SCIENTIFIC RATIONALITY AS NORMATIVE SYSTEM

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ABSTRACT: Decision-theoretic approach and a nonlinguistic theory of norms are applied in the paper in an attempt to explain the nature of scientific rationality. It is considered as a normative system accepted by scientific community. When we say that a certain action is rational, we express a speaker's acceptance of some norms concerning a definite action. Scientists can choose according to epistemic utility or other rules and values, which themselves have a variable nature. Rationality can be identified with a decision to accept a norm. This type of decision cannot be reduced only to its linguistic formulation; it is an act of evolvement of the normative regulation of human behavior. Norms are treated as decisions of a normative authority: a specific scientific community is the normative authority in science. These norms form a system and they are absolutely objective in the context of individual scientists. There exists an invariant core in all the norms of rationality, accounting for their not being liable to change, as compared with the flexibility of legal norms. The acceptance of and abidance by these norms is of social importance – it affects the aims of the community. A norm only defines the common framework and principles of scientific problem-solving; its application is a matter of professional skills and creative approach to a particular problem. It is of no importance at all, if an agent's cognitive abilities do not live up to the requirements of a norm. Such discrepancy can be compensated for by the fact that a scientist carries out work in a conceptual and normative framework established by a respective scientific community.

KEYWORDS: norm, decision, normative system, scientific community, scientific rationality

1. On the Pluralism of Rationality

In my view, it would not seem to be warrantable to take in science as a pattern of rationality, and to consider scientific activity as being more rational than other types of human activity, without a clear-cut understanding of the concept of rationality, scientific rationality in particular. On the other hand, its perceiving of as an abstract construction with dogmatic and restrictive characteristics – or as a wholly evaluative concept void of content – would have a serious grounding.

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There exists no agreement in the overwhelming majority of contemporary philosophers about the nature of scientific rationality and its traits. Obviously, it is of major importance to find out positive solutions to problems of the nature of rationality in the context of the intellectual crisis holding sway, when criticism of science and irrationalism are in aggressive offensive and there is talk about 'collapse' of scientism, scientific attitude, foundationalist programs in philosophy, and scientific or rationalistic perception of the world.[1] Below I try to explain the nature of this issue by means of referring to the concepts of *norm* and *decision*. Scientific rationality is perceived by me – as a normative system accepted by a specific scientific community. An informal decision-theoretic approach is the methodological instrument of the analysis made by me.

The concept of rationality relates to the instruments of carrying out human activity and defining suitability in terms of aims. The ideas of 'rationality' and 'rational-irrational' have a philosophical history of their own. Classical philosophical tradition draws a line of demarcation between rationality of thinking and rationality of action, between theory and practice. It is based on a response to the so-called problem of the genesis of knowledge: the main part in it is played by Reason via innate universal knowledge (the so-called 'innate' ideas). It is a response of rationalism – the foundation of the so-called 'modernistic project' of the Enlightment, which defines the universal laws of Reason, guiding nature, society, humans and knowledge.[2] This type of rationality is selfsame for all people and is not dependent on time and social conditions. It characterizes the development of thinking, not that of reality. Rationality of thinking is an emanation of transcendental Reason. Typically, it is identified with the laws of logic and other 'innate' truths. The rationality of an action is determined by aspects of: situation of choice, limited ability and knowledge of a given individual, and his free will. These aspects are rational, falling in with aims, and conducive to their realization.

Another conception of the nature of rationality, featured below, is the methodological one: we can think of rationality of science as a definite set of characteristic features of a scientific method. The positivist and postpositivist philosophy of science identify rationality via a set of methodological rules. This conception of rationality presupposes evolvement and availability of a universal method and systematization of sciences. Scientific theories have to abide by

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[1] Raimo Tuomela, "Science, Protoscience and Pseudoscience," in *Rational Changes in Science*, eds. Joseph C. Pitt and Marcello Perra (Dordrecht: Reidel, 1987), 93.

[2] Stephen Toulmin, *Cosmopolis. The Hidden Aggenda of Modernity* (New York: The Free Press, 1990).

certain rules and standards, themselves the gist of logical stringency. Rationality is guaranteed by means of abidance by such rules and standards, themselves an expression of procedures of acceptance, justification and criticism of knowledge. Their uniqueness and logical power determine the priority of science as regards other forms of knowledge. They are means of gaining objective, genuine knowledge; or of adequate explanation of phenomena. Their fathoming leads to the construction of rational models with claims on ability to reveal the nature of scientific knowledge and scientific change (Here I mean the models brought out by Karl Popper, Thomas Kuhn, Imre Lakatos, Larry Laudan, Paul Feyerabend and others). In this methodological context we can understand the definitive words of Kazimierz Ajdukiewicz, the prominent polish philosopher, who treats rational knowledge as "intersubjectively communicable and verifiable" by means of the use of objective methods.[3]

Are scientists rational in terms of the "methodological conception of rationality?" Lars Bergström is right in saying that it "confuses means and ends, or process and product, in a certain way."[4] Methodological rules could be perceived of as forwarding some of the aims of science, not as determining any particular behavior of individual scientists.

So far, the contemporary philosophy of science has not been successful in proving, convincingly, that rationality of scientific knowledge might be perceived of as one keeping up to rigid methodological rules. Paul Feyerabend thinks that such type of rationality is a holdback in the feasible advance in science; it imposes limitations on human freedom. Scientific progress makes headway through breaking up the constraint of methodological rules.[5] The hope that such general and all-embracing directives exist has been dwindling away all along, primarily due to the impact of the established pluralism of forms of rationality. Feyerabend convincingly points to the real variety of 'rational' standards. The latter determine different cognitive strategies and practices. One might rightfully infer that the interpretation of a certain cognitive procedure or action as rational ones could not be pared down to a finite set of qualities and characteristic features. The concept of rationality is of a relative and changeable nature. There exists no idea (or

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[3] Kazimierz Ajdukiewicz, *Zagadnienia i kierunki filozofii. Teoria poznainia. Metafizyka* (*Problems and Theories of Philosophy. Theory of Knowledge. Metaphysics*) (Diamonion, 2003), 50 (in Polish).

[4] Lars Bergström, "Some Remarks Concerning Rationality in Science," in *Rationality in Science*, ed. Risto Hilpinen (Dordrecht: Reidel, 1980), 1-3.

[5] Paul Feyerabend, *Against Method. Outline of One Anarchist Theory of Knowledge* (London: Verso, 1975).

activity, tradition) that might be assessed as „the one-and-only rational", for good. Richard Rorty works out to an extreme relativism this entirely grounded conclusion of Feyerabend to an extreme relativism.[6] This assertion is entirely unacceptable, because there are also evaluative and normative invariants going to the making of rationality.

At present, following pragmatist criticism – and on the basis of the use of the decision-theoretic approach – philosophy stipulates an elimination of the difference between thought and action, and between theory and practice. Thought is considered to be a type of practical activity, a singling out of alternative decisions. A subject's development is a process, the nature of which is determined by internal and external factors. We can say that the distinction made between methodological and practical rationality, between inferential and behaviorist conceptions of knowledge and reasoning, arises out of the unjustifiable 'thought/action opposition.'

The decision theory is, as I see it, the most successful winner in the evolvement of a model of practical rationality. In terms of practice, rationality is a choice padded with good grounds.[7] The theory of decision seeks to offer a plausible model of rational action and to formulate general principles of rationality, guiding decision-makers under conditions involving risk and unreliability of information. 'The agent' has to make a choice in the presence of several alternatives: their results depend on the actual occurrence of a situation – reciprocally excluding each other in a set of situations. The agent will be striving to act in a way that might bring about a maximum meeting of his needs or preferences. A choice is rational if it maximizes an expected utility (usefulness) of a given action. This is the main principle of rationality in the theory of decision.

There exists a shared agreement that the decision theory can be applied to the problem of scientific rationality, 'hard problems' in particular, such as confirmation and justification.[8] A relatively successful methodological trend in the contemporary philosophy of science is developed on the basis of decision logic. One could speak about epistemic utility and about choice of scientific hypotheses as an activity modeled by some rules of rational decision-making. However, this new methodological paradigm calls for existence of a more convincing conceptual

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[6] Richard Rorty, *Philosophy and the Mirror of Nature* (Oxford: Blackwell, 1980), 331.

[7] Frederic Shick, *Making Choices. A Recasting of Decision Theory* (Cambridge: Cambridge University Press, 1997), 34.

[8] Ronald N. Giere, *Understanding Scientific Reasoning*, 4th edition (Orlando: Harcourt Brace College Publishers, 1997), Colin Howson and Peter Urbach, *Scientific reasoning: The Bayesian Approach* (La Salle: Open Court, 1989).

justification based on the concepts of norm and normative systems as regards human action and its normative regulation.[9]

2. Types of Rationality of Action

It is true that all typologies of rationality of action are based on the making of a distinction between rationality of ends and rationality of means for the fulfillment of aims. They might be defined as *axiological* and *instrumental* types of rationality. It is a characteristic feature of European thought that it interprets reality by means of the use of models in the context of the 'means-ends' relationship, yet. Models are abstract conceptual structures representing the main characteristics of reality.

Instrumental rationality can be termed as technological or economical one, too. We can consider it as a choice of means in the realization of a definite end through minimal effort. Their 'ratio' is a yardstick of action effectiveness. Instrumental rationality encompasses the real essence of the capitalist organization of society and of its bureaucratic administration and economy.

Instrumental rationality has different forms of manifestation. As regards organizations it functions as *system rationality*, featuring the need for of effective implementation of definite organizational objectives. It can also be defined as *action rationality* – in the context of the practical situation of making a choice of alternatives.

In his paper *Rationality as a Value* Klemens Szaniawski, another prominent Polish philosopher, emphasizes that rationality is a "fully rational value, which has positive or negative meaning as regards respective aims."[10] Axiological rationality is determined by a choice of appropriate aims. The task of formalizing the axiological content of a decision is very difficult. Choice of aims is determined by: value orientation, subjective preferences and empirical experience. The definition of an aim is an objective realization of thought. If one wants to fathom the process of discovery, formulation and realization of aims – he has to get to know the essence of a thought in its relations to reality. Here one has to deal with scientific rationality – with scientists' search for realization of some scientific aims.

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[9] Vihren Bouzov, "Scientific Rationality, Decision and Choice," in *Bulgarian Studies in the Philosophy of Science*, *Boston Studies in the Philosophy of Science,* Volume 236, ed. Dimitri Ginev (Dordrecht: Kluwer, 2003), 17-29.

[10] Klemens Szaniawski, "Rationality as a Value," in his *On Science, Inference, Information and Decision-Making: Selected Essays In The Philosophy Of Science*, eds. Adam Chimelewski and Jan Wolenski (Dordrecht: Kluwer, 1998), 232-240.

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The opposition between *formal* and *cultural* rationality is another aspect of our principal classification of rationality. Formal rationality presupposes availability of certain objective criteria and measures of choice-making, all of them with a quantitative expression (Example: an individual's choice of some marketed goods). Cultural rationality is determined by selection of aims: it has an evaluative basis rooting in cultural, social and individual experience.

Referring to the use of old philosophical approaches, we can distinguish between subjective and objective rationality. Rationality, as an evaluation, expresses acceptance by a given evaluator of specific norms determining an agent's behavior.[11] *The evaluator* can be an individual, a social group or a society (here I mean also self-evaluation). The objective content of rationality spells out the relation between an action and a state of the world. The rationality of science itself has an objective aspect, too.

Rationality can be considered as modality, as well.[12] We can interpret the context of "A is rational" in this way. In such context, with variable A means beliefs interpreted as epistemic relations to propositions. It can be applied to descriptions of actions. Rationality cannot be reduced to the definition of truth. Referring to an analogy with the classical *logical square*, we can expand the area of possible rational evaluation of human action as follows (A is a proposition or an action-description):

A   is   rational   A is non-rational

A is non-irrational   A is irrational
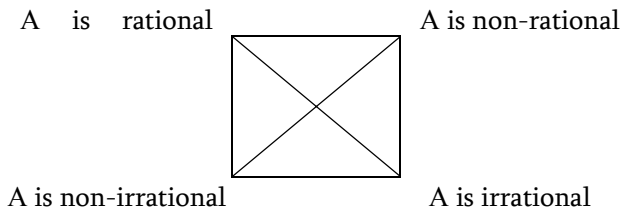
All relations – in the well-known logical square are intact – contraries are mutually-excluded, subcontraries are mutually-added, diagonal ones are in contradiction, subalterns propositions are in a relation of logical consequence – from general to particular. We can deduce "A is non-irrational" from "A is rational" and "A is irrational" from "A is non-rational." Rationality is opposed to irrationality, non-rationality is opposed to non-irrationality.

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[11] Bouzov, "Scientific Rationality."

[12] Jan Wolenski, "Racionalnosc jako modalnosc" ("Rationality as Modality"), in *W stronie logiki* (*From the Point o View of Logic*) (Krakow: Aureus, 1996), 125-137 (in Polish).

This typology directs us to getting over contradiction between rationality and irrationality. An action can be non-rational, not irrational (for example: buying a present for a girlfriend). Scientific activities can be rational or non-rational.

3. Norms, Values, and Scientific Rationality

When we say that a certain action is rational we do not express an assertion, be it true or false. This type of assertion has a definite comparative and evaluative element: we express a speaker's acceptance of some norms permitting or prohibiting the performance of an action. According to Isaac Levi, the requirements of coherence and consistency – the so-called "weak principles of rationality" – are "normative standards of rational health." They "could be deployed by deliberating agents to evaluate their options, probability judgments and value judgments;" they should be applicable to self-criticism as well.[13] Hence, it is an "action-guiding dimension" of rationality; in this sense the decision theory, as a normative theory, "provides normative criteria for assessing how decision problems are resolved."[14]

But "the external perspective" is of greater importance in rational evaluation. The decision theory can be a methodological tool in predicting or explaining human behavior. Norms themselves are *decisions* of a normative authority. The value judgment of a respective scientific community is external to an individual scientist. The external perspective of the application of rational normative standards is objective and is determined by social factors. Statements of rationality can be objective even if 'the rational' is only valid for humans in specific contexts.[15] Therefore, one can say that scientific rationality is a non-stringent regulatory system.

Norms are prescriptions for action, based on values and systems of preferences, yet, they are of an objective nature, too. They are introduced by performative utterances of the type of: "I state that A is obligatory (prohibited)," thus expressing a decision of a certain normative authority. The formulation of norms bears on 'the will,' but it is not devoid of rational grounds. A decision cannot be reduced to its linguistic formulation only; saying that it is an act of

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[13] Isaac Levi, *The Covenant of Reason. Rationality and the Commitments of Thought* (Cambridge: Cambridge University Press, 1997), 24-6.

[14] José Luis Bermudés, *Decision Theory and Rationality* (Oxford: Oxford University Press, 2009), 14.

[15] Hillary Putnam, "Pragmatyzm i wiedza pozanaukowa" ("Pragmatism and Extrascientific Knowledge"), in *Pragmatyzm i filozofia Hilarego Putnama (Pragmatism and the Philosophy of Hilary Putnam)*, ed. Urszula M. Zeglen (Torun: UMK, 2001), 24-5 (in Polish).

evolvement of normative regulation, a process of imposing an authoritative will, the result of which is a division of all possible actions into three, mutually-disjoint sets: obligatory, forbidden and indifferent. The decision to enact a norm and its acceptance by an addressee are actions. Norms are ordered pairs of the type of $<OA_i,K_i>$, where $OA_i \in X$, X is a set of initial obligations $\{OA_1,....,OA_m\}$, the variable A_i expresses actions, and for every $W \in K_i$ (the set of possible worlds), $V(A_i,W)=1$. In the context of logic, 'normation' spells out choice of a normative function. It is a choice of a set of postulated possible worlds imposed on the real world (the *normed Universe*) as its deontic alternatives. Obligations and prohibitions, established in the real world, are realized therein.

Normativity (and, in general, directivity) is viewed as a pragmatic, not as a semantic characteristic of utterance; it cannot be pared down to the concept of 'truth in model.' Normative discourse is made up of deontic propositions and performatives – themselves of a propositional character. The conception of norms, developed above, includes some basic ideas of the so-called non-linguistic theory of norm, suggested by Jan Wolenski.[16] I think that this theory does not give answers to important epistemological questions – it could only be instrumental in asking questions about verification and justification of norms.[17]

The logic of norms can be bolstered up in a broader context of decision logic, which has a prescriptive force. As stated above, it is a normative theory in nature. The choice of a norm is a rational choice based on definite rules; they are not entirely formal ones, because they have a definite social content. On this basis, decision logic can be specified as an *intensional* logic of rational choice. Decision-makers can conceptualize the situation in which their choice is made. It can be expressed by means of choosing a suitable norm, acceptable to a given community.

A norm only defines the common framework and basic principles of scientific problem-solving. Normative decision is a choice called upon to substantiate aims of a normative authority. Scientific community is the authority in science. It enacts and guarantees the binding force of the norms of scientific rationality, on the basis of knowledge, empirical verification, tradition, general understanding of science and its aims, taking into account existing social factors and prescriptions. These norms are absolutely objective in the context of work done by individual scientists or members of a scientific thought collective. Their

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[16] Jan Wolenski, *Z zagadnein analitycznej filozofii prawa (Some Problems of the Analytical Philosophy of Law)* (Warszawa-Krakow: PWN, 1980), ch. III. (in Polish), Jan Wolenski, "Deontic Sentences, Possible Worlds and Norms," *Reports on Philosophy* 6 (1982): 65-73.

[17] Vihren Bouzov, "Norms as Decisions," *ARHE, Casopis za filozofii* 2 (2004): 113-7.

violation dooms a scientist's research to failure. But this fact does not question the statute of norms. We can agree that scientific rationality is not "a code of directives, applied mechanically, but is a set of general directions with ethical value."[18] The acceptance of and abidance by these norms is of social importance – it affects community aims. The specific content of systems of rationality norms and their historical development is determined by different cognitive and social factors of variable nature. The norms of Aristotle science are different from the norms of modern science; they themselves are subject to change nowadays.

Following suitable analogy with laws of nature, we can say that norms are relatively independent of normative decisions. An agent makes a decision to accept or reject rational norms, because such decisions are in chime with his own interpretation of science's aims and problems, and with the interpretation accepted by the scientific community he belongs to. The choice of a norm is determined by the interest taken in maximizing an expected 'epistemic utility' (Carl Hempel). It is important to emphasize that the interpretation of norms developed by me is not a form of theories of 'norm conformity.'[19] A norm only defines the common framework and the principles of scientific problem-solving; its application is a matter of professional skills and creative approach to a particular problem. It presents possible "good grounds" determining rational choice.[20] One can say that it is not justifiable to compare the role of norms of scientific rationality and their collective acceptance with religious fate[21] – they include requirements of criticism and free choice; and they are of importance in the creative process.

It is of no importance at all, if an agent's cognitive abilities do not live up to the requirements of a norm. Such discrepancy can be compensated for by the fact that a scientist carries out work in a conceptual and normative framework established by a respective scientific community. There exists an invariant core in all the norms of rationality, accounting for their not being liable to change, as compared with the flexibility of legal norms. The requirements of empirical and theoretical justification of knowledge,[22] critical attitude, explanatory and predictive force, can play such a role.

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[18] Szaniawski, "Racionalnosc," 536.

[19] Steven Hetcher, *Norms in a Wired World* (Cambridge: Cambridge University Press, 2004), 4.

[20] Shick, *Making Choices*, 34.

[21] Wang Shan Bo, "The Link Between Scientific Rationality and Religious Rationality," *Journal of Dialectics of Nature* 28, 4 (2006).

[22] Peter Maher, *Betting on Theories* (Cambridge: Cambridge University Press, 1993), 25-30.

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Such a role and the development of various systems of norms of scientific rationality (in the synchronic and diachronic aspects) might be a subject of another philosophical analysis.