Morality as a Complex Adaptive System: Rethinking Hayek's Social Ethics[1]

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1 PHILOSOPHY AND ECONOMICS: INTERDISCIPLINARY AND TRANSDISCIPLINARY ANALYSES

Daniel M. Hausman and Michael S. Macpherson commence their highly influential *Economic Analysis, Moral Philosophy and Public Policy* (2006: 3) by providing a classic specification of the scope of the study of ethics and economics: "We prescribe no code of conduct and preach few sermons. Rather in this book we try to show how understanding moral philosophy can help economists to do better economics and how economics and ethics can help policy analysts to improve their evaluations of alternative policies. We also hope to show how philosophers can do ethics better by drawing on insights and analytical tools from economists." We might call this the cross-fertilization program for *interdisciplinary* inquiry. Each discipline brings its core findings and tools to bear in ways that enlighten and refine the other discipline. The study of "philosophy, ethics and economics," then, takes places at the intersection of two distinct, well-developed, disciplines, and learns from each. This interdisciplinary exchange between philosophers and economists has proved immensely fruitful. Economists have, for example, taught welfare-oriented philosophers a great deal about aggregating utility functions (Sen 2017) and political philosophers about game theory and the dynamics of cooperation (Sugden 1986; Binmore 1994, 1998). And philosophers from Hume (see Hardin 2007) to Rawls (1999) have contributed greatly to the level of sophistication that economists bring to the study of welfare, fairness, justice and rights.

In recent years some have embarked on *transdisciplinary* analyses (Page 2018). While this term is employed in many (some perhaps regrettable) ways, one core use is to signal that the same model that enlightens us in one field applies equally well to a very

[1] I have greatly benefited from exchanges with my good friend Fred D'Agostino about the issues raised in this paper. My thanks also to Jenann Ismael, with whom I conducted a graduate seminar on complexity and self-organization at the University of Arizona. I learned heaps from her, as I did from all the seminar participants, so thanks to one and all.

different discipline's area of study. In contrast to interdisciplinarity, we are not sharing the results of two distinct disciplines, but seeing that what at first looked like very different phenomena have the same underlying dynamics. A complexity model from physics, for instance, might straightforwardly apply in biology, or an analysis of biological selection may apply to organizational theory or scientific inquiry (Weisburg and Muldoon, 2009; D'Agostino 2010). Or, as I shall try to show in this chapter, models of complex adaptive systems apply to moral norms as well as to the market. Both, I shall argue, are self-sustaining spontaneous orders (Robbins 1977: 9). Or, rather, both are part of the same adaptive order.

Though "transdisciplinarity" is something of a buzz word today, the idea is not new. Throughout his long career, and especially from the 1950s through the 1970s, F. A. Hayek repeatedly stressed that the model of a complex evolutionary order characterized social evolution, the economic order, and morality itself. For half a century Hayek was essentially a lone voice in the wilderness. While economists became increasingly obsessed with highly abstract, usually static, mathematical models and philosophers got lost in conceptual and utopian analyses — with almost everyone abhorring the very idea of social evolution[2] — Hayek stressed that economic systems were constantly evolving, adapting, and dependent on an unplanned moral framework, which was also constantly adapting (Gaus 2013b). Only recently have some economists, philosophers and complex systems scientists recaptured this insight. In recent work biologists, anthropologists, political scientists, philosophers and economists have come to recognize how both biological and social systems form complex adaptive systems, and that social rules, including moral rules, are part of these systems.

This chapter focuses on Hayek's analysis of morality as an evolved spontaneous order, while updating and revising it, taking account of current research and models. We shall see that while, of course, his path-breaking work requires revision, the heart of his analysis is reinforced by recent work in evolutionary theory, complex systems

[2] One of the most pejorative terms of all — "Social Darwinist —was (quite wrongly) applied to Hayek, by both libertarians (Paul, 1988) and by social democrats (Miller, 1989). Until the 1990s, the very idea of social evolution was often thought to have fascist overtones.

analysis and social norms theory. Hayek presents an analysis of a complex moral order that is far more in tune with current science than are the highly rationalistic analyses of contemporary political philosophy, which often seek to present utopian plans for the perfectly just society (Gaus 2016). Yet, I shall argue, we need to rethink important claims, as is befitting an ongoing research program.

2 RULES

2.1 Mind and Rules

Complex systems are rule governed (Lane 2017: 10). Whereas *Homo Economicus* has a difficult time explaining rule following (Gaus 2011: chap. 2) Hayek (1973: 11) puts it at the core his analysis: "Man is as much a rule-following animal as a purpose-seeking one." This claim is deeply embedded in his neural network account of the mind (Gaus 2006; Lewis 2015): the mind itself is inherently rule-governed. On connectionist theories such as Hayek's the brain is composed purely of neurons that simply have on/off states: qualitative differences (e.g., between thoughts) are the results of a complex pattern of neural activation (Hayek 1952: 57). On this account neurons are either excited or inhibited by other units; the output of the entire network is a function of its initial conditions and the pattern of activation between the neurons. The system changes the weights of the excitatory and inhibitory inputs according to some learning rule, so inputs are represented simply by the changes in weights they have caused (Gärdenfors 2004: 41).

The fundamental aim of Hayek's neural network theory is to explain "the kind of process by which a given physical situation is transformed into a certain phenomenal picture" (Hayek 1952: 7). A certain state of the external world W exists at time t: how is W_t transformed into a sensory experience S of W_t, and how does $S[W_t]$ relate to sensory experiences of other states of the world — when will these be perceived as the same as $S[W_t]$, and when will the sensation be different? The key to Hayek's analysis is "classification" via of neuronal connections, "a process of channeling, or switching, or 'gating,' of the nervous impulses so as to produce a particular disposition or set" (Hayek 1967b, 51):

> By "classification" we shall mean a process in which on each occasion on which a certain recurring event happens it produces the same specific effect, and where the effects produced by any one kind of such events may be either the same or different from those which any other kind of event produces in a similar manner. All the different events which whenever they occur produce the same effect will be said to be events in the same class, and the fact that every one of them produces the same effect will be the *sole* criterion which makes them members of the same class (Hayek 1952: 48).

Thus two events are the same just in case they trigger the same neuronal configuration. The central nervous system, then, takes what we might think of as an undifferentiated world and, via the connections in the neuronal network, creates a formal structure of classes of sensations (Hayek 1952: 51). But this is to say that the mind is rule governed: the neuronal connections constitute perceptions of patterns. In a fundamental sense the mind *is* a set of rules that takes sensory inputs and yields classifications and perceptions.

Cristina Bicchieri's influential account of social norms is also grounded in a connectionist theory of the mind (Bicchieri and McNally 2018). On her analysis a norm or social rule can be understood as involving a sort of scripted activity. When an individual categorizes a situation as, say, a commercial exchange, a sort of script is invoked about payment and relevant information. But before the script can be invoked individuals must have categorized the situation. Schemata, on Bicchieri's account, "are knowledge structures that help people interpret the world around them. The more elements of a schema that we observe, the more likely that schema will be activated. The fewer elements relevant to a schema that one observes or the less prototypical the elements are, the less likely the schema will be activated. A prototype is the 'standard' conceptualization of a particular kind, category, or phenomenon" (Bicchieri and McNally 2018). For example,

> [d]epending on how one interprets the situation, subjects could either decide that reciprocation or equality is more important, ultimately resulting in completely different decisions. In this respect, changing these schematic lenses can serve to alter how norms are activated….
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> As is implied by the connectionist underpinnings of schema theory, individual scripts and schemata do not exist in isolation; they are inherently linked to each other to varying degrees,

> and the activation of one influences the activation of another. The entirety of one's interconnected schemata is termed a semantic or associative network. A semantic network is a model of conceptual interconnectivity, with each individual schema serving as a node, and each relationship between schemata represented as a link of varying strengths. Chronic activation of multiple schemata in tandem will increase the strength of their associative links (Bicchieri and McNally 2018).

Schemata, which provide a general system of categories that allow us to interpret and classify social situations, and scripts which instruct us what a social rule calls for in these situations, are produced by reinforcement of connections within the semantic network.

2.2 Rules and Action

In a fundamental sense, then, rules are prior to purposes. In order to even characterize a situation as one relevant to goal pursuit — for example, "this is a case of profit-to-be-had" — the agent must already have applied a system of categorizations (Gaus 2011: 144-5). An agent's schemata must have identified this as counting as a case where profit-making is relevant. Given this, the popular project of deriving rule-following from goal pursuit (one which has been especially attractive to theorists impressed by economic models [Gaus 2011: chap. 2; Gaus 2018a]) gets things almost exactly backwards, at least as far as the workings of the mind are concerned.[3] And for Hayek the fundamental place of rule following in cognition carries over into action or "motor behavior." Action also follows from neural connections and so human action is inherently rule-based: it is regulated by a network that is based on classification of types of sensation and how they relate to types of responses. Practical rules identify "patterns of actions" that are classified as having the same meaning; the activation of such rules disposes the agent to act (Hayek 1967b: 57).

Hayek is surely right that the social life of humans, from its earliest moments, developed within a framework of action-guiding social rules.[4] Indeed, human genetic

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[3] "In humans you first need to acquire the social norms and rules governing the world you are operating in, and only then is strategic thinking useful." (Henrich 2016: 52).

[4] See Boehm (2012: 217ff); Kitcher (2011: chap. 2); Gaus (2011, chap. 3, 2018b). In this essay I do not

evolution has for long periods occurred within culture and its moral rules, such that the environment in which genetic evolution has taken place has been rule-governed.[5] In this sense, it is entirely appropriate to say that we are, by nature, rule-following creatures (Gaus 2011: chap. 3). As Henrich (2016: 149) stresses, "While many evolution and economics oriented researchers have often assumed that social norms … are merely a superficial window dressing on our evolved psychology, the evidence suggests that such social norms run deep and profoundly shape social life." It is thus a fundamental error of the common economic mind-set to suppose that "[a] mere norm is unlikely to override self-interest in many … contexts" (Hardin 2013: 414). Experimental and field evidence has consistently shown the power of norms or social rules to shape behavior (Bicchieri, 2016; Gaus 2018b).

3 COMPLEXITY

3.1 Bodo Rules

For much of our evolutionary history the evidence indicates that humans lived in relatively small-groups of anywhere between 25 and 150 persons.[6] Indeed, for most of recorded history most humans lived in small face-to-face groups with low levels of social diversity. There were, of course, differences in gender roles, age, sometimes modest occupational differences and, of course, expected personality variance.[7] In these simple societies, the rules of social life could cover most eventualities: the useful or appropriate act-types could be identified by the group's history. Individual invention of "new ways of living" were at best infrequent and gradual (Hardin 2013: Gaus and Nichols 2017).[8] Moreover, because of the homogeneity in metaphysical, religious, moral

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distinguish social rules, social norms and the rules of social morality. While in some contexts these are fundamentally different, in this case nothing significant turns on their differences.

[5] See Boehm (2012); Richerson and Boyd (2005); Henrich (2016).

[6] Friedman (2008: 16) points to 150, with much larger numbers when groups fused. See also Rose (2011: chap. 3), who mentions 200 as the typical size of the groups in which humans evolved. Closer examination shows that group size may be understood differently: average band size may differ from typical group size (Bowles and Gintis 2011: 95).

[7] Ethnographic accounts of small-scale societies wonderfully reveal these. Turnbull's (1963: chap. 5) tale of the selfish and domineering Cephu is classic.

[8] In the extraordinarily harsh late-Pleistocene climate, change often came much more swiftly (Richerson and Boyd 2013).

and cultural values (see e.g., Brandt 1954), how one person acted within a rule would be largely the way his fellows did, so the overall results would be highly predictable.

This is nicely brought out in Russell Hardin's (1999: 402-1) tale of Bodo:

> Axel Leijonhufvud… characterizes the village society of eleventh century France in which the villager Bodo lived. We have detailed knowledge of that society from the parish records of the church of St. Germaine. Today one would say that that church is in the center of Paris, but in Bodo's time it was a rural parish distant enough from Paris that many of its inhabitants may never have seen Paris. Virtually everything Bodo consumed was produced by about eighty people, all of whom he knew well. Indeed, most of what he consumed was most likely produced by his own family. If anyone other than these eighty people touched anything he consumed, it was salt, which would have come from the ocean and would have passed through many hands on the way to St. Germaine, or it was spices, which would have traveled enormous distances and passed through even more hands.

In this world, Hardin (1999: 403) observes, the ethics of Bodo's community probably had some notion of "distributive justice" in the form of a "a principle of establishing a lower bound on how impoverished a person could be…. In Bodo's society, charity might be subject to a principle of fairness — not fairness toward the poor but fairness toward one's peers in shouldering a share of the burden of charity. Such fairness can be assessed in such a community because so much about everyone is a matter of common knowledge." Not only did everyone know a great deal about others, but it would be highly predictable how much charity would be given and by whom, how the impoverished would react to charity, as well as the attitudes of those who must bear the burden. The shared cultural outlook not only recognizes the rule, but provides highly regularized ways of complying and responses to compliance.[9]

3.2 Large-scale Society: The Diversity of Compliance Behavior

Because Bodo's society would have only a modest number of rules, with predictable ways of complying, the rule system would generally have highly predictable

[9] We should not press this point too hard. Research on the Aché distinguishes four types of individuals in terms of their attitudes towards helping others and group production (Boehm 2012: 294-7). The important point is the severe limits of diversity, not the absence of difference.

consequences. Fundamental to Hayek's analysis was that social morality undergoes a fundamental transformation in the move to large-scale social orders; indeed, he suggests (1988: 12) reserving the term "morality" for the "new and different morality" that arises with large-scale social organization. The effects of large numbers and greatly increased heterogeneity of agents combine to produce a qualitative transformation in the nature of a rule-based moral order. Two changes drive this transformation: (*i*) the increased heterogeneity of the actors complying with the rules (§3.2) and (*ii*) the increase in the number of rules (§3.3).

3.2.1 HETEROGENEITY. Consider the charity rule suggested by Hardin: the rule says that one ought to assist those in severe need. As I remarked, in Bodo's society, there would be a high degree of consensus on what was needed and who qualified, as well as attitudes about the appropriate responses to giving and receiving charity (allowing for general human variance between more and less altruistic individuals). Now assume that we have a society that still endorses the rule, but agents have a wide variety of different moral perspectives and background theories. For example, some may have a theory that sharply distinguishes deserving and undeserving poor while some may be Malthusians who hold that charity should be linked to reduced opportunities for reproduction. In the nineteenth-century England both of these perspectives might agree that poor relief should take the form of the workhouse rather than outdoor relief, but stress different aspects of the workhouse (compelled labor for the former, segregation of the sexes for the latter) as its morally important feature.[10] Others rejected the workhouse as inconsistent with true Christian charity or with genuine concern for the poor, who were the victims of industrialization. Given this background diversity, predicting the effects of even universal compliance with a rule of charity becomes exponentially more difficult (the workhouse, outdoor relief or socialism?), for each different perspective will have different ways of complying, with vastly different effects.

[10] Compare Malthus (1959) and Bosanquet (2001).

3.2.2 TYPES OF RULES AND THE ELIGIBLE MORAL SPACE. It may be thought that this is simply a problem with vague rules such as "give charity to the very needy," which allow open-ended interpretations. However, vagueness is not the crux of the matter: almost all rules specify a space or range of compliant action, not a determinative complaint action. Shaun Nichols and I (2017) studied two types of rule systems: permissive and prohibitory. Permissive systems instruct the agent what she is allowed to do. We found that if agents are taught rule systems containing only permission rules, they infer a closure rule for uncovered cases: what is not permitted by one of the rules is prohibited. That is, one is prohibited from acting unless one has a permission stated in some rule. This is in many ways a very restrictive rule system, seeking to guide all actions into permitted channels. Yet even these rule systems allow tremendous diversity of responses. Chess, after all, is a system of permissions: what the rules of chess do not allow is prohibited. One may not say: "Ah! The rules of chess say nothing about melting your queen, so there she goes!" If it is not in the rules, it is disallowed. But the number of possible moves in chess has been estimated as at least 10^{120}.

Nevertheless, pure systems of permissions are in a way especially restrictive: they necessarily identify a set of acceptable act-types, and given that people infer that what is not permitted is also prohibited, it follows that they are interpreted as disallowing new act-types: act types that are not permitted by the rules are prohibited. Hayek held that in large-scale societies with dispersed information, rules should aim to provide some definite expectations of the actions of others while allowing each individual to pursue her individual plans, given her different values and background assumptions. The critical function of social rules is to secure cooperation while leaving people free to pursue their diverse aims:

> One of the main aims of the rules … must therefore be to eliminate for the individual as much avoidable uncertainty as possible. This means that he must be able to ascertain from the circumstances which he can know what he is free to do, and under what circumstances and in what manner other human forces will constrain him. If he is to use his knowledge to the best advantage for achieving his aims, the world around him must be, as far as possible, given to him. Of course, in a changing world much of his task and his merit will be to foresee changes correctly, to adapt himself successfully to ever changing conditions (Hayek 2014: 162).

Adam Smith (1981: 687) held that this result is best secured through the "system of natural liberty" in which "[e]very man, as long as he does not violate the laws of justice, is left perfectly free to pursue his own interest his own way." For Smith (1982: 82) justice was largely a matter of negative rules:

> Mere justice is, upon most occasions, but a negative virtue, and only hinders us from hurting our neighbour. The man who barely abstains from violating either the person, or the estate, or the reputation of his neighbours, has surely very little positive merit. He fulfils, however, all the rules of what is peculiarly called justice, and does every thing which his equals can with propriety force him to do, or which they can punish him for not doing. We may often fulfil all the rules of justice by sitting still and doing nothing.

Smith's systems of natural liberty is psychologically coherent and easy to learn: in the study with Nichols, we found that those taught purely prohibition rules, or even sets of rules mixed with prohibitions and permissions, tended to import the principle of natural liberty: if the negative rules do not prohibit an action, it is allowed. Note that systems of natural liberty allow agents to invent new ways of acting: an act-type that is unmentioned by the rules is allowed. Because of this, Smith's system of natural liberty allows tremendous variation in compliance behavior: there are infinitely many ways not to do something (cf. Hayek 1960: 150-2). As the diversity of plans, values and background theories multiplies, the variety of compliance behavior greatly expands in unpredictable ways.

3.3 Large-scale Society: The Size of the Rule System

Because the system of natural liberty allows exploration of new act-types (Gaus and Nichols 2017), as exploration and invention proceed some of these will be found to pose obvious dangers, and so new moral rules will be required to regulate them. Compared to Bodo's society, in the large and diverse societies encouraged by the system of natural liberty, cultural values, religious and metaphysical theories provide far less reliable social coordination (as they are not deeply shared), again resulting in the growth of the rules of social morality. Now as the rule system grows, the ways that one rule affects the overall relations among people will be dependent on other rules in the system, and the ways that people comply with them (Hayek 1967d: 91). A rule that invokes heavy

penalties for stealing may have very different consequences if there is also a rule that requires assistance to those in need, or when the rules of property are vague. This is not a philosophical conjecture. In her extensive fieldwork on actual institutions Elinor Ostrom stressed that institutions are composed of numerous rule configurations; the constituent rules have strong interdependencies, both with each other and with environmental conditions. "A change in any one of these variables produces a different action situation and may lead to very different outcomes" (Ostrom 2014: 111; see also Lewis 2017).

We need not assume maximal interconnectedness of each rule with all others: clusters of rules will form systems reasonably independent of the rest of the set. But identifying these clusters will itself be a matter of discovery. Such interdependencies are seldom formal parts of the rules; a rule's interactions with other rules is often unexpected and can change as circumstances vary. We could not have anticipated, for example, that in response to a law prohibiting the consumption and sale of alcohol, conjoined with certain policing rules and practices, many became much more skeptical of legal regulation and of the police while less suspicious of organized crime (Stuntz 2000). As individuals witness each other's behavior under the system of rules, each takes her observations into account in her own future compliance behavior. Observing, for example, that the prohibition of alcohol was most systematically directed at the poorer, most easily monitored beer-drinking, population, an agent may change her consumption to spirits, begin to draw back cooperation with the police, or become less suspicious of her suppliers, organized crime (Stuntz 2000). As some individuals change their behavior in these ways others will in turn adjust theirs. At each point the compliant behavior of some is an input into new compliance decisions of others, perhaps inducing non-compliance. In more technical terms, the system is one with multiple feedback loops. It may well be impossible to predict the future behavior of such orders: systems of equations with multiple levels of feedback quickly become incalculable.

3.4 Complexity and Emergence

As diversity and scale increase, the overall effects of the rule system thus become complex and perhaps impossible to predict in any detail. Once we have arrived at this juncture the overall moral order — how individuals morally relate to each other in a society — is as an *emergent property* of countless diverse individuals responding to each other's moral decisions. Having built in widespread diversity, considerable interconnectedness and individual moral choices according to rules, the moral system is, in a technical sense, complex.[11] Moreover, if we think of social morality as a technology of cooperation (Kitcher 2011: 221-41; Gaus 2013a) then like other technologies, it seems to become increasingly complex as it develops (Arthur 2015: chap. 1). Rules are added as refinements on the preexisting system, producing yet more interconnections and, so more complexity.

Hayek (1967b, 1967c) was one of the first to recognize that under these conditions of complexity, the overall moral order will be an emergent property of the system of rules employed by diverse agents (Lewis 2015, 2017). Emergent properties are sometimes distinguished from mere "resultant" properties on the grounds that, while a resultant property is the expected consequence of an underlying set of properties, emergent properties are very often novel and unexpected. In perhaps the earliest analysis of such systems, John Stuart Mill (2006: 370-73; 438ff; Auyang 1998: 173ff) considered a system, say, *S,* composed of elements (e.g., rules) $\{r_1 \ldots r_n\}$ and an overall resulting order *O*. Mill proposes three features of property *O*:

(1) *O* is not the sum of $\{r_1 \ldots r_n\}$;

(2) *O* is of an entirely different character than $\{r_1 \ldots r_n\}$;

(3) *O* cannot not be predicted or deduced from the behavior of the members of $\{r_1 \ldots r_n\}$ considered independently (i.e., apart from their interactions in *S*).

Thus it is said that waves are an emergent property of H_2O. The properties studied by hydrology are not the sum of the properties of hydrogen and oxygen (as opposed to a mechanical force, which may be seen as the sum of its causes); waves have a very

[11] On complexity see Mitchell (2009), Page (2011), Holland (2014).

different character than a chemical compound, and the properties of an individual water molecule do not allow us to deduce the relevant laws concerning waves.

The scientific study of complex orders cannot, Hayek (1967b) rightly insisted, aim at the prediction of the "specific" future states or values of the individual elements. To be sure, just how specific a specific prediction needs to be is context-dependent; his claim, though, was that in many natural sciences (such as parts of physics), "it will generally be possible to specify all those aspects of the phenomenon in which we are interested with any degree of precision we may need for our purposes" (Hayek 1967a: 8). In contrast, when dealing with complex phenomena we are simply unable to specify the values (in contemporary terms, the system is modeled in nonlinear equations (Vaughn 1999: 245; Holland 2014: 4; Mitchell 2009: 22ff.): we can only predict the "range of phenomena to expect" (Hayek 1967a: 11; Hayek 1967b). We can understand the general principles on which the system operates, and with this knowledge we can predict the parameters within which the system will settle (Hayek 2014: 43).

4 COMPLEX SYSTEMS: MACRO ADAPTATION

4.1 Macro Selection

Once we examine their features, it is manifest that systems of moral rules in large-scale diverse societies are complex. The concept of a *complex adaptive system* identifies complex systems that arise through agents responding to each other's action, and adapting their actions in response to each other (Holland 2014: chap. 3; Page and Miller 2007). In an important essay D. S. Wilson (2016) presses the question of what renders these complex interactions *adaptive* as opposed to simply complex. Great complexity can lead to "complexity catastrophe" which results in chaos (Kauffman 1993: 52-4). Wilson distinguishes two mechanisms of adaptation: selection pressures at the system or macro-level (this section) and rational adaptation of each agent (§5).

What Wilson refers to under the (less-than-memorable) designation of "CAS1" systems, the complex system is subject to adaptive pressures at the system-level. This is a form of multi-level selection (Okasha 2006) — in the most familiar form, a type of "group selection." On D. S. Wilson's view (2016: 44) this is the most plausible basis for system level adaptation: "[f]rom an evolutionary perspective…only when a society is a

unit of selection…. does it function well as a unit." The critical claim is that a complex social order will maintain its cooperative functionality only if, at the societal level, forces are constantly selecting more over less functional variants. And this, perhaps surprisingly, was precisely Hayek's view. At the macro level, what is selected, Hayek argues (1967c: 71), is an "order of actions" — the emergent property of moral order that arises in a rule-based society. At the macro level evolutionary selection pressures operate directly on "the order of actions of a group" (Hayek 1967c: 72). This distinction between a set of rules and the order of actions to which it gives rise is a fundamental insight of Hayek's, which allows him to distinguish the focus of selective pressure (the functionality of the order) and the underlying rules (that structure it), which are transmitted. On Hayek's analysis (1967b: 23-4), a group of individuals living under a set of social rules *R*, composed of rules $\{r_1...r_n\}$, will give rise to a certain emergent pattern of social interactions, *O*, on which macro selection operates: "systems of rules of conduct will develop as a whole" (Hayek 1967d: 71).

On Hayek's analysis, macro social evolution is a form of cultural group selection. "The rules of conduct have … evolved because the groups who practiced them were more successful and displaced others" (Hayek 1973: 18). If society S_1, characterized by order of actions O_1, is more productive than S_2 based on O_2, society S_1 will tend to win conflicts with S_2, a mechanism akin to natural selection: O_1 was more adaptive than O_2 (Bowles and Gintis 2011). But perhaps more importantly, the members of S_2, seeing the better-off participants in S_1 characterized by O_1, may either immigrate to S_1, or seek to copy the underlying rules R_1, thus inducing differential rates of reproduction between the two sets of underlying rules (Richerson and Boyd 2005: chap 3; Mesoudi 2011: chaps. 3-5). The overall order of actions is adaptive because there are systematic selection pressures that favor rule sets that promote overall orders that are more adept at facilitating cooperation and securing its social benefits, satisfying the interests and commitments of its populating agents.

4.2 Evaluating the Upshot of Macro Selection

This macro-selection theory of the evolution of culture is widely endorsed today. One of its implications is that we seldom can fully understand the point of evolved moral

rules or the work they do for us. In his recent wide-ranging overview of cultural evolution Henrich (2016: 57) observes that "[I]ndividuals reliant on cultural adaptations often have little or no understanding of how or why they work, or even that they are 'doing' anything adaptive;" in particular "[s]ocial norms make it possible for humans to solve — often without anyone understanding how — what would otherwise be inescapable social dilemmas" (Henrich 2016: 145).

In a fundamental sense, then, the rules of social morality cannot be understood as a means to obtain social ends, for we do not know why they were selected or what social ends they serve. Hayek (1972: 81) thus describes these rules as "purpose-independent." This would certainly preclude standard consequentialist justifications of rules: we often do not know what rules do, for their effects may be linked in surprising ways to other rules and values. More generally, any systematic attempt at justify the entire system of morality would seem doomed, for we do not know what the consequences of our entire system are, nor can we predict the effects of radical changes in a tightly coupled system of rules (Hayek 1988: chap 5; see also Gaus 2018c). Yet Hayek (1988: 27) draws back from an evolutionary ethics in which the outcome of evolution simply defines the good. The picture is not conservative in the sense of accepting whatever is — it is, rather, of a "Whiggish" inclination (Hayek 1960: 409). Edmund Burke, a Whig admired by Hayek, was a moral critic of English policy towards the American colonies and the slave trade, while adamantly opposed to the radical social and moral reconstruction attempted by the French revolution.[12] From within a moral system a Whig can strenuously criticize rules, laws and policies that violate its traditions — stepping back from this or that matter and evaluating it "piecemeal" in light of the whole (Hayek 1988: 8). But a Whig cannot sensibly step back from the whole, and seek to reconstruct the evolved social morality in the light of some philosophical commitment such as utilitarianism or welfarism. "We must always work inside a framework of values and institutions which is not of our own making" (Hayek 1960: 63).

Hayek, though, sometimes suggests a more radical view. He chides the conservative for accepting whatever outcome has been produced by the latest intervention (1960: 397ff), and so the conservative's failure to stand up for the core principles of a free order,

[12] See Burke (1999, vol. 1: 221-89; vol. 2; Miscellaneous Writings).

such as liberty and property. Now interestingly, he believes that these principles can be derived — or at least confirmed by — an understanding of complex systems. "A commitment to principles presupposes an understanding of the general forces by which the efforts of society are co-ordinated, but it is such a theory of society and especially of the economic mechanism that conservatism conspicuously lacks" (1960: 401). One way of interpreting this idea on a way that is consistent with a strong role for macro selection (society as a "CAS1" system), involves a sort of reverse engineering of the evolved complex system. We take an evolved system, and seek to model the ways that it came about: if we are able to do so, then we have confidence about the organizing principles and dynamics of our system (Green 2015). Armed with this theoretical knowledge, the social philosopher would be in a position to take a more radical stance than the refinement of the evolved tradition. As Hayek urges, she can stand up for the core organizing principles of the system. This, however, is a demanding research program. Reverse engineering of evolved highly complex systems is no mean feat, and serious work on it has only just begun. The question is: do agents contemplating significant moral reform really need to pursue this demanding research agenda?

5 COMPLEX SYSTEMS: AGENT-BASED ADAPTATION

5.1 When Macro Selection Pressures Ease

D. S. Wilson (2016) is clearly skeptical of the ability of a complex system to be adaptive (i.e., functional) in the absence of significant — probably quite strong — selection pressures at the system-wide level.[13] Absent macro selection, he argues, functionality is endangered. In such cases "[b]etween-group selection, if it takes place at all, is not sufficiently strong to oppose within-group selection. The groups remain functionally impaired indefinitely and there is no invisible hand to save the day" (2016: 38). Substantial evidence indicates that during the late Pleistocene era group-level selection pressures were indeed intense. Climate was rapidly changing and groups were often thrown into severe conflict for resources (Bowles and Gintis 2011: chap. 6; Richerson and Boyd 2005: 224-29; Richerson and Boyd 2013). And in small-scale societies group

[13] It is important that this macro selection does not entirely swamp individual-level selection — as E. O. Wilson (2012: 243) notes, otherwise human society would look like insect colonies

competition can remain quite intense (Richerson and Boyd 2005: 206-9). Some advocates of social evolution suppose that macro selection pressures remain strong today among our large-scale societies but this is hardly obvious. To be sure, competition exists between large-scale social orders, and learning, copying and migration continue, and in some cases this can be a source of selecting more cooperatively-functional rules. But for the same reasons that group selection pressures were so strong in the late Pleistocene era — harsh, quickly changing climate, numerous socially distinct groups near the margin of viability — we would expect that our modern era, characterized by the absence of these features, would have greatly mitigated macro-selection pressures.

But if so, then it would seem that while the evolution of our cooperative and moralistic sentiments can be readily explained by a group-selection hypothesis,[14] it is much less obvious that macro competition explains current functionality of our large-scale orders. Of course it could be that they are really dysfunctional — but compared to the hunter-gather bands of the late Pleistocene era, this supposition does not seem especially plausible.

5.2 Agent-Based Adaptive Complex Systems

This leads us to the second type of complex adaptive system identified by D. S. Wilson (his "CAS2" system): adaptation via adjustment by each actor to the actions of the rest. He (2016: 40) believes that such systems could only be functionally organized by chance because of what might be called his evolutionary mindset: at each level actors are seeking to maximize their fitness in competition with others, and so unless this competition is suppressed by a higher-level selection, there is no reason to think that group functional cooperation will emerge — it would be only a random event. Here economics and game theory can provide a wider framework: when the possibilities of mutual gains to agents through cooperation generally outweigh for each the benefits of individual defection, cooperative arrangements can arise simply though mutual adjustments by each actor. Consider Hume's example of two rowers in a boat, analyzed by Vanderschraaf (2018: chaps. 1-2). Two men are in a boat, each aims to get to the other

[14] See Bowles and Gintis (2011), Richerson and Boyd (2005: 229-31). But see Bohem (2012: chap. 7) for an argument that other forms of selection were also important.

side of the river, and it takes two men to row together to do so. They are in a game of perfect coordination: no one has any incentive to defect on the functional outcome, yet there is no obvious sense of which there is group-level selection.[15] As agent-based simulations such as those pioneered by Axelrod (1997), Skyrms (1996, 2004), Alexander (2007) and Vanderschraaf (2018) demonstrate, in a wide variety of contexts with different underlying games, cooperation and norms of fairness can emerge from self-organized action without any macro selection pressures.

Agent-based game theoretic models of adaptation do not typically employ robust assumptions about individual rationality and maximization — many of the formal models mentioned in the last paragraph employ simple learning rules. The great contribution of the work of Richerson and Boyd (2005: chaps. 3, 6) has been to show how modes of learning such as conformity bias, prestige bias and copying successful neighbors can promote the spread of group beneficial norms in a population. We are alert to how well our neighbors are doing, for example, and as we observe them thriving we are apt to copy their actions. Because culture has evolved complex adaptive practices, humans typically do well by imitating the behavior of others around them. We often do not understand precisely the overall benefits of our cultural practices, but because culture is largely transmitted via imitation, people often do not have to know why something is done, only that it is the useful done thing around here, or the most successful. Whereas intelligent primates such as chimps tend to figure out problems for themselves, human infants have a much stronger tendency to simply copy what they observe being done, copying "stupid" acts which the chimp sees as pointless (Horner and Whitten, 2005). But by copying so much we learn a great deal from others.

5.3 How Can "CAS2" Systems Remain Functional?

We can identify three fundamental features of human cooperation that allow for functional "CAS2" systems. All three of these features, it is plausible to suppose,

[15] A theory can always define any cooperative arrangement between two actors as a "group," thus preserving the group selection hypothesis (see Sterelny 1996). I set aside this problem: the critical question is whether behaviors can be selected that, in some context, are not in equilibrium for individuals seeking simply to pursue their own aims, such as altruism. See Bowles and Gintis (2011: chaps. 2, 3).

evolved in our earlier history, when there were indeed very strong selective macro pressures for group cooperation.

(*i*) Humans have developed modes of social organization that are hyper-social, and so most of the resources and advantages that an individual might gain are the fruits of participating in social cooperation. To put the point in less elevated terms, we are inherently tribal creatures who gain primarily through participation in groups (E. O. Wilson 2012: chap. 7). The traditional philosophical tale explaining how atomistic individuals in competition came to leave a state of nature for society is precisely that — a tale that may have some modelling uses, but has tended to create a puzzle where none exists. Humans have long since passed the point where they were in the position to attain significant advantages as solitary agents. As Henrich (2016: chap. 17) stresses, we have evolved within culture and are, at our core, cultural creatures: gaining what we need and desire through social cooperation is how we live.

(*ii*) To be sure, this inherently social source of benefits provides space for opportunism, in which individual advantage can be obtained through defecting on cooperation. Solving the two men in a boat problem is easy: things suddenly become much more difficult when there are three in the boat, but only two have to row (Vanderschraaf, 2018: chap. 1). However, the critical Hayekian claim (§2) is relevant here: a critical legacy of our evolutionary history is that we are as much rule-following as purpose-seeking creatures, and few are on the constant lookout to defect on rules of cooperation. As Henrich (2016: 315-6) notes, "Our social psychology appears designed for navigating a world with social rules and reputations, where learning and complying with these rules is paramount… We internalize costly norms as goals in themselves, usually via cultural learning, and are particularly good at spotting norm violators, even when those violations have nothing to do with cooperation."

(*iii*) As Henrich observes in the last sentence, we are experts at spotting rule violation: by four years old we are excellent cheater detectors (Cummins 1996a, 1996b). Moreover in recent years evidence has accumulated that many are disposed to spend their own resources to punish detected cheaters, without any prospect that the punisher will be a future beneficiary from such action (Gaus 2011: 103-112). This greatly stabilizes cooperation.

Thus by (*i*) we benefit mainly through social cooperation, by (*ii*) we are disposed to follow the social rules of cooperation, and by (*iii*) many of us are on the lookout for those who do succumb to opportunistic cheating and are prepared to expend resources to punish them. Given these pillars of human cooperative life, societies can maintain functional systems of cooperation even given very modest macro selection pressures.

5.4 Self-organization and the Return of the Invisible Hand

Those such as D. S. Wilson (2016; see also Gowdy et. al. 2016: 331) tend to be dismissive of the idea of the invisible hand unless it occurs in the context of a system with fairly selection by group-level evolution. However models that understand evolution simply in terms of learning rules that lead agents to adopt more advantageous cooperative strategies and norms ("CAS2" systems) seem well described as "the invisible hand of evolution" (Alexander, 2007: 18). Indeed, complex systems ordered by agent-based adaptations are self-organizing in a more interesting sense than D. S. Wilson's "CAS1," macro-selected, systems. The latter are, to a significant extent, precisely what their name implies: macro-selected. The rules under which strongly group-selected orders operate are selected via competition with other societies. To be sure, individual agents are the vehicles for instituting these rules, and they adapt their actions to them, but in a fundamental sense it was group selection mechanism that "chose" what rules were adaptive. In contrast, in agent-based adaptive systems ("CAS2"), each agent adjusts his actions to those of others in order to better secure his ends within a system of rules. Like Smith's invisible hand, the constituent individuals organize the order through their actions and based on their decisions: it is their mutual adjustments that gives rise to a cooperative order. In an important sense, as Hayek (1973: 29) says, such complex adaptive systems are truly the result of human action and planning but not of collective design.

In my view, Hayek, like. D. S. Wilson, places too much importance on macro selection in his account of current system functionality. The result is, as we saw, an inclination to a Whiggish, Burkean, approach toward altering the rules of cooperation. They are macro functionally adaptive for reasons that must remain obscure to us (unless we achieve robust reverse engineering), so we best be careful with undertaking

significant changes. The social reformer is a little like a doctor: if one knows enough and is careful, one can reliably fix modest failures of functionality, and sometimes bigger ones,[16] but it is very easy to make matters worse. Contrast this to a system that is closer to the "CAS2" model, organized primarily through individual agent-based adaptions to the actions of others. Such systems are based on constant individual feedback and adjustments. Individuals reevaluate their actions within the rules making micro-changes on the basis of their local knowledge, and their evaluation of whether an adjustment would better promote their plans. To be sure, individuals cannot know the overall social consequences of rules, but they can decide whether the rules make their individual attempts at coordination smoother or more difficult. As Hayek (1960: 63) approvingly notes, individuals continually test the rules to determine whether they are still serving to coordinate their plans with others: "it is, in fact, desirable that rules should be observed only in most instances and that the individual should be able to transgress them when it seems to him worthwhile to incur the odium which this will cause.… It is this flexibility of voluntary rules which in the field of morals makes gradual evolution and spontaneous growth possible, which allows further experience to lead to modifications and improvements." This individual exploration and testing makes perfect sense if the rules evolve as adjustments to agents searching for better local ways of cooperating. The rules came about through individual adaptive actions and so continued decisions whether they remain acceptable makes perfect sense. (As it makes perfect sense for others to regularly enforce them if the rules strike them as worthwhile). None of this is obviously well grounded if we think of the system as strongly macro-selected, for in a "CAS1" system the rules were not adapted because individuals found them fruitful.

Of course any actual system of cooperation will be the result of both macro- and agent-based adaptation: I do not wish to suggest a stark choice. Yet the point remains: the more we are convinced that system functionality requires strong macro-selection, the less confident we will be that when individuals find the rules ill-suited to their individual plans they should search for better ones and challenge the current ones. Indeed, on a multilevel selection account, the higher-level selection inherently restrains

[16] The human body is far less complex than the economy. See Saari (1995).

lower-level (individual) selection. *We might say, in a rough and ready way, that frustrating individual plans in order to secure system wide functionality is precisely what macro-selection does.* "When mechanisms evolve that suppress the potential for disruptive self-serving behaviors with groups, the group evolves to be … a veritable superorganism" (Gowdy et al. 2016: 336). Given this, it is very hard to see how macro-focused accounts can accord primacy to individuals searching for "self-serving" ways of acting — those that better secure their individual aims and values.

6 CONCLUSION

Since Plato political philosophy has assumed that justice and social morality is a resultant property of a set of institutions. We inquire into what sort of society is just, good or virtuous, and then propose an institutional scheme to achieve it. Or, we select a set of institutions and accurately predict the resulting justice of the society they produce — at least if we assume full compliance. That, indeed, traditionally has been the subject of political philosophy, and the last fifty years has been no exception. The emerging complexity analysis in economics and philosophy shows this to be an illusion.

On this macro- and agent-based adaptive accounts concur: a social philosophy that treats society and its morality as a plannable order is a fantasy. We need to take seriously "the imperative of complexity" (Page 2018). The debate between them concerns the preferred explanation of why our complex cooperative systems maintain functionality. I have argued that the more we see a complex moral order as agent-based adaptive, the more accurate it is to see the order as self-organizing: it is constantly reshaping itself, as individuals make changes, observe feedbacks, and readjust their actions to secure better cooperative or moral results. I have argued elsewhere that morality can be self-organizing in this sense (Gaus 2019). In a similar way, Bicchieri (2016: chap. 5) models the way in which "trendsetting" individuals can commence a process of norm change that will be taken up by others in their community, resulting in a revised, self-organized, rule network. Bottom-up social self-organization is a powerful and important moral process.

To be sure, there are limits to individual adaptation and change. Social rules can be both manifestly harmful to the lives and plans of agents, yet difficult to dislodge, and

so collective action is often required to eliminate or replace them. This leads to important and difficult problems — once we recognize that we are dealing with a complex adaptive system that cannot be designed in the way the democratic public would choose, we need to rethink the appropriate aims of methods of public policy (for a general proposal, see Colander and Kupers 2014). Hayek provided critical key insights, but serious contemporary work here has barely begun. And we are also led to rethink political philosophy: it no longer can be the designing of an ideal set of institutions for collective choice in the just society (D'Agostino 2018; Gaus 2016: chap. 4). As Hayek's path-breaking analysis suggested, once we begin to view social morality as a complex adaptive system, everything changes for moral, social and political philosophy.

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