabled by the human mind/brain, arguably again a case of liminal causation. The brain has been determined to be what it is by evolutionary processes because symbolic understanding played a key role in human survival and dominance of this planet via technology (Bronowski 2011, Harari 2014). The fact that we are a symbolic species (Deacon 1998) enables abstract thought and thus underlies that dominance. This again happens in a social context:

> *"The mental can only be understood when we take seriously its social character and its role in action: language is to be understood in the first instance in the light of its role in adaptive action-feedback loops within the physical and social environments"* (Murphy and Brown 2007:182).

That social interaction is crucial in structuring our understandings and hence our actions (Berger 1963, Berger and Luckmann 1966, Rogoff 1989, 2003, Wenger 2008, Heyes 2018).

Mental Causation Abstract causation in society is based in individual mental causation. Because the brain is both an embodied brain and is the topmost level of the control hierarchy for the human body, it operates as the

topmost control level L6 for the organism as a whole (**Figure 3**). Mental states are causally effective in that they have physical outcomes (Menzies 2003). Note that the relevant causal processes do not reside in the brain alone. We will not find a concept like the square root of -1 or justice in any particular neural circuit. Thoughts and concepts are social as well as requiring the biological processes forming the physical state of the brain when those concepts are being entertained. They extend beyond the neural processes necessary for them to be possible because they are representations of abstract entities, such as the idea of democracy or justice,[36] which are socially developed over time as an interaction between individuals and relevant communities (Berger 1963, Berger and Luckman 1966, Deacon 1998, Wenger 2008, Tomasello 1999, Donald 2001, Tomasello 2019).

These concepts must be included in order to determine mental outcomes. An important aspect of this social dependence of cognitive processes is that there is no purely biological level at which causal closure occurs. The conceptual inextricably meshes with both the physical and the social. The position we are proposing does not therefore lead to a form of Cartesian dualism: the immaterial and material factors mesh with each other at all levels. On this view immaterial entities, thoughts, concepts, social and legal structures, and ideas such as democracy and justice, all have causal roles, as discussed above. These roles are quite distinct from mechanical efficient causes: they are efficient causes at the psychological level **L6** in **Figure 3**.

Reasons and other immaterial influences are not the same as physical causes because they are multiply realisable non-material entities (List 2014), and cannot, in themselves, be direct physical causes in the way that molecules can be. But they can be *selected by us to be* the reasons we give for mentally choosing one physical process over another (Noble and Noble 2020). That automatically gives them a privileged role, because they, as reasons, do not themselves directly partake in the up and down processes that form the multi-level biological mesh. The up and down arrows of causation involved are very different from the interactions between all the physical levels of organisation. They are nevertheless effective: they make a difference. The influence of rationality and values is not comparable to that of molecules interacting with each other physically.

This processes in the brain by which thoughts affect neural connections act as structuring causes include meta-level self-supervision, off-line simulations, external scaffolding, symbolic language, and intentions acting as contextual constraints (Murphy and Brown 2007:221-229). Feedback from the environment acts top-down to select from amongst a vast number of neural connections those result in advantageous answers (Murphy and Brown 2007:230). These are remembered through plasticity mechanisms that include gene regulation related to memory storage (Kandel 1998, 2001) and neuronal group selection via neuromodulators (Edelman, 1987). The latter resembles in important ways the processes by which antibodies are selected by the adaptive immune system (Cooper and Alder 2006). The immune system selects amongst innumerable possible immunoglobulins thrown up by hypermutation in the coding for the variable part of the immunoglobulins. The selection does not have to be a completely perfect fit to do the job of neutralising the antigen. In a similar way, what actions are chosen in behaviour do not have to be a perfect fit to the reason given for the action. That is true of anticipatory

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[36] Mental tasks and mental entities are characterized by a *cognitive atlas* (Poldrack et al 2011).

behaviour (Poli 2019) where speed may matter more to survival than finding the most rational response. Higher order processes shape this all (Murphy and Brown 2007:231):

"*Most important is development of higher order processes that involve pattern recognition, cognitive operations involving patterns of patterns, and evaluation of such higher order operations*" .

That evaluation is where the element of purpose, meaning, and values enters.

4. Rationality, Perception, Emotion, and Values

There is a complex interaction of rationality, perception, emotion, and values guiding thought and action. As is the case in all higher animals, the brain makes action choices on the basis of predictions of future situations informed by past experience (Davidson 2001, Hawkins and Blakeslee 2004). These are remembered through the key attribute of brain plasticity (Kandel 2001, Edelman 1987): experiences and learning literally alter brain structure at both macro and micro levels. Interoceptive processing, extero-ceptive processing, and mental-self processing take place (Qin *et al* 2020), the latter being the domain where rational thought and analysis occurs and allows reasoned action and abstract causation. Interactions with society affect these processes crucially at all times (Berger 1963, Berger and Luckman 1966, Cacioppo *et al* 2002, Wenger 2008, Rogoff 1990, 2003, Heyes 2018, Tomasello 2019). Thus social and cultural learning takes place, including processes whereby values are imparted to individuals (Berger 1963, Heyes 2022).

4.1   The interacting complex of mental processes

Heyes identifies cognitive mechanisms that are central to human brain functioning thus (Heyes 2018:78-79):

(i)   Mechanisms for dealing with the inanimate world: causal understanding, the ability to develop a predictive model of the world on the basis of past experience. Ginsburg and Jablonka (2010) characterise the uniqueness of humans in this regard as possessing *Unlimited Associative Learning*.

(ii) Faculties for dealing with both the animate and inanimate world: episodic memory (memories of specific events). Related to this is predictive processing of sensory data (Purves 2010, Clark 2013,).

(iii) Specialised cognition for dealing with social stimuli: face processing , imitation, selective social learning, language, and mind-reading. These are developed in each individual through processes of social learning, and have come into being in our species via processes of cultural evolutionary psychology.

(iv) *Cultural learning* is those social learning processes that are specialised for cultural evolution (Heyes 2018:85-89), for example mind-reading (Frith 2007, Heyes and Frith 2014).

We have above affirmed the causal power of rationality through the effects of abstract thoughts and plans, but note now that this is strongly influenced by perceptions, expectations, imagination, attitudes to risk, and emotions, with purpose and values guiding the deployment of rationality. Values are affected by the interaction with society, which affects all these dynamics.

These interactions are summarised in **Figure 12**, which is in effect a very simplified version of the LIDA model of brain function (Franklin *et al* 2012, 2013).
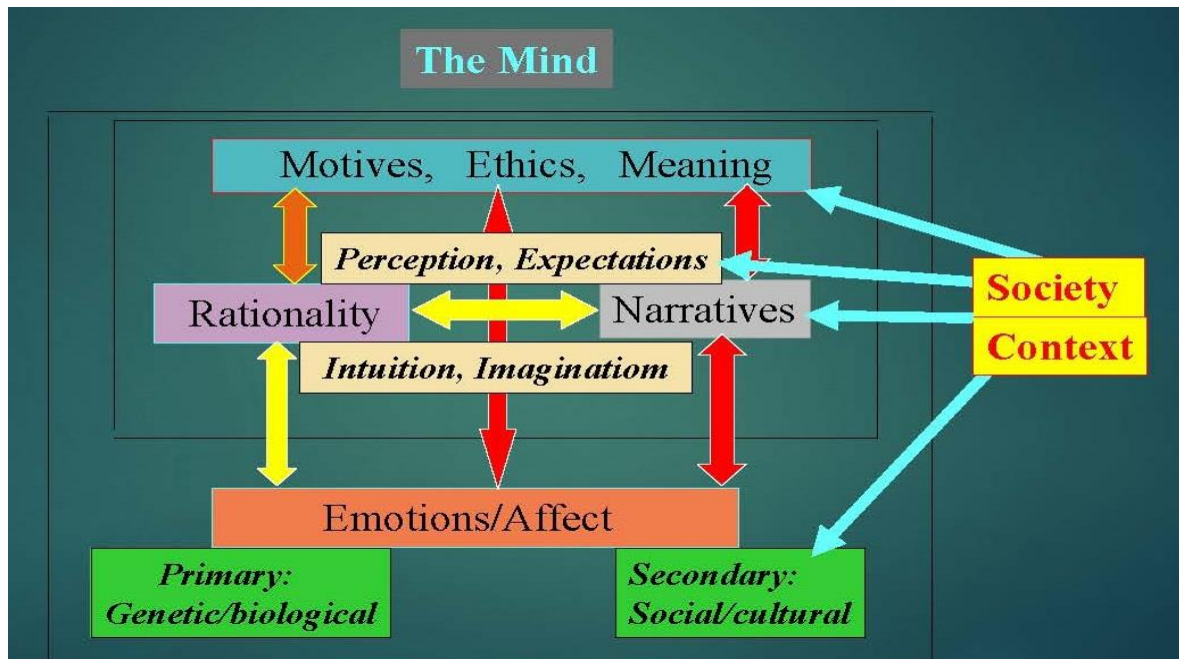
Figure 12: The interacting factors that together shape the functioning of the mind.

Prediction, Rationality, Perception, and Expectations The central function of the brain is prediction (Hawkins and Blakeslee 2004). The predictions are based in mental models of various kinds: explicit or implicit, sophisticated or simple, with metaphors playing a key role (Lakoff and Johnson 2008). Past experience and learning is key in developing these models: each of us is in essence a scientist, making hypotheses and testing them and thereby updating our world models (Felin and Koenderink 2022). The problem the brain faces is how to handle and utilise the huge multi-modal stream of incoming data, some of it easily predictable, some not; some of it important, some not.

Rationality Traditionally, "cognitive science" deals with rationality: the reason-based choice between different options, making decisions based in either motivating or normative reasons (Alvarez 2017), given available data and optimisation criteria (Simon 1978, Gilboa 2012) and using logic (Cheng 2018). This is formalised by economists in the idea of "homo economicus", represented by optimisation processes as can be summarised in spread sheets and linear programming, and in sociology by the stratification model of action (Giddens 1984: Figure 1). This is a form of abstract causation, as the data explicitly shapes outcomes. More realistically, probabilities have to be estimated (Gigerenzer 2002, 2008) and heuristics used to make decisions on the basis of incomplete knowledge (Kahneman 2011). Organisms tend to "satisfice"; they do not, in general, optimise (Simon 1956). Canonical neural networks perform active inference to minimise the risk associated with future outcomes (Isomura *et al* 2020).

Expectations However, there is almost never enough evidence available to make a sure decision in a world of radical uncertainties (Kay and King 2020). Things may change, people may not keep their promises, they may fall ill, and so on. Real world decisions – whether to take a job, move to another place, get married- are always based in expectations - faith that promises will be kept and people will act fairly, hope that the calculations one has made are adequate and things will work out as planned, despite the randomness of the real world.

Perception is key to how this works (Chater *et al* 2018) and is crucial in making such judgements (Parr *et al* 2019).

Perceptual capacities and social biases determine what issues are seen as important, indeed what issues are perceived and taken into account at all. Felin and Koenderink (2022) discuss key issues in the relation between rationality and awareness, pointing to results from psychophysics that highlight key aspects of perception affecting our understandings and decisions. Simon (1990) emphasizes the roles of adaptivity and rationality. Expectations arising from the social context influence how we see things**.**

Predictive Processing in Perception and Action The brain is largely a Bayesian brain that functions in a predictive processing manner (Clark 2013, Kirchhoff 2018, Pezzulo *et al* 2022), for example visual, auditory, and somatosensory systems operate in this way via cortico-thalamic feedback loops described by Alitto and Usrey (2003), with motor systems integrated into a predictive feedback model (Wolpert *et al* 1995, Shergill *et al* 2013). The process is that of predicting what the incoming information ought to be and comparing the predictions with incoming data, sending an error signal to the cortex only when the discrepancy is above a sensitivity dependent threshold (Hohwy 2013, Friston 2012, 2018). *Inter alia* this involves a massive filtering of incoming information: billions of bits of data are ignored in order to focus on that which is significant for ongoing predict and modelling of outcomes (Beer 1981). It also involves filling in missing information on the basis of context and past experience, together with a growing ability to recognise relevant cues (Felin and Koenderink 2022). At a psychological level, this results in a variety of visual illusions (Purves 2010) which demonstrate the nature of the mechanism. Similar processes control action outcomes, where results of action plans are monitored on an ongoing basis and any discrepancy used to correct actions (Wolpert *et a*l 2002), as for example controlling exercise intensity in athletics (Gibson and Noakes 2004, Gibson *et al* 2006).

Intuition Furthermore many understandings occur rapidly at a subconscious level (Kahneman 2011). Intuition (Myers 2002, Pust 2019) is not the same as instinct. It is the learnt expertise of someone with so much experience that automatised so it is now rapidly available without conscious deliberation, e.g. a medical doctor consulting with a patient: "It's probably TB, I'll book you an X-ray", and can be rationalised later if necessary.

Related to this, **habits** are key way of dealing with repeatedly encountered situations: the automatization of routines involved saves mental effort in considering the same situation time and time again (Hodgson 1997, Ouellette and Wood 1998, Neal *et al* 2012) enabling a reduction of stress (Wood *et al* 2002).

Imagination plays a key role in rational choices (Warnock 1976, Harris 2000, Kauffman 2019, Dieter and Schmidt 2021), underlying creativity (Sternberg 2006, Tonelli 2021, Asma 2021). Those with little imagination will only be comparing a small number of options to choose from in their deliberations, whereas those with much imagination will be looking at options others have not even conceived of. Steve Jobs is an iconic example (Becraft 2016), as is Jeff Bezos (Dumaine 2020). Their creative thinking has literally transformed society by powering technological change.

Narratives Because of the complexity of the issues that face us, and the key role of radical uncertainty as we face possible future events (Kay and King 2020), rather than logical analysis, use of narratives is a key form of understanding (Johnson *et al* 2020). We discuss this in Section 4.3 below.

Emotions guiding rationality It has been pointed out by Damasio (1994, 1998, 1999) that emotions are not just a distraction from rationality that have to be fought. On the contrary, they are affective states, experienced as feelings (Pace-Schott *et al* 2019, Damasio and Carvalho 2013),[37] that play a key role not just in conveying affective states to others, an important aspect of social interactions, but in guiding rationality (Seth and Friston 2016) through a complex interaction (Pessoa 2008, 2013, 2015). Indeed affects can be regarded as playing an important role in brain homeostasis (Solms 2021). But they also affect economic decisions (Etzioni1999).

There is a key point here: some emotions are **primary (basic) emotions** (Ekman 1992, Izard 2007), arising due to genetically determined ("hard wired") primary affective systems that have been studied in depth by Panksepp **(**2004).[38] These release neuromodulators such as dopamine and serotonin (Iversen and Iversen 2007) via the reticular activating systems (`ascending systems') thereby inducing feelings that immediately influence perception and attention. However they also affect neural plasticity via Edelman's process of *Neural Darwinism* (Edelman 1987) because these are the same systems as those referred to by Edelman (Ellis and Toronchuk 2005). They are our evolutionary biological heritage, giving guidance to our rational facilities as to how to behave inorder to increase our chances of survival (Panksepp and Biven 2012). They include fight and flight systems, the sexual system, the belonging (affiliation) system, and so on, and the basic system labelled by Panksepp the SEEKING system, which underlies exploration and the search for understanding and meaning: a key aspect of our lives (Frankl 1985). These systems (Steriade 1996, Maldonato 2014, Kovalzon 2016, Brudzynski *et al* 2018, Wijdicks 2019, Hu *et al* 2021) and the associated neuromodulators (Espana *et al* 2016) have been selected for via evolutionary processes precisely because they play a key role in survival. The ascending systems are very different from cortical columns.

Some emotions however, such as pride and guilt and shame, are **secondary emotions**. They piggyback off the affiliation (bonding) primary system (Stevens and Price 2015), which plays a key role in social life, and arguably underlies the social brain (Baumeister and Leary 1995, Dunbar 1998, Frith 2007) and its development of mind reading capacities (Frith 2007, Heyes and Frith 2014). These secondary emotions are socially determined, and so vary with culture. They form part of our evolutionary cultural heritage. In both cases the emotions guide us and strongly motivate what we do (Pessoa 2008, 2013, 2015). They help us select priorities for our cognitive attention (Miller and Clark 2018) and have an effect on economic decision making (Elster 1998, Etzioni 1999, Loewenstein 2000, Rick and Loewenstein 2008, Bossaerts 2021), where for example investments may be based in considerations of prestige, motivated by the dominance/hierarchy system (Stevens and Price 2015, Ellis and Toronchuk 2013), rather than by purely economic considerations (Heffetz and Frank 2011). Overall when combining this with the hierarchical model represented in **Figure 3**, one has a hierarchical integrated model of brain function (Blair and Ku 2022), in which executive function is the cognitive component of the model, together with emotional, behavioural, physiological and genetic components allowing self-regulation and causal closure (see Figure 1 of that paper).

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[37] Barrett (2017) denies the existence of differentiated emotions. We disagree with her *Theory of Constructed Emotions* (TCE) because the seat of felt emotions, effected via neuromodulators such as dopamine, is sub-cortical (Panksepp 2004, Solms 2021), and because the TCE does not take evolutionary origins into account, see https://illis.se/en/constructed-theory-of-emotions/.
[38] See also Ellis and Toronchuk (2013).

Social Effects There are manifold ways whereby society reaches down to influence all these mental events at the individual level (Berger 1963, Berger and Luckmann 1966), particularly through institutions (Bellah *et al* 1992), see Section 4.3. Socially, predictive processing , guided by roles and norms, shapes expectations of how others will behave as we meet them. Cultural evolution depends both on innovation - the creation of new cultural variants by accident or design - and high-fidelity transmission, which preserves our accumulated knowledge and allows the storage of normative conventions (Jagiello *et al* 2022). Cultural practices includes rituals that link the individual to the group. They link the present to the past and future, and link individual actions to common actions by the group, *inter alia* by promoting social emotions.

Choices as commitment A key point is that making a choice may result in a commitment that changes the decision-making context in the future (Chang 2017). The narrative is changed foundationally by a commitment decision. and this alters all future outcomes because of the new context created by the choice. Affiliation, whether religious, political, social, or even academic, is a key contextual variable that changes actions and outcomes, right down to the physical level ("I'll buy a MAGA hat", "I'm off to Alcoholics Anonymous", "I'll go to the string theory meeting"). Hoff and Steiglitz (2016) make this explicit (see Section 2.3 and equation (2.3) in that paper).

4.2 Explicit and Implicit Values as key shapers of individual thoughts and action

 Where do **values** fit into such multi-level schemes of organisation? We discussed this in Section 1.1: they act as the high-level influencers of individual thought and action across all domains (**Figure 3**). The predictive processing view of brain function (Clark 2013) must be enlarged to take beliefs and desires into account (Yon *et al* 2020), and the values that shape what kinds of decisions are made (Maley and Piccinini 2017). This is reflected in the cognitive neuroscience of human decision making (Leslie 2010) and the way that the Global Neuronal Workspace hypothesis and its extension to the LIDA (Franklin et al 2012, 2013) includes evaluative systems, thus involving a value assessment, as a key input (Mashour *et al* 2020).

One consequence of the non-physical nature of reasons and values is that their effects will often be diffuse in influencing the repertoire that an organism constructs throughout its life time. That is most obviously true of values, which develop slowly over time. Their long-term effects can be seen as contributing to the repertoire of behaviour at a neural level, from which we choose the actions that represent the values we have acquired. On any given occasion, of course, there will be specific neural circuits that generate the behaviour chosen. This is why Noble *et al* (2019) chose to represent social factors as a cloud overlying the biological levels of organisation (**Figure 7**), with a specially-coloured double arrow connecting to the organism itself. Here we rather represent them as effective forces at the individual and social levels, as in Figures **3** and **5**. What is not open to debate is the existence of the causal consequences of being constrained by reasons and values explicitly or implicitly, often embodied in narratives.

Ethics, Aesthetics, and Meaning The nature of purpose ("Telos")[39] and meaning is to do with what we choose to do with our lives both on a daily basis, and as regards our long term plans and activities. This embodies the meaning we create for ourselves or discover as we live our lives, and implicitly or explicitly manifests what we regard as valuable. We may search for meaning though sport or adventure or commerce or science or engineering or medicine or literature and stories, or through art or spirituality or religion, or simply through family life. These choices generally shape a major part of what we do, although of course day to day events reflect random choices and inputs as regards minor events as well. Life choices often involve aesthetics and beauty (Diessner et al 2008) because many people find great value in music, paintings, sculpture, ballet, and so on, or perhaps being in nature and valuing its beauty. As regards meaning, Rebecca Henderson comments that "*The sense of being part of something greater than yourself can lead to high levels of engagement, higher levels of creativity, and the willingness to partner across functional and product boundaries within a company, which are hugely powerful*".[40]

Implicit and Explicit values Purpose involves ethics in key ways. Essentially the central issue is to what degree our lives centre on the welfare of ourselves and our close group, or on the welfare of others? This is true whether the values are chosen explicitly, through a conscious process of reflection, or are implicit in what we do – when they are just as real, even if not resulting from deliberative value choices. One can determine what a person or organisation's real values are by observing their conduct in relation to others (are they considerate and caring for all people, or not?) and the environment (do they protect it, or plunder it for personal gain?)**.** Thus we claim they are empirically determinable, and may or may not coincide with claimed values (see below).

The Spectrum of Values expressing this set of ethical positions (set out in Ellis 2017) is shown in **Figure 13,** ranging from a values position **V1** to **V8.** As we discuss below, these values may be explicit or implicit.
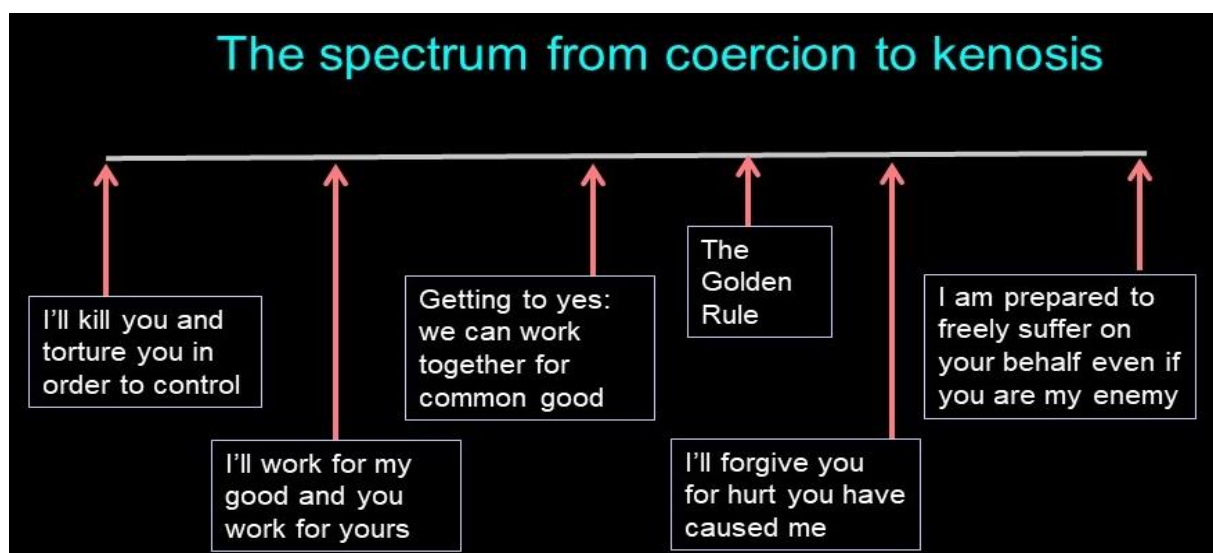
Figure 13: The spectrum of values, *from extreme coercion to kenosis. All implicit or explicit personal and organisational values lie somewhere on this spectrum. From Ellis (2017).*

[39] See Mac Cumhaill and Wiseman (2023) for the way Iris Murdoch, Mary Midgley, Philippa Foot and Elizabeth Anscombe brought the topic of purpose and meaning back into philosophical focus in the UK, in opposition to the move to meaninglessness by a group of analytic philosophers ("The Brethren", pp.49-51), particularly A. J. Ayer.
[40] Quoted by Carney (2021): page 359.

On the far left is the extreme totalitarian position **V1** where one group seizes power, grabs all material benefits for themselves, and subjects all others to their will, torturing them or killing them if necessary to attain this goal; they are the only people who matter, all others are subject to them. This was for example the case in both the Catholic Church and the Anglican Church some centuries ago, when dissidents were tortured and burnt at the stake. Many medieval castles in Europe featured torture chambers. The Mafia started as a society of "Men of Honour" who did not hesitate to kill in order to maintain economic control over the Sicilian countryside (Catanzaro 1992). The Apartheid regime in South Africa tortured and assassinated political opponents. There are still countries today where political opponents are tortured or assassinated. This behaviour expresses the values of the people in charge.

Next is a position **V2** of being willing to suppress other groups by any means possible in order to benefit one's own group, no matter what harm one causes to the other: the position *inter alia* of the totalitarian wing of the Republican party in the USA today, and their supporting evangelical churches. It includes a willingness to remove all environmental safeguards for personal and corporate profit: "I'm prepared to cause you damage as long as I profit."[41] It is associated with a values position that no amount of material goods (houses, yachts, private jets, above all money) is ever enough, in contrast to the concept of "The Good-Enough Life" (Alpert 2022).

Next is the position **V3** of live and let live: I'll work for my good and you work for yours, but we won't help each other: a basically unsupportive society. Next is the more positive position **V4** of *Getting to Yes* (Fisher and Ury 2011): we can work together for the common good without losing out ourselves. But it is still motivated by self-interest: this is just a good way of getting what you want.

On the positive side of the spectrum is the *Golden Rule* **V5***:* do unto others as you would they do unto you (Gensler 2013). Here we have concern for the welfare of others, and a willingness to work to help them. This is a positive foundation for creating a worthy social order: it is more than caring just for oneself.

A little further on is the African concept of *Ubuntu* **V6***,* reflecting our common human nature: '*umuntu ngumuntu ngabantu''*, which is, ''a person is a person through other persons'', or "*I am who I am because of you"* (Lutz 2009, Birhane 2017). Thus this is a deep foundation of social thought underlying how one should act. It is a deep statement that the whole (the group) is more than the parts (those individuals who make it up).

Next we have one step further: forgiveness **V7** as a route to reconciliation of those who have been bitterly opposed to each other, a practical step towards creating common good. This is the position of Nelson Mandela and Desmond Tutu, and lay behind the remarkable largely peaceful transition to a democratic government in South Africa that they enabled. It is based in the vision of Ubuntu.

Finally we have the position **V8** of *kenosis*: a willingness to voluntarily suffer on your behalf, even if you are my enemy, in order to create a better society where all are valued and prosper.[42] The word "voluntary" is key: it must be a choice freely made in order to have its true quality. This is extraordinarily difficult to do, requiring great dedication and courage. It was the position of Mahatma Gandhi and Martin Luther King, and the basis of their political

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[41] A current example is pumping of raw sewage into rivers in the UK in order to keep up shareholder profit.
[42] We are not here referring to the specifically Christian view of the concept, but to a wider one that generalises it without any necessary theological connotations. It is a way of living that any religious or atheist person can adopt.

campaigns.[43] It is the only truly transformational ethic: it has the power to turn an enemy into a friend.

What about the "free rider" problem, in this context? The whole point of the kenotic approach is that it transcends the usual zero-sum calculus of gain and loss underlying standard economics: it operates on a different transformational plane, which when successful completely changes outcomes by changing their context. Its nature is characterised by the concept, *I refuse to see your gain as my loss, because the individual is realized only in and through the community* (Bellah et al 1992:5). It simply does not comply with the standard zero-sum economic paradigm embodied in The Prisoners Dilemma, Game Theory, and so on. In practical terms, *Noble Competition* is possible, where "*Noble competition is helping your rivals to reach their full potential*" (Stucke and Ezrachi 2020:256-260). It involves expanding the safety net to protect and promote the well-being of those left behind by competition (Stucke and Ezrachi 2020:269-272). Through moral leadership, one can avoid toxic competition that erodes corporate culture to become one whose core aim is to rip clients off: "*Such a culture is toxic not only to the `muppets', but ultimately to the company itself*" (Stucke and Ezrachi 2020:274-276). In the end, it is about how you transform yourself (MacIntyre 1984, 1989), and so what values you give your organisation, and what it becomes.

Further values, related to context and process. We regard **Figure 13** as the primary moral spectrum, expressing the central nature of our values. Others derive from it, such as attitudes and practices related to truth and lying, to efficiency and waste, and to valuing the natural environment.[44] Carney (2021) characterizes such values firstly as

- *Trust*, *integrity*, and *transparency* (pp.4,69,87). We point out that *these key values are invariably inversely related to position on the spectrum in Figure 13.* The values **V1-V2** are associated with consistent lying, deception, and lack of integrity, for example Donald Trump and the MAGA republicans in the USA,[45] while values from **V4** on are necessarily related to integrity and trustworthiness in order to be meaningful. Thus

  ⇨ *In this sense, these specific values are implied by the spectrum depicted in Figure 13, and can be used as indicators of what the true (empirical) values VI are. For example constant lying, corruption, and lack of trust in others are reliable indicators of a position in the range V1-V2.*

Secondly, Carney identifies (pp. 8-9) common values that underlie a successful economy and society. Some are values which are associated with the scale **V1-V8.** They will increasingly be present from **V4** on:

- *Fairness,* particularly in markets to sustain their legitimacy,
- *Solidarity,* whereby citizens recognise their obligations to each other and share a sense of community,
- *Sustainability,* with long term perspectives that align incentives across generations,

Again they can be used as indicators of what the true values are. The latter relates to inter-generational values: caring for future generations as well as our own[46] as regards the environmental legacy we leave them. Values relate

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[43] See Ansbro (1982) for a discussion of the development of the thought of Martin Luther King Jr.

[44] We will not here enter the millennia-old debate on moral philosophy, which would require a whole book. We rather refer to Chapter 5 of Briggs *et al* (2018) and Mac Cumhall and Wiseman (2022) for discussion of these issues.

[45] E.g. the Supreme Court judges who lied about their attitudes to Roe vs Wade during their confirmation hearings.

[46] We do not endorse the project called "Longtermism" both because of its attempts to reduce ethics to a form of calculation rather than a matter of deep moral understanding, but also because its attitude of denying the value of current generations in favour of projected billions of future generations is highly dangerous (Torres 2021).

specifically to one's chosen life path: as a businessman, politician, academic, engineer, artist, writer, explorer, sports player, entertainer, and so on. These are particular contexts within which values and meaning are expressed, for example the medical and teaching professions are explicitly aimed at helping others.[47] One's chosen path may be just being a loving person in society who cares for others. This is no less worthy than the rest.

Finally Carney identifies (pp. 8-9) common values that underlie a successful economy and society as ,

- **Dynamism, Resilience, Humility**, and **Responsibility,** which we regard as means to turn values into value rather than values *per se;* they are characteristics that should be valued for this reason.

Their downwards effects These values and purposes influence our actions in a downward way (Section 1.1). This takes place positively in terms of choices: if the meaning in one's life is based in music, that will shape not just one's mental activities (thinking about music, talking about it, playing it, listening to it) but the physiological, biochemical, and physical interactions at all levels in the hierarchy (**Figure 3**) as one plays a musical instrument. These levels will all be coordinated to serve whatever higher purpose one has chosen, within the constraints of one's capabilities. But it also takes place in a constraining way: our ethical stance determines what we find acceptable and what unacceptable, shaping activity at all levels. If we regard stealing and lying as acceptable, that will shape decisions as regards goals, strategies, and tactics which then determine physiological and molecular outcomes as well as physical outcomes in the world (someone else's wallet is in my pocket, for example; or a major program of deceit spreads lies about election results via social media and television). If they are not acceptable, these outcomes will not occur. The same logic goes for views on the death penalty and nuclear warfare, global climate change, the COVID-19 pandemic, and reproductive rights, and resulting policies. They all have physical effects expressing specific values.

Morals and Emotions A fundamental point is that morals are not the same as emotions. It is true that there are a variety of emotions that support (or undermine) morality (Haidt 2007, 2012), but it is in our view a category mistake to state that they are the same, despite some who claim the opposite. Greene and Haidt (2002) state

> *"Moral psychology has long focused on reasoning, but recent evidence suggests that moral judgment is more a matter of emotion and affective intuition than deliberate reasoning. Herewe discuss recent findings in psychology and cognitive neuroscience, including several studiesthat specifically investigate moral judgment. These findings indicate the importance of affect, although they allow that reasoning can play a restricted but significant role in moral judgment. They also point towards a preliminary account of the functional neuroanatomy of moral judgment, according to which many brain areas make important contributions to moral judgment although none is devoted specifically to it."*

We point out they are referring to *moral psychology* – the purview of psychologists – not to *morality* as such, which is the domain of moral philosophers and ethicists (e.g. Rawls 1991, 2020). Thus we query the phrase "moral judgement": that is,whether this statement relates to what is actually right of wrong. They are looking at motivation

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[47] Of course this may not be the case in reality: thus a medical practice may essentially be a money making enterprise.

as related to moral issues, but not whether the outcomes are right or wrong in a moral sense. One of the issues here is what kinds of issues are looked at in these psychological studies: are they realistic moral dilemmas, or rather laboratory versions that do not in fact involve genuine moral dilemmas as occur in the real world.[48] Examples of ecologically valid psychological experiments that involve genuine moral dilemmas are Fourie *et al* (2011, 2012, 2014).

Our position, arguably in line with Adam Smith in *The theory of moral sentiments* (Smith 2010),[49] is that morals and ethics are not the same as emotions. They are strongly influenced by emotions, but are also influenced by other considerations and experiences in crucial ways. The fact I feel something is right is not necessarily the same as stating it is morally right. At the emergent psychological level, there is an intricate interaction between feelings of what is right, and what is actually right. The latter is the subject of moral reasoning (Murphy and Brown 2007), which is to be sure influenced by emotions. But the latter are ephemeral (Fox 2018), while one's moral character and resultant moraldecisions are built up over decades (MacIntyre 1984, 1999) and involve deep thinking and costly reflection – costly because it can eventually lead to courageous and dangerous action.

Out of many examples we could choose, we refer here to the 15 years that Martin Luther King Jr spent considering the problems facing black Americans and how to right them, before engaging in a costly course of action that transformed American society (Ansbro 1982). Following in the path of Gandhi, he developed a highly moral form of action that cost his followers a great deal through never disrespecting the enemy – indeed fundamentally refusing to treat them as enemies, which is the strategy of *kenosis* discussed above. He used many emotional strategies to encourage and pull his followers together. But the whole process was a moral rather than emotional one. The values it embodied shaped all the actions that followed.

The major moral leaders who have transformed human history have all gone into the wilderness, literally or figuratively, to figure out their value system and how to transform it into an action plan whereby change arises out of their value system. This is the process whereby the process of choosing values and ways to implement them is set in place. Emotion informs it and assists it, but is crucially different.

4.3 Values in the relation of societies, organisations, and individuals

The core point of this paper is that just as individual values influence individual outcomes in key ways as discussed in Sections 1.1 and 4.1, entraining the underlying physiology, microbiology, and physics, the implicit or explicit values of social structures influence social and hence physical outcomes as well. In effect the interactions shown in **Figure 12** apply in this case too, except that while there are no genetically determined emotions, there are indeed inherited ones (part of institutional memory), as well as ones impinging on the organisation from outside (perhaps via social

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[48] The so-called "trolley problem" is a fake situation unrelated to real life, that is unlikely to invoke any genuine moral feelings or indeed moral decision making. Wikipedia states: "Characteristic of this literature are colorful and increasingly absurd alternative scenarios Beginning in 2001, the trolley problem and its variants have been used extensively in empirical research on moral psychology." The word "empirical" is being used in a very generous sense. These studies are disjoint from real moral dilemmas.

[49] And contrary to the position of A. J. Ayer, see Mac Cumhall and Wiseman (2022).

media). As in **Figure 3** in the individual case, organisational purpose and values are top level drivers of what happens in society, because they shape the goals in that feedback system. Existence of churches and cathedrals, art galleries and soccer stadia, the Hubble Space Telescope and vaccines for COVID-19 are amongst thenumerous artefacts that attest to this fact: they all embody purpose and meaning that are in the end based on one or other set of values adopted by a social group or institution. Different high level policies result in different outcomes.

But what is the nature of social and organisational values? We propose that the same spectrum of values as shown in **Figure 13** for individuals underlies organisational behaviour. They can range from rapacious capitalism (Friedmann 1970)[50] to the Golden Rule (Boulding 1969) to Ubuntu (Lutz 2009), and arguably even to kenosis (Stucke and Ezrachi 2020). This is why moves to change organisational values to the more caring end of that spectrum (Collier 2018, Mayer 2018) are important. Lutz (2009) proposes that the theory of management should regard the firm as a community, not a collection of individuals, and should understand the purpose of management as promoting the common good. Is this realistic: can it actually happen? Yes, indeed; an example of a firm that does precisely this is the Scott Bader Commonwealth.[51] But the spectrum depicted in **Figure 13** does not apply only to economics: it applies to legal, political, and social aspects of society, as characterised in **Figure 5**.

Underlying this is a multilevel interaction of human behaviour with social and biological levels (Cacioppo *et al* 2000). The interaction has four dimensions we discuss next: A) the effects of social structures on individual values, B) social neuroscience as the causal basis by which this happens, C) the effects of individual values on social structures, and D) specific outcomes are determined by causal closure of these effects. We discuss them in turn.

A) The effects of social structures on individual values As described above, a society is comprised of meso-level organisations which are the key mechanisms by which individuals exert emergent powers, and also a key way society influences individuals (Bellah et al 1992).

Organisations are groups of individuals structured by a set of relations between them that involve rules, norms, and shared strategies (Crick and Ostrom 1995). They tend to be strongly structured by specialised roles or social positions, and are marked by significant authority relations between at least some of those roles (CPSS:152-153).

"*Role descriptions implicitly or explicitly specify norms that define how an incumbent of the position must relate to other members of the organisation, and also how they relate to outsiders when acting on behalf of the organisation*" (CPSS: 153).

Thus roles define relations between people. The people plus the relations between them are the emergent higher level entity which has causal powers in its own right because of this structuring (CPSS:155). As in the case of organisms, organisations tend to satisfice rather than optimising (Simon 1947, Mintrom 2015). As in the case of individuals, to attain goals, organisms and institutions collect and analyse information, using it to predict future states and outcomes. This leads to action choices that will promote activities likely to achieve the organisation's

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[50] See Carney (2021:351-352) for Friedmann's comments, and a response.
[51] See https://www.scottbader.com/humanity/scott-bader-commonwealth/?sb_analytics_cookies=accept.

overall aims via specific actions. They also work via predictive processing methods, selecting a small subset of information to be utilised out of the maelstrom of incoming information in order to update models of the world, and using a predictive feedback process in carrying out actions (Beer 1966, Forrester 1961). They do so in order to attain goals which must be carefully chosen (Drucker 1995, 2012; Edersheim 2007), and which will necessarily embody values shaping their outcomes (Mayer 2018, Stucke and Ezrachi 2020).

Roles are closely related to **habits and routines**, which play a key role in organisational behaviour (Giddens 1984, Hodgson and Knudsen 2004, Hodgson 2008), which assist internalisation of understanding and behaviour. They will by their nature in general incorporate a value system (routines for quality control, for taking safety measures, or for checking customer satisfaction, and indeed how both customers and staff are treated).

Society and Social Norms Heyes (2022) states

> *"Human lives are drenched in social norms. Our clothes, eating habits, sexual and parental behaviours, and day-to-day modes of interaction with one another – from greeting and speaking to helping and harming – can be described by rules about what is appropriate, allowed, required, or forbidden in different contexts for various members of a social group. Some norms are crisply codified in law (e.g., drive on the right, thou shalt not kill), while others would be difficult for any group member to articulate (e.g., how much eye contact is appropriate in conversation with superiors, subordinates, equals). Some have a moral flavour – a prohibition against unnecessary harm to other people may apply to everyone at all times - while other norms, such as who should wear a particular kind of hat, are obviously transitory and group-specific. "*

According to Longres (2000:35,

> "*The most important attribute of a social system is the social norms that hold it together. **Norms** consist of all the agreements, formal or informal, explicit or implicit, which regulate and order and give purpose to a system, be it a primary or secondary group. Examples include goals and objectives; values and ideologies; traditions, lifestyles, and folkways or mores; dogmas, laws, policies, and procedures; and rules, regulations, obligations, and duties. Social norms are experienced by individuals as **expectations**, the expectations of other people as well as the expectations that emerge from the self as a function of participation with other people*").

Outcomes in a society are determined by the way values are embodied in norms and roles, which in turn are shaped by normative institutions. "*The system of goals tells what must be done; the normative regulation of means prescribes how*" (Aberle et al 1950). Through them, values play a key role in legitimation of the social order (Berger and Luckmann 1966:92-96), giving it a normative aspect underlying its practical imperatives**.**

In a divided society there may be different groupings with different norms. The society as a whole may or may not be coherent in this regard. A key point then is which norms prevail in a society as a whole; but at least as important is which norms prevail in meso-level institutions that are the setting of daily life.

Society and individuals We largely derive our expectations from interactions with the society in which we live through a variety of mechanisms which shape our view of social reality (Berger 1963, Berger and Luckmann 1967, Longres 2000). But what are the mechanisms whereby this happens as regards values? The key way is via normative

institutions and their associated roles (Berger and Luckmann 1967:56-60, Longres 2000:41-45), which is a particular form of communities of practice (Wenger 2008).

In a detailed analysis, Elder-Vass (SPSS:115-143) proposes that the key normative social institutions are **norm circles,** which are emergent properties of overlapping or cross cutting social groups concerned *inter alia* with specific normative questions**;** examples are families, sports clubs, schools, police forces, and religious institutions such as churches. They have emergent powers to influence their members by virtue of the way their members interact with them. He states (CPSS:123),

> *"Like all causal powers in the critical realist model, normative institutions do not* determine *behaviour but only* contribute *causally to its determination, alongside other causal powers with which they interact, and hence they only* tend *to produce a given outcome…. The parts of the circle are the individuals who are its members. But what is the mechanism by which the circle (as opposed simply to the individuals) generates this causal power? …It is the commitment they have made to* endorse and enforce *the practice with each other that makes a norm circle more effective than the sum of its members would be if they were not part of it. .. In other words, the members of a norm circle share a collective intention to support the norm, and as a result they each tend to support it more actively than they would if they did not share that collective intention"*

He then (CPSS:124) characterizes the ways norms are enforced socially by relations between its members, which provide a generative mechanism which gives a norm circle an emergent property or causal power. They affect individuals by a process of downward causation because the individual knows both what the expected behaviour is and the pattern of incentives their behaviour is likely to meet. This results in a form of internalisation (CPSS:125) of the sort discussed by Berger and Luckmann (1967): institutions work by changing individuals through changing their beliefs or dispositions so that they will be inclined to behave in a different way (CPSS:125). Thus, as discussed above (Section 2.2 B), they change the nature of their component entities.

Chapter 4 of Berger (1963) titled "Society in man" claims there are concentric circles of social controls that affect the individual and result in such internalisation, and discusses them in detail. One way to express it is as follows: consider again the multilevel feedback control system shown in **Figure 5**, Section 1.2, whereby individuals and groups in society are able to a great or lesser extent to meet their desired goals.

We can look again at this dynamic in a new light: *the same kind of system enables society to influence us and our values, in order to meet its needs*, but with a new link expressing how the legal system can be directly influenced by the political system, and not just through resource allocation.

⇨ ***One can claim there is a dual system of essentially the same nature as Figure 5, whereby society shapes the individuals and organisations who make it up so as to conform to social norms. It has legal, political, economic, and social dimensions, and allows investment in any of these aspects by society in order to better achieve these results. Thus a modified version of Figure 5 (see Figure 14) applies equally as a model of how society influences individuals.***
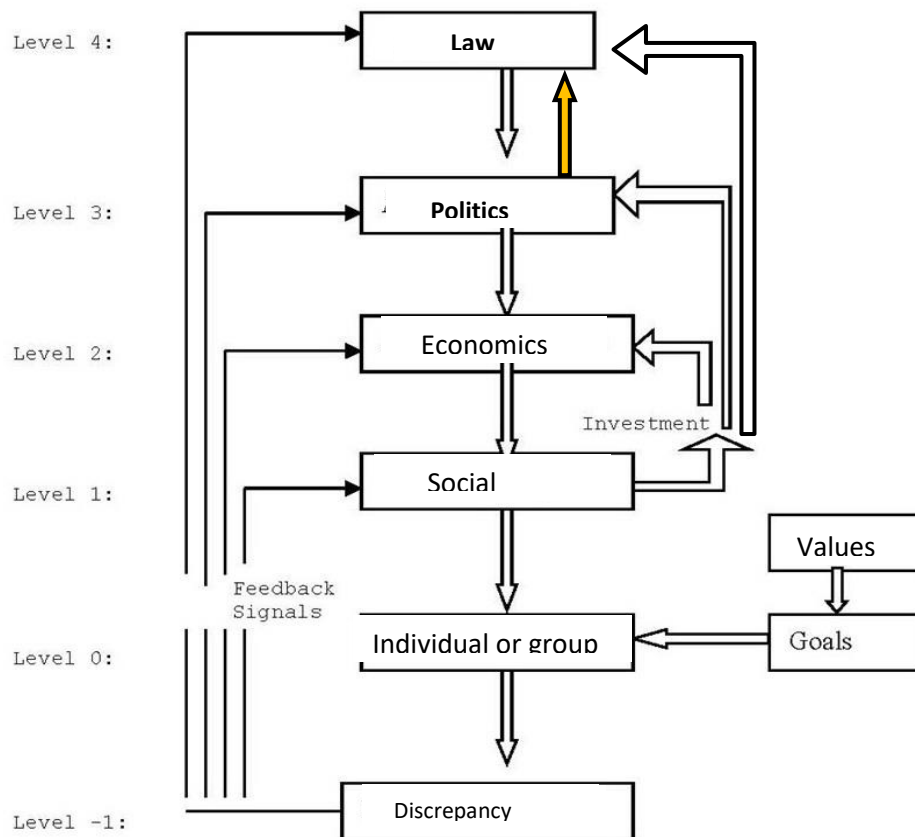
Figure 14: The inverse "Quality of Life" feedback system in society, *determining the understandings and values of a particular group or individual on the basis of societal norms. Similar systems exist for each group in society, in terms of influencing the people in the group.*

The many aspects of this influence are discussed in Berger (1963), Chapters 4 and 5, and Bellah *et al* (1992) in effect explicating the dimensions of this inverse system, shown in **Figure 14**. Berger emphasizes the internalisation of norms and understandings that result in individuals fitting well into their roles in society and in specific organisations. He emphasizes the role of coercion and threatened or actual violence in keeping the social fabric stable (see Level 3 in **Figure 14**), resulting in the existence of police, prisons, and so on that realise this. Katz et al (2020) discusses the evolution of law in complex societies to attain these goals.

B) The social neuroscience underlying this. Because these downwards effects from society to individuals shape expectations and understandings, they alter brain microstructure – specific synaptic connections – in a downwards way (as do all experiences we have) through the key feature of brain plasticity. Studying how this happens is the province of social neuroscience (Cacioppo *et al* 2002, Pfeiffer *et al* 2013).

C) The effects of individuals on values of social structures. The goals, purposes and values of a society result from actions of individuals over time as they create and shape institutions of all kinds. They are shaped for specific purposes by those that create them (Ellis 1989, Scott and Davis 2007, Drucker 2012, Edersheim 2007), otherwise

they would not exist. There is a key historical component to this dynamic, so those who shaped them initially may long since be dead, but generically these purposes will undergo revision from time to time, for example expanding to a broader view of organisational purpose in response to changing circumstances (Drucker 2012), and with chance events often shaping outcomes in an unpredictable way ("I met a friend who told me about an Ashram where she had a revelation of how love could be transformational, so we started one where I live").

The values imbodied in social institutions may be explicit, stated in mission statements, goals, etc, or implicit; in either case they either strongly shape the way the organisations operates, or at least influence its outcomes to some degree. There is a contrast here between empirical and stated values that we comment on below.

D) The causal closure of these effects that results in specific outcomes. As discussed elsewhere in this paper, causal closure only occurs when we take into account both the upwards influences that occur (how people create organisations with agency and thereby the institutional structure of society), and resultant downwards effects (how those emergent institutions at various levels affect people in society). They whole is an ongoing interlevel interaction that develops on multiple timescales, just as in the case of biology. Particular outcomes at a specific time and place depend on this circular causation, with its historical dimension of specific events shaping outcomes. This applies in particular to values (**Figure 15**); Bellah *et al* (1992) discuss the interaction powerfully.
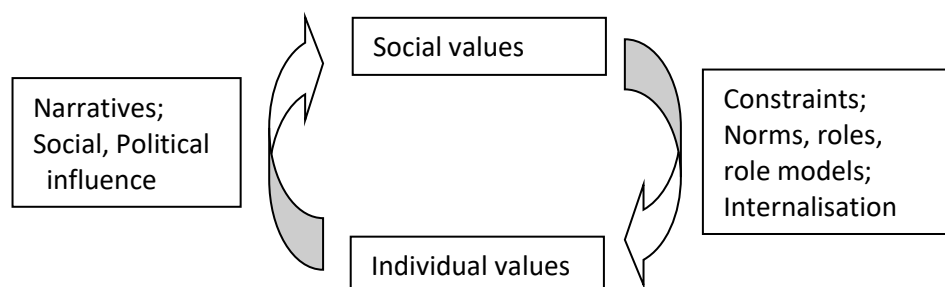

Figure 15: The causal closure between social and individual values

4.4 The key role of narratives in shaping decisions

We need to have an effective understanding of complex social situations as a base for action choices, but few people adopt a purely logical approach to problems in general and social issues in particular, as envisaged in standard economic theory. Radical uncertainty in any case undermines the power of probabilistic modelling and understanding (Kay and King 2020). Furthermore emotions compete with rationality to shape understandings and decisions (Section 4.1).

Given this context, as indicated in **Figure 12**, narratives provide a key form of understanding – in effect, a model of a social situation – which does not require formal reasoning, but is readily accessible, and has quite good predictive power if the narrative is true.   Stories are a good form of teaching (Wilson 2002). The significance of narratives is emphasized by Johnson *et al* (2020) in their paper Conviction narrative theory: A theory of choice

under radical uncertainty. We cannot state the case better than they do there:

> *CNT proposes that people use narratives—structured representations of causal, temporal, analogical, and valence relationships—rather than probabilities, as the currency of thought that unifies our sense-making and decision-making faculties. According to CNT, narratives arise from the interplay between individual cognition and the social environment, with reasoners adopting a narrative that feels 'right' to explain the available data; using that narrative to imagine plausible futures; and affectively evaluating those imagined futures to make a choice… … According to CNT, narratives—mental representations that summarize relevant causal, temporal, analogical, and valence information—are the psychological substrate underlying such decisions. Narratives support and link four processes—explanation (structuring evidence to understand the past and present, yielding emotional satisfaction), simulation (generating imagined futures by running the narrative forward), affective evaluation (appraising the desirability of imagined futures and managing commitment toward a course of action over time), and communication (transmitting decision-relevant knowledge across social networks to justify, persuade, and coordinate action). Narratives are why the above-mentioned properties so often co-occur: In contexts marked by radical uncertainty and fuzzy evaluation, we use narratives to make sense of the past, imagine the future, commit to action, and share these judgments and choices with others.*

Narratives have been a key part of human social life for aeons, for example when a group has been gathered around a fire at night and shared stories about the day and the past. Thus Gottschall claims this is a key part of being human in his book *The storytelling animal: How stories make us human*. (Gottschall 2012). It is a key part of political agency, as explained by Froese (2009), who comment that in Towards a narrative theory of political agency, Akerlof and Shiller (2009) have recently argued that homo economicus *inter alia* is motivated by the human ability to form intuitive beliefs based upon stories. Crucial for the present paper is that narratives not only involve emotions, but are also are a form of moral reasoning, as stated in the paper *Narratives, imperatives, and moral reasoning* by Bénabou *et al* (2018) They influence outcomes by shaping the multidimensional feedback goals and selection criteria of the adaptive feedback systems summarised in **Figure 5** and **Figure 6**. Slogans that summarise narratives are also a key form of simplistic understanding that is strongly motivating in political contexts, such as "Make America Great Again" and "Get Brexit Done".

Values Narratives involve values and are a strong way of promoting them, whether positive or negative in terms of the spectrum of values (**Figure 14**). A key point is that, as indicated in **Figure 12** in the individual case,

> *Narratives affect both emotions and perceptions, and in turn are affected by them; and this takes place in a self-reinforcing social context as in **Figure 15**.*

The relation to the viewpoint of this paper is this:

⇨ ***Well-developed narratives for any society or organisation have social, economic, political, and legal dimensions that each fall somewhere on the spectrum of values shown in in Figure 14. Associated slogans powerfully represent those narratives and reinforce those values***.

An example is MAGA slogan in the USA, representing the values of a set of White fundamentalist Christians who believe they have the right to control what everyone in the country does, irrespective of what those people want, including determining women's reproductive rights, and that black people should have no political rights at all. They are on the far authoritarian side of the spectrum of values as regards social, economic, political, and legal values.

5.   The requirements for moral action

Moral action The importance of norms and values is they underlie moral action. The key issue in philosophical and neural terms is how moral actions are possible, leading to change in the world. Talbert (2019) states

> "*The judgment that a person is morally responsible for her behavior involves—at least to a first approximation — attributing certain powers and capacities to that person, and viewing her behavior as arising (in the right way) from the fact that the person has, and has exercised, these powers and capacities*."

What are the requirements for moral action, allowing the guiding role of values individually and in society? We suggest the key features are firstly, existence of individual agency (§5.1), and secondly (§5.2), meta-analysis involving reflection on the importance and nature of values and their relation to the spectrum in **Figure 14**.

5.1 Individual agency

Underlying the agency of social structures is the agency of individuals. As mentioned earlier, there is a huge literature on this from a philosophic viewpoint, see Pink (2004), O'Connor and Franklin (2021), and references therein. Together with List (2014, 2019) and Elder-Vass, we argue that autonomy emerges (Boden 2008): human individuals do indeed have causal powers of our own, and those causal powers are emergent properties (SPSS:87). Elder-Vass comments that in fully explaining the powers of human individuals to exercise agency, in line with his explanatory method outlined above, we must identify what are the parts, and how are they related, to makeup human individuals? How does this kind of structure lead to the powers that they possess? How is this structure brought about and sustained?

This is the biological basis of human capacities, but equally we cannot neglect that human behaviour is causally affected by external factors, and specifically by social context (Berger 1963, Longres 2000, Rogoff 1989, 2003, Heyes 2018), as discussed above. Human action is affected by such causes but are not fully determined by them: as stated by Elder-Vass,

> "*The critical realist account of the co-determination of actual events by a multiplicity of causes, potentially from a variety of levels in the hierarchy of emergence, provides the framework needed to reconcile the claim for agency with the recognition of the causal impact of external events on human action (both natural and social)*" (SPSS:87-88).

It also reconciles it with the causal impact of the underlying biological and physical levels.

The multiple attacks on agency by various authors amounts in each case to a choice of one or other emergent level as the primary level determining all. But each of these well-determined levels emerges out of lower levels. Each such proposal is in the end a claim that at least one of the lower levels is not causally effective, but (*as per* the

Principle of Biological relativity) they demonstrably are so. Thus if genes and neurons were the lowest level determining mental outcomes as claimed by Crick (1994), then the underlying physics level would not be the real causally effective level, as claimed by Greene (2019), Hossenfelder (2021), and Carroll (2021). **But these claims contradict each other**. They cannot all be true. In fact they are all causally effective.

   Supervenience issues We have already fully dealt with the problems supposedly arising from the issue of supervenience and the alleged causal completeness of physics. The latter is not in fact the way things work (Humphreys 1997, Ellis 2020a, 2021), as discussed above. This disposes of much of the argumentation in the philosophical literature that disputes the existence of agency. Some of the writings that support our view are Dupré (2001), Macdonald and Macdonald (2010), Gabriel (2017), List (2019), Brass *et al* (2019), and Baggini (2021). We note particularly List's defence, based in the claim (List 2014) that the appropriate frame of reference in asking if a particular action is possible for an agent is not that given by fundamental physics, but that given by our best theory of human agency, which employs a more coarse-grained state space than the physical one. He emphasizes the crucial role of multiple realisability in relating this emergent frame to lower levels, as we do above. Following the approach laid out in earlier sections, our concern is with the mechanisms that might make individual agency possible.

   We consider in turn, A) mechanisms of agency, B) the role of stochasticity, and C) intentions and action tendencies.

   A)   **Mechanisms of agency** Murphy and Brown (2007) and Ismael (2016) emphasize the mechanisms that make brains self-organising systems. Ismael discusses how a transfer of information takes place between macro and micro levels of information (hence this is downward causation). Thereby reciprocal causation takes place between the wholes and the parts, with feedback loops filtering them. Self-governance takes place via adaptive homeostatic control loops, as Ismael (2016) discusses in detail:

> "*Self-governance is built on top of a functional hierarchy that is self-organising at lower levels by adding a super-loop of system-wide representation that provides the setting for deliberative reasoning. The super-loop consolidates information distributed across lower level subsystems, re-represents it in a form that separates objective from self-locating information, and puts that information to use in a deliberative process that articulates goals and identifies means for achieving them. In human beings, this super-loop is the psychological space within which the concept of the self as distinct from the world takes place… There is an internal locus of control inside the system that plays a pivotal role in the production of voluntary behaviour .. deliberation brings into the chain of determination between stimulus and response*" .*

Thus she emphasizes self-modelling and top-down control, in line with our position, with that subjective view embodying the choice of values that are the subject of our concern, centred in the creation of self-meaning.

   Murphy and Brown (2007) essentially pursue the same line of argument, but giving a more in-depth study of the hierarchical adaptive homeostatic mechanisms involved. Evans *et al* (2021) give an analysis of how agency relates to causal models developed by an agent via interactions with the environment. This endows the causal agent with a "*causal viewpoint*: *a distinctive mix of knowledge, ignorance and practical ability that a creature must apparently exemplify, if it is to be capable of employing causal concepts*" (Price, 2007: 255).

As emphasized above, a key aspect of the dynamics is constraint closure: thus (Wilson and Prescott 2021) emphasize the capacity of layered brain architectures to scaffold themselves across multiple timescales, with cortical processes constraining the sub-cortical processes, and the latter constraining the way cortical systems self-organize and refine themselves. Thereby mental states are causally effective (Menzies 2003).

B) Agency, stochasticity, and choice Despite these strong arguments, for hardcore physicalists there will still be a nagging issue: and yet, surely the underlying physics does indeed in the end determine all, if one were to know in detail *all* the relevant data at a sufficiently detailed level? (which is of course completely impossible in practice: it is a highly theoretical question). The answer is in three stages.

1. Open systems Firstly, this is simply not possible because, as is the case for all biological systems (Peacocke 1989), we are open systems (Ellis 2021). The data that affects what we do in the future includes our current brain state, but also all the incoming data that we receive via our senses (vision, sound, smell, touch), which are determined by external events including actions of other agents. At any time t_0, our brain has no access to all the data that will arrive at times $t_1 > t_0$, so brain operation at any such time t_1 cannot be uniquely determined by the state of the brain at time time t_0: it simply does not have the data needed to make such a determination. Thus suppose Jane, walking down the street, sees an accident at time t_1 where a man is badly injured. This rapidly triggers brain outcomes determined by computational processes at the emergent brain level (Hopfield 1982, Churchland and Sejnowski 1994), thereby shaping her immediately successive thoughts (``I must call an ambulance''), based in her character (helpful) and previous knowledge (ambulances bring help). Prior knowledge of the state of every particle in her body at any time $t < t_1$ cannot predict this outcome of her brain state at times $t > t_1$ because the unpredictable accident (Henry fell) occurred at an external location: the neurons and ions in her brain were simply not involved. Causal completeness based in the total details of her initial brain state is not possible. The incoming data affects the pattern of action potential spike chains in her brain to reflect her choice of action for times $t > t_1$, which are shaped by rational thought that alters the positions $R_i(t)$ of nuclei in the voltage gated ion channels in her brain, in the context of neural connections that have been shaped by past experiences (Drossel 2023:\S6). Circular causation takes place (Noble *et al* 2019) that involves all these levels, and indeed also the level of society in which the action is situated, which leads to the existence and functionality of the ambulance. Overall, the physical state of her brain is only one component of the interacting systems that determine the specific outcomes that occur.

2. **Uncertainty and chaotic dynamical systems** The physicalist may (does!) retort, that incoming data is predictable if one knows the entire state of the universe to the last detail at the initial time. However it is not possible even in principle to predict outcomes in this way because of the huge numbers of collisions involved in a gas or fluid, as evidenced by Brownian motion,[52] together with foundational uncertainty in setting initial data arising from the Heisenberg uncertainty principle[53]: the position and momentum of every particle is subject to that uncertainty so the

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[52] https://en.wikipedia.org/wiki/Brownian_motion
[53] https://en.wikipedia.org/wiki/Uncertainty_principle.

data needed by Laplace's demon[54] to uniquely determine later outcomes Is not available even in principle. Such uncertainty can get amplified to macroscopic scales due to *the Real Butterfly Effect* (Palmer *et al* 2014, Palmer 2022): chaotic dynamics due to a strange attractor can lead to the existence of an absolute finite-time predictability barrier in multi-scale fluid systems, implying a breakdown of continuous dependence on initial conditions for large enough forecast lead times. The possibility of predicting the arriving data is not achievable because of these combined effects on weather. There is even unpredictability on cosmic scales (Neyrinck *et al* 2022, Rincon 2023, Arzamasskiy *et al* 2023) and in the solar system.[55]

    3. **Stochasticity and selection**   Huge stochasticity occurs at the molecular level in all the cells in the brain. This locally decouples emergent brain activity from the remorseless logic of the underlying physical laws (Newton's Laws of motion, Maxwell's equations, etc). This stochasticity is taken advantage of by molecular machines such as kinesin and dynein to enable their purposeful functioning (Hoffman 2012, Mavroidis *et al* 2014), which is essential to cell operation. A biomolecule collides 10^{13} times a second with water molecules at room temperatures.[56] Any detailed molecular information inevitably gets lost as those collisions take place inside a cell or in the intracellular medium.

    An ever growing literature emphasizes the key role of stochasticity not just in molecular machines (Philips and Quake 2006, Hoffman 2012, Chowdhury 2013), genetic circuits (McAdams and Arkin 1997, Raser and O'Shea 2005, Eldar and Elowitz 2010), developmental processes (Cohen *et al* 2010, Kupiec 2014), metabolism (Kiewit *et al* 2014), the adaptive immune system (Cooper and Alder 2006, Hodgkin et al 2007), and evolutionary processes (Abbott *et a*l 2002), but in biology in general (Buiatti and Longo 2013). It is also key in brain function (Skarda and Freeman 1990, Harris and Wolpert 1998, Glimcher 2005, Faisal *et al* 2008,**[57]** Deco *et al* 2009, Rolls and Deco 2010, Ribrault *et al* 2011, Garrett *et al* 2013, Papo 2014, Averbeck *et al* 2006, Deco and Kringelbach 2020, Braun 2021). This enables effective brain functioning to emerge, where by "effective" we mean that the kinds of everyday challenges met by individuals are coped with in a broadly reliable way. For example signal dependent noise determines motor planning (Harris and Wolpert 1998); Payeur et al (2021) show how burst-dependent synaptic plasticity can coordinate learning in hierarchical circuits; while maturational changes in brain noise represent the enhancement of functional network potential – the brain's dynamic repertoire (McIntosh *et al* 2010), , and the peripheral nervous system can be made more sensitive to small signals if uncorrelated noise is added to the stimulus (Weinstein and Pavlic 2009). Nolte *et al* (2019) discuss how typical responses of cortical neurons to identical sensory stimuli are highly variable, with stochastic release of neurotransmitters a key component of internally generated variability, leading to rapidly diverging chaotic recurrent network dynamics. This dynamic can transiently overcome the chaos via weak feed-forward thalamocortical inputs, resulting in reliable spike times with millisecond precision.

    Underlying all this is the way that added noise improves the ability to communicate information across a channel (Still and Crutchfield 2007), and can enhance detection of weak signals (Palmer 2022) and help improve biological

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[54] https://en.wikipedia.org/wiki/Laplace%27s_demon
[55] Cepelewicz, J (2023) "New proof finds the ultimate instability in the solar system" *Quanta* May 16, 2023.
[56] See "Cells are very fast and crowded places" by Ken Shirriff.
[57] See Box 1 in that paper for benefits of noise.

information processing (Hänggi 2002) and neural performance (Qiao *et al* 2023). Agency of an organism as a whole is enabled by adaptative selection of goals (Murphy and Brown 2007), allowed by lower level stochasticity (Noble and Noble 2018, 2020) which provides an ensemble of micro states from which macroprocesses can select those that are preferable from the viewpoint of attaining desired macro level outcomes. This is based in the broader principle that randomness improves algorithms[58] and assists optimisation and creative processes in general (Abbott *et al* 2002, Danchin *et al* 2011, Palmer 2022).

   C) Agency: Intention, Tendencies, and Actions What about the celebrated action potential results by Libet (1985) that are alleged to show free will does not exist because the brain has already determined what we will do before we are consciously aware of that decision? This is a highly simplified view of what is entailed, and does not reflect the real nature of what happens when action choices are made. Agency is a multistage activity as emphasized by Donald (2001): the pushing of a button as in the Libet experiments is only one event in a chain of causation. Elder Vass develops this further, emphasizing that the intention to act is separate from the action itself. Following Chaiken and Trope (1999), he adopts a *dual process* theory of human cognition (CPSS:97), where cognition involves one fast, automatic, and largely unconscious process, and one slow and deliberate (Kahneman 2011):

   ”*The conscious decision takes place at one time and the execution of that decision is done non-consciously at a later moment … all decision- making works as follows: we do make conscious decisions but these decisions are only the indirect and partial causes of our behaviour, in that (a) they occur a variable length of time before the action concerned, and (b) they are always incomplete regarding the details of the action to be taken … Decisions, then, do not seem to produce behaviour directly, but rather produce dispositions to behave in a given way in the future in certain circumstances. Indeed we may define a decision as en event in which an episode of conscious reflection (a process) leads to a change in our dispositions (our tendencies) to act in particular ways*” (SPSS:94,95,96).

This works out as follows (SPSS: 98), where we note that ***this statement applies to values as well as reasons***:

   “*Reasons can be causes of our actions, but they are only partial and contingent causes. Reasons are emergent mental properties (and thus causal powers of the individual concerned) that co-determine our decisions, and decisions are stored in our brains as neural configurations – dispositions – which in turn co-determine our actions. But other factors are also involved and these other factors can lead to some of our decisions not being realised. There are therefore good reasons why there are no exceptionless empirical regularities governing decisions and actions… Reasons can indeed be causes, but they always operate in conjunction with a complex of other factors in determining our behaviour.*”

Libet’s action potential observations relate only to a late part of this chain of events. As List (2014) states,

   “*When Martin Luther reaffirmed his criticism of the Roman Catholic Church by saying “here I stand; I can do no other”, he was not denying that he had free will. He was taking full responsibility for his actions, implying that these were a consequence of who he was. But although this might be taken to suggest that free*

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[58] Brubaker, B (2023) “How Randomness Improves Algorithms” (Quanta Magazine April 3rd)

will does not require the ability to do otherwise, Luther need not be interpreted as saying that it was strictly impossible for him to do otherwise. It would just have amounted to a betrayal of his values and beliefs: he could not do otherwise without sacrificing his integrity."

This is the nature of agency at the psychological level (**Figure 1** and **Figure** 3). How does it allow moral action?

5.2 The need for meta-analysis

Murphy and Brown (2007:244) cite the following requirements for moral action to occur:

1. A symbolic self ("different possible futures for *me*");
2. A sense of the narrative unity of life ("to imagine myself moving forward from the present");
3. The ability to run behavioural scenarios, involving imagination, and predict likely outcomes;
4. The ability to evaluate these predicted outcomes in the light of goals;
5. The ability to evaluate the goals themselves ("alternative sets of goods .. different modes offlourishing");
6. The ability to act in the light of 1-5.

The last implies the possibility of agency, which we have discussed above. To these we add,

7. The ability to modulate the interaction between emotions and values in doing so, so as to allow values to shape outcomes overall. This requires metacognition of that interaction.

Murphy and Brown (2007:243-258) discuss this carefully, showing they are all possible given theunderstandings of emergence and brain function we have outlined above: namely (Murphy and Brown 2007:209):

"Mental events are not reducible to brain events, because mental events are largely constituted by relations to actions in the environment. In this respect mental events are constituted in action loops in which brain events are interlocked with environmental context,with the history of the outcomes of previous actions events playing a primary role".

This is in accord with Clark (2013), Gallagher and Bower (2013), Hohwy (2013), Seth (2013, 2014), Seth and Critchley (2013). This enables a compatibilist view of free will (Murphy and Brown 2007:267-305, da Cunha and Relvas 2017) which is unproblematic provided Leibniz' *Principle of Sufficient Reason* is satisfied (Gabriel 2017:193-194), which is just the condition of causal closure discussed above, *provided* it includes the moral level **C** we propose, and specifically the capacities just discussed.

Then *w*e are able to evaluate the factors that shape and modify our interactions in the light of some concept of the good (Murphy and Brown 2007: 241). This includes reflection on the balance between emotion and rationality in one's actions, guided by values. This is meta-cognition about one's behaviour (Fleming and Dolan 2012, Fleming *et al* 2012, Heyes *et al* 2020). It involves adaptive selection of both homeostatic goals and adaptive selection goals (Ellis 2012). The causal closure involved in determining specific outcomes includes this level of meta-analysis, which makes moral actions possible.

6. To what degree do values determine outcomes?

However, is this an over idealised view of the situation? How does it work out in reality? We thank our colleague Dennis Snower for the following comments in this regard.

"We often do things that are not in accord with our deliberate goals - whether good or bad, logical or illogical - and our goals are often ill defined and contradictory. the ideas we are expressing do not depend on whether the purposes and reasons are good or bad. Hitler had his purposes. Reasons given don't have to be good or logical ones. Emotion plays a big role too. Most of the time we don't work like logical calculators. Higher levels of organization constrain the dynamics of lower levels. The central features this approach highlights - that we are dealing with open systems, lower-level systems nest within higher-level systems, and causal interactions among these systems occur across the boundaries between levels of organization - can be applied straightforwardly to economic analysis. Economic decisions are nested within social and political networks, which are themselves nested within natural environments and there is causation across all these domains. "

"Within such a system of systems, people can exercise agency at the level of the individual and can also do so by participating in various collectives (social groups). Decision makers exist in domains that they perceive as radically uncertain. In this context, they can harness stochasticity consciously or unconsciously. In retrospect, they can give reasons for actions that turn out to have been appropriate to the challenge they face and this they identify as their exercise of will. In practice, the act of choice harnesses the uncertainty of the constraints they face. Within this context, many of our actions are not driven by our purposes and values. There are well-documented problems of self-control; there are moral dilemmas; there are overriding drives in times of threat, etc. Choices made at the level of purpose do not necessarily shape everything that happens at lower levels. Most people do not live up to their highest ideals. Many of their values are contradictory: most people feel the pull of consequentialist, deontological and virtue approaches and the incompatibility of these approaches leads to much anguish. Often people try to justify what they have done - often driven by unconscious drives - by cherry-picking the appropriate values for this purpose. In all these arenas, it is difficult to see why the level of purpose should be privileged, rather than nested within a system of systems. In practice, mission statements are usually the outcome of the forces outlined above. Often they are strategic documents that are meant to generate goodwill on the part of customers and regulators."

We agree that all these complexities arise: values and purpose are indeed nested within a system of systems, and they do not always win. Nevertheless we submit that implicit values are factors that play a key role, whether or not they are explicit. For example organisational mission statements set out what their purpose and ideals are, and express organisational values that influence their activities. They represent ideals that shape organisational purpose, even if imperfectly achieved, providing a direction that can shape outcomes. If this was not the case, there would be no point in the work represented by Collier (2018), Mayer (2018), Carney (2021), and even the paper by Snower and Wilson (2022). Indeed the latter refer (page 28) to "*motivated decision making .. not only the individuals objectives, but also the group's objectives – defined in terms of its purposes values and norms – are relevant for human behaviour.*"

But are they a key factor? We claim they are, when one makes the distinction (**Section 4.2**) between explicit and implicit values. Implicit values are the central factor shaping what happens, whether they are explicit values or not, because they shape goals and restrict acceptable actions. A series of issues arise from these comments.

6.1 Issues occurring in relating values to social outcomes

We consider in turn, 1. Value Coherence; 2. Social Scale and Cohesion; 3. Ethical Dissonance; 4. Valueless organisations? and, 5. Application Dimensions: coercion, corruption, the environment.

1: Value Coherence A key issue is the coherence of the goals and values of the constituent entities[59] of a social structure: do they largely agree with each other on these values, or not? It is only if they do that the feedback system (**Figure 5**) makes sense: only then does the group form an emergent entity with sufficiently congruent goals that the dynamics represented by that Figure make sense. If that is not the case, one should at least conceptually divide the group into subgroups that are indeed coherent in this sense. In that case we will refer to them as *Value Coherent*, and **Figure 5** applies to them, as they are functioning as a reasonably coherent whole. Otherwise the group concerned is value incoherent, a set of competing entities. If it's an organisation as such (Scott and Davis 2007, Hatch 2011) it will usually have coherent goals. If it's a more general social structure (an economic or political system, for example) that may not be the case. This leads to a key concept: it is possible that *the whole is less than the sum of its parts* as noted by Morin (1997:112-114)[60], Bertin and Jensen (2019).[61]

Consider a social structure **S** comprised in some way of subunits **S1** and **S2**, where **S1** on its own has capacities **C1, S2** on its own has capacities **C2,** and the resultant entity **S** has capacities **C**. Then it is possible that,[62]

- **C** is the same as **C1** and **C2**. Then **S** is just *the sum of its parts*: nothing more, and nothing less. An example might be a village with a church choir and a football club. Even if some individuals belong to both, they are separate entities with separate missions that do not (in general) affect each other.

- **C** includes capacities that are not included in either **C1** or **C2**. Then the whole is *more than the sum of its parts.* An example might be workers in a factory who are each capable of specific tasks; when performing them jointly in a factory making automobiles, they produce outcomes neither could produce on their own.

- **C** does not include all the capacities in at least one of **C1** and **C2**. Then the whole is *less than the sum of its parts.* An example might be a company with internal strife so that one unit sabotages the work done by another. Another is the political system of the USA at present, where a central aim of the Republican Party is to prevent the Democratic President from improving infrastructure and health care across the country.

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[59] Whether individual people, or lower level social structures.

[60] The key passage in Morin's book has been translated by M F McCullough and is available at *NavigatingComplexity.net* here: https://navigatingcomplexity.net/2019/05/01/edgar-morin-the-whole-is-less-than-the-sum-of-its-parts-1977/.

[61] An example is concrete buildings after a fire, which can emerge as more or less , depending on context (Bailey 2002).

[62] Note that this classification does not work for the case of chemistry, when sodium and chlorine combined to give salt, or hydrogen and oxygen combine to give water, lose all their individual essential properties and producing quite new ones. In these cases *the whole is different than both of its parts.*

2: Social Scale and cohesion Social cohesion is related to the issue of scale. Snower comments that there is much less coherence of values and goals at larger social scales than smaller ones, so values are not driving factors at large scales, even if they are at smaller scales. We agree to a large degree: while there are some issues where goal coherence occurs even on the global level (Carney 2021), as we discuss below, coherence mainly occurs at the meso-level, as essentially claimed in CPSS. This key issue is discussed below in Section 6.2.

3: Ethical Dissonance In section 4.2, we considered the contrast between Explicit and Implicit Values as key shapers of individual thoughts and actions. The same issue arises for any organisation or social institution. The stated (explicit) values and goals may or may not be the same as the empirical (implicit) values and goals, which can be determined by recording and analysing their actions. For example a corporation may have a vision statement including the aim of protecting the environment (a stated value) but may pay politicians to weaken environmental legislation (a verifiable outcome of an implicit value of ranking profit over environmental damage). In this case we can refer to the situation as ***ethical dissonance.***

What matters in social and environmental terms are the empirical values, not the stated values: in terms of difference making, they shape social and physical outcomes at various scales. Stated values can be operationalised by ensuring that indicators of organisational performance represent desired outcomes, for example including in company accounts measures of environmental damage caused (Mayer 2018), to be offset against profits and remedied by environmental restoration projects. Ethical dissonance can be lessened by such measures.

4: Valueless organisations? What if the organisation has no stated values? In his book on management, Hendry (2013:102,105) comments on *managerialism*, which involves an emphasis on means over ends, where "*Economic efficiency takes centre stage, and all questions of purpose or values are not just neglected but actively suppressed. Moral issues, for example, cannot be openly discussed at work, and can only be resolved when converted into economic terms – when reduced to issues of pricing.*" The meta-reflection that underlies morality simply does not take place. In fact this position is actually a value choice: inevitably such a view results in implicit values that default to something like values **V3** in the spectrum of values. Selective disengagement of moral self-sanctions as regards transgressive conduct takes place, resulting in injurious corporate transgressions, as illuminatingly discussed by Bandura *et al* (2000).

5. Application dimensions: coercion, corruption, the environment

In what specific ways do institutional values affect human welfare? Some specific key areas where the spectrum of values depicted in **Figure 13** plays a central role are A) Coercion and anti-democratic tendencies, B) Corruption, and the Environment, with C) global climate change being a particular issue in the latter case.[63]

A) Coercion and anti-democratic tendencies There is a worldwide movement promoting anti-democratic politics, driven by values at the coercive end of the values spectrum. There are still ongoing attacks on sovereign nations by others wishing to take them over, with Putin's attack on Ukraine a prime current example, but the USA hardly being innocent in many cases. The violent attack on the US Capitol on January 6th, 2022 was an attempt

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[63] Carney (2021) also includes the global COVID pandemic (Chapters 9 and 10).

orchestrated by President Donald Trump and supporters, including the wife of a supreme court judge, to overthrow a democratic election. It was prepared for by a systematic disinformation campaign run *inter alia* by Fox News, and with security forces conspicuously failing to take adequate safety measures despite abundant evidence this was going to happen, all this being documented in depth by the January 6th Commission.[64]

B) Corruption Worldwide, various forms of corruption represent a way that people with access to power drain off resources that should be used for the common good, to be used for their own benefit, often happening on an outrageous scale as in the Zuma administration in South Africa. Massive power outages that are cripplingl the economy at the time of writing are a consequence of this corruption, which has been linked to at least two people at Cabinet level in the Government. Huge poverty and suffering in the population at large results.

C) The environment and global climate change Because of an enhanced greenhouse effect[65] due to industrial activity, aircraft, automobiles, and other sources of atmospheric pollution, global average temperatures
are estimated to rise 1.5 degrees Celsius above preindustrial levels within the next decade as humans continue to burn fossil fuels (Carney 2021:Ch11, IPCC 2023). Exceeding 1.5 C global warming could trigger multiple climate tipping points (Armstrong *et al* 2022), with devastating effects on the environment (particularly fires, floods, and droughts) and causing change in many ecosystems resulting shifts (e.g. Reich *et al* 2022) with resultant changes in animal physiology (Ryding et al 2021)[66] and even extinction (Cahill *et al* 2013). Under the Paris climate agreement (Schleussner *et al* 2016), most nations agreed to pursue efforts to hold warming to 1.5 degrees Celsius. Beyond that point, the impacts of catastrophic heat waves, flooding, drought, crop failures and species extinction will become significantly harder for humanity to handle.

To shift course would require industrialized nations to join together to halve greenhouse gases by 2030 and then stop adding carbon dioxide to the atmosphere by the early 2050s – an economically costly social effort for the common welfare, needing *inter alia* an economics of water as a common good (Rockström *et al* 2023)

6.2 The Different Scales and Contexts in the real world

Snower comments as follows as regards scale of interaction:

> *"It appears that the higher the level of functional organization, the lower the degree of causality. Needless to say, this claim will need to be heavily qualified. It is meant to capture the observation that we generally feel much stronger allegiance to small social groups such as our families than we do to the inhabitants of our neighbourhood or our country or to the rest of humanity. In the process of evolution, however, very high levels of functional organization can become cohesive once the components require their interaction within a higher level of functional organization to sustain life. Then they become part of a superorganism. In many realms of human affairs, this is not the case. Individuals need to be embedded in social groups in order to*

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[64] Select January 6th Committee Final Report and Selected Supporting Materials Collection *GovInfo website* (USA)
[65] A small greenhouse effect is essential to our survival: otherwise Earth would be too cold for life to occur.
[66] While major evolutionary transitions occur on evolutionary timescales, these changes occur on the order of decades.

thrive, but they do not need to be nested within any particular social group for that purpose. The greater the

social group, the greater the opportunities for thriving outside one's current social group."

Thus Snower, and Elder-Vass by implication, suggest it is only meso-level organisations that have the required

cohesion and associated causal powers for our thesis to be correct. However in our view the situation is more

complex. In real world contexts, it is true that the degree of social coherence as regards values depends on

scales and contexts; and we suggest that value-driven action indeed takes place at all scales.

To consider this, **Figure 16** indicates the variety of scales where decisions are taken and values are

expressed, starting at the largest scale **S1** and extending down to the individual level **S9.** The issue pans out

differently at the different social scales indicated**.** Note that the labels may not apply precisely as shown there in

particular geographic contexts: the labelling may need to be adapted to take local social and organisational

circumstances into account. Also there are links between levels, so they strongly interact with each other; they

are not independent. We consider them briefly in turn (see Carney (2021) for a fuller discussion).

Scale	Nature	Entities	Organisations
S1	**Global**	Humanity as a whole	UN, IPCC, ICC World Bank
S2	**International**	Groups of Nations Capitalism as a system	G8, G20, and similar; Multinational corporations
S3	**National**	Country National Economic system	National Government, National corporations
S4	**Regional**	State	State Government, Regional corporations
S5	**Local**	City	Municipality
S6	**Meso-Level**	City Centres, Suburbs	Firms, Universities, Banks Local corporations
S7	**Community**	Local areas, Villages	Sports clubs, Churches, Schools
S8	**Family units**	Related or voluntarily conjoined individuals	
S9	**Individuals**	People as such	

Figure 16: The scales at which values are expressed.

S1: Global: Worldwide One can consider here global political organisations, and global corporations.

Humanity as a whole The first attempt to establish values at a global level was the League of Nations, which

later morphed into the United Nations (UN). While the UN is certainly imperfect, and has been a notable failure

as regards stemming wars and international authoritarianism because of disagreement amongst members on

values and goals in this regard, it has had some successes. It has provided an international forum where

universal values could be debated, consequently the *Universal Declaration of Human Rights* has been agreed to,

and the International Criminal Court (ICC) set up, representing a crucial set of values applicable at least in

principle to all nations. As regards economics, global actors are the International Monetary Fund (IMF) and the

World Bank, which has a set of value-based criteria for actions, which have evolved over time in response to

criticism of its actions, largely to do with the way initial goals did not adequately take social consequences into account.[67] Agreement on the *Sustainable Development Goals* ([SDG](#)s)[68] has led to international actions going some way towards meeting those goals by setting economic activity in a broader social and developmental context. It has been widely influential in Governments and grant-making, so can be argued as a substantial win.

However the most important globally coherent action has been as regards the clear and present danger of global climate change (Carney 2021: Ch.11), now generally realised and acknowledged. The international response has been coordinated by the *International Panel on Climate Change* (the [IPCC](#)), promoting a program of energy usage change to reduce global warming, realised to some degree by a program of carbon offsets[69]. But by far the most successful such action, not celebrated enough, has been the successful dealing with [ozone layer](#) depletion[70] (Petrescu *et al* 2018, Amos *et al* 2020) due to the UN Environmental program.[71]

Global corporations are of three kinds**.**

- *Product-based organisations* that provide some useful physical service, with outlets in many countries, such as global hotel chains , car hire firms, and food providers. Their values are consistency and quality, something like **V4** in the spectrum of values. There are manufacturers of products used world-wide such as aircraft, computers, and key software. Their success depends on the quality of their products, their main value.

- *Resource-based organisations* such as petroleum/energy based organisations and mining. They are meeting an important need by providing these products, but often at the cost of considerable environmental damage; in many cases their values are towards the rapacious end of the spectrum, somewhere between V2 and V3. But this is not always the case: forward looking energy companies are at the core of transition to a green energy economy,[72] with a controversial topic being the degree that nuclear energy should be used.[73]

- **Internet based organisations** The enormous power of the World Wide Web has led to the astounding arise of enormously influential organisations, whose explicit or implicit value systems are having a huge impact on the world globally. They include Google, Amazon, Netflix, providing quality consumer products on a global scale, but with problematic aspects related to predatory behaviour. Then there is social media, primarily Facebook, Instagram, Twitter, and U-Tube, with the well-known problem that algorithms used are designed to generate as many "clicks" as possible in order to maximise advertising revenue, no matter what social damage results; and this is best done by contents that generates outrage and social division. In practice the values enabled by social media have in many cases been on the far authoritarian end of the value spectrum by creating echo-chambers and spreading conspiracy theories to a highly damaging extent.

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[67] D Bradlow, "[The World Bank used to cause untold harm- but 30 years ago it started reforming. What went right](#)". The Daily Maverick 2023/03/24

[68] It is regrettable that these goals are rather disordered: they don't relate to each other in a coherent way.

[69] See https://en.wikipedia.org/wiki/Carbon_offset.

[70] See https://en.wikipedia.org/wiki/Ozone_depletion.

[71] See *[Ozone layer recovery is on track, helping avoid global warming by 0.5°C](#)*

[72] See [Top 10: The largest renewable energy organisations in the world](#)

[73] See the OECD Nuclear Energy Organisation website: https://www.oecd-nea.org/.

S2: International: Groups of nations, capitalism as a system Here we have seen the rise in recent times of a value system, underpinned by some academic economists, that states explicitly that the only goal of a company is to maximise profits for shareholders, and this has largely shaped the nature of international financial order. It led to the global financial crisis of 2007 (Carney 2021:Ch6). Groups of nations such as the **G8/G7** and **G20** and **OECD** have been set up on the basis of joint values and interests in order to try to prevent such crises, and with attempts to influence action at this level towards mutual welfare (**V4** to **V5**) rather than just national interests.

Capitalism. The struggle is on between rapacious capitalistic values that create inequity and division, and social values that support harmony and cooperation. There is currently a reformist movement aiming to change this so that the capitalism system (Collier 2018) is reformed to have ethical goals.

S3: National: Countries and their Economic systems In some countries recently, divisive leadership style and methods have greatly exacerbated civil conflict and divisions, and truth has been sacrificed to short term political gain. The underlying value systems have had devastating effects on the ground. However they often have explicit value statements in their constitutions: for example, South Africa has a *Bill of Rights[74]* enforceable by law, and is a key embodiment of values; in Uganda, homosexuality is punishable by death.

Economic systems in each country and their national corporations nowadays largely have values in the **V2-V3** range in **Figure 13**. Examples of this are the Boeing 737-Max decisions by Boeing (Herkert *et al* 2020, Englehardt *et al* 2021)) , and the way Fox News handled lies about the USA Presidential Election in 2022.[75] Again a reformist program as regards the nature of corporations is under way (Mayer 2018) and making some progress. It involves ensuring their accounting systems take environmental impact into account, and considering how values work in the CEO-Shareholder-Board interaction.

S4: Regional: States These will (by definition) have regional Government structures with causal powers, but the amount of independence states have depends very much on the specific political system in the country, often with major debate about the separation of powers between national and local government. However this works out, the relevant values have social and economic outcomes, the latter being complex because while some organisations (banks, supermarket chains, hotels) may be specifically state based, some may be branches of national organisations that set the policy and practices, based in their values, that will be carried out locally.

S5: Local: City Essentially the same issues arise at the City level, which will have a City Council handling local affairs according to values of those elected, which will make key differences to local outcomes. Cities will usually have explicit or implicit values driving some of their actions, for example the social goal of lessening homelessness.

S6: Meso-Level: City Centres, Suburbs, Villages A city will have a variety of areas of different character and with a variety of organisations that are the heart of the interaction of society with people living there, or just passing through: local shops, restaurants, churches and mosques and synagogues, schools, factories, stations and airports, and so on. Each will have explicit or implicit values that determine their actions and outcomes. There

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[74] See The Bill of Rights, South Africa's moral compass that may yet redeem us (Daily Maverick 2023/03/25)
[75] See A D Sorkin (2023), Where Dominion versus Fox Could Lead *The New Yorker* March 27, 2023.

may be local councils to some degree governing local affairs at this level. This is the level that is emphasized by Elder-Vass as being crucial in terms of the causal power of social structures. However as many of them will be branches of regional, national, or maybe international organisations, the situation is more complex than saying only meso-level interactions matter. The values of the larger scale organisational will to a greater or lesser degree be impressed on and expressed in the local ones.

S7: Communities in Local areas   Here we are concerned with community structures that are to a large degree not based in formal organisations: tennis clubs, football clubs, bridge clubs, walking groups, and so on, as well as interactions that are not formalised in any structure at all. The basic values and value here will be local community building and camaraderie, probably not formalised in any way, but crucial in the bonding processes in society that create experienced value.

S8: Family Units Family life is the core of where individual values come from, because of the intense interaction between children and their carers, and the example given by family heads. The resulting moral positions, and degree of thought going into them, is extremely variable across countries, classes, and local circumstances, and in the vast majority of cases are probably not deeply thought through. However there are cases where very conscious individual reflection on values takes place, a particular example being Alcoholics Anonymous and their 12 Steps Program (Marron 1993), demonstrating how a thought-out set of values can transform individual lives.

 S9: Individuals Ethical awareness starts at the individual level, shaped by the interaction with the society in which they are imbedded, as discussed above, and centrally based on the degree of moral thought and introspection indulged in by the individual (Murphy and Brown 2007). This is the foundation for higher level values through the interlevel processes discussed above.

 6.3 Values, decentralisation, and agency

This discussion of the relation between agency and values at different scales highlights tension between individual agency and group agency, and indeed between different levels of group agency both between groups and within groups. Organisational structures (Ellis 1989, Scott and Davis 2007) are designed to handle this, with greater or lesser degrees of success. They must handle the issue of two-way information flows between the centre and periphery, and how to handle requisite variety (Ashby 2017, Heylighen1992a). These themes are discussed in depth in Beer (1978), pursuing a strong analogy between how such dynamics works in the nervous system and in organisations, and Beer (1981), discussing how to structure management so as to handle these issues. The problem is that the data available to those at the centre will often not have all the information they need to make necessary decisions, no matter how good the information systems, because problems apparent to those at the coal face will often be unknown to them. Thus there may be a leak in the roof after heavy rains; a road may be flooded; there may be bad smells in the dining room because of garbage bins next door; the customers may prefer yellow to pink; the instructions provided may be difficult to understand. These issues must be handled by those aware of them in a

timely manner, and they must have the authority to do so – in accordance with organisational values.

How to diffuse values and agency in organisations The challenge is to enable agency of the parts or individual agents, enabling them to handle any such issues locally without having to require authorisation from the centre, while also attaining central goals and upholding central vision and values. Leadership is key here (section 6.4). One must avoid creating organisations where one's human integrity is denied at work (Baldissarri and Fourie 2023).

Markets The market is a mechanism for handling this problem by decentralising decisions to relevant agents, resulting in "The invisible hand" that locally optimizes outcomes. But this requires some regulation to keep it aligned with community values: e.g. limiting cartels and monopolies The challenge here is to design a moral market system (Carney 2021:107-129,168-176, 409-410, Collier 2018). This has to be done at national and international levels by appropriate legislation, shaping the legal **Level 4** in **Figure 5** at each of these scales**.**

Experts In a bureaucratic age, the myth of centralised omnipotence of "experts" or "professionals" acts in the directly opposite direction in an organisation where managers dictate procedures when they are out of touch with specific context in a branch – or even in the same building. The same issue occurs in political systems, where centralised control by Government bureaucrats, using inappropriate metrics for outcomes that do not take local contexts and opportunities adequately into account, reduces local opportunities and causes misallocation of resources nationally, as is the case in the UK at present.[76] There is an underlying issue of arrogance: a lack of the qualities identified by Carney as underlying economic success. Humility is required (Carney 2021:449-456).

6.4 Character Building and institutional support

In the end the issue is about character building, which is what determines outcomes in the long term. So the ultimate key is the kind of character we have developed through our choices over a long time. In mechanistic terms, this occurs through the adaptive selection of homeostatic goals and of adaptive selection criteria (Ellis 2012). In philosophical terms, this is self-causation, which is indeed allowed through all the mechanisms that we have discussed here: one changes oneself into what kind of person one chooses to be. It is about how you create who you are. This works as follows (Ismael 2016):

"Every bit of information collected over a lifetime of experience is synthesized and distilled into a subjective point of view honed over years of reflection … you have a self-consciously creative role in the construction of your life and an unavoidably creative role in the production of yourself".

This issue of character building and its relation to the social context is emphasized by MacIntyre (1984, 1999), In *After Virtue*, he proposes there can be no true justice apart from virtue and character formation, and that there can be no character formation outside practices, traditions, customs, and laws of the community.

Our view does not mean values always succeed in shaping outcomes. It does mean they are an underlying force shaping outcomes in the long term and making a difference to what occurs. It is related to developing habits of a moral nature, as emphasized by MacIntyre. As pointed out by Wagner and Northoff (2014), in the case of

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[76] We thank Paul Collier for an enlightening presentation on this situation.

individuals, such habits bridge the gap between personhood and personal identity. The same battle plays out in organisational and political contexts: their moral nature is determined by similar processes over time, particularly the degree of moral reflection in an organisation.

The importance of organisational support and values based leadership The organisational issue is how to set a framework that encourages moral action, and discourages harmful actions. The challenge is how to align the organisational reality with those goals in a hierarchical structure (Beer 1981). This requires values-based leadership (Carney 2021:303-338), enabled by purpose; perspective; clarity; competence; and trust.

Managers are sense-makers and storytellers (Hendry 2013:Ch 9), who thereby are inevitably engaging with issues of morality (Hendry 2013:Ch 10). Organisations are run by leaders who, if they undertake transforming leadership (Burns 2004), emphasize meaning and sense-making as the core of management (Hendry 2013: Ch.9). The core is *transforming leadership* (Burns 1978):[77]

> "*Transforming leadership occurs when one or more persons engage with each other in such away that leaders and followers raise one another to higher levels of motivation and morality.Their purposes which might have started out separate but related in the case of transactionalleadership become fused. Power bases are linked not as counterweights but as mutual support for common purpose ….. Transforming leadership ultimately becomes moral in that itraises the level of human conduct and ethical aspirations of the leader and the led, and thus has a transforming effect on both … The institutional leader is primarily an expert in the promotion and protection of values.*"

Underlying this is the morality of the leaders – where they fit on the spectrum should in **Figure 13**.[78] Even when this is the case, the open question is whether business leaders, setting their corporate purpose autonomously, can ensure that their organizations work in the public interest, since many of the welfare effects of the business – socially and environmentally – extend well beyond the stakeholders of the business. The issue is how to make values result in value in the world, taking this in account. Transformational leadership (Burns 1978, 2004, Bass and Riggio 2006) has the potential to do this. Ostrom (1990, 2000, 2010), Crawford and Ostrom (1995), and Wilson *et al* (2013) consider ways to help this happen by institutional design focused both on external and internal normative mechanisms (Snower and Wilson 2022). The need is communities of practice (Wenger 2008) and norm circles (Elder-Vass 2010) that embody the needed values. In the current world, a key aspect is influencing social media so as to move towards positive values: a difficult task we will not deal with here, other than to comment that international legislation to shape the social media environment is key (Snower and Twomey 2020, 2022).

Finally the dynamic described by Burns can of course work in the opposite direction: the leader and followers can drag each other's moral level downwards rather than up, in a reinforcing negative circular dynamic. The classic current example is Donald Trump and the MAGA Republicans in the USA. The challenge is to develop socio-economic mechanisms, rooted in sound understanding of perception and motivation, that will counter this.

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[77] Quoted in Waterman and Peters (1982:pp.83-85).

[78] Desmond Tutu's view is given here: "You want a leader who is also a servant."

7. Values and purpose shape the nature of society and economics

Although standard economic theory ignores this fact, economics is a moral science (Boulding 1969, Carney 2021), with economic and social transactions strongly intertwined in a multilevel way (Smelser 1963, Snower and Wilson 2022), as discussed here in Section 1.2. Individual and social values, purpose, and meaning ("Telos") shape real world outcomes in multiple ways, right down to the physical level (**Figure 1** and **Figure 3**) because deductive causation takes place (Ellis and Kopel 2019) and enables us to predict outcomes of action choices (Hawkins and Blakeslee 2004) and so make value-based choices between them (Bellah *et al* 1992). This is the inverse of what is assumed by reductionist physicists, who do not take context into account when proclaiming the physical level **L1** in **Figure 1** and **Figure 3** (or an unknown lower physical level) to be the only real causal level. But values manifestly do change physical outcomes in the real world, for example when authoritarian "Christian" values result in the United States Supreme Court strongly restricting women's reproductive options across the entire country, altering outcomes right down to the molecular and particle levels.

Thus we maintain it is correct that the overarching feature giving general direction to the causal hierarchy in both individuals (Noble and Ellis 2022) and society (this paper) is the level or sphere **C** of value (**Figure 3**), related to meaning and purpose. The relevant factor is the empirical values shaping institutions, whether they correspond to stated values or not. What these real driving values are is determined by observable behaviour, rather than by protestation.

7.1 How values affect outcomes

Societies are made up of people and institutions: law courts, parliaments, corporations, associations, football clubs, chess clubs, churches, shops, *etc*, each of which have abstract structures such as constitutions, rules and regulations, and roles, determined by a mixture of formal processes and social agreement, and an institutional culture (Miller 2019). They have physical aspects involving buildings, infrastructure, energy and material use, waste disposal, and so on. These taken together allow them to have causal powers (Elder-Vass 2010)**.** Our argument is as follows:

a) Societies have a legal system (Level 4), political system (Level 3), financial/economic system (Level 2), and social system (Level 1), that act together as in **Figure 5** to provide a multi-level feedback system determining the state of welfare (Level 0) for each individual, group, or institution, with components as in **Figure 6** and **Figure 17**.

b) Economic activity takes place firstly via choices of resource deployment per unit time (a rate) at Level 1, either for immediate use to meet health, social, recreational, and other needs (**Figure 6**), or for investment in the stock of resources (Level 2), political power (Level 3), or legal power (Level 4). It is at Level 1 that supply and demand curves characterise how market forces, constrained by law to some extent, determine prices and physical outcomes.

c) Economic activity takes place secondly at Level 2 (stocks) via transformation of resources from one form to another by manufacture, farming, mining, and so on, or by exchange at some rate of exchange. Resources used to enable such transformation include finance, management, labour, information. Physical constraints restrict what is possible, which is facilitated by the abstract representation of economic value by money (Carney 2021:70-106).

d) A multifactorial time-dependent utility function is implicit in the set of goals of the feedback system that determine its dynamics as a cybernetic (goal-seeking) system, with basic dynamics as in **Figure 8**. Your evaluation of

the utility that you will get from goods and services depends on the goods and services that you have purchased in the past, on your state of poverty: what you are lacking to achieve your goals, and on those goals themselves.

   e) Each such homeostatic system for any particular social group interacts with similar systems for other groups in society, the whole interacting both with the natural environment and with other groups or societies (Ellis 1984).

   f) The overarching feature of values and meaning is a privileged factor that shapes what happens at all levels in terms of difference making, because it shapes the goals of the feedback system (**Figure 5**), which in turn shapes its dynamic behaviour to a large degree. These goals can be characterised as lying on a foundational spectrum of values (**Figure 13**), ranging from extreme authoritarianism (**V1**) to caring (**V5**) to self-sacrificial (kenotic) behaviour (**V8**).

   g) The guiding values and meaning are determined by intricate interactions between individuals, social institutions, and leaders (**Figure 15**), with narratives playing a key role. There is an inverse multilevel homeostatic system to that in **Figure 5** whereby society influences individual and group values via constraints and internalisation, occurring through legal, political, economic, and social interactions, including norms and role models in each case (**Figure 14**). Causal closure only takes place when we take all these interlevel interactions into account (**Figure 15**).

   h) Because society is not static, with technology, population growth, inflation, and the external world changing all the time, the result is not an equilibrium state as in standard economic theory: the whole undergoes constant change. However for short enough time scales it may locally be close enough to equilibrium to use standard economic analysis for some aspects of the interactions, in particular how markets enable local optimisations processes.

   i) Either explicit or implicit morality may change over time, particularly due to changing narratives. We hypothesize that on taking the interlevel interactions determining values into account (**Figure 15**), the result is a dynamical system[79] for values of particular group, with different basins of attraction[80] and concomitant possibility of rapid radical change if public sentiment changes as social outcomes of particular policies become apparent.

   j) The way this works out is different at each of the emergent societal levels: in the world as a whole, in a society, and in organisations, as indicated in **Figure 16**. The interaction between centralisation and local agency shapes how this works out at each scale, and how central values either diffuse or not in an organisation or society. Meso-level organisations and corporations are key locations of agency, based in the agency of those comprising them.

   k) As regards the basic question, ***Why are values different from utility?***, the answer is,

   Because values provide a metric for evaluating different concepts of utility in terms of the spectrum
   of values shown in Figure 13, as regards each of the dimensions of welfare considered here.

   One could claim, following Hoel and Levin (2020), that what we are saying is simply that in many ways, the sphere of meaning and values is an optimal level for understanding causation, because it applies as a more or less reliable background pattern of behaviour that influences all lower level activities. This is an example of what is claimed by Pezzulo and Levin (2016): higher levels can have their own unique dynamics that offer better more parsimonious and

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[79] See [Dynamical System](#), Wikipedia.
[80] The concept of a [basin of attraction](#) is discussed in Snower and Wilson (2022).

potent explanatory power than models made at lower levels (Noble & Noble, 2022, 2023). However we claim something stronger: there are irreducible emergent entities that have genuine causal powers, such as genes (Dawkins 2016) and neurons (Kandel *et al* 2000), as is taken for granted by Francis Crick in his book *The Astonishing Hypothesis* (Crick 1994), gene regulatory networks (Jacob and Monod 1961, Monod *et al* 1963), and neural networks (Churchland and Sejnowski 1994, Yuste 2015, Hopfield 1982, Nolte *et al* 2020). The fact that any one of them has causal powers does not mean any of the others do not (Noble 2012). Similarly we claim there is indeed a genuine causal power of emergent values and morals that crucially influences function at the psychological and social levels, which then shape physical outcomes in crucial ways. Most importantly, they determine the meta-issue of to what degree one's behaviour will be determined by holding true to one's values, or letting emotional winds shape what happens, or letting expediency dominate one's actions. The key emergent feature is the nature of the morality one has developed for oneself, as emphasized by MacIntyre (1984, 1989), Murphy and Brown (2007), and Wagner and Northoff (2014).

The Basic Question The issue is the degree to which society is structured to work for the good of all and in particular supports the less well-off via various mechanisms, or allows the wealthy to dominate all decisions to their own benefit and to corner the wealth of society to their own benefit irrespective of how this affects others (see **Figure 13**). These opposing views are characterised and their outcomes analysed in Piketty (2015). There is evidence that great economic inequality leads to dysfunctional societies (Sen 1995, Sen and Foster 1997, Picket and Wilson 2010, 2015), and that inequality has become hugely greater in recent years. This is the topic of various books we have referred to (Mayer 2018, Collier 2018, Stucke and Ezrachi 2020, Carney 2021) and the paper by Snower and Wilson (2022) and references therein. Our point is that one's standpoint on this debate – and the outcomes one arrives at – depend on the values we discuss in this paper, and the way social structures are created so as to create value based in those values, as per **Figure 5**. Peter Berger explores this struggle and its remedies in his classic text *Pyramids of Sacrifice* (Berger 1974). He states in the Preface, "*No humanly acceptable discussion of the anguishing problem of the Third World's poverty can avoid ethical considerations*". We agree. But nowadays this applies equally to rapidly increasing poverty in so-called First World nations. Bellah *et al* (1992) and Temelkuran (2021) are the kinds of manifesto needed.

What we have not done Dennis Snower comments, "I *cannot help thinking that, in order to break the grip of methodological individualism on the economics discipline, it will be necessary to formulate a mathematical model of upward and downward causation between decisions by individuals affecting social forces (norms and values) that in turn affect decisions by individuals. In this context, the individual decision maker is the lower level and the social group (or groups) is the higher level. The individuals act partly as empowered agents and partly as members of their social group (or groups). The interaction between the two systems creates causal closure within this model. In other words, causal closure requires a micro-foundations of macroeconomics (which is standard in the economics discipline) and a macro-foundation of microeconomics (which does not exist in this discipline).*"

We agree this is worth pursuing, and suggest the framework of this paper is a sound foundation to do so. Our

key point in this regard is the following: Values crucially shape goals, which then are the basis for the homeostatic operation of society acting as a system enabling individuals and groups to attain their desired outcomes (**Figures 5 and 6**) as well as acting a system influencing individual and group goals and values (**Figure 14**). A key aspect of the macro foundation of micro-economics is the downward mechanisms touched on in this paper, whereby firstly, individual preferences, values, and perceptions are influenced by social structures, norms, and interactions as outlined here, following in the footsteps of Bellah *et al* (1992) and Berger and Luckman (1996); and secondly, these downward mechanisms have legal, political, social, and welfare dimensions as well as economic ones. Economics is not an isolated independent aspect of society. All these social aspects reach down to influence multi-dimensional individual or organisational utility functions, which can be evaluated in terms of the spectrum of values (**Figure 13**).

7.2 The Dimensions of Poverty

Given this overall model, we can give a multi-dimensional characterisation of the state of poverty or wellbeing of any group in society, that follow directly from the basic form of the welfare feedback system shown in **Figure 5** and **Figure 6.** The indicators of poverty or well-being we propose are shown in **Figure 17,** which has two parts, summarising the quality of functioning of the Welfare Feedback System at a very broad scale. with the convention that positive values indicate poverty (a bad state) and negative values indicate wellbeing (a good state).

> *0: Health/welfare Poverty,*
> *1: Social poverty,*
> * 1a: Cultural poverty*
> *2: Economic poverty,*
> *   2a: Educational Poverty*
> *   2b: Environmental Poverty*
> *3: Political poverty*
> *4: Legal poverty*

Figure 17a *The basic components of poverty (positive scores) or wellbeing (negative scores)*

> *5: Psychological poverty*
> * 5a: Lack of a meaningful life*
> *6: Poverty of causal understanding*
> *7: Ideological poverty (worldview)*
> *8: Moral poverty: choice of goals*

Figure 17b *The extended components of poverty (positive scores) or wellbeing (negative scores)*

Figure 17: Dimensions of Wellbeing/Poverty *The QOL feedback system (**Figure 5**) leads to a set of Wellbeing/ Poverty indicators, separated into a basic set (**Figure 17a**) and a set that probe the foundations of welfare in the broadest sense (**Figure 17b**). In each case, poverty in those dimension might be represented on a scale of 1 (low poverty) to 5 (extreme poverty), with well-being being represented by negative values from -1 (low wellbeing) to -5 (high wellbeing). This choice of sign is just a convention.[81]*

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[81] One could flip these figures to represent states of wellbeing rather than states of poverty. Then being in poverty would be represented by negative values, and while being in a good state would be represented by positive values.

The basic set of poverty or well-being indicators we propose are shown in **Figure 17a**.

0): *Health/welfare poverty* is a state of poor health/welfare in a group, immediately felt and indicating severe societal or environmental problems, for example the state of the NHS in the UK at present, or the gun violence epidemic in the USA,[82] both a result of ideological and moral poverty (see below).

1): *Social poverty* is a lack of community and social cohesion, with **1a): *cultural poverty*** being a lack of cultural assets (libraries, museums, etc) and opportunities, and consequently a lack of cultural understanding and breadth. This is greatly on the increase in the USA at present in states such as Florida.[83]

2): *Economic* poverty is the usual concept of poverty, with *inequality* a key factor shaping how it is experienced (Pickett and Wilkinson 2010, 2015) resulting in social dysfunction (Wilkinson and Pickett 2009), but absolute poverty is crucial in terms of people simply having enough to survive. Important aspects are,

2a): *Educational Poverty* (education is an aspect of investment) or Learning Poverty (UNESCO 2017) because that greatly restricts economic opportunities and hence future welfare, a key aspect being literacy education.[84] Secondly,

2b): *Environmental Poverty* (the environment can be regarded as a resource stock playing a key part in welfare), with three aspects: first, polluted water, air pollution, noise, uncontrolled rubbish, and so on, which directly affect health. Second, a lack of recreational areas, including pristine natural parks allowing walking, hiking, cycling, camping, and so on. Third, the increasing prevalence of floods, drought, extreme heat or cold, and fires, associated with global environmental change. This is a global problem that must be tackled at that level (Carney 2021:228-302).

3): Political Poverty is when the group concerned is unable to materially influence the power structure in the country so as to take their welfare adequately into account. This is the case for the majority of the population in all dictatorships, such as Putin's Russia at present. It is the case for many women in the USA at present when State legislatures restrict their reproductive rights, even in cases of violent rape.

4): Legal Poverty is when the legal system in the country does not represent the values and interests of the group concerned. The majority of the population in the USA are suffering from legal poverty at the present time, where a corrupt supreme court[85] is engaged in restricting their rights: women's reproductive rights, and potentially minority voting rights. The potential of this happening in Israel is at the centre of current massive protests there.

The populace at large also suffer from legal poverty if people who are known to have caused massive damage to the country go unpunished, as is the case in South Africa as regards those involved in state capture; and if victims of crimes have to wait many years before their cases are heard: justice long delayed is itself an injustice. It is also the case when major secondary trauma is caused by aggressive court proceedings, particularly in cases of rape.

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[82] Jessica Winter (2023): "After the Nashville school shootings, a faithless remedy for gun violence" *The New Yorker*, March 28.

[83] Juliana Kim (2023) A principal is fired, invited to Italy after students are shown Michelangelo's David *NPR* March 27 2023

[84] Crucial here is the way education is carried out: it may be that a lot of money is spent on education, but the nature of the education provided is low level rote learning rather than an education in enquiry and understanding that will prepare students for an era of rapid technological change requiring flexibility and imagination. Also highly problematic is the way literacy is being taught in many countries, see Ellis and Bloch (2021) for a neuroscience based discussion..

[85] During their confirmation hearings, a number of appointees explicitly denied they would upset the Roe vs Wade decision when questioned about the issue. They would not have been appointed if they had told the truth.

The Extended components of poverty or well-being are shown in **Figure 17b.** They are more controversial: they refer to a deeper level of causation, namely what underlies the functioning of the welfare system (**Figure 5**). The dynamic of that system depends centrally on its goals, which in turn depend on social-psychological interactions that shape them, and the underlying world view. Thus in this list, each factor depends on the next one in key ways. We defend them, despite their controversial nature, because in the end they are getting at the foundations of what is going on: what values really are, and how they shape value (Bellah *et al* 1992, Carney 2021). They are as follows:

5): Psychological poverty refers to the adequacy or not of the interactions represented in **Figure 12**, for an individual or a group. Do they make decisions decisively, on the basis of adequate information, or fritter around indecisively till the opportunity is past? Do they handle uncertainty adequately? Do they have the right level of imagination in considering the choice of alternative courses of action? Do they to the right degree allow automated decisions (habits/procedures) to take the load off consciously considered choices? Do they handle the balance between rationality and emotions (the driving force of thought and action) in a fruitful way?

5a): Lack of a meaningful life Do they have some basic meaning underlying their thoughts and activities, or do they drift around in a meaningless way without such a psychic centre? In that case, they are missing a core element of individual human well-being (Frankl 1985); arguably this is also true for organisations.[86]

6): Poverty of Causal Understanding Is their understanding of causal relations sound, whether based in explicit models or at an intuitive level, enabling them to reasonably accurately predict outcomes of action chices? Are the narratives informally shaping their understandings a reliable indicator of the true nature situation? Or are these understandings faulty and misleading, perhaps due to conspiracy theories and active misinformation campaigns?

7): Ideological poverty (worldview) Is their world view narrow and constricted, representing only their immediate social circle and region, or do they have a wide understanding of and appreciation of other cultures and world views, even if not agreeing with them? Do they reject such worldviews simply because they are different, rather than on an unbiased assessment of their actual practices and values?

8): Moral poverty: choice of goals and values Do individuals or a social group undertake the meta-reflection that is the key to moral behaviour (Murphy and Brown 2007)? Or do they just act as they do without any explicit reflection on morals and values? In that case, self-seeking behaviour will often result.

Above all, where do their implicit (empirical) values lie on the spectrum of values depicted in **Figure 13**? If they lie in the authoritarian region **V1** to **V2,** we claim the relevant individuals or group are suffering from moral poverty ("moral bankruptcy")[87], both because on the one hand these positions inevitably lead to deceit, lying, and other antisocial behaviour, with a major discord between stated and empirical values:[88] they have lost their integrity as human beings; and on the other hand, because holding such a position is in and of itself a moral bad. It is a position that actively causes harm to others, and thereby separates the perpetrators from fellowship with broader humanity,

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[86] That is, apart from just making a profit. Is there some meaningful social need they aim to fulfil (Mayer 2018, Carney2021:359)?
[87] O'Connor, P (2014) "Declaring moral bankruptcy"
[88] e.g. MAGA churches in the USA that claim to have Christian values, but behave in direct contradiction to the loving and caring values expressed in the Biblical New Testament.

involving dehumanisation of the other (Kteily and Landry 2022). Such values shape the choice of goals in the welfare system (**Figure 5**), and so shape social and economic outcomes in a way that causes harm if moral poverty exists. We believe determining and publicising these dimensions of poverty can be very useful in policy discussions, including the need for moral education (Bellah *et al* 1992:§5) based in the value system underlying our analysis (discussed below).

There are very complete analyses of poverty carried out by others, e.g. Costanza *et al*. (2008), Alkire *at al* (2015), the US National Academy of Science,[89] the Global Multidimensional Poverty Index, which we applaud. However we suggest those schemes could be expanded to include the dimensions noted here, insofar as they do not already do so.

Happiness We are aware of the commendable work that has been done as regards the World Happiness Report,[90] developing from the idea of **Gross National Happiness** (**GNH**) introduced in Bhutan (Ura *et al* 2012). Why have we not included Happiness as a key component of either Level 0 or level 1**?** There are four reasons for this.

- **Psychological characteristics** We suggest that some individuals simply are not happy individuals. No matter what the circumstances, they are likely to complain: altering conditions will not in fact make them happy. An interesting question is to what degree this may apply to some cultural groups also (e.g. Senik 2014).

- **Shifting bottlenecks** Lack of happiness often depends on some specific issue that is causing problems for an individual or community. For example I may have a pothole in the road outside my house, and that causes a traffic bottleneck there with noise and noxious fumes. Suppose now the pothole gets fixed. The problem is there is another pothole 100 metres down the road, which becomes the next bottleneck; unhappiness remains. In this sense there is in practice always some bottleneck which is the current source of unhappiness; their existence is a permanent condition leading to continuing unhappiness with a different locus even as conditions change.

- **Acclimatisation** is the opposite issue. For good psychological reasons, the human mind becomes acclimatised to ongoing situations, whether good or bad, and after a while takes them as the expected norm and no longer experiences major unhappiness about them. In these cases resignation can occur even in terrible conditions that cannot be changed, when this acceptance is a survival necessity. "Happiness" adjusts to this context.

- **Philosophy dependence** Unhappiness may be due to the worldview underlying one's assessment of happiness, which can be altered to produce different outcomes. Thus is if one is a multibillionaire EM whose purpose in life is to be richer than every other multibillionaire on Earth, one will be very unhappy when this is not the case.   But suppose EM goes to an ashram where he attains enlightenment and changes to a quite different philosophy of life, where caring for others and the environment is central. Then his state of happiness will change at once, without any change in his physical, social, or financial circumstances.[91] Thus one can alter one's mental state and goals in response to such changed values, and so alter radically one's state of happiness in this way. This is how values affect value.

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[89] NAS "An updated measure of Poverty" https://nap.nationalacademies.org/download/26825
[90] Downloadable here: World Happiness Report 2023
[91] See Colston, P (2023) The Finnish Secret to Happiness: Knowing when you have enough (*New York Times* 2 April)

Actually, according to the Gross National Happiness Commission Report by the Royal Government of Bhutan, the four pillars of GNH are, 1. Sustainable and equitable socio-economic development; 2. Environmental conservation; 3. Preservation and promotion of culture; and 4. Good governance. None of those are in fact direct measures of happiness, and so subject to the above critique; they are rather the kinds of issues proposed in this document as shaping wellbeing, and mentioned by Carney (2021) as leading to economic prosperity.

The nine domains of GNH are Psychological well-being, Health, Time use, Education, Cultural diversity and resilience, Good governance, Community vitality, Ecological diversity and resilience, and Living standards. The only ones directly related to happiness are psychological well-being, health, and community vitality; the rest are factors leading to wellbeing, as envisaged here. The one that does not fit in with what we propose is *Time Use*.   This is indeed key, as time is our ultimate resource. Perhaps an indicator in this respect ("Time poverty") is needed.

A stand on the nature of morality It is important to make clear that our discussion is based on a specific stand about morality, namely that values in the range **V1-V2** are intrinsically bad values, by their very nature, and those in the range **V6** on are, in and of themselves, intrinsically good values. This is an *effective* position of moral realism: some values are good by their very nature, independent of human thought. This is the implicit underlying value system of the series of supportive writings we refer to: Bellah *et al* (1992), Burns (2004), Etzioni (2004), Stern (2009), Etzioni (2010), Ostrom (2015), Stucke and Ezrahi (2020), Temelkuran (2021), Sandel (2021), Grayling (2021), Carney (2021), Wilson and Snower (2022), Alpert (2022). They all *take it for granted* as a sound foundation for analysis of policy and outcomes. It is for this reason that it is an *effectiv*e position: it is simply assumed to be the way it is, and so shape outcomes.

At a deeper level some will see this as based in a *metaphys*ical claims of moral realism (see e.g. Rawls 1991, 2020, Ellis 2017, Gabriel 2022, Mac Cumhaill and Wiseman 2022:42-43, 185-186), but we will not base our argument on that position.[92] Rather we point out that eschewing such metaphysical considerations, *in practice* such a commitment is implied in the major body of literature we refer to in this paper: it is essential to their formulation.

- It is implied in all the considerations of the nature of a good society referred to above, and specifically by Rawls (1991, 2020),[93] Bellah *et al* (1992), and Carney (2021);

- It is basic to the nature of transformational leadership as envisioned in Burns (1978, 2004), Bass and Riggio (2006), Carney (2021);

- It is implied by all the indicator systems we refer to, such as the SDGs and their Action Platforms, the SAGE Dashboard (Lima de Miranda and Snower 2020), Freedom House Democracy Indicators, the Global Multidimensional Poverty Index, Human Development Report, Our World in Data: Poverty, Our World in Data: Democracy, Our World in Data: Human Rights, and so on, which all take for granted what a better situation is. This

[92] Even though one of us (GE) supports it (Ellis 2017, 2020c).
[93] See J. Wolf (2023), "Justice for all? The curious political legacy of John Rawls' masterpiece", *Times Literary Supplement*, May 19, 2023.

basic understanding is foundational to the way these indicator systems are formulated.

- It is implied in all considered practical policy system applications. For example Atkins *et al* (2011) consider an integrated approach to marine ecosystem management within the DPISR (Drivers, Pressures, State, Impact, and Response model of intervention) framework. The approach aims to reach a balance of the three objectives of the Convention for Biodiversity (CBD): conservation, sustainable development, and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources. These represent the values we refer to, and shape the planning process.

Prescriptive Indicators? The nature of the latter proposals above (*Ideological Poverty* and *Moral Poverty*) may well be resisted by some as representing an unjustified and questionable commitment to moral realism. We rather claim that even though a claim of moral realism can be coherently argued, it is not essential to use of these concepts: they are justified by the way they fit into the overall scheme where a pragmatic moral realism is essential to all indicator schemes and policy proposals, whether or not the metaphysical position of moral realism is proposed.

Secondary Indicators The same does not apply to Secondary Indicators, such as the OECD economic indicators,[94] which are not directly value related in our sense: rather they are indicators of the kinds of circumstances (in this case, economic) that might lead to better conditions as indicated by the primary indicators. The basic problem is the disagreement about what changes in social conditions would improve the circumstances represented by the primary indicators. Might it be gender equality that is the key path to development, or education, or tackling a colonial legacy and consequent social injustice that is needed, or attempts to change the nature of capitalism (Collier 2018) or the firm (Mayer 2018) or financial policy (Carney 2021) that is the key? Or is it attempts to increase civic engagement that is the key (Putnam 2000), because institutions have become arenas for competition and exploitation instead of for the common good? Or is it class differences that are the key, so the use of government aid to help relieve urban poverty will not work (Banfield 1958)? That book states (p.110-111)

> "*In the Montegrano mind, any advantage that may be given to another is necessarily at the expense of one's own kind. Therefore one cannot afford the luxury of charity, which is giving others more than their due, or even of justice, which is giving them their due. The world being what it is, all those who stand outside the small circle of the family are at least potential competitors and therefore also potential enemies. Towards those who are not of the family the reasonable attitude is suspicion. The parent knows that other families will envy and fear the success of his family and that* they *are likely to seek to do it injury. He must therefore fear them and be ready do to them injury in order that they have less power to injure him and his.*"

This collapse of social cohesion thus demonstrably results in a value position V2 on the value spectrum.[95] If so, what to do? How does one rebuild community trust? This cannot be achieved simply by an infusion of money.

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[94] The OECD Indicators are Balance of payments, Business tendency and consumer opinion surveys, Composite leading indicators, Financial statistics, Industry, International trade, Labour market statistics, Consumer and Producer price indices, inflation rate, Purchasing power parities, Comparative price level, Quarterly national accounts (GDP, GDP growth rates).

[95] This supplies an example of how suitable data can establish a value position on that spectrum.

In short: how can one make the Welfare Feedback System (**Figure** 5 and **Figure 6**) work better? The answer is not obvious.[96] Consequently the relation between primary and secondary indicators is unclear, and the latter do not univocally relate to values in the way the primary indicators do.

Value statements in practical projects There are however practical projects where explicit value statements, implicitly involving the effective moral realism stance outlined above, do indeed play an effective and clear role. We choose as an example the USA National Academy of Science report *State Transportation Agency Decision-Making for System Performance: Practitioner's Playbook* (NAS 2023). The nine system objectives contained in the analytic framework are:[97]

a)   *Safety* – Reducing fatal and serious injury crashes to zero.

b)   *Equity* – The fair and appropriate distribution among all stakeholders of transportation benefits and costs

c)   *Accessibility* – The transportation system's capacity to enable access by all stakeholders to goods, services, activities, and destinations.

d)   *Mobility* – The transportation system's capacity to enable movement from one place to another using one or more modes of transportation.

e)   *Economic Development* – The transportation system's capacity to improve access to markets, employment, and resources at reasonable cost.

f)   *State of Good Repair* – Maintaining capital assets in a condition sufficient for them to operate at a full level of performance.

g)   *Reliability* – Steady, predictable travel times, that is, low variability in travel time.

h)   *Resiliency* – An asset's or a system's capacity to perform or rapidly recover its function under predictable or unpredictable events.

The first three are where the explicit value statements related to effective moral realism occur. The rest are subsidiary to those primary goals, aiming to achieve them in a reliable way (these are the supportive element of the primary objectives, underlying their consistent attainment). One can relate this to the Welfare Feedback System (**Figure 5**) by asking which economic, political, and legal policies, institutions, and practices promote these objectives. One can remark that in the USA, the Republican Party's objectives of defunding Federal projects clearly does not fulfil these criteria. The physical outcome is a state of infrastructure decay across the country.

7.3 The Relation to the Snower and Wilson paper

Our paper agrees with and supports Snower and Wilson (2022). They propose (page 26) that "*Economics can be defined as that discipline that explores how resources, goods, and services can be mobilized in the pursuit of thriving societies, now and in the future .. where the concept of wellbeing is to be broadly construed taking into account all human needs and purposes, insofar as they are relevant for the mobilization of commodities*

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[96] We thank Fen Hanson for discussion on these topics.
[97] We have re-ordered them in order to relate conveniently to our discussion.

(resources, goods, and services". This paper agrees with them, but provides a more developed model of how this happens than their Figure 2 (See our **Figure 5**).

   We agree with their emphasis on the Darwinian triad of variation, selection, and replication operating not just within living systems but also in organisations and social systems. We also agree with their multilevel paradigm:

1.   Multiple, flexible levels of functional organization, covering economic embeddedness.

2.   Primacy of social relations, enabling people to operate at higher levels of functional organization, so socially embedded economic activity

3.   Uncertainty, arising from the economic aspects of variation.

4.   Multilevel sources of wellbeing and progress, which are drivers of selection and transmission.

   Finally we agree with their value statement: "*The purpose of the economy is to serve society, where individuals derive many of their capacities and objectives through the interactions with one another*" and their description of the mechanism enabling this: "*Here individuals are not only enculturated actors, but also motivated actors, who are capable of both individual and collective motives, where the collective motives make individuals capable of higher levels of functional organization. The culture that is embedded in enculturated actors rests on both external mechanisms (rewards and punishments regarding specific behavior patterns) and internal mechanisms (such as personality traits reinforced by the external mechanisms).*"

   Crucially then, *"Moral values may be understood as a central feature of multilevel functional organization in humans … [They] clearly play a major role in helping people address collective challenges, such as public good and common pool resource problems. "* (pages 36, 37) T*he multilevel paradigm […] recognizes that moral values pervade all economic decisions, since they influence the motives underlying our actions, the identification of causal relationships, and the level of human functional organization. …They do so through value-driven narratives that help us make sense of our environment, focus attention on particular events and characters, assign social roles and identities, define power relations and convey social norms (Akerlof & Snower, 2016). These narratives also help us make conditional predictions concerning the consequences of our actions, thereby giving us the conviction to act (see Tuckett & Nikolic, 2017). Values play an important role in generating conviction, since values evoke emotions, influence the degree to which a narrative reduces anxiety, shape our perception of the plausibility of the narrative, and affect our trust in others who believe in the"* (page 39).

   Thus that paper agrees with this one: they reinforce each other.

References

A note to the reader: A large number of references are given here, and you may feel this is excessive. Why so many? The answer is twofold. Firstly, a referee criticised a previous incarnation of this paper as not having enough references to the academic literature. This is no longer the case. Second, the paper touches on many varied topics, and there is a large relevant literature in each case. We have endeavoured to link to many references that are of real value in pursuing the themes we discuss, taking them further in many ways. We believe the list is a valuable resource in its own right, particularly because it reaches back to some older papers and books that are still of value: we do not believe only the latest papers and books matter. The references given mainly cohere round the emergentist position we take, and cogently back it up, but for completeness we also link to a few papers and books that take a strongly opposing view.

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Appendix: Detailed aspects of the QOL levels

LEVEL 4: ACCESS TO LAW

1: Administrative Corrective Procedures	2: Legal Corrective Procedures	3: Correction of Legal Procedures	4: Legal Freedom and Access
Institutional effectiveness: Functioning, efficiency, accountability, corruption			

LEVEL 3: ACCESS TO POWER

Direct Political Power	Direct Economic Power	Indirect Power
1:National Government	1:Employer's power	1:Influence on national Government
2:Local Government	2: Employee's power	2: Influence on local Government
3:Specific Utilities and Organisations	3:.Producer's power	3: Indirect economic power
	4:Consumer's power	4:Indirect international power
Institutional effectiveness: Functioning, efficiency, accountability, corruption		

Persuasive Power	Coercive Power	Political Freedom
1. Legitimation	1. Local	1. Political action
2. Moral	2. National	2. To organise
3. Standards	3. International	3. Expression
4. Charisma		
5. Motivation		

LEVEL 2: AVAILABLE RESOURCES (Stock)

Natural Resources	Human Resources	Economic Resources
1.Land resources	1. Population	1. Personal income
2. Non-renewable resources (Precious ores, minerals)	2. Labour	2. Group income
3. Renewable resources (Biodiversity)	3. Management	3. Capital
	4. Recruitment	4. Borrowing power
	5. Skills	5. Goodwill
	6. Leadership	
Institutional effectiveness: Functioning, efficiency, accountability, corruption		

Technological Resources	Enabling Resources	Economic Freedom
1. Energy	1. Stability	1. Ownership
2. Information technology	2. Information	2. Work choice
3. Transport	3. Assessment and Adaptability	3. Trade and Manufacturing
4. Coercive	4. Motivation	4. Training
5. Productive	5. Initiative	5. Information
6. Technocrats		
Institutional effectiveness: Functioning, efficiency, accountability, corruption		

FIGURE 18 (continued): Aspects of Welfare: Levels 1, 0 and -1

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LEVEL 1: LEVEL OF LIVING (Flow)

Physical Welfare	Safety	Economic Investment	Political investment

1.Nutrition
2.Clothing
3.Dwelling
4.Utilities
5.Health
6.Environment
	1.Police protection
	2. Unofficial groups
	  and security expenditure
	3. Fire, ambulance
	4. Rescue, emergency
	5. Environmental control
		1. Education
		2. Processing, distribution
		  and maintenance
		3. Resource investment
		4. Trade and Export
		5. Persuasion
			1. Political activity
			2. Coercion
			3. Persuasion

Institutional effectiveness: Functioning, efficiency, accountability, corruption			

Higher Needs	Organisation	Loss of Resources	Social Freedom

1. Facilitating resources
2. Community resources
3. Self-affirmation
4. Recreational and cultural
5. Living environment
6. Religious resources
	1. Community
	  organisation
	2. Economic
	  organisation
	3. Public
	  organisation
		1. Resource Loss,
		  Theft, Accident
		2 Resource decay
		3 Inefficiency
		4 Ineffectiveness
			1 Freedom of action
			2 Freedom of association
			3 Freedom of expression
			4 Freedom of communication
			5 Religious Freedom

Institutional effectiveness: Functioning, efficiency, accountability, corruption			

LEVEL 0: STATE OF WELFARE

Physiological	Safety	Belongingness	Esteem	Self-Actualisation
1. Nutritional status 2. Health status 3. Bodily status 4. Physical fitness	1. Environment 2. Violence and accidents 3. Existence 4. War 5. Vulnerability	1. Family life 2. Community life 3. National acceptance 4. International acceptance	1. Morale 2. Group status	No indicator

LEVEL -1: LEVEL OF PRESSURE

Physiological	Social	Economic	Political
1. Death rates 2. Diseases 3. Medical action 4. Surveys	1.Social action 2. Social protest 3. Social pathology 4. Subjective Indicators	1. Economic action 2. Work pathology 3. Market pathology 4. Subjective Indicators	1. Political action 2. Political protest 3. Political pathology 4. Subjective indicators

FIGURE 18: More detailed classification of features affecting quality of life, according to the scheme outlined in **Figure 5**. The components of Welfare indicated in **Figure 6** are here separated into their major aspects. Each aspect will be measured by a suitable set of indicators.