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The Failure of Excluded Middle.

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What follows is the presentation of a symposium scheduled to take place in August 2020 at the 10th European Congress of Analytic Philosophy (ECAP 10) hosted by Utrecht University, The Netherlands. The symposium was cancelled due to the Covid 19 pandemic and has been rescheduled to take place with the same participants at the university of Lille Nord-Europe in the Spring of 2021. The participants are Selene Arfini, Michèle Friend, Gabrielle Ramos-García and Fabrice Pataut.

THE TENTH EUROPEAN CONGRESS OF ANALYTIC PHILOSOPHY

ECAP 2020

SYMPOSIUM

**Defects of human rationality: views from epistemology, logic and the
cognitive sciences**

Organizers: Gabrielle Ramos-García (National Autonomous University
of Mexico - UNAM) and María del Rosario Martínez-Ordaz (Federal
University of Rio de Janeiro)

Contributors: Selene Arfini (University of Pavia), Michèle Friend
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It is undeniable that the study of human rationality is a fundamental component of most research projects in epistemology and cognitive science. In addition, logic, understood as the analysis of good, or correct reasoning also hits importantly on the issue of which inferential patterns are indicative of rationality. For a long time, these three areas of research have focused on the description of the positive aspects of rationality, i.e., on its relation to belief and knowledge, the minimal conditions for satisfactorily ascribing rationality to agents, the different ways in which rational behavior is displayed in different contexts (such as science, ethics, economics and religion), the biological basis of human rationality, and the reliability of some inferential patterns as indicative of rationality (for one of the most comprehensive attempts to tackle rationality along these lines, see [1].)

Unfortunately, and despite the value of addressing the positive aspects of human rationality, the picture these projects have provided is significantly incomplete. In particular, while much of our satisfactory reasoning and rational behavior may be described within these traditional frameworks, in our daily life we don't meet rationality straightforwardly. As a matter of fact, even when being rational or acting rationally, we often resort to defective (partial, vague, conflicting, inconsistent, and false) information (see [2]), to "suspicious inferences" (see [3] and [4]), and to unknown facts (see [5] and [6]). In addition, when following reliable inferences, working with good (consistent, coherent, accurate, precise) information and knowing all the relevant facts, we sometimes still fail to be rational. Call these *the defects of human rationality*.

While the defects of human rationality have often been addressed by epistemologists and logicians as counterexamples to specific theories of rationality, the defects themselves have not been examined in sufficient detail. During the last decade, this has changed. In recent years, much attention has been paid to the role of ignorance, dysrationalia and "suspicious" reasoning so as to achieve a comprehensive study of human rationality.

The symposium is devoted to the exploration of connections between logic, epistemology and cognitive science insofar as they are concerned with negative aspects of rationality such as ignorance and dysrationalia. The main objective of the symposium is (a) to discuss the different ways in which research in logic, epistemology and cognitive science may provide an explanation of the defects and failures of human rationality, and (b) to assess the virtues of the various methodological approaches that may help us unify their results and perspectives.

The symposium is divided in two parts: the first tackles the issue of explaining why individuals fail to achieve rational behavior. This part

includes discussions of the possible connections between ignorance, irrationality and dysrationalia. The authors aim to merge researches in logic, epistemology, and cognitive science in an attempt to achieve a better understanding of rationality through an interplay between ignorance, irrationality and self-deception. In particular, the claim that the cognitive scientist's description of rational behavior may be grounded on philosophical logic to explain human rationality is called into question.

The second part of the symposium is concerned with formal languages, specifically with their ability to represent inferential capacities in scenarios where possession of knowledge is compromised and ignorance is prominent. The problem described concerns semantics for natural languages, logic as such, and the empirical sciences, e.g., macro-chemistry.

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Selene Arfini

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THE STRANGE CASE OF SELF-DECEPTION: DISCUSSING LINKS
BETWEEN IGNORANCE AND IRRATIONALITY

Ignorance is traditionally considered an epistemic condition for individuals, usually described as a lack or absence of knowledge, information, or competence. On the other hand, irrationality is a cognitive impediment, which entails self-limiting thinking, belief, and behavior. Intuitively, ignorance and irrationality have a lot in common; unfortunately, they are poorly connected in the current academic literature. I believe that by merging research on ignorance and irrationality, both phenomena could benefit from a better understanding with the help of research in logic, epistemology, and cognitive science. To open this opportunity, the paper will focus on a particular topic, which requires the acknowledgement of an interplay between ignorance and irrationality: self-deception.

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Michèle Friend

(Université Lille Nord-Europe)

A FORMAL LANGUAGE FOR ANALYZING REASONING IN MACRO-
CHEMISTRY

I present an original formal language based on the idea that in macro-chemistry we reason over substances rather than entities. The formal language expresses chemical processes. With the formal language we display the junctions where we might apply reasoning in case a process yields something unexpected. I work through an example. The philosophical challenge is to see if the language is strong enough that any other form of reasoning will fail to count as rational.

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Gabrielle Ramos-García
(National Autonomous University of Mexico - UNAM)

ASSESSING COGNITIVE STYLES IN THE
PHILOSOPHY OF LOGIC

Cognitive scientists have had a controversy regarding the possible relation between intelligence and rationality for at least thirty years. Even though there is a widely accepted theory regarding intelligence (*g factor*), it is still undisclosed whether it is capable of explaining rationality. Addressing this problem, dual processes theorists have appealed to the notion of *cognitive styles*, which seems to offer a description of rational behavior, but may be challenged regarding its explanatory power. I argue that cognitive styles can be grounded on philosophical logic to explain human rationality in such a way that most problematic explanatory blanks of the approach are satisfied.

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THE FAILURE OF EXCLUDED MIDDLE

If we are under the illusion of possessing a knowledge we do not possess when we claim to know, for any A , that either A or its negation must be the case, whether or not we either know that A or that not A , then we are irrational on two counts. Not only does our ascription of knowledge lack a warrant, but the lack may be explained by the fact that we have failed to assess the limits of our inferential capacities. We falsely believe that we are able to draw inferences from known judgements to new judgments that become known in virtue of these inferences, e.g., from $\neg\neg A$ to A , given the meanings that we have assigned to the logical constants occurring in the judgments when, as a matter of fact, we have unduly idealized these capacities and assigned to the constants meanings they may not have.

If that is indeed the case, then we are facing a dilemma when justifying the choice of introduction and elimination rules for the logical constants of some object language. Either our semantics makes no

presupposition whatsoever about the conceptual means required for a grasp of their meanings and we end up describing regularities in the behavior of agents who might after all be engaged in some purposeless and irrational activity, or we beg the question of justification because the logical laws that hold in the object language also hold in the metalanguage. In the first case, there are no genuine logical laws whose validity might be proved nor putative ones whose invalidity might be proved and we end up with a descriptive and predictive theory in a naturalistic setting, couched in terms of conditioned responses. In the second case, although the semantics is true to the intended meanings of the constants, it fails to give a satisfactory explanation of these meanings and amounts to a *petitio principii* as far as explanation is concerned.

Consider the case of an intuitionist semantics in terms of Beth trees. We might expect that the semantic theory will remain stable under the substitution of classical for intuitionistic logic as that governing the metalanguage, so that assuming the law of excluded middle for the metalanguage will not affect the ability of the semantic theory to yield a demonstration of invalidity for the object language. However, Beth trees, although they yield a counter-example to $(\neg\neg A \rightarrow A) \rightarrow (A \vee \neg A)$, provide neither a specific statement A that would fail to satisfy the law, nor a bona fide proof of the invalidity of excluded middle.

It is usually supposed, in this context, that it is harmless to presuppose a knowledge of the meanings of the constants whenever they occur in statements that are decidable by non-skeptical standards. Does the feasibility of the application of a decision procedure secure the practical knowledge? One might be dissatisfied with this assumption. The issue, after all, is not only epistemological, but also logical. The core contention that opposes the classical logician to the non-standard logician is that the former is committed to the view that it could happen that conclusively decidable statements were true even though not verifiable by us although, as a matter of fact, they happen to be verifiable us. If the laws of classical logic give us the illusion of possessing a knowledge we do not actually possess, then so must any conception that likewise divorces truth from the possibility of its recognition by us.

Consider now the different case of a linear semantics in terms of resources. Four cases of idealization are at stake: (i) the addition of elements to a sequent, either by way of an extension of the assumptions

(LEFT WEAKENING) or by way of an extension of the conclusions of our proofs (RIGHT WEAKENING), and (ii) the disregard for the number of occurrences of a formula in a sequent, either in the antecedent (LEFT CONTRACTION) or in the consequent (RIGHT CONTRACTION). The rejection of both sets of rules leads to the introduction of two disjunctions, respectively additive: \oplus and multiplicative: \wp . When we choose to reject the structural rules that capture properties of the consequence relation, rather than to curb the idealization in the intuitionistic way, we get two different versions of excluded middle: an additive law $A \oplus \neg A$ that is not provable, additive disjunction behaving like intuitionistic disjunction, and a multiplicative law $A \wp \neg A$ that is indeed provable, but only because it may be reduced to the tautology “A implies A.”

Strong antirealists who insist that the inert notion of ratification at play in intuitionistic proofs must be replaced by a notion that is both effective, feasible and dynamic, may choose to proceed in this way, but it doesn't look like we have made any genuine progress as far as de-idealization is concerned. What makes an intuitionistic proof still platonic is that, just as in classical logic, the proof embraces LEFT CONTRACTION and RIGHT CONTRACTION, and that these structural rules are what turns formulas into types. In substructural logics, formulas have two advantages: they are tokens (as opposed to types), and they are acts (as opposed to objects). What we get in this perspective is a construal of assertability-conditions in dynamical terms, i.e., in terms of justificative acts which do not have the cognitive inertia of documents we merely acknowledge and ratify.

However, although we do have tokens and acts, as opposed to types and ratifications, as far as excluded middle is concerned we don't have anything that is genuinely true to the idealizations of classical logic. On the intuitionistic side, rather than disclosing the constructive content of classical logic, we have gone ahead with the introduction of new constants that (i) do not curb the idealizations of classical logic as strongly as an intuitionist would and (ii) take their introduction and elimination rules for granted.