On the Evolution of Norms Aggregated in Homo Sapiens as Required by the Interdependence Hypothesis

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Abstract: Normative phenomena can be described in aggregative terms – as evolutionary phenomena in ultra-social species homo sapiens (sapiens), as Michael Tomasello has shown in his evolutionary story *A natural history of human morality*, where the so-called *interdependence hypotheses* plays the most important role. In this paper, along with this hypothesis, key concepts of normative aggregation will be defined. From the evolutionary (i.e. natural) perspective, this approach makes it clear what norms actually are, that is a specific (complex) group behavior, and nothing more.

Keywords: Normativity, evolution, normative aggregation, group behavior, interdependence hypothesis.

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1 Introducing Remarks

This paper will outline that what is usually understood by normative phenomena is nothing more than particular group behavior, which is describable by the theory of evolution. By combining many phylogenetic and ontogenetic studies and experiments, the anthropological approach of Michael Tomasello and colleagues showed the fact and how of the development of social and moral norms during the evolution of Homo Sapiens. Thus, norms emerge from nature, which already indicates that there is no is-ought problem or natural fallacies here. Within this context, it is possible to use the term 'normative mechanism' or 'normative function', which are proposed to be aggregative. Hence, normative mechanisms can be described by normative mapping functions.

The following schematic drawing is set within the field of so-called "evolutionary ethics" or "biological ethics," but these terms are still misleading, because the majority of people uses the term "ethics" unscientifically. The composition of "ethics" with "evolution" and "biology" is still often attacked by humanists as a naturalistic fallacy or impermissible reduction. However, because *ethics* is still an unscientific concept and as such can hardly be precisely defined, we will use the term *normology* for a genuinely scientific study of normative phenomena as mechanisms of *group behavior* embedded in evolution.

Definition 1. (Normology)
Normology is the scientific approach that uses interdisciplinary empirical and mathematical theories to precisely describe normative phenomena, i.e. origins and elements of normativity.

Within normology, we can distinguish between *theoretical* and *practical* normology. The first focuses on the empirical and mathematical approaches of normativity; the second is about applying these theories to society, for example the re-structuring of politics and education and also in technology, today mainly in the computation of so-called *moral machines.*

Until the present, however, normology has been in a difficult position. There is fear of naturalization of humans or even of "social Darwinism."[1] This fear is groundless. A better understanding of normativity can lead to a more humane and just civility. Society can be better organized if we really understand normative phenomena. Additionally, digital revolution pushes our understanding of how social and moral norms arise. The progress in artificial intelligence requires the precise parameters of *normative programming.* Humans can only find answers here if they better understand and describe the principles and mechanisms of norm formation in human beings themselves.

Continental philosophy in particular, as the watchdog of humanism and enlightenment, unconsciously rather than consciously prohibits an in-depth understanding of normative mechanisms. It is a matter of time that old humanistic fears will be overcome. There

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[1][Har12, 559]

are signs of this. All over the world, there are already proper approaches in the direction of normology. Philip Kitcher's *The Ethical Project* already went in the direction of an evolutionary ethics.[2] And Peter Stemmer's approach of *ontologically embedded normativity* shows that normative phenomena are specific natural phenomena.[3] These approaches have already opened up the possibility of a new science of norms: normology. The quest to understand normativity must, at least partially, leave philosophy and become a concrete theoretical branch of anthropology, and Tomasello is a pioneer here.

In the paper *On a Mental Viewpoint Concerning Aggregative Normativity*, the author has already outlined the necessary elements, i.e. principles of normativity as aggregative behavior of human individuals. In that paper, we speak of the theory of *aggregative* normativity (TAN) in contrast to the other, mostly traditional theories of normativity. Thus TAN is a *special* theory of normativity. In the present paper, we naturalistically unfold the idea in the direction of a theory of *normative* aggregation (TNA). The focus here is on normative aggregation as only one kind of aggregation. Thus, normative aggregation is only a special case of a *universal* aggregation. In other words, we proceed on the assumption that every norm is inherently aggregative.

According to TAN, the necessary principles or conditions of all normative behavior are still aggregativity, mentality (or intentionality), and rationality. And all this is embedded in nature, so that the *existence condition* will be explicitly mentioned in the following specifications of the TNA.

Proposition 1. (Theory of Normative Aggregation – TNA)
TNA is the theory that normativity involves the following four necessary conditions, where (i) and (ii) are considered ontological and (iii) and (iv) epistemic:
(i) existence of something (existence),
(ii) existence of mental states (mentality/intentionality),
(iii) laws of nature as rules of aggregation (universal aggregativity),
(iv) logical rules (rationality).

Condition (i) only seems strange in the domain of normativity, but it is also evident that norms must somehow exist.[4] And why should condition (ii) be a necessary condition of normativity? Because without mental states there can be no ability to suffer or to avoid suffering and thus to *desire* something, and without all of this, normativity seems to make no sense. However, instead of the term "mentality"—as a property of all mental states—Tomasello[5] uses the term "intentionality," which he takes from philosophers, above all from Searle. For Searle, intensions are *particular* mental states.[6] There is a big debate about whether intentions are mental states (e.g. Searle, Davidson) or just identical with the cognition of action or the acting behavior itself (e.g. Anscombe). It

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[2]Cf.[Kit11, 3]
[3][Ste08, §3-4]
[4][Ste08]
[5]our point of reference
[6]Cf.[Sea93]

is all about the old mind-body problem. For our purposes, it is sufficient to set out that intentions are a subset of mental states, i.e. intentionality is a part of mentality.

And why assume laws of nature for normativity at all? Because everything that exists shows some regularities, otherwise we would not be able to describe anything. Laws of nature are usually understood epistemically or nomologically, i.e. physically as the most general rules of the observed. And if they are not just epistemic, then they must be assumed to be ontological, as something existent, but now in a particular way.

Condition (iv) as the principle of rationality is hardly controversial in discourses of normativity. This condition entails logical rules of consistency, because contradictions in normative decisions—about what individuals intend—cannot be generalized. Contradictions tend to annihilate themselves, at least at one point in time and space.

In the evolutionary context, Tomasello assumes only an *instrumental* form of rationality.[7] The notion *instrumental rationality* is simply the consistency requirement applied to the ends-means relation, so that if a certain end is held, and it is necessary to achieve this end only by some particular means (and only by these means), then it is rational to use these means to achieve this end.

In discourses of normativity of rationality, so-called *substantial* rationality is discussed as opposed to instrumental rationality. This type of rationality presupposes some criteria according to which the pursued ends can be *evaluated* as right and good, i.e. here the *quality* of ends is involved. But until the present, these criteria are not captured, i.e. there is not even a minimal agreement on what makes goals or goods *substantially* rational. As long as this is the case, substantial rationality/fin German: Vernunft remains a mystery or simply a metaphysical remnant.

In the following, rationality is functional speaking an instrumental condition and mathematically speaking simply a *structurally* necessary condition of normativity, i.e. it is an epistemic set of rules for inferences according normative phenomena. The instrumental rationality can be understood as a subset of structural rationality, which entails the requirements of consistency and completeness. The *qualitative* property of individual ends is given in the presupposed mental states.

At this point, it may not be irrelevant to what follows to further specify some crucial concepts Tomasello uses, to align these with our concepts (although we claim more precise concepts).

What Tomasello calls *morality*, we call normativity. He reserves the word *normativity* for *cultural norms* in the developed human cultures of very large groups, where normative aggregation does not take place directly between individuals, but is already normalized, codified and handed down. We want to define normativity in a much more general sense, so that morality would appear to be only one kind of normativity.[8]

What we call mentality, Tomasello calls intentionality, which has a rich ordinary lan-

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[7][Tom16, 35]
[8]We define *morality* and *normativity* below.

guage based on phenomenology, but which he actually identifies with *psychological mechanisms*.

Rationality is what Tomasello also calls rationality, and is meant by him to be an instrumental property of human cognition. However, as a psychologist, he does not sufficiently reflect the ontological presumptions behind this concept, a criticism which also applies to the rest of his concepts. But some presumptions can be inferred from his evolutionary narrative which suggests one and only one natural world. Tomasello is primarily trying to grasp the *natural* mechanisms in the evolution of morality and narrate an evolutionary story. The task is to extract the logical structure of normativity from his research and narration as clear and precise as possible in order to use that for TNA.

So it is asserted here that our approach is almost compatible with and supported by the evolution of morality developed by Tomasello and colleagues. In what follows, we identify compatible elements, try to structure and order the concepts, and discuss how far science has advanced in understanding morality, i.e. normativity, as a pure natural phenomenon.

2 Evolution of Normativity

2.1 Aggregation

Tomasello provides an evolutionary account of the emergence of human morality based on the assumption that human morality is a *form of cooperation*, "specifically, the form that has emerged as humans have adapted to new and species-unique forms of social interaction and organization."[9] In this account homo sapiens is an ultra-cooperative primate, and as such the only one with morality. In contrast to humans' nearest living relatives—the great apes—early human individuals became ever more interdependent with one another for survival support. But sociality is not necessarily a survival trait. There are many species that live relatively solitary lives, also for reasons of survival. But there are also many species that stick relatively close to others of their kind to form *groups*. The evolutionary function of this group-formation is primarily protection against predators.

> *Such* safety-in-numbers *sociality is sometimes called cooperation, as individuals aggregate with others relatively peacefully. But in more complex social species, cooperation may manifest in more active social interactions, such as altruistic helping and mutualistic collaboration.*[10]

All this complexity presupposes the existence of quite a lot, above all the existence of *individuals* themselves.

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[9][Tom16, 2]
[10][Tom16, 9]

Definition 2. (Individual*)
An *individual** is an organism (distinct from other organisms) with more or less complex cognition or behavior.

This definition is suitable for all kinds of species, not only humans, but also, for example, honey bees. A species is a set of individuals* that form a reproductive unit of individuals* with common features which are determined on the basis of external or genetic properties.

Although we introduced normativity above, this definition is not yet sufficient for our normative purposes. Since, mental states or intentions in the organisms are necessary for normative behavior.

Definition 3. (Individual)
An *individual* is an individual* having some mental or intentional states.

We deliberately do not speak of *persons* here, as philosophers often do. Because persons are already understood as so-called "moral subjects" (with autonomy, duties, and rights). Our definition of individuals is minimal and based on Tomasello. For him, great apes are already *individuals* as well as many other intentional living beings, even if they do not have any individual rights.

Tomasello distinguishes socially living *individuals* from solitary living *individuals* and, within all socially living individuals, from ultra-social or ultra-cooperative individuals, namely *homo sapiens* with its features of cooperation. Within a social or ultra-social species, individuals naturally form *groups* in which they build relations to others of their kind. The necessity for the formation of sociality is actually what Tomasello calls *interdependence.*

Definition 4. (Interdependence)
Interdependence is a set of necessary relations that individuals have with each other, such that each individual is a necessary condition for himself and every other individual to survive.

Interdependence can only be a property of individuals themselves[11], which have to coordinate their behavior for the sake of survival. Further, it can be assumed that individuals, in addition to a set of **inter**dependent or social properties also have a set of **in**dependent or private ones, because of its distinction from its peers.

Given these properties of individuals, how is the group of individuals to be determined? And most of all, what could be a mathematical representation here? What can be said now is that a group formation (be it species, kind or genus) is a form of aggregation, and aggregation can be defined as follows:

Definition 5. (Aggregation)
Given a set of an input and a set of constraints, the aggregation is a mapping from an input to an output.

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[11]Otherwise, a collective would also count as an individual.

From this very general point of view, aggregation appears not only in the theory of evolution and normativity but already as well in physical theories describing general *laws of nature*, such as gravity. Gravity as a law of nature presupposes the existence of matter points or existing primitives. Particles mutually interact and behave in space and time, since they are necessarily qualified for it by nature. Natural law therefore consists of something existing that is more than one, and it consists of the necessary changes or behavior of the existing primitives. Thus, one can make the following bold conjecture:

Conjecture 1. (Universal Aggregation)
(i) Each group formation or behavior (of more than one) is an aggregation. (ii) Each aggregation is a group formation or behavior (of more than one).

The group formation (formation of more than one) can be considered a law of nature, which presupposes the existence of something or, in the normative case, of individuals behaving jointly, since they are necessarily qualified for this by nature.

Since we assume a one-world ontology, it must be emphasized that group property as such does not exist after the aggregation; there are only individuals themselves who display a group property or behavior (a certain identical or very similar behavior of each individual). This group behavior of *each* individual (in the group) can be epistemically considered a *new* property of individuals. The evolutionary story is heuristically based on the *emergence* of such *new* properties shared by individuals of a *group*.

In a very general way we can describe the evolutionary grouping or group behavior in the following manner:

Definition 6. (Group*)
A *group** is a set of individuals that is *unanimously* mapped onto itself so that each individual has the property of being a member of the group*.

In other words, a set of individuals unanimously has a basic property in common – the property of being in the same group. Individuals who do not have this group* property do not belong to the group* or are outside the group*. The group* behavior is by definition based on unanimity. The group* may simply can be constrained by spatial proximity of genetically similar or even almost identical individuals. Group* is a group when several individuals (each of them) unanimously "agree" to be a group*, to be a member of the group*. So the group* is a unanimous aggregation. The aggregation rule is here the unanimity itself. With this definition, the group* can be, for example, a hive, a pack, a swarm, or even a hominid tribe. This unanimous group* – in relation to a primitive group* property *to be a member of the group* – can be called the *minimal grouping*.

Since everything in nature is dynamic and heterogeneous, the group as a group can hardly be totally homogeneous; the temporary unanimity in the group formation can be challenged at any time because individual properties change over time. Therefore, in the minimal group, there can be (and realistically always is) a non-unanimity on at least one property or behavior. This behavior entails individuals who can change their behavior.

In this case, the aggregation rule can not be unanimity but one of all non-unanimity rules.

Definition 7. (Group)
A *group* is a set of individuals with at least one *non-unanimous* property or behavior mapped onto itself so that the aggregation rule is one of all non-unanimity rules.

The majority rule is a widespread rule of non-unanimity, and the output here is that either the differing individuals accept the majority (so that unanimity is maintained) or they establish their own group, which is also unanimous among itself. For example, in a tribal group of primitive humans, if the majority explicitly decides or implicitly behaves in such a way that, e.g., the prey is divided equally among all the members (without taking into account the merits of individuals in hunting), and the minority cannot live with this behavior, the minority will either form their own group (unanimous in unequally sharing the food) or they obey the established *norm*, at least as long as the advantages of staying in the group (with the majority) outweigh the disadvantages. If, in such a non-unanimous situation, it comes to group preservation, i.e. if some individuals have adapted their behavior to the majority, then the previous unanimity holds, and the group continues to persist by creating a "new" property or behavior, i.e. compliance with the majority.

If, within a non-unanimous group, a subgroup adapts its behavior to the group on the basis of an aggregation rule (be it majority or other domination rules), then in this context one can already speak of this rule as a *norm* if (and only if) individuals have intentions or desires. Again even if, due to the disunity in the group, not all individuals want to have an aligned output for themselves (because they want something different than the majority), they eventually do, if they accept this output, follow the norm by staying with the group, which means that this norm property can be internalized in each individuals cognition or behavior accompanied by mental states.

Definition 8. (Norm)
A *norm* is an output of an aggregation in groups of individuals having mental states, intentions or desires, without which a norm is simply a special law or regularity of nature.

Again, it is not individuals themselves who are aggregated, but their individual properties that make aggregenda. So only when the aggregenda (i.e. something to be aggregated) contains individual mental states, e.g. intentions or desires, we by definition can speak of *normative aggregation*.

Definition 9. (Aggregenda)
An *aggregenda* is a matrix consisting of a number of individuals and the number of property or behavior issues each individually affirmed or denied, intended or not intended, i.e. each issue is positively or negatively evaluated by each individual.

We can now define normative aggregation:

Definition 10. (Normative Aggregation)
A *normative aggregation* is the implicitly or explicitly coordinated group behavior of interdependent individuals where an aggregation rule is a function that maps an aggregenda to a norm.

Therefore, the special theory, the so-called *theory of judgment aggregation (TAJ)* can be used as a modelling framework here; at least, that is our assumption.[12] We use TAJ instead of similar Social Choice Theory, because it is simpler and more fundamental. Instead of operating with preferences (i.e. better, worse or indifference relations) in TAJ, we have just yes (1) and no (0) premises, which are somehow logically interconnected.

Conjecture 2. (Theory of Judgment Aggregation (TJA))
The TJA is an appropriate and sufficient theory to capture the general structure of normative aggregation.

Since Tomasello speaks of morality rather than normativity, or he uses them synonymously, we need to distinguish the two concepts. It generally applies that moral norms make up a subset of all norms. Other subsets are conventional norms, linguistic norms, legal norms, cultural norms, etc. It seems to be that moral norms in particular are norms of direct symmetry-experience or equivalence-experience of one individual with another as equally suffering or thriving beings, each attached to one's own survival. We can say that moral norms are norms of suffering reduction or well-being enhancement (even deontologists would hardly be able to deny this). However, moral norms must also be understood as aggregative ones—in terms of group behavior—of a special one, indeed.

Definition 11. (Moral Norm) A *moral norm* is a norm of a more or less direct suffering reduction. Moral norms are a subset of norms.

Because inter-individual suffering and well-being as mental phenomena are always individual, the criterion distinguishing between e.g. moral norms and other norms must already be aggregative, if it is supposed to be a group property or behavior. However, this thought presupposes that individuals with mentality strive to reduce their suffering and potentiate their well-being.

Conjecture 3. (Reduction of Suffering)
All individuals, who have complex behavior or cognition accompanying by mental states, and therefore are capable of suffering, want to reduce their suffering.

Actually, all norms must ultimately be understood in terms of suffering reduction, but heuristically it is perhaps appropriate to say that moral norms are to be understood in this way in particular, because in a more direct way, they are related to the reduction of individual suffering, and so they differ from other norms in the small *numbers of questions* (in the agreement sequences) which must be asked in order to reach the direct avoidance of the suffering of the individuals involved.

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[12]See the paper *On a Mental Viewpoint Concerning Aggregative Normativity*. Preprint, ResearchGate.

Normative aggregation can however be a given only in animals with the cognition and behavior somehow accompanied by mental states or intentions. Since there is still no theory of the mental or a solution to the mind-body problem, it cannot be said which social species form normative aggregation and which do not. We have here only heuristic, intuitive, and comparative classifications. It seems that, for example, honeybees do not form mental states like intentions, the aggregation is non-intentional for them (not to say purely physical), if they "decide" by following the majority rule e.g. in which direction they should swarm[13].

Definition 12. (Non-Intentional Aggregation)
An *non-intentional aggregation* is a group behavior of a social species which does not indicate any mentality.

This form of aggregation seems to be unproblematic as here we can simply refer to biophysics. But what about group behavior or aggregation in much more complex social beings? Here we draw on Tomasello when he says that normativity or morality only emerges in humans, because only humans are aware of their group behavior[14], even sometimes so explicit that they *vote* beforehand on what should happen, on how the group ("we") should behave.

Great apes are already quite complex when implicitly coordinating their group behavior toward specific goals, but they do not interrelate in the sense of more or less explicit aggregation or agreement.[15] In light of our definition, their group behavior is already normative, although in the primitive sense. So we can say that not only humans show normative behavior, but all living beings that have intentions or desires. Thus, the group behavior, i.e. normative aggregations, of great apes and humans are structurally identical, even though they differ in the entries of aggregenda and probably also in aggregation rules. It is obvious that great apes hardly ever vote explicitly, but communicate in a more implicit way.

Definition 13. (Implicit Aggregation)
An *implicit aggregation* is a group behavior of intentional social individuals who coordinate their individual behavior without the (meta-)cognition of being a member of the group, i.e. without awareness of the aggregation.

And we define further:

Definition 14. (Explicit Aggregation)
An *explicit aggregation* is a group behavior of intentional *ultra-social* individuals who cooperate with each other with the (meta-)cognition of being a member of the group, i.e. with awareness of the aggregation.

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[13][See11]

[14]Cf.[Tom16, 139] "a sense of "we-ness" (shared intentionality, especially in the form of a joint commitment)"

[15]Cf. [Tom16, Cap.2]

In other words, in implicit group behavior, individuals are unaware of the aggregation (aggregenda and aggregation rules) or of explicitly belonging to the group, and in an explicit group behavior, the opposite applies. The latter refers to a special intentional group behavior that Tomasello interprets as *joint intentionality based on joint agency*[16]. This is when individuals put their heads together to decide together how to act. But this conception of *joint intentionality* remaining in the description of Tomasello is still somehow speculative if it is not theoretically reduced to individual (experienced) goal cognition. It is still individual brains and bodies in which such complex behavior emerges. Individuals acting jointly are not conjoined twins.

However, the great apes as a social species already have normative group behavior, so in the words of Tomasello, they already *cooperate*, but without a *"we"-mode*. And we simple say that they do not have sufficiently complex brain and cognition for more explicit normative aggregation.

A great ape is able to recognize what another ape perceives[17]. They already have a so-called *Theory of Mind* (ToM), e.g. that an ape sees other apes seeing or not seeing a banana, and they use this ToM knowledge strategically for themselves by, for example, distracting others, who have not seen the banana, in order to get the banana for themselves. Tomasello has provided the evidence that they cannot manage to form joint goals, for example, distracting the others in pairs (dyadically) in order to get the banana in tandem and then share it equally or fairly.

Here we should specify joint intentionality with the following definition:

Definition 15. (Joint Intentionality)
Joint intentionality is an (experienced) recognition of more or less explicit aggregation in small groups where individuals know that other individuals in the group have the same goal and each of them pursue or desire this goal jointly.

At a certain point in the evolution of early humans, it became possible for a goal or intention to be synchronized in a particular, complex and communicative way (Tomasello says that this was initially done by means of visible eye focus, i.e. behavioral mimicry and gestures) between two (or several specific individuals), and this is due to the recognized equivalence[18] or symmetry between the individuals—between the self and others in relatively small and egalitarian groups. Regardless of the different individuals' positions in space, the goal or intention is still focused on the same (joint) goal.

The group behavior of each individual synchronized to an output is actually an *ought*—a normative group-regularity shared by members of a group, a specific group-norm, a contextual *law*). The norm or law for how something has to be and how someone has to

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[16][Tom18, 66]
[17]Cf.[Tom16, 35]
[18]Cf.[Tom16, 55]

behave in a group is thus the output of an aggregation. This seems to be trivial, although it is completely contained within the sense of Tomasello's robust research. And it can be a step in the direction of a modeling of a (to-date incomprehensible and intuitively assumed) normativity and morality as well.[19]

To sum up thus far: In the sense of TNA, the ought is the aggregated and accepted group behavior describable as the norm and embodied in every individuals cognition and behavior. Regarding the one-world ontology, the norm is a particular existence. Thus, an ought is a particular existence. There is no is-ought-gap here.

2.2 The Principle of Survival of the Fittest

Since Darwin, competition is a necessary condition of evolution. Another such necessary condition of evolution is according to Tomasello cooperation.

There is nothing problematic here. Both are simply behaviors or strategies of more or less social individuals, similar to the negative and positive charges or attractive and repulsive movements of physical particles. Natural selfishness, aggression and dominance belong to the strategy-complex of competition, and natural altruism, mutualism, and collaboration belong to the strategy-complex of cooperation. The ratio of cooperation to competition is always particular and relative to the circumstances, species, or individuals involved.[20] Thus, competition and cooperation are mechanisms of group behavior, which can and must be understood in aggregative terms as well.

However, according to Tomasello's interdependence hypothesis, the species *homo sapiens sapiens* is characterized by the particular complex cooperative-competitive patterns such that in-group competition is *cooperativized*.[21] It can be said that in the course of evolution, humans have been exposed to accelerated iterative normative aggregations, i.e. adjustments of the individual cooperation-competition proportions.[22], up to individual's *mathematical points*[23]. As Tomasello has shown, nothing here contradicts Darwin's *selection principle of survival of the fittest*. Cooperation, i.e. normativity and morality are obviously successful survival strategies of *homo sapiens sapiens*, because, as a simple

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[19]In Tomasello, morality is merely a special normative aggregation or group behavior (of cooperation) based on constraints such as self-other equivalence (equality or symmetry) and impartiality.

[20][Tom16, 9-38]

[21][Tom18, 662]

[22]Cf.[Tom16, 16] "Social beings thus have at least a small stake in each of their groupmates. The outcome is that the overall stake I have in any given groupmate is the sum of many particular stakes I have in her, for example, as alarm caller, as coalition partner, as group member, and so forth. Thus, I will perform an altruistic act for her when $s_1 B_1 + s_2 B_2 \ldots s_k B_k > C$, where each different term represents one way in which I am dependent on her, have a stake in her, each at its own quantitative level. Again, organisms obviously do not need to cognitively compute their stake in others before acting; as always, Mother Nature provides cognitive heuristics and other shortcuts appropriate to the species, with more socially and cognitively sophisticated organisms presumably being more skillful and flexible in their determinations."

[23][Tom16, 17]

empirical observation confirms, this species still exists on the planet.

It turns out that *altruism* and *mutualism* are two basic types of cooperative group behavior, i.e aggregation, of more or less self-interested but interdependently living individuals. These two basic types of friendly group behavior are also what Tomasello simply calls *cooperation*. Cooperation is for him a fundamental survival behavior or property of social individuals. It is a set of all affirmative, benevolent, or friendly types of individual's group behavior.

In Tomasello's work, *competition* is conceptualized as an *integral* counterpart of cooperation, although he focuses almost exclusively on cooperation, which has brought upon him some criticism for one-sided-ness. His focus gives the impression that humans are particularly peaceful and cooperative beings, but he meant it differently: Humans are much more cooperative *only in relation* to great apes and other social animals. This does not mean that humans are less aggressive. On the contrary, because humans are relatively highly aggressive beings, restriction of competition and augmentation of cooperation is all the more necessary to survive as a species. Therefore, competition is a fundamental survival behavior or property of individuals. It is a set of all conflictive or aggressive types of individual's group behavior. In short, cooperation and competition are two basic forms of individual's group behavior, especially of those individuals who live more or less in proximity to each other, of those who need each other for resources as they compete with each other for the same resources.

Thus, cooperation and competition are actually what takes place in a direct (dyadic) way between individuals in a resource-scarce environment, and as a set of such affirmative or negative dyadic relations, they are a necessary condition for group formation or aggregation into groups, as defined above. In our slightly reductionist approach, we can reduce the complexity of the phenomena of cooperation and competition as follows.

Definition 16. (Cooperation)
Cooperation involves *unanimous* aggregations in the behavior of small (dyadically structured) groups of interdependent individuals: Cooperative individuals agree to the aggregation and its output.

The benefits of a group formation are estimated to be greater than the costs of this group formation. Either the interdependence arises here initially or it is just confirmed. This means we can say that every cooperation is a group behavior, but not every group behavior is a cooperation. Cooperation relies on a particular unanimity at a certain point in time.

In relation to the cooperation defined, competition can now be understood as the negation of cooperation.

Definition 17. (Competition)
Competition involves *non-unanimous* aggregations or their rejection in the behavior of small (dyadically structured) groups. Some of the individuals involved either agree to aggregate but finally disagree with the output, or they do not even agree to attempt an aggregation.

The benefits of a group formation are estimated to be too small or detrimental. If before there was an interdependence between the now competing individuals, with competition the non-interdependent property of the individuals is revealed.

Such group behavior is essential for all beings living in groups, but the more complex the brain, cognition, and behavior of individuals of a species, the more complex its group behavior becomes. In humans, this generates morality and culture, as Tomasello suggested. It can be said that there are not fewer different aggregations of individuals as there are different aggregations of matter-points in the universe—a theoretically incomprehensible and inconceivable quantity. There are individuals who behave in particular ways and if they have some properties to behave so, then they form groups.

3 Group Behavior in Great Apes, Early Humans, And Modern Humans

Tomasello has attemped to "ground human morality in human cooperation without reducing it to it".[24] But we intend to *reduce* morality to normativity and further to aggregation. Without such reduction, we think the evolutionary story remains merely narrative and flowery, but we really want to *explain* it, i.e. to logically or mathematically model it, to make it possible for operationalizations. For this, we need to understand the *nomological* nature of normativity. Thus, we are concerned with evolution of normativity as an *aggregative* natural phenomenon which does not contradict the conjectured ontology. With reference to Tomasello and to the definitions introduced above, we can now sketch the most important points of the evolution of normativity.

3.1 Great Apes

For Tomasello, great apes can already cooperate, thus they have normative behavior, but only in a very limited and primitive way.

Great apes are instrumentally rational beings. Their social life is structured mainly by competition. Most of their cooperations (e.g., in coalitions and alliances) serve competitive ends. The selection is based on good competitors. Apes show sympathy for close relatives and coalition partners, and sometimes for other individuals in need if the costs of helping are not too great. They hunt in groups for small mammals, but there is

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[24]Cf.[Tom16, 143]

no evidence for joint intentional structuring of this activity.[25]

We can reductively say that implicit norm-aggregation occurs in great apes, mostly according to the dominance rule and not constrained by self-other equivalence and impartiality, as it was the case in the first quite *egalitarian* societies of the early humans, according to Tomasello's narrative. And their individual cognition and intentions (psychology) are less complexly structured, meaning that joint intentionality cannot occur. Tomasello has provided evidence that apes do not have synchronized joint intentions. They also lack a sense of equality and fairness.[26]

According to the interdependence hypothesis, the cognition (or brain) of apes and the environmental factors were such that the interdependence between individuals was much less strong in contrast to early humans. Their cognition and environment were not sufficient for more *explicit* aggregation.

Something happened that led to bigger brains and to more complexity and also speed in the processing of interdependence premises in early humans. Nevertheless, apes already have normativity in the aggregative sense we have defined (although still very primitive when compared to humans). There are individual profiles with intentions as input, aggregation rules (usually dominance based) and outputs as normalized group behavior (norms). What is missing in great apes is the higher level complexity or second order of an more explicit aggregation.

3.1.1 Excursus: Theory of Mind

In terms of Theory of Mind (ToM), we can picture the following complexity in great apes and probably in early humans, which resulted in the separation of the species. Imagine the ToM-levels of an ape.

I (Ape 1) know where a banana is. I know that Ape 2 (he) knows that I know where the banana is. He knows that I know that he knows that I know where the banana is, and I know that. That is: I know that he knows that I know that he knows that I know where the banana is. This "knowledge" is of course only intuitive, it is not explicitly known, it is just somehow *felt* or perceived. And it is related to the sufficient interdependence, otherwise apes would not be social beings.

Consider this with regard to the strong competition for the banana. The psychology can already be quite complex in apes and, as a preliminary stage to humans, even significant: I (Ape 1) stole the banana. So I know that I stole the banana.

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[25] Cf.[Tom16, 143]
[26] *There seems to be no sense of fairness.*[Tom16, 143]

Ape 2 caught me doing it. Therefore, he knows that I stole the banana. But I watched him watching me. So I know that he knows that I know that I stole the banana. In short: He knows that I know that I stole the banana. But he watched me watching him when I stole the banana. I stole the banana. So he knows that I know that he knows that I know that I stole the banana. So I know that he knows that I know that he knows that I know that I know that I stole the banana. What happens if he knows that in turn? Then he knows that I know that he knows that I know that he knows that I know that I stole the banana. By then, different consequences are possible (various fears and perhaps enjoyments when I escape the sanction) depending on what Ape 2 knows. This must have been already the cognition of early humans.

Could be there another level of experience in ToM? It might not be possible because of the complexity. And it would have no use in evolution. But then what is the transition from ape to man?

Ape 1 has stolen the banana. Ape 2 observed Ape 1 doing that action. Ape 1 has noticed that Ape 2 has observed him stealing – and will not do it in the future, because Ape 2 will beat him for it. This is the end of the *intelligence* of apes. More intelligence is not possible here.

But what if at some point Ape 2 thinks: watch out, fellow! I saw you steal the banana and you know that I saw you do that. Now he fears the consequences, but those do not come immediately. That would be the next step: Ape 1 must now *continually* fear the consequences of his action and develops an internalized anxiety of getting caught. Ape 2 controls him and vice versa, i.e. they control themselves mutually.

What would the next step be then? Ape 1 must now consider when he will suffer the consequences. Can he still prevent the consequences? In any case, he must now be very careful. Ape 2 is watching him. Ape 1 will try to observe an offense of Ape 2 as well, so that he no longer has to fear the consequences. But this is only possible if Ape 2 knows that Ape 1 had observed him. And only in this way can one imagine the partner control and partner evaluation necessary for collaboration, which are important for interdependence hypothesis.

And this could be the crucial transition point from great apes to early humans. It had to come in such a way that humans would become *nervous*, because the negative consequences can come in a time-delayed fashion, or they can still be avoided by means of a particular knowledge. Happy is the one who has nothing to fear, because he is much stronger. Then he can take what he wants. The higher social cognition is therefore an adaptation to the expected negative or positive consequences coming from others. The Early Human 2 will (because he can) even communicate what he has seen, so that Early Human 1 will be not accepted as a partner by the others.

And that's what everyone is supposed to fear then, because they are threatened with

exclusion. That is an example of implicit aggregation from non-unanimity to unanimity. The explicit aggregation is then only a small step: Individuals explicitly agree on what is to be done in the group with someone who inflicts damage or suffering on individuals in the group, e.g. has stolen or killed. Clear moral norms emerge.

3.2 Early Humans

About 400,000 years ago, early humans were forced into an ecological niche of collaborative foraging, which made individuals strongly interdependent for survival and thus concerned for the well-being of (potential) partners and worried about not being considered as a partner. They recognized this strong interdependence, so it became an integral part of their instrumental rationality.

Early humans' group behavior thus came to have the "dual-level structuring of joint intentionality"[27]. Each partner knows what to do in the collaboration, and both knew together "in common ground the ideal way those roles must be played for joint success. Because partners understood that both of them were required for joint success, and because they knew that their role ideals were agent independent and interchangeable, there arose a sense of partner (self–other) equivalence."[28] This self–other equivalence is a first form of *equality* between (in-group) individuals. Each vote in the collaboration counts equally because of the recognition of equal interdependence.

This led to an increasingly complex social psychology: Mutual evaluation and control of whether one is a good or bad partner; mutual respect between partners; joint commitment; internalization and transfer of this process into the next generation. "The result: two second-personal agents self-regulating their collaboration via mutually agreed-upon and impartial normative ideals."[29] So, what emerges in this process is the constraint of *impartiality*. Thus normative aggregation is brought to an higher level, which is grounded in the development of *culture* in modern humans. Such high-level norms (*normative axioms*) constrain what enters the matrix of further aggregations and agreements.

3.3 Modern Humans

About 100,000 years ago, modern humans began living in larger, tribal, cultural groups that competed with other such groups for resources. "This led to a distinct group-mindedness in which individuals knew that they were dependent on the group more than the group was dependent on them, so they conformed to its strictures. The interdependence of in-group members led them to be especially sympathetic and loyal to one another but unhelpful to and mistrustful of all out-group barbarians."[30]

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[27]Cf.[Tom16, 144]
[28]Cf.[Tom16, 144]
[29]Cf.[Tom16, 144]
[30]Cf.[Tom16, 145]

Modern humans' processes of social control manifested in their social *institutions*. Individuals were born into this preexisting, normatively structured culture, where norms are codified. Earlier agreements were taken for granted – up to a certain point of suffering – and passed on to the children, so the early explicit agreements became largely implicit and were believed to be "objective" facts and values.[31]

Modern human individuals did not just create joint commitments with partners to self-regulate the dyad. They also bought into the agreements that already existed in their culture (i.e., its norms and institutions) and used them to self-regulate. Individuals implicitly agree to some as "objectively" accepted norms of the group or explicitly question or stand up against the same.

At some point, different cultural groups began creating somewhat different conventions and institutions, and groups with more effective versions out-competed other groups "[...], with the process intensifying in civil societies with codified laws and organized religion"[32] and today instead of religion—organized science.

4 Bottom line

To put an evolutionary and aggregative theory of normativity in a nutshell: Great apes already have norms, but these are based only on implicit aggregation. Their non-joint, intentional entries in the aggregenda-matrix are different and more primitive than in early humans and of course in modern humans. Further, the aggregation mappings in apes are not egalitarian, and the unanimity in group behavior is often established by a dictatorship or violent domination. With early humans, it comes to the explicit aggregation of norm formation, whereby the intentional entries in the matrix became more complex. Additionally, the aggregation is passed off under completely different conditions or constraints, above all under the condition of the self-other equality and (later) impartiality—even if only in particular group configurations, so that majorities and subsequent unanimities were sometimes organized quite peacefully, even if the majorities often had only slim margins. Nevertheless and obviously, dictatorship or dominance also occurred and still occur in humans, but these aggregation rules are not the only ones. As Tomasello has shown, in the evolution of homo sapiens, the egalitarian or solidary constraints were much more decisive and they are still decisive for existence or survival of human beings on the planet.

If it is convincing that normativity is a particularly natural form of – and in a particular way a constrained form of – aggregation, then we can set out to find and invent norms intentionally desired from everybody in the present day according to particular contexts.

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[31] Cf.[Tom16, 146]
[32] Cf.[Tom16, 146]

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