Moral action as cheater suppression in human superorganisms: Testing the human superorganism approach to morality

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'For it is peculiar to man as compared to the other animals that he alone has a perception of good and bad and just and unjust and other things [of this sort]; and partnership in these things is what makes a household and a city.' (Aristotle, The Politics 37)

Aristotle. *The Politics.* Trans. Carnes Lord. Chicago: University of Chicago Press, 1984.

Abstract

Large-scale human groups cannot rely on shared genetic interests or dyadic reciprocity to ensure social cohesion as genetic similarity is low and indirect reciprocity is rife; nevertheless, such societies continue to cohere, due to the evolution of novel regulatory mechanisms that inhibit defaulting on social obligations: moral sentiments and actions. The present paper argues that the extent of moral concern can be most usefully identified by defining the set of functions required to sustain a human 'superorganism'. These functions are determined to be boundary, production, distribution, storage, control, structure, enforcement, signaling, memory, excretion, perception and reproductive functions. Moral obligations to act arise when individuals default on contributing to these functions. To test this approach, roughly 80,000 respondents from over 200 countries completed a web-based experiment hosted by the British Broadcasting Corporation (BBC). This experiment elicited a suite of responses to a set of 33 short scenarios derived from the 13 domains of superorganism function. Results indicate that all functions are moralized, while violations falling outside this domain (social conventions and individual decisions) are not. People living in larger communities exhibited stronger moral sentiments and action propensities, consistent with the greater interdependence of living in groups with more social roles. Such people were also more likely to see the function of the justice system as supporting group-level protection rather than personal recrimination or restitution, were more willing to engage in punishment of those who failed to punish cheaters, and more offended by those who choose not to contribute to social welfare. These results support the contention of Human Superorganism Theory that large-scale human groups strongly rely on moral propensities to regulate those who fail to perform superorganismal functions. Given this supporting evidence, we believe this new approach to defining the moral domain has implications for fields ranging from psychology to legal theory.

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Defining the moral domain

Until recently, morality was largely the domain of philosophers. A typical debate might involve defining why killing another human being is wrong (taken as one of the foundations for a good society). Answers might include: because it will destabilize society and lead to general unhappiness (the consequentialist position of Berkeley), or because it violates the Golden Rule of doing to others what we would want them to do to us (subscribed to by deontologists like Kant), or because people of good upbringing and hence virtuous character would not be inclined to do so (the position of virtue theorists like Aristotle). However, relatively little headway was made on such ethical issues because the standard philosophical toolkit of linguistic analysis, logical argument and introspection provided insufficient means to settle such arguments.

Currently, a variety of disciplines have begun to engage in empirical investigations into the nature of morality. Indeed, morality is currently a hot topic in biology [1], psychology [2], philosophy [3], law [4] primatology [5] and the social sciences [6]. Though controversies continue to rage, there is now general agreement about some aspects of morality. It is thought to be a quintessentially human trait, although the behavioural roots of morality (such as loyalty to kin, intolerance of theft and punishment of cheats) can be seen in related primate species. [7-9]

Moral systems have psychological, social and behavioural components: the psychological mechanisms enable individuals to recognize actions that are moralized, and produce intentions to conform to normative expectations as well as to punish moral offenders; social mechanisms like ostracism or shunning help to enforce moral norms; and behavioural violations invoke the activation of the psychological and social mechanisms in the first place (i.e., immoral actions like incest or murder). All of these components need to be in place for moral systems to function properly.

Recent work in psychology has established a number of principles relevant to morality. It is broadly accepted that moral judgments have specific emotional underpinnings (e.g., shame, guilt, retribution), [10-12] and are made rapidly without rational calculation as to harms and benefits [13] – although when presented with moral dilemmas, people may derive judgments from the interaction of intuitive and rational faculties. [14] Further, Mikhail's notion of a 'moral grammar' may help explain how moral intuitions are generated via a set of both rational and emotional components in the brain. [2,15]

Debate continues, however, as to exactly what functions morality serves – except to say that moral judgments and action facilitate social cohesion in some way. [2,3,5,16,17] Sam Harris has recently argued that morality concerns the maximization of 'flourishing' (or well-being) among conscious creatures – essentially a modern rewrite of Berkeley's utilitarian idea that morality is a consciously applied rule to maximize the utility of the greatest number of people. [18] However, this gambit only replaces one unknown (morality) with two (flourishing and consciousness), a move which isn't particularly helpful. Richard Joyce argues that making actions moral (i.e., normative) increases their motivational impetus, thus increasing the likelihood of cooperative activity. [3]

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While these efforts help to clarify a number of issues (e.g., how moral feelings fit into the psychology of emotion), none help us to characterize the origins or adaptive function of human morality. Here we want to focus on the problem of defining the proper domain of moral concerns. Why do we think of assault, theft, eating meat, abduction, public nudity, treason, rape, counterfeiting money and denying the Holocaust as all being immoral? We will argue these concerns all constitute violations of implicit obligations to obey social rules. These obligations derive from a requirement that emerged from developments in social organization during the recent evolutionary history of our species.

In particular, moral actions seek to control defections from public obligations by other members of large-scale human groups. This problem is acute because humans depend on each other – due to a significant division of labour – for everyday necessities, but can't rely on shared genes or direct reciprocity to ensure ready supplies of what is needed to stay alive. Social organization in large groups of unrelated individuals instead depends on threats of retaliation for failures to abide by cooperative obligations, including fulfilling one's own roles in the social group. These threats are made real by an underlying moral psychology that motivates the punishment of social infractions, even in the face of no direct benefit to the punisher. In effect, anyone in such a social group can potentially punish (or reward) anyone else in the group for 'bad' (or 'good') behaviour. Further, we will argue that to the degree that these large-scale groups cohere and function (at least partly thanks to moral threats and actions), they can be called human 'superorganisms'.

The remainder of this paper will first outline a new approach to elucidation of the moral domain, Human Superorganism Theory, and then provide a variety of empirical tests that novel claims based on the theory are correct, using a large dataset of responses to behavioral situations. We conclude that identifying the adaptive function of moral action should go a long way toward clarifying the ancillary issues that dominate the contemporary study of morality.

Human society as a superorganism

The idea that human societies form superorganisms can be derived from a recent development in evolutionary biology called 'major transition theory'. [19] The basic premise of this theory is that the means by which information can be stored, translated and transmitted from one generation to the next has itself changed a number of times during the history of evolution on Planet Earth. Major transition theory thus suggests that the way evolution works has itself evolved, with the consequence that new levels of functional complexity are achieved with each transition (e.g., the transition from RNA to DNA as the store of genetic information, or uni-cellular to multi-cellular life, or multi-cellular to social life).

The central difficulty in using major transition theory for explaining any evolutionary problem is showing how cheating can be suppressed at the lower-level so a higher level of organisation can evolve. [19-21] This is because there are always incentives (in strategic, often genetic terms) for the members of an organization to defect from the cooperative actions that sustain the new level of cohesion in favour of their individual interests. Mechanisms for regulating these 'selfish' behaviours must therefore evolve to consolidate activities that ensure the new level of organization coheres and persists. These mechanisms are likely to be specific to each case of transition. For example, explaining the evolution of multi-cellular from uni-cellular life-forms may have to do with a mutation that causes cells not to separate after division, and then acquiring a reproductive/soma differentiation of function. [22]

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The most recent transition recognized by major transition theory is that to ultra-society. [23] The human species is unique in living in ultra-social groups – that is, large groups of cooperative members who are essentially unrelated to one another (e.g., in tribal groups, or cities). [24] Recall that for a major transition to occur, fitness differences within groups must be suppressed so that selection at the level of the group becomes the primary evolutionary force at work. Ultra-sociality appears to have been achieved by transforming the ancestral form of social organization in related ape species of rank-based dominance (which creates significant differences in fitness between individuals within a social group) to one of enforced egalitarianism, as seen in extant human forager societies. [25] The initial trigger for the evolution of large groups in our human ancestors may have been a change in diet toward meat-eating, which required group foraging. [26,27] In these societies, potential fitness differences are suppressed through enforced food sharing, monogamy and alloparenting (sharing the parental care of particular children among families), all of which served to decrease fitness differences within groups. This first level of social interdependence for achieving basic needs was later reinforced by the need for coordinated defense against competing groups. [26,27] It appears that there was considerable inter-group conflict among our ancestors. [28-30] Such inter-group aggression could have a considerable impact on fitness, because entire groups could be decimated, and their reproductive resources (women) lost to other groups from the frequent wars fought by such groups. [31,32] Battles and raids would have been more likely to be successful to the extent that war-parties were large and well-organised.

Although these societies lacked centralized policing authorities, they apparently could nevertheless manage to produce large-scale inter-group competition via punishment mechanisms. Norms are more likely to be enforced as the degree of social interdependence increases, [33] as is the case with large groups. For example, the Turkana, a contemporary African pastoralist society, engage in frequent cattle raids on other ethnic groups with parties of several hundred members drawn from most or all of the clans composing that ethnicity. Because these are risky endeavours, men can desert or otherwise defect. Such cheats are informally judged by the community, and beaten, fined, or socially excluded, even by those not present at a raid. [34] It is also more likely that 'parochial altruism' (cooperation *against* others) will evolve when there is significant intergroup conflict. [35,36] Thus, pre-state societies without formal institutions (only informal organizational principles such as age-grades, gender roles and endogamy) are able to organize mechanisms that protect and sustain groups of many tens of thousands of individuals.

This combination of enforced egalitarianism within the group, coupled with significant inter-group competition, was an ideal way to minimize within-group selection and maximize inter-group selection, thus facilitating the formation of organizational adaptations at the ultra-social group level. If this combination was a general condition for pre-state societies during human evolution, it would give considerable depth to the history of ultra-social organisation, consistent with the expectation of psychological adaptations for such a lifestyle (e.g., shame, guilt, moral concern). Ethnic groups of this size probably arose tens of thousands of years ago – plenty of time for psychological adaptations to have been established.

Gene-culture coevolutionary theory provides evidence that specific psychological machinery to support morality – in the form of perceptual biases, social learning abilities and neurological mechanisms – could have evolved in human populations through the kind of intensive cultural group selection just discussed, accounting for the appearance of moral systems in our recent history. According to this theory, humans should have evolved expectations to find some behaviours are sanctioned in the groups to which they belong, to have innate abilities to

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recognize which behaviours are moralized, to rapidly learn how to perform these behaviours from others in their vicinity through sophisticated forms of social learning, and to experience both conformity with norms and punishment of norm violators as rewarding, so that moral experiences are reinforced. [37] Further, this machinery should produce defaults that lead to automatic conformity with social norms, such that cognitive efforts are necessary to override this tendency, so that the prosocial psychology has been internalized in the form of internal sanctions like feelings of shame or guilt. These suppositions are consistent with experiments using behavioural economic games, social psychological studies and neuro-economic evidence.

Recent evolutionary biological theory also suggests that societies which become truly large share two characteristics: a multi-individual (group-level) production system involving a division of labour and defensible outputs (e.g., nest), and a multi-individual reproductive system in which the young require significant nurturing (e.g., a colony). [38] These features ensure high levels of social interdependence, and form the organizational principles on which natural selection at the level of the group can act to secure cohesive ultra-social groupings. In primate societies, raising an offspring successfully went from the job of the mother to the family, and in some cases, a troupe of alloparents. [39] Simultaneously, the basic economic production unit has gone from individuals to families to professional organizations (such as guilds and companies), as more and more resources have been dedicated to these processes, and a wider variety of interdependent roles have been required for the production of increasingly specialized outputs. Social groups with these two features thus developed both productive and reproductive stores of resources – in the form of domesticated animals and women – that could be contested by other groups, leading them to become desirable targets for take-over through inter-group conflict, as suggested above. Like eusocial insect groups, these human populations could be considered a 'factory inside a fortress' which constituted the foundation of selection for super-organisms. [38] This self-reinforcing process of social differentiation leading to increasing resource accumulation allowed further increases in group size, culminating in the very large groups one can find in both social insects and humans.

These large groups of humans with a low average level of relatedness require novel mechanisms for maintaining social cohesion. The suggestion made here is that morality is a control mechanism punishing social defection in human ultra-social groups. [17,40]

The primary question, then, is what set of functions is needed to organize cooperation in ultra-social groups. Such a set should define the domain of moral action. To answer this question, we will treat human ultra-social groups as superorganisms. A superorganism can be defined as a 'collection of single creatures that together possess the functional organization implicit in the formal definition of organism.' [41] This is a perspective that has been adopted in evolutionary biology to describe the social organization of a variety of species, ranging from insects like ants, termites and bees, to mole rats. [42-44] The idea has also been extended to human social groups. [45-50] However, the extent to which human societies cohere is less than that seen in eusocial insects (which have the advantage of high levels of average kinship). Thus we might say that the human superorganism is relatively 'crude'. [48,51] It might also be the case that our major transition to superorganism status is still in progress, and that future developments (e.g., the world wide web) will increase the degree of social cohesion, leading to an even greater relative importance of group selection pressures. [52] In any case, my contention will be that not only is human society organized in a fashion worthy to be called a (crude) superorganism, but that the function of morality is to *police defections from cooperative activities among individuals in their obligations as 'cells' in a human superorganism*.

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A theory of superorganism functionality

Our task then is to find a way to rigorously define these obligations. This is a step that has not previously been taken in discussions of morality, partly because selection at a particular level of organization will produce novel adaptations to fulfill functions operating only at that level. Thus, one cannot assume that a superorganism (a level of coherent organization above the level of the individual organism) will exhibit all of the systems of a multi-cellular organism, for example. That is, simply transferring 'organs' from one level to the other by analogy is unlikely to always work. [53] Rather, selection in groups could result in the evolution of novel features to support the development and maintenance of membership in groups. [54] What we require then is a foundation for making inferences about the 'shape' of a superorganism from a more general theory. [55]

We can find that theory by recognizing that organisms at any level of organization are complex adaptive systems – that is, they can be described in terms of dynamic processes involving flows of material, energy and information. [35,56,57] As living systems, they are complex adaptive systems that are open (i.e., exchange material, energy and information with their environments) and self-organizing (by means of interactions among their elements), with emergent properties. Relevant kinds of organizational functions at the superorganism level can therefore be extracted from 'living systems' theory, [58], 'minimal life' theory, [59-61] collective animal behaviour, [57] and eusocial insect ecology (where these societies are treated as superorganisms), [42-44,62] as well by comparison to the set of organs in multi-cellular organisms like Mammals, and the Indian caste system (taken as an example of a human superorganism) (see Table 1 below). [1]

Table 1: Potential Components of the Human Superorganism*

Component	Living Systems Theory	Mammalian organ systems	Eusocial systems	Indian caste system	Minimal life	Collective animal behaviour
Boundary	boundary	integu-mentary system (e.g., skin)	defensive caste (e.g., soldiers), colony recognition labels, alarm-defense communi-cation	Kshatriyas (warriors)	holism (indivisibility)	predation defense
Control (Decision-making)	decider	nervous system (brain)		Brahmins (priests)	control	collective decision-making, regulation
Production	producer		worker caste	Sudras (artisans)	metabolism	enhanced foraging
Structure	supporter	skeletal system	nest		stability	structures (e.g., nests)
Commun-ication (Info-distribution)	channel and net	nervous/ endocrine systems	communi-cation interactions		information carrying	information transfer

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Distribution	distributor	circulatory system (i.e., cardio-vascular, lymphatic)	food distribution system	Vaisyas (merchants)		
Reproduction	reproducer	reproductive system (e.g., gonads)	reproductive caste (e.g., queen)			reproductive opportunities
Perception (Info-production)	input transducer	sensory systems (e.g., eyes, ears)	combined sensory organs of members			
Excretion	extruder	execretory system (e.g., kidneys, bladder)		Harijans (out-castes)		
Storage	matter-energy storage	adipose tissue (i.e. body fat)				
Memory (Info-storage)	memory	endo-cannabinoid system^				
Signaling (Info-excretion)	output transducer					
Enforcement		immune systems				
	motor	muscular system				locomotion efficiency
	ingestor					
	converter					
	internal transducer					
	decoder					
	associator					
	encoder					
		respiratory system				
		vestibular system (e.g., cochlea)				

* Derived from Miller 1978, Hölldobler and Wilson 2008 (Figure 5.1), traditional social distinctions in India [106], the set of Mammalian organ systems, Gánti 2003, and Sumpter, 2010, respectively. (Note: collective animal behaviour lists the evolutionary benefits of group living, which can be tied to specific functions.)

^ The recently identified endocannabinoid system (composed of a class of lipids and specialized brain receptors) plays a central role in the regulation of learning and memory. It acts essentially as a negative feedback mechanism within the central nervous system to dampen the release of classic neurotransmitters. By so doing, it helps control energy balance (eating, digestion, adipose storage and related metabolic processes), but is also actively involved in the

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formation and storage of long-term memory in the hippocampus, [107,108] and plays a particular role in regulating emotional responses based on memory of fearful events. [109]

From these sources, we can extract a set of subsystems that all living systems must depend upon to survive and reproduce, regardless of their complexity.[2] Any function nominated by two or more of these sources will be taken to qualify as a subsystem of a human superorganism (i.e., single nominations will be considered to be eccentric). There is a high level of agreement among these sources, with only a few nominations not qualifying by this rule (at the bottom of the table).

However, there are reasons to include two components, despite their not meeting this criterion, and to exclude another, even though it does. (Remember, one has to take into consideration the special features of superorganisms, rather than simply transfer all potential functions.) Enforcement can be included because it is the primary function of moral action, and occurs at the organism level in humans – a close evolutionary analogue to the human superorganism – in the form of an immune system. Signaling should also be included because it happens in eusocial insects (although not mentioned explicitly by our source on eusociality) – another close analogue of the human superorganism. Including signaling also makes for a complete set of information-based functions to mirror those working on material and energetic aspects.

Another decision has been taken to exclude one function even though it has been nominated by several sources: the motor/movement function, which doesn't apply to human superorganisms, as they do not move territory or migrate as large units of unrelated people (although eusocial insect colonies can move location when local resources are depleted). (Human superorganisms are more akin to plants than animals in this respect, being concentrated on growth rather than movement.) Movements of superorganism 'body' parts (e.g., displays of strength in the form of military parades, or signals of trustworthiness in the shape of free market institutions) can be considered expressive or communicative; hence the most relevant kinds of superorganism 'movement' are encapsulated in the notion of signaling in any case.

Thirteen functions of a human superorganism can be identified in this way (see Table 2 below). For example, living systems need boundaries to hold their elements together and protect them from threats in the external environment. These boundaries can manifest as specific structures at different levels of organization, such as a specialized membrane at cell level, skin at organism level, or an army (to patrol territorial encapsulation) at superorganism level. [3]

Table 2: The Human Superorganism as a Living System

Subsystem	Function	Examples		
		Cell	Organism	Human super-organism
SYSTEMIC FUNCTIONS				
Boundary	Hold components together; regulate entry of elements from environment	Membrane	Skin	Army, Border patrol
Enforcement	Internal defense	Lysosome	Immune system	Police
Structure	Maintain proper (spatial)	Cyto-skeleton	Skeleton	Physical

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	relationships among units	(micro-filaments/ tubules, vacuoles)		infrastructure (e.g., road systems, WWW)
Reproduction	Create similar offspring	Miosis	Sexual reproduction	Family-based reproduction
Control (Decision-making)	Coordinate/ regulate the system as a whole	Chromosomes	Brain	Government bureaus
MATERIAL/ENERGY FUNCTIONS				
Production	Transform materials or provide services for use within system	Ribosome, Golgi complex	Digestive system	Factory
Storage	Retain material/energy within system for later use	Mitochondria (energy), Endoplasmic reticulum (proteins)	Adipose tissue	Warehouse
Distribution	Transport material/energy between system components	Cytoplasm	Circulatory system	Economy
Excretion	Remove wastes from system	Membrane vesicle	Execretory system	Sewer system
INFORMATION FUNCTIONS				
Perception (Info-production)	Update information on external and internal conditions	Chemical exchange	Sensory organs	Media organi-sations
Memory (Info-storage)	Retain information for later use	Chemical states	Endo-cannabinoid system	Archives
Communi-cation (Info-distribution)	Transmit information between internal components	Chemical signaling (internal)	Peripheral nervous system	Gossip networks
Signaling (Info-excretion)	Indicate state/ express identity; Send messages into external environment	Chemical signaling (external)	Phenotypic markers, Speech	Diplomatic corps, Public relations organisations

This list of components can be adequately summarized by a phrase used to describe a eusocial superorganism: 'a factory inside a fortress'. [67] This phrase highlights the sometimes competing goals of defense and production (the basic political and economic functions of any social group). For example, the biological fitness of a eusocial insect colony depends on the ratio of soldiers to workers: if there are more soldiers, the colony is more secure, but this means fewer workers, and hence reduced food production for the colony (i.e., the workers' 'factory' job), and hence a smaller colony size. Such colonies have mechanisms to regulate the soldier/worker ratio such that it optimizes colony survival. [43] Similarly, the number of plumbers, doctors and lawyers in a human group is loosely regulated by market forces (i.e., how much these professions can earn).

Of particular interest for us is the fact that group cohesion requires agents at sub-levels in the organisation to act for the good of the group rather than in their own genetic interest. As a consequence, punishment is needed to keep individual elements in line. In cells, punishment is undertaken by lysosomes, cellular organelles that contain acidic enzymes to break down waste materials and cellular debris. They digest excess or worn-out organelles, food particles, and pathogens. In multi-cellular organisms, punishment is meted out by the immune system, which identifies pathogens and kills them. In superorganisms, we argue that this policing function is performed by individuals motivated by moral sentiments. These motivations inspire people to punish infractions by other members of their group. Opportunities to serve a moral function arise when individuals fail to perform their functions as components of a superorganism. (Note that we suggest *all* tasks are subject to policing, including failures to serve informational or other control functions – even policing itself.) In such situations, other individuals are required to serve as enforcing agents, bringing the offenders back into line, so that the human superorganism continues to cohere. It is this domain of behaviour we wish to investigate here.

Thus, we suggest that people living in a superorganism serve functions analogous in many cases to the cells in a multi-cellular organism (see Appendix 1 for a detailed description of how each function works). [48] Whereas cells tend to serve a single function – e.g., as muscle or fat cells, neurons, or sensory receptors – individuals do not exhibit the same level of specialization due to the more recent, looser organization of ultra-social groups. Hence a particular individual may serve a variety of superorganism functions during their life-time.

Testing the Human Superorganism Approach

To test this approach to morality, we designed a web-based study that surveyed a large, international population (i.e., those who voluntarily visited the study web-site http://www.bbc.co.uk/labuk/experiments/morality) with respect to their responses about a wide variety of potentially offensive situations.

Experimental design

We presented respondents with a set of 33 short scenarios (see Appendix 2) derived from the 13 domains of superorganism function identified by the HSoT perspective. Several scenarios were included per functional domain (plus 4 conventional or personal goal scenarios as placebos) to illustrate various aspects of each classification. Each scenario was purely behavioural, couched in terms of present action, by adults, without mention of psychological causes or consequences. [4]

Immoral acts are typically found to be not only wrong, but disgusting or anger-inducing. [10,68] People are also willing to punish immorality to different degrees – either through simple avoidance, or active violence. [69] We therefore measured several aspects of the response to scenarios:

- Moral *judgment* about the act in question:
  - Wrongness
- Moral *feelings* toward the perpetrator:
  - Disgust
  - Anger

- Willingness to engage in moral *reactions*:
    - Avoidance
    - Punishment

In particular, each scenario was presented in written form, together with a pictorial representation of a salient moment in that situation, followed by the following set of questions:

- How **wrong** is what this person has done? [0='Not at all' to 10='Very']
- How **disgusted** do you feel towards this person? [0='Not at all' to 10='Very']
- How **angry** do you feel towards this person? [0='Not at all' to 10='Very']
- If you encountered this person, to what extent would you go to **avoid** interacting with them? [1='No extent at all' to 10='A great extent']
- Given the opportunity, how much would you **punish** this person? [1='Not at all' to 10='Extremely']

Completion of the test required around half an hour's time. Each respondent began by answering a number of background questions (see Appendix 2 for a listing of these questions, as well as the scenarios used).

A similar design has been followed by others studying aspects of moral psychology. [70] Note that the two behavioural tendencies are expressed in terms of degree of effort expended (at least implicitly), that all the questions are focused on the primary construct of interest (e.g., avoidance), and that all the response choices are phrased in similar fashion. These similarities should increase our ability to compare responses both within and between scenarios. [1]

To the degree possible, the scenarios refer to everyday situations so that they do not overly tax sensibilities, can be compared with one another, and so that individuals of any kind can readily relate to them. They all require the respondent to reflect on a situation that does not involve themselves, nor members of any group to which they explicitly belong (except vaguely, by being based on situations in the context of a modern urban society, the predominant life-style of those who will be completing the survey). In this sense, the scenarios ask them about their feelings with respect to, and willingness to engage in, so-called 'third-party punishment', which appears to be uniquely human. [71] Third-party punishment occurs when someone is punished for a norm violation by a person not involved in the original infringement.

Pictures of each scenario were included to make them more vivid, so that respondents could better imagine themselves in that situation, and to help clarify who's action is being judged when the scenarios are a bit complicated socially or emotionally, while hopefully not introducing significant biases themselves (e.g., they were designed to be relatively 'flat' in valence, and generic in depiction, so that those of any culture or continent could respond similarly to them). Pictures were of three colours (black, white and red), with the focal person in red (in cases where multiple people were depicted) (see Figure 1 for an example). Only 33 scenarios could be included (due to informant fatigue). These can be grouped into multiple categories, based on the type of offense: against systemic functions (Boundary, Control, Structure, Enforcement or Reproduction) material resources (scenarios associated with Production + Storage + Distribution + Excretion functions), Informational (the Perception, Memory, Communication and Signalling functions). Finally, a set of Placebos was also included (scenarios concerning social conventions or personal decisions). Due to limitations of web-based software used, the order of scenarios was not varied between informants. Various hypotheses were tested by combining

the scenarios in different ways and performing relatively simple (typically bivariate) statistical tests to compare scores between categories (see below).

Figure 1. Example scenario illustration.

HSoT 'Effects'

If HSoT is correct, then everyone should have some recognition – most likely implicitly rather than consciously – that the function of morality is to regulate social life in large, unrelated groups through the everyday enforcement of social norms, and that anyone can – and should – punish anyone else within the 'in-group' who behaves in an anti-social fashion (given the absence of other mechanisms). Here we will argue that those living in larger communities are more exposed to the necessity of social regulation of all-by-all, and should therefore experience heightened concerns that morality function appropriately, including the expression of greater self-involvement in moralistic punishment. For most of the following tests, then, we will use a respondent's reported current community size as a proxy of variation in exposure to superorganism-like effects, which should therefore be more strongly observed among those living in larger communities. Overall, these are tests that those living in larger communities think in less utilitarian, more 'groupish' terms, particularly with respect to actions that might diminish superorganism functionality. Evidence in favour of these tests will be taken as support for the proposition that morality evolved to support large-scale social life.

Limits of the Moral Domain. Each domain is hypothesized to translate into a type of moral concern, such that actions which inhibit that function can be seen as morally reprehensible (e.g., bestiality can be seen as wasting reproductive resources better spent on producing the next generation of people). Each domain can also be associated with specific institutions (e.g., the economy functions to distribute goods and services through the social group, fulfilling the

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distribution function with respect to physical and social resources). This allows us to test the theory by suggesting a scenario in which one of these functions (or the operation of one of these institutions) is compromised and looking for moralized responses.

One kind of social violation which should fall outside the moral domain is violations of social conventions. Moral rules can be distinguished from social conventions because they have an objective, prescriptive force (not dependent on authority); are taken to hold generally not locally (all places and times); concern harm to victims whose rights have been violated or to whom an injustice has been done; and are more serious than violations of conventional rules. [72] Conventional rules, by contrast, are arbitrary and situationally dependent, geographically and temporally local, do not involve harm, and are considered less serious. Even more generally, we expect behaviours which have no implications for group functioning (i.e., purely personal decisions) not be moralized.

Justice Type Effect. Perhaps the key test for individual- versus group-level explanations of morality is that the former suggests an individual will never prefer an outcome in which they gain less than from other options, whereas an altruistic ('groupish') preference would be one which leads to greater welfare in the group, even if it means a less good outcome for the individual in question. [Baumard, 2012] This can be tested by showing which kind of justification is preferred for moral punishments. Concern with fairness is individual- (or dyadic) level, as is a retribution or restitution-based sense of justice (where the individual victim is 'paid back' for the offense). Incarceration or rehabilitation comes at a greater cost to the individual, to help support a former contributor to society for some lengthy period while in prison, compared to one-off physical retribution or restitutionalist justice (which comes at no cost to the group). Thus, observing incarceration/rehabilitation to be higher among those from larger communities, even though it comes at a higher cost, is an excellent test of 'superorganism' morality.

Community Size Effect. HSoT suggests that people living in larger communities will feel their greater interdependence and therefore be more concerned with moral issues, including being more willing to punish their fellows for misbehavior. Indeed, the 'strong reciprocity hypothesis' predicts that individuals will engage in costly punishment of others, even when they cannot expect any benefit in return, when those others engage in anti-social acts. [71] These concerns should manifest in those from larger communities being more willing to punish and condemn the full range of moral offenses.

Public Display Effect. People should take greater offense at public displays of immorality because such acts involve at least a disregard for – and potentially a flouting of – public control, and hence send the message that public authority is to be subverted or undermined. As this would reduce the ability of the superorganism to function, it should be seen as more wrong than a private offense.

Social Obligation Effect. 'Private' or 'victimless' harms (eating the 'wrong' food, 'deviant' sex, and self-abuse) are difficult to explain using the standard arguments of fairness and harm. Some have turned to other grounds, suggesting that these acts are moralized because they violate ideas of purity or sacredness (e.g., suicide is bad because we have a soul; bestiality because it is 'unnatural'), [17], or because one has a duty to treat oneself well (e.g., one has a duty to respect one's own rationality and autonomy; suicide or drug use undermines these abilities, therefore, these practices should be considered morally wrong). [73] However, HSoT suggests that such practices can also be seen as causing harm to the body politic: these issues could be moralized because they represent violated obligations to the human superorganism.

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This kind of effect can be examined by looking at whether people living in larger communities are more incensed by choices by individuals that make them less productive of social goods (including simply fulfilling their highest-value social function). Thus feelings toward an elderly, retired, terminally-ill man whose spouse and family have all died, who attempts to kill himself should be indicative, as should feelings toward an individual who trains successfully to become a surgeon, but then opts to spend his life as a street musician.

Second-order punishment effect. If morality is about ensuring that people make costly contributions for the social good (such as punishing those who are anti-social), as suggested here, then the moral system will be subject to what is known as the 'second-order punishment problem'. [74,75] This problem arises when potential social cheaters don't expect to be punished (by first-order punishers) because those who refuse to incur the cost of punishing them for their malfeasance don't expect in their turn to be punished (by second-order punishers). If HSoT is correct, then those living in larger communities should be more aware of this problem, but due to their greater reliance on the moral system to maintain social cohesion, and should therefore be more willing to pay the costs of punishment, even of second-order control failures. Two scenarios included in this study concern potential punishment of those who have failed to punish miscreants. Respondents from larger communities are therefore expected to express a greater willingness to punish these 'first-order' punishment failures (i.e., to be second-order punishers).

Ecological validity tests

Tests can also be undertaken to establish that the dataset being used is consistent with known results concerning moral psychology and values. We perform three such tests:

Action Principle. Actively causing harm is worse than causing harm through inaction, so moral outrage (wrongness, anger and disgust scores) should be higher on scenarios involving acts of commission rather than omission. [5] [76-78]

'Contact Principle': It feels worse to cause harm by one's own hand than to do so indirectly (by some other proximal causal agency). [77] This was tested by comparing average levels (scores) of wrongness for scenarios in which the protagonist engaged in physical contact with the victim compared to those in which no such contact takes place. [6]

Victim Group Size Effect. A classic position in ethical thought is act-based consequentialism, which holds that acts should be judged by how much good that act produces (e.g., the 'greatest good for the greatest number' criterion associated with utilitarian philosophy). [79] The inverse of this principle would be a greater condemnation of acts which produce greater harm. Thus, moral judgments should be more severe as the number of people being victimized by an offense increases (cf. [Tassy, 2013]). [7]

Results

Ethics statement

Permission to conduct the study was obtained from the London School of Hygiene and Tropical Medicine Ethics Committee. The study also conformed to the British Broadcasting Corporation's internal guidelines. All participants consented to scientific use of their responses prior to

completing the survey questionnaire by registering with the BBC Lab UK website (http://www.bbc.co.uk/labuk/). Data from this study will be deposited by the BBC with the standard UK social science data repositories.

Sample characteristics

Between November 2011 and July 2012 a total of 80,199 individuals initiated the BBC survey (see Table 3), of whom 78,357 completed all scenario questions (a 97.8% completion rate). Sixty-seven percent of these respondents were British or Irish, 18% were American, 3% Canadian and 2% Australian, meaning that 90% of the sample came from English-speaking "Western" countries. However, people from 202 different countries completed the survey. There was a preponderance of young people as well, with 58% of the sample being under 30 (*35*). 10.8% of respondents reported living in a village, 28.3% in a town, 23.6 in a city, 21.7% in a large city and 15.7% in a metropolis.

Table 3. Characteristics of Survey Respondents

		N	%
Gender	Male	41,777	46.2
(n=78,538)	Female	36,761	46.8
Age	18-25	35,534	44.4
(n=79,968)	26-30	11,220	14.0
	31-40	14,553	18.2
	41-50	10,077	12.6
	51-60	5,700	7.1
	over 60	2,884	3.6
Religion	Buddhist	1,849	2.4
(n=78,538)	Christian	27,120	34.5
	Hindu	1,032	1.3
	Muslim	1,317	1.7
	Jewish	777	1.0
	none	40,577	51.7
	Sikh	199	0.3
	other	3,456	4.4
	Won't say	2,211	2.8
Education level	Incomplete schooling	1,223	1.6
(n=78,538)	Schooling to GCSE-equivalent (age 16)	5,688	7.2
	Schooling to A'level equivalent (age 18)	12,030	15.3
	Vocational training	1,472	1.9
	Higher education	27,088	34.5
	Post-graduate degree	13,775	17.5
	Still in education	17,262	22.0
Social Class	Working	31,413	40.0
(n=78,538)	Middle	38,189	48.6

	Upper Middle / Upper	8,936	11.4
Employment status (n=78,538)	School	8,176	10.4
	University	17,449	22.2
	Full-time employment	33,907	43.2
	Part-time employment	5,741	7.3
	Self-employed	5,032	6.4
	Homemaker (stay-at-home parent)	1,539	2.0
	Unemployed	4,122	5.3
	retired	2,572	3.3
Type of work (n=78,538)	prof/tech	28,258	36.0
	higher admin	4,638	5.9
	clerical	7,465	9.5
	sales	4,577	5.8
	service	4,353	5.5
	skilled	3,493	4.5
	semi-skilled	1,700	2.2
	unskilled	3,059	3.9
	farm	299	0.4
	other	20,696	26.4

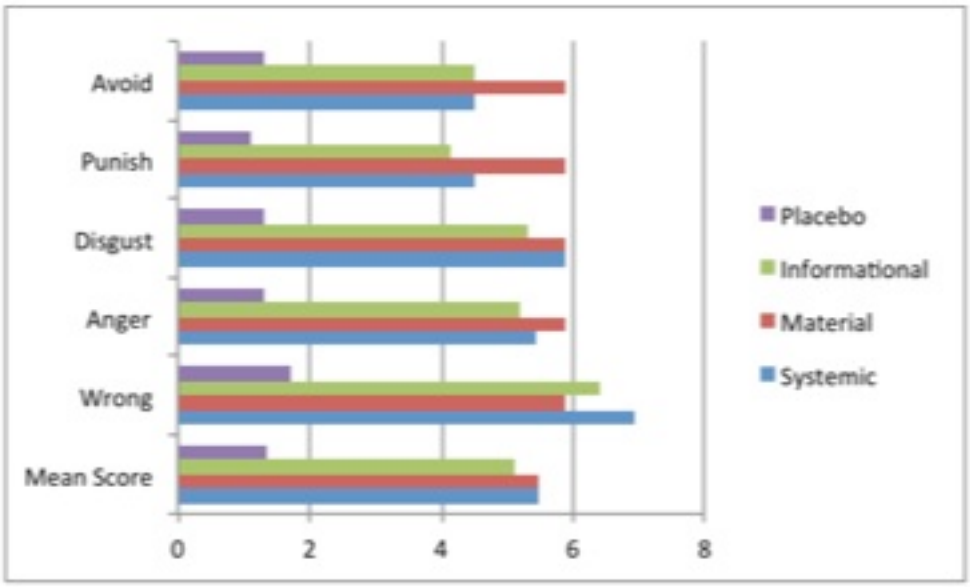
Denominators vary. Overall, 80,199 individuals began the survey and 78,357 completed all questions.

HSoT Effects

Extent of Moral Domain. Our first concern is to determine whether HSoT correctly identifies the range and extent of moral concerns. Figure 2 shows that the moral domain includes all of the categories expected by HSoT, but not the placebo scenarios, which exhibit significantly lower values (mean wrongness score for the conventional 'hat' placebo = 1.27, for the 'golf' scenario = 1.38, for the 'surgeon' scenario = 1.16, and for the "suicide" scenario = 2.35; mean wrongness score for the non-placebo scenarios = 6.61; $p < 0.001$ for the comparison of each placebo with non-placebo scores).

Figure 2. Mean scores for each domain for all moral measures.

Scenarios comprising each domain were scored from 1 – 10 on five factors: how wrong the offense was; whether the actor in the scenario angered or disgusted the respondent; and whether the respondent wished to avoid or punish the actor. Scores per domain are the mean score given across all scenarios comprising the domain.



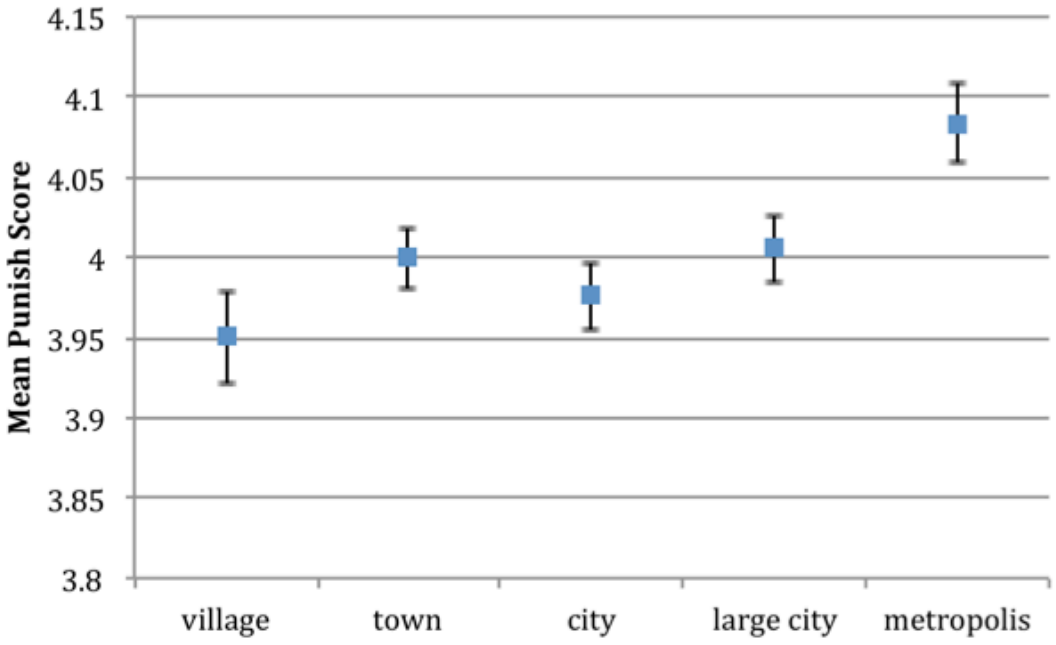
Justice Type Effect. This effect is demonstrated by showing that respondents from bigger communities see the role of the legal system being less about retribution against individuals or repaying individual victims than keeping such individuals away from the social group via incarceration (43.6% of people living in villages vs. 45.0% of those from a metropolis, Chi-square test: $p = 0.04$; responses between mid-range community sizes were not significantly different from each other). Further, the function of incarceration itself is seen among cosmopolitan respondents as being more about rehabilitation and keeping offenders apart than punishing them in proportion to what they did wrong, with a 9% increase in the odds for each increasing size of community (logistic regression with community size as a continuous dependent variable; $p < 0.001$).

Those living in larger groups are also significantly more likely to respond with strong agreement to the statement that they feel they have to correct unfair situations: there is an 8% increase in the odds of strongly agreeing with each increase in community size (logistic regression output, continuous variable for community size and strongly agree vs. all other categories for the binary outcome; $p < 0.001$).

Community Size Effect. We find that respondents living in larger communities express a stronger willingness to punish moral offenses than those living in smaller communities (non-parametric test of trend across ordered groups; $Z = 5.65$, $p < 0.001$ see Figure 3). Further, the difference is most pronounced with respect to punishment (compared to the other forms of response, consistent with the strong reciprocity hypothesis. Post-hoc comparisons using the Bonferroni test found that the differences lie between all sizes of community and those living in a metropolis ($p < 0.001$ for all associations) and between villages and large cities ($p = 0.029$). Linear regression also showed that people who have lived in a greater number of countries (range 1 to 6) had higher punishment scores ($p < 0.001$). [8]

Figure 3. The extent to which individuals living in different types of communities wish to punish perpetrators of moral crimes.

A score out of 10 (10 being highest) was obtained for the extent to which respondents wished to punish the actors in 33 scenarios. The figure shows the mean score and 95% confidence intervals for all scenarios by community size.



Public Display Effect. Those offenses taking place 'in public' were seen as more egregious than those taking place 'in private'. This was tested by showing an individual's own difference between average wrongness scores for scenarios involving public display versus offenses committed privately. [9] Mean scores for wrongness were 6.72 (95%CI 6.71 – 6.73) for public displays of immorality and 6.51 (95%CI 6.50 - 6.52) for private displays; $p < 0.001$.

Social Obligation Effect. Suicide is seen as more wrong among practicing members of religious groups (average wrongness among religious practitioners = 4.04 vs. non-practitioners = 2.38, p<0.001; mean punishment among religion practitioners = 1.27 vs. non-practitioners = 1.13, p<0.001), but also among those agreeing more strongly with the statement 'When making decisions, I always consider the effect that my actions will have on others, and try to do those things that will bring other people the greatest benefit' (wrongness: $F(4,78352 = 79.48)$, $p < 0.001$). Most importantly, the perceived wrongness of the act and willingness to punish a person thinking of committing suicide increase among those living in larger communities (wrongness: $F(4, 78353 = 40.08)$, $p < 0.001$; punishment; $F(4, 78353 = 14.01)$, $p < 0.001$). Respondents from larger communities also found the surgeon playing street music to be more wrong than those from smaller communities.

Second-order Punishment Effect. The two relevant scenarios were considered more serious offenses among those living in larger communities (son-as-vandal: $F(4, 78362 = 8.93)$, p<0.001; AWOL soldier punishment: $F(4, 78362 = 2.75)$, $p = 0.027$).

Ecological validity tests

Action Principle: Mean scores for wrongness (omission: 4.85, 95%CI 4.84-4.86; commission: 6.99 (95%CI 6.98-7.00); p <0.001), anger (omission: 3.98, 95%CI 3.97-3.99; commission: 5.39 (95%CI 5.38-5.40); p <0.001) and disgust (omission: 4.01, 95%CI 4.00-4.02; commission: 6.04 (95%CI 6.02-6.05); p <0.001) were significantly higher for scenarios involving action.

Contact Principle: The mean score for wrongness across scenarios causing physical harm was higher than scores for scenarios without (7.80 (95%CI 7.80 – 7.82) vs. 5.98 (5.97 – 5.99); p <0.001).

Victim Group Size Effect: Offenses against larger groups were in fact judged more severely – that is, when victims were known individuals or family, punishment and wrongness were lower than when victims were whole societies or the world-at-large (although the trend is stronger for wrongness than punishment; see Table 4).

Table 4. Victim Group Size Effect Results

Level of Social Organisation	Mean Punishment Score	SD	Mean Wrongness Score	SD
Individual	3.009	0.924	4.441	1.027
Family	2.623	1.703	6.340	2.013
Organisation	3.962	1.679	6.256	1.649
Society	4.872	1.680	6.767	1.407
World	3.731	2.006	7.209	2.051

Discussion

Moral domain testing. Moralizing responses to scenarios extended far beyond the traditional concerns of fairness and harm to include all of the functions associated with human superorganisms. On the other hand, violation of a social convention (i.e., a woman not wearing a hat to a wedding) is less emotionally and behaviourally charged than superorganism-based violations. (That this behaviour is conventional can be seen in the fact that this scenario is less moralized in secular Western countries like the US and UK, while being more controversial behaviour in Muslim-dominated middle Eastern countries, where the wearing of specific items of clothing has been associated with religious practices (mean wrongness score = 1.24 in Western countries compared with 1.73 in the Middle East (including Bangladesh and Pakistan), p < 0.001).[10] Conventions (arbitrary rules to increase social coordination) and actions with repercussions only for individuals do not elicit moralistic responses, and so fall outside the moral domain, as expected if morality is about regulating social activity, not just coordinating it. [11] In effect, these results indicate that people moralize issues in those areas covered by HSoT, but not areas outside of HSoT.

All of the violations considered by HSoT could be reinterpreted as insults to the superorganism itself. That is, the primary claim of HSoT could be expressed as: 'acts of moral violation cause harm to the human superorganism', because each violation – whether burning a public library or a governmental functionary taking money from public coffers for personal use – reduces the

ability of the superorganism to function. Consideration of the superorganism as a 'body' makes this kind of language sensible, and in this way, the traditional discourse of harm and fairness could continue to apply, and be considered a sufficient explanation of the moral domain. However, only consideration of the specific set of functions that can be violated can determine just what actions are likely to be moralized and sanctionable in society. For this reason, we believe it is both prudent and necessary to continue to make reference to violations against the variety of functions of superorganisms, rather than stating the nature of morality as simply being harms to an ultrasocial group.

Justice Type Effect. People living in larger communities are less likely to see the role of the justice system as restitution to individual victims but rather as serving the needs of the social group, either by excluding perpetrators from social interaction via incarceration, or by setting them apart and retraining them until they can again contribute to social welfare. This suggests that those living in metropolises are more willing to pay the cost of incarceration, which is altruistic in the sense that the cost incurred may never be repaid directly to the individual. Showing that even ideas about the fundamental nature of morality/justice differs by community size is powerful evidence that people exposed to life in superorganisms are more likely to see the function of justice as being about group-based functionality rather than individual-level fairness or harm-restitution.

Community Size Effect. People living in larger communities exhibit greater moralizing tendencies than those living in smaller communities, on average seeing the scenarios as more wrong and being more willing to punish the miscreants described. This result contradicts mainstream thinking in social psychology, where it is argued that people in large groups should be *less* willing to act pro-socially, feeling that personal responsibility is dissipated in this context (the 'bystander effect'). [81] Bystander effects have been demonstrated to decrease moralistic punishment. [12,82] Just visualizing a crowd makes you less likely to help/intervene. It is therefore difficult to explain the result here except as a response to experienced pressures to regulate social life at large scale.

Further, such an effect seems to overcome the fact that very large social clusters like cities are a relatively modern phenomenon in evolutionary terms. In this regard, it is interesting that the significant differences come between village, mid-sized communities, and metropolis. Communities of metropolitan size (> 1 million) are an evolutionary novelty, arising with any significance only a couple of hundred years ago, with industrialization. Nevertheless, people living such communities seem to respond differently from those living in communities whose sizes have been possible for much longer. Both the bystander and evolved recency factors should reverse the relationship between the severity of moral sentiments and community size, the former by dissipating the sense of public responsibility among a greater number, and the latter by not leaving time for ingrained psychological mechanisms to enforce costly punishment in metropolises. But these are overwhelmed by the need to maintain moral concern.

Public Display Effect. If morality is about everyone taking part in regulating social life around them (in the absence of other mechanisms), then moral violations that take place in public spaces should arouse greater ire because, by taking place where they can be witnessed, they beg for punishment, thus forcing observers to engage in the costly duty of punishment. Symbolically, they at least implicitly challenge social norms, and thus are more egregious in that sense as well. Thus, we found that moral violations taking place where they can be observed arouse more severe responses.

Social Obligation Effect. The moralization of suicide, taken as an example of a 'victimless crime', was shown to be disapproved of for sanctity-of-life reasons (which we presume to be associated with religious practice), but also due to the social obligations of the potential suicide. People exhibit stronger moral sentiments against suicide if they live in superorganism-sized groups, implying that those who live in larger groups (and hence depend to a greater degree on the 'kindness of strangers' to accomplish everyday goals) feel more strongly that removing oneself from the group is wrong. Wrongness and willingness to punish is also higher among those who are more conscious of their social obligations, so those with stronger (and more altruistic) 'social instincts' see suicide as more morally culpable, also suggesting a social foundation for the moral condemnation of such practices. Similarly those living in large groups are less willing to just let a trained surgeon make his living as a street musician, foregoing the more significant contributions he could make to society.

Second-order Punishment Effect. Willingness to engage in 'second-order' punishment (i.e., the punishment of those who fail to punish offenses) has been shown to overcome cooperation problems in game theoretic models. [75,83,84] Here, respondents living in large communities were significantly more willing to punish a woman who had not reprimanded her son for vandalizing a public building and an army officer for not reporting one of his soldiers for going absent without leave. Showing that individuals living in larger societies report greater willingness to punish non-punishers lends support to the contention that one function, at least, of morality, is to ensure that cheaters – even second-order ones – do not prosper in the group, and thus support the continued functioning of the superorganismal group.

Study limitations. First, the web test does not allow for the possibility that there can be positive aspects to moral behaviour – e.g., rewarding of good behaviour. In addition, some people can view some scenarios as morally righteous (e.g., flag-burning as protest in country with a despicable government), although this was not allowed. Second, the behavioural options are limited to avoidance and punishment; the test does not allow for respondents' desires to engage in rehabilitation or 'talk therapy' with the perpetrators (which might be more appropriate for some protagonists, such as the desperate gambler). Third, all hypothesis tests might be confounded by a variety of factors which have not been controlled for in the statistical procedures used.

Comparison to Moral Foundations Theory

Perhaps the most advanced and widely accepted contemporary approach to understanding the moral universe is Moral Foundations Theory (MFT). [17] This theory is based on an insight from cross-cultural work that moral considerations exist beyond the typical Western concerns of harm and fairness (which are both associated with individual rights). [12] MFT asserts that there are also moral concerns about spiritual purity and degradation, about fulfilling roles in a social hierarchy, and about expectations of loyalty to the local or national group. It is based in earlier work on three 'ethics' or 'moral codes' (autonomy, community, and divinity), identified by Richard Shweder during cross-cultural work. [Shweder, 1997 #1811,85] To this base, authority (from relational models theory [86]) and harm/care (from attachment theory [87]) were added, based on a cross-cultural review of research on virtues. [88] In its most recent formulation, [40] MFT suggests that morality has six dimensions (what we will call the 'Six Dimension Hypothesis'):[13]

- Harm/care (attachment, empathy, nurture)

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- Fairness/cheating (based on reciprocal altruism, with idea of justice, property rights and autonomy)
- Loyalty/betrayal (coalition formation, self-sacrifice for group)
- Authority/subversion (recognition of status differentials; respect for tradition)
- Sanctity/desecration (based in the sense of disgust and contamination, body as a temple, underlies attempts to live elevated, less carnal life)
- Liberty/oppression (reactance/resentment at dominance; often in tension with authority dimension)

Comparing the domain of moral concern defined by Human Superorganism Theory to that resulting from MFT is quite difficult to do, given that the two theories have somewhat different ambitions: MFT looks at the psychological foundations or dimensions of support for morality, while HSoT identifies kinds of cheating that affect functional problems for social groups. Nevertheless, we can attempt to draw rough parallels between their categories (see Table 5). [14]

Table 5. Comparing Moral Foundation Theory with Human Superorganism Theory

MFT	HSOT	Concern	Timing
Purity/sanctity	Excretion	disease avoidance (disgust)	pre-Mammalian
Harm/care	Reproduction	violence to self/kin	Mammalian
In-group loyalty	Boundary	insiders vs outsiders	Primate
Fairness/justice	Distribution	resource allocation issues arising from the division of labour	Forager
Respect for authority	Structure	status differentials (MFT); general organizational issues (HSoT)	Agriculturalist
—	Perception, Memory, Communication	information processing functions	Forager (for reputations)
—	Production, Storage	fulfillment of social roles	Agriculturalist
—	Control	maintenance of group cohesion, coordination of within-group functions	Industrialist

As there is nothing in MFT to which HSoT does not have an equivalent, this comparison suggests that HSoT covers the entire range of MFT, plus some additional territory. This indicates that, although MFT has considerably broadened the notion of morality beyond individual rights and obligations (i.e., harm and fairness concerns), it still has not identified all the ways in which people can 'fail their group' and hence be morally punished.

In particular, HSoT identifies several entirely new categories of moral concern. The first is associated with group-level information processing.[15] According to HSoT, one has obligations to correctly transmit information about others through the social group (the Communication function), not to violate group Memory about its own past and to ensure that others Perceive the group correctly. If we make the assumption that legal sanctions reflect a community's moral concern with various types of action, then the fact that there are 'information-based' crimes

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would support HSoT. In fact, failures to deal with social information truthfully are legalized in many criminal codes (as crimes of slander, perjury and treason, for example).

The second novel area concerns the fulfillment of social roles (i.e., the Production and Storage of material produced). An important aspect of modern human groups is the existence of organisations like businesses, governmental bureaucracies, and local clubs. MFT has little concern for social role fulfillment except for recognizing the authority of others (i.e., being subservient in social relations). HSoT suggests one has an obligation to the group to fulfill one's potential in one or more socially productive roles (contrary to the notion that one is free to express oneself and choose how to spend one's life without concern for others). Again, if failure to fulfill the missions of the various organisations to which one belongs is moralized, that would support HSoT. In fact, various kinds of failures to perform official or private duties are criminalized in many societies and have proven to arouse moral concern in several scenarios here (e.g., the inability of a government official to efficiently perform his professional responsibilities). [16]

Further, there is nothing in MFT about a third issue: the moralization of failures to punish or contribute to social welfare, or 'second-order morality', associated with the Enforcement domain. Again, criminal codes suggest that these areas are in fact moralized: people can be fined or imprisoned for not helping during emergencies or for taking their punishments of others to an extreme, as in homicide or injuring innocent others.

Finally, MFT (like most other moral theories) has difficulty explaining 'victimless crimes' (http://faculty.virginia.edu/haidtlab/Current_Research.html). Why do many people moralize issues related to intake of food, 'deviant' sex, and self-abuse? MFT suggests these moral intuitions are related to ideas of purity or sacredness (e.g., suicide is bad because we have a soul; bestiality because it is 'unnatural'). On the other hand, HSoT suggests that these actions are not in fact without harm, but rather cause harm to the 'body politic': they involve failures to perform the literally vital functions of reproducing the superorganism, either because individuals are withholding their own productivity as components of the superorganism, or fail to reproduce themselves effectively, thereby not helping to create the next generation of superorganism components (i.e., families). Thus, there are many kinds of actions which MFT does not (currently) cover but which HSoT suggests should be moralized, and which have been shown here to arouse moral concern, and which evidence from criminal law suggests social groups find morally objectionable.

Taking the HSoT perspective on the nature of the moral domain also has a couple of theoretical advantages over the 'Six Dimensions' view of MFT. First, Human Superorganism Theory is based on a single concept: that morality functions to enforce social mechanisms in the human superorganism resulting from a major evolutionary transition to ultra-sociality, and thus suggests a single succinct role for morality. It is therefore a more parsimonious theory than MFT, which amalgamates six foundations from various sources to explain the domain of moral concerns. Second, HSoT is more powerful, as it explains a broader range of moral phenomena than MFT. For these reasons, HSoT should be preferred *a priori*.

Conclusion

David Hume thought that the need for justice is a function of a society's size: in small societies, members can rely on kinship to align interests and thus minimize conflict; he thought that only

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when society extends beyond the narrow circle of kin does the need arise for rules to regulate human affairs. [89] Similarly, Human Superorganism Theory (HSoT) suggests that morality is designed to produce 'good' behaviour in the large, unrelated populations that have arisen recently in the human species. 'Good' people are from this perspective those who fulfill their roles in their superorganism; those who do not are 'bad'.

A number of specific claims of HSoT about the nature of the moral domain have been upheld in empirical testing using a large, web-based study with a global reach. In particular, this work shows that people's moral concerns include all of the issues addressed by HSoT, but not violations of social conventions or failing to follow-through on personal decisions. This result establishes that the moral domain is broader than even the broadest current approach (Moral Foundations Theory) has been able to account for theoretically. Using HSoT brings us closer to a correct picture of the extent of the moral domain by suggesting new kinds of offenses that people find objectionable. The pattern of response is consistent with the HSoT thesis; that is, all scenarios which debilitate a superorganism function are found to be objectionable, while those which have no such function do not.

Further, situations involving information are judged just as severely as 'concrete' ones. That is, people report being willing to punish 'talking' violations (e.g., reputation disparagement) just as severely as violations against bodies (e.g., rape) or resources (e.g., theft). This implies that morality is not just about the interpersonal relations of harm and fair-dealing, but also about a wider range of individual responsibilities to the public sphere. By contrast, violations of social conventions and lack of personal goal achievement – neither of which are central to superorganism functioning – are not judged in the same way.

Second, we tested hypotheses which could only have been derived from HSoT, some of which also run contrary to expectations from other theories. These establish that moral concerns increase as a function of the size of the community within which one lives, contrary to expectations that social responsibility gets diffused through larger groups. Further, suicide was shown to be more strongly condemned by those who are more aware of their social obligations, and by those who live in groups with greater dependency on others. Only a theory which suggests that morality is an adaptation for regulating group-level functioning could account for these results. That the dataset used to generate these conclusions is not idiosyncratic is also suggested by our ability to replicate well-known findings in moral psychology, such as the 'Action Principle' and 'Contact Principle'. [77] For all of these reasons, we believe that the Human Superorganism approach to understanding the moral domain has been shown to be highly predictive of moral sentiments and behaviours.

Some might argue that the tests conducted here support the proposition that morality has a group-level function, but not necessarily a superorganism-based function. However, we believe the demonstration that people moralize offenses dealing strictly with informational and systemic violations just as strongly as ones involving standard concerns of economic, corporeal harms or fairness in social dealings is strong evidence that these results are not just 'groupish' but 'superorganismal', since it was only by taking the nature of a superorganism into account that this suite of functions was identified in the first place. Further, most tests are based on predicting the consequences of increased exposure to the kinds of social life which HSoT postulates morality evolved to support: large-scale, often anonymous social groups like cities and nation-states. In many tests, it is those living in truly 'modern' conditions, associated with metropolitan life, that express the greatest divergence from others. Finally, the implication from the surgeon scenario is that a more professional and specialized role is being willfully foregone,

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and that is presumably what people find wrong about the individual's action in that case. So we believe this test in particular demonstrates that concern is over the loss of social contribution from the individual, which is judged to be more wrong by those living in superorganism-like conditions. We argue these are predictions and results that would not necessarily derive from a simple 'groupish' perspective on morality, but are specific to 'superorganismal thinking'.

All of this depends on the legitimacy of the suggestion that human societies can profitably be considered (crude) superorganisms. As indicated earlier, the truth of this assertion depends on human society having undergone a major transition toward strong group-level regulation of social life. An example of regulation at the social level can be seen in eusocial insect colonies, where the lifespan, growth rate and rate of reproduction of these colonies are nearly indistinguishable from those of individual organisms (scaled to their difference in sizes), suggesting that superorganisms obey the same kinds of metabolic rules as units at the lower level of organization. [92] Similarly, human social networks regulate metabolic features of the individuals within them. In particular, a person is 10% more likely to be obese if the friends of their friends' friends are obese, even if they don't know those people directly. [46] People are not aware of the structure of their own networks, and do not control them. Yet how people are connected determines what kinds of functions the network can perform, as well as its qualities (e.g., people tend to be happier in denser networks). Human social networks thus have emergent properties – the primary quality of a complex adaptive system. For these reasons, the collective of all social networks in a population can be called a 'human superorganism'. [46]

Of course, the mechanisms through which social control occurs remain important. Human superorganisms differ from eusocial insect colonies in not being able to depend on the genes in such groups sharing a common fate – genetic diversity is much higher in human societies than among haplodiploid social insects. Nor do individuals acquire all their goods directly from those who produce them. Hence kin selection and reciprocal altruism cannot explain the level of cooperation observed in modern human societies. Here, we have argued that the function of moral concerns is to induce behaviours that help such ultrasocial groups cohere, both through fear of punishment for anti-social behaviour and the promise of rewards for pro-social behaviour. This need for regulation arose because of the incredible degree of interdependence between people living in societies characterized by a sophisticated division of labour.

Specific actions may also be required by one superorganism, but not another. How these behaviours are selected for moralization is an interesting question. HSoT suggests this process is related to the action's ability to demonstrate pro-social tendencies, or to the action's relationship to some superorganism function. While there may be some arbitrariness in the initial choice of practices used to demonstrate prosocial intentions and trustworthiness, there is likely to be some selection of those which serve a social function. This is certainly the case for manners, for example, where European rules of etiquette that had hygienic functions (e.g., urinating in private) were more likely to persist over several centuries than those which were simply local conventions (such as where to place one's hands during a meal) [91]. Inter-group variation in moral codes can thus be arbitrary and non-functional in their origin, but probably become functional once they become sanctionable moral practices, as they reinforce social cohesion and limit cheating.

A benefit of HSoT is that it provides theoretical support for current legal manifestations of social regulatory systems, such as contemporary criminal codes, which have previously lacked theoretical foundation in morality, because HSoT and criminal codes cover similar ground. [90] A major advantage of HSoT is therefore that it brings a society's legal systems much closer to

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its moral systems – they can be shown to overlap in content to a much greater degree than when moral justification is based on traditional approaches limited to fairness and harm, or even the six different foundations of Moral Foundations Theory. [93] In particular, the categories of moral concern identified in this way also map closely onto the types of offenses in a consensus-based criminal code derived from legal codes from around the world, suggesting that HSoT is consistent with the kinds of problems that social groups actually need to solve through sanctioning systems. HSoT can thus provide a parsimonious yet powerful way of delineating the domain of real-world moral concerns. This could present a significant boon to legal scholars and others seeking to legitimate the criminalization of particular kinds of anti-social behaviour.

Given the empirical demonstrations shown here and these practical uses, we conclude that Human Superorganism Theory is a powerfully grounded, parsimonious explanation of what human beings find morally offensive that can guide scientific work and provide everyday utility as well.

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Appendix 1: Functions in the Human Superorganism

The human super-organism needs to work properly in many ways. Here, we discuss each of its functions in some detail.

Boundary

The boundary serves two natural functions: it keeps the outside from being inside (i.e., establishes a physical line between self and non-self), and helps to defend what is held inside from threats originating in the environment (e.g., the role of cell membranes and multi-cellular skin). In the case of the human superorganism, the primary job is to keep unwanted people and hazardous substances out of the social 'body'. The Border Patrol and Coast Guard services in the United States, for example, regulate immigration, exercise customs (i.e., prevent entry of illegal goods and hazardous materials), and control the spread of disease into the country with their quarantining authority. Socio-political boundaries serve as markers of geographic territory, and as the site at which defensive agents can be deployed.

Boundaries can also move: human superorganisms can grow during their life-spans, by increasing the number of families within it, either internally (through demographic 'success') or externally, by taking over members of other groups (e.g., through immigration). Growth can also be achieved by conquering entire groups (e.g., by invading a country with a military force) and thus incorporating surrounding territory, changing the location of boundaries.

Enforcement

Sometimes the boundary is ineffectual in protecting the group from hazards (e.g., at organism level, letting in pathogens, or at superorganism level, social parasites). This requires a second line of defense against threats that are (or have become) internal to the group. As stated above, this is the category of primary interest here because it includes moral action.

There are several kinds of threats in fact (see Table 6). First, there can be problems with those who do not perform their social roles – social parasites, whether they are born into the group, or infiltrate it – who need punishing. Sometimes, even those who are 'insiders' don't follow through on their responsibilities, or break the rules; these individuals need punishing. This is a job that, in the human superorganism, every citizen is informally expected to perform. Types of informal punishment are typically somewhat limited: shunning, verbal abuse, refusal to cooperate, or mild pain inducement.

Table 6: Types of Enforcement

Type	**Who**	**Reason for punishment**
Informal	everyone	non-performance of social role
Second-order	everyone	non-performance of informal enforcement role
Formal	police/judges	'criminal' enforcement (e.g., murder, assault)

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Further, what can be called 'second-order' enforcement, or the punishment of non-punishers, is directed at those who did not perform their function as informal punishers of primary offenses. Reinforcing the non-enforcers to toe the line, or punishing those who engage in non-performance of the enforcement role helps to produce group cohesion. [71,94]. However, perceived responsibility to perform this function can be dissipated by the presence of others in equal position to take on the task (the so-called 'bystander effect'). [81]

Others (e.g., the police and legal system) are also weighed with the professional responsibility of punishing norm violators in the group. This formal enforcement is usually left to the police because enforcement in such cases is considered dangerous (e.g., targets violent offenders), is more serious (e.g., incarceration or major fines) or requires the authority of the state to 'stick'. What gets punished in this case is often 'criminal' malfeasance, which can include over-zealous punishment of within-group members without due cause (e.g., murder, assault). These acts of criminal enforcement are typically motivated by moral sentiments – that is, the individual who perpetrates the crime thinks they have a moral reason that justifies the act (e.g., she is my sexual partner and has violated our relationship; the 'condemned' are members of an irreligious community), but the logic is not generally recognized in the cultural group. This includes the category of 'crimes against the person' (in particular, their body – in the form of suicide, drug use, homicide, or assault and battery – or liberty, via slavery or abduction).

Note that, from a superorganism perspective, 'unlawfully' eliminating a member of the group is also an offense against production (due to lost economic benefits), and reproduction (particularly to the family to whom the member belonged). These ramifications make unwarranted violence against insiders emotionally reprehensible. Superorganism theory thus suggests that it is legitimate to injure or take the life of others if they are outsiders (especially in the context of intergroup conflict), and insiders too, if they are not being a 'good citizen', but that punishment of 'good citizens' is itself punishable.

Structure

Structures like a vertebrate's skeleton maintain spatial and functional relationships among an organism's components. In a superorganism, structures include physical infrastructure such as city buildings, electricity, transportation and other public service systems. (Note, Structure is restricted to physical structures and processes; social processes are under the Control function below.) Thus, hampering this function is associated with vandalism of public facilities (including religious buildings, cemeteries, monuments, historic sites, and military installations), sabotage (major disruption to government functions, the use of public services and potentially major economic loss), and mischief with respect to services (including transportation, water supply, postal services, voting). These actions can destroy or damage public property, render it dangerous or inoperative, or obstruct its proper use or enjoyment. Such practices are often exhibited by juveniles, perhaps because adolescence is a period during which individuals reflect on whether or not to follow social norms and conformist social roles. [95,96]

Hate crimes (e.g., ransacking a church or synagogue, abortion clinic or vivisectionist research lab) are a related phenomenon, which interferes with working relationships among subgroups of the superorganism (even graffiti is often sexist or racist or directed against religious groups). These kinds of offenses are often considered to be relatively minor, but can involve substantial expense to the public purse, and be disruptive to (the quality of) public life. Vandalism can also risk public safety (e.g., by taking place in a context of rioting, where destruction of public property is used as a tactic of political protest).

Reproduction

Reproduction is the most crucial function for any living system, which must survive and duplicate itself (when it cannot persist indefinitely), or simply cease to exist. Insect superorganisms often reproduce by going through a 'reproductive funnel' (all reproduction is handed over to a single individual, the hive queen), but in the human superorganism (as in mammalian societies generally [97]), the unit of reproduction is the family, which produces copies of itself through a complex process of producing component parts – offspring – who then combine with members of other families to form new families. These cooperative breeding units are necessary in humans because it is advantageous to recombine genetic adaptations. This requires sexual unions between unrelated individuals (so there is an optimal outbreeding distance [98]). Because offspring are born highly immature and dependent, they also require investment from multiple individuals (ideally), so mothers pair-bond long-term with fathers to help provide that care and the necessary resources, both physical and cultural (since children have a lot to learn as well, being born altricial), for proper growth and development of the new member of society.

There are several ways for a family to fail to reproduce itself: poor choice of mate (e.g., same-sex coitus), or misallocation of reproductive effort (e.g., incest, as a failure of family members to mate outside the family, and thus reproduce the family unit). So in addition to the usual faults of stealing the reproductive resources of others (e.g., rape, child molestation), and inappropriate allocation of mating effort (e.g., bestiality), there is the potentially immoral action of not investing sufficiently in being a parent by failure to raise independent, pro-social offspring (e.g., neglect or abandonment of a child).

Control

Control, as conceived here, is essentially about subsystems that contribute to the guidance, coordination and regulation of the internal system. Group-level control in a superorganism begins when some individuals restrict access of others to resources; this happens when social dominance or status conflicts arise. Alternatively, groups of low-status individuals can gain power by involving themselves in political coalitions. [99] Where boundary functions are directed toward outsiders, control functions are about regulation of internal processes, particularly social processes (unlike the Structure function). These processes occur at several levels of organization. Human superorganisms contain organisations like government, businesses, religious groups, and fan clubs – one of the unique features associated with human ultra-sociality. These organisations help to coordinate actions among the members that belong to them, and to define relationships between those who belong to different organisations as well. In this way, they help give structure to social relationships. Local institutions (both public and private) and national governments serve to regulate many of the other functions of those within their jurisdiction. These tend to be dominant forces in HSoTs in 'making the rules' by which those in the group live.

Production

Production in the form of economic work is one of the primary requirements of any person living in a human superorganism. The individual's obligation is therefore to find their most economically valuable role in their human superorganism, produce their output as efficiently as

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possible (i.e., to the best of their ability), and then make it available to the group as a whole. Failure to engage in any of these aspects of production should be culpable. Hence, engaging in subterfuge with respect to the rights of property, including intellectual property (so-called 'white collar crime'), and thus gaining an unfair advantage in business, should be morally reprehensible.

Storage

As soon as people began to modify their environments in relatively durable ways through their own labour, there was a need to defend these modifications from theft or appropriation. This includes shelters and tools, which had to be guarded by corporate groups (beginning with families). With the rise of agriculture, social systems began to accumulate surplus material resources which required storage (e.g., seeds for subsequent planting). Safeguarding such stores became an important function for survival of the group. Destruction of these agricultural stores (e.g., destroying domesticated animals) should therefore be considered harmful. Failure to conserve resources (i.e., waste) or to set aside some portion of surpluses for a 'rainy day' can also be seen as failures to optimally allocate resources over time, as well as reckless consumption or loss of resources (e.g., through gambling). Finally, there are criminal failures associated with 'storing' people against their will – i.e., so-called 'offenses against liberty' such as confinement, detention and slavery – and not recognizing the value of 'human capital', or mistreating people as economic goods or chattel (e.g., slavery).

Distribution

Distribution is one of the primary needs once a social system involves a division of labour, as no one then produces all the means necessary to survive themselves and must acquire some of what they need from others in the group. [100,101] This is obviously the function of an economy (whether regulated or free market). Failures to abide by the rules of exchange (i.e., theft, breaches of contract obligations, debasement of the means of exchange) should therefore be important targets of moral retribution.

Excretion

Animals of any kind should not surround themselves with their own wastes as this exposes group members to infection. Thus, there are always (implicit) rules in place about how to increase the distance between group members and their own waste (e.g., defecation grounds). This category has been extended in humans to include rules for controlling the social effects of any of an individual's metabolic processes, such as eating, flatulence, or sneezing (i.e., manners). At the superorganism level, people should also be punished for not contributing to the production or maintenance of clean public spaces as well as sanitation systems such as sewers.

Perception

By perceiving its external and internal environment, an organism maintains and updates its awareness of current conditions. A vital task is to continually update information about any threats and opportunities arising, either from the external environment or from activities within the group itself. Those who manage to gain access to such information have an obligation to share it with others in their human superorganism. Failure to do so, or to convey false

information, can cause damage or result in lost opportunities, and hence represent moral failures by the responsible parties from the perspective of the human superorganism.

Memory

A living system learns through experience. If the information acquired in this way is not stored, it is lost. Whatever good information individuals have, and whatever useful learning that those in the group acquire through experience, should be stored for later use by themselves or others in the group should similar situations recur. Human groups depend significantly on information stored in linguistic form, which enables many new kinds of more specific information (e.g., social reputations) which can be distributed diffusely throughout the group (as in the nervous system of a multi-cellular organism). (Reputations begin even earlier than Mammals, however: individual contributions to social production can be remembered and recalled even by fish. [102]) Groups often use older members of the group as stores of such information, as they are most likely to have had a wide range of experience, and to have survived those experiences. 'Forgetfulness' should therefore be a 'sin' (e.g., letting old people die without 'downloading' their wisdom). Group or cultural memory of the group's history should also be seen as valuable as a means to preserve group identity.

Communication

Coordination of functions often requires that different sub-systems get inputs about what is happening elsewhere in the system. This is the job of the informational equivalent of the circulation system that transfers material between components. In HSoT this is accomplished at the inter-individual level by linguistic exchanges (e.g., gossip about reputations). This function is facilitated by technological infrastructure such as the telecommunications networks and world wide web, which allow communication between individuals who aren't geographically proximate to one another. Misrepresentations of one's own status or that of others in the social group (i.e., crimes related to reputation) are the primary cause of moral censure with respect to this function.

Signalling

Sometimes it is also necessary to exchange information with the outside environment, including interacting with other superorganisms. Signalling typically concerns the (symbolic) power of the group as a whole (e.g., in inter-group conflicts), not the functioning of particular processes within the group (which affects Control). Signalling can be cooperative or combative in intent, depending on the context and target. This 'supersocial' communication between groups may involve translation from one language to another, or simple use of displays. For example, it is likely that the evolution of eusociality depended on a high level of group selection, which could have been associated with intergroup conflicts that began as territorial displays by large groups of soldiers (larger groups of soldiers indicate larger group size and hence greater colony strength). [103,104] The HSoT equivalent is obviously military parades and displays of weaponry, exemplified by the concept of mutually assured destruction – the display of weapons so powerful it is not necessary to actually use the weaponry in an attack. (Symbolic displays can also be important in the context of mating (e.g., leks and bower bird nests); [105] however, this context seems irrelevant to relations between superorganisms.) Defecting on participation in such aggressive displays could have been a significant cost to the group.

Signalling can also be important in cooperative situations, to indicate that a superorganism is a trustworthy partner for international trade or exchange, for example. Signals can also serve as markers of membership in cultural groups – e.g., political coalitions of superorganisms such as NATO or the Allied Powers in recent Western history. It is the job of diplomatic ministers to maintain good relations between governments, and public relations departments between organisations belonging to different superorganisms. The crime of treason or sedition (expression of sentiments in favour of or inciting insurrection against the established order) obviously undermines both cooperative and combative relations between human superorganisms by making the group look weak or uncoordinated.

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Appendix 2: The Questionnaire

- **What is your gender?**
  - Male
  - Female

- **What is your relationship status?**
  - Single (never married)
  - In a relationship, but neither married/in a civil partnership, nor living together
  - Living together, but not married/in a civil partnership
  - Married (first marriage)
  - Civil partnership
  - Separated (but still legally married)
  - Divorced
  - Divorced and remarried
  - Widowed
  - Widowed and remarried

- **How many children do you have?**
  - None
  - One
  - Two
  - Three
  - Four
  - Five
  - Six or more

- **What is the highest level of educational qualification you have attained?**
  - Did not complete GCSE/CSE/O-levels of equivalent
  - Completed GCSE/CSE/O-levels of equivalent
  - Completed post-16 vocational course
  - A-levels or equivalent
  - Undergraduate degree or professional qualification
  - Postgraduate degree
  - **Still in education (Dependant question – if they select this then the following appears:**

    ● If you are still in full time education, what is the highest level of education you expect to obtain?
    (Help Text = *If you are being educated outside the UK, please choose a UK-equivalent. GCSEs are usually taken at 16; A-levels are usually taken at 18.)*

  - *Do not expect to obtain GCSE/CSE/O-levels*
  - *GCSE/CSE/O-levels*
  - *Post-16 vocational course*
  - *A-levels*
  - *Undergraduate degree or professional qualification*
  - *Postgraduate degree)*

- **What is your occupational status?**
  - Still at school
  - At university
  - In full-time employment
  - In part-time employment
  - Self employed
  - Homemaker/full-time parent
  - Unemployed
  - Retired

- **Select the category that best describes your occupation:**
  - Accounting/finance
  - Administration
  - Business development
  - Consultancy
  - Customer service
  - Education/training
  - Engineering/R and D
  - Executive/senior management
  - Healthcare
  - IT
  - General management
  - Government/military
  - Homemaker
  - Legal
  - Manufacturing/operations
  - Media
  - Medical/science
  - Personnel
  - Policing
  - Professional
  - Purchasing
  - Sales/marketing/advertising
  - Skilled labour
  - Other

- **Which of these descriptions best describes the sort of work you do?**
  - Professional and technical occupations (e.g. doctor, teacher)
  - Higher administrator occupations (e.g. banker, high government official)
  - Clerical occupations (e.g. sales manager, insurance agent)
  - Sales occupations (e.g. sales manager, insurance agent)
  - Service occupations (e.g. restaurant owner, police officer)
  - Skilled worker (e.g. motor mechanic, printer)
  - Semi-skilled worker (e.g. bricklayer, bus driver)
  - Unskilled worker (e.g. labourer, porter)
  - Farm worker (e.g. farmer, fisherman)
  - Other

- To which social class do you identify yourself as belonging?

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- Lower working class
- Middle working class
- Upper working class
- Lower middle class
- Middle middle class
- Upper middle class
- Upper class

What follows are some questions about your life story.

In which country did you spend most of your childhood and teenage life?
How many countries have you lived in during your life-time?
With which religion do you personally identify?

- No religion
- Christian (including Church of England, Catholic, Protestant and all other Christian denominations)
- Buddhist
- Hindu
- Jewish
- Muslim
- Sikh
- Other

Are you a regularly practicing member of this religious group? [y/n]

In what size of community have you spent the most time living? (village [< 1K], town [< 10K], small city [< 100K], major city [> 100K], metropolis [> 1 million],no preference)
In what size kind of community would you prefer to live? (village [< 1K], town [< 10K], small city [< 100K], major city [> 100K], metropolis [> 1 million], no preference)

We'd now like to you to comment on some statements concerning various topics. In all cases there is no 'right' answer; we are simply interested in your honest opinion.

- There is no universal right or wrong; whether something is wrong depends on the culture in which you are raised. *(strongly disagree, disagree, neutral, agree, strongly agree)*
- I often do favours for other people. *(strongly disagree, disagree, neutral, agree, strongly agree)*
- I sometimes get into physical fights. *(strongly disagree, disagree, neutral, agree, strongly agree)*
- When seeing something unfair happening, I have to do something about it. *(strongly disagree, disagree, neutral, agree, strongly agree)*
- We now live in a global society. *(strongly disagree, disagree, neutral, agree, strongly agree)*
- When making decisions, I always consider the effect my actions will have on others, and try to do those things that will bring other people the greatest benefit. *(strongly disagree, disagree, neutral, agree, strongly agree)*
- I really get angry when I see someone taking advantage of their social position. *(strongly disagree, disagree, neutral, agree, strongly agree)*
- I argue a lot with others. *(strongly disagree, disagree, neutral, agree, strongly agree)*

These questions have a different kind of answer, asking how you feel when something happens. In all cases there is no 'right' answer; we are simply interested in your honest opinion.

I step in dog poo. ***(very disgusting, somewhat disgusting, slightly disgusting, not disgusting at all)***

I accidentally touch someone else's bloody cut.***(very disgusting, somewhat disgusting, slightly disgusting, not disgusting at all)***

The legal system should deal with people who harm others by (choose one):

- Putting them in prison (incarceration)
- Physically harming them in return
- Forcing them to repay their victims in some way

If a society imprisons offenders, it should be to (choose one):

- Punish them in proportion to what they did wrong
- Keep them apart from the rest of society and thus prevent further offenses
- Rehabilitate them so they can return to society when they have been 'made good'

Scenarios (accompanied by pictures) were then presented in the following order:

Order	Scenario	Category
1	A political journalist has a newspaper column in which he argues that a ceiling should be placed on immigration because people from other countries are 'dirty and do not have our values'.	Systemic
2	A woman burns her country's flag at a public demonstration.	Informational
3	A woman tries on an expensive dress in a shop, rips off the price tag and walks out without paying.	Material
4	The head of government signs a law that significantly increases taxes on the poorest members of society.	Systemic
5	An employee secretly sells her company's plans for an exciting new product to a competitor.	Material
6	A man loses a lot of money in a dubious business deal, and then – in an attempt to restore his finances – engages in a desperate, but losing, binge of gambling that leaves his family destitute.	Material
7	After successfully qualifying as a surgeon, a man gives it up to pursue the life of a street musician.	Placebo
8	An extremely rich sports star never gives any of her money to charity.	Material
9	A politician makes improvements to her personal home, but claims the costs as a professional expense, which is paid for by the taxpayer.	Systemic/ Material
10	For his own amusement, a man decides he will learn to play golf, but then never follows through on his decision.	Placebo
11	A woman runs a large paper-making company that causes significant deforestation in several countries.	Material
12	A rich banker arranges his financial affairs so he hardly pays any tax.	Systemic/ Material
13	A man has an on-going sexual relationship with his father's sister	Systemic

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	(his aunt).	
14	The leader of a country cuts defense spending so much that, when a neighbouring country attacks, she has insufficient military force to repel the attackers.	Systemic
15	A man's household sewer pipe breaks, leaking sewage into neighbouring properties, but he doesn't do anything about it.	Systemic
16	A woman gives an employee, who is also her cousin, a glowing recommendation for a promotion, even though she knows that her cousin is lazy and often doesn't show up for work.	Systemic
17	An officer fails to report one of his soldiers who fled, uninjured, from a battle, leaving his comrades to fight on without him. As a result, the soldier is not court-martialled.	Systemic
18	A man has non-consensual sexual intercourse with a drunken teenage girl at a neighbourhood party.	Systemic
19	A woman with the 'flu goes to her doctor's office to get a check-up, and sneezes repeatedly on patients in the crowded waiting room.	Systemic
20	A woman's son vandalizes a public building, but she doesn't take any corrective action against him.	Systemic
21	A woman often asks her friends for small favours but never offers to help them in return.	Material
22	A young woman learns that her teenaged sister has become a drug addict, but doesn't tell anyone about it.	Informational
23	A woman has a number of children in order to become eligible for higher family support payments from the government.	Material
24	Unlike all the other women in attendance, one woman does not wear a hat to a wedding ceremony.	Placebo
25	A woman lies about her academic qualifications and prior experience in a job application, and gets the job over a better-qualified person based on this application.	Informational
26	A woman sets fire to a museum, destroying many priceless artefacts and documents from her country's ancient past.	Informational
27	A protestor punches a politician in the face at a rally in a public square, inciting on-lookers to riot, which causes injuries to a number of people.	Systemic/ Material
28	A government bureaucrat charged with scheduling trials is a very poor organiser, leading to severe delays in regional court proceedings.	Systemic
29	An elderly, retired, terminally-ill man whose spouse and family have all died attempts to kill himself by taking too many sleeping pills, but is unsuccessful.	Placebo
30	A prominent academic publishes a book that argues a genocidal event in the country's past never took place.	Informational
31	A man breaks into a house while the family sleeps and takes a number of valuable objects, including several of deep sentimental value.	Material
32	An expert in charge of computer security for the national tax office fails to secure its website. The website gets hacked, resulting in the release of millions of people's private financial information onto the internet.	Informational

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33	A man competing with someone else for the romantic affections of the same woman circulates a false rumour that his competitor treated a previous girlfriend badly.	Informational

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Footnotes

[1] Other scholars are working in this area. Heylighen has previously argued that the functions of a human superorganism can be identified using Living Systems theory, but not in the context of morality. [63] Kesebir has suggested that morality helps regulate human superorganisms, but does not identify the specific kinds of obligations that would define a moral domain using this insight. [51]

[2] Other sources which are relevant, but which don't provide listings of system components, because they are largely about principles of self-organisation, include cybernetics and general systems theory [64,65] and biological self-organisation theory. [66]

[3] Obviously, there are aspects of any analogy which do not apply, so that, for example, a superorganism does not reproduce sexually, and a single family does not constitute or reproduce the whole superorganism, but rather can be thought of as the equivalent of a 'cell' in the larger group, with each cell having a greater or lesser probability of persisting over time. A family is the unit of superorganism reproduction in the sense that it is the smallest replicating organization at this level. The limitations of these analogies do not reflect weakness in the analogies themselves, but rather differences in the mechanisms by which organic forms achieve the same biological function at different levels of organization.

[4] Many people in the pilot study (and in on-line comments about the test) found it difficult to respond to these questions about scenarios, saying that their responses would vary depending on the degree to which the offense was intentional, or the socioeconomic conditions of the perpetrator, or other situational factors. (In particular, the punishment response depends on how the respondent interprets the degree to which individuals are allowed to punish; many thought this the job of legal institutions – as one would expect from HSoT.) However, including these dimensions would have made analysis more difficult, as it would have meant that the severity of response was due to these situational factors rather than the type of offense itself; the questions were therefore purposely designed not to include these elements in order to get a response which reflects only the participant's own process of generalizing across such contexts.

[5] Scenarios characterized by an offense that involves the omission of an action: 7,8,10,12,14,15,17,20,21,22,24,28,32; commission scenarios: 1,2,3,4,5,6,9,10,11,13,16,18,19,23,25,26,27,29,30,31,33.

[6] Contact scenarios: 13,18,27.

[7] Scenarios, grouped by type of affected/offended party (i.e., level of organisation):

- Self: 7,10,24,29
- Other (known) individual(s) (e.g., friends, neighbours): 9,15,16,18,19,20,21,25,31,33
- Own family member(s): 6,13,22
- Organisation (e.g., company): 3,5,8,17
- Country/Society-at-large/Major social group (e.g., poor people): 2,4,12,14, 23,26,27,28,30,31,32
- World-at-large (e.g., ecology, immigrants): 1,11

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[8] This effect holds for both first-order offenses (i.e., punish the offender) and second-order offenses (i.e., punish someone who has failed to punish the offender). Wrongness and punishment should be higher for first- than second-order offenses because failures to punish offenders is a job that can be performed by anyone, while failures to perform primary social duties are restricted to those playing particular roles. The mean wrongness score for first-order offenses is higher than second-order offences (6.16 vs. 6.02 respectively, $p < 0.001$; first order offenses include all scenarios but 17 and 20, which are second order); and for mean punishment score first-order vs. second-order offences (3.98 vs. 3.85 respectively, $p < 0.001$). However, second-order punishment should be higher in larger, more complex societies if larger groups depend to a greater degree of moralistic sentiments and actions to achieve social cohesion. Willingness to engage in second-order punishment also differs significantly by community size, $F(4,78362) = 12.94$, $P<0.001$; the differences lie between all smaller community sizes and metropolises ($p < 0.001$ for all comparisons) and between villages and large cities ($p = 0.025$). [80]

[9] The public context of the offensive act (which is not obvious in all cases): Public/overt display/seeking to be 'caught': 1,2,3,4,15,17,27,28,31; private/covert: 5,6,7,8,9,10,11,12,13,14,16,18,19,20,21,22,23,24,25,26,29,30,32,33

[10] In this analysis, we included all Western countries with 200+ respondents (n=74181 from 21 countries: UK, US, Australia, Canada, New Zealand, Poland, South Africa, Germany, France, Netherlands, Sweden, Norway, Spain, Belgium, Italy, Finland, Greece, Switzerland, Demark and Portugal). The Middle Eastern countries (N = 502) included Afghanistan, Armenia, Bahrain, Bangladesh, Egypt, Iran, Iraq, Kuwait, Oman, Pakistan, Qatar, South Arabia, Syrian Republic, UAE and Yemen.

[11] The moral/conventional distinction does mean that the same behaviour might be seen in two different ways by different people – indeed which particular behaviours are seen as conventional and which as moral is a function of the social group in question (in fact, this is one of the predictions of the HSoT approach). If a group has turned a particular behaviour into a way of signaling pro-social intentionality or an example of conformity with arbitrary norms (as wearing a hat can be), then for that group, it has a superorganismal function of helping coordinate social cooperation in large, anonymous groups, where such signaling can be important. There is a common conception that some behaviours should not be considered moral because they are 'victim-less' (e.g., eating the wrong food), but these have been moralized in some groups too, again as a signal of in-group membership or group conformity. Marking group membership is a superorganism function of signaling to outsiders (i.e., the Signalling function), but which behaviours are used to facilitate this function can vary.

[12] MFT and HSoT share some intellectual foundations, as Haidt has argued that major transitions in human evolution led to superorganisms, and that morality is an evolved solution to the free rider problem. [40] Nevertheless, we argue that the current paper makes a number of advances over MFT: it provides a derivation of the functions characteristic of human superorganisms, then links those functions to categories of moral concern, and finally demonstrates empirically that the new, extended domain is consistent with the actual concerns of a global sample of people.

[13] The sixth dimension, liberty/oppression, was added in 2011, and several others (including honesty, ownership, and self-control) are currently being investigated as well. [40]

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[14] Kesebir (2012) argues that each of the foundations of MFT has a specific role in the human superorganism (working from the earlier version with five dimensions). She suggests that purity/sanctity is about preservation of the 'natural order' and of the 'meaning system', thus distinguishing moral acts from the mundane. The harm/care foundation derives from the mammalian system of attachment (between mother and offspring). It underlines the basic moral capacity to dislike the pain of others. The in-group loyalty foundation involves hostility toward free-riders and traitors, and is concerned with 'sharpening group boundaries', while fairness/reciprocity underlies the human concern with egalitarianism (i.e., economic exchanges). Hierarchy/duty calls for respectful submission to legitimate authorities, institutions and cultural traditions.

[15] The MFT questionnaire includes items on cultural history or tradition related to Memory, but categorizes them differently.

[16] However, one of the dimensions 'currently under investigation' by those associated with MFT [40] is 'ownership', which arguably is a psychological motivation underlying Production and Storage of goods and services, while another, 'honesty', could be said to be associated with moral performance of the information functions of Perception, Memory and Communication (e.g., reputation management). In this way, several of the 'holes' in the comparison in Table 6 could be filled, making MFT more similar in range to HSoT, although still without the simple theoretical definition of the moral domain as cheater suppression mechanisms in human superorganisms. Haidt's definition [40], by contrast, is this: 'Moral systems are interlocking sets of values, virtues, norms, practices, identities, institutions, technologies, and evolved psychological mechanisms that work together to suppress or regulate self-interest and make cooperative societies possible.' This definition does not limit morality to humans, as many species have evolved psychological mechanisms to support cooperation, or if restricted to humans by the focus on institutions and technologies, does not describe why we need these extra mechanisms in order to cooperate effectively.