ON THE PRECONDITIONS OF RATIONALITY

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Abstracts: *In the field of legal argumentation theory, rational justification is probably the most important part, and yet it is not fully understood by scholars even today. In several publication the author has presented already presented her theory on this, but has not discussed all the preconditions. In the present contribution this will be handed in – at least in a short version. Thus, aspects of epistemology and linguistic theory are discussed, as well as what the author calls the 'LBA theorem' (from 'The Least Bad Alternative'), which relies on the law of noncontradiction and describes a criterion for when exactly an assertion is rationally justified.*

1. Preliminary note

As a guiding idea for society, rationality has clearly seen better days. Although it has found some reservation in the natural sciences and technology and some at least temporary retreat area in medicine, economics and law, it seemingly has lost all ground in the socio-politically most important disciplines, i.e. the humanities. Since one of the most important arguments against rationality is based on the premise that it is impossible anyway, it pays to contribute some substance to the discussion, which the author has already tried to do in a number of contributions[1]. However, since it was not always possible to deal with all the relevant preconditions of rationality there, this should be made good on here. Our starting point is a naturalistic conception of a universe with sufficiently intelligent agents in a living environment shaped by evolution. Beside this, the author feels committed to analytical philosophy, but mostly without the use of formulas.

2. The concept of rationality

Rationality is a property that can be meaningfully ascribed to many entities, because in principle anything can solidly be said to be rational, iff[2] there exists an assertion that says so, and iff that assertion itself is rationally justified. I.e. an attitude is rational iff asserting so is rationally justified, a person iff his/her actions are (sufficiently often) rationally justified, etc. Since here justification means a "justifying argumentation", rationality in essence is a (distinguishing) *property of justifying argumentation*. Consequently, the question arises as to what kind of property this exactly is. In the classical view, rationality is usually taken to be the "good and proper" use of reason without any relevant impediment by will or emotion (i.e., "sine ira et studio"). This, in turn, is precisely the case iff one has used the available means of evidence the optimal way in the justification –

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[1] KREUZBAUER, HANNA MARIA, Inference to the Best Explanation in the Legal Universe: Two Challenges and One Opportunity, in: Legal Theory 47, 2016, pp. 333–347. KREUZBAUER, HANNA MARIA, 'Inference to the Best Explanation' in Behauptungs-Netzwerken, in: Schweighofer, Erich/Kummer, Franz/Hötzendorfer, Walter/Borges, Georg (eds.): Netzwerke: Tagungsband des 19. Internationalen Rechtsinformatik Symposions: IRIS 2016, Österreichische Computergesellschaft, Vienna 2016, pp. 329–338, and KREUZBAUER, HANNA MARIA, Juristische Rationalität, in: Schweighofer, Erich/Kummer, Franz/Hötzendorfer, Walter/Sorger, Christoph (eds.): Trends und Communities der Rechtsinformatik: Tagungsband des 20. Internationalen Rechtsinformatik, IRIS 2017, Österreichische Computergesellschaft, Vienna 2017, pp. 329–336.

[2] For 'iff' stands for 'if and only if'.

the *Pareto-optimal*[3] way, to be precise. Therefore an assertion is rationally justified exactly iff in justifying it the available means of evidence have *been used Pareto-optimally,* and every other phenomenon is rationally justified exactly iff, as already mentioned, a rationally justified assertion can be made that says just that. Since all this is a somewhat more complex constellation, some presuppositions are necessary, and these are what we shall be concerned with, for rationality requires a notion of assertion and correspondence, for that in turn of sense and language, and for that ultimately of information and mapping. These preconditions shall now be briefly introduced.

3.   Preconditions of rationality

3.1.   Information and mapping

Information: According to our assumptions (see above) we assume sufficiently intelligent agents in an evolutionary shaped environment within the universe. An important strategy for these agents is *orientation in the* world outside and inside (think of pain) themselves. An important strategy for producing this is the use of the *information*[4] by evolving *information-processing systems*. Thus, in a sense, information stands at the beginning – a kind of λόγος.

Mapping: Information-processing systems are, as far as is known, exclusively realized in such sufficiently intelligent agents, and one of the central strategies of these information-processing systems is the acquisition, integration and processing of information for the purpose of delivering this aforementioned orientation. From a certain stage of development on, these systems can and must also *map* something, for which in principle everything outside the respective concrete mapping itself comes into question – self-mapping would lead to paradoxes. Mapping is the production of a sufficiently equivalent mapping/image, thus offering the integration of data into the processes of the information-processing system. This allows the system to compute the world in order to better control the agent's reponses. In many living beings, including humans, nature relies on such mapping strategies. In general, humans are not known for having the best "detectors" – aka "sensory organs". But, with the human brain, however, we have by far the best information processing system – at least at the present state of the technology.

A central issue with any mapping is its quality, and the extent to which it is correct, i.e. the extent to which it corresponds to what has been mapped. This is usually called "truth", but for this article we call it "*correspondence*" and will deal with at a central point further below.

3.2.   Sense and language

Sense ["Sinn"][5]: In the biological sphere of reality mappings in our sense are realized *neuronally*[6] and with some certainty not by single neuronal events but by many, thus by a structured set of single neuronal events, which we will call a *population*[7] here. But, humans are also known to experience mappings in the brain mentally, which means that although the mapping is realized on the substrate of neuronal populations, it also exists

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[3]   GABLER WIRTSCHAFTSLEXIKON: Pareto-Optimum, Springer, Wiesbaden 2021, https://wirtschaftslexikon.gabler.de/definition/pareto-optimum-45936 (accessed November 15, 2021).
[4]   Note that here the term 'information' is used only in the sense of a scientific fiction.
[5]   Cf. also LUHMANN, NIKLAS, Soziale Systeme: Grundriss einer allgemeinen Theorie, Suhrkamp, Frankfurt am Main 1984, p. 92ff.
[6]   Recall the axiomatic assumption of a naturalistic worldview mentioned above.
[7]   Cf. BEGON, MICHAEL/MORTIMER, MARTIN/THOMPSON, DAVID J. , MÜLLER, JAKOB. 1997. population ecology. Spektrum Lehrbuch, Spektrum, Heidelberg et al. 1997, BOYD, ROBERT/RICHERSON, PETER J.,: The Origin and Evolution of Cultures, Oxford University Press, Oxford et al. 2005, and BOYD, ROBERT/RICHERSON, PETER J., Not by Genes Alone: How Culture Transformed Human Evolution, University of Chicago Press, Chicago 2005.

mentally.[8] Starting from a certain stage of development, the *(mental) ability to classify* plays an important role, which is a kind of *coding*[9]. In humans – but presumably also in other animals – mental experiences are encoded multiple times, and a basic and especially important kind is the *coding into "things"*[10] *and "proper-ties" (including relations)*, because humans[11] do not mentally experience the world as a pure data stream, like a computer might "experience" it, but as things and properties – including ourselves. All this is responsible for our experiencing the world in a meaningful way, which leads to the concept of sense, which is central in-sofar as it sorts the world, so to speak. So, to illustrate this, we perceive a soccer ball being kicked into a goal rather than simply changing streams of data. This simultaneously sorts the world and also opens up at least the categories of 'soccer balls', '[soccer] goals' and 'kicking'. Sense is arguably one of the most important mental tools of all, and it works even without language, because we can effortlessly recognize a song even if we know neither the title nor the lyrics, or both are in a language we don't understand. In all cases the very bases of such a mental category is again a population, but here a population of mental events

In the standard case, *things are imagined* explicitly or implicitly as carriers of properties, and both, things and properties, are imagined *essentialistically*, thus as *universal and discrete*, although to a large extent this fictitious. Things and properties can be roughly divided into several classes, such as esp. metaphysical-mat-hematical (think of existence, identity and difference, number, superordination and partiality, etc.), physical (think of form and dimensionality, spatio-temporal position and boundaries, phases, etc.), biological (think of living beings or life itself), mental (think smart, sad, disgusted, etc.), and socio-cultural (think sympathetic, Catholic, liberal, woke, etc.). This "objectification" also affects meta-properties, i.e. properties of properties, of all possible meta-levels. In the case of population-based properties (such as the properties of a flock of birds), essentialist fiction can become a problem, for example because they are virtually always found in the socio-cultural realm: Morality, for example, exists as a "swarm" of individual moral assumptions, rather than as a "monolithic" property. Similarly, there are problems with taking properties discretely to have undefined (steady, chaotic, etc.) transitional phases: For example, when exactly does dawn begin? From exactly how many grains of sand on, does a collection of grains of sand count as a pile of sand? From how many replaced planks on is a ship no longer the same? This has always led people to false conclusions: for example, the existence of the uncertain boundaries of twilight does not justify the claim that day and night do not exist, just as the existence of intersexuality does not justify the claim that the two biological standard sexes, male and female, do not exist. Also, two of the most famous classical dilemmas, namely the Sorites dilemma and the Ship of Theseus dilemma, are problematic only because they supposedly innocently call for the most impossi-ble, namely to use discretely meant property terms to map phenomena with undefined phase transitions. Apart from this, however, sense and essentialist property notions have proved dramatically successful in practice, because in many cases essentialist fictivity plays absolutely no role, and we are all familiar with the many work-arounds, like the rule exception dichotomy and the core edge dichotomy.

Of course, sense is also a *socio-cultural phenomenon*: Individually, it is indeed a neuro-mental population phenomenon, which means that the realization is based on populations of neuronal events, and the realization of the mental constancy of meaningful experience is based on populations of individual mental events – both of which take place in a single brain. However, agents naturally perceive other agents, and (presumably very often imperceptibly) the brains involved also influence each other in the process – not only in humans – which corresponds to a social phenomenon. Thus the neuronally generated and mentally experienced activities of the

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[8]   This would eventually leads to the fundamental problem of the temporal constancy of mental phenomena, but this cannot be discus-sed further.

[9]   Coding is a type of mapping in which the mapping consists of a sequence of characters, where both the characters and the combi-nation types are finite and manageable, while there are in principle an infinite number of possible combinations. A good example of this is Morse code.

[10] Meant here in the sense of "entity".

[11] As said above this probably holds also to other animals.

brains *synchronize* (as we will call it here), creating structured social populations of (individual) synchronous mental events, and thus also the supra-individual social component of sense, which also becomes a social phenomenon. Again, this can be thought of as a swarm, which also coordinates individual behavior in such a way that it becomes something social.[12]

Language: Sense is the most important mental precondition for language, whereby only humans can encode "meaningful" knowledge linguistically in more than a rudimentary way. (Natural) language is a complex coding system that serves perception, thinking, remembering and communicating. Thus, indirectly it also helps in the production of everything for which all this can be used socio-culturally. However, my language does not(!) determine the boundaries of my world, as is often wrongly assumed, because smells, tastes or melodies, for example, do belong to the world, but can be encoded linguistically only poorly, if at all. For the individual agent, first of all language serves for perceiving, thinking and remembering, or indirectly also for feeling and willing. Analogous to sense, language is a population phenomenon, i.e. it is realized on the neuronal level as a population of neuronal events, and on the mental level as a population of mental events.[13]

Even here, however, brains synchronize, and therefore language acquires a communicative and social dimension, for it becomes a constantly changing, regionally etc. differentiated, social population of synchronized mental individual events. Depending on the brain regions involved, this starts with vocabulary and syntax and ends semantics. Simply put, this involves verbal and factual thoughts, which in supra-individual cases are best called "ideas". Of course, we do not experience language this way, but essentially as a system of rules, i.e. a *langue* realized in *parole*. This, too, is only an essentialist fiction, for in reality *language is only parole*, and langue is constructed upon it, which also the invention of writing did not changed. However, even in science it is practically impossible to approach language in a population-theoretical and non-essentialist way, which is why we should allow ourselves this fictions – at least to some extent.

3.3.   Assertion and correspondence

Assertion: All this forms the basis for the meaningful, linguistic-cognitive mapping of the world, whose most important building block is the assertion.[14] If we just for the sake of simplicity hold on to the essentialist concept of language[15], its smallest building blocks are *parts of signs,* like the i-dot, then come the "*basic characters*" *(=sounds or written characters),* like e. g. the i, which only mean themselves, then *words* (or word compounds), i. e. signs with unspecified meaning, like e. g. 'dog', 'bite' etc., then *sentences*[16] , which we will discuss shortly, such as 'The dog bites Hanna.' and finally *text and discourse,* such as 'Now Hanna bites the dog, and properly, whereupon ...'.

For our goal assertions are the most important parts of language, and they are coded by sentences. Generally, an assertion is just a linguistically encoded idea, which maps something outside of itself in a *property-specific* manner. This is done either the individual-specific or the class-specific way, i.e. a property (incl. relations) is ascribed to an individual or to all elements of a class.[17] This goes beyond the properties fixed in constants, and thus is much more specific. Usually – however not always without problems – one also says that assertions map a *state of affairs*, and it shall be repeated briefly here, that mapping does not only work linguistically, but also in many other ways – with and without coding.

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[12]   Once again, all this presumably also applies to animals, because animals too can develop cultures for which they have to synchronize socially. This has been researched in bird songs, for example.

[13]   It should be emphasized that the author relies on the concept of population thinking, was mostly and most meritoriously established by Robert Boyd and Peter J. Richerson (cf. FN 7).

[14]   Assertions can be presented not only linguistically but in other ways as well, e.g. visually.

[15]   Which is an allowed and fruitful scientific fiction.

[16]   Note that assertions/sentences are the smallest elements of language that can be negated.

[17]   We do not need to discuss the real existence of all these phenomena here.

Correspondence: Every assertion is, of course, only a *proposal for* a *correct assumption* about the world.[18] In fact, this "correctness", i.e. the *correspondence* between the mapping (i.e. the assertion) and what is mapped (i.e. the state of affairs being asserted) is an enormously important question. For this special relation between the mapping and the mapped, one usually uses the notion of *truth,* esp. in the medium of language, and indeed some kind of idea of the truth or otherwise of a mapping is indispensable for any theory of rationality. Even if, in the nihilistic manner, one would like to consider it impossible, unknowable, or unsayable, one cannot avoid it, because even such nihilistic positions can only be formulated as assertions, and thus the question of whether they are true or not arises all the more. Nevertheless, because the concept of truth is enormously loaded, we will hereafter use the concept of *correspondence*, and by this we mean the fact that a mapping sufficiently corresponds with the mapped.[19]

4.   Rational justification according to the LBA theorem

'LBA' stands for 'The Least Bad Alternative', which means a *criterion of rationality.* It says that an assertion is rationally justified iff it is the least bad alternative, where the alternatives are not simply other assertions but also the *negation of the original assertion* and the *ignorance assertion,* which says that the correspondence of the original assertion is currently undecidable. Recall that, according to our definition above, assertions are rationally justified precisely iff means of evidence were used Pareto-optimally in justifying them. Note, however, that we do not claim that the method of rational justification built on the LBA theorem works in every case.

First, to a trivial but important point, namely, that from the fact that truth cannot be established (though we do not claim that this really is so) it does not necessarily follow that the same is true of falsehood. Indeed, if there were no assertion for which correspondence is absolutely decidable, this does not mean, that there is no assertion for which non-correspondence absolutely decidable. Indeed, in a sound lottery from 1 to 45, it cannot be soundly predicted which number will be drawn between 1 and 45, but e.g. it can soundly be predicted that it will not be 1 and not 1 together. Therefore, it is obvious to seek rationality indirectly, namely by eliminating the worst justified propositions, which under the right parameters gives rise to the basic idea of considering the least bad alternative as rationally justified. A central role is played by the *law of noncontradiction* already advocated by Aristotle (384 to 322 BC)[20], which states that of two contradictory assertions ('A ∧ ¬A'), cannot correspond simultaneously.[21] The law of noncontradiction is the only proposition known to the author that is, in a sense, self-justifying, for one can only refute without applying it oneself. That is, if I advocate it, i.e. if I maintain that two contradictory assertions cannot correspond simultaneously, no one can prevent me from doing so by rational means. However, like its counterpart, the tautologies, contradictions are empirically empty, i.e. they tell us nothing about the world outside themselves, so we are not done by now.

But, as said before, at least one of the assertions involved must be non-corresponding. We just don't know which one that is. To solve this problem, we now let the two assertions compete against other assertions in the

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[18]   For if the universe had to conform to assertions, that would be great magic, which the author would also like to master.

[19]   This is not meant in the sense of a naive theory of truth and the idea is relatively easy to make plausible: Imagine (solidly) photographing a subject. Then photograph the subject and the photograph just taken again, so that you have a picture of the subject and a picture of the picture of the subject. Now you have a picture of the picture and a picture of the subject, both encoded in the same medium and you are now able to compare the question of equivalences in the basic dimensions of the mapping, here essentially the distribution of frequency reflections in the plane, and determine relatively easily whether correspondence is the least bad explanation for any equivalences to be found in fact, or not. This works analogously with linguistic and other methods of mapping.

[20]   ARISTOTLE, Metaphysics, 1011b13–14, http://www.perseus.tufts.edu/hopper/text?doc=Perseus%3Atext%3A1999.01.0052%3Abook%3D4%3Asection%3D1011b (accessed November 15, 2021).

[21]   Actually, there are two types of contradictory oppositions, namely the "contradictory [sensu stricto]" and "contrary" one. In the case of a *contrary* opposition ("1 will be drawn and 2 will be drawn.") the two assertions cannot correspond at the same time, but they can be non-correspond. In the case of contradictory [sensu stricto] opposition ("1 will be drawn and 1 will not be drawn."), they cannot do that either.

same context in a "*rationality tournament*", which consists of "*rationality rounds*". Each round consists of several games in which the given two (contradicing) assertions X_1 ... X_n (e.g. "The butler is the murderer. ...") "compete" against each other. In addition, the adversarial negations X_{N1} ... X_{Nn} of the assertions (e.g. "The butler is not the murderer. ...") and the general ignorance assertion I_X ("Whether the butler is the murderer or not is currently undecidable.") are part of the game. "Competing" in this case only means checking whether the assertions contradict each other or not. After the round, we count how many times each assertion contradicted another one. The ones with the most contradictions we call 'bad performers' and sort them out. If there is a clear winner, the matter is settled. Otherwise, further rounds are held, letting the remaining assertions "compete" against new assertions, again adding the contradictory negations and the ignorance assertion. It seems plausible to enrich the tournament with aditional parameters, such as weighting parameters or "short-cuts", such as that contradicting with particularly proven performers or empirical protocol assertions yields more "negative points" than contradicting with others, etc. But these are purely application-oriented considerations that will not be discussed further in this article.

The tournament ensures that the available means of evidence have been used Pareto-optimally, and in the end three results are conceivable: first, that the matter is undecidable, i.e. that I_x is the LBA; second, that exactly one other assertion $X_{(N)I}$ is the LBA or third, that more assertions $X_{(N)1}$ ... $X_{(N)m}$, are LBA. Of course, the result is to be accepted in any case. In the first two cases there is a decision, at least for the moment, because the remaining assertions are the *least bad performers in* terms of Pareto-optimal exploitation of means of evidence, and thus rationally justified. In the third case, it depends: If the number of not eliminated assertions is sufficiently low, one could try to live with this, if not the tournament is to be repeated. Since all other details of this have already been elaborated in Kreuzbauer 2017[22], we will not repeat this but modestly refer to this article.

5. Outlook

Especially in the area of argumentation with values and norms, rational justification is still largely not understood by science, which is why the LBA theorem could be of great help. But it should also be applied for making discourse more rational. This not only applies to legal discourse, but also to public discourse, in which moral values and norms seem to play an increasingly important role. So, it has to be left to further research to show that the LBA theorem could be the basis for modelling such discourse, in order to make it more comprehensible, but also for improving it.

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[22]   Cf. KREUZBAUER 2017, p. 334ff. (cf. FN 1).