EXPLANATORY GAMES[*]

C. Mantzavinos

Published in: *The Journal of Philosophy*, vol. CX, Nov. 2013, pp. 606-632

https://www.pdcnet.org/jphil/content/jphil_2013_0110_0011_0606_0632

A philosophical theory of explanation must solve many problems. It must provide a descriptive account of the explanatory activity of scientists in the different domains of science. It must show how this activity differs from the provision of commonsensical explanations permanently offered in everyday life by ordinary people and how the explanatory practices evolve over time in different social arenas. It must also account for the fact that explanatory activities very often, if not always, take place under conditions of a cognitive division of labor in which different participants in the explanatory enterprise undertake different tasks and assume different roles. In a nutshell, a philosophical theory of

[*] I would like to thank Hans Albert, Theodore Arabatzis, Martin Carrier, Volker Gadenne, Jens Harbecke, Carl-David Mildenberger, Stathis Psillos and two anonymous reviewers for many helpful comments on earlier versions of this article. Talks based upon this paper were presented at the 14th International Congress of Logic, Methodology and Philosophy of Science in July 2011 in Nancy, at the University of Bielefeld in November 2011, at the University of Athens in March 2012, at the Technical University of Munich in June 2012, at the 86th Joint Session of the Aristotelian Society and the Mind Association in Stirling in July 2012, at the 8th Congress of the Gesellschaft für Analytische Philosophie (GAP) in Konstanz in September 2012, at the 1st Congress of the Gesellschaft für Wissenschaftsphilosophie (GWP) in Hannover in March 2013 and at the 23rd World Congress of Philosophy in Athens in August 2013. I thank all participants of the above events for their comments and suggestions.

explanation must be able to provide an adequate descriptive account of the different facets of the explanatory activity, a task which is much harder than it prima facie appears.

Besides, it must also provide standards for judging the quality of the outcomes of the explanatory activity. Some explanations are better in certain respects than others, and a set of norms is necessary for providing judgments of their quality. Some explanations provided in everyday life and in science can be more accurate, simpler or closer to truth than alternatives that are on offer. They might be able to provide a better understanding of the subject matter that they are supposed to deal with, and they might be much easier to use when one wants to intervene in the world on the basis of them. In short, normative rules for adjudicating between the explanations offered in different social contexts are needed and must be worked out and debated critically.

These diverse aims that a philosophical theory of explanation must accomplish are of both a *descriptive* and a *normative* nature. Stated differently, a philosophical theory of explanation is to provide solutions to a series of problems, both descriptive and normative, using not only philosophical resources, but whatever resources are also available from other disciplines. The aim of this essay is to establish the claim that this can be best done if one theorizes in terms of explanatory games rather than focusing on the explication of the concept of explanation.

I. THE WRONG QUESTION: WHAT IS AN EXPLANATION?

Though most of the thoughts and arguments that gained currency in the theory of explanation of the twentieth century can be found one way or another in the works of some past philosopher, from Aristotle to John Stuart Mill, the great advancements in logic and the explosion in the technical sophistication of the philosophers of the twentieth century have led to a more systematic treatment of scientific explanation, giving birth to a whole sub-discipline in the philosophy of science that deals with this issue.[1] Since the classic contribution of

[1] For a competent and precise review starting with Aristotle and including the main models of explanation prevailing in the present discussion, see Stathis Psillos, "Past and Contemporary Perspectives on Explanation", in Theo Kuipers, ed., *Handbook of the Philosophy of Science. Focal Issues* (Amsterdam and Oxford: Elsevier, 2007), pp. 97-174.

Hempel and Oppenheim,[2] the modern theory of explanation has largely come to reflect the virtues and vices of the analytic tradition: precise formulations and carefully exposed arguments on the one hand, but also a passionate insistence on logical aspects at the cost of more substantial aspects on the other. The primary question that the philosophical theory of explanation has tried to answer has been "what does an explanation consists in." As an answer to this question, Hempel has famously maintained that to explain a singular event is to show how this event can be expected to happen if one takes into account the laws that govern its occurrence together with its initial conditions. One set of reactions to the so-called "received view" of scientific explanation[3] has centred around the provision of counterexamples to Hempel`s model, ranging from shadows explaining the height of poles[4] to magicians hexing salt[5] and much more. The more constructive critics of Hempel have offered alternative models of explanation showing how they could better account for the cases in which Hempel`s model failed. Just to name the most influential ones: the *causal mechanistic model*, which claims that an explanation consists in the identification of mechanisms understood as entities and activities organized such that they are productive of regular changes from start to termination conditions[6]; the *unification model*, which claims that explanations are deductive arguments that provide understanding by fitting the particular facts and events within a general theoretical framework[7]; the *pragmatic account* of explanation, which claims that explanation is not a relationship like that of description, i.e. a relationship between theory and fact, but

[2] See Carl G. Hempel and Paul Oppenheim, "Studies in the Logic of Explanation", *Philosophy of Science*, XV (1948), pp. 135-75 [Reprinted in Carl G. Hempel, *Aspects of Scientific Explanation* (New York: Free Press, 1965)].

[3] See Wesley Salmon, *Four Decades of Scientific Explanation* (Minneapolis: University of Minnesota Press, 1989) p. 8, who has coined this term.

[4] In the literature the vertical flagpole example is usually referred to, but in his seminal paper Bromberger refers to the height of a telephone post to which a taut wire is connected – exemplifying, of course, the same point. See Sylvain Bromberger, "Why-Questions" in Robert Colodny, ed. *Mind and Cosmos* (Pittsburgh: University of Pittsburgh Press, 1966), p. 105.

[5] See Henry E. Kybourg, "Comment", *Philosophy of Science*, XXXII (1965): 147-151 and Wesley Salmon, "Statistical Explanation" in Robert G. Colodny, ed., *The Nature and Function of Scientific Theories* (Pittsburgh: University of Pittsburgh Press, 1970), pp. 173-231. [Reprinted in Wesley Salmon, *Statistical Explanation and Statistical Relevance*, (Pittsburgh: University of Pittsburgh Press, 1971), pp. 29-87].

[6] This is the definition of mechanism of the influential paper by Peter Machamer, Lindley Darden and Carl Craver, "Thinking About Mechanisms," *Philosophy of Science*, LXVII (2000), p.3. The causal/mechanical model of scientific explanation has been mainly developed by Wesley Salmon. See especially Wesley Salmon, *Scientific Explanation and the Causal Structure of the World* (Princeton: Princeton University Press, 1984) and Wesley Salmon, *Causality and Explanation* (Oxford: Oxford University Press, 1998). For specific applications of the mechanistic approach, see e.g. Carl Craver, *Explaining the Brain: Mechanisms and the Mosaic Unity of Neuroscience* (Oxford: Clarendon Press, 2007), William Bechtel, *Mental Mechanisms: Philosophical Perspectives on Cognitive Neuroscience* (London: Routledge, 2008), Jon Elster, *Explaining Social Behavior* (Cambridge: Cambridge University Press, 2007) and Pierre Demeulenaere, ed., *Analytical Sociology and Social Mechanisms* (Cambridge: Cambridge University Press, 2011).

[7] See Michael Friedman, "Explanation and Scientific Understanding," *Journal of Philosophy*, LXXI (1974): 5-19, Philip Kitcher, "Explanatory Unification," *Philosophy of Science*, XLVIII (1981): 251-81 and Philip Kitcher, "Explanatory Unification and the Causal Structure of the World," in Philip Kitcher and Wesley Salmon, eds., *Scientific Explanation*, vol. 13 of Minnesota Studies in the Philosophy of Science, pp. 410-505.

rather a three-term relationship, i.e. between theory, fact, and context[8]; the *manipulationist account* of explanation, which claims, relying on invariant generalizations rather than covering laws, that an explanation primarily answers a "what-if-things-had-been-different-question", i.e. that an explanation primarily enables us to see what sort of difference it would have made for the explanandum if the factors cited in the explanans had been different in various possible ways;[9] and the *kairetic model*, which claims that explanation is a matter of finding, by way of using a kairetic criterion, which of the causal influences on a phenomenon are relevant to its occurrence, demanding more specifically that the explanation is not missing parts and that every aspect of the causal story represented by the explanatory model makes a difference to the causal production of the explanandum.[10]

All these models of explanation – even though their designers intended them to be alternatives to Hempel`s model – still remain in the same research tradition of producing unitary models in order to capture what is supposedly the main aim of (theoretical) science, explanation. If not explicitly, then at least implicitly, the main philosophical project of the philosophers working in this tradition consists in offering an explication of the concept of explanation, or stated more neutrally, in answering the "What is an explanation?"-question. The development of the precise meaning of the concept of scientific explanation occupies centre-stage in all those approaches. Nobody can oppose – and I do not either – the famous dictum of John Stuart Mill that "[t]he word *explanation* occurs so continually and holds so important a place in philosophy, that a little time spent in fixing the meaning of it will be profitably employed."[11] However, this cannot be but a mission of peripheral importance to a philosophical theory of explanation for the simple reason that the outcome of this endeavour can only be a more precise concept of explanation – to be used in the discourse about the solution of the descriptive and normative problems of scientific explanatory activity making up the core of the philosophical enterprise.[12]

---

[8] See Bas van Fraassen, *The Scientific Image* (Oxford: Oxford University Press, 1980) and Peter Achinstein, *The Nature of Explanation* (Oxford: Oxford University Press, 1983).

[9] See James Woodward, "Explanation and Invariance in the Special Sciences," *The British Journal for the Philosophy of Science*, LI (2000): 197-254 and James Woodward, *Making Things Happen. A Theory of Causal Explanation* (Oxford: Oxford University Press, 2003).

[10] See Michael Strevens, *Depth. An Account of Scientific Explanation* (Cambridge/Mass.: Harvard University Press, 2008).

[11] See John Stuart Mill, *A System of Logic. Ratiocinative and Inductive*, vol. VII of the Collected Works of John Stuart Mill, eds., J.M.Robson and R.F.McRae (Toronto: University of Toronto Press and Routledge & Kegan Paul, 1974), p. 464.

[12] Surprisingly, the only text that endorses this view is Noretta Koertge, "Explanation and Its Problems," *British Journal for the Philosophy of Science*, XLIII (1992): 85-98, p. 86: "What strikes me as unsatisfactory about the current philosophical discussion of explanation is not its failure to match our intuitions about flagpole shadows or mayors with paresis. Rather it is the paucity of explicit *theories* of explanation—the absence of systematic

But even if one disagrees about the nature of the philosophical enterprise that a philosophical theory of explanation should launch and follow, a cursory glance at the prevailing scientific practices shows that the unitary models of explanation on offer have only a limited range of application. It is simply a matter of fact, thus, that their resources cannot capture anything but the explanatory activities of *some* areas of (theoretical) science. The claim that each of them raises, i.e. that it is supposed to accommodate *all and every* scientific activity, is not tenable. I will briefly focus on the case of the social sciences, providing three examples in a very general form that are intended to show that the unitary models of explanation have at best limited application.

II. A BRIEF OUTLOOK ON THE SOCIAL SCIENCES

The social sciences constitute a very disparate domain of science replete with debates and all kinds of controversies, and this is not the place to even start reviewing them. I will only select three fields in order to exemplify my argument. Since the three more influential models of explanation are the causal mechanistic model, the unification model and the manipulationist model, I will show that only one of those three models is suited to each case that I will discuss. My aim is not only to show that one philosophical model of explanation fits to the respective case, but also that the other two do not.

II.1. Neoclassical microeconomic theory. The most theoretically developed field of the social sciences is probably neoclassical microeconomics: It avails of a well-developed mathematical formulation, has a great range of applications, and is indeed the only piece of social scientific knowledge that is offered in a standardized way in every single economics textbook. Since Alfred Marshall,[13] who gave a systematic and thorough shape to the ideas provided by the marginal revolution of the 1870's,[14] neoclassical economic theory, based on the theoretical

philosophical generalizations in which the competing explications or models of explanation play a central role. I suggest that we reverse the order of investigation. We should begin by asking what *problems* a good theory about scientific explanation might reasonably be expected to solve. Only then can we begin to sketch such a theory. […] I believe it is only by focusing on the philosophical problem-situation that we can transcend the forty years of explication of *explanation* […]".

[13] See Alfred Marshall, *Principles of Economics* (London: MacMillan & Co, 1890).

[14] See the pioneering works of Carl Menger, *Grundsätze der Volkswirtschaftslehre* (Wien: Wilhelm Braumüller, 1871), William Stanley Jevons, The Theory of Political Economy (London and New York: MacMillan & Co,

construction of utility maximization, has provided a systematic account of the interplay between supply and demand on product and factor markets. Neoclassical microeconomics offers a global theoretical framework for both a partial analysis of a single market and a total analysis of all markets in an economy, using the maximization hypothesis and focusing on the properties of economic equilibrium. The neoclassical toolbox has also been applied to phenomena other than markets, as for example to politics,[15] law,[16] crime, and family.[17]

The explanatory practices of neoclassical economists are definitely better captured by the unification model of scientific explanation: a few generations of neoclassical economists have worked in the direction of subsuming a great range of economic and other social phenomena under a unique descriptive and explanatory scheme.[18] One of the great merits of the neoclassical theory consists precisely in its unifying power, i.e. its ability to subsume a great range of social phenomena under a unique descriptive and explanatory scheme. Thus Kitcher's main message seems to fit precisely to neoclassical economic theory:

"Science advances our understanding of nature by showing us how to derive descriptions of many phenomena, using the same patterns of derivation over and over again, and, in demonstrating this, it teaches us how to reduce the number of types of facts we have to accept as ultimate (or brute)."[19]

More specifically, the general argument pattern that lies at the heart of the neoclassical enterprise is one of maximization under constraints. There is a long series of specific argument patterns: the utility maximization of consumers, the profit maximization of firms, the vote maximization of politicians in democratic politics, etc. More and more specific argument patterns can be embedded into the larger argument pattern of maximization under

---

1871) and Leon Walras, *Éléments d' Économie Politique Pure, ou Théorie de la Richesse Sociale* (Lausanne: L. Corbaz & Cie, 1874).

[15] See the seminal monographs by Anthony Downes, *An Economic Theory of Democracy* (New York: Harper, 1957), James M. Buchanan and Gordon Tullock, The *Calculus of Consent – Logical Foundations of Constitutional Democracy* (Ann Arbor: University of Michigan Press, 1962) and Mancur Olson, *The Logic of Collective Action* (Cambridge/Mass.: Harvard University Press, 1965). For an overview of Public Choice as in principle a neoclassical economic theory of politics, see Dennis Mueller, *Public Choice III* (Cambridge: Cambridge University Press, 2003).

[16] See e.g. Richard Posner, *Economic Analysis of Law*, 8th ed. (New York: Aspen Publishers, 2010).

[17] See e.g. Gary Becker, *The Economic Approach to Human Behavior* (Chicago: The University of Chicago Press, 1976) and Gary Becker and Richard Posner, *Uncommon Sense: Economic Insights from Marriage to Terrorism* (Chicago: The University of Chicago Press, 2009).

[18] For specific historical examples, see Uskali Mäki, "Explanatory Unification: Double and Doubtful," *Philosophy of the Social Sciences*, XXI (2001): 488-506.

[19] Philip Kitcher, 1989, *op.cit*, p.432.

constraints, however, and thus provide explanations by means of unification. It is obvious that the unification model of explanation is clearly the appropriate model to accommodate these sets of practices.

The alternative models cannot adequately capture these practices. Let us start with the causal-mechanistic model of explanation. This requires the identification of mechanisms which will ultimately provide explanatory information. In the words of Salmon, it is the "underlying causal mechanisms […] which hold the key to our understanding of the world".[20] This is because "causal processes, causal interactions, and causal laws provide the mechanisms by which the world works; to understand *why* certain things happen, we need to see *how* they are produced by these mechanisms".[21] However, microeconomics textbooks never pay any attention to "causal processes, causal interactions, and causal laws", and there is indeed absolutely no causal talk included in the analysis of any type of market, be it the competitive market, a monopoly or an oligopoly. The endeavour is to determine precisely the equilibrium price and quantity without paying any attention to causal interactions. The causal-mechanistic model is clearly not the fitting model here.

The same is true for the manipulationist model of Woodward. Indeed, a notorious criticism of the mainstream neoclassical theory is that it operates at a level of abstraction that makes it extremely difficult to test the theory empirically. The well-worked out deductive arguments employed to analyze market behavior are not amenable to an analysis of the manipulationist approach. The equations that make up neoclassical economic theory are not offered as invariant generalizations that continue to hold under some range of interventions. In fact, contrary to the model of Woodward, it is required that they be invariant under all possible changes and interventions. The decision calculi that are offered in neoclassical economic theory can definitely not be accommodated by the manipulationist model, which focuses on formulating the necessary and sufficient conditions for a generalization in order for it to be descriptive of a causal relationship, i.e. that it be invariant under some appropriate set of interventions. The decision calculi of neoclassical economic theory are clearly argument patterns that can be only accommodated by the unification model of explanation.

II.2. Social mechanisms in sociology. In sociology and political science, on the other hand, a great bulk of the work of practicing scientists is concerned with the identification of social

[20] Salmon, 1984, *op.cit.*, p. 260.
[21] Salmon, 1984, *op.cit*., p. 132.

mechanisms and the description of their working properties. Take the well-observed phenomenon in the liberal democracies of the Western world that the expansion of educational opportunity does not increase social mobility nor reduce social inequality. Raymond Boudon has provided a widely accepted explanation of the puzzle that although education does provide opportunity for individuals to improve their social position, this does not translate into change in the social structure.[22] In every educational system, at some point in the curriculum, the individual has to make some choices about staying or not staying at school. These decisions are always taking place within a certain social context and give rise to a specific educational performance. Boudon distinguishes between primary and secondary effects of social origin. The primary effect directly influences the educational performance of the children as a joint result of class-specific primary socialization processes such as the potential of parents to actively support their child in school, the general cultural differences, etc. In the words of Boudon: "The lower the social status, the poorer the cultural background – hence the lower the school achievement."[23]

The other mechanism, called the secondary effect, focuses on how families from different social backgrounds estimate the costs and benefits of higher education tracks. The prospects of success of children of working class families in higher education tracks are estimated to be rather low by their parents since the parents are mostly not familiar with this type of school themselves. A major interest of the parents themselves, which influences decisively their decision making, is status maintenance, i.e. they want to ensure that their current status is maintained. A consequence of this is that their children receive sufficient praise and acceptance in their family environment even if they do not necessarily aim at the highest academic achievement. Parents in families with a higher social background, on the other hand, are motivated to provide their own children with the best possible education in order to make sure that their intergenerational status level remains relatively stable. This mechanism gives rise to parents from unequal social status producing children, through a family socialization process, that make unequal use of educational opportunities. The differentially educated children – even in partly meritocratic societies such as those in the modern Western world – often just replicate the social statuses of their parents.

In a nutshell, even though education does provide opportunity for individuals to improve their social position, this does not translate into change in the social structure. Rates of social

[22] See Raymond Boudon, *Education, Opportunity and Social Inequlity* (New York: Wiley, 1974).
[23] Boudon, *op.cit*., p. 29.

mobility have not increased over time, although the set of educational opportunities has increased, and it is not the case that societies with more expansive educational systems have higher mobility rates.

"Other things being equal […] educational growth […] has the effect of increasing rather than decreasing social and economic inequality, even in the case of an educational system that becomes more equalitarian."[24]

The causal mechanistic model of explanation seems to best capture this and similar cases of explanatory practice prevalent in sociology, political science, psychology, and the other social sciences. The scientific endeavor of the practicing scientists consists in uncovering mechanisms in the social world, and it certainly offers a "local" rather than "global" understanding. In the example that we have been discussing, Boudon's explanation does not apply to societies outside the Western liberal democracies and does not aspire to provide insights into the causal structure of the educational systems of say the developing countries or those of the Middle Ages.

It is clearly not the case that one looks for global theoretical frameworks and attempts to fit the particular instances under them. There is no formalized argument pattern provided in the concrete example of Boudon, nor is there any attempt to embed a specific argument pattern into a more general one. The philosophical model of explanation as unification is not fitting in this case or in similar cases in the social sciences.

Nor is the manipulationist model. The central notion of intervention is not employed by Boudon. His explanation is not based on regression equations, nor any type of counterfactual reasoning is involved. The same is true for a series of other mechanistic explanations provided by practicing social scientists – the manipulationist model cannot accommodate them.

II.3. Econometrics. Finally, let us have a very brief look at a purely empirical part of social science research, econometrics. The attempt here is to estimate regression equation models which specify a functional relationship between dependent and independent variables, taking into consideration that the relationship contains a random element, the "measurement error". Regression equations take the form:

[24] Boudon, *op.cit*., p. 187.

$Y = B_1X_1 + B_2X_2 + \ldots\ldots + B_nX_n + U$

X_1, X_2,… X_n are the independent variables, B_1, $B_{2,\ldots,}$ B_n are the coefficients, Y is the dependent variable, and U the error term (which makes the model a stochastic one).

The manipulationist model of explanation best accounts for this set of practices in the social sciences. Woodward`s theory offers what he calls a "natural causal interpretation of regression equations":

"[A regression equation] may be understood as claiming that each of X_1,… X_n are direct causes of Y […]. These causal relationships are understood as holding for each individual in the population of interest, in the sense that for each such individual [the regression equation] characterizes the response of the value of Y possessed by that individual to some range of interventions that change the values of X_1,… X_n for that individual. On this interpretation, the error term U also has a causal interpretation: it represents the combined influence of all the other causes of Y besides X_1,… X_n that are not explicitly represented in [the regression equation]."[25]

In those cases where the explanatory activity consists in establishing the truth of quantitative relationships in specific populations and under specific conditions, the manipulationist model of explanation is clearly the most appropriate. It is characteristic of the nature of the philosophical enterprise that, even if Woodward`s account seems to be tailored to much of the applied work in the social sciences, it still stands in the long tradition of unitary models aiming at explicating the meaning of the concept of explanation.

"I distinguish this *interpretive* issue from issues about the conditions under which one can reliably estimate the coefficients in [a regression equation]. The latter issues are epistemological: they have to do not with what [a regerssion equation] *means* but with when and how one can determine the values of the coefficients in [a regression equation]."[26]

The unification model clearly cannot capture the econometric practices. There are no argument patterns involved to be embedded in more general argument patterns, and there is a

[25] Woodward, *op.cit.*, p. 320.
[26] Woodward, *ibid*.

clear commitment to causal relationships that involve counterfactual reasoning – all aspects that are intentionally left out of the unification model.

Though the generalizations that are offered in econometrics invoke causal talk and causal inference, they never identify a causal *mechanism* proper. These generalizations constitute a sort of causal knowledge, which although not possessing the dignity of laws, do depict invariances which offer satisfactory explanatory information. Regression equations and structural models do not specify mechanisms and cannot, thus, be adequately captured by the causal mechanistic model either.

These three examples show that the unitary models of explanation cannot account for all and every explanatory activity in the social sciences. They are, if at all, only partially relevant as means of description and/or normative standards, at least in the social sciences, though a similar case can be made for other parts of science as well[27]. What does this teach us then?

III. EXPLANATORY PLURALISM

The lesson that one can draw from this brief overview is that *each* of the three main models currently on offer, the unificationist, the mechanistic, and the manipulationist, can accommodate *some* of the existing scientific practices in different social scientific domains. Though they are well-worked out models of scientific explanation and they can definitely be applied successfully in different and distinct domains of (social) scientific knowledge, their main claim – tied to their design as unitary models of scientific explanation – cannot be upheld: none of them can successfully claim the monopoly as the one and correct account of scientific explanation. In different domains of science different kinds of scientific practices prevail; so trying to establish a monolithic philosophical theory of explanation that is supposedly good for everything cannot be an acceptable strategy. In a nutshell, the goal of a philosophical account of explanation should not be to capture *the* explanatory relation, but

[27] Salmon, 1998, ch.4, *op.cit*., made a similar point about the physical sciences, suggesting that causal models were better suited to explanations of individual events, unification models to high theory. For a discussion see Henk W. de Regt, "Wesley Salmon' s Complementarity Thesis: Causalism and Unificationism Reconciled?", International Studies in the Philosophy of Science, XX (2006): 129-147.

rather to capture the many ways in which explanations are provided in the different domains of science.

The position that seems obvious and which I wish to adopt is that of an explanatory pluralism, which allows for different ideal types of explanation, i.e. different exemplary accounts, intended to provide a classification of different types of explanatory activities that are offered in diverse domains of science. Before elucidating the position of explanatory pluralism further in a more positive way, let me state clearly what this position does not amount to. First, explanatory pluralism is different than the explanatory ecumenism that Jackson and Pettit endorse insofar as it is independent of any type of commitment to causality.[28] What they call "causal fundamentalism," i.e. the position that every explanation must provide information on the causal history of what is to be explained, need not be an ingredient of explanatory pluralism. Quite to the contrary, Lewis's dictum that "to explain an event is to provide some information about its causal history,"[29] which Jackson and Pettit endorse, need not be followed: a genuinely pluralistic position can and should make as few commitments as possible to causality (and other metaphysical issues). Causal fundamentalism is an unnecessary restriction imposed on the process of producing successful explanations in science. Second, explanatory pluralism need not hinge on positions and discussions of reductionism. In the few cases in which such a position is defended in the literature, be it in the philosophy of psychology,[30] the philosophy of biology,[31] or the philosophy of the social sciences,[32] it has always been done in the context of the dispute between reductionists and anti-reductionists. However, the passion for viewing scientific phenomena through the lenses of reductionism is a relic of logical positivism and of the epoch of the explanatory monarchy of physics (which designated all other sciences as "special") rather than of the explanatory liberal democracy of our times. Going deeper on this issue would lead us astray; it suffices to note that one can be an explanatory pluralist without adopting a specific stance toward the issue of reduction.

---

[28] See Frank, Jackson and Philip Pettit, "In Defense of Explanatory Ecumenism," *Economics and Philosophy*, VIII (1992): 1-21.

[29] David Lewis, "Causal Explanation," *Philosophical Papers Volume II*, (Oxford: Oxford University Press, 1986), p. 217.

[30] See e.g. Robert McCauley and William Bechtel, "Explanatory Pluralism and Heuristic Identity Theory," *Theory and Psychology*, XI (2001): 736-760, Robert McCauley, "Time is of the Essence: Explanatory Pluralism and Accommodating Theories About Long Term Processes", *Philosophical Psychology*, XXII (2009): 611-635.

[31] See e.g. Kim Sterelny, "Explanatory Pluralism in Evolutionary Biology," *Biology and Philosophy*, XI (1996): 193-214.

[32] See e.g. Caterina Marchionni, "Explanatory Pluralism and Complementarity. From Autonomy to Integration," *Philosophy of the Social Sciences*, XXXVIII (2008): 314-333.

Stating explanatory pluralism in a positive way is, of course, much harder and must avoid two dangers: first, of serving a merely *apologetic function* by providing ex-post legitimization of any and/or all explanatory scientific practices; and second of sliding into an *anarchic position* that christens as acceptable any explanation offered in scientific discourse by entirely giving up the authority of any kind of scientific rationality. I propose that these two dangers can be evaded if one theorizes in terms of explanatory games. Let us proceed with the elaboration of this claim.

IV. THE EXPLANATORY ENTERPRISE

Explanatory activity is part of the scientific activity undertaken by imperfect biological organisms with a limited cognitive capacity in interaction with artefacts in a specific social context. The explanatory enterprise is a social process, and it consists of the attempt of the participants to this process to provide answers to puzzles and solutions to theoretical problems. The explanatory enterprise is embedded in certain practices employed by the participants and unfolds according to normative standards that have emerged in a long evolutionary process of trial and error. There is a history to the explanatory enterprise, a history that includes the more and less successful attempts of answering specific "Why?"-questions, the development of more and less accurate means of representation devised to answer such questions, and the permanent change of institutional constraints under which the participants engage in their activities. The explanatory enterprise has a prehistory rooted in the attempt of our remote ancestors to understand what was going on in their immediate physical and social environment and a history reflected in the progressive exposure of explanations to a critical attitude and testing. Mythical explanations of rain caused by a frustrated Zeus sitting on the top of Olympus throwing thunder to the mortal have given place to scientific explanations of natural phenomena tested in different experimental settings with the aid of highly sophisticated techniques. The explanatory enterprise emerges as a human phenomenon – therefore permanently unfinished, and it should be understood as a *project* in which humanity has been engaged for most of its history.[33]

[33] For a similar argument in the realm of ethics, see Philip Kitcher, *The Ethical Project* (Cambridge/Mass: Harvard University Press, 2011), p. 2.

At every moment of time there is a stock of explanations available in a society proposed by ordinary people "in the wild" or by specialists organized formally or semi-formally within specific organizational structures such as churches, universities, etc. This explanatory reservoir is distributed among diverse individuals and groups in the society under conditions of a cognitive division of labour. The terms of provision, control, and dissemination of explanations in this collective explanatory enterprise are regulated by the different rules that the participants have come to adopt over time. These rules incorporate the normative standards that guide the processes of discovery and justification of explanations as well as the modes of their communication, dissemination, and adoption. They constitute *the rules of the explanatory game* that the participants are playing.

Explanations emerge in the process of playing the game. How the game is played depends on the rules of the game. Obviously, different people play different explanatory games, which give rise to different outcomes. The distinction between rules and actions within rules is constitutive of the analysis of the explanatory enterprise in terms of games. The players of a respective game, be they ordinary people, scientists, or religious preachers, are constrained at any moment of time by a series of rules concerning their explanatory activities. The rules of the game divide the, in principle, innumerable possibilities for providing explanations into those that can be undertaken and those that cannot. The rules of the game define the means that the players can use to represent the phenomena that they want to explain as well as the class of explanatory strategies that the players are allowed to undertake. They structure the interaction between the players and shape the way that the explanatory game is played over time.

This view conceptualizes the explanatory enterprise as a set of explanatory games and highlights explanatory activity as fundamentally social. In the case of science, for example, there is a cognitive division of labour: some provide the big intuitions; others build the bridges to existing theoretical structures, providing the unification of phenomena; others elaborate on the means of representation; and still others work out the empirical testing and applications to different ranges of phenomena. Explanations are the outcome of the complex processes of social interaction between individuals pursuing different aims and undertaking different tasks. Even in those cases where explanations deemed to be very successful seem to be prima facie due to the labours of a single scientist, it is never the case that she masters all the practices *and* has invented all means of representation *and* has designed all the techniques

necessary for the provision of them. In other words, it is literally never the case that all parameters of the explanatory process are controlled by one individual and all the ingredients of a successful explanation can be offered by a single scientist.

V. THE EXPLANATORY PROCESS

A conceptualization of activities in terms of explanatory games goes hand in hand with a focus on explanation as a process rather than as an outcome. The task is to highlight the *complex process of explanation* rather than to pose the issue as if explanation were a *static situation.* During an evolutionary process of trial and error, explanatory activities are undertaken according to the prevailing rules of the game, and a permanent flow of explanations is produced, tested, and retained or discarded. Novelty is a permanent feature of this process since new ways of representing the phenomena constantly emerge, new ways of testing are being constantly designed, and new means of criticism are constantly invented. The traditional view of explanation in its many facets has failed to see this point and has instead undertaken scholastic efforts to analyze the outcomes of this process, highlighting mainly the logical aspects of what was supposed to be "the explanatory relation." There has been silence about a whole range of issues pertaining to the processes of the construction of (successful and less successful) explanations and to the diverse factors that play a role in their rise and demise – quite a natural attitude since the philosophical project has been concerned with the explication of the concept of explanation rather than with the analysis of the process of explanatory activity. More fatally still, the hidden consensus has been that there is a single outcome, "the explanation" to be described, rather than a range of explanations produced in a constant process; and it has been thought that there is a single ideal, "the successful explanation" that is to be normatively appraised, rather than a great range of normative rules that structure the process, which are to be criticized and refined.

To use a metaphor, the traditional view of explanation has focussed on what comes out of the pipe instead of the flow in it; and it has offered the analysis of the drain that comes out of the flow as if it were analogous to the pressure of the influx at the beginning of the pipe. Between the two ends, however, lies an elastic and changeable reservoir, whose magnitude depends on a series of circumstances. Analogously, in the case of ordinary explanations the analysis

should focus on the flow of the river in the valley rather than on how the landscape around the mouth of the river is shaped by the water ending in it. One can grasp the explanatory process if one conceptualizes it as a continuous flow or river, which produces unceasingly, in its mouth, the final products emerging in multiple transformative processes after the initial insertion of inputs. At every moment of time many such streams flow, or, even more, complexly branched river systems emerge next to each other, each a bit more advanced than the next. The final products of all those streams appear in more or less distant points in time.

The flow of explanations is channelled by the rules that govern the explanatory activity. Depending on the rules, only certain classes of activities can be undertaken; consequently a whole range of explanations that are possible in principle are never produced and never considered. The rules of the game are whatever constrains the flow and gives it a shape; there can be natural or artificial impediments that channel the flow in different ways: little stones and branches which push the flow in a certain direction or big artificial dams which interrupt it violently and force the water to collect in artificial lakes. The rules of the game influence decisively the explanatory process and shape the possible final outcomes.

Explanatory activities take place in historical time. The history develops according to basic rules that set the trajectory for development and that the participants learn in their socialization process. The historicity of explanations is embedded in the rules of the explanatory game: in the case of scientific explanations, this occurs in processes whereby *apprentices* learn the ways to play the game from *veterans* in the respective scientific community.[34] The historicity of the explanatory enterprise refers to nothing more than the learning history of the individual members of the respective group regarding which explanatory strategies are permissible and which are not. And the best way to analyze the slogan "history matters" is to analyze the rules that govern the respective explanatory games. How should such an analysis proceed and what can it accomplish?

[34] See Philip Kitcher, *The Advancement of Science* (Oxford: Oxford University Press, 1993), p. 58ff.

VI. THE RULES OF THE EXPLANATORY GAMES: AN ABSTRACT CHARACTERISATION

The analysis of the rules of an explanatory game can be both of a descriptive and a normative nature. I will tackle the descriptive task in this and the next section before taking up the normative task in the following two sections.

A precise description of the rules of a game includes the way that the rules have emerged over time, but also their precise content. It is straightforward that there are different types of explanatory games, and the means for classifying them refer to the similarity of the rules that govern the explanatory activities of the respective participants. There are religious explanatory games, mythical explanatory games, scientific explanatory games, etc. The description of the different kinds of games requires the exposition of the special rules that characterize them and an account of how they differ between them. I will not undertake this task here, but will devote my attention instead to the harder task of providing an abstract characterization of an explanatory game.

Such a characterization can be given from both a static and a dynamic view. From a static perspective one can mainly distinguish between three kinds of rules:
1. Constitutive rules. There is a basic set of rules that constitute an explanatory game as a game. They include three categories of rules: *a) Rules determining what counts as an explanandum.* Aristotle famously regarded motion as an explanandum and he provided causes as an explanans. Newton did not regard motion as an explanandum. Motion was taken to be what it was, the explanandum being the change of motion. Aristotle and Newton played a different kind of explanatory game. *b) Rules determining what must be taken as given.* Every game takes place within a context of background knowledge that remains unquestioned and is taken as given. There is a bedrock of unquestioned facts, beliefs and practices which are left out of the game, implicitly or explicitly. When August Cournot explained the pricing behaviour of a monopolist he took as given that the earth is round, all human beings can breathe and that the cooking of a pie requires a system that produces heat. *c) Rules determining the metaphysical presuppositions.* No explanatory game can take place in a metaphysical vacuum. The metaphysical assumptions act as constraints on the generation of the other rules, and belong therefore to the constitutive rules. The structure of the game is predicated on prior assumptions concerning the way the world is and by what means it is

explainable in principle. These rules can be implicit or explicit and they can vary from stone-age metaphysics to highly refined metaphysical assumptions.

2. Rules of representation. Because of the hospitality the people of Attica showed Demeter when she was searching for Persephone, the Olympian goddess first gave agriculture to the human race. This mythical explanation of the emergence of agriculture is not only represented by means of an oral story (later also documented in written form) using metaphorical language, but also with the aid of some visual representations like a fifth-century BCE red-figure attic stamnos, showing Triptolemos teaching agriculture, the gift of Demeter.[35] In contemporary scientific explanatory games, representation occurs by means of artefacts, both concrete, like graphs, scale models, computer monitor displays, etc. and abstract, like mathematical models.[36] Which rules of representation guide the explanatory activities is fundamentally important for the quality of explanations generated during the game.

3. Rules of inference. In every explanatory game a set of inferential strategies are used which aim at whatever is regarded as the explanandum. Inferences act on the representations provided and they can be of very different sorts. In religious explanatory games, for example, inferences are frequently made from experiences of revelation to phenomena easily observable without sophisticated means of scientific representation. In scientific explanatory games, laws or law-like statements, along with rules that respect some formal logical requirements, are the basic rules of inference. Such rules can be very specific and very diverse, ranging from recipes to formulate predictions to instructions about how to construct arguments.

From a dynamic perspective the most important is the set of rules of development:
4. Rules of scope. These are rules of specification, i.e. they give instructions about the scope of phenomena to which the explanatory game should be applied. The scope of the explanatory game that evolutionary theorists were engaged in originally included plants and animals. The scope has been then extended to include human culture. It has been extended and specified further to include even routines employed by firms in market competition and much more. The rules of scope are responsible for one main property of games, which I would like to call *nestedness.* They give instructions on how to dock one explanatory game into another and so provide nested games. The easier the fit between the rules of scope of different explanatory

[35] See Matthew Clark, *Exploring Greek Myth*, (Malden: Willey-Blackwell, 2012), p. 7ff.
[36] See Bas C. van Fraassen, *Scientific Representation* (Oxford: Oxford University Press, 2008).

games, the higher the degree of their nestedness and the greater the potential of interlocking different explanatory games. For example, the rules of scope of the explanatory game of biological evolution and the rules of scope of the explanatory game of growth economics have turned out to be congruent, so that the economics of evolutionary change by Nelson and Winter[37] has emerged as an explanatory game, nested in the two other games.

So, it is easier to get into a game if nestability is given. You need not learn (a lot of) new rules in order to get into it. (Nestability is, thus, in a sense the analogue of depth in the reductionist accounts of explanation.)

In a nutshell the rules of scope comprise the instructions about where to apply the explanatory practices of the game and how to apply the game to new phenomena – they are, thus, of a dynamic nature by virtue of extending or contracting the phenomena on which the specific explanatory practices of the game are to be applied.

VII. A (VERY SHORT) CASE STUDY

In order to exemplify further this rather abstract characterization of a game, I am going to discuss very shortly an explanatory game in the history of economic analysis which concerns the value of commodities. I will start with the explanatory game that classical political economists of the 18th century were playing and will then show how this game was transformed into the one that marginalist economists came to play at the end of the 19th century.

1. The *constitutive rules* of the explanatory game consisted first (a) in what counted as an explanandum. Adam Smith, David Ricardo, J. S. Mill and the other classical economists regarded exchange value as the explanandum.[38] Further (b) the explanatory game took place within a context of background knowledge, both natural scientific and common sense

[37] See Richard Nelson and Sidney Winter, *An Evolutionary Theory of Economic Change* (Cambridge/Mass.: Harvard University Press, 1982).
[38] See Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations*, ed. Edwin Cannan, (Chicago: The University of Chicago Press, 1776/1976), Bk. I, Ch. IV, p. 32f.

knowledge, which remained unquestioned. This bedrock of unquestioned facts and beliefs were left out of the explanatory game in an implicit manner. Finally, (c) the main rule regulating the metaphysical presuppositions was that the social world is in principle knowable, that it exemplifies an order commensurate to the order of nature and that it is governed by laws which are discoverable. 2. In order to explain the value of commodities, the classical economists used natural language and numerical examples as the sole means of representation. The *rules of representation* that structured their explanatory game were, thus, very basic. 3. The *rules of inference* used to explain the exchange value of commodities were the rules of logic prevailing at that time, along with a series of law-like statements. The most important one is included in the title of Chapter I, Section I of David Ricardo`s Principles: "The value of a commodity, or the quantity of any other commodity for which it will exchange, depends on the relative quantity of labour which is necessary for its production, and not on the greater or less compensation which is paid for that labour." [39] 4. The *scope* of the explanatory game is the "commercial society". An additional rule of scope is explicitly mentioned by Ricardo: "In speaking then of commodities, of their exchangeable value, and of the laws which regulate their relative prices, we mean always such commodities only as can be increased in quantity by the exertion of human industry, and *on the production of which competition operates without restraint*."[40] Under competitive conditions the "whole annual produce of labour of every country, taken complexly, must resolve itself into the same three parts, and be parcelled out among different inhabitants of the country, either as the wages of their labour, the profits of their stock, or the rent of their land".[41] The explanatory game of the value of commodities is nested, thus, into the explanatory game of the value of factors of production and this is made possible by the rules of scope.

The explanatory game played by classical economists for approximately one century was structured by the sets of rules that I have indicated. Within these rules their explanatory activities unfolded and there was a specific cognitive division of labour. It was Adam Smith who has provided the big intuitions, David Ricardo who specified more rigorously the rules of inference and John Stuart Mill who has extended the scope of applications of the theory. The explanations that have been generated while these and other less memorable classical economists were playing the game were the outcome of the complex processes of social

[39] See David Ricardo, *On the Principles of Political Economy and Taxation*, ed. Piero Sraffa, (Cambridge: Cambridge University Press, 1817/1951), p. 11.
[40] David Ricardo, *op.cit*., p.12, my emphasis.
[41] Adam Smith, *op.cit*., Bk.I, Ch.VI, p. 58f.

interaction between individuals pursuing different theoretical and practical aims. A flow of explanations of the value of commodities was produced and criticized mainly on theoretical terms since in this case no direct experimental evidence has been produced. It has primarily been these theoretical criticisms that have gradually led to the change in the rules of inference; and it was the introduction of mathematical models that gradually led to a new set of rules of representation. The scope of the analysis has also been extended to include monopolies and (later) oligopolistic competition. In this specific explanatory game the change has concerned all kinds of rules: the rules of inference, the rules of representation and the rules of scope. The change has been initiated by the marginalists. These economists, Walras, Jevons and Menger being the most influential ones among others, were still playing the same game since the constitutive rules had not changed: the explanandum remained the value of commodities, the metaphysical assumptions remained largely the same and a great part of what was taken for granted by the classical economists was also taken for granted by the marginalists.

The *rules of inference* started changing when economists confronted a series of difficulties in explaining prices because of the lack of a theory of demand. The concept of substitution at the margin provided a more satisfactory explanation of prices of products and factors of production. The marginal economists introduced a new rule of inference, the maximisation principle, so that distribution became nothing more than the outcome of the application of a more general principle. So, the marginalists achieved greater generality and unification by explaining both factor and product prices with the help of a single principle. This maximization principle also facilitated the introduction of *new rules of representation*: mathematical calculus, more specifically maximization under constraints. The application of this formal means of representation made the explanations more precise, simpler and offered a unification of diverse economic phenomena. The *scope* of the explanatory game was also extended to include the explanation of prices under monopolistic conditions. The classical economists did address the case of monopoly prices, but in a very unsystematic way since their main rule of inference – i.e., that value depends on the amount of labour – could only work under competitive conditions.

This change of the rules of the game came about as the outcome of a process in which the explanatory activities of those economists still employing the initial sets of rules were criticized by an ever growing number of economists who were propagating the advantages of the new rules. Those advantages were mainly conceived in terms of increased consistency of

the rules, increased accuracy and simplicity. The unification provided by the extension of the scope of the explanatory game also counted as an additional benefit. The successful propagation of the new rules by a few innovators called more and more imitators to the scene, and so a widespread adoption of the new rules of the explanatory game took place in a gradual learning process. Whether this change of rules had a revolutionary character or a more gradual one is an issue that I will leave undiscussed here. It is only important to stress that under the new set of rules, new kinds of explanatory activities started generating novel explanations of market prices of commodities at different levels.

VIII. CRITERIA OF APPRAISAL OF THE RULES: A PROCEDURAL CONCEPTION

From a normative point of view, the focus on rules is equally important. The normative discourse about explanations has centred around the goodness of the outcomes rather than the goodness of the rules. The traditional philosophical account of explanation adopts a static stance when trying to develop normative standards by which to judge the outcomes of explanatory activity. Philosophers of science engage in the business of developing unitary models of what "the successful explanation" is supposed to accomplish. The development of the notion of an "ideal explanatory text",[42] for example, is a characteristic attempt to offer an eternal standard for judging the quality of explanations (even if meant to serve only as a regulative ideal). The provision of a general model able to serve as a reference that applies to all times and conditions suggests itself if one focuses on explanations as outcomes.

However, the opposing procedural conception is based squarely in the rejection of any claim that the explanations that are good are "out there" waiting to be discovered by scientists or anybody else. The rules of the explanatory game are quite literally made up or created in some participatory process of discussion, criticism, and persuasion. Good explanations are those that have emerged because good rules have been followed, and working out the criteria of their goodness is not a once-for-all matter, but rather a continuous enterprise, taking place with the participation of different kinds of experts or other participants in the explanatory game. The expert in the philosophy of science quite simply occupies no specific metier that

[42] See Peter Railton, "Probability, Explanation, and Information," *Synthese*, XLVIII (1981), p. 240ff.

allows the privilege of making claims to define what is best for others. The elucidation of this participatory process is the fundamentally *naturalistic* element of the approach.

The moral is that it is not possible to provide a general model able to serve as a reference for a successful explanation, which applies at all times and under all conditions. Rather, the concrete specification of the prescriptive rules that govern the explanatory activity must proceed from a critical analysis of the prevailing situation, and it must get by without an atemporal abstract ideal. In other words, the explanatory process is channelled by rules which are themselves changing. This refers to all kinds of rules, including the rules of logic (which are especially important in the context of scientific explanations) since logic, like every other discipline, develops over time.[43]

The virtues and vices of the rules of an explanatory game can be themselves analyzed, debated, and criticized. This criticism takes place at a first level with respect to specific criteria of appraisal that emerge in the process of the evolutionary change of the rules. These criteria of appraisal encapsulate the diverse values that those that undertake the explanatory activities hold. These can be epistemic values, like accuracy, simplicity, consistency, fruitfulness, etc., or non-epistemic values like honesty, integrity, piety, beauty, etc. There is, naturally, value-pluralism. At a first level, the critical appraisal of the rules of the explanatory games takes place with reference to these diverse values by participants and non-participants in the game alike. The means of the critical appraisal can, of course, differ. Some explanatory games are characterized by a great dogmatism and the critical appraisal of the rules takes place by violent means – this is often the case with religious explanatory games. The means of critical appraisal used for judging the quality of the rules of modern scientific explanatory games are non-violent – this has become so common that is regarded as self-evident.

IX. EXPLANATORY METHODOLOGY AS TECHNOLOGY

This poses the question whether there is some kind of external criterion or justification process that can be used in order to judge the superiority of the different values that are used in the critical appraisal of the rules of different explanatory games. It should be clear that the

[43] The refinement of the logical aspects of scientific explanation with the aid of first-order predicate logic is, thus, naturally, only an instance in a long evolutionary process rather than the final word on the matter.

quest for an ultimate justification of values and rules is a manifestation of the vain quest for certainty originating in the idea of a positive, sufficient justification. This general philosophical idea, operative both in epistemology and philosophy of science as well as in ethics and political philosophy mandates the quest for an adequate foundation, a sufficient justification, for all convictions and principles. The demand for a justification of everything leads to a situation with three alternatives, all of which unacceptable: the Münchhausen Trilemma, named such because of an analogy existing between this problem and one which that baron once had to solve.[44] It involves three options: one has the choice between an infinite regress, a logical circle or a dogmatic suspension of the process at a particular point. The traditional philosophical theory of explanation typically suspends dogmatically the argumentation at some point in favour of the ultimate "given" that the respective philosopher favors.

The dogmatism and the Münchhausen Trilemma can be avoided by substituting the principle of critical examination for the principle of sufficient justification. In accord with this principle, a discussion of the problems of epistemology, philosophy of science, or ethics need not refer back to ultimate reasons in order to be convincing or "rational". Instead, problems that arise in the sphere of cognition or in the sphere of praxis are to be discussed and solved in light of the already existing solutions. Solutions to new types of problems of any sort require creativity and imagination and are not worked out in a social and mental vacuum. The application of the principle of critical examination means that solutions are to be creatively discovered, they are to be weighted in reference to certain values and standards, and, on this basis, the preferred solutions to problems are to be decided upon. Solutions are not judged to be good or rational by virtue of being based on certain knowledge or ultimate values. Instead, our solutions in all areas of cognition and action are fallible, but they can be improved by critical discussion.

The idea of the immanent rationality or goodness of certain models of explanation is a dogma. In contrast, the critical discussion of the rules of the explanatory games aiming at their modification and revision on the basis of a weighting of the various feasible alternatives with regard to different criteria and values is a way of escaping dogmatism, without sliding into any kind of anarchic position of "anything goes". This middle-ground position between

[44] See Hans Albert, *Treatise on Critical Reason* (Princeton: Princeton University Press, 1985), p. 16ff.

dogmatism and extreme relativism consists of three essential ingredients: pluralism, fallibilism and revisionism. Let me specify very briefly these three ingredients.

A pluralistic account acknowledges positively the existence of many values, epistemic and non-epistemic alike. Pluralism is fundamentally different than relativism since pluralism does not involve a renunciation of judgment and commitment as relativism does.[45] A pluralist engages with what she disagrees, poses critical arguments and proposes alternatives – an attitude very far away from the relativistic "whatever". Besides, relativism does not necessarily imply pluralism: the requirement to treat equally all alternatives that do exist does not entail the requirement to have many alternatives. If all agree on one alternative and there is no active search for other alternatives, relativism has nothing to oppose to monism.[46]

Fallibilism is the position that all our knowledge, activities, principles, positions and rules are prone to error. In all areas of cognition and action human beings constantly make mistakes, but they are able to learn from them. A fallibilist treats all problem solutions as hypothetical: she provisionally accepts them instead of searching for a final justification for them. The fallibilistic attitude can be applied to all areas of human activity: science, politics and even religion. (The existence of God can be treated as a hypothetical postulate to be critically discussed, for example.) What concerns us more here, criteria and values can all be accepted as hypotheses amenable to criticism.

Revisionism is the position that all our beliefs and problem solutions, fallible themselves, are amenable to revision – and possibly to a progressive one. Revisionism is a corollary of the procedural view adopted – any static ideal would not be compatible with it.

This middle-ground position views explanatory methodology as a technological discipline. A technology operates, as is well known, with hypothetical rather than categorical imperatives. Having accepted that the quest for certainty is vain and that the attempts to provide final justifications of our values are futile, the main endeavour consists in accepting provisionally a series of values and normative criteria that have emerged and then inquire into how the different rules help to attain them. To judge the performance of different sets of rules of explanatory games, it is only necessary to hypothetically presuppose certain performative

[45] See Hasok Chang, *Is Water H_2O? Evidence, Realism and Pluralism* (Berlin and New York: Springer, 2012), p. 261.
[46] Chang, *ibid.*

criteria, and then to investigate the degree to which the explanatory activities guided by these rules can fulfil these criteria. Truth or verisimilitude could be such a criterion, for example, and a critical discussion of the rules of an explanatory game can take place with respect to whether the explanations of a phenomenon on offer at a certain point of time are true or close to the truth. If truth is not accepted as a criterion or epistemic value, however, then the quality of explanations can be judged according to other criteria, such as, for example, beauty.

Favouring explanatory methodology as a technological discipline does not force us to ostracize the domain of values to a dogmatic or relativistic heaven. Values are not to be viewed as impervious to critical discussion as the positivistic dogma demanded for decades. Nor are they ostracized to an indifferent relativistic universe. Values as normative principles of highest generality can be themselves critically debated. The outcomes of such discussions are, however, always of a provisional character, the results of human endeavour themselves, amenable to further debate and criticism. An Archimedean point of departure does not exist in this case; nor does it in any other case. There can just be moments or longer periods of consensus about what are supposed to be the highest virtues of the rules of the game, crystallizing the fallible outcomes of the ongoing discussion. There is, to put it differently, no ultimate justification of the rules, but a provisional consensus, if at all, about the most general normative standpoints and the highest principles, a consensus amenable to revisions.

But the technological character of explanatory methodology that I would like to stress here is not dependent on the outcome of the ongoing discussion about values. Explanatory methodology can be conceptualized as a rational heuristic: the different sets of rules are appraised with respect to the different values, which are accepted only hypothetically. And it is possible, of course, to evaluate different kinds of rules with respect to different values. The rules of inference of a certain explanatory game, for example, can be evaluated with respect to truth, but also with respect to beauty. One can have a set of rules of inference that satisfy aesthetic criteria (say highly complex mathematical calculi), but fail to give a true account of the phenomena to be explained. The hypothetical imperatives employed are of the type: if one wants to attain a true explanation of the phenomenon A, then one should employ rules of inference that provide valid information about the structure of the respective part of reality. The critical debate will concern whether this has been attained or not, and this is a problem that requires creativity and ingenuity on the part of the participants, who can be experts in a specific field and philosophers of science alike.

All we avail of as participants to this discussion is the possibility of framing informed judgments about these issues and defending them with arguments. A holy grail to help us find the Scientific Method does not exist. Our fallible judgments are all what we have, and at some point we have to make choices about the rules we prefer – not necessarily rejecting the rest (there can be also a second and a third prize, not only a first prize). And it is important to stress that there is no algorithm relieving us from the necessity to make the choices. Controversies cannot be substituted by calculations – we still have to form judgments and decide which calculations to adopt.

X. CONCLUSION

One way to defend explanatory pluralism is, thus, to view the myriads of explanatory activities undertaken by scientists and ordinary people in terms of explanatory games. In social life and in different domains of science different explanatory games are played, and the philosophical project consists in describing and normatively appraising the rules that constitute these games. This project is fundamentally liberal, in the sense that participants and non-participants to the game alike engage in the critical discussion and revision of the rules, or to put it in other terms, the project is fundamentally naturalistic – philosophers and scientists equally take part in it.

The explanatory enterprise being a process that is developing, all we can do is to point to the constraints of this process, the rules of the game, but we can never work out the necessary and sufficient conditions of what should be called an "explanation". "What is an explanation" is a question that cannot be answered by a single philosophical account of explanation, but it is up to the various explanatory games to come to terms with this. The traditional theory suggests that we explain if and only if we use a theory of a certain sort (e.g. mechanistic, unificationist, manipulationist). According to my suggestion we explain if and only if we use a theory insofar as this theory is embedded in a certain explanatory game, where the "explanatory" is defined as a network of certain rule-guided practices.